Tighe&Bond

City of Easthampton - Anaerobic Digestion Feasibility Study

Prepared For:

City of Easthampton, Massachusetts

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Prepared with Support from the

MASSACHUSETTS CLEAN ENERGY CENTER

Executive Summary

With recent changes to the market for solar PV and the slower adoption of land-based wind in New England, Massachusetts has placed an increasing focus on anaerobic digestion (AD) as a critical piece of the state's clean energy future. Anaerobic digestion is a biological process during which microorganisms break down organic material in the absence of oxygen to produce biogas containing a high percentage of methane. The methane can then be used to generate electricity and/or heat. Depending on the type of digester and feedstock, additional useful outputs may be produced, such as a soil amendment and compost.

AD technology qualifies as a renewable energy technology through the state's RPS, and various agencies and offices including the Department of Environmental Protection (MassDEP), the Massachusetts Clean Energy Center (MassCEC), and Department of Energy Resources (DOER) have established funding programs to help advance the deployment of AD projects in the state. In addition to its clean energy benefits, there are other drivers for AD related to solid waste and materials management. MassDEP's 2010-2020 Massachusetts Solid Waste Master Plan calls for the aggressive diversion of food waste and other organic materials from the solid waste stream. The state's pending Organic Waste Ban (scheduled to take effect October 2014), will prohibit the disposal of commercially generated organic materials at landfills.

With the increased opportunities for AD in Massachusetts, the City of Easthampton has been approached by numerous private developers with interest in developing an AD project at the City's Ferry Street wastewater treatment facility (WWTF). An AD project at the WWTF has the potential to result in numerous benefits for the City, including:

- Generation of local, renewable energy
- Avoided cost savings for electricity and heat at the WWTF
- Avoided cost savings for wastewater sludge disposal and dewatering
- Potential revenue through lease payments
- Beneficial use of source-separated organic materials that formerly were disposed of at landfills

To better understand the technical and economic issues associated with such a project, the City engaged with Tighe & Bond to conduct a comprehensive Feasibility Study of the project. The Feasibility Study has been funded with a grant from the MassCEC, through its Organics to Energy (OtE) program. The Feasibility Study involves an evaluation of technical, site development, economic, and community impact factors to determine the feasibility of the project. Based on the results of the project, the City may proceed to the next steps of development, which would include further design, permitting, procurement, and construction of the project.

Project Site

The project site is located at the Easthampton Wastewater Treatment Facility (WWTF), situated at 10 Gosselin Drive off of Ferry Street in Easthampton, MA. The project site consists of two main parcels owned by the City. The WWTF is located on the east parcel, No. 130/24. The area for potential project development is located in the west parcel, No. 130/23, and is an open cleared area of approximately 2.6 acres. The site is currently used for materials storage by the Easthampton Department of Public Works (DPW). The parcel was formerly associated with the adjoining J. P. Stevens Mills textiles complex, which operated a textile production mill in the late 1920s until 1960s. The site was used for disposal of materials from the former textiles production operations until approximately 1969. Since that time, the site has been inactive.

Summary of Evaluations

The Feasibility Study report documents the data, assumptions, calculations and research used to support conclusions on technical and economic feasibility of an AD project at the Easthampton WWTF. For the purpose of this Executive Summary, the key findings and recommendations are provided below.

Site Assessment

The first step of the project involved an assessment of existing site conditions to determine any potential constraints or fatal flaws to the siting of an AD project. The analysis is based on a review of desktop and online information, plans and information provided by the City of Easthampton, and information collected on-site. The Site Assessment also includes a review of the site's existing electrical and thermal demand, and an assessment of existing electrical, heating, and other infrastructure. The results of the detailed site assessment are provided in Sections 2 and 3 of the Feasibility Study.

- **Physical Characteristics:** The facility is accessed from Gosselin Drive from Ferry Street just east of the Easthampton Water Tower. The WWTF and operations consumes a majority of the parcel. The area to the west of the WWTF is currently being used by Sewer Department as a stockpile and staging area for current projects. According to City personal, this is the preferred location for a potential AD facility. The site is very suitable for the proposed project, since the site is already engaged in wastewater treatment activities.

- **Environmental and Cultural Resources:** There are several jurisdictional inland wetlands and streams located adjacent to and within the project site that are protected pursuant to the Massachusetts Wetlands Protection Act (WPA). The western portion of the project parcel contains area of Estimated or Priority Habitat as mapped by the Natural Heritage and Endangered Species Program (NHESP). Additionally, Potential Vernal Pools are located approximately 250 feet north of the site at the Manhan River and 400 feet southeast of the site. Though there are mapped habitat and vernal pool areas proximate to the site, work is not proposed to occur within these areas and the project is not anticipated to cause any adverse impacts to environmental resources. There are no buildings at the WWTF property or in the immediate vicinity of the project site which are identified as historic properties. However, the project site is located proximate to areas that are included in MHC's Inventory of the Historic and Archaeological Assets of the Commonwealth which contain MHC Historic Inventoried properties. The entire project is located within a MassDEP Wellhead Protection Area.

- **Zoning:** The project site, parcel No. 130/23, is located in the Mixed Use / Mill Industrial (MI) district. Additionally, the site is partially located within mapped 100-year flood plain (flood zone AE), however, it is anticipated that the AD project can be sited outside of the portion of the parcel within the floodplain district. As the entire site is located within a MassDEP approved Wellhead Protection Area (Zone II), it is anticipated that the project will need to comply with the Wellhead Protection related land use restrictions of 310 CMR 22.21(2). Furthermore, since well number

1087000-07G is approximately less than one-half mile from the project site, it is assumed that the Aquifer Protection District restrictions may apply.

- **Permitting:** A summary of anticipated permitting obligations at the local, state, and federal level is provided in the Feasibility Study report. In addition to approvals that may be needed with regard to regulated resource areas at the site, this section of the report also addresses potential permits that may be required regarding air quality, wastewater, and composting and conversion. It is not anticipated that environmental or local land use permitting will be a challenge for the project.

- **Facility Energy Profile:** The WWTF currently consumes approximately 690,000 kWh of electricity per year. Over this period, the average monthly consumption was approximately 57,700 kWh with a minimum and maximum monthly consumption of approximately 49,990 kWh and 66,750 kWh respectively. The heating load at the WWTF is currently met through the use of number two fuel oil, liquefied propane (LP) and electric heaters. The total annual heating load of the facility is approximately 840 MMBTU with an average monthly heating load is 70 MMBTU. It was estimated that the WWTP uses 6,000 gallons of number 2 fuel oil and 4,000 gallons of propane annually.

- **Electrical Interconnection:** The project site is located within a Western Massachusetts Electric (WMECo) service area, in the West Central Massachusetts ISO-NE load zone. As part of this Feasibility Study, a Distributed Generation Pre-Application form was submitted to WMECo to obtain information about the proposed point of interconnection. Based on information provided by WMECo, power at the WWTF and proposed site is provided by the Gunn Substation located at the intersection of Line and Phelps Street. The voltage at the substation is 22.9kV and is constructed as four wire multi-grounded neutral Wye. The circuit supplying the WWTF is 15A5. It is presumed for purposes of analysis that the ultimate transformer will require a capacity of 1,000 kVA; the existing transformer has a capacity of 300 kVA. Net metering would be accomplished at the secondary voltage of 277/480 Volt four wire Wye.

The overall conclusion of the site assessment is that no fatal flaws related to environmental resources, site conditions, or on-site infrastructure exist that would prevent the development of an AD project at the site. The site is very suitable for the proposed project, since the site is already engaged in wastewater treatment activities. However, further coordination with WMECo should occur to determine the scope of a future impact study or whether system upgrades are required to accommodate the proposed project.

Feedstock Assessment

The Feasibility Study included a consideration of sludge waste generated on-site at the WWTF and off-site food waste. Organic feedstock generators that will be subject to MassDEP's pending organic waste ban within a 30 mile radius of the proposed AD facility were identified. A radius of 30 miles was selected based on a review of similar studies and experience from similar projects. The estimate of potentially available feedstock was determined based on an analysis of data provided by MassDEP and limited additional research in the vicinity of the project site.

Within a 30 mile radius of the Easthampton WWTF, there are approximately 263 institutional/ commercial entities that are expected to be subject to the one ton per week limit for the expected waste ban (i.e. generating 50 tons a year or more) that cumulatively generate approximately 69,290 tons a year assuming an estimated percentage of contamination specific to each generator category. The characteristics of organic waste generated by commercial and industrial sources vary considerably both across generator sectors and within the sectors themselves. The report provides the general waste characteristics by industry sector including typical moisture content, contamination levels, and types.

The Feasibility Study also included a discussion of potential options for the management and disposal/reuse of the digestate from each the AD process. Estimates of liquid and high solids digestate were provided. The digestate management and reuse scenario will ultimately be decided by the project developer.

Technical and Financial Analysis

Based on the identification of potentially available feedstock, and the quantity and characteristics of this material, a system size and type was identified for the Feasibility Study evaluation. Following an analysis to determine the suitability and composition of the SSOM, the following volumes of feedstock were modeled for the AD system: 48 tons per day (TPD) food waste and 4.9 TPD dewatered sludge.

While the Feasibility Study necessarily established a potential system size based on project site constraints and the potential availability of feedstock materials, it should be noted that the report does not represent a specific recommendation of a particular system size, type, or configuration. It is anticipated that if the City issues a solicitation for the project, it will allow respondents a level of flexibility with regard to project size and type.

Based on the feedstock inputs to each system, it was estimated that the 600 kW AD system could produce 7,500 ft^3/hr of biogas. The biogas generated by the AD project can be used to generate electricity and heat. Current electricity and thermal consumption data for the Easthampton WWTF was reviewed to determine current demands. For the purpose of the study, we elected to model a reciprocating engine cogeneration system that would use the biogas generated through the AD process. For the 600 kW system, it was estimated that 4,222 MWh of electricity would be produced annually. Based on current electrical consumption at the WWTF, the project can offset a significant amount of electrical demand.

The cogeneration system will generate a significant amount of waste heat, even after diverting a portion of it to the digesters and accounting for downtime for system maintenance. The excess heat generated by the cogeneration system can be used for space heating at the WWTF if an interconnection between the AD facility and the heating plant is made. The preliminary analysis shows that the unit can meet the majority of WWTF's heating demand; however during periods of cold weather or system downtimes it is expected that the facility would require supplemental heating.

Economic Assessment

The Feasibility Study included a life-cycle cost analysis completed for two project scenarios: a project that would be developed, owned and operated by the City and one that would be developed, owned, and operated by a private entity. The analysis included development of an economic pro forma for each scenario that incorporates project costs, financing mechanisms and incentives, and potential post-construction revenue. Costs include capital equipment; site development, design, and permitting; operations and maintenance; taxes; and financing. Revenue includes tax and other incentives; sale of Renewable Energy Credits, Alternative Energy Credits, CHP Rebates; and tipping fee from the feedstock. In the private developer scenario, it was assumed that the City would enter into a Power

Purchase Agreement with the developer for the electricity and Thermal Purchase Agreement to supply the WWTF's thermal load.

Under the City-owned scenario, the City of Easthampton would incur the cost of design, construction, and operation and maintenance of the project. In the private developer scenario, the developer would develop, own, and operate the AD facility through a PPA and/or lease agreement with the City. The same system size and associated capital costs were modeled for both scenarios. Food waste tipping fee revenue remained constant between both scenarios. Note that the pro forma was completed from the perspective of the private developer to gauge the financial performance of the project.

The economic pro forma analysis shows that ***as modeled***, only the publicly owned scenario is economically viable. Key differences between the two models include energy cost savings revenue to the City in the public scenario, and the impact of tax payments in the private scenario. Additionally, compared to other renewable energy technologies that can benefit from federal tax credits of 30% of capital costs, this credit is only 10% for AD/CHP. While the pro forma assumed the private project could benefit from accelerated depreciation, the first year 50% bonus was not considered.

In general, the results of the economic analysis point to several key drivers for AD projects; namely project size, tipping fee, digestate management, O&M costs, and the ability to offset electrical and thermal load. Most notably, tipping fee revenue and digestate disposal costs significantly impacted the viability of project modeled in the Feasibility Study. In the private scenario, revenue streams associated with power sales are not significant enough to overcome the relationship between tipping fees/ digestate management costs.

The Feasibility Study used conservative assumptions for cost and revenue inputs. The study includes a sensitivity analysis to test cost and revenue assumptions. ***Given the incentives for AD projects and regulatory drivers for organic material diversion, the initial results of the economic pro forma analysis do not mean that a project is not economically viable at the site.***

Conclusions and Recommendations

This report evaluated the feasibility of the installation of a potential AD system at the City of Easthampton WWTF. The intent of the study was to help the City determine whether the site is suited for an AD project and whether such a project could be technically and economically viable. The analysis modeled a private-development project, in which a private developer would develop, own, and operate the facility; and a City-owned scenario in which the City of Easthampton would be responsible to develop, own, and operate the AD facility.

The above factors affecting the feasibility of an AD project at the Easthampton WWTF are summarized in Table E-1, below. As shown on Table E-1, the economic evaluation determined that as modeled in the Feasibility Study only the public scenario is viable. The economics for the publicly owned project are more attractive due to the significant energy cost savings revenue enjoyed by the City. ***Tighe & Bond employed conservative values in our analysis and assumed revenue would not be produced from the potential reuse of digestate. Should a private developer be able to utilize additional revenue sources or reduce digestate disposal costs, the project economics would improve significantly.***

It should be noted that the quantity of food waste available to the project was based on the Draper/Lennon study which provided the most comprehensive data source of available generators in the region. However, the Draper/ Lennon study does not account for current diversion practices. Based on our outreach efforts with regional generators, several commercial and institutional entities have initiated practices to reduce waste generated and/or currently divert their organic waste to other disposal facilities, such as local farms. The sizing and economics of the project are subject to change depending on the quantity of feedstock available.

Given the potential benefits of the project to the city and suitability of the site, it is recommended that the project proceeds to the procurement stage to solicit responses from the development community.

Recommended next steps to be conducted either by the City or a private developer, and either prior to procurement or as part of project development, include:

- Confirmation of the availability and composition of feedstock for the project.
- Confirm status of other AD projects in project area, and determine the potential impact to a project at the Easthampton WWTF.
- Confirmation of project development costs (including modification to the WWTF and interconnection costs).
- Additional site evaluation, including topographic survey and geotechnical evaluations prior to design of tanks, footings, and foundations to determine the actual soil characteristics to design the bearing structures accordingly. A formal wetland delineation should occur to confirm wetland boundaries on-site.
- Confirmation of current heating demand and estimated thermal costs at the WWTF
- Additional evaluation of water needs for the project, including domestic and fire prevention needs.
- Consideration of management scenarios and economics associated with digestate from the AD process
- Further coordination with WMECo with regard to electrical interconnection and remaining capacity on the proximate circuit
- Pre-permitting consultation with the City of Easthampton to confirm the local zoning permit requirements and consultation with MassDEP to confirm the air quality permitting strategy

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TABLE E-1
Easthampton WWTF Anaerobic Digestion Project - Overview of Project Feasibility

Project Owner:	**City of Easthampton Ownership**	**Private Developer Ownership**	
Feedstock: **Scenario:**	WWTF, Sludge & Food Waste **1**	WWTF, Sludge & Food Waste **2**	**Comments:**
Factor:			
Rated Capacity	600 kW	600 kW	
Land Use	No conflict expected	No conflict expected	As the project site is located within a MassDEP approved Zone II, it is anticipated that the project will need to comply with the Wellhead Protection related land use restrictions of 310 CMR 22.21(2).
Zoning	Site Plan Review or Special Permit Approval from Planning Board	Site Plan Review or Special Permit Approval from Planning Board	If the project is considered an extension of the WWTF, Site Plan Review is required. If the project is considered a power plant facility, a Special Permit will be required.
Electrical Interconnection	East side of operations building. Existing 3 phase power lines.	East side of operations building. Existing 3 phase power lines.	
Thermal Interconnection	Interconnect with WWTF	Interconnect with WWTF	
Feedstock Assumed for System	50 Tons Per Day Food Waste 10,000 Gallons Sludge	50 Tons Per Day Food Waste 10,000 Gallons of Sludge	
Estimated Biogas Production (ft^3/hr)	7,500	7,500	
Estimated Annual Electrical Generation (MWh)	4,222	4,222	
Estimated Annual Thermal Generation (MMBTU)	11,000	11,000	
Estimated Digestate Production:			
Dewatered Digestate (tons/day)	14.5	14.5	
Liquid Digestate (gallons/day)	16,800	16,800	
Environmental Factors:			
Historic and/or Cultural Resources	Minimal/No Impact	Minimal/No Impact	Must submit Project Notification Form to Massachusetts Historical Commission.
Rare Species	No impact	No impact	Project not located within the limits of mapped Natural Heritage and Endangered Species Program (NHESP) Estimated Habitats for Rare Wildlife or Priority Habitats for Rare Species.
Wetlands	Minimal	Minimal	Order of Conditions from Conservation Commission/Determination of Applicability likely required.
Permitting Requirements	Moderate Permitting Effort	Moderate Permitting Effort	Comprehensive Plan Approval required from MassDEP may require modeling and comprehensive evaluation. Will require MassDEP approval to accept organic waste and local approval via the Industrial Pretreatment Program.
Economic Factors:			
Est. Capital Cost	$5,408,500	$5,408,500	
Est. O&M Cost	$214,579	$214,579	
Financial Viability:			
IRR (leveraged)	11.5%	N/A	
NPV (leveraged)	$1,189,644	-$3,075,890	
Payback Period (yrs, leveraged)	8.4	47.8	
Economic Feasibility	YES	NO	

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SECTION 1

Section 1
Introduction

The Commonwealth of Massachusetts has established an ambitious set of clean energy goals, as evidenced by the passage of key legislation such as the Green Communities Act and the Global Warming Solutions Act; the establishment of the Massachusetts Clean Energy Center (MassCEC) and the Department of Environmental Protection's Clean Energy Results Program; and the development of strong incentives for renewable energy through the state's Renewable Portfolio Standard (RPS). These initiatives help promote the responsible siting of clean energy technology which will lead to reduced greenhouse gas emissions, stronger local economies, and increased job opportunities for Massachusetts residents.

The City of Easthampton is also a clean energy leader, with a proven record of completing innovative projects in the interest of environmental sustainability. In 2012, the City developed a 2.3 MW solar PV system at the Oliver Street Landfill. This was the first solar PV project on a landfill in the Commonwealth of Massachusetts and generates nearly three million kilowatt hours of electricity per year. One of the first designated Green Communities in the state, Easthampton also recently established a citizen-led Energy Committee, who is working with the Mayor and City Planner to further promote clean energy projects.

With recent changes to the market for solar PV and the slower adoption of land-based wind in New England, Massachusetts has placed an increasing focus on anaerobic digestion (AD) as a critical piece of the state's clean energy future. Anaerobic digestion is a biological process during which microorganisms break down organic material in the absence of oxygen to produce biogas containing a high percentage of methane. The methane can then be used to generate electricity and/or heat. Depending on the type of digester and feedstock, additional useful outputs may be produced, such as a soil amendment and compost.

AD technology qualifies as a renewable energy technology through the state's RPS, and various agencies and offices including the Department of Environmental Protection (MassDEP), the Massachusetts Clean Energy Center (MassCEC), and Department of Energy Resources (DOER) have established funding programs to help advance the deployment of AD projects in the state.

In addition to its clean energy benefits, there are other drivers for AD related to solid waste and materials management. MassDEP's 2010-2020 Massachusetts Solid Waste Master Plan calls for the aggressive diversion of food waste and other organic materials from the solid waste stream. The state's pending Organic Waste Ban (scheduled to take effect October 2014), will prohibit the disposal of commercially generated organic materials at landfills. To encourage the development of AD projects that will help meet organic material diversion goals, Massachusetts has recently revised several key regulations for materials management and wastewater facilities to better facilitate this kind of project.

With the increased opportunities for AD in Massachusetts, the City of Easthampton has been approached by numerous private developers with interest in developing an AD project at the City's Ferry Street wastewater treatment facility (WWTF). An AD project at the WWTF has the potential to result in numerous benefits for the City, including:

- Generation of local, renewable energy
- Avoided cost savings for electricity and heat at the WWTF
- Avoided cost savings for wastewater sludge disposal and dewatering
- Potential revenue through lease payments
- Beneficial use of source-separated organic materials that formerly were disposed of at landfills

To better understand the technical and economic issues associated with such a project, the City engaged with Tighe & Bond to conduct a comprehensive Feasibility Study of the project. Tighe & Bond has a long history of involvement at the WWTF and with other renewable energy projects in the City, as well as significant technical experience related to AD projects. The Feasibility Study has been funded with a grant from the MassCEC, through its Organics to Energy (OtE) program.

The Feasibility Study involves an evaluation of technical, site development, economic, and community impact factors to determine the feasibility of the project. Based on the results of the project, the City may proceed to the next steps of development, which would include further design, permitting, procurement, and construction of the project.

1.1 Site Location & History

The project site is located at the Easthampton Wastewater Treatment Facility (WWTF), situated at 10 Gosselin Drive off of Ferry Street in Easthampton, MA. Figure 1-1 at the end this section depicts the site location within Easthampton. The project site consists of two main parcels owned by the City. See Figure 1-2 at the end of this section for a parcel map of the project site. The WWTF is located on the east parcel, No. 130/24. The area for potential project development is located in the west parcel, No. 130/23. A more detailed description of the project site and existing facilities is provided in Section 2 of the report. The site under consideration for the siting of an AD project is an open cleared area of approximately 2.6 acres. The site is currently used for materials storage by the Easthampton Department of Public Works (DPW). The parcel was formerly associated with the adjoining J. P. Stevens Mills textiles complex, which operated a textile production mill in the late 1920s until 1960s. The site was used for disposal of materials from the former textiles production operations until approximately 1969. Since that time, the site has been inactive.

1.2 Project Description

As described in further detail in this report, the size and type of AD project evaluated as part the Feasibility Study is based on potentially available feedstock, project site considerations, and input from the City of Easthampton. Please note that the exact size, feedstock mix, type of equipment, and other factors are likely to change as the project proceeds into further design. The project evaluated would use wastewater sludge and food waste from surrounding communities as feedstock for the AD system. The AD system modeled as part of the study is a continuous feed, wet AD system that will process feedstock at about 12% total solids. Biogas from the project would be used to run a combined heat and power generator. Electricity and heat from the project would be used to provide parasitic load to the digesters, heat and power to the WWTF facility, and then any net excess electricity would likely be used to offset demand at other municipal facilities through net metering. For the purpose of the Feasibility Study, we have assumed that digestate from the AD process would be dewatered at the AD facility. The remaining solids would be hauled off-site while the liquid filtrate would be returned to the WWTF for treatment and disposal.

The City has expressed interest in partnering with a private entity who would design, develop, construct, own, and operate the facility; however the Feasibility Study compares both public and private ownership scenarios.

Infrastructure associated with the project could potentially include two large digester tanks; an operations building or an enclosed operations building with a tipping floor for solid food waste; a cogeneration building; a flaring system; and some outbuildings. A small above-ground structure would likely be required to house the generation equipment and electrical infrastructure. For the purpose of the Feasibility Study and because biosolids are part of the feedstock mix, we have assumed that solid digestate would not be stored or processed on site. See Section 6 for additional information on the potential facility layout and associated figures. It is not anticipated that substantial vegetation clearing will be required to accommodate the project due to the previously disturbed nature of the site.

1.3 Feasibility Study Overview

The scope of work for the Feasibility Study was developed in coordination with the City of Easthampton and MassCEC. Following this introduction, Section 2 of the report provides the results of the detailed site evaluation, including an analysis of potential environmental impacts, site constraints, and permitting and zoning requirements. An overview of existing electrical and heating infrastructure and usage at the WWTF is provided in Section 3.

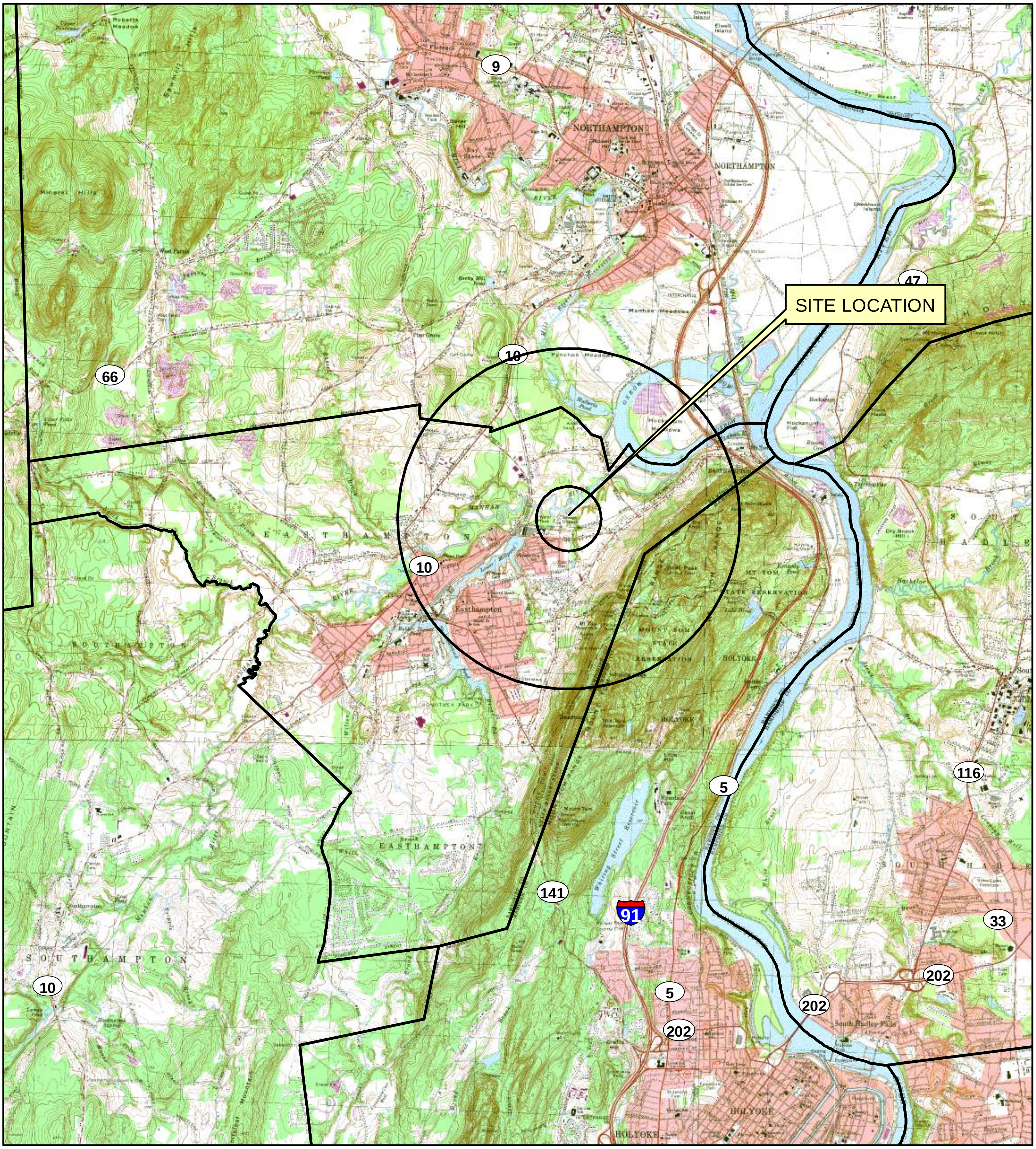
Section 4 of the report provides a discussion of potential sources of feedstock that may be available to the project. Data on wastewater sludge currently generated at the WWTF is provided. Section 4 also presents the results of the food waste characterization that was conducted for the project. The evaluation focuses on generators within a 30 mile radius of the site that will be subject to MassDEP's pending Organic Waste Ban.

Based on the identification of potentially available feedstock, and the quantity and characteristics of this material, an AD system size and type were identified for the Feasibility Study evaluation. Section 5 of the report presents the results of the technical evaluation conducted for the project, including an overview of biogas production potential, required system components, and facility outputs (i.e. electricity, heat, and digestate). While the Feasibility Study necessarily established a potential system size based on project site constraints and potentially available food waste, it should be noted that the report does not represent a specific recommendation of a particular system size, type, or configuration. It is anticipated that if the City issues a RFP or RFQ for the project, it will allow respondents a significant level of flexibility with regard to project size and type.

Section 6 presents a preliminary conceptual facility layout and a discussion of how the project would be integrated with existing facilities at the WWTF. Section 7 provides a discussion of potential community impacts, including noise, odor, and traffic. This section also provides a summary of the Community Engagement Plan that was completed at the beginning of the project, per MassCEC program requirements.

Section 8 of the report presents the results of the life-cycle cost analysis completed for the two project ownership scenarios. The analysis included development of an economic pro forma that incorporates preliminary project costs and revenues. The report summarizes assumptions about potential sources of funding and revenue, as well as project costs including equipment, project development, operations & maintenance, financing, and other factors. The results of the project are compared against a variety of standard financial project metrics including payback period, annual and cumulative cash flow, net present value, and internal rate of return.

Section 9 of the report provides a concluding summary of the entire analysis, and recommended next steps for additional evaluation and project implementation.



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Feet

Based on USGS Topographic Map for Easthampton, Mount Holyoke, Mount Tom, and Springfield North, MA Quadrangles.
Revised 1979. 10-Foot Contour Interval.

Circles indicate 500-foot and half-mile radii

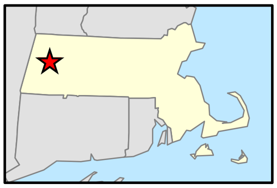

FIGURE 1-1
USGS PROJECT LOCATION MAP

WWTF
Easthampton, Massachusetts

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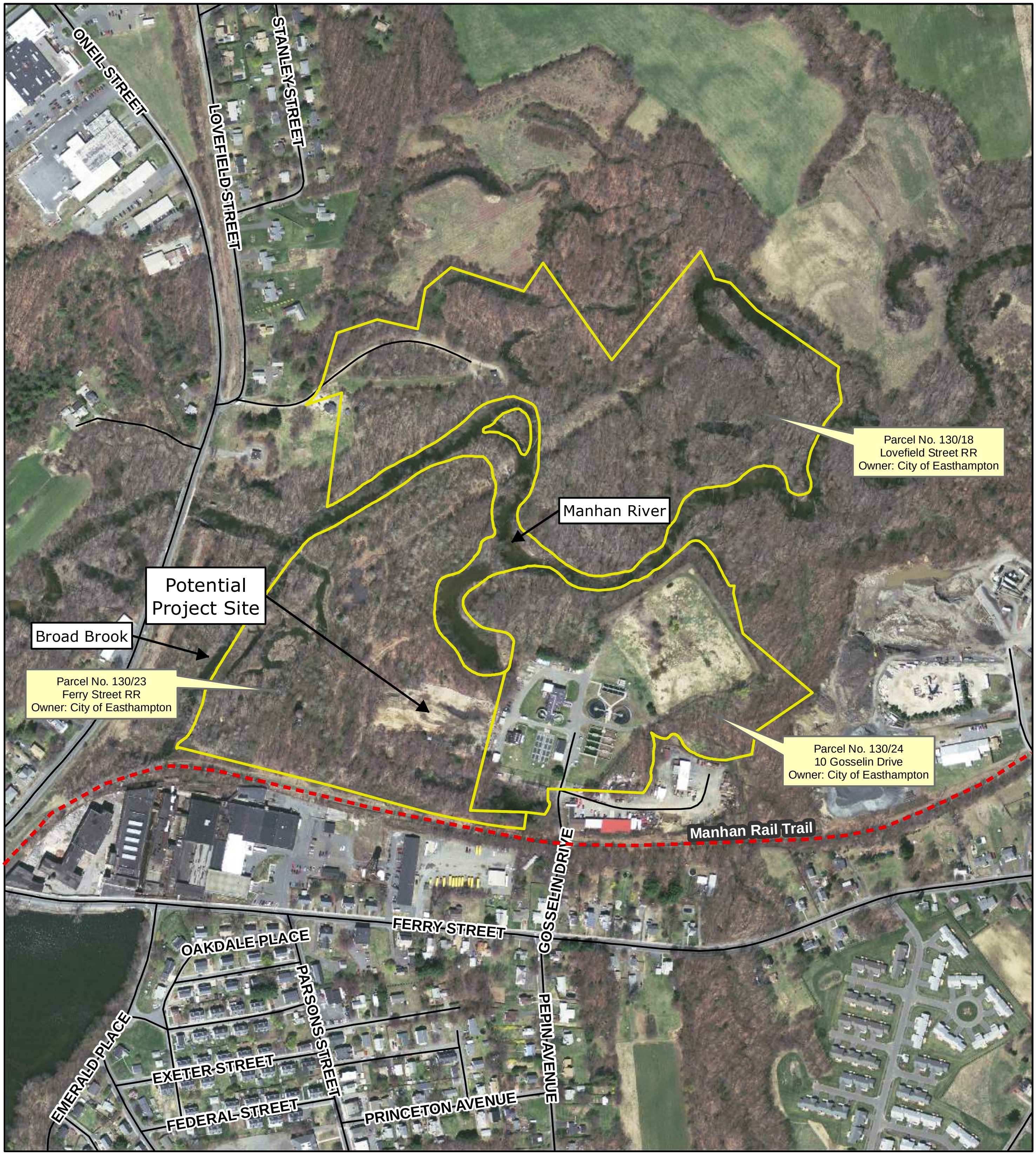
January 2014



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Legend

City of Easthampton Parcels

Based on MassGIS Color Orthophotography 30cm (April 2009)

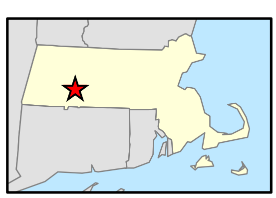

FIGURE 1-2
Parcel Map

WWTF
Easthampton, Massachusetts

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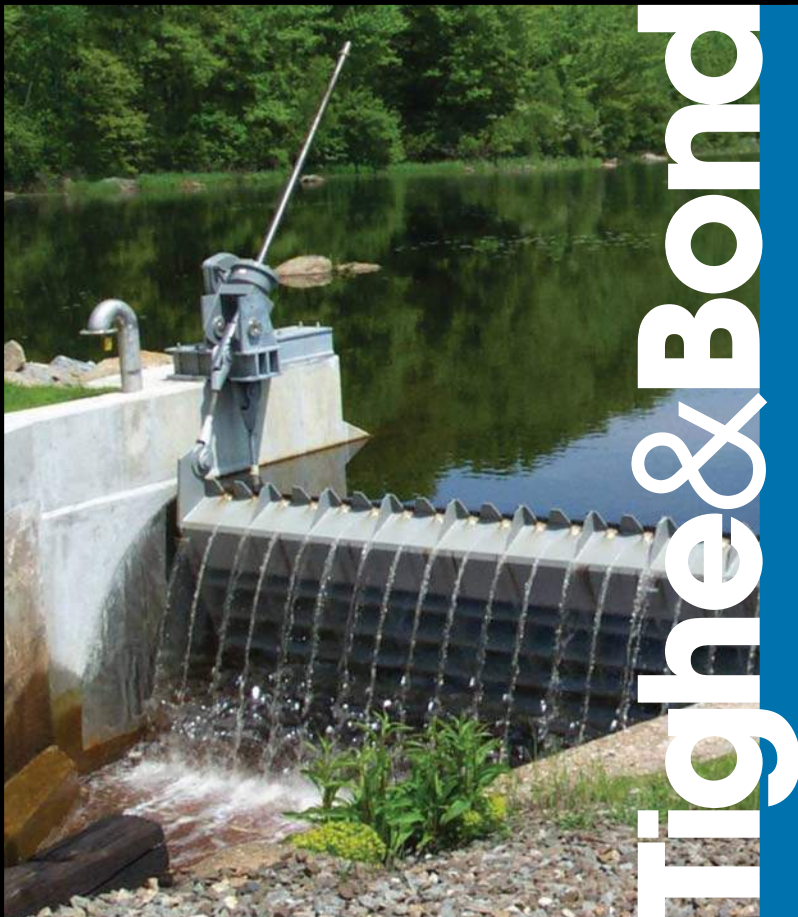
January 2014



SECTION 2

Section 2
Detailed Site Assessment

The following sections of the report provide an evaluation of the site's physical, environmental, and cultural characteristics to identify potential development constraints, environmental impacts, and to develop a preliminary project layout. The analysis is based on a review of desktop and online information; plans and information provided by the City of Easthampton; and information collected at a December 19, 2013 site visit and previous visits to the site. Photos from the site visit are included in Appendix A.

2.1 Physical Characteristics

The facility is accessed from Gosselin Drive off of Ferry Street. The site is comprised of two parcels. The WWTF is located on Parcel No. 130/24. A second City-owned property, Parcel No. 130/23, is the proposed location of the AD facility. This site is currently used by the Department of Public Works for materials storage and staging. Both parcels are bound to the north by a large parcel owned by the City of Easthampton, which is adjacent to a large area of protected land. Please refer to Figure 1-2, attached to Section 1, for an overview of site parcels.

The project site is bound to the south by the Manhan Rail Trail Bikeway. Property uses to the south of the bikeway along Ferry Street include industrial and manufacturing activities. There are also residential properties proximate to the WWTF, including one on Gosselin Drive, the primary access to the WWTF. To the southwest of the potential project site is the former J.P. Stevens Mills Complex. West and north of the site is the Manhan River, Broad Brook, and associated wetlands, as further described in this section. The site is well suited for the development of an AD project given its current use, and remote and buffered location.

The area is generally level and cleared. According to the National Resources Conservation Service, the majority of the soil on proposed location is a Ninigret fine sandy loam. Please refer to Appendix B for the complete Natural Resources Conservation Services hydrologic soil map of the project site.

2.2 WWTF Facility

The WWTF was designed and constructed as a 3.8 million gallons per day (MGD) secondary wastewater treatment facility that receives a combination of domestic and industrial wastewater from the City of Easthampton. The collection system is a gravity system with pump stations in low-lying areas. The wastewater flows by gravity though the liquid treatment processes at the WWTF to the receiving waters. The primary discharge is to the Connecticut River. Flows above approximately 3.1 MGD discharge to the Manhan River. Annual WWTF flows since 2005 average 2.14 MGD, approximately 56% of the permitted flow.

The conventional activated sludge plant was constructed in 1971 and is comprised of a headworks (mechanically-cleaned bar screen and aerated grit tanks), four rectangular primary clarifiers, two aeration tanks, two circular secondary clarifiers and two chlorine contact tanks. The final treated effluent is dechlorinated and discharged to the Connecticut River and Manhan River. Primary and secondary sludge is thickened in a gravity thickener and dewatered using a belt filter press (BFP). Dewatered sludge is trucked off site to the Synagro facility in Waterbury, CT. Decant from the thickener and filtrate from the BFP are returned to the primary clarifiers. Typically, the facility accepts minimal quantities of septage, approximately one to two truckloads per month. Septage is discharged to the headworks and combined with the influent flow from the collection system.

The two aeration tanks are 50-foot by 100-foot rectangular basins with a 12-foot sidewater depth. Two 50-HP mechanical aerators in each basin provide oxygen for biochemical oxygen demand (BOD) removal. Clarification of the activated sludge is provided by two 65-foot diameter center feed clarifiers with draft tube sludge return pipes. The two return activated sludge pumps are designed with Variable Frequency Drives and have a capacity of 1,500 gpm each. Sludge is transferred from the bottom collection well of the clarifier, and dedicated WAS pumps transfer the sludge from the clarifiers to the gravity thickener.

To the north of the existing clarifier tanks is an inactive sludge residual landfill. According to DPW staff, this area has reportedly been partially capped with glacial till and would likely be unsuitable for development due to the soil conditions.

Please refer to Figure 2-1 for an overview of the existing WWTF layout and site conditions.

2.3 Historical Environmental Site Assessment Issues

Tighe & Bond reviewed the MassDEP Waste Site Cleanup files for the Ferry Street Site (RTN 1-00067) in Easthampton as they relate to the proposed construction of an anaerobic digestion project on the parcel adjacent to the City's WWTF. The site assessment file includes a Phase II report prepared by Weston & Sampson on behalf of the City in August 2002. The full report is available for download on MassDEP's website. According to the report, this area was used as a water treatment area for the former J.P. Stevens textile mill complex that operated adjacent to this property between the early 1900s and the 1960s.

Weston & Sampson drilled soil borings, installed monitoring wells and excavated test pits within the property, but these assessment activities were focused within a coal ash/lime waste fill area (north of the proposed project area), a suspected former waste pipe outfall (west of the proposed project area) and a half-buried storage tank (contents unknown) south of the proposed project area. There were no assessment activities performed within the footprint of the proposed digester project. Please refer to Figure 2-2 for the Site Plan from the Weston & Sampson Phase II report.

The soil and groundwater data generated during the Phase II were reviewed relative to the current Massachusetts Contingency Plan (MCP) Reportable Concentrations (RCs) to evaluate whether a Release Abatement Measure (RAM) Plan might be necessary during construction. The data tables were updated with the current RCs and the data reviewed. The only exceedence of the current RCs identified was for chromium and nickel in the soil sample from boring B-104 at a depth of 25 to 27 feet. This boring is located within the ash disposal area, north of the proposed project area. Construction activities are not expected to disturb soils at this depth, so these soils would not be handled, even if conditions at B-104 extended to the project area.

Additional borings were conducted immediately west of the proposed project area and samples collected from a depth of 1 to 2 feet were analyzed for volatile organic compounds (VOCs) and extractable petroleum hydrocarbons (EPH) with target analytes. Low concentrations of three VOCs were detected in one of the samples. EPH and target analytes were detected in two of the samples. The detected concentrations were well below the most conservative RCS-1 values.

While it is reasonable to infer that the surficial/shallow conditions within the proposed work area do not vary significantly from conditions in these three borings, we cannot be certain of this without performing some limited subsurface assessment work within the proposed project area. It is recommended that once the layout of the system has been determined and the areas to be graded, excavated for footings, and trenched for subsurface connections to the WWTF are known, that a limited subsurface assessment be performed so that soil conditions are known prior to the initiation of construction. This will avoid the potential delays associated with the preparation of a Release Abatement Measure Plan if contamination is detected during construction. It will also allow proper management of any excess soils from the project.

If the project proceeds under a private ownership scenario, the City may also wish to establish pre-occupancy conditions before the lessor occupies the site such that any environmental degradation caused by the lessor can be identified at the time of lease termination/expiration so the City does not incur that liability after-the-fact.

2.4 Environmental and Cultural Resources

Environmental factors considered as a part of this analysis include the location of wetlands, rare and endangered species, vernal pools, abutting land uses, and protected open space. These factors were evaluated using MassGIS data and site reconnaissance. Cultural factors were evaluated using the 2011 Massachusetts State Register of Historic Places and the Massachusetts Cultural Resource Inventory System (MACRIS).

2.4.1 Historic and/or Cultural Resources

Any new construction projects or renovations to existing buildings that require funding, licenses, or permits from any State or federal governmental agencies must be reviewed by the Massachusetts Historical Commission (MHC) for potential impacts to historic and archaeological properties or sites. As the project will likely require at least one state permit, it must be reviewed by MHC to ensure that it will not cause adverse impacts to historic or archaeological resources.

Tighe & Bond conducted a preliminary search for historic properties in Easthampton using the Massachusetts Cultural Resource Information System (MACRIS) database. MACRIS data are compiled from a variety of records and files maintained by MHC, including but not limited to, the Inventory of Historic Assets of the Commonwealth, National Register of Historic Places nominations, State Register of Historic Places listings, and local historic district study reports. The system includes no information on archaeological sites. Tighe & Bond also reviewed the 2011 Edition of the State Register of Historic Places.

As shown on Figure 2-3, there are no buildings at the WWTF property that are identified as historic properties. Additionally, the State Register did not identify any historic properties within the immediate vicinity of the project site. However, the MACRIS database indicated that the project site is located proximate to areas that are included in

MHC's Inventory of the Historic and Archaeological Assets of the Commonwealth. The Ferry Street Mills Inventoried Area contains a number of inventoried buildings and is bound by the Manhan Rail Trail to the north, Ferry Street to the south, Lovefield Street to the west, and continues east to the intersection of Parsons Street with Ferry Street. The MACRIS database notes the area was used as a textile mill industrial complex or district. The New City Inventoried Area is located farther from the project site than the Ferry Street Mills Area and is primarily located south of Ferry Street. However, as shown on Figure 2-3, four inventoried properties are located north of Ferry Street within this area. Five additional inventoried properties are located 1,100 to 1,400 feet west of the project on Lovefield Street.

A Project Notification Form (PNF) should be completed and submitted to MHC to initiate the formal MHC review process. MHC will evaluate the project's potential to adversely impact proximate historic and archaeological resources and will determine the need for any potential archaeological investigations or whether the project might result in an adverse effect. Due to the thick vegetated buffer around the project site, impacts to historic resources are not anticipated; however this should be confirmed through consultation with MHC.

2.4.2 Rare Species

As shown on Figure 2-4, the western portion of the project parcel contains an area of Estimated or Priority Habitat as mapped by the Natural Heritage and Endangered Species Program (NHESP) Natural Heritage Atlas (13th Edition, Effective October 1, 2008). Additionally, per MassGIS data, Potential Vernal Pools are located approximately 250 feet north of the site at the Manhan River and approximately 400 feet southeast of the site. Though there are mapped habitat and vernal pool areas proximate to the site, work is not proposed to occur within these areas and the project is not anticipated to cause any adverse impacts to rare species or vernal pool habitat.

2.4.3 Wetlands

As shown on Figure 2-4, there are several jurisdictional inland wetlands and streams located adjacent to and within the project site that are protected pursuant to the Massachusetts Wetlands Protection Act (WPA). The City does not have a local wetlands protection ordinance. Please note that a formal wetlands delineation has not been conducted at the site as part of this project, and preliminary observations regarding on-site wetlands are based on a review of MassGIS data and orthophotographs.

The Manhan River is located to the north of the site and facility, and Broad Brook is located to the west of the project site. According to the Wetlands Protection Act (WPA), a river or stream is considered perennial if it is shown as perennial on the current USGS quadrangle or more recent map provided by MassDEP. Perennial streams (i.e., rivers) have an associated Riverfront Area (RFA) that is defined as the area of land between a river's mean annual high-water line and a parallel line located 200 feet away. Figure 2-4 depicts the approximate 200' RFA from these streams.

The site also contains inland wetlands and their associated 100' buffer zone. As shown on Figure 2-4, we have assumed that the inland wetland to the north of the project site is not hydrologically connected to the Manhan River as there appears to be an earthen berm between the two waterbodies. This area is also shown as a potential vernal pool based on MassGIS data. To the south of the potential project site is another inland wetland area and associated 100' buffer zone. Note that the potential vernal pool symbol on Figure 2-4 is likely associated with this resource area and its location is a

MassGIS error. MassGIS data also indicates another perennial stream to the east of the WWTF on the sludge residuals landfill; we have assumed the stream no longer exists due to site activities (grading, seeding, etc) and is non-jurisdictional per the MA WPA.

Depending on the final layout of the project, and the results of a formal wetlands delineation, project activities may occur within a portion of the 100' buffer zone to inland wetlands at the site. If this occurs, permission must be granted by the Easthampton Conservation Commission via the issuance of an Order of Conditions or a Negative Determination of Applicability for work in the buffer zone. Based on initial observations, it is not anticipated that the project will result in any direct wetland impacts, or impacts to the 200' RFA. We note that the project may be exempt from RFA requirements pursuant to 310 CMR 10.58(6)(h) which applies to the following uses: *"construction, expansion, repair, restoration, alteration, replacement, operation and maintenance of public or private local or regional wastewater treatment plants and their related structures, conveyance systems, and facilities, including utility lines."*

The MA WPA also regulates areas of inland flooding as Bordering Land Subject to Flooding (BLSF). In some, but not all cases, BLSF is coincident with the 100-year floodplain as shown on Flood Insurance Rate Maps (FIRMs). As defined in the MA WPA at 310 CMR 10.57(2), the boundary of BLSF is the estimated maximum lateral extent of flood water which will theoretically result from the statistical 100-year frequency storm. The precise boundary is determined based on the most recently available flood profile data prepared for the community under the National Flood Insurance Program, currently administered by the Federal Emergency Management Agency. For the purpose of the Feasibility Study, we have evaluated the extent of 100-year floodplain at the site based on MassGIS data associated with the 2013 FIRM as shown on Figure 2-5. Note that a small portion of the western end of the potential project site may be located within the 100-year floodplain. The extent of BLSF should be confirmed at the site as part of a formal wetlands delineation and topographic survey, to compare site elevations to flood profile data. Work activities within BLSF will require an Order of Conditions from the Easthampton Conservation Commission and the provision of compensatory storage for any lost flood storage capacity.

2.4.4 Protected Open Space/ Drinking Water Resources

The proposed project site is not located within an area mapped by MassGIS as Open Space. As shown on Figure 2-4, there is protected open space located to the north of the property. This area is the municipally owned Lovefield wellfield. As noted on Figure 2-4, the project site is located within a MassDEP Approved Wellhead Protection Area (Zone II) of the Lovefield Wellfield. Wells are located approximately 1,300 feet to the north of the project.

2.5 Zoning

The project site consists of the two parcels owned by the City of Easthampton as shown on Figure 1-2, attached to the end of Section 1. The western parcel (Parcel No. 130/23) consists of approximately 21.81 acres of unutilized, vacant land and offers the most appropriate location for an AD project. According to the City's Zoning Map (dated December 16, 2003), Parcel No. 130/23 is located in the Mixed Use / Mill Industrial (MI) district and Parcel No. 130/24 is located in the Industrial (I) district. Please refer to Figure 2-6 for a snapshot of the City's zoning map highlighting the project site location.

As can be seen on Figure 1-2, Parcel No. 130/23 does not have any frontage. Based on discussions with the City of Easthampton, the site is generally considered an extension of the main WWTF site, sharing access from Gosselin Drive. Based on a review of the Table 5-1 *(Easthampton Table of Use Regulations)* of the City's Zoning Ordinance, it is likely that an AD project on the site would be considered an expansion of the existing WWTF or a Power Plant.

If the project is considered an expansion of the WWTF it would require Site Plan Review and approval from the Planning Board. The Site Plan Review application generally requires the following information: existing conditions, proposed conditions, grading and stormwater management, utility plan, and landscape plan. See Section 12.74 of the Zoning Ordinance for additional submittal requirements. The project could also be permitted as a Power Plant facility. Under community facility uses in Section V of the Zoning Ordinance, solar energy facilities and power plants are permissible by Special Permit from the Planning Board. Per Section 12.75 of the City's Zoning Ordinance, a detailed site plan must be submitted with the Special Permit application and a public hearing is required.

A portion of Parcel No. 130/23 is partially located within mapped 100-year flood plain (flood zone AE) and the Wireless Communications Overlay District. Section 7.12 establishes a Floodplain Overlay District which includes Zones A and A1 through 30 of the Easthampton Flood Insurance Rate Map (FIRM). The boundaries of the district are defined by the 100-year water surface elevations shown on the FIRM. Areas within the floodplain district must comply with the conditions of Section 7.13 of the Zoning Ordinance, which requires a Special Permit for any new building in the district. As shown on Figures 2-5 and 6-1, it is anticipated that the AD project can be sited outside of the portion of Parcel No. 130/23 within the floodplain district.

As the entire site is located within a MassDEP approved Wellhead Protection Area (Zone II), it is anticipated that the project will need to comply with the Wellhead Protection related land use restrictions of 310 CMR 22.21(2). These regulations prohibit land uses and the storage of certain materials that could be hazardous to groundwater. Additionally the location of the site has been designated by MassDEP as a potentially productive medium yield aquifer for future water supply. The City has established an Aquifer Protection Overlay District to preserve groundwater resources from adverse development and land use practices.

Based on a review of the City's Zoning Map, the project site is not within the Aquifer Protection Overlay District (see Figure 2-6). However, Section 7.03 of the City's Zoning Ordinance states that the district "consists of lands lying within the primary and secondary aquifer recharge of groundwater aquifers or within one-half mile radius of wells…" Since Well No. 1087000-07G is approximately less than one-half mile from the project site; it is assumed that the Aquifer Protection Overlay District restrictions may apply. The AD project could be allowed by Special Permit based on Section 7.053 of the ordinance, which allows uses permitted in the underlying district (either by right or by Special Permit). However, the project would require design considerations to prevent compaction and siltation, loss of recharge, seepage from sewer pipes and contamination of groundwater, and would be subject to the Aquifer Protection performance standards established in Section 7.054 of the Zoning Ordinance.

2.6 Constraints Map

The results of the above evaluation are depicted graphically on Figure 2-7 (Development Constraints Figure), which highlights opportunities for and constraints to project development. As shown on the Figure, the existing cleared area of the site is approximately 2.06 acres. Note that work in some portions of the cleared area may require approval from the Easthampton Conservation Commission for work in the buffer zone or BLSF, depending on the outcome of additional site evaluations.

The site parcel does not have any frontage area and the eastern border of the project site immediately abuts the WWTF located on the neighboring parcel (Parcel N0. 130/24). Based on consultation with the City Planning Department, the project would likely be considered an expansion to the existing WWTF. The remaining borders of the proposed project site are buffered by wooded areas and are setback at least 80 feet from parcel boundaries. Parcels within the MI district are required to have a 15 foot side setback and 30 foot front and rear setbacks. Tighe & Bond assumed that a 15 foot setback may apply to the eastern parcel boundary and considered this setback in our determination of the potential developable area. We recommend that the developer confirm any setback requirements.

2.7 Regulatory Assessment

Based on our understanding of the proposed project and anticipated impacts, we have prepared the table at the end of this section (Table 2-1) that summarizes potential local, state, and federal approvals that may be required for the project. Note that we have evaluated the permitting requirements for the project as assessed during the Feasibility Study, which does not include permits that may be required for hazardous material abatement or building demolition.

Permitting requirements are subject to change should the project deviate from what has been assumed for the purpose of this Feasibility Study. Table 2-1 also highlights new permits related to the operation of the proposed anaerobic digestion facility in conjunction with the existing WWTF. In addition to the permitting table, we have provided some additional discussion below regarding potential air quality and wastewater permitting requirements for the project. Though this study assumes that the solid digestate disposal and/or reuse will be evaluated in greater detail by a private developer, we have also provided some additional information below regarding potential permitting requirements for digestate management.

2.7.1 Air Quality

MassDEP has the discretion to require a Comprehensive Plan Approval (CPA) for a new or existing facility in instances where the facility, equipment, or operations emissions are below any threshold contained in the regulations if it is determined the emissions will cause a condition of air pollution (e.g. create a nuisance), or have the potential to do so. MassDEP has indicated that all AD facilities are being permitted through the CPA process, regardless of whether a project may qualify to be permitted via the MassDEP Environmental Results Program or other regulatory mechanism. As such, it has been assumed that the project will require the submittal of a CPA to MassDEP as a fuel utilization facility pursuant to 310 CMR 7.02. This filing typically includes a best available control technology (BACT) evaluation. We anticipate that the CPA for the project site will also address the excess biogas that will be flared during periods of maintenance.

At a minimum, the CPA submittal will require a certification that all facilities under common control are in compliance with the 310 CMR 7.00 regulations or on a MassDEP-approved compliance schedule; and a description of the proposed project, including calculations of expected emissions. The generator system evaluated as part of this Feasibility Study includes equipment to meet the emissions related requirements.

MassDEP may also require a modeling analysis to be conducted as part of project review to demonstrate the facility will not violate the National Ambient Air Quality Standards for carbon monoxide, sulfur dioxide, particulate matter, fine particulates, nitrogen dioxide, ozone, and lead. Noise modeling may also be required to demonstrate the project's compliance with MassDEP noise guidelines.

Once the CPA has been approved, the Applicant must maintain documentation of monitoring, testing, and reporting to demonstrate ongoing compliance with MassDEP regulations and the Plan Approval. As noted above, the MassDEP plan approval will require compliance with BACT or the more stringent Lowest Achievable Emission Rate (LAER) when the project is subject to 310 CMR 7.00, Appendix A – Nonattainment New Source Review. Note that determining compliance with BACT may require an evaluation of the project's environmental, energy, and economic impacts. Furthermore, we note that the BACT requirements for a commercial facility or cooperative are more stringent than those required for an agricultural facility or facility engaged in "farming" as defined in M.G.L c.128 §1A.

Generally, complying with the CPA requirements will result in a project that limits emissions below major source thresholds, thereby avoiding additional federal approval. However, although unlikely, there still may be additional federal notification requirements depending on project size pursuant to new source performance and/or Maximum Achievable Control Technology (MACT) standards. Applicable Federal regulations may include: 40 CRR 63 Subpart ZZZZ—National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (should a generator be proposed); and/or 40 CFR 60 Subpart KKKK- Standards of Performance for Stationary Combustion Turbines.

2.7.2 Anaerobic Digestion Project Permitting

As noted in subsequent sections, it is most likely that the AD facility will be developed, owned, and operated by a private entity and will not be considered a municipal facility. However, based on conversations with MassDEP, the AD facility can likely be permitted via 314 CMR 12.03(13) which regulates municipally owned WWTFS as the project will occur on municipally owned land and will convey wastewater to a municipally owned WWTF.

314 CMR 12.03(13) states *"…a Publically Owned Treatment Works may accept and process organic material…in anaerobic digesters operated at its wastewater treatment facility with prior written approval of the Department."* Note that organic material from supermarkets requires specific approval from the Department through this same process. Based on this, the AD facility will require written approval from MassDEP to accept organic material feedstock.

2.7.3 Wastewater Discharge Permitting

For the purpose of the Feasibility Study, we have assumed that the liquid digestate that remains after dewatering will be sent back to the WWTF headworks for treatment. In the private ownership scenario, the discharge of the dewatering liquid would be considered an industrial discharge to the WWTF and subject to compliance with the City's Industrial Pretreatment Program (IPP) pursuant to 40 CFR 403.

If the facility is classified as a "Significant" Industrial User (SIU), the liquid digestate will need to comply with the local effluent limits in the IPP. A "Significant" Industrial User (SIU) is defined at 40 CFR 403.3(v) and generally includes the following: Industrial Users subject to Categorical Pretreatment Standards; users that generate an average discharge ≥ 25,000 gpd of process wastewater; users that generate process waste streams that make up 5% or more of the average dry weather hydraulic or organic capacity of the WWTF; or users that have a reasonable potential for adversely affecting the WWTF's operation as determined by the City.

Based on consultation with the City's WWTF Pretreatment Coordinator the local IPP limits have not changed since the 2008 Reassessment of Technically Based Local Limits. The 2008 local limits for industrial discharges are attached in Appendix C. Should the AD Facility be classified as an SIU then an Industrial Discharge Application will need to be provided to the City's WWTF pretreatment coordinator that demonstrates the discharge will comply with the local IPP limits. The application should also contain information regarding how the discharge (liquid digestate) will travel to the WWTF, the nature of the discharge, average and maximum flows, and may also require representative samples or similar data regarding discharge composition. Local IPP limits are established to ensure that the WWTF will be able to treat any new discharges to the limits contained in their NPDES permit. Therefore, compliance with the local IPP limits should ensure the WWTF will remain in compliance with their NPDES permit. However, as the composition of the discharge is unknown at this time, an analysis cannot be performed to determine whether the project's discharge will comply with the IPP limits. Note, the project will also be required to comply with the City's Sewer Use Ordinance.

The Easthampton WWTF is authorized to discharge to the Connecticut River and Manhan River in accordance with the effluent limits and monitoring requirements set forth in the facility's NPDES permit. A copy of the current NPDES permit (No. MA0101478) is included in Appendix C. We note that EPA is currently in the process of revising the Total Maximum Daily Load (TMDL) limits for Long Island Sound and the Connecticut River, and anticipate that future NPDES permits that are issued for the Easthampton WWTF may contain more restrictive nitrogen limits. The issuance of more restrictive NPDES Permit effluent limits will require that the local IPP limits also be revised accordingly to reflect the revised limits. It is anticipated that upgrades to the WWTF may be required in the future to meet future NPDES effluent limits. Typically, the City will require all users of the WWTF to share the cost of the upgrade based on the user's flow, load, nutrient content and other factors. Therefore, depending on the volume and characteristics of the digestate discharge from the AD facility, in the future, the project owner may be required to make financial contributions towards maintaining the plant's compliance with permit limits.

2.7.4 Wastewater Treatment Facility Permitting

As described in Section 6, modifications to the WWTF's process flow are required in order to transport the sludge and liquid digestate between the WWTF and the AD Facility. Other modifications include the installation of power and heat interconnections. These modifications will require MassDEP approval via the submittal of BRP WP 68 (Treatment Works Plan Approval, without Permit Modification). This approval is required for any modifications to the WWTF treatment system that do not result in modifications to the groundwater discharge permit or reclaimed water permit. The purpose of this approval is to protect the public health, welfare and the environment through the control of pollutant discharges to groundwater or surface water. The permit application will require an existing conditions narrative, hydraulic profiles, flow schematic, flow characteristics, existing odor and safety provisions, construction details, site plan and general layout, specifications of instrumentation and alarms and plan profile views of existing and proposed piping and processing units.

2.7.5 Solid Digestate Disposal/Reuse

As noted above, the Feasibility Study assumes that the details associated with the disposal and/or reuse of the solid digestate byproduct will be evaluated in greater detail by a developer. However, a brief overview of the regulatory requirements for digestate management is provided below to assist the City and/or future developer in understanding the potential permitting requirements.

As human waste will be utilized in the AD process, the resulting solid digestate is considered a biosolid. Biosolids reuse is regulated through MassDEP and through the Environmental Protection Agency (EPA). All biosolids reuse must comply with both the state and federal regulations. A brief summary of the applicable regulations is provided below.

MassDEP Regulations

Biosolids reuse is regulated in Massachusetts by 310 CMR 32.00: Land Application of Sludge and Septage. Sludge and septage are regulated together and are categorized as Type I, II, or III sludge based on the quality of the sludge. A summary of permitted uses for each category is described below.

- **Type I** – Sludge approved by the MassDEP which may be used or distributed without approval of application sites by MassDEP, and which may be used for growing vegetation. Septage is not eligible for Type I classification. Type I sludge must not exceed the pollutant limits provided in Table 32.12(2
  a) of 310 CMR 32 and must not be putrescible.
- **Type II** – Sludge and septage approved by MassDEP which may be land applied or distributed on a site only with prior annual approval of the Department, and which may be used for growing any vegetation. Type II sludge must not exceed the pollutant limits provided in Table 32.12(2
  b) of 310 CMR 32.
- **Type III** – Sludge or septage approved by MassDEP which may be land applied or distributed only with prior annual approval by MassDEP, and which may be used for growing only specific types of vegetation, and whose application must be recorded in the Registry of Deeds. Sludge is classified as Type III if it exceeds any of the pollutant limits in Table 32.12(2)(b) of 310 CMR 32 for Type II sludge.

Type II or III sludge may only be applied to land that meets certain criteria for the following parameters: soil type, solid drainage, depth to groundwater, depth to bedrock, soil pH, slope, and certain site control measures. Type II and III sludge cannot be applied with 2,500 feet of a well or 300 feet of a private drinking water supply well. Distance from surface water is determined on a case-by-case basis. Type II or III sludge must also not be applied within the high water mark of fields or ditches. The sludge must not exceed the land application rates specified in 310 CMR 32. Lastly, note that MassDEP may require groundwater monitoring as a condition of the land application.

Note that treatment facilities in Massachusetts treating domestic sewage are required to apply for a permit through the Residuals Management Program for the reuse of biosolids.

EPA Regulations

EPA regulates the use or disposal of biosolids, including land application, surface disposal, or incineration; pathogen and vector requirements; and sampling and analysis requirements. The EPA regulates biosolids based on intended use, falling into one of four categories:

- Lawn or home garden
- Sold or given away
- Agricultural land, forest, or a reclamation site (non-public contact sites)
- Public contact site (site frequently visited by the public)

The regulations define pollutant level requirements, pathogen requirements, vector attraction reduction requirements, monitoring, and record keeping for each defined use. Lawn or home garden application and selling/giving away are regulated the most stringently, with the lowest pollutant levels required and the highest pathogen kill requirements.

Part 503 (Standards for the Use or Disposal of Sewage Sludge) defines domestic septage as sewage sludge and defines separate requirements for domestic septage applied to agricultural land, forest, or a reclamation site (i.e. nonpublic contact sites). If domestic septage is applied to public contact sites or home lawns and gardens, the requirements are the same as for the non-septage biosolids. Part 503 also provides for ceiling concentrations and loading rates for various pollutants.

Biosolids applied to land must meet Class A or Class B pathogen requirements and site restrictions, and one of ten vector attraction reduction methods provided in the regulations. A list of pathogen reduction and vector attraction reduction alternatives is provided in Part 503, however, a brief description of Class A and B is provided below:

Class A - Class A biosolids must meet a pathogen kill requirement and can be distributed with no restrictions if one of eight vector attraction reduction options are applied.

Class B – Class B biosolids must be monitored for pathogens and may require pathogen reduction, and can be applied to all types of land except for lawn and home gardens if one of ten vector attraction reduction options is implemented.

As noted in Section 8, the Feasibility Study conservatively assumes that solid digestate is hauled off-site and does not have a beneficial reuse. The specific regulatory requirements associated with the management, disposal, or reuse of the digestate cannot be determined at this time as they are dependent upon the feedstock composition and pollutant levels of the resulting biosolids. To produce a Class A biosolids, the AD process would have to involve a thermophilic digestion range (122 – 150 degrees F) to ensure that pathogens are destroyed. Many AD systems, including the system evaluated in this Feasibility Study, only digest feedstock material in the mesophilic range (85-100 degrees F) thus not ensuring all pathogens are destroyed. Heavy metal limits must also be below thresholds specified in the regulations.

If the AD system produces Class A or Type I product, this can be composted with woodchips to produce an optimal moisture content for reuse. Composting methods that are typically used include wind rows with mechanical aeration, wind rows with forced air aeration, or aerated bin composting. Note that the additional permitting required to market Type II or III sludge can outweigh the benefits of composting. Given the lack available space at the project site, and potential odor concerns, no on-site aerated composting was evaluated.

TABLE 2-1
WWTP Anaerobic Digestion Feasibility Study, Easthampton, MA - Summary of Potentially Required Permits

Permit/Approval Name	Issuing Authority	Regulation/ Statue	Review Timeframe[1]	Area of Jurisdiction	Notes
Local Permits/Approvals					
Industrial Pretreatment Program / Industrial Discharge Permit	Easthampton WWTF Pre-Treatment Coordinator	40 CFR 403; MGL c.21 § 26-53; 314 CMR 12	Not specified.	Liquid digestate discharge into the WWTF system (only required if project is privately owned/operated).	Required assuming AD facility qualifies as a Significant Industrial User as defined per 40 CFR 403.3(v).
Site Plan Review or Special Permit Review	Planning Board	M.G.C. c. 40A; Easthampton Zoning Ordinance	Site Plan Review: Planning Board must hold a public hearing within 60 days of receiving a complete application. Final action must be taken the 60 days. Special Permit: Planning Board must hold a public hearing within 65 days of receiving a complete application. A decision must be issued within 90 days following the close of the public hearing.	Entire project area.	If the project is considered an extension of the WWTF, Site Plan Review is required. If the project is considered a power plant facility, a Special Permit will be required.
Order of Conditions / Determination of Applicability	Easthampton Conservation Commission	MGL c. 130 § 40, 310 CMR 10.00	Notice of Intent - 60 days[2] Request for Determination of Applicability - 45 days	Site alteration that occurs within jurisdictional wetland resource areas or buffer zones.	Required for impacts to jurisdictional wetlands or buffer zones. MassDEP has appeal authority. Project may be exempt from RFA requirements via 310 CMR 10.58(6)(h).
State Permits/Approvals					
Permit/Approval Name	**Issuing Authority**	**Regulation/ Statue**	**Review Timeframe[1]**	**Area of Jurisdiction**	**Notes**
Organic Material Processing Approval	Massachusetts Department of Environmental Protection (MassDEP)	314 CMR 12.00	Not specified.	Publically Owned Treatment Works that accepts and processes organic material for use in anaerobic digesters.	Based on consultation with MassDEP, the privately owned and operated AD facility can be permitted via 314 CMR 12.03(13) which regulates municipally owned WWTFS as the project will occur on municipally owned land and will convey wastewater to a municipally owned WWTF.
BRP WP 68 - Treatment Works Plan Approval, without Permit Modification	MassDEP	314 CMR 5.00	Up to 24 days of MassDEP administrative review, followed by up to 36 days of MassDEP technical review.3	Any modification to the WWTF that does not involve a modification to the existing groundwater discharge permit.	
Comprehensive Plan Approval	MassDEP	MGL c. 111 § 142A-142M, 310 CMR 7.00	Up to 30 days of MassDEP administrative review followed by up to 90 days of MassDEP technical review.3	Per 310 CMR 7.02 (5)(a)(10), MassDEP has the discretion to require a Comprehensive Plan Approval (CPA) for a new or existing facility in cases where the facility, equipment, or operations emissions are lower than any threshold contained in the regulations if they determine the emissions will cause a condition of air pollution (e.g. create a nuisance), or have the potential to do so.	MassDEP's pending regulatory reform commits to 72 days of total review.
Massachusetts Historical Commission Review/Project Notification Form	Massachusetts Historical Commission	MGL c.9, § 26-27 D/ MGL c. 40C, 950 CMR 71.00 also Section 106 of National Historic Preservation Act	MHC will issue a determination within 30 days of receipt of the Project Notification Form (PNF).	Entire project area.	If an adverse impact to historical and/or archaeological is identified, formal consultation and Memorandum of Agreement required with MHC.
Federal Permits/Approvals					
Permit/Approval Name	**Issuing Authority**	**Regulation/ Statue**	**Review Timeframe[1]**	**Area of Jurisdiction**	**Notes**
National Pollutant Discharge Elimination System (NPDES) Construction General Permit	U.S. Environmental Protection Agency	33 U.S.C. § 1251 *et seq.*, 40 CFR 122	Notice of Intent must be submitted at least 14 calendar days prior to commencing earth-disturbing activities.	Entire project area.	Will require Stormwater Design, Drainage Plans, Erosion and Sedimentation Control Plan (required for all on- and off-site improvements). Requires submission of Notice of Intent and Stormwater Pollution and Prevention Plan to EPA.

See accompanying Feasibility Study for additional information regarding potentially required permits. Table contains permits related to the operation of the AD system. Table does not include local permits that may be required, such as plumbing, electric, and gas permits or any required approvals from the Department of Public Safety.

Table Notes:
1: Permit review timelines assume no extension of regulatory review periods and no appeals. Does not include time for permit application preparation.
2: Estimated - No specific review timeline in regulations.
3: Assumes submittal of administratively complete application and that a second technical review by MassDEP is not required. ☐

Assumptions:
A: No adverse impacts to historical/cultural resources.

FIGURE 2-1

EXISTING SITE CONDITIONS

Legend

N

0 100

Feet

1:1,200

NOTES

1. Based on MassGIS Color Orthophotography (April 2011-2012)

WWTF

Easthampton, Massachusetts

January 2014

Tighe&Bond
Consulting Engineers
Environmental Specialists

V:\Projects\E\E0702\Maps\WWTF_PlantLayout.mxd

E-0702

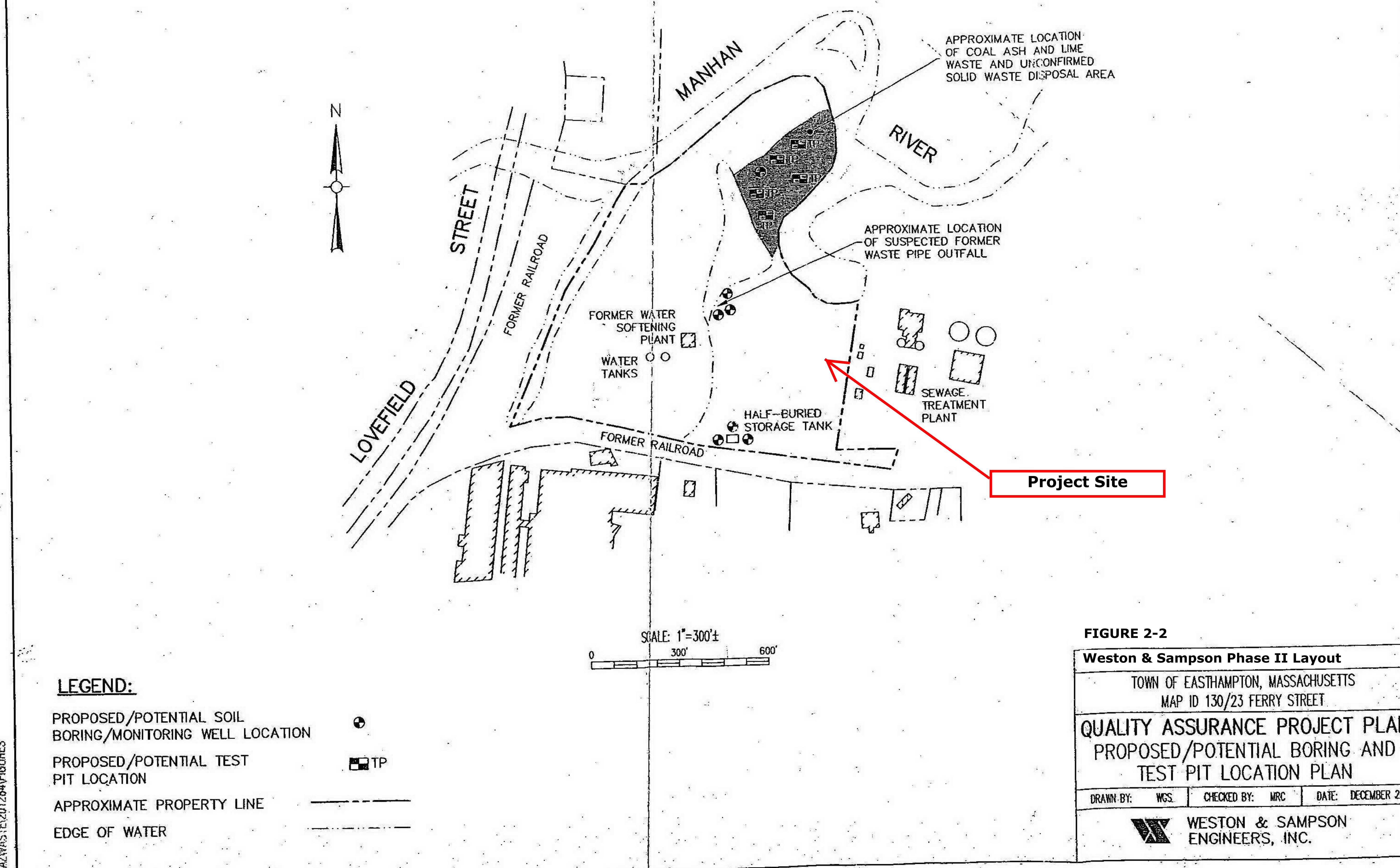


FIGURE 2-2

Weston & Sampson Phase II Layout

TOWN OF EASTHAMPTON, MASSACHUSETTS
MAP ID 130/23 FERRY STREET

QUALITY ASSURANCE PROJECT PLAN
PROPOSED/POTENTIAL BORING AND TEST PIT LOCATION PLAN

DRAWN BY: WGS | CHECKED BY: MRC | DATE: DECEMBER 2001

WESTON & SAMPSON ENGINEERS, INC.

Legend

★ MHC Inventoried Property

MHC Inventoried Area

1:4,200

0 250 500 Feet

Based on MassGIS Color Orthophotography 30cm (April 2009)

MHC Historic Inventory from MassGIS (2013), data maintained by Massachusetts Historical Commission (MHC)

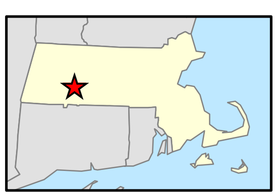


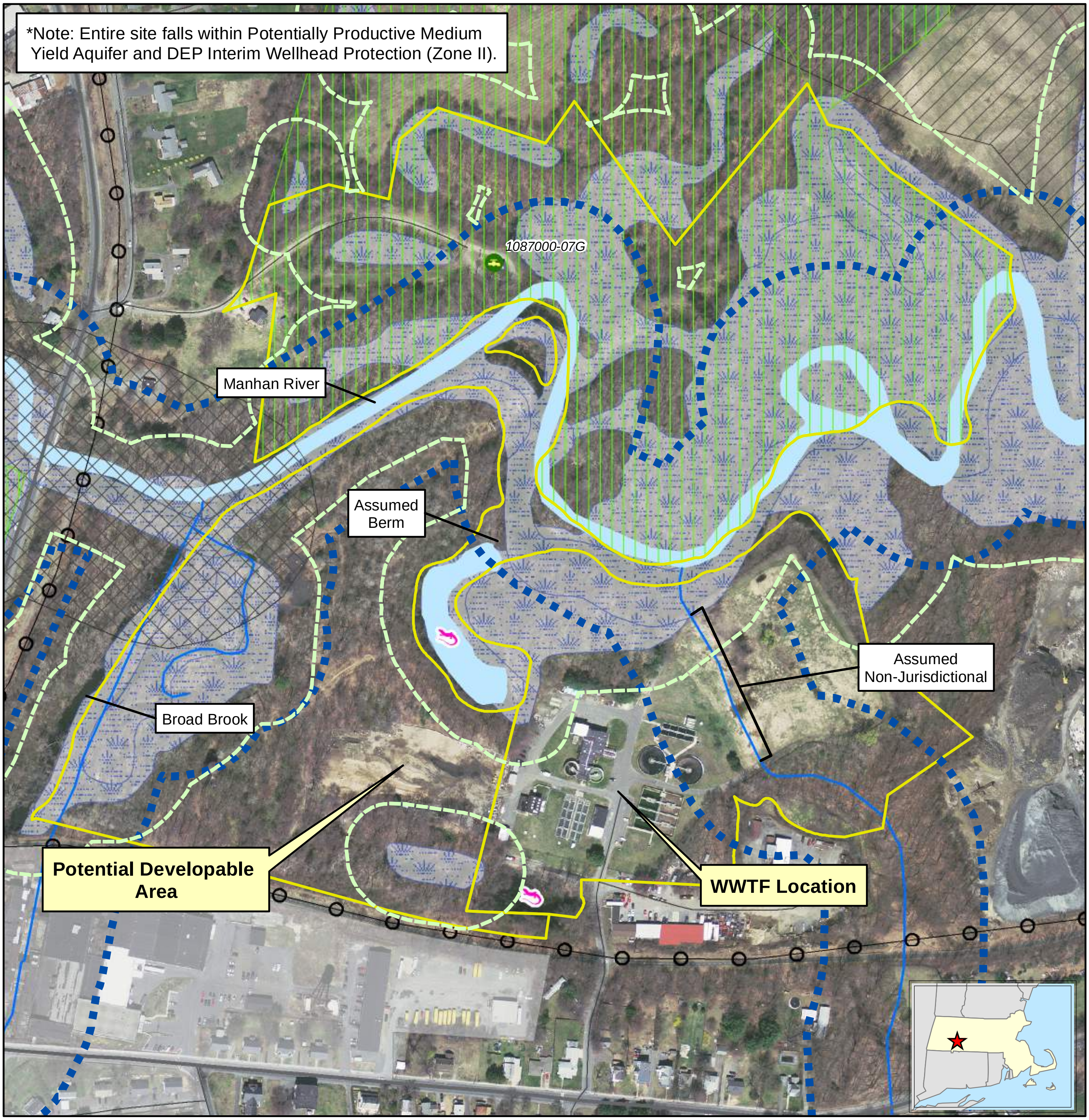
FIGURE 2-3
HISTORIC AND CULTURAL RESOURCES

WWTF

Easthampton, Massachusetts

Tighe&Bond

January 2014



- Approximate 100' Wetlands Buffer Zone
- Approximate 200' Riverfront Area
- NHESP Certified Vernal Pools
- Community Public Water Supply - Surface Water
- Community Public Water Supply - Groundwater
- Non-Community Non-Transient Public Water Supply
- Non-Community Transient Public Water Supply
- Non-Potential Drinking Water Source Area - High Yield
- Non-Potential Drinking Water Source Area - Medium Yield
- Potentially Productive Medium Yield Aquifer *
- Potentially Productive High Yield Aquifer
- EPA Designated Sole Source Aquifer
- DEP Approved Wellhead Protection Area (Zone II) *
- DEP Interim Wellhead Protection Area (IWPA)
- NHESP Priority Habitats for Rare Species
- NHESP Estimated Habitats for Rare Wildlife
- Public Surface Water Supply Protection Area (Zone A)
- Protected and Recreational Open Space
- Area of Critical Environmental Concern (ACEC)
- Solid Waste Landfill
- City of Easthampton Parcels
- NHESP Potential Vernal Pools
- Public Surface Water Supply (PSWS)
- Fresh Water Non-Forested Wetland
- Waterbodies
- Stream/Intermittent Stream
- Limited Access Highway
- Multi-Lane Highway, NOT Limited Access
- Other Numbered Highway
- Major Road - Collector
- Minor Street or Road
- Town Boundary
- County Boundary
- Track or Trail
- Powerline

0 175 350 Feet

FIGURE 2-4
ENVIRONMENTAL RESOURCES

WWTF
Easthampton, Massachusetts

Tighe&Bond

January 2014

Data source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs. Data valid as of October 2012.

Legend

100 Year FEMA Flood Plain

500 Year FEMA Flood Plain

1:4,200

0 250 500 Feet

Based on MassGIS Color Orthophotography 30cm (April 2009)
FEMA Flood Data: MassGIS, 2013

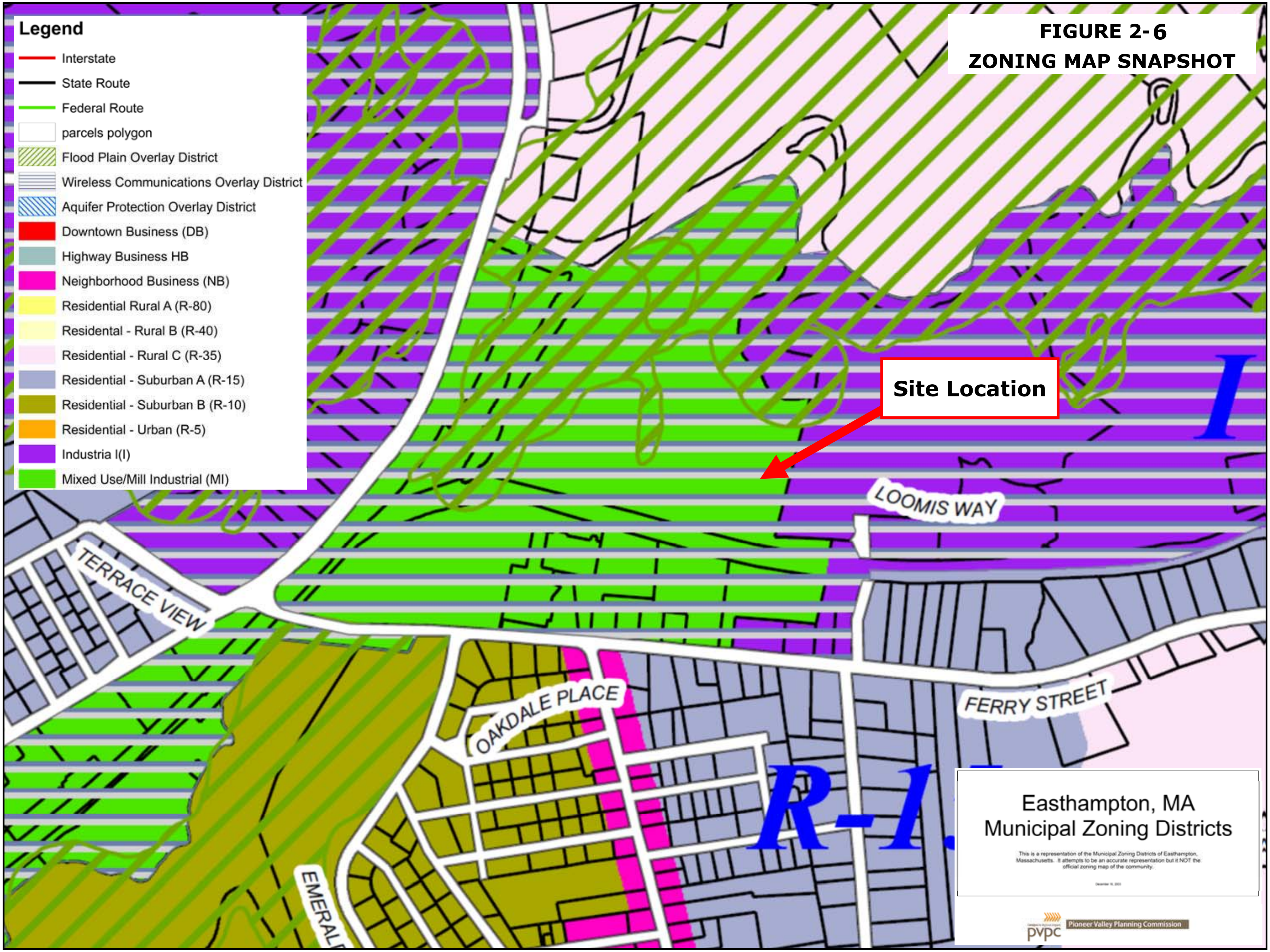
FIGURE 2-5
REGULATORY FLOODPLAIN

WWTF
Easthampton, Massachusetts

Tighe&Bond

January 2014

FIGURE 2-6
ZONING MAP SNAPSHOT



Legend

- Approximate 100' Wetlands BufferZone
- Approximate 200' Riverfront Area
- Wetlands
- 15 Ft Building Setback
- Potential Developable Area
- City of Easthampton Parcels
- NHESP Potential Vernal Pools

0 40 80 Feet

FIGURE 2-7
DEVELOPMENT CONSTRAINTS MAP

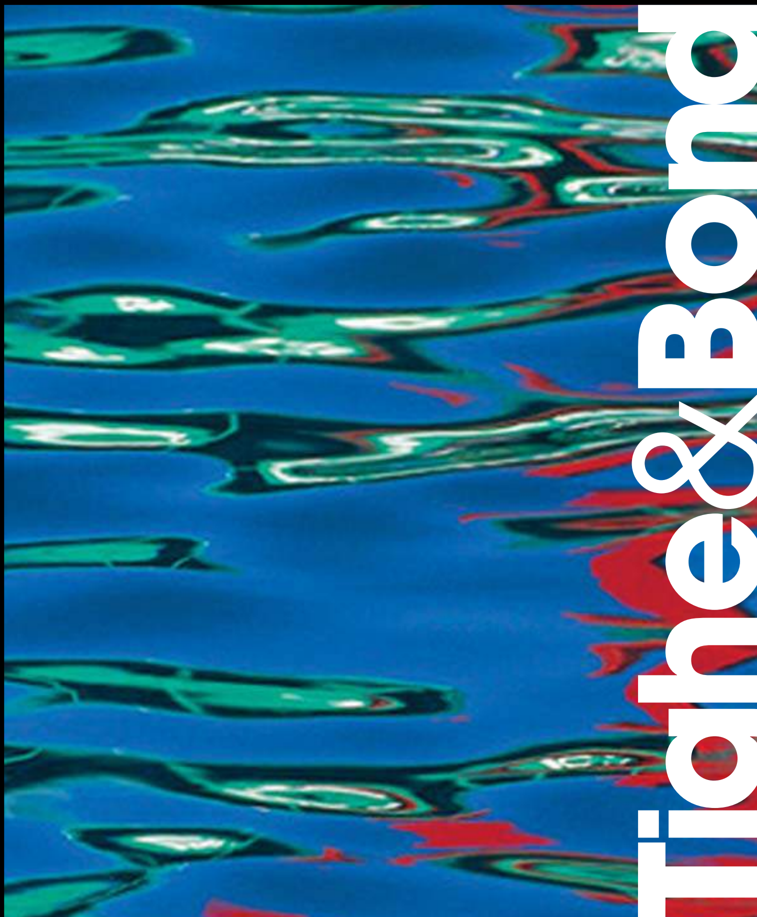
WWTF

Easthampton, Massachusetts

Tighe&Bond

January 2014

Data source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs.
Data valid as of October 2012.



SECTION 3

Section 3
Facility Profile - Utilities

The following section of the report provides a summary of existing electrical and heating infrastructure at the WWTF, as well as current electrical and heating demands. The analysis is based on a review of facility plans and information from th eDPW. This section also discusses potential means of electrical and heating interconnection for the AD facility.

3.1 Existing Electrical/Heating Infrastructure

The existing electrical and heating infrastructure at the WWTF appears to be in fair condition and in good working order based on our observations and information provided by the facility operator. Please note however that Tighe & Bond did not conduct a comprehensive systems evaluation as part of the Feasibility Study.

Currently, the WWTF is served by three-phase power. The facility's incoming underground three-phase service line feeds a transformer directly east of the main operations building before servicing the switchgear located in the basement. All electrical needs for the WWTF are serviced from this panel and emergency backup power is provided by a diesel fired generator interconnected to this switchgear.

The heating load at the WWTF is currently met through the use of number two fuel oil, liquefied propane (LP) and electric heaters. The operations building is heated by a hydronic system with hot water being supplied by an 80% efficient 1.01 MMBTU/hr oil fired boiler. The boiler and associated equipment appear to be in good working order and are approximately five years old. The headworks building and various outbuildings are heated with LP units, however, because of the relatively warm temperature of the wastewater entering the facility, the headworks building is rarely heated. The butler building and garage are heated with LP units while the remaining two buildings at the facility are heated with electric units.

3.2 Facility Energy Profile

Based on data provided by the City for the period between November 2012 and October 2013, the WWTF currently consumes approximately 690,000 kWh of electricity per year. Usage is recorded by two different electrical meters on the property. Over this period, the average monthly consumption was approximately 57,700 kWh with a minimum and maximum monthly consumption of approximately 49,990 kWh and 66,750 kWh respectively. Refer to Figure 3-1, below, a graph of the facility's monthly electrical consumption. Please note that consumption is represented on the left vertical axis in thousands of kWh and demand is represented on the right vertical axis in kW. To provide some clarification; kilowatts (kW) are a unit of power, while kilowatt hours (kWh) are a unit of energy.

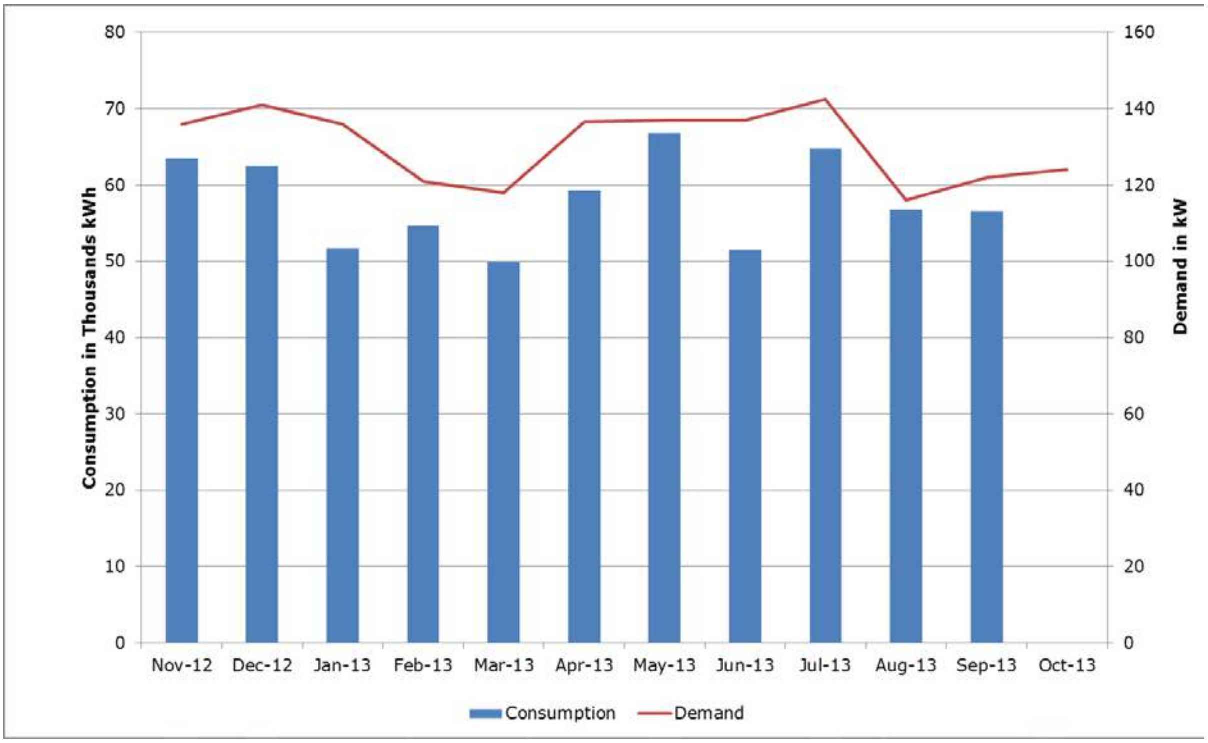


Figure 3-1
Easthampton WWTF Electrical Data (November 2012-October 2013)

The average peak electricity demand at the WWTF is approximately 130 kW. Refer to Figure 3-1, a graph of peak demand and consumption; again, note that consumption is represented on the left vertical axis in thousands of kWh and demand is represented on the right vertical axis in kW. The facility has a relatively stable annual demand and consumption. Note that there is a slight increase in the average demand during the summer months.

Thermal energy is typically measured in British Thermal Units (BTU). One BTU of energy can heat one pound of water by one degree Fahrenheit. Because of the size of WWTF and the amount of energy consumed as thermal energy, it is measured in millions of BTU or MMBTU. The thermal energy consumed over the period of one hour is notated as BTU/hr or MMBTU/hr. Space heating needs at the WWTF are met by multiple separate heating systems that use heating oil, propane and electricity. Since there is not an electrical meter at the WWTF that measures only the electricity consumed for space heating, it has not been included in the heating calculations but is accounted for in the electrical consumption.

Because no actual heating fuel invoices were provided for the study, fuel consumption was based on estimated data provided to Tighe & Bond from the City. It was estimated that the WWTP uses 6,000 gallons of number 2 fuel oil and 4,000 gallons of propane annually. Using this data, we calculated an approximate annual BTU consumption, which was then interpolated to a monthly demand based on estimated heating loads. Table 3-1 (below) provides a summary of the Easthampton WWTF current heating requirements.

TABLE 3-1
Current Heating Requirements – WWTF

Period	Heating Requirement
Total Annual Heating (MMBTU)	840
Average Monthly Heating (MMBTU)	70

Refer to Figure 3-2 for a graph of estimated fuel oil and LP consumption at the WWTF from November 2012 to October 2013. The vertical axis is displayed in millions of BTU consumed.

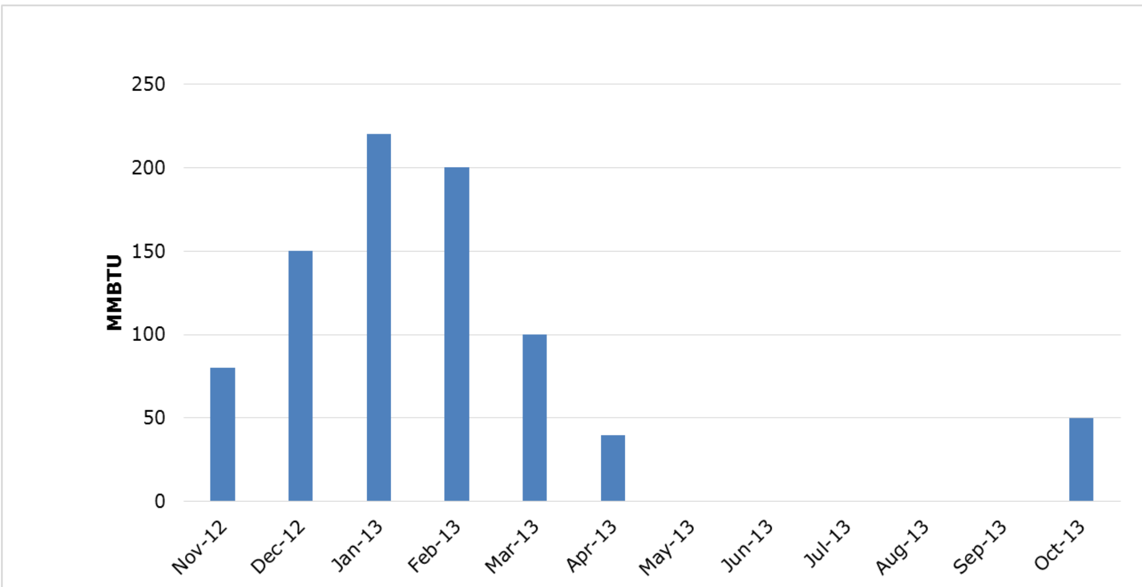


FIGURE 3-2
Estimated MMBTU Consumption November 2012-October 2013

Absent more comprehensive heating data, the estimate of the heat energy required at the WWTF is preliminary. A detailed heating load calculation should be completed prior to the interconnection of an AD cogeneration system to the WWTF heating system.

3.3 Electrical Interconnection

The project site is located within a Western Massachusetts Electric Company (WMECo) service area, in the West Central Massachusetts ISO-NE load zone. As part of this Feasibility Study, a Distributed Generation Pre-Application form was submitted to WMECo to obtain information about the proposed point of interconnection. The WMECo response can be found in Appendix D. The pre-application request noted that there is 98.2 kW of aggregate facilities currently connected to the circuit with an additional 6 kW of generation with completed applications that have not yet been interconnected.

Tighe & Bond also reviewed a previous report generated by Borrego Solar Systems for the City to obtain information about electrical interconnection to the site. The report was produced as part of Borrego's assessment of opportunities for solar PV throughout the City.

Based on information provided by WMECo, power at the WWTF and proposed site is provided by the Gunn Substation located at the intersection of Line and Phelps Street. It is noted that the Gunn Substation is undergoing upgrades as part of the Pleasant Street Mills Infrastructure project.

The voltage at the substation is 22.9kV and is constructed as four wire multi-grounded neutral Wye. The circuit supplying the WWTF is 15A5. The Borrego report also noted that the existing transformer is consistent with a unit rated at or below 500 kVa. To accommodate a generator on the site, WMECo may require the transformer to be upgraded to the full rated capacity of the generator. It is presumed for purposes of analysis that the ultimate transformer will require a capacity of 1,000 kVA; the existing transformer has a capacity of 300 kVA. Net metering would be accomplished at the secondary voltage of 277/480 Volt four-wire Wye. The medium voltage cable is presumed to be #2 Aluminum or larger 25 kV solid dielectric power cable with a 1/3 rated concentric neutral in a polyethylene jacket.

Electrical equipment required for the AD project would include one or more generators, a pad-mount transformer, and protective relay equipment. A relay disconnects the incoming service and the generator when WMECo power service is interrupted and brings the generator back on line when service resumes. The protective relaying will also sense overload and overcurrent conditions in the distribution line. Depending on the ownership scenario, the interconnection equipment may vary. It is expected that WMECo will require a reverse read meter so that generated electricity can be recorded as it enters the grid, which will enable net metering. WMECo will perform a design review and may require adjustments, upgraded equipment, or additional equipment. If the developer or City elects to participate in net metering, a *Schedule Z (Additional Information Required for Net Metering Service)* must be completed and submitted to WEMCo. The Schedule Z should be submitted at the earliest date possible, if project development continues, in order to secure a place in the interconnection and net metering queue.

The application to WMEco for interconnection approval will require information specific to the generation equipment, distribution equipment and stamped engineering plans. The fee to complete the initial screening is $4.50 per kW of generation with a maximum cost of $7,500. WMECo will review this package for completeness within 10 business days and complete the standard initial review within 20 days. If additional studies are required then WMECo will notify the Applicant within five days with the cost to continue. The Applicant is required to pay the actual cost of the study which typically ranges from $15,000 to $30,000 depending on location. If the Applicant proceeds then a low level impact study will be completed in 55 days or a detailed impact study in 85 days. Within 15 days of the study completion, WMECo will issue an executable agreement to the Applicant. The total days required to approve the application and impact study cannot exceed 150 days. Note that at this time, we cannot determine whether an impact study will be required, or whether any system upgrades will be necessary.

3.4 Thermal Interconnection

The byproduct of the combustion of biogas and creation of electrical energy is thermal energy. A portion of the thermal energy from the cogeneration system can be used to heat the anaerobic digester and the excess remaining thermal energy could be used to decrease the consumption of fuel oil and LP currently used for heating at the WWTF. To transfer the excess thermal energy from the cogeneration system into the existing heating infrastructure, a cross connection, or heat exchanger, between the cogeneration system and existing heating system would need to be made.

A piping network would have to be constructed between the AD facility and the existing heating systems, however much of the piping network within the main operation building could expected to be repurposed. Since the heating system is owned and operated by the City, if a private developer operated the AD plant, an agreement between the private developer and the City would need to outline who owns and maintains the heat exchanger equipment.

A preliminary calculation based on current heating fuel consumption provided by the City suggests that a majority of the thermal needs of the WWTF could be provided by the waste heat from the biogas cogeneration system assuming that it is sized correctly and that adequate biogas is produced. For all of the spaces and outbuildings at the WWTF to be heated by the cogeneration system, it may be necessary to convert or replace existing heating systems. For example, spaces that are currently heated by propane, such as the headworks building could be converted to a hot water system. Additionally, it may be possible to modify the existing propane systems to burn biogas produced by the AD facility. Note that the biogas may need to be cleaned and the boiler jets changed to use the biogas in the propane heaters.

SECTION 4

Section 4
Feedstock Availability

As part of the Feasibility Study, Tighe & Bond assessed the availability and types of feedstock including food waste and wastewater biosolids for a potential AD project at the Easthampton WWTF. In order to maximize the potential feedstock available, energy generation, and revenue benefits, the study did not consider a sludge-only or food waste-only system.

4.1 WWTF Sludge

The Easthampton WWTF currently dewaters sludge generated from the wastewater treatment process with a belt filter press. The dewatering process is a time consuming, energy intensive, and costly activity. Chemical and polymers are added to the sludge to assist in the dewatering and to reduce odors during the operation and transportation. The dewatering operating produces a sludge cake with an approximate total solids content of 25% that is then transported offsite for disposal. Table 4-1 provides a summary of sludge generation information for the Easthampton WWTF. The weight of the sludge shown is after dewatering, or when the material has a totals solids content of approximately 25%. Note that the economic implications associated with sludge management are addressed in Section 8.

TABLE 4-1
Sludge Data

Category	Quantity
Average Daily Sludge Generation (dewatered)	4.9 tons
Average Monthly Sludge Generation (dewatered)	150 tons
Average Annual Sludge Generation (dewatered)	1,800 tons
Annual Sludge Disposal Cost	$167,600
Annual Cost of Thickening Polymer	$8,000
Annual Misc. Maintenance Cost	$5,000
Annual Sodium Hypochlorite for Odor Control	$31,000

This Feasibility Study did not evaluate the potential of additional sludge feedstock other than what is generated at Easthampton; however other communities have expressed interest in transporting their sludge to a local AD facility if it is economically beneficial. It should be noted that most facilities are easily scalable and can accept a wide range of feedstock parameters. Benefits of accepting additional sludge include additional biogas production leading to additional electricity generation and the added revenue from tipping fees.

For the purpose of the Feasibility Study, it has been assumed that sludge feedstock from the Easthampton WWTF would not be dewatered prior to digestion. This would reduce the need to dewater twice and likely reduce the volume of material dewatered. Sludge feedstock that has not been dewatered can be pumped directly from the WWTF into the AD facility without processing.

4.2 Food Waste

Potentially available food waste was identified based on a high-level survey of organic material available in the surrounding area and focused on generators that would be subject to the pending Massachusetts Organics Waste Ban. It should be noted that Tighe & Bond is not able to guarantee the source and supply of organic feedstock material that may be available to the project and that the analysis presented herein is based on publicly available data. It is unlikely that a definitive quantity of feedstock would be available until feedstock agreements between the owner of the AD facility and interested suppliers are established.

In order to meet solid waste reduction goals, MassDEP has proposed a waste ban (310 CMR 19.000) which adds “commercial organic material” to the list of materials banned from disposal (via disposal, incineration, or transfer for disposal at a solid waste disposal facility) effective October 2014. Commercial Organic Material is defined as “food material and vegetative material from any entity that generates more than one ton of those materials for solid waste disposal per week, but excludes material from a residence”. Businesses potentially subject to the ban include supermarkets, colleges and universities, large secondary schools, large restaurants and hotels, food manufacturers and processors, and hospitals and nursing homes. The ban is tailored to address concerns from small businesses by exempting entities, such as most restaurants, convenience stores, small markets, and schools that dispose of less than one ton of organic material per week.

4.2.1 Food Waste Analysis Methodology

The base data used for this study was the Draper/Lennon report "Identification, Characterization, and Mapping of Food Waste and Food Waste Generators in Massachusetts" (Draper/Lennon) completed for the Massachusetts Department of Environmental Protection, Bureau of Waste Prevention in 2002. It should be noted that the quantitative data provided by the Draper/Lennon report has not been updated since the original submission and does not reflect inventory and process practices that have been widely adopted in the last 10 years. The list of businesses included in the study has been updated since the original submission to MassDEP, however the statistical factors that the report uses to estimate specific generator volumes have not been updated. It is important to note however that the Draper/Lennon report continues to serve as the predominant model for estimating available food waste for feasibility studies conducted in Massachusetts and in other States.

The Draper/Lennon study evaluates potential food waste generation according to a variety of sectors, including supermarkets, restaurants, food processing, education, and others. Due to high levels of variation found within the processing, food and beverage manufacturers, and wholesale food distribution sectors, the Draper/Lennon report does not provide detailed quantitative volume estimates for these sectors. These three sectors are estimated to account for almost 65% of the total annual food waste generated in the state.

Using data from the Draper/Lennon study, total annual generation of potentially available food waste was calculated for each source category. Rates of contamination for each sector were developed based on input from Tighe & Bond partners in the organic waste hauling community. This data is shown in Table 4-2 below. In some cases, data was not available for certain waste generators in the Draper/Lennon study, most notably, food processors and wholesale distributers. However, the report does provide an estimate of potential food waste generation per establishment for each category based on the total organic waste generation (tons/year) and total the number of establishments identified in Massachusetts. In order to develop a general estimate, Tighe & Bond applied the generation per establishment estimates provided in the Draper/Lennon study where data was missing to account for additional food waste that may be available.

4.2.2 Potentially Available Food Waste

To determine the available quantity and source of food waste in the vicinity of the project site, organic waste generators within a 30 mile radius were evaluated. A radius of 30 miles was selected based on a review of similar studies and is expected to reflect a reasonable hauling distance for organic materials.

TABLE 4-2
Available Feedstock by Generator Sector

Category	# in Category	Total Generation (Tons per Year)
Healthcare	22	2,045
Colleges/Universities	12	2,130
Conference facilities	7	427
Supermarkets	56	12,586
Restaurants	79	6,210
Food processors	72	47,232
Wholesale Distributers	15	2,058
Total	**263**	**72,688**

Within a 30 mile radius of the project site, there are 263 food waste generators who will likely be subject to the Organics Waste Ban. The largest sectors include food processors, restaurants, and supermarkets. However, based on consultation with industry waste haulers and our review of other feasibility analyses, reduction systems have been broadly utilized within the food processing sector. The reduction in the generation of waste in conjunction with on-site processing significantly reduces the available feedstock. Additionally, supermarkets have also implemented significant waste reduction practices since the Draper/Lennon database was developed in 2002. For example, MassDEP established the Supermarket Recycling Program Certification (SRPC) in 2005. This voluntary initiative has gained substantial participation among large chain supermarkets and achieved an estimated 60 to 75 percent recycling rate of organic waste in 2005. The restaurant sector has the greatest number of sites that would fall under the ban and also typically has very low rates of current diversion. From a feedstock availability standpoint, the restaurant sector offers the best potential to divert organic materials that are currently not source separated although there are significant implementation challenges to consider.

4.2.3 Feedstock Characteristics by Sector

The characteristics of organic waste vary considerably both across generator sectors and within the sectors themselves. This section of the report outlines the general waste characteristics by sector including typical moisture content, and contamination levels and types. Contamination estimates are based on Tighe & Bond's experience on similar studies and input from an independent organics hauler. The estimates also make an effort to account for food waste from new sources that are likely to have higher contamination rates than current levels. This expectation reflects the anticipated learning curve as commercial and institutional establishments adopt organics separation programs.

4.2.3.1 Healthcare

The healthcare facilities within a 30 mile radius of the WWTF represent a mix of regional acute care hospitals, specialty facilities, and nursing homes, including Baystate Medical Center in Springfield, Soldiers Home in Holyoke, Cooley Dickinson Hospital in Northampton, and Mercy Medical Center in Springfield. Organic waste generated from all of these facilities tends to be skewed to waste generated from food preparation (otherwise known as "back of the house" or pre-consumer) at approximately 75% by weight versus plate scrapings at 25%. Anecdotal reasons for this trend include the facilities' utilization of on-demand, menu based meal service for patients versus a standardized, 3 meals per day and non-menu generated approach. Also, many facilities offer full cafeterias which prepare much of the food on site. Due to the multiple meals throughout the day, the food waste contains a broad range of constituents with varying levels of moisture content. As a result, the approximate consolidated moisture content of a given load would range from 60-70%. Contaminant levels are typically in the range of 10-15% and include plastic, silverware, ceramics, rubber gloves, metal and glass.

4.2.3.2 Independent Schools

There are only three independent schools located within the target radius of the Easthampton WWTF included in the Draper/ Lennon report, including Eaglebrook Academy, Williston Northampton School, and Deerfield Academy. However, based on the data available none of these facilities produce enough organic waste to be subject to the proposed ban. In practice, the waste stream from independent schools resembles other educational settings with on-campus food service although the waste tends to have lower levels of contaminants due to the smaller size and ability to monitor disposal inputs more closely.

4.2.3.3 Colleges / Universities

There are several colleges within a 30 mile radius of project site, including Hampshire College, Holyoke Community College, Smith College, Westfield State College, and Springfield Technical Community College. As food service operations associated with on-campus dormitories and stand-alone food service facilities would fall under the proposed ban structure, these facilities could potentially contribute feedstock to an AD facility. Organic waste generated from these categories tends to be skewed to waste generated from food preparation at approximately 75% by weight versus plate scrapings at 25%. There are examples in the dataset of on-site processing capacity although the majority of these facilities are not currently source separating. Due to the multiple meals throughout the day, the food waste contains a broad range of constituents with varying levels of moisture content. As a result, the approximate consolidated moisture content of a given load would range from 60-70%. Contaminant levels are typically in the range of 10-15% and include plastic, silverware, ceramics, rubber gloves, metal and glass.

4.2.3.4 Conference Centers

The conference facilities that are within the radius of the WWTF are primarily hotels that have conference activities, such as the Hotel Northampton and Marriott and Sheraton in Springfield. These facilities offer food service as a part of their product offering and have residuals from both back of the house as well as plate scrapings. As conference facilities typically offer multiple meals and snacks during events, the waste contains a broad range of constituents with varying levels of moisture content with the average running 60-70% in a given load. Contaminant levels are typically in the range of 10-15% and include plastic, silverware, ceramics, rubber gloves, metal and glass.

4.2.3.5 Supermarkets

There are approximately 56 supermarkets subject to the ban within a 30 mile radius of WWTF, many of which are large multi-location chains. Supermarkets include several Big Y and Stop & Shop stores. Other supermarkets include Whole Foods, Atkins Market, and Big E's Supermarket. The waste that is generated from this segment is very high in fruits and vegetables but also includes other departments including grocery, prepared foods, meats, deli, seafood and bakery. The products that comprise the waste stream though, are heavily skewed towards the produce department where culling of less than perfect product occurs multiple times a day. Sophisticated inventory management systems are utilized on both incoming and outgoing waste streams and department heads are held responsible for product shrinkage. As a result, levels of organic material have greatly diminished compared to when the Draper/ Lennon report was completed. Supermarkets as a whole have the highest diversion rates of any segment due to the voluntary Supermarket Recycling Certification Program that MassDEP established several years ago.

Reflecting the high fruit and vegetable content of the waste stream, the moisture content is relatively high at 85% and the contaminant level is relatively low at 5-10%. Contaminants typically found in this waste stream include plastic, rubber gloves, metal and glass.

4.2.3.6 Food Processors

There are approximately 72 food processors that may fall under the ban and are located within a 30 mile radius of the project site, such as HP Hood, LLC in Agawam, Friendly's in Chicopee and Wilbraham; Paper City Brewery, Inc. in Holyoke; and Coca-Cola in Northampton. These processors have been identified on the basis of sales from the organic material generator database produced by the Draper/ Lennon Study for MassDEP. The most critical elements for determining feedstock characteristics for this sector are the amount of residuals after processing, the moisture content of those residuals, and whether or not the facility has on-site processing capacity. On-site processing is quite common for food processors as the economics of post-processing waste treatment often lead to integrated solutions. For those processors that do not have on-site capacity, many have found channels to up-cycle their residuals or have organics processing sites that are very desirous of their waste due to its continuity and low contamination levels. Moisture content ranges greatly from almost all liquid to almost all solid for bakeries. Food processors, representing industrial organic waste, have the lowest contaminant levels (2%), consisting mainly of plastic, rubber gloves, metal, glass, rocks and grit.

4.2.3.7 Wholesale Distributors

Based on the Draper/Lennon data, 15 wholesale distributers were identified in the study area. Wholesale distributers included the 2nd Street Baking Company in Turners Falls; Hampton Farms, in Springfield; and Masse's Seafood in Chicopee. Similar to food manufacturers and processors, there is wide variation in waste generation among wholesale distributors. Based on the Draper/ Lennon analysis, most food wholesalers and distributors generate little recyclable organic waste, since the majority of these establishments warehouse and redistribute pre-packaged items. Wholesale distributors also have low estimated contaminant levels (2%), consisting mainly of plastic, rubber gloves, metal, glass, rocks and grit.

4.2.4 Generator Outreach

Subsequent to categorization by quantity and sector using the Draper/ Lennon report, selective outreach was conducted with several potential generators in the study area. Specific data obtained through this exercise was not used as part of the estimate of potentially available food waste; however the information is useful in assessing current food waste disposal practices. Tighe & Bond conducted telephone interviews with selected local generators. Please note that generator outreach was limited, and the results do not suggest that materials from respondents would be available to a project in Easthampton. Table 4-3 shows the results of the generator outreach surveys.

TABLE 4-3

Generator Outreach Surveys

Entity	Location	Estimated Generation	Notes
Paper City Brewing	Holyoke	6,000 lbs/wk	Organic waste is picked up and used as pig feed and compost at Martin Farms in Greenfield, MA.
Northampton Brewery	Northampton	5,000 lbs/wk	Waste from brewing picked up and used as pig feed. Other SSOM is sent to composting at Martin Farms
Abandoned Building Brewery	Easthampton	800 lbs/wk	Organic waste is picked up and used as pig feed.
Big E's Market	Easthampton	3,000 lbs/wk	All compostable waste is sent shipped up to Martin Farms for compost. This includes wax boxes, seashells and other items.
Tandem Bagel	Easthampton	200 lbs/wk	Any food waste is disposed of in the trash. They limit all waste as it cuts into profits.
Atkins Farm and Country Market	Amherst	Unavailable	Organic waste is sent to Martin Farms and used for compost.
Hampshire College	Amherst	2,000 lbs/wk	Food waste generated is sent to Martin Farms for compost. The school then purchases the compost

			back for use on their fields.
Log Cabin	Holyoke	2,000 lbs/wk	Food waste is disposed of with solid waste.
The Delaney House	Holyoke	2,000 lbs/wk	Food waste is disposed of with solid waste.
Big Y World Class Market	Various	44 tons/wk	Organic waste is source separated and disposed of at various compost farms throughout MA. All other recyclable material is recycled for an overall savings of 2.3 million annually.

It is our understanding that Martin Farms charges a hauling fee but not a disposal fee, and that drop offs of food waste in Greenfield can be made for free.

4.2.5 Competing Facilities

The difficulties in securing a long term and consistent supply of food waste from generators and haulers is one of the most substantial challenges for any anaerobic digestion developer, regardless of site or technology. Not only does the developer have to secure the feedstock material, it has to create a positive economic return for all parties. The tipping fee must be low enough to be competitive with the market prices yet generate a revenue stream for the developer. As noted above by our limited generator outreach, many generators in the project area are already separating food waste from their solid waste streams, even in advance of the MassDEP Organic Waste Ban.

Currently, there are several different types of existing processing capacity for organics in the targeted radius of the facility: commercial composters, farms (both agricultural, dairy and pig), and on-site processing. Additionally, Tighe & Bond is aware of other AD projects under consideration in the area, including projects at the UMass Amherst/ Town of Amherst WWTF, and projects in Chicopee and Greenfield. Many of these projects are in early stages of development and may not come to reality, but could in theory compete for food waste with an AD project in Easthampton.

Other sources of potential competition include on-site technologies for organic waste management that certain large generators may currently be implementing. These technologies include pulpers, dehydrators, on-site composting and biological liquefaction. The extent that these on-site solutions that have been adopted by large scale organic waste generators is not known. Anecdotally though, other recent, more detailed waste characterization studies have shown a very high rate of current on-site or diversion strategies in place. This data reinforces the importance of securing feedstock supplies as early in the project process as possible either through direct contracts with generators or through partnerships with haulers that have access to food waste materials.

4.3 Summary of Feedstock Characterization

Based on the results of the feedstock characterization described in the preceding sections, an estimated percentage of contamination was applied to the food waste estimates based on the type of generator as shown in Table 4-4.

Table 4-4
Summary of Feedstock Characterization

Category	Contamination (%)	Tons/Day
Healthcare	13%	4.9
Colleges/Universities	13%	5.1
Conference facilities	13%	1.0
Supermarkets	8%	31.7
Restaurants	13%	14.8
Food processors	2%	126.8
Wholesale Distributors	2%	5.6
Total		**190**

The materials listed in Table 4-4 above are the total available food waste materials available to a potential AD facility after accounting for an estimated level of contamination. Our analysis assumes that the feed waste feedstock may be processed for removal of contaminants between the point of generation and the AD facility, or that raw food waste will arrive at the AD facility and be visually screened for contaminants. Feedstock that is heavily contaminated could be rejected prior to use in the digester.

To make allowances for unknowns related to the actual availability of potential food waste due to existing diversion practices and competing facilities, Tighe & Bond applied an “availability factor” to the data estimate to make the analysis more conservative. Table 4-5 shows a range of availability factors that were considered. It was determined that an availability factor of 25% represented a conservative estimate of potential feedstock available based on our review of other feasibility analyses and experience with similar projects. An availability factor of 25% indicates that approximately 48 tons per day of feedstock is available for an AD project in Easthampton.

TABLE 4-5
Availability of SSOM Estimate

	SSOM Estimate
Tons per Year	69,290
Tons per Day	190
25%	**48**
30%	57
40%	76
50%	95

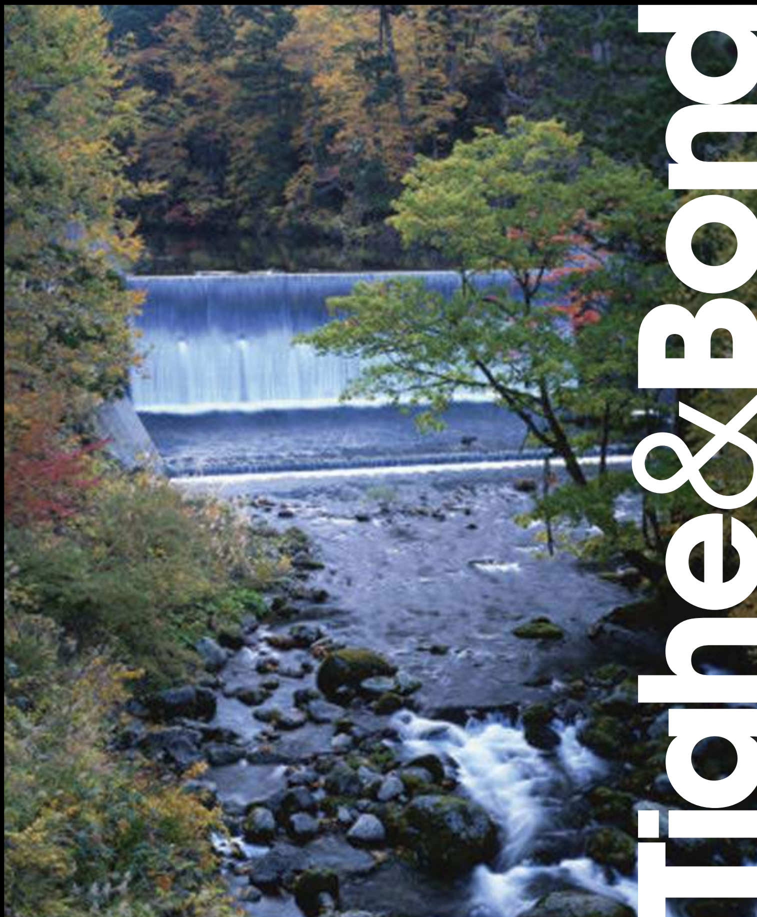
Based on the analysis described in this section, Table 4-6 provides a summary of sludge and food waste feedstock potentially available to the project. As discussed previously, it has been assumed that the sludge from the WWTF would not be dewatered prior to digestion. Data on the volume, total solids, and volatile solids is presented. The total solids and volatile solids of the food waste feedstock were estimated based on industry standards and the sludge waste information was provided by the Easthampton WWTF operator. The volatile solids are the portion of the total solids that can be consumed to produce biogas. The greater the volatile solids content of the feedstock, the more biogas can be produced.

Based on available sludge and the projected contamination levels of the food waste stream, approximately 92 TPD of feedstock was assumed to be available for digestion. For the purpose of this study, the sludge waste was converted into a unit of weight. To convert the sludge waste to a unit of weight, the density of the sludge at 3% solids was assumed to be the same as the weight of water at 8.34 pounds per gallon.

TABLE 4-6
Summary of Available Feedstock

Description	Food Waste	Sludge Waste
Total Input	48 TPD	10,000 GPD
Solids Content	18 %	3 %
Volatile Solids Content	86 %	77 %
Total Input (Food Waste and Sludge)		**92 TPD**

The data in Table 4-6 was carried forward to the technical and economic components of the Feasibility Study, described in subsequent sections of the report.



SECTION 5

Section 5
Technical Analysis

5.1 Proposed Technologies

This section of the report provides an overview of AD system technologies, and a discussion of potential outputs associated with a potential food waste and sludge AD project at the Easthampton WWTF. Based on the feedstock analysis summarized in the previous section, and the technical project components described herein, estimates of biogas, electricity, thermal energy, and digestate are provided.

5.1.1 Anaerobic Digestion Systems

Anaerobic digestion technology is commonly available and there are a variety of turnkey products available for installation in the U.S. Sludge and food waste anaerobic digestion technology is particularly well developed in the agricultural industry, where manure, food waste, and crop residues are readily available. Additionally, many high solids anaerobic digestion facilities are in operation at privately owned food processing food plants throughout the world. Examples of facilities that have a food waste or sludge anaerobic digestion process include the Jordon Farm in Rutland, MA; the Redhook Brewery in Portsmouth, NH; the Massachusetts Water Resources Authority (MWRA) Deer Island WWTP; the Greater Lawrence Sanitary District WWTF; and the Pittsfield, MA WWTP.

There are two main type of anaerobic digesters; wet and dry. A wet digester is designed to process material as a slurry. This slurry can be either low or high in total solids (0-30%). In a low solids wet digester, water can be added to the feedstock to dilute the feedstock stream and reduce the solids content. A high solids system is typically more compact than a low solids digester because of the reduced space needed to process the associated liquid. Wet anaerobic digestion is best suited for feed stocks with higher moisture content such as manure, wastewater and pulped food scraps that have less than 20% solid content. However, there are many emerging anaerobic digestion technologies that are capable of handling feedstock with high solids (up to 30%) in a wet form.

In a wet digester, organic feedstock is typically blended, mixed, heated and inoculums are pumped into the chamber(s) to kick-start the digestion process. The material is moved into an air tight chamber where digestion and biogas production occur. After digestion, the solids are separated from the liquids and either composted or processed for land application. If human waste is used in the process, the solids product must meet MassDEP standards for land application as discussed in Section 3. Liquids generated from the process can be sent to a wastewater treatment plant or contained and transported to be used as liquid fertilizer. Wet digestion systems typically consume more energy than dry systems because of the need to pump waste internally.

Dry digestion, also known as “dry fermentation”, is best used to process stackable materials like food scraps and yard debris that have a solids content between 25% – 50%. Feedstock materials are mixed and mechanically loaded into digestion chambers. After approximately two weeks in the digester, the partially degraded material is removed and may be aerobically composted. This design will likely have a longer retention time and a reduced composting stage.

For the purposes of this study Tighe & Bond consulted with Bioferm, a leader in AD technology located in Madison, Wisconsin. Bioferm is a supplier of turnkey AD facilities that can be designed to handle varied and diverse feedstock materials typical of community AD systems. Please note that the study did not include an exhaustive evaluation of all manufacturers and models currently available on the market. Accordingly, while our study includes a recommendation on a potential project configuration, it should not be construed as a recommendation of a specific manufacturer and model for this project. Once the project advances to the design stage, the equipment selection process will be influenced not only by the characteristics recommended in this study, but by the design team chosen and the existing relationships each firm has with anaerobic digester manufacturers.

Bioferm has installed numerous digesters throughout the United States and Europe. Their technology accepts most feedstock materials and is easily scalable in size. Depending on the feedstock characteristics, the material to be digested can be either pumped or tipped into a hopper for processing prior to digestion.

Based on the feedstock analysis for the Easthampton project, Bioferm recommends that their Coccus system be installed. The Coccus system is a complete mix AD system designed for low solids feedstock materials. Please refer to Attachment 1 in Appendix E for more information. In a typical installation for this system, feedstock can be delivered to a receiving building where is it prepared for digestion. The feedstock undergoes a partial size reduction and mixed to ensure a homogeneous consistency with a total solids content less than 12%. The size reduction is completed by the use of grinders. This building has odor control systems installed to reduce odors.

The feedstock mixture is then be pumped to a complete mix digester where it is retained for approximately 30 days for digestion. When inside the digester, the feedstock is heated and mixed. Digested material settles to the bottom where it is removed for dewatering. The material to be dewatered is sent to a screw press that mechanically removes excess water by forcing the material through a screen. Biogas that is generated raises to the top of the system where it is collected to be used for energy. All systems controls and process systems can be monitored in the operations building.

5.1.2 Cogeneration System

Cogeneration systems produce both heat and power, with the electricity that is generated generally being utilized onsite to offset power purchased from the grid, while the recoverable heat is used for digester and facility heating. Cogeneration results in higher overall efficiencies than heating systems or generation systems since heat resulting from electricity generation that would otherwise be wasted is recovered. Currently, there are three widely utilized technologies which utilize biogas in cogeneration to produce electricity: microturbines, fuel cells, and internal combustion engines. The technology choice and size is generally driven by the size of the anaerobic digestion facility, feedstock characteristics, and predicted daily biogas production.

Fuel cells produce an electric current and heat from a chemical reaction between hydrogen and oxygen rather than combustion. They require a clean gas fuel or methanol with various restrictions on contaminants. To be utilized by a fuel cell, raw biogas would require full treatment (where the biogas is cleaned of carbon dioxide (CO_2), hydrogen sulfide (H_2S), water vapor, and other trace contaminants) followed by reformation (conversion of methane to hydrogen). Reformers increase the concentration of hydrogen and decrease the concentration of gas species toxic to the fuel cell. Challenges for utilizing biogas for fuel cells result from the high variability of contaminant concentrations in the biogas and the cost associated with cleaning the biogas to prevent fouling of the fuel cell catalyst. A 2011 study conducted by the US EPA Combined Heat and Power Partnership found that of reciprocating engines, turbines, and fuel cells; fuel cell systems are the highest cost option ($5,000/kW to $6,000/kW even for larger generations over 1MW)[1]. However in recognition of the high capital cost, the National Renewable Energy Laboratory (NREL) has financially encouraged fuel cell research and development to make fuel cells more competitive with incumbent technologies. It may be a viable option in the future provided a large grant or a source of funding is secured to offset the high capital costs of a fuel cell.

A **reciprocating engine** generates electricity by burning biogas to generate electricity and utilizing a heat recovery unit to capture the heat from the combustion system's exhaust stream. Reciprocating engine technology has improved over the past few decades, driven by economics, environmental regulations, increased fuel efficiency and reduced emissions. This is currently one of the more widely used technologies, and has a higher electrical efficiency and a lower capital cost than other cogeneration technologies. Unlike turbine-type technology, gas compression is not required prior to combustion.

Microturbines generate electricity by burning gaseous fuels (methane mixed with compressed air) to create a high-speed rotation which turns an electrical generator to create power. Microturbines are typically more sensitive to impurities in the biogas such as hydrogen sulfide and siloxanes compared to reciprocating engines; however require less longer-term maintenance. Microturbines are able to utilize low calorific (methane) value fuel more efficiently than reciprocating engines. Additionally, microturbines often have a higher parasitic load than reciprocating engines. A parasitic load is the power used by the cogeneration system itself. The parasitic load for microturbines is often higher as energy is utilized to pressurize the gas for combustion. The parasitic load is less in reciprocating engines as there are engines that utilize low-pressure biogas.

The following analyses were completed based on the installation of reciprocating engine technology on the site. Tighe & Bond has reviewed the various technologies available and has been in contact with numerous manufacturers of anaerobic digestion and cogeneration systems and finds that a reciprocating engine is appropriate for the Easthampton project for the following reasons: the size of the facility; the efficiency of the reciprocating engine; the lower sensitivity to siloxanes and hydrogen sulfide in fuel; and the lack of compression required prior to combustion. Furthermore, the efficiency of a reciprocating engine does not rapidly decrease when operation is not at the rated fuel rate or generation capacity. This is an advantage over turbines in a situation where there may be variable fuel flow rate due to wastewater flows and seasonally available feedstock material in the fuel stream.

The system selected for the Feasibility Study is a power-led system, which means the system will operate primarily to generate electricity. Generally, the overall fuel efficiency of heat-led systems can be higher than power-led systems. However, since a heat-led system would only be operating when there is heating demand, the summer

[1] U.S. Environmental Protection Agency, Combined Heat and Power Partnership, "Opportunities for Combined Heat and Power at Wastewater Treatment Facilities: Market Analysis and Lessons from the Field," October 2011.

months would still result in an excess of biogas and energy lost to flaring. A power-led system would operate year round and transfer the energy otherwise lost to electrical energy. Also, when one takes into account the quality of the output energy, power-led systems have a similar or better efficiency to heat-led systems. This is because electricity has a very high quality, or ability to do work, and heat has a lesser quality. The quality of a form of energy also translates into economic benefit, as is evident since electricity has a high value.

Tighe & Bond contacted Cenergy, a manufacturer of reciprocating cogeneration systems that can be fueled by biogas. Based on the estimated size of the digester, feedstock quantities, and biogas production, Cenergy recommended their AvuS 600kW system with sound enclosure to reduce noise. Please see Attachment 2 in Appendix E for Cenergy equipment specifications.

Although the technology of cogeneration systems has improved over the last few years it is still expected that the system will require regularly scheduled maintenance. For this Feasibility Study, based on manufacture recommendations, it was assumed that the cogeneration system will be operational 96% of the time. It is anticipated that the generation equipment will need regular fluid changes and that the emissions equipment will need similar minor servicing.

As the AD process is a continuous operation, feedstock material can continue to be delivered to the facility when the cogeneration unit is being maintained or is experiencing downtime. Biogas will continue to be generated when the cogeneration system is offline and can either be stored or flared if necessary. Although revenue will be lost because the cogeneration system will not be operating, losses can be limited by the revenue generated by the tipping fees. The electrical and thermal energy production estimates include an assumption of 4% equipment down time and has been adjusted because of fluctuations in biogas production.

5.2 Potential Facility Outputs

5.2.1 Biogas Output

Biogas is created during the decomposition of the volatile solids (VS) contained within the feedstock in an oxygen free environment. The created biogas, produced by the consumption of the volatile solids, contains 50-75% methane[2], the usable portion of biogas. Based on the estimated feedstock material makeup and quantity, the biogas production was calculated based on industry standards and the actual chemical composition of the Easthampton sludge feedstock. For the purpose of the evaluation, it was assumed that feedstock availability was fairly constant and uniform biogas production is predicted to be stable throughout the year. Based on the actual estimated feedstock the methane content of the biogas is approximately 55%.

[2] Handbook on Energy Efficiency and Renewable Energy 25.1.8.1

TABLE 5-1
Estimated Biogas Production

Feedstock	Biogas Production ft^3/hr	Biogas Production ft^3/yr
Sludge and Food Waste	7,500	65,600,000

The estimated biogas production numbers are based on the composition of the feedstock. If the feedstock characteristics vary from what has been modeled in the Feasibility Study, the biogas production rate will be different. With the estimated 50 TPD of food waste feedstock and 10,000 gallons of sludge feedstock, a predicted 7,500 cubic feet per hour of biogas will be produced. Before the biogas can be utilized by the cogeneration system, it must be refined/scrubbed to remove contaminates, such as siloxanes, which can damage the cogeneration unit. The AD system that has been modeled for this Feasibility Study includes a system that removes contaminants and the cost has been included in the financial pro forma.

5.2.2 Electricity Production

Based on the feedstock characteristics and quantities summarized in Section 4.3, it is estimated that 7,500 cubic feet of biogas per hour would be produced by the proposed AD system. Based on this information, one reciprocating engine with an electrical output of 600 kW was evaluated. Refer to Attachment 2 in Appendix E for Cenergy equipment specifications. The production of biogas at the plant was assumed to be fairly consistent. Therefore, system output calculations took the full load percentage (actual energy input/design energy input) into consideration. The system has been sized to accommodate the entire biogas flow rate, allow biogas production fluctuation, minimize flared biogas, and maximize electricity generation.

The daily and annual electrical power generation was calculated based on the selection of the cogeneration system. Refer to Table 5-2 to see the predicted electrical output.

TABLE 5-2
Estimated Electrical Production

Technology	Electrical Production (kWH/yr)
Estimated Cogeneration System Production	4,222,000
Estimate Parasitic Load of AD Facility	1,055,500
2012-2013 WWTF Electrical Load	689,690
Net Excess Electricity Generation	**2,476,810**

It is estimated that the 600 kW system will generate approximately 350 MWH of electricity per month, or an annual energy production (AEP) of approximately 4,222 MWH. Because of the additional infrastructure and equipment being installed on the site, there will be additional electrical loads associated AD facility. To represent the additional loads, the parasitic energy consumption, a reduction of the usable power output of the cogeneration system was estimated. The estimated usable AEP is 3,166 MWH and it has been assumed that the WWTF will consume about 689,690 kWh/year.

Since the rated capacity of the cogeneration system (600 kW) is greater than the average electricity demand at the WWTF (approximately 140 kW), there will be likely periods when the system is generating more electricity than the facility is consuming. Additionally, since average monthly electricity use (57,700 kWh) at the WWTF is less than the estimated monthly generation, it is anticipated that there will be net excess generation from the facility.

The City or private developer can enroll in net metering to virtually net meter to other City owned facilities within the same WEMCo ISO load zone[3]. Refer to Figure 5-1, a graph showing the electricity consumption at the Easthampton WWTF for the November 2012 to October 2013 period (blue), and the anticipated electricity generation from the AD project (red).

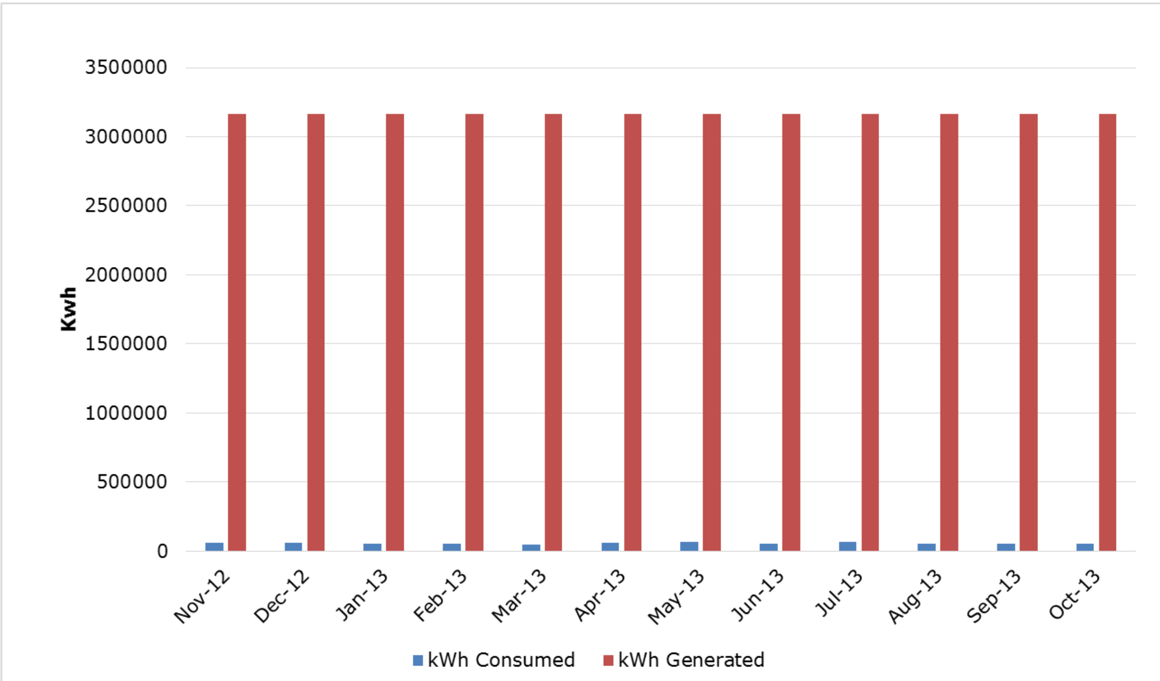


FIGURE 5-1
Electrical Consumption & Estimated Generation

5.2.3 Thermal Energy Production

According to manufacturer specifications, the cogeneration system will generate approximately 11,000 MMBTU per year. After deducting the annual average energy required to heat the digester (40%) there is a significant amount of heat remaining. The excess heat generated by the cogeneration system can be used for space heating at the WWTF if an interconnection between the AD facility and the heating plant is made. The excess heat generated by the AD facility is estimated to be more than the annual heating requirement of the WWTF as determined in Section 2.6, which is approximately 840 MMBTU. However, during periods of cold weather or system downtimes it is

[3] Subject to net metering caps as outlined at 220 CMR 18.00 and in WEMCo net metering tariff.

expected that the facility may require supplemental heating. Refer to Table 5-3 for the estimated thermal production of the AD Facility.

TABLE 5-3
Estimated Thermal Production

Technology	Electrical Production (MMBTU/yr)
Estimated Cogeneration Production	11,000
Estimated Parasitic Load of AD Facility	4,400
Estimated WWTF Heat Load	840
Excess Heat	**5,760**

For the purpose of this study the thermal demand of the digester was averaged for the year. The AD system proposed by the manufacturer is insulated and designed for cold weather operation to reduce thermal losses. Refer to Figure 5-2, a graph of the heating currently used on site based on preliminary data from the City, and the thermal energy that will be available from the proposed system by month.

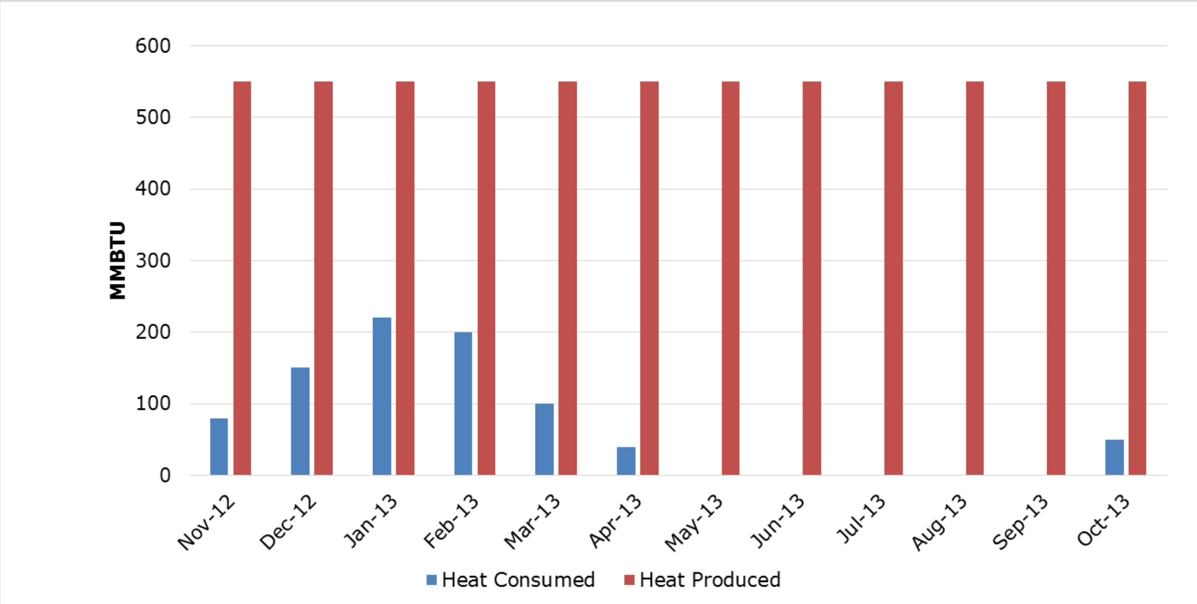


FIGURE 5-2
Estimated Thermal Energy Consumption and Production

5.2.4 Digestate Production

As previously noted with respect to the project modeled as part of this Feasibility Study, it is assumed that wastewater biosolids will not be dewatered prior to digestion. The AD process will result in the production of digestate. We have assumed that the digestate will be dewatered to a total solids content of 25% using a screw press. Liquid from the dewatering process will be returned to the WWTF.

Since human waste is to be used in the AD process, the solids product must be disposed of in accordance with MassDEP 310 CMR 32.00 standards if it is to be used for land application. Some AD systems are capable of producing digestate that will meet MassDEP standards for land application by heating material to remove all pathogens, however for the purpose of this study it has been assumed that all solid digestate will be landfilled.

Another option to consider is the installation of a parallel train system with two digesters, one for food waste and one for sludge. The biogas produced by each system would be piped together to one centrally located cogeneration system. This configuration would result in digestate from the food waste AD system that is easier to reuse and may have financial value associated with reuse. This scenario was not evaluated as part of this study, however, has it has been suggested by AD system vendors. Having two digestion systems would increase the capital cost, facility size, and operation and maintenance costs; however, could allow more reuse alternatives for for digestate.

Please see Table 5-4, below, for an estimate of digestate production based on information provided by Bioferm using the feedstock estimates for this project. Based on the size of the facility and the technology selected the amount of digestate produced will vary.

TABLE 5-4
Estimated Digestate Production

Parameter	Quantity
Annual Digestate Production at 4.3% total solids	30,840 TPY
Daily Digestate Production at 4.3% total solids	85 TPD
Annual Digestate Production at 25% total solids	5,300 TPY
Daily Digestate Production at 25% total solids	14.5 TPD
Gallons of Liquid Digestate back to Headworks	16,800 GPD

SECTION 7

Section 6
Integration with WWTF

6.1 Conceptual Facility Layout

Based on the system evaluation conducted as part of this Feasibility Study and the site development constraints, Tighe & Bond developed a conceptual facility layout as seen in Figure 6-1. Please note that at the Feasibility Study stage, the layouts are conceptual and do not represent an engineering design. The ultimate project configuration will be determined by further site evaluations, system size, and the desired layout of the system developer.

The AD facility will be accessed from Gosselin Drive, the main access point for the WWTF. Vehicle traffic will include food waste delivery, solid digestate haulers, and employees. The incoming feedstock will pass over a scale on the incoming access road that will be recorded at the operations building. A circular site access drive should be constructed to provide efficient access through the site. The operations building will house all facility operations, including a staff area and restroom. Onsite parking would be provided for facility personnel adjacent to the operations building.

Feedstock material could be tipped within an enclosed and ventilated building with an installed odor control system. The cost of a pre-fabricated metal building has been accounted for in the capital cost estimate of the AD system. Sludge from the existing WWTF dewatering building would be pumped to the feedstock delivery and dewatering building where it would be mixed with the incoming food waste feedstock. Depending on whether the food waste feedstock is transported directly from the point of generation, a screening device to remove contaminants may be required. We also assume that food waste loads will be visually screened for contaminants before digestion. Some storage of feedstock can occur in this building to account for variability in delivery.

The digester tanks are located within the access road. Piping runs between the delivery and dewatering building and the digester tanks would supply feedstock and remove digested material. Biogas collection piping would transfer biogas to the point of consumption. Heating piping from the cogeneration system can be used to heat the digester tanks reducing the digestion time and increasing biogas production.

Biogas produced by the digestion process would be stored in a storage vessel before being consumed by the cogeneration unit. The cogeneration unit will burn the biogas to produce electrical power and thermal energy that can then be used by the AD facility and the WWTF. The cogeneration system would be interconnected to the electrical grid allowing net metering, and the heating systems between the facilities can be connected to allow the transfer of thermal energy. If there is excess biogas, it would be flared via an onsite flare.

Digested material would be pumped back to the delivery and dewatering building where it is dewatered. Liquids from the dewatering process would be sent back to the WWTF headworks building for treatment. Solid digesate would be stored within the building in roll off containers before being hauled offsite for disposal.

To limit project costs and stormwater runoff, impervious areas of the site should be minimized to the greatest extent practical. To the west of the site is a proposed stormwater infiltration area. To allow the treatment of surface water before being infiltrated into the ground. Once construction of the facility is complete, the area can be landscaped with native shrubs and grasses to reduce visual impacts and improve stormwater management.

6.2 Integration with Existing Facilities

The integration of an AD facility with a WWTF has been completed numerous times before and is well proven in Massachusetts. The proposed AD system configuration evaluated as part of this Feasibility Study would be integrated with the WWTF as follows.

Sludge that has settled out during the treatment process and historically been sent to the belt filter press would be pumped into the digester where it would breakdown in an oxygen free environment producing biogas and reducing the organic material in the sludge. Because the sludge does not require dewatering, it could be pumped directly from the dewatering room at the WWTF to the feedstock delivery building and then into the digesters. We have assumed this would be a subsurface connection from the main operation building to the AD facility feedstock delivery building where it would be mixed with incoming food waste feedstock.

Biogas generated from the AD process would piped to the cogeneration unit and burned to produce electricity and heat. If the AD facility is publicly owned then an underground electrical line could run from the cogeneration system to the main operations building and the electrical interconnection would likely be made to the switchgear located in the basement. At this location there would be a utility grid power disconnect and a meter capable of being net metered. The electrical generation would offset the consumption and excess could be fed back to the grid via net metering.

If the AD facility is privately owned, then an onsite transformer would likely be installed and an interconnection to the grid would be made to allow excess electrical generation to be back fed. Disconnect equipment that is compliant with interconnection regulations would be required.

Excess heat generated by the cogeneration unit could be transported to the main operations building by a hot water loop connected to a heat exchanger in the currently installed heating system. The existing heating system could remain as a standby unit. Buildings that are currently heated by propane could be heated by hot water coil units and propane systems could remain as backup. Additionally, it may be possible to modify the existing propane systems to burn biogas produced by the AD facility.

The AD system evaluated in this study uses a mechanical screw press to dewater digestate produced and therefore the City's existing dewatering equipment could be decommissioned. Solid digestate from the project would be hauled off-site while liquid digestate would be returned to the WWTF headworks for treatment and disposal. Based on the feedstock mix evaluated in this study, it is assumed that additional pretreatment aside from dewatering would not be required in order for the liquid digestate to meet the City's IPP limits. Depending on the nature of feedstock ultimately selected, pre-treatment may be required before returning the liquid digestate to the plant.

CONCEPTUAL FACILITY LAYOUT

N

SCALE: 1"=80'

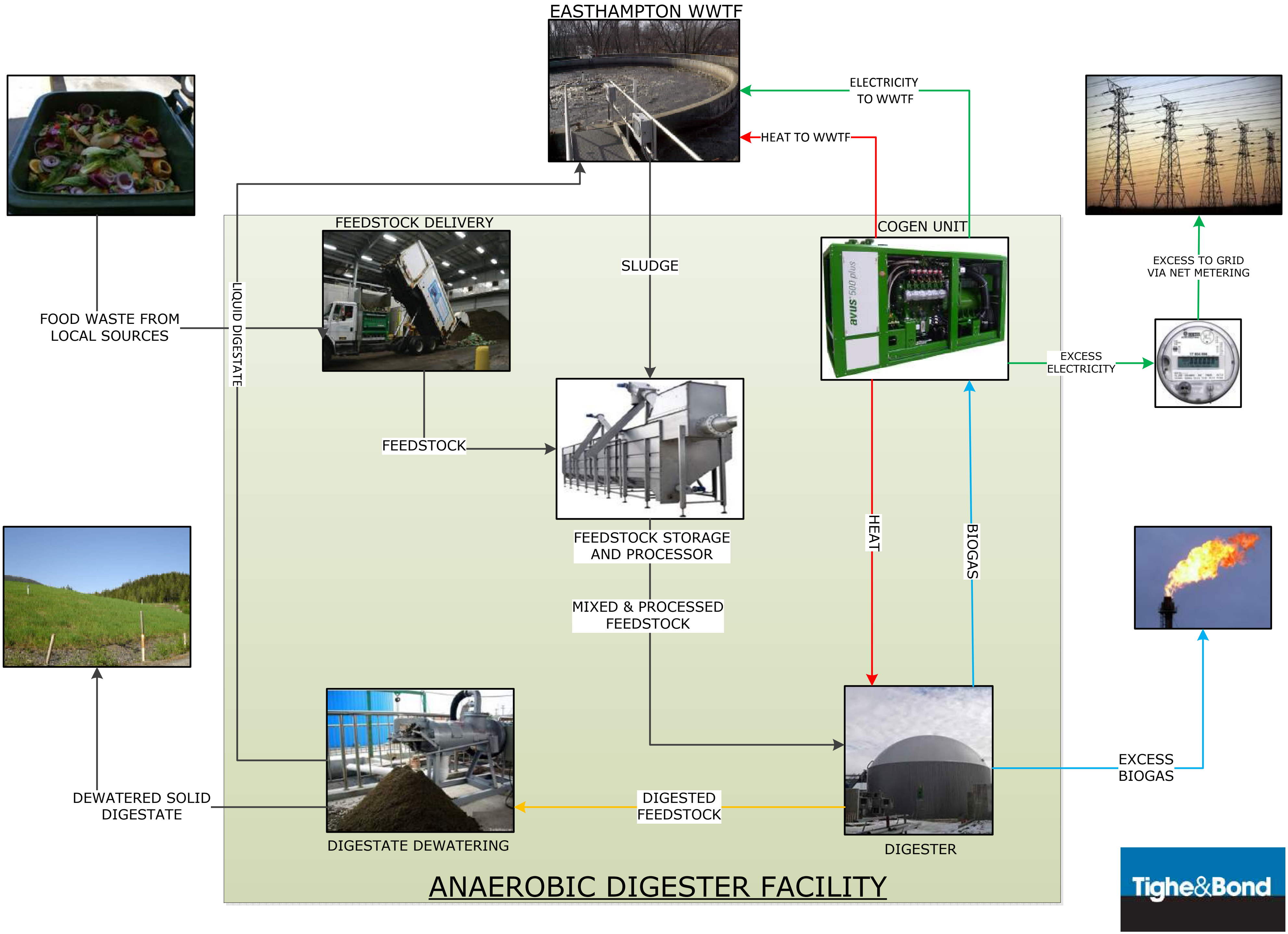
FIGURE 6-1
CONCEPTUAL FACILITY LAYOUT

WWTF
Easthampton, Massachusetts

January 2014

Feb 14, 2014-11:20am Plotted By: dgm
Tighe & Bond, Inc. J:\E\E0702\DWG-CAD\DESIGN\E0702_Site.dwg Layout: Layout2

Figure 6.2: Conceptual Process Flow Diagram



SECTION 7

Section 7
Community Impacts

Community concerns regarding AD projects generally relate to the potential for odors or noise from the facility or truck traffic associated with the transport of feedstock or digestate. The site is very suitable for the proposed project as the project will be an extension of the current land use. Furthermore, the entire project site is surrounded by a dense vegetated buffer and/or wetlands, and there is minimal abutting residential use.

This section provides a discussion of potential community impacts, including truck trips, and potential odor and noise issues. This information is in direct response to concerns raised by members of the public during the Community Engagement process conducted at the onset of the project. Refer to the Section 7.4 for additional information on public outreach and the Community Engagement Plan.

7.1 Trucking Volumes and Traffic Generation

As a part of this Feasibility Study, Tighe & Bond estimated potential traffic impacts associated with the construction of an anaerobic digestion facility at the Easthampton WWTF. Note that the evaluation summarized below does not constitute a comprehensive traffic impact and access study, and no formal traffic counts were conducted as part of the project.

Tighe & Bond obtained data from the City related to current sludge production and associated truck traffic in order to establish a baseline. Currently, approximately 150 tons of dewatered sludge per month is generated at the WWTF, resulting in 10 to 15 vehicles per month entering the facility to remove the waste (average of 0.6 trucks per day). Sludge is off-hauled from the facility in roll off trailers by tandem axle trucks during normal operating hours.

Traffic generation for the AD facility was estimated based on the size of the facility, capacity of the trucks hauling feedstock into the facility, and the production rate of digester waste. Based on this data, it is anticipated that approximately 10 trucks would enter the facility per day to deliver food waste to the facility. It is anticipated that approximately two trucks per day would leave the facility to off-haul the remaining solid digestate. Therefore, compared with current traffic, the AD project would result in a net increase of 10 to 12 truck trips per day to/from the site.

It is anticipated that trucks would utilize I-91 and Routes 141 or 10 depending on the point of origin. From there, trucks will likely access the site from Ferry Street via Lovefield Street or East Street. Based on the location of feedstock generators, it anticipated that the majority of traffic will be entering and exiting the site from the west. Deliveries will occur throughout the day and likely not during peak-hour traffic. The proposed AD facility is expected to have a limited impact on the traffic flow within the vicinity of the WWTF.

The condition of the existing access road may require upgrades to accommodate the additional trucks. These improvements have not been carried in the economic analysis.

7.2 Noise

The facility will be designed to minimize the potential for noise impacts. Potential sources of noise include the cogeneration system, and equipment for offloading and managing food waste. It is anticipated that the cogeneration engines will be located in an enclosed sound reducing structure that is pad mounted. Food waste will be delivered and transferred to the digesters inside a metal building with sound-proofing considerations. Should noise be determined to be a significant concern, many vendors offer additional equipment add-ons specifically designed to reduce sound. The project must also comply with Section 10.27 of the City's Zoning Ordinance which states that *"[e]xcessive noise at unreasonable hours shall be required to be muffled so as not to be objectionable due to the intermittence, beat frequency, shrillness or volume".*

7.3 Odor

The existing odor conditions at the WWTF are associated with the operation of the sludge thickening process and will not be impacted or exacerbated by the proposed project. The AD system is not anticipated to cause any odor issues as the trucks containing the food waste will off-load feedstock material in a closed building and sludge feedstock will be directly pumped into the systems. Furthermore, once the feedstock is received on-site it will remain in sealed digester tanks for the entire digestion process.

Dewatering of digestate will happen inside a closed building with an odor control system. Solid digestate will be stored in closed containers before being shipped offsite. The facility (including odors) will also need to comply with MassDEP's Air Regulations – including the Best Available Control Technology and meet the odor containment conditions discussed in Section 2.7.1 of the report. Additionally, the project will need to comply with Section 10.21 of the City's Zoning Ordinance, which prohibits odorous gases or odorous matter "in such quantities as to be offensive" and requires any processes that involve the creation and/or emission of any odors to be provided with a secondary safeguard system. As such, adverse odor impacts are not anticipated.

7.4 Community Engagement Plan

Tighe & Bond worked collaboratively with the City to develop a Community Engagement Plan for the project to help ensure the project is a positive benefit for the community. The Community Engagement Plan is attached as Appendix F. The plan identified key stakeholders, including project abutters, significant food waste generators, and relevant energy/environmental interest groups in the City. See Table 7-1 below for a summary of the stakeholders that were identified during this process.

TABLE 7-1
Potential Stakeholders

Stakeholder	Interest in Project
Manhan Rail Trail Users	Potential visual and odor impacts
Adjacent Property Owners/Developers	Potential visual, truck traffic, and odor impacts
Local Breweries	Potential source of feedstock
Local Farms/Agricultural Operations	Potential source of feedstock
Other Large Producers of Organic Waste	Potential source of feedstock

All Municipal Boards/Commissions/City Council	Potential to reduce City's expenses and generate additional source of revenue.
Pascommuck Conservation Trust	Potential visual and odor impacts, potential support for environmental benefits of project
MassAudubon, Arcadia Sanctuary	Potential visual and odor impacts, potential support for environmental benefits of project
Vendors	Potential to develop project and enter into a Power Purchase Agreement with the City
Community	Potential for reduced sewer rates and continued demonstration of City as clean energy leader. Potential for concern regarding visual, truck traffic, and odor impacts.
MassCEC	Provided source of grant funding. Desire to accelerate development of renewable technologies in MA.
MassDEP	Desire to utilize synergy of waste ban to reduce reliance on fossil fuel. Enforce air permitting and solid waste regulations.

Prior to undertaking the Feasibility Study evaluation, Tighe & Bond held a public information meeting on May 7, 2013 at the Easthampton Municipal Building. The purpose of this meeting was to provide general information on anaerobic digestion, explain the City's interest in the project, describe the scope of the Feasibility Study, and to solicit initial input from the community. The intent was to obtain public comment at the beginning of the process in order to help focus on the issues that are most important to the community as the Feasibility Study progressed. The stakeholders identified above and other community members were informed of the public meeting in a variety of methods.

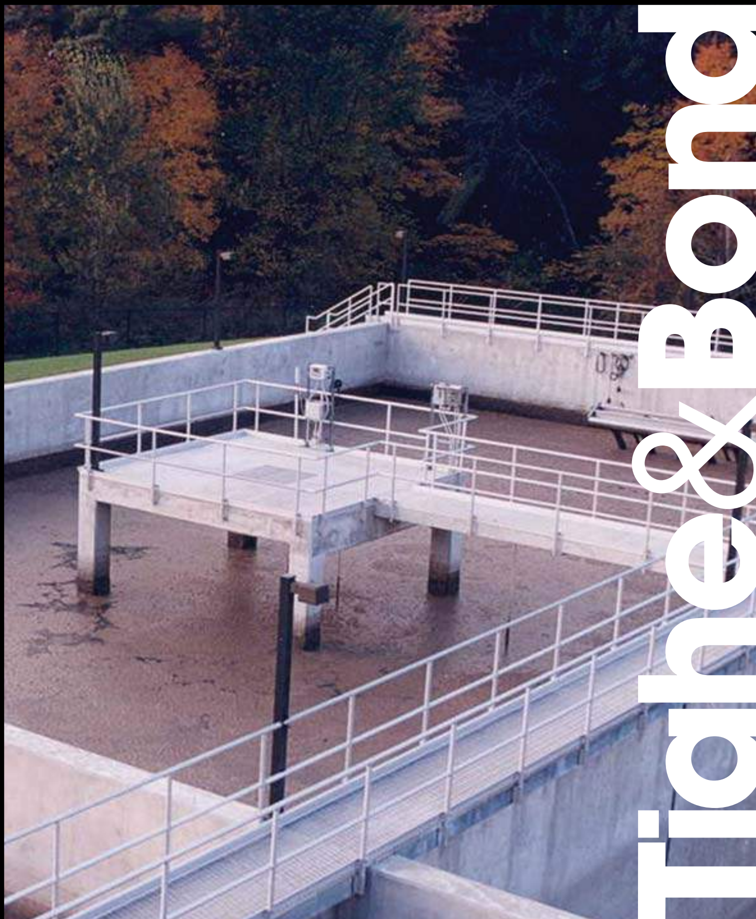
Though significant advance notice of the meeting was provided in a variety of electronic and printed formats, there was small attendance. Notably however, the meeting was attended by several City Councilors and the Mayor, indicating an interest from decision-makers.

Questions and public input received at the public meeting are provided below:

- What types of waste will the project accept?
- How many tons per day of feedstock will the project accept? What is the project size?
- How many truck trips will the project generate?
- How will odors be controlled?
- Why isn't a larger facility being looked at?

Responses to the above questions are provided in this Feasibility Report and were also addressed in Section 3 of the Community Engagement Plan. The Community

Engagement Plan (which includes copies of the presentation and public meeting notifications) is attached in its entirety as Appendix F.



SECTION 8

Section 8
Economic Analysis

The economic analysis is intended to express the data collected in this Feasibility Study in economic terms for the City to use as a tool for decision making about a potential AD project. The economic analysis is based on a preliminary proforma for the project that takes into account project cost, financing mechanisms and incentives, and potential post-construction revenue. A brief discussion of these three factors is provided below. Potential sources of revenue and funds as well as the time-value of key factors that could change over the project's 20-year life are discussed below. The scenarios have been modeled based on the feedstock and energy production parameters discussed in Section 4.3 and 5.2, respectively.

As with other aspects of the Feasibility Study, the economic analysis has been prepared for the conceptual project size and type reviewed as part of this project. Note that the project economics will change based on the size and scale of the project, technology selected, project development and financing approach of the developer, and other factors.

An Economic Summary Table (Table 8-3) is attached at the end of this section for easy reference. More detailed pro forma summary tables for each scenario evaluated are provided in Tables 8-4 and 8-5.

8.1 Ownership Models

The Feasibility Study evaluated two project development/ ownership scenarios. Scenario 1 assumes the project is developed, owned, and operated by the City of Easthampton, whereas Scenario 2 assumes a privately developed, owned and operated project. The pro forma analysis is conducted from the perspective of the developer. A brief description of the development models is provided below.

8.1.1 City-Owned Project

Under the City-owned project scenario, the project would likely be developed by the City following an Engineering-Procurement-Construct (EPC) development model similar to other municipal infrastructure projects. The cost of design, construction, operation and maintenance of the project would be incurred by the City of Easthampton. Easthampton would manage electricity generation and retain all revenue from energy generation and the sale of Renewable Energy Credits (RECs), Alternative Energy Credits (AECs), and utility rebates for combined heat and power (CHP). Cost of the project would be driven by project size and is incurred during development and construction of the project and annually for O&M costs. Revenue would be driven by the performance of the system. Since the City does not have tax liability, tax benefits and accelerated depreciation offered for private renewable energy developments are not available. However, publicly owned projects generally have greater access to low cost debt and grant funding.

In Scenario 1, revenue would be generated through:

- Electricity generation resulting in avoided energy costs at the WWTF
- Thermal generation resulting in avoided heating costs at the WWTF
- Revenue from net excess electrical generation from the project

- Class I RECs and AECs, CHP rebates
- Tipping fees collected from food waste suppliers
- Avoided sludge disposal costs
- Grant funding

Costs associated with this scenario include:

- Capital equipment, project development, and operations & maintenance costs
- Disposal fees and costs associated with the treatment and disposal of the liquid and solid digestate

8.1.2 Privately-Owned Project

The proposed project may also be owned by a private developer, on municipal land, with a Power Purchase Agreement (PPA) and/or a lease agreement. In this case the City would likely follow a typical municipal procurement process with a Request for Proposals (RFP) solicitation under MGL c.25A, 11C or a Request of Qualifications (RFQ) solicitation under MGL c. 25A, 11I for an AD developer who will design, construct, own and maintain the project. A long-term lease between Easthampton and the developer would give the developer rights to construct and operate the AD facility on the City's land. A PPA, often a 20 year agreement, is a long-term contract between Easthampton and the developer for the purchase of power or net metering credits. A PPA gives Easthampton the opportunity to maximize revenue through electricity cost savings and to hedge against rising fuel costs through agreement on the long-term purchase price of the electricity or the net metering credits. A PPA also provides a developer with a steady income source for the project, often necessary for the procurement of financing.

In Scenario 2, revenue to the project developer would be generated by:

- Sale of electricity to the City of Easthampton
- Sale of thermal energy to the City
- Additional sale of excess energy generation
- Class I RECs and AECs, CHP rebates
- Food waste and sludge tipping fees
- Grant funding
- Federal tax incentives

Costs incurred by the developer would include:

- Capital equipment, project development, and operations & maintenance costs
- Land lease payments
- Disposal fees and costs derived from the treatment of the liquid and solid digestate

Additional details on cost and revenue streams are discussed in the following sections. Note again that the pro forma analysis was conducted from the perspective of the developer. Therefore, in Scenario 2, potential revenues would accrue to the private developer. However, to allow the City to fully compare both project ownership scenarios, we have also summarized potential cost savings or revenue that the City might enjoy in the private ownership scenario. This information is presented at the end of this section.

8.2 Preliminary Financial Pro Forma

The pro forma analysis integrates the cost and revenue assumptions into a 20-year cash flow life-cycle cost analysis to determine three critical project indicators for each of the scenarios. The cash flow analysis calculates the costs and revenues for every year, taking value escalation and debt payments into account. From the 20-year cash flow analysis, it is possible to calculate the Internal Rate of Return (IRR), the Net Present Value (NPV), and the Payback Period of the project. These are financial indicators commonly used in order to identify an optimal project investment. A brief discussion of these three factors is provided below.

The IRR shows the rate at which the project costs are recovered from the initial capital expenditure considering the net cash flow. A project is generally acceptable if the IRR is greater than the cost of capital throughout the project. IRR measures the quality of an investment (good or bad), but does not give direct information about the quantity of profit or loss resulting from the investment. The NPV is one way to compare the potential profitability of each scenario. It is the present value of all costs and revenues throughout the project's lifetime. If the NPV is greater than zero, the project is expected to earn a profit for the owner. The Discounted Payback Period represents the amount of years it will take for the cumulative revenue of the project to exceed the cumulative costs of the project. The Payback Period is an indicator of the point at which a project will become profitable. If the project indicators are favorable, the project is anticipated to have a beneficial financial return for the project. Refer to the "Project Indicators" section of Tables 8-3 and 8-4.

Note that each scenario is analyzed in both a leveraged (with financing) and unleveraged (no financing) case, to show the range of values for indicators depending on financing options. The unleveraged payback period is often used for comparison to other capital projects and is not skewed by the low initial investment of a financed project. The impact of the tax incentives and more aggressive financing sometimes causes the projects to make more financial sense when owned by a private developer.

8.2.1 Cost Inputs

Costs incurred by the facility owner include project development costs, capital equipment, operation and maintenance, digestate disposal, and financing. Under private development, the developer will also be responsible for costs associated with local tax on personal property and land lease payments. Additional details are provided in the subsequent subsections.

8.2.1.1 Capital Costs

A cost estimate was prepared for the anaerobic digestion system based on the packaged-system cost from Bioferm. A cost estimate for the cogeneration system was based on package-system costs supplied by Cenergy. The digester system includes all components to accept the feedstock material, transport and process it through the AD system, create biogas, and produce a digestate for disposal. Note that at this time, the capital costs do not include screening equipment for the removal of contaminants, which may be required for unprocessed food waste feedstock.

The cogeneration system includes an appropriately sized generator based on the predicted biogas production and a selective catalytic reduction (SCR) system to reduce exhaust pollutants. Please see Table 8-1 below for a summary of anticipated capital costs for the project. The equipment costs were the basis for contingencies added for engineering and construction of the system. A 15% contingency was added for design, permitting, and engineering and a 15% contingency was added for installation of the system, based on our experience with similar projects.

The total estimated installed equipment cost of the digester system is estimated to be approximately $5,408,650. This includes costs associated with modifications to the existing WWTF, which may be necessary to connect with the AD system. These costs were estimated to be $400,000 to account for piping improvements to connect the WWTF and AD facility. In Scenario 1, these costs are incurred by the City; in Scenario 2, they would be paid by the private developer. Additional costs associated with electrical interconnection or off-site electrical equipment were not included in the analysis.

TABLE 8-1
Estimated Equipment Cost

Description	Amount	
Digester System	$	(2,630,500)
600 kW Cogeneration Unit	$	(1,000,000)
Selective Catalytic Reduction System	$	(130,000)
WWTF Modifications	$	(400,000)
Estimated Site Work & Installation	$	(624,075)
Estimated Design, Engineering, & Permitting	$	(624,075)
Total	**$**	**(5,408,650)**

8.2.1.2 Operation and Maintenance

Operation and Maintenance costs (O&M) were included in the financial analysis to account for staff and associated equipment for operation of the AD system, as well as on-site management of the digestate prior to it leaving the site. The O&M estimate is based on maintenance costs associated with the CHP system (based on $0.012 per kWh of generation) and the digester system (based on 1.5 percent of the total equipment cost). 1.5% was the suggested O&M rate provided by the AD vendor, however, to be conservative, the estimated maintenance cost for the digester system was increased to 3%. An additional $85,000 was included in the annual O&M cost estimate to account for two staff members.

8.2.1.3 Digestate Disposal

As discussed in Section 5.2.4 of this report, it has been assumed that the solid digestate will be dewatered to total solids content of approximately 25% and then disposed of at an off-site location. Currently, the City pays $100/ton to dispose of wastewater sludge (dewatered). For the purpose of the Feasibility Study, it was conservatively assumed that the solid digestate would be disposed of at an off-site location at the same cost. Any screenings or contaminated materials removed from the feedstock prior to digestion would be disposed of in the solid waste stream; these costs are not included in the pro forma.

Following dewatering of the digestate, liquid digestate would be returned to the WWTF. As discussed in Section 2, this would likely be considered an industrial discharge to the WWTF. The City of Easthampton does not have a rate schedule for industrial discharges. Given the volume of the potential discharge, and potential O&M considerations that may need to be made to the plant to accommodate the additional flow, we have assumed a discharge rate of $0.05/gallon for the Feasibility Study analysis. We have assumed the same cost in the publicly owned scenario. In both cases, the cost was only assessed against the portion of dewatering liquid associated with the food waste digestate. Although the system modeled in the Feasibility Study involves codigestion of biosolids and food waste, the water associated with the wastewater sludge is already currently processed at the WWTF. Therefore, for the purpose of the pro forma analysis it was assumed that the $0.05 charge would be assessed against half of the liquid digestate (3,066,000 gpy).

8.2.1.4 Local Tax

Personal property tax is a local property tax assessed upon non-real estate, tangible assets. The Easthampton Board of Assessors assesses personal property taxes on all personal property subject to tax as required by MGL c. 59. There are many conflicting opinions on the appropriate method for taxing renewable energy projects; there is even little agreement between state agencies. Similarly, developers take many different approaches to handling tax payment estimates in pro forma analyses; some even opt to presume that their project will be tax exempt.

For the purpose of the private development scenario, we have included a local tax payment to the City calculated as 5% of the project's net revenue. We have assumed an exemption from local tax in the case where the City is the project owner.

8.2.1.5 Lease Costs

In the private scenario, the AD developer and the City will negotiate an agreement that may include a PPA and land lease payment. If there is no lease payment, the PPA rate will be slightly increased, and vice versa. The Feasibility Study analysis assumes that the developer pays an annual land lease payment to the City of Easthampton, modeled as $20,000 per MW.

8.2.1.6 Financing

If privately developed, the project will likely be mostly funded by the private developer through financing. Typically, renewable energy technology is eligible for moderate-cost financing for a long-term loan. If a developer has adequate tax liability it is possible for to the investment tax credit (see below) to be applied against 10% of the financed portion of the project. We have assumed that the developer would finance 70% of the total project cost at 6.8% on a 20-year term, that the ITC would cover another 10% of up-front project costs, and that the developer would pay cash for the remaining 20%. If publicly developed, it was assumed that the City would finance 100% of the total project cost at 2.0% on a 20-year term loan.

8.2.2 Revenue Inputs

Revenue generated by project will include avoided energy costs, sale of excess energy generation, sale of environmental attributes (RECs/ AECs), grant revenue, and organic material tipping fees. The following sections provide detailed descriptions of these potential revenue streams.

8.2.2.1 Power Purchase Agreement / Net Metering/ Avoided Energy Costs

Since the AD system is predicted to be under 10 MW in size, it qualifies to be net metered per the DPU's Net Metering Regulations at 310 CMR 18.00. Net metering allows the owner of the meter at the project site to be credited for the excess electricity generation the AD project produces that is not used "behind the meter."

There are three classes of net metering facilities: Class I, Class II, and Class III. The project would qualify for net metering as a Class II Net Metering Facility since the project size is anticipated to be greater than 60 kW and less than 1 MW in capacity. Per 220 CMR 18.04, a Class II Net Metering Facility Net Metering Credit (per kWh) is equal to the sum of the default service kWh charge, and the transmission, transition, and distribution charges. Demand charges and system benefit charges, such as the energy efficiency and renewable energy charges, are not included in the calculation of the value of net metering credit. Therefore, the owner of the meter will receive net metering credits in the amount of the per-kWh charges times the amount of generation during the billing period. In the event that there is excess generation, net excess generation during a billing cycle would be credited to the owner's account over subsequent billing periods at a rate equal to the default service rate.

Under the City-owned model (Scenario 1), it is assumed that the City would see cost savings from behind-the-meter use at the WWTF. Revenue would also be generated from net metering credits for excess generation (total AEP minus parasitic and behind-the-meter load). In the case that the project produces more electricity than will be consumed by eligible City accounts, the electricity bill credit will "roll over" until a time when consumption is higher than production. For the purpose of the pro forma analysis, the net metering credit rate was assumed to be $0.08 (which is an average of the variable Medium and Large Business Basic Service (G2) rate as of 2013).

If the City partners with a private developer to implement the project, the developer will likely register the project for net metering to generate revenue from net metering credits. It is assumed that the generated revenue will be passed through to the City of Easthampton as a lease and power purchase agreement (PPA). The rate at which the City pays the developer for electricity under the PPA would likely be higher than wholesale and lower than the net metering credit rate that the developer is receiving. We have assumed a PPA rate of $0.07 based on the potential profitability of this project to the developer and recent renewable energy project contracts.

8.2.2.2 Thermal Purchase Agreement

In the private scenario, it would also be economically beneficial for the City to enter into a Thermal Purchase Agreement with the private developer to purchase excess thermal waste heat generated from the AD facility to meet the WWTF's thermal load (approximately 840 MMBTU). It was assumed that the Thermal Purchase Agreement rate would be less than what the City is currently paying for heat to be advantageous to the City. The Thermal Purchase Agreement was modeled as $25.00 per MMBTU based on the City's current estimated thermal cost of $36.90 per MMBTU. In the public scenario, avoided heating costs are shown as revenue.

8.2.2.3 Renewable Energy Credits / Alternative Energy Credits

Revenue is also generated from the sale of the "environmental attributes" of the electricity produced. In Massachusetts, investor-owned utilities are required to meet the Renewable Portfolio Standard (RPS), and a certain percentage of their generation must be from qualified renewable energy sources (7% in 2012, with a 1% increase each year after). Therefore, Renewable Energy Credits (RECs), which are accumulated proportionally to energy generation, are bought and sold on an established market to help utilities meet the RPS. REC value is expected to stay relatively stable while the renewable energy market establishes itself in the US. This is because new renewable generation is not expected to increase at a rate much higher than the RPS standards increase of 1% per year. However, on a longer term basis, once the many large renewable energy projects being planned now are operational, the value of RECs may decrease due to a supply greater than demand.

One REC is generated for each MWh of electricity generated. REC generation is recorded in the New England Power Pool NEPOOL GIS system, and REC transfers are administered by ISO-New England. RECs are typically sold at auction or by contract through a procurement process.

The Commonwealth has adopted the Massachusetts Renewable Energy Portfolio Standard (RPS) which mandates that electricity suppliers obtain a percentage of electricity from qualifying renewable energy generation units for their retail customers pursuant to M.G.L Ch. 25A Section 11F. Renewable energy sources are classified as Class I and Class II resources. Anaerobic digestion facilities qualify as Class I renewable energy resources per the criteria established in 225 CMF 14.00. It is anticipated that one Class I REC will be generated for each MWh of electricity generated. The 2013 Alternative Compliance Payment rate for an unmet Class I REC is $65.27. For the purpose of this analysis, it is assumed that REC value will remain around $50 per MWh for the duration of the project evaluated in this pro forma[4].

As the system evaluated in this study is a cogeneration heat and power system it is also eligible to generate Alternative Energy Credits (AEC). The system would generate credits pursuant to M.G.L c 25A § 11F½ as a generation facility that produces heat and power based on approval from the Department of Energy Resources (DOER). For the purpose of this analysis, it is assumed that AEC value will remain approximately $15 per MWh[5] for the duration of the project evaluated in the pro forma. In Scenario 1, revenue from RECs and AECs goes to the City. In Scenario 2, the private developer receives this revenue.

8.2.2.4 Tipping Fees

The solid waste and material disposal market in Massachusetts typically utilizes a charge for receiving materials, generally termed tipping fees, to offset the costs associated with disposal, treatment, handling or processing of these waste materials. In the materials market in Massachusetts, tip fees are generally set by the market on a supply and demand basis; as the "supply" of disposal space and "demand" for material disposal changes, the prices fluctuate throughout the industry. Location also will play a factor in

[4] U.S Department of Energy Renewable Energy Certificates, REC Prices

[5] MASS Energy and Environmental Affairs Alternative Compliance Payment Rates

determining the market and defining the tip rate because transportation costs can be a significant component of the disposal costs of a material as the distance from the source to the disposal/treatment/processing facility increases.

For the proposed AD facility, the facility owner will receive a tip fee from generators seeking to dispose of organic materials at the project. Tipping fees for organic waste vary considerably by regional demand. Tighe & Bond researched regional organic waste tipping fees received by waste management facilities which indicated tipping fees values are approximately $20 to $25. Tighe & Bond also reviewed feasibility studies for similar projects which suggested slightly higher tipping fees may be viable. However, based on outreach conducted of local generators, several generators in the region are already diverting and taking efforts to minimize their organic waste generation. In some cases, as noted in Section 4, some regional generators are currently diverting their food waste for free.

Another factor that will affect the food waste tipping fee is whether the food waste is processed at another location between the point of generation and the AD facility to remove contaminants. This processing will add costs for the hauler and therefore result in a lower tipping fee, but will remove the need to remove contaminants at the AD facility.

A competitive tipping fee will be required for the AD project to successfully compete with other avenues for organic material disposal. Based on MassDEP's expectations of potential food waste tipping fees for AD projects, we have used a $25/ton fee in the pro forma. Given the uncertainty associated with food waste availability and potential tipping fees, we also conducted a sensitivity analysis in the pro forma by bringing the food waste tipping fee down to $0. The results of this analysis are discussed in the pro forma summary at the end of this section.

The City of Easthampton currently pays approximately $100 per ton (at 25% solids) to dispose of wastewater sludge off-site. In the private scenario, it is assumed that the City will pay a tipping fee for the private developer to use the wastewater sludge in the digestion process. Because the wastewater sludge will no longer be dewatered prior to digestion, the sludge tipping fee was calculated as $14.60 per ton to account for the reduced solids. In the public scenario, the City does not pay a sludge tipping fee and enjoys avoided cost savings associated with the use of the wastewater sludge in the AD process. This was modeled at $120/ton to account for avoided cost savings with sludge disposal and dewatering.

8.2.2.5 Grants

A modest amount of grant funding associated with the use of food waste as feedstock was assumed for both the City-owned and private developer-owned scenarios. Current funding is available from the Massachusetts Clean Energy Center (MassCEC), MassDEP, and other sources. Please refer to Appendix G for a summary of grant funding currently available in Massachusetts for AD project. For the pro forma analysis, we assumed an up-front grant of $200,000 in both ownership scenarios.

8.2.2.6 Federal Incentives

If the project is privately owned, it would be eligible for federal tax benefits. Tax benefits come in the form of accelerated depreciation as well as tax credits. Since cogeneration equipment qualifies for accelerated depreciation, it is possible for a private company to decrease the value of their taxable assets early in the asset's lifetime. In the economic analysis, five year depreciation is used. A 50% year one bonus depreciation was enacted in February 2008 by the *Economic Stimulus Act of 2008* and has been modified and extended several times since then. However, this incentive has not been extended since it expired December 31, 2013 and therefore was not included in the pro forma analysis.

The Investment Tax Credit (ITC), which can offset the capital investment of a renewable energy project by 10%, is also available to first-year project costs. To qualify for the ITC, the system owner must be a taxpaying entity. The equipment must be put in service between December 31, 2005 and December 31, 2016. If a private developer has sufficient tax liability, the maximum tax benefits available to the project could be fully utilized or passed through to other related entities. If the developer does not have adequate tax liability – which is likely the case in most scenarios – they have to find a way to monetize the tax credit. For that purpose they generally bring on a tax equity investor partner. To incorporate the cost of converting the credits to dollars on the part of the tax equity partner, we have modeled the value of the ITC as $.90 on the dollar.

Other government funding programs such as the Renewable Energy Production Incentive (REPI) and Clean Renewable Energy Bonds (CREBs) administered by the US Department of Energy were initiated to provide publicly owned projects with benefits similar to the tax benefits available to privately owned projects. However, the IRS is not currently accepting new applications for CREBs. The REPI incentive is in the form of a payment of 2.1 cents per kWh for the first ten years of AD operation, though, it does not appear funds have not been appropriated for this program since the fiscal year 2008. Due to the uncertainty of these federal programs, no REPI or CREB benefits have been included in the pro forma for the publicly owned project.

8.2.2.7 Combined Heat and Power (CHP) Rebate

The project can also benefit from a CHP rebate available for $750 per kW of generation capacity for installed cogeneration units. This rebate is regulated and provided by investor-owned utility companies, including WMECo. In this evaluation, a CHP rebate of $450,000 was assumed for the AD system for both scenarios based on a system capacity of 600 kW and rebate of $750 per kW.

8.3 Other Pro Forma Assumptions

In order to simulate a 20-year project life for a given scenario, several assumptions were made regarding the change in cost and revenue values over time. Both scenarios assume the various revenue types and financing as described above. The discount rate is used in the cash flow analysis to determine the present value of future cash flows, or net present value (NPV). Additionally, the discount rate measures the risk of future cash flows. The discount rate was assumed to be 3.4% based on typical cost of capital for the City-owned model (Scenario 1). For private development scenario, a discount rate of 6% was used based on typical cost of capital for a private entity and average inflation conditions.

Escalation of O&M costs was assumed to 2.5%, typical for power generation equipment. O&M escalation represents the increase in materials and labor costs. The escalation of avoided cost (cost of electricity) was assumed to be 2.3%, as predicted in the US Energy Information Administration long term electricity price forecast to 2035, released May 2013. The thermal cost escalation was assumed to be 2.1%. An escalation factor of 2.1% for REC and AEC revenue was also assumed in the pro forma analysis.

8.4 Pro Forma Summary Results

The pro forma was completed for two scenarios, including a City-owned project (Scenario 1) and a privately-owned project (Scenario 2). The applicable costs, revenues, and incentives were based on the assumptions discussed in the preceding sections. The same technology and associated capital costs were modeled for both scenarios. Food waste tipping fee revenues remained constant between both scenarios.

The pro forma summary tables for each scenario are included at the end of this section. Below we have presented a brief summary of economic project performance for each of the project scenarios.

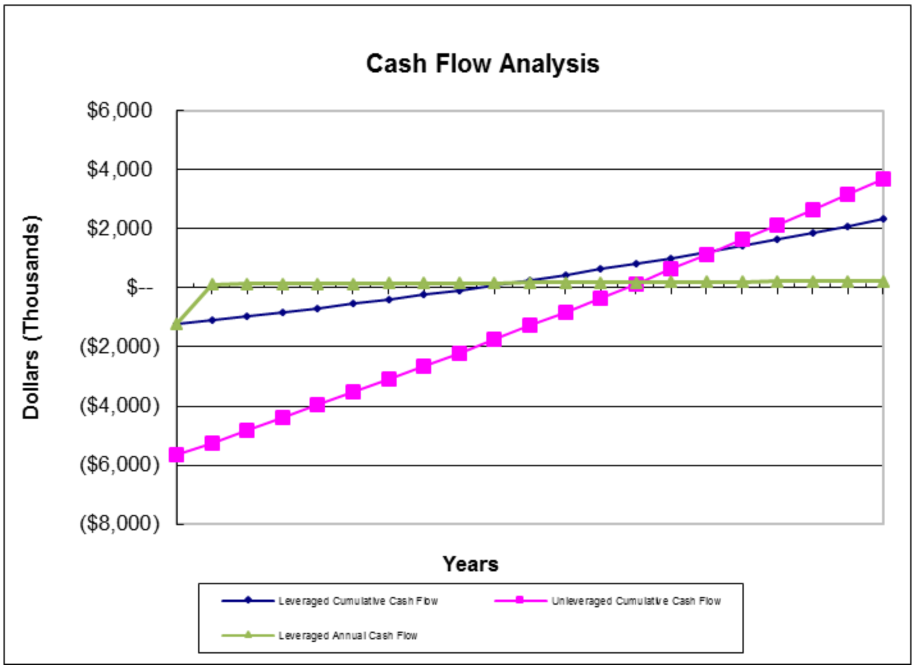


FIGURE 8-1
Cash Flow Analysis Schematic under City of Easthampton Ownership

In Figure 8-1, "Cash Flow Analysis Schematic under City of Easthampton Ownership," a 600 kW system was modeled. Over the 20 year duration the project has a net present value of $1,189,644. The leveraged and unleveraged payback periods are 8.44 and 12.69 years, respectively.

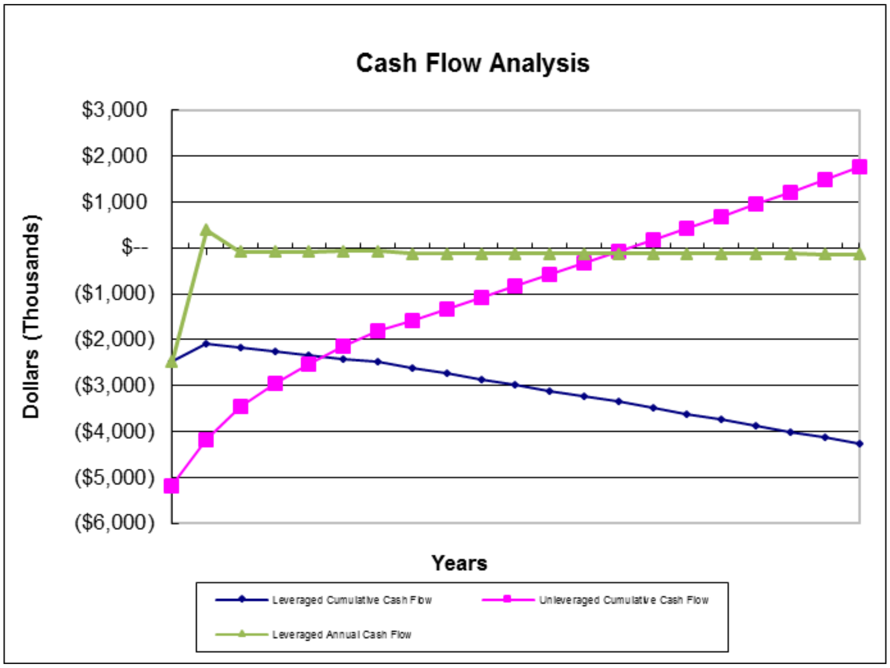


FIGURE 8-2
Cash Flow Analysis Schematic under Private Development Ownership

In Figure 8-2, "Cash Flow Analysis Schematic under Private Development Ownership," a 600 kW system was modeled assuming the project was developed and owned by a private entity. At the start of the project the leveraged annual cash flow annual is inflated because of the five year accelerated depreciation. Over the 20 year duration the annual and cumulative cash flows never become positive.

8.5 City of Easthampton Cost Savings in Private Scenario

In Scenario 2, all project costs and revenues are modeled from the perspective of the private project developer. However, the City of Easthampton will also enjoy financial rewards from this project ownership model. While current sludge disposal costs are essentially made neutral through the payment of a tipping fee from the City to the private developer, the City will benefit from energy cost savings. For example, we have assumed that the City would enter into a Thermal Purchase Agreement for heating needs at the WWTF. Assuming a Thermal Purchase Agreement rate of $25/mmBTU, the City would save $9,996/year on heating costs in the private scenario.

The private scenario assumes that 75% of the electricity production from the AD system (total AEP minus parasitic load) is net metered to City accounts, and that the City would enter into a PPA with the developer for the entire generation amount. The City will receive net metering credits for the generation, and the difference between the net metering credits and PPA payments will result in energy savings to the City. 75% of the AEP of the AD project is 3,166,500 kWh. Paying the PPA rate of $0.07 instead of $0.10 kWh would result in annual savings to the City of $94,995.

8.6 Pro Forma Conclusions

The analysis modeled a private-development project, in which a private developer would develop, own, and operate the facility; and a City-owned scenario in which the City of Easthampton would be responsible to develop, own, and operate the AD facility. The economic pro forma analysis shows that ***as modeled***, only the publicly owned scenario is economically viable. Key differences between the two models include energy cost savings revenue to the City in the public scenario, and the impact of tax payments in the private scenario. Additionally, compared to other renewable energy technologies that can benefit from federal tax credits of 30% of capital costs, this credit is only 10% for AD/CHP. While the pro forma assumed the private project could benefit from accelerated depreciation, the first year 50% bonus was not considered.

In general, the results of the economic analysis point to several key drivers for AD projects; namely project size, tipping fee, digestate management, O&M costs, and the ability to offset electrical and thermal load. Most notably, tipping fee revenue and digestate disposal costs significantly impacted the viability of project modeled in the Feasibility Study. As currently modeled, the food waste and sludge tipping fee revenues are $25/ton and $14.60/ton respectively. Dewatered digestate is disposed of at a cost of $100/ton, and dewatering liquid from the food waste digestate at a cost of $0.05/gallon. While solids reduction occurs during the digestion process, this does not occur at a high enough rate for the digestate disposal costs to be offset by the relatively low tipping fees. In the private scenario, revenue streams associated with power sales are not significant enough to overcome the relationship between tipping fees/ digestate management costs.

We note that the values carried for digestate disposal may be conservative and that one of the goals of AD developers is to reduce digestate management costs and possibly generate revenue through the beneficial reuse of these materials. Given that the Feasibility Study evaluated a codigestion scenario however, using a disposal fee equivalent to the sludge disposal cost is appropriate. If the project involved parallel digestion systems, one for food waste and the other for wastewater biosolids, this would allow the system owner to dispose of food waste-generated digestate at a substantially lower cost. In addition, modifications could be made to the AD system or digestate management process to produce a Class I product that has a greater beneficial reuse value.

It is also noted that the food waste tipping fee of $25/ton may be considered low in comparison to other AD Feasibility Studies. Given the lack of certainty about this source of revenue however, the 25% availability factor applied to the potential food waste volume and the $25/ton tipping fee is appropriate.

We also note that other project configurations may change the economic viability of the project. The project modeled as part of this study eliminates the dewatering of the sludge in advance of the digestion process, resulting in a significant amount of water being transferred from the WWTF to the AD facility, and then back to the WWTF. This project configuration affects the size of the required digester (and therefore up front capital costs), as well as costs associated with liquid digestate disposal. As previously noted however, the pro forma only assessed a disposal cost for half of the dewatering liquid associated with the project.

Other potential sources of project revenue could be realized through selling waste heat from the project. As currently modeled, after accounting for on-site heating demand at the WWTF and the parasitic load of the AD facility, approximately 48% of the thermal energy produced by the CHP system is waste heat.

To test the impact of cost/revenue inputs to the model, Tighe & Bond conducted a sensitivity analysis to evaluate the impact of the cost/revenue assumptions. Factors that were tested include: capital cost, food waste tipping fee, and solid digestate disposal costs. All other inputs remained as previously described aside from the variable being tested in each example below. Table 8-2 below provides a summary of this exercise.

TABLE 8-2

Pro Forma Sensitivity Analysis Results

Factor	Public Scenario	Private Scenario
Food Waste Tipping Fee: $0/ton	Not Viable	Not Viable
Food Waste Tipping Fee: $50/ton	Viable – 2.09 year payback period in leveraged scenario	Viable – 6.08 year payback period in leveraged scenario
Solid Digestate Disposal: $50/ton	Viable – 2.43 year payback period in leveraged scenario	Viable – 11.08 year payback period in leveraged scenario
Solid Digestate Disposal: $0/ton	Viable – 1.05 year payback period in leveraged scenario	Viable – 3.14 year payback period in leveraged scenario
Capital Costs Reduced by 25%	Viable – 5.31 year payback period in leveraged scenario	Not Viable

In determining which model to proceed with, it is important the City not only considers the economics of the project, but also contemplates its appetite for risk and ability to own and manage an AD facility. If owned by the City of Easthampton, the City will have a higher level of financial risk. Although the City has the capacity to utilize all of the power generation, Easthampton will still be financially responsible for the technical success of the project and its long-term performance. Easthampton will also be responsible for coordinating with a broker for the sale of RECs, along with securing feedstock agreements with food waste generators, which are vital for the success of the project. The City should evaluate the magnitude of equity available for investment in the project and the type of financing available in the interest of reducing the total annual debt service fee. Additionally, Easthampton will be required to set up and maintain generation allocation to eligible accounts with WMECo.

In Scenario 2, under a private developer's ownership, the level of financial risk to the City would be reduced. Easthampton must only negotiate the land lease and PPA price with the developer. The burden of creating a successful project, selling the power, selling RECs, securing feedstock agreements, and utilizing the incentives is borne by the developer. It is common for developers to transfer ownership of the project to the land owner when the debt service is paid. At this time, maintenance and decommissioning would become Easthampton's responsibility. The City would also retain all net metering credits at the full rate. Potential transfer of ownership should be considered and agreed upon as a part of the initial project negotiations.

TABLE 8-3

Economic Analysis Summary

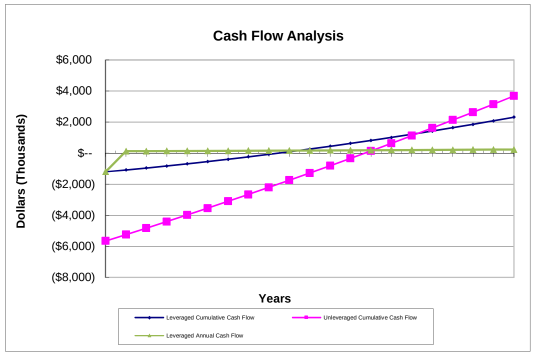
Anaerobic Digestion Economic Analysis Summary

	City of Easthampton Ownership	Private Developer Ownership
	WWTF, Sludge & Food Waste	WWTF, Sludge & Food Waste
Scenario	**1**	**2**
System Rated Capacity (kW)	600	600
Annual Facility Electrical Load (kWh)	690,000	690,000
Annual Facility Thermal Load (MMBTU)	840	840
Ownership	Public Ownership	Private Developer Ownership
Revenue Sources	Avoided Energy Costs, Net Metering,and Tipping Fees (Food only)	100% Net Metered to City and Tipping Fees (Sludge and Food)
Local and Federal Tax Requirements	N/A	30% Federal, 5% Local Tax
Incentives Utilized	REC / AEC Sales and CHP Rebate	REC / AEC Sales, Depreciation, and CHP Rebate
Financing	20 year loan at 2.0% on 100% of Total Project Cost	20 year loan at 6.8% on 70% of Total Project Cost
Annual Electricity Production (kWh)	4,222,000	4,222,000
Annual Thermal Production (MMBTU)	11,000	11,000
Sludge Waste Input (Tons Per Year)	15,000	15,000
Food Waste Input (Tons Per Year)	18,200	18,200
Yard Waste Input (tpd)	0	0
Total Estimated Project Cost	($5,408,500)	($5,408,500)
Pro Forma Results		
Net Present Value (Leveraged)	$1,189,644	($3,075,890)
Payback Period Base (Unleveraged)	12.7	13.3
Payback Period (Leveraged)	8.4	47.8
Project Annual Cash Flow (Year 1, Leveraged)	$121,222	$395,192
Project Annual Cash Flow (20-year Average, Leveraged)	$175,979	($89,662)
Annual Cash Flow to the City through PPA	N/A	$105,787
Annual Cash Flow to the City through Thermal Purchase Agreement	N/A	$10,472

Table 8-4 — Anaerobic Digestion Economic Analysis Summary

Financial Pro-Forma — WWTF, Sludge & Food Waste

PROJECT SCENARIO			City of Easthampton Ownership [1]
Utility Rates			
Current Electric Cost ($/kwh)[2]	$0.10	$71,351.75	
Current Thermal Cost ($/mmBTU)[3]	$36.90	$30,996.00	
Energy Loads			
Facility Thermal Load (mmBTU)		840	
AD System Parasitic Load (mmBTU)		4,840	
Facility Electric Load (kWh)		690,000	
AD System Parasitic Load (kWh)		1,055,500	
System Performance			
Electrical Output Capacity (kW)		600	
Operation Commencement		1/1/2015	
Operation Duration		20 years	
Annual Performance Degradation		-0.05%	
Waste Input			
Annual Sludge Waste Input (tons)[4]		15,000	
Annual Food Waste Input (tons)		18,200	
Annual Yard Waste Input (tons)		0	
Energy Production			
Annual Electricity Production (kWh)		4,222,000	
Percentage AEP Used On-Site		16%	
AD System Parasitic Load (%)		25%	
Percentage AEP Available for Off-Take/Net Metering		59%	
Annual Thermal Production (mmBTU)		11,000	
Percentage ATP Used On-Site		8%	
AD System Parasitic Load (%)		44%	
Thermal Generation Available for Off-Take (%)		8%	
Waste Heat (%)		48%	



COSTS		
Capital Costs[5]		
Estimated Equipment Cost		($4,160,500)
Estimated Design, Permitting, & Engineering		($624,000)
Estimated Site Work and Construction		($624,000)
Other Cost		$--
Subtotal Capital Costs		($5,408,500)
CHP Rebate[6]		$450,000
Investment Tax Credit/Grant[7]		$--
Other Grant[8]		$200,000
Total Capital Costs		**($4,758,500)**
Depreciable Basis		$--
Operating Costs		$/yr[5]
Operation & Maintenance ($/yr)[9]		($214,579)
Annual Land Lease[10]		$--
Solid Digestate Disposal		($530,000)
Annual Digestate Quantity (tons/yr)	5,300	
Disposal Fee ($/ton)	$100	
Liquid Digestate Disposal		($153,300)
Annual Digestate Quantity (gal/yr)	3,066,000	
Disposal Fee ($/gal)	$0.05	
Escalation	2.5%	
Total Annual Operating Costs		**($897,879)**
Warranty		$--
Insurance (% on Equip. Cost)	0.30%	($12,482)

REVENUE	$/unit	$/yr
Energy Revenue		
Avoided Electricity Cost ($/kWh)	$0.10	$71,352
Net Metering Credit Agreement Rate[11]	$0.08	$192,692
Escalation	2.3%	
Electric Generation Utilized On-Site (%)	16%	
Electric Generation Net Metered (%)[12]	59%	
Avoided Thermal Cost ($/mmBTU)	$36.900	$30,996
Thermal Sale Rate (if applicable)	$--	$--
Escalation	2.1%	
Thermal Generation Utilized On-Site (%)	8%	
Incentives		
Initial REC Value ($/kWh)	$0.050	$211,100
Escalation	2.1%	
Alternative Energy Credits ($/kWh)	$0.015	$63,330
Escalation	2.1%	
Annualized Grant (Y1-YXX) ($/kWh)	$--	$--
Production Tax Credit (Y1-Y10)	$--	$--
Tipping Fees		
Food Waste Tipping Fee ($/ton)	$25	$455,000
Sludge Waste Tipping Fee ($/ton)	$--	$--
Yard Waste Tipping Fee ($/ton)	$--	$--
Soil Amendment Sales ($/ton)	$--	$--
Quantity (tons/year)	0	
Avoided Sludge Disposal & Dewatering Costs ($/ dry ton)[13]	$120	$216,000
Annual Revenue (Y1)		**$1,240,470**

FINANCING		
Total Capital Costs		($4,758,500)
Long Term Debt Size	100%	($4,758,500)
Rate		2.0%
Term		20
Bond Cost[14]		($835,446)
Annual Bond Payment		**($291,014)**

TAX	
Discount Rate[15]	3.4%
Local Tax (% on Profit)	--%
Assumed Tax Rate	--%
PTC or ITC	N/A
Depreciation[16]	N/A

PROJECT INDICATORS[17]

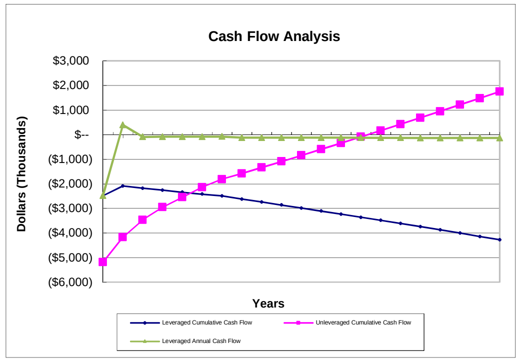
Leveraged	20-yr	**Unleveraged**	20-yr
IRR	11.5%	IRR	5.1%
NPV	$1,189,644	NPV	$3,683,488
Payback Period	8.44	Payback Period	12.69

1 Note pro forma analysis completed from the perspective of the system owner.
2 Based on all kWh charges shown in bills from October 2013 provided by the City. The variable price of the basic service charges was calculated as an estimate of the 2013 variable rates.
3 Thermal cost includes oil and propane expenses based on an estimated consumption of 6,000 gallons per year of oil and 4,000 gallons per year of propane.
4 This value is based on sludge input at 3 percent total solids.
5 Refer to Report for cost estimate information. Potential site remediation costs were not included in the cost estimate for site development activities.
6 Current CHP rebate based on 750$/kW generation.
7 ITC is 10% of Subtotal Capital Costs. Not applicable under public development.
8 A grant of $75,000 was included in the analysis. It was assumed that both public and private projects could receive MassCEC grant funding through the Organics to Energy program.
9 O&M Costs included: $0.012 per kWh generation for the CHP unit, 3% of total equipment cost for the digester system, and $85,000 for personnel.
10 Land lease based on a cost of $20,000 per MW. Not applicable under public development.
11 Includes the following applicable charges: default service kWh charge, distribution kWh charge, and transition kWh charge. Service charge based on an available of the 2013 G2 variable price Medium and Large Business Basic Service rates.
12 Percentage of electricity generation that is net metered and allocated to the Owner's accounts, excludes generation sold at any discount from the net metering value.
13 Accounts for avoided sludge disposal and dewatering costs.
14 Net Present Value of interest payments.
15 Discount rate is an estimate of the Owner's current cost of capital, used in NPV analysis.
16 Depreciation is 5-yr MACRS schedule. Not applicable under public development.
17 N/A indicates: IRR<0, Payback Period>55.

Table 8-5
Financial Pro-Forma

Anaerobic Digestion Economic Analysis Summary
WWTF, Sludge & Food Waste

PROJECT SCENARIO			Private Developer Ownership [1]
Utility Rates			
Current Electric Cost ($/kwh) [2]	$0.10	$71,351.75	
Current Thermal Cost ($/mmBTU) [3]	$36.90	$30,996.00	
Energy Loads			
Facility Thermal Load (mmBTU)		840	
AD System Parasitic Load (mmBTU)		4,840	
Facility Electric Load (kWh)		690,000	
AD System Parasitic Load (kWh)		1,055,500	
System Performance			
Electrical Output Capacity (kW)		600	
Operation Commencement		1/1/2015	
Operation Duration		20 years	
Annual Performance Degradation		-0.05%	
Waste Input			
Annual Sludge Waste Input (tons) [4]		15,000	
Annual Food Waste Input (tons)		18,200	
Annual Yard Waste Input (tons)		0	
Energy Production			
Annual Electricity Production (kWh)		4,222,000	
Percentage AEP Used On-Site		16%	
AD System Parasitic Load (%)		25%	
Percentage AEP Available for Off-Take/Net Metering		59%	
Annual Thermal Production (mmBTU)		11,000	
Percentage ATP Used On-Site		8%	
AD System Parasitic Load (%)		44%	
Thermal Generation Available for Off-Take (%)		8%	
Waste Heat (%)		48%	



COSTS			REVENUE	$/unit	$/yr
Capital Costs[5]			**Energy Revenue**		
Estimated Equipment Cost		($4,160,500)	Avoided Electricity Cost ($/kWh)	$0.10	$--
Estimated Design, Permitting, & Engineering		($624,000)	Power Purchase Agreement (PPA) Rate [11]	$0.07	$221,655
Estimated Site Work and Construction		($624,000)	Escalation	2.3%	
Other Cost		$--	Electric Generation Utilized On-Site (%)	--%	
Subtotal Capital Costs		($5,408,500)	Electric Generation Net Metered (%) [12]	75%	
CHP Rebate [6]		$450,000	Avoided Thermal Cost ($/mmBTU)	$36.90	$--
Investment Tax Credit/Grant [7]		$486,765	Thermal Sale Rate (if applicable) [13]	$25.00	$21,000
Other Grant [8]		$200,000	Escalation	2.1%	
Total Capital Costs		**($4,271,735)**	Thermal Generation Utilized On-Site (%)	8%	
Depreciable Basis		($4,965,118)	**Incentives**		
Operating Costs		$/yr [5]	Initial REC Value ($/kWh)	$0.050	$211,100
Operation & Maintenance ($/yr) [9]		($214,579)	Escalation	2.1%	
Annual Land Lease [10]		($12,000)	Alternative Energy Credits ($/kWh)	$0.015	$63,330
Solid Digestate Disposal		($530,000)	Escalation	2.1%	
Annual Digestate Quantity (tons/yr)	5,300		Annualized Grant (Y1-YXX) ($/kWh)	$--	$--
Disposal Fee ($/ton)	$100		Production Tax Credit (Y1-Y10)	$--	$--
Liquid Digestate Disposal		($153,300)	**Tipping Fees**		
Annual Digestate Quantity (gal/yr)	3,066,000		Food Waste Tipping Fee ($/ton)	$25	$455,000
Disposal Fee ($/gal)	$0.05		Sludge Waste Tipping Fee ($/ton) [4]	$14.6	$219,000
Escalation	2.5%		Yard Waste Tipping Fee ($/ton)	$--	$--
Total Annual Operating Costs		**($909,879)**	Soil Amendment Sales ($/ton)	$--	$--
Warranty		$--	Quantity (tons/year)	0	
Insurance (% on Equip. Cost)	0.30%	($12,482)	**Annual Revenue (Y1)**		**$1,191,085**

FINANCING			TAX	
Total Capital Costs		($4,271,735)	Discount Rate [15]	6.0%
Long Term Debt Size	70%	($2,990,215)	Local Tax (% on Profit)	5.0%
Rate		6.8%	Assumed Tax Rate	30.0%
Term		20	PTC or ITC	ITC
Bond Cost [14]		($1,675,160)	Depreciation [16]	5.0%
Annual Bond Payment		**($277,883)**		

PROJECT INDICATORS[17]			
Leveraged	20-yr	**Unleveraged**	20-yr
IRR	N/A	IRR	3.9%
NPV	($3,075,890)	NPV	$1,754,286
Payback Period	47.84	Payback Period	13.34

1 Note pro forma analysis completed from the perspective of the system owner.
2 Based on all kWh charges shown in bills from October 2013 provided by the City. The variable price of the basic service charges was calculated as an estimate of the 2013 variable rates.
3 Thermal cost includes oil and propane expenses based on an estimated consumption of 6,000 gallons per year of oil and 4,000 gallons per year of propane.
4 This value is based on sludge input at 3 percent total solids.
5 Refer to Report for cost estimate information. Potential site remediation costs were not included in the cost estimate for site development activities.
6 Current CHP rebate based on 750$/kW generation.
7 ITC is 10% of Subtotal Capital Costs. Assumes project will be placed in service by December 31, 2016 to be eligible.
8 A grant of $75,000 was included in the analysis. It was assumed that both public and private projects could receive MassCEC grant funding through the Organics to Energy program.
9 O&M Costs included: $0.012 per kWh generation for the CHP unit, 3% of total equipment cost for the digester system, and $85,000 for personnel.
10 Land lease based on a cost of $20,000 per MW.
11 Discounted net metering credit rate to represent allocation to a non-owner entity.
12 Percentage of electricity generation that is net metered by the private developer and allocated to the Citys accounts, including the WWTF.
13 The value was assumed to be slightly less than current cost the City of Easthampton pays for thermal energy.
14 Net Present Value of interest payments.
15 Discount rate is an estimate of the Owner's current cost of capital, used in NPV analysis.
16 Depreciation is 5-yr MACRS schedule. It is assumed a private entity can fully utilize depreciation benefits.
17 N/A indicates: IRR<0, Payback Period>55.

SECTION 9

Section 9
Conclusions & Recommendations

This report evaluated the feasibility of the installation of a potential AD system at the City of Easthampton WWTF. The intent of the study was to help the City determine whether the site is suited for an AD project and whether such a project could be technically and economically viable. Potential feedstock for the projects evaluated in the study included on-site sludge from the WWTF and off-site food waste from a variety of generators that will be subject to MassDEP's pending Organic Waste ban. A summary of key factors evaluated as part of the Feasibility Study is provided in Table 9-1.

The Feasibility Study included an analysis of potentially available food waste and sludge waste for the project. The estimate of potentially available feedstock was determined based on an analysis of data provided in Draper/Lennon report conducted for MassDEP. Additional data was also collected through interviews with organic waste generators within a 30 mile radius of the WWTF. Note that the Feasibility Study does not confirm the availability of this material to a potential project; something that will need to be verified during next steps for the project or by a potential private developer.

It should be noted that the quantity of food waste available to the project was based on the Draper/Lennon study which provided the most comprehensive data source of available generators in the region, but does not account for current diversion practices. Based on our outreach efforts with regional generators, several commercial and institutional entities have initiated practices to reduce waste generated and/or currently divert their organic waste to other disposal facilities, such as local farms. The sizing and economics of the project are subject to change depending on the quantity of feedstock available.

Following an analysis to determine the suitability and composition of the source separated organic material (SSOM) for the AD system, the following volumes of feedstock were modeled for each type of system: 48 TPD food waste and 10,000 gallons per day of sludge. Based on the feedstock inputs to each system, it was estimated that the system could produce 7,500 ft^3/hour of biogas. Biogas production estimates were provided by AD system vendors that Tighe & Bond coordinated with to obtain possible system specifications for evaluation in the study.

The biogas generated by the AD project can be used to generate electricity and heat. Current electricity and thermal consumption data for the WWTF was reviewed to determine current demands. For the purpose of the study, we elected to model a reciprocating engine cogeneration system that would use the biogas generated through the AD process. For the 600 kw system, it was estimated that 4,222 MWh of electricity would be produced. Based on current electrical consumption at the WWTF, the project can offset the entire electrical demand and the facility.

Tighe & Bond also evaluated a potential heating interconnection for the project. The cogeneration system will generate a significant amount of waste heat, even after diverting a portion of it to the digesters. The excess heat generated by the cogeneration system can be used for space heating at the WWTF if an interconnection between the AD facility and the heating plant is made. The preliminary analysis shows that the unit can meet the majority of WWTF's heating demand; however during periods of cold weather or system downtimes it is expected that the facility would require supplemental heating.

The evaluation of the proposed project site did not indicate any technical or siting fatal flaws to the project. There are minimal environmental constraints on the site, and the site provides a cleared, previously developed area with good site access. In addition, while there are some residences within proximity to the site, in general it is set back from abutting residential uses that may be adversely impacted by the operations. Since the site is already engaged in wastewater treatment activities, the site is suitable for the development of an AD project.

Information provided to Tighe & Bond from WMECo on the pre-application inquiry suggests that there is ample capacity on the interconnection circuit for additional distributed generation. WMECo did state that the WWTF is currently fed by a 300 kVA transformer that is electrically downstream of two reclosers and in a loop scheme. Therefore, it is recommended that further coordination with WMECo occur to determine any required system upgrades or analyses.

The analysis modeled a private-development project, in which a private developer would develop, own, and operate the facility; and a City-owned scenario in which the City of Easthampton would be responsible to develop, own, and operate the AD facility. The pro forma analysis shows that only the publicly owned scenario is economically feasible as modeled. The economics for the publicly owned project are more attractive due to the significant energy cost savings revenue enjoyed by the City.

In general, the results of the economic analysis point to several key drivers for AD projects; namely project size, tipping fee, digestate disposal costs, and the ability to offset electrical and thermal load. As shown in the sensitivity analysis in Table 8-2, food waste tipping fees and digestate disposal costs are key drivers in determining the viability of an AD project. ***While the model does not show positive economic returns for the privately owned project, the results of our sensitivity analysis suggest that under slightly different tipping fee and digestate disposal conditions, a privately developed project may be viable. Tighe & Bond employed conservative values in our analysis and assumed revenue would not be produced from the potential reuse of digestate. It is expected that a private developer may be able to utilize additional revenue sources, such as the reuse of waste heat and digestate as a soil amendment, or reduce disposal costs through a parallel digestion system for food and sludge waste streams as discussed in Section 8.6.***

Given the potential benefits of the project to the City and suitability of the site, it is recommended that the project proceeds to the procurement stage to solicit responses from the development community. Recommended next steps to be conducted either by the City or a private developer, either prior to procurement or as part of project development, include:

- Confirmation of the availability and composition of feedstock for the project.
- Confirm status of other AD projects in project area, and determine the potential impact to a project at the Easthampton WWTF.
- Confirmation of project development costs (including modification to the WWTF and interconnection costs).
- Additional site evaluation, including topographic survey and geotechnical evaluations prior to design of tanks, footings, and foundations to determine the

actual soil characteristics to design the bearing structures accordingly. A formal wetland delineation should occur to confirm wetland boundaries on-site.

- Confirmation of current heating demand and estimated thermal costs at the WWTF
- Additional evaluation of water needs for the project, including domestic and fire prevention needs.
- Consideration of management scenarios and economics associated with digestate from the AD process
- Further coordination with WMECo with regard to electrical interconnection and remaining capacity on the proximate circuit
- Pre-permitting consultation with the City of Easthampton to confirm the local zoning permit requirements and consultation with MassDEP to confirm the air quality permitting strategy

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TABLE 9-1

Easthampton WWTF Anaerobic Digestion Project - Overview of Project Feasibility

Project Owner:	**City of Easthampton Ownership**	**Private Developer Ownership**	
Feedstock:	WWTF, Sludge & Food Waste	WWTF, Sludge & Food Waste	**Comments:**
Scenario:	**1**	**2**	
Factor:			
Rated Capacity	600 kW	600 kW	
Land Use	No conflict expected	No conflict expected	As the project site is located within a MassDEP approved Zone II, it is anticipated that the project will need to comply with the Wellhead Protection related land use restrictions of 310 CMR 22.21(2).
Zoning	Site Plan Review or Special Permit Approval from Planning Board	Site Plan Review or Special Permit Approval from Planning Board	If the project is considered an extension of the WWTF, Site Plan Review is required. If the project is considered a power plant facility, a Special Permit will be required.
Electrical Interconnection	East side of operations building. Existing 3 phase power lines.	East side of operations building. Existing 3 phase power lines.	
Thermal Interconnection	Interconnect with WWTF	Interconnect with WWTF	
Feedstock Assumed for System	50 Tons Per Day Food Waste 10,000 Gallons Sludge	50 Tons Per Day Food Waste 10,000 Gallons of Sludge	
Estimated Biogas Production (ft^3/hr)	7,500	7,500	
Estimated Annual Electrical Generation (MWh)	4,222	4,222	
Estimated Annual Thermal Generation (MMBTU)	11,000	11,000	
Estimated Digestate Production:			
Dewatered Digestate (tons/day)	14.5	14.5	
Liquid Digestate (gallons/day)	16,800	16,800	
Environmental Factors:			
Historic and/or Cultural Resources	Minimal/No Impact	Minimal/No Impact	Must submit Project Notification Form to Massachusetts Historical Commission.
Rare Species	No impact	No impact	Project not located within the limits of mapped Natural Heritage and Endangered Species Program (NHESP) Estimated Habitats for Rare Wildlife or Priority Habitats for Rare Species.
Wetlands	Minimal	Minimal	Order of Conditions from Conservation Commission/Determination of Applicability likely required.
Permitting Requirements	Moderate Permitting Effort	Moderate Permitting Effort	Comprehensive Plan Approval required from MassDEP may require modeling and comprehensive evaluation. Will require MassDEP approval to accept organic waste and local approval via the Industrial Pretreatment Program.
Economic Factors:			
Est. Capital Cost	$5,408,500	$5,408,500	
Est. O&M Cost	$214,579	$214,579	
Financial Viability:			
IRR (leveraged)	11.5%	N/A	
NPV (leveraged)	$1,189,644	-$3,075,890	
Payback Period (yrs, leveraged)	8.4	47.8	
Economic Feasibility	YES	NO	

APPENDIX A

Photo 1: Behind the operations building looking east towards the sludge landfill and chlorination tanks.

Photo 2: Rear of the main operations building.

Photo 3: West side of the main operations building.

Photo 4: Looking south towards the headworks building. Proposed project site to the right.

Photo 5: Looking south towards the main entrance of the WWTF.

Photo 6: Stockpiles in the proposed project site.

Photo 7: Stockpiles at the proposed project site.

Photo 8: Main electrical transformer to facility.

Photo 9: Settling tanks at WWTF.

Photo 10: Headworks building at WWTF.

Photo 11: Settling tanks at the WWTF.

Photo 12: Main electrical panel. Likely interconnection point.

Photo 13: Piping network in the main operations building.

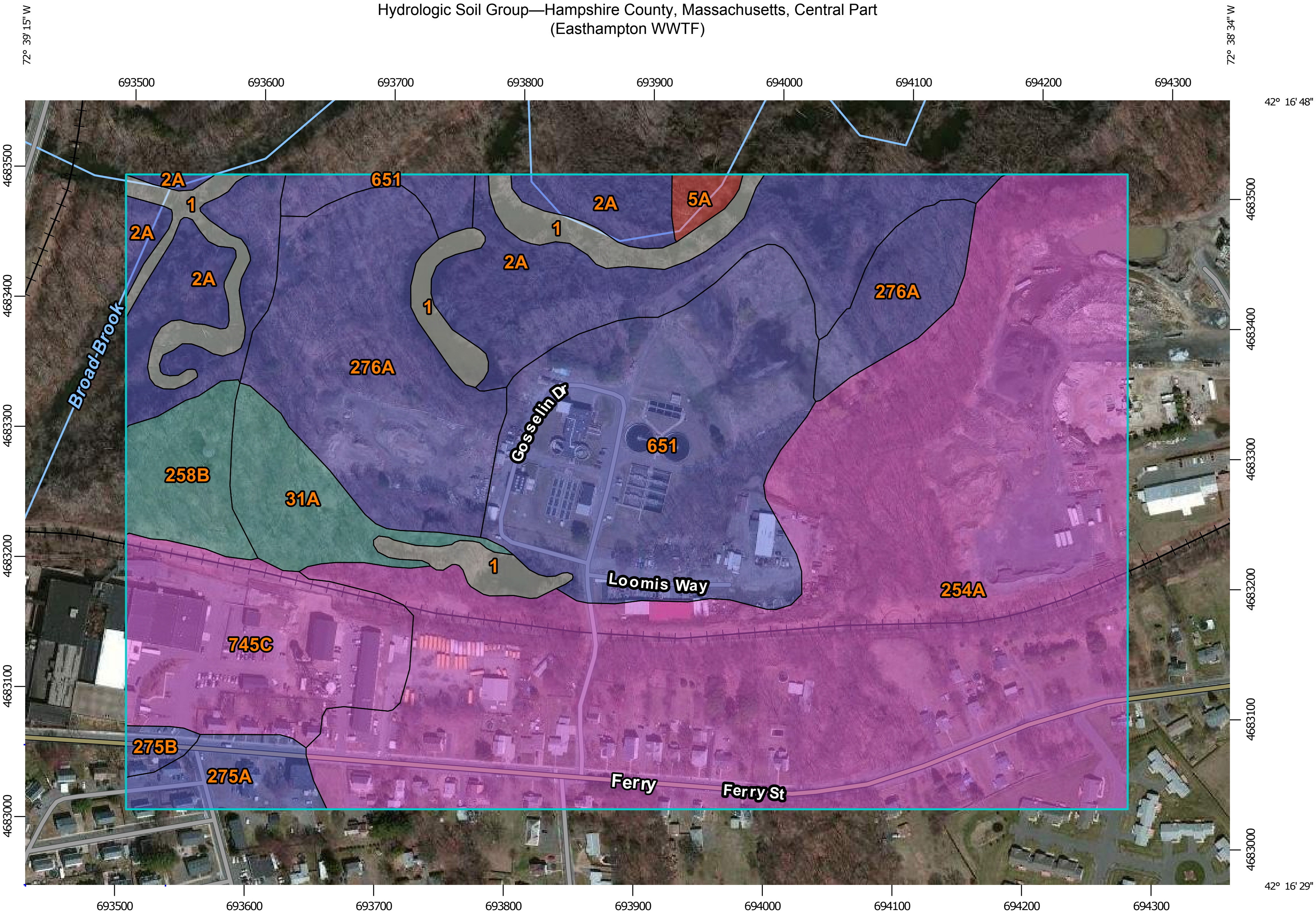
Photo 14: Looking north towards the existing sludge landfill.

Photo 15: Aeration basin.

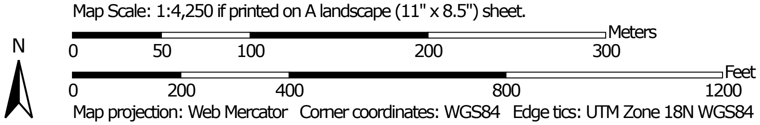
Photo 16: Sludge after dewatering.

APPENDIX B

Hydrologic Soil Group—Hampshire County, Massachusetts, Central Part
(Easthampton WWTF)



Map Scale: 1:4,250 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hampshire County, Massachusetts, Central Part
Survey Area Data: Version 7, Sep 22, 2012

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 28, 2011—May 12, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Hampshire County, Massachusetts, Central Part (MA609)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
1	Water		3.9	4.2%
2A	Pootatuck fine sandy loam, 0 to 3 percent slopes	B	11.0	11.7%
5A	Saco silt loam, 0 to 3 percent slopes	D	0.5	0.5%
31A	Walpole fine sandy loam, 0 to 3 percent slopes	C	2.7	2.9%
254A	Merrimac fine sandy loam, 0 to 3 percent slopes	A	40.5	43.3%
258B	Amostown fine sandy loam, 3 to 8 percent slopes	C	2.3	2.5%
275A	Agawam fine sandy loam, 0 to 3 percent slopes	B	1.7	1.8%
275B	Agawam fine sandy loam, 3 to 8 percent slopes	B	0.4	0.4%
276A	Ninigret fine sandy loam, 0 to 3 percent slopes	B	10.5	11.2%
651	Udorthents, smoothed	B	13.5	14.4%
745C	Hinckley-Merrimac-Urban land complex, 3 to 15 percent slopes	A	6.6	7.1%
Totals for Area of Interest			**93.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

APPENDIX C

2008 Industrial Pretreatment Program Local Effluent Limits

Tighe&Bond

REASSESSMENT OF TECHNICALLY BASED LOCAL LIMITS (TBLLs)

POTW Name & Address : Easthampton WWTF, Gosselin Drive, Easthampton, MA 01027

NPDES PERMIT # : MA0101478

Date EPA approved current TBLLs : c. 1991

Date EPA approved current Sewer Use Ordinance : c. 1987. Revised May 2006; awaiting EPA approval.

ITEM I.

In Column (1) list the conditions that existed when your current TBLLs were calculated. In Column (2), list current conditions or expected conditions at your POTW.

	Column (1) EXISTING TBLLs	Column (2) PRESENT CONDITIONS
POTW Flow (MGD)	2.70 MGD	2.40 MGD*
Dilution Ratio or 7Q10 (from NPDES Permit)	1850 cfs	Outfall #001 = 1810 cfs Outfall #002 = 30 cfs
SIU Flow (MGD)	0.553 MGD	0.246 MGD
Safety Factor	10%	N/A
Biosolids Disposal Method(s)	Co-disposal in Landfill	Disposal at Synagro-Northeast, Waterbury, CT

* Note that the influent flow meter has been determined to be inaccurate. The Easthampton WWTF is currently exploring options for flow metering improvements.

ITEM II.

EXISTING TBLLs			
POLLUTANT	NUMERICAL LIMIT (mg/l) or (lb/day)	POLLUTANT	NUMERICAL LIMIT (mg/l) or (lb/day)
Arsenic	0.86	Silver	0.46
Cadmium	0.014	Zinc	0.16
Chromium (III)	7.8	Copper	5.1
Cyanide	0.86	Lead	0.40
Mercury	0.04	Boron	8.5
Molybdenum	0.06*		
Nickel	1.4		
Phenol	441		

*Note that one industry, CheMetal, has been granted a permit limit of 3.0 mg/L for Molybdenum.

ITEM III.

Note how your existing TBLLs, listed in Item II., are ~~allocated to your~~ Significant Industrial Users (SIUs), i.e. uniform concentration, contributory flow, mass proportioning, other. Please specify by circling.

ITEM IV.

Has your POTW experienced any upsets, inhibition, interference or pass-through from industrial sources since your existing TBLLs were calculated?

If yes, explain.

In the fall of 2005, the facility experienced an isolated foaming incident. Operators were able to trace the foam to an industry which had mistakenly discharged the foamy substance to the sanitary sewer. The problem was corrected, and the industry has been cooperative in preventing future accidental discharges.

Has your POTW violated any of its NPDES permit limits and/or toxicity test requirements?

If yes, explain. Easthampton WWTF is not presently violating any of its current NPDES permit limits.

ITEM V.

Using current POTW influent sampling data fill in Column (1). In Column (2), list your Maximum Allowable Headwork Loading (MAHL) values used to derive your TBLLs listed in Item II. In addition, please note the Environmental Criteria for which each MAHL value was established, i.e. water quality, sludge, NPDES etc.				
Pollutant	Column (1) Influent Data Analyses Maximum (lb/day)	Average (lb/day)	Column (2) MAHL Values (lb/day)	Criteria
Arsenic	0.0220	0.0474	4.5	Inhibition
Cadmium	0.0200	0.0134	0.08	Sludge
Chromium	0.0501	0.0481	40	Sludge
Copper	1.1623	0.9552	27	Sludge
Cyanide, T	<0.2004	0.0868	4.5	Inhibition
Lead	0.3447	0.2191	3	Sludge
Mercury	<0.004	0.0020	0.40	Sludge
Nickel	0.0681	0.0701	8.0	Sludge
Silver	<0.1002	0.0234	2.4	Water Quality (Chronic)
Zinc	1.6433	1.4629	2	Inhibition
Other (List)				
Molybdenum			0.40	Sludge
Phenol	DATA NOT	AVAILABLE	2,252	Inhibition
Boron			45	Sludge

ITEM VI.

Using current POTW effluent sampling data, fill in Column (1). In Column (2A) list what the Water Quality Standards (Gold Book Criteria) were at the time your existing TBLLs were developed. List in Column (2B) current Gold Book values multiplied by the dilution ratio used in your new/reissued NPDES permit.

Pollutant	Column (1) Effluent Data Analyses		Columns Water Quality Criteria (Gold Book)	
	Maximum (ug/l)	Average (ug/l)	(2A) From TBLLs (ug/l)[1]	(2B) Today (ug/l)[2]
Arsenic	<10.000	2.367	190	SEE
*Cadmium	<1.000	0.500	0.52	ATTACHED
*Chromium	<5.000	1.167	92	TABLE
*Copper	24.000	19.000	5.1	
Cyanide	7.500	5.833	5.2	
*Lead	3.000	2.467	0.897	
Mercury	<0.200	0.100	0.012	
*Nickel	<10.000	3.000	68	
Silver	<5.000	1.167	0.12	
*Zinc	38.000	33.667	45.6	
Other (List)				
Molybdenum			N/A	
Phenol	DATA NOT	AVAILABLE	2,560	
Boron			N/A	

*Hardness Dependent (mg/l - CaCO3)

1. From report entitled "Final Report on the Update of the Industrial Pretreatment Program for Easthampton, Massachusetts," by SEA Consultants, Inc., February 1995. Hardness value used was 37 mg/L $CaCO_3$.
2. Hardness = 35 mg/L $CaCO_3$ based on current (Dec. 2007) NPDES Permit Fact Sheet. See attached sheet for calculation of chronic and acute water quality criteria. Dilution factor for Outfall #001 = 308, Outfall #002 = 11.7.

ITEM VII.

In Column (1), identify all pollutants limited in your new/reissued NPDES permit. In Column (2), identify all pollutants that were limited in your old/expired NPDES permit.			
Column (1) NEW PERMIT Pollutants	Limitations (ug/l)	Column (2) OLD PERMIT Pollutants	Limitations (ug/l)

SEE ATTACHED SHEETS FOR NPDES PERMIT LIMITS.

NOTE THAT THERE ARE SEPARATE PERMIT LIMITS FOR OUTFALLS #001 AND #002.

ITEM VIII.

Using current POTW biosolids data, fill in Column (1). In Column (2A), list the biosolids criteria that was used at the time your existing TBLLs were calculated. If your POTW is planing on managing its biosolids differently, list in Column (2B) what your new biosolids criteria would be and method of disposal.

Pollutant	Column (1) Biosolids Data Analyses Average (mg/kg)	Columns Biosolids Criteria (2A) From TBLLs (mg/kg)	(2B) New* (mg/kg)
Arsenic	<8.2	N/A	
Cadmium	2.1	2	
Chromium	14.6	1,000	
Copper	240.0	1,000	
Cyanide	NOT ANALYZED	N/A	
Lead	57.0	300	
Mercury	0.7	10	
Nickel	8.9	200	
Silver	NOT ANALYZED	N/A	
Zinc	354.0	2500	
Molybdenum	<12.6	10	
Selenium	9.7	N/A	
Other (List)			
Boron	20.6	300	

* The Easthampton WWTF does not currently intend to change its biosolids disposal method.

Easthampton WWTF NPDES Permit

Tighe&Bond

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),

City of Easthampton
Board of Public Works

is authorized to discharge from the facility located at

Easthampton Wastewater Treatment Facility
10 Gosselin Drive
Easthampton, MA 01027

to receiving waters named

Connecticut River and Manhan River

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

This permit will become effective on the first day of the calendar month immediately following sixty days after signature.

This permit and the authorization to discharge expire at midnight, five (5) years from the last day of the month preceding the effective date.

This permit supersedes the permit issued on September 29, 2007.

This permit consists of **Part I** (19 pages including effluent limitations and monitoring requirements); **Attachment A** (USEPA Region 1 Freshwater Acute Toxicity Test Procedure and Protocol, February 2011, 8 pages); **Attachment B** (Procedures for a pH Adjustment Demonstration Project, 3 pages); **Attachment C** (USEPA Region 1 Reassessment of Technically Based Industrial Discharge Limits, 9 pages); **Attachment D** (USEPA Region 1 NPDES Permit Requirement for Industrial Pretreatment Annual Report, 2 pages) and **Part II (**25 pages including NPDES Part II Standard Conditions).

Signed this 13th day of August, 2013

/S/ SIGNATURE ON FILE

____________________________	____________________________
Ken Moraff, Acting Director	David Ferris, Director
Office of Ecosystem Protection	Massachusetts Wastewater Management Program
Environmental Protection Agency	Department of Environmental Protection
Boston, MA	Commonwealth of Massachusetts
	Boston, MA

PART I

A.1. During the period beginning on the effective date and lasting through expiration, the permittee is authorized to discharge treated effluent from outfall serial number **001** to Connecticut River. Such discharges shall be limited and monitored as specified below.

EFFLUENT CHARACTERISTIC			**EFFLUENT LIMITS**			**MONITORING REQUIREMENTS [4]**	
PARAMETER	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE TYPE[6]**
FLOW: sum Outfalls 001 and 002[2]	*********	*********	3.8 mgd	*********	Report mgd	CONTINUOUS	RECORDER
FLOW: sum Outfalls 001 and 002[2]	*********	*********	Report mgd	*********	*********	CONTINUOUS	RECORDER
FLOW: Outfall 001[3]	*********	*********	Report mgd	*********	Report mgd	CONTINUOUS	RECORDER
BOD_5 [5]	951 lb/day[5]	1426 lb/day[5]	30 mg/l	45 mg/l	Report mg/l	2/WEEK	24-HOUR COMPOSITE
TSS [5]	951 lb/day[5]	1426 lb/day[5]	30 mg/l	45 mg/l	Report mg/l	2/WEEK	24-HOUR COMPOSITE
pH RANGE[1]	6.0 - 8.3 S.U. (SEE PERMIT PARAGRAPH I.A.1.b.)					1/DAY	GRAB
ESCHERICHIA COLI [1,7] (E. coli) *(April 1 to October 31)*	*********	**********	126 cfu/100 ml	*********	409 cfu/100 ml	2/WEEK	GRAB
TOTAL RESIDUAL CHLORINE[1,7] *(April 1 to October 31)*	*********	**********	1.0 mg/l	*********	1.0 mg/l	1/DAY	GRAB
TOTAL RECOVERABLE ALUMINUM	*********	*********	0.087 mg/l	*********	*********	1/MONTH	24-HOUR COMPOSITE

CONTINUED FROM PREVIOUS PAGE

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

EFFLUENT CHARACTERISTIC	**EFFLUENT LIMITS**					**MONITORING REQUIREMENTS** [4]	
PARAMETER	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE TYPE**[6]
TOTAL NITROGEN[8]	Report lb/day	*********	Report mg/l	*********	Report mg/l	1/MONTH	24-HOUR COMPOSITE
AMMONIA-NITROGEN[8]	Report lb/day	*********	Report mg/l	*********	Report mg/l	1/MONTH	24-HOUR COMPOSITE
TOTAL KJELDAHL NITROGEN[8]	Report lb/day	*********	Report mg/l	*********	Report mg/l	1/MONTH	24-HOUR COMPOSITE
TOTAL NITRATE[8]	Report lb/day	*********	Report mg/l	*********	Report mg/l	1/MONTH	24-HOUR COMPOSITE
TOTAL NITRITE[8]	Report lb/day	*********	Report mg/l	*********	Report mg/l	1/MONTH	24-HOUR COMPOSITE
TOTAL PHOSPHORUS	Report lb/day	*********	Report mg/l	*********	Report mg/l	1/MONTH	24-HOUR COMPOSITE
WHOLE EFFLUENT TOXICITY [9, 10, 11]	Acute $LC_{50} \geq 50\%$					2/YEAR	24-HOUR COMPOSITE
Hardness[12]	*********	*********	*********	*********	Report mg/l	2/YEAR	24-HR COMP
Total Recoverable Cadmium[12]	*********	*********	*********	*********	Report mg/l	2/YEAR	24-HR COMP
Total Recoverable Copper[12]	*********	*********	*********	*********	Report mg/l	2/YEAR	24-HR COMP
Total Recoverable Nickel[12]	*********	*********	*********	*********	Report mg/l	2/YEAR	24-HR COMP
Total Recoverable Lead[12]	*********	*********	*********	*********	Report mg/l	2/YEAR	24-HR COMP
Total Recoverable Zinc[12]	*********	*********	*********	*********	Report mg/l	2/YEAR	24-HR COMP

A.1. During the period beginning on the effective date and lasting through expiration, the permittee is authorized to discharge treated effluent from outfall serial number **002** to Manhan River. Such discharges shall be limited and monitored as specified below.

EFFLUENT CHARACTERISTIC		**EFFLUENT LIMITS**				**MONITORING REQUIREMENTS** [4]	
PARAMETER	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE TYPE** [6]
FLOW: Outfall 002[3]	*********	*********	Report mgd	*********	Report mgd	CONTINUOUS	RECORDER
BOD_5 [5]	*********	*********	30 mg/l	45 mg/l	Report mg/l	2/WEEK	24-HOUR COMPOSITE
TSS [5]	*********	*********	30 mg/l	45 mg/l	Report mg/l	2/WEEK	24-HOUR COMPOSITE
pH RANGE[1]	6.5 - 8.3 S.U. (SEE PERMIT PARAGRAPH I.A.1.b.)					1/DAY	GRAB
ESCHERICHIA COLI [1,7] *(April 1 to November 30)*	*********	**********	126 cfu/100 ml	*********	409 cfu/100 ml	2/WEEK	GRAB
TOTAL RESIDUAL CHLORINE[1,7] *(April 1 to November 30)*	*********	**********	1.0 mg/l	*********	1.0 mg/l	1/DAY	GRAB
TOTAL RECOVERABLE ALUMINUM	*********	*********	*********	*********	Report mg/l	1/QUARTER	24-HOUR COMPOSITE

CONTINUED FROM PREVIOUS PAGE

A.1. During the period beginning the effective date and lasting through expiration, the permittee is authorized to discharge from treated effluent from outfall serial number **002** to Manhan River. Such discharges shall be limited and monitored as specified below.

EFFLUENT CHARACTERISTIC	**EFFLUENT LIMITS**					**MONITORING REQUIREMENTS [4]**	
PARAMETER	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**AVERAGE MONTHLY**	**AVERAGE WEEKLY**	**MAXIMUM DAILY**	**MEASUREMENT FREQUENCY**	**SAMPLE TYPE[6]**
TOTAL NITROGEN[8]	Report lb/day	*********	Report mg/l	*********	Report mg/l	1/MONTH	24-HOUR COMPOSITE
AMMONIA-NITROGEN[8]	Report lb/day	*********	Report mg/l	*********	Report mg/l	1/MONTH	24-HOUR COMPOSITE
TOTAL KJELDAHL NITROGEN[8]	Report lb/day	*********	Report mg/l	*********	Report mg/l	1/MONTH	24-HOUR COMPOSITE
TOTAL NITRATE[8]	Report lb/day	*********	Report mg/l	*********	Report mg/l	1/MONTH	24-HOUR COMPOSITE
TOTAL NITRITE[8]	Report lb/day	*********	Report mg/l	*********	Report mg/l	1/MONTH	24-HOUR COMPOSITE
TOTAL PHOSPHORUS (April 1-October 31)	Report lb/day	*********	Report mg/l	*********	Report mg/l	1/MONTH	24-HOUR COMPOSITE
WHOLE EFFLUENT TOXICITY [9, 10, 11]	Acute $LC_{50} \geq 100\%$					2/YEAR	24-HOUR COMPOSITE
Hardness[12]	*********	*********	*********	*********	Report mg/l	2/YEAR	24-HR COMP
Total Recoverable Cadmium[12]	*********	*********	*********	*********	Report mg/l	2/YEAR	24-HR COMP
Total Recoverable Copper[12]	*********	*********	*********	*********	Report mg/l	2/YEAR	24-HR COMP
Total Recoverable Lead[12]	*********	*********	*********	*********	Report mg/l	2/YEAR	24-HR COMP
Total Recoverable Nickel[12]	*********	*********	*********	*********	Report mg/l	2/YEAR	24-HR COMP
Total Recoverable Zinc[12]	*********	*********	*********	*********	Report mg/l	2/YEAR	24-HR COMP

Footnotes:

1. Required for State Certification.

2. Report annual average, monthly average, and the maximum daily flow. The limit is an annual average, which shall be reported as a rolling average. The value will be calculated as the arithmetic mean of the monthly average flow for the reporting month and the monthly average flows of the previous eleven months.

3. Outfall 001: Report monthly average and maximum daily flow on the discharge monitoring report (DMR). Attach a report to each monthly DMR which includes the total daily flow, maximum daily flow rate, and minimum daily flow rates for each day.

   Outfall 002: Report monthly average flow (total monthly discharge divided by days of discharge) and maximum daily flow on discharge monitoring report (DMR). Attach a report to each monthly DMR which includes the duration of discharge, total daily discharge and maximum flow rate for each day that the discharge is active.

   The facility is required to maximize flow through Outfall 001. This requirement is to ensure that the dilution attributed to Outfall 002, which is based on the normal operation of the facility since May of 2010 rather than the 7Q10 of the Manhan River, is protective under all flow conditions.

4. Effluent sampling shall be of the discharge and any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

   A routine sampling program shall be developed in which samples are taken at the same location, same time and same days of the week each month. Occasional deviations from the routine sampling program are allowed, but the reason for the deviation shall be documented in correspondence appended to the applicable discharge monitoring report.

   All samples shall be tested using the analytical methods found in 40 CFR § 136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR § 136.

5. Sampling required for influent and effluent.

   The mass limits for BOD_5 and TSS are the total allowable mass discharge from both Outfall 001 and 002. The monthly average mass discharge shall be calculated using the monthly average flow from the effluent flow meter and the monthly average concentration. The daily discharge shall be calculated for each day a sample is taken using the concentration from the sample and the total daily flow on that day as measured at the effluent flow meter. The day with the greatest mass discharge shall be reported as the maximum daily discharge. The combined BOD_5 and TSS mass discharges shall be reported on a separate DMR.

6. 24-hour composite samples will consist of at least twenty-four (24) grab samples taken during one consecutive 24-hour period, either collected at equal intervals and combined proportional to flow or continuously collected proportionally to flow.

7. The monthly average limit for *E. coli* is expressed as a geometric mean. *E. coli* monitoring shall be conducted concurrently with a total residual chlorine sample.

   Total residual chlorine monitoring is required whenever chlorine is added to the treatment process (i.e. TRC sampling is not required if chlorine is not added for disinfection or other purpose). The limitations are in effect year-round.

   The minimum level (ML) for total residual chlorine 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. 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 as zero on the discharge monitoring report.

   Chlorination and dechlorination systems shall include an alarm system for indicating system interruptions or malfunctions. Any interruption or malfunction of the chlorine dosing system that may have resulted in levels of chlorine that were inadequate for achieving effective disinfection, or interruptions or malfunctions of the dechlorination system that may have resulted in excessive levels of chlorine in the final effluent shall be reported with the monthly DMRs. The report shall include the date and time of the interruption or malfunction, the nature of the problem, and the estimated amount of time that the reduced levels of chlorine or dechlorination chemicals occurred.

8. See Part I.F for requirements to evaluate and implement optimization of nitrogen removal.

9. The permittee shall conduct acute toxicity tests for Outfall 001 two times per year. The permittee shall test the daphnid, *Ceriodaphnia dubia*, only. Toxicity test samples shall be collected during the second week of June and September. Results are to be submitted by the last day of the month after the sample, *i.e.*, July 31 and October 31.

   The permittee shall conduct acute toxicity tests for Outfall 002 two times per year. The permittee shall test the daphnid, *Ceriodaphnia dubia*, only. Toxicity test samples shall be collected during the second week of March and December. Results are to be submitted by the last day of the month after the sample, *i.e.*, April 30 and January 31. If Outfall 002 is not active during either of those two weeks, then toxicity testing should be done on the first day that discharge does occur following those weeks. If the discharge is not active for the remainder of the months of March or December, no toxicity test is required for that quarter.

   The tests must be performed in accordance with test procedures and protocols specified in **Attachment A** of this permit.

After submitting one year and a minimum of four consecutive sets of WET test results, all of which demonstrate compliance with the WET permit limits, the permittee may request a reduction in the WET testing requirements. The permittee is required to continue testing at the frequency specified in the permit until notice is received by certified mail from the EPA that the WET testing requirement has been changed.

10. The LC_{50} is the concentration of effluent which causes mortality to 50% of the test organisms. Therefore, a 50% limit means that a sample of 50% effluent shall cause no more than a 50% mortality rate, as applied to Outfall 001. A 100% limit means that a sample of 100% effluent (no dilution) shall cause no more than a 50% mortality rate, as applied to Outfall 002.

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**.

12. For each whole effluent toxicity test the permittee shall report on the appropriate discharge monitoring report, (DMR), the concentrations of the hardness and other listed metals 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.

Part I.A.1. (Continued)

a. The discharge shall not cause a violation of the water quality standards of the receiving waters.

b. The pH of the effluent from Outfall 001 shall not be less than 6.0 S.U. or greater than 8.3 S.U. at any time and the pH from Outfall 002 shall not be less than 6.5 S.U. or greater than 8.3 S.U. If the permittee submits a written request for an adjustment of the pH range for Outfall 002, the permittee must conduct a pH adjustment demonstration project following the procedures in **Attachment B** of this permit.

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

d. The effluent shall not contain a visible oil sheen, foam, or floating solids at any time.

e. The permittee's treatment facility shall maintain a minimum of 85 percent removal of both total suspended solids and biochemical oxygen demand. The percent removal shall be based on monthly average values.

f. The permittee shall minimize the use of chlorine while maintaining adequate bacterial control.

g. The results of sampling for any parameter done in accordance with EPA approved methods above its required frequency must also be reported.

h. If the average annual flow in any calendar year exceeds 80 percent of the facility’s design flow, the permittee shall submit a report to MassDEP by March 31 of the following calendar year describing its plans for further flow increases and describing how it will maintain compliance with the flow limit and all other effluent limitations and conditions.

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

a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of the Clean Water Act if it were directly discharging those pollutants; and

b. Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

c. For purposes of this paragraph, adequate notice shall include information on:

(1) The quantity and quality of effluent introduced into the POTW; and

(2) Any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

3. Prohibitions Concerning Interference and Pass Through:

a. Pollutants introduced into POTW's by a non-domestic source (user) shall not pass through the POTW or interfere with the operation or performance of the works.

4. Toxics Control

a. The permittee shall not discharge any pollutant or combination of pollutants in toxic amounts.

b. Any toxic components of the effluent shall not result in any demonstrable harm to aquatic life or violate any state or federal water quality standard which has been or may be promulgated. Upon promulgation of any such standard, this permit may be revised or amended in accordance with such standards.

5. Numerical Effluent Limitations for Toxicants

EPA or MassDEP may use the results of the toxicity tests and chemical analyses conducted pursuant to this permit, as well as national water quality criteria developed pursuant to Section 304(a)(1) of the Clean Water Act (CWA), state water quality criteria, and any other appropriate information or data, to develop numerical effluent limitations for any pollutants, including but not limited to those pollutants listed in Appendix D of 40 CFR Part 122.

B. UNAUTHORIZED DISCHARGES

This permit authorizes discharges only from the outfall(s) listed in Part I.A.1, in accordance with the terms and conditions of this permit. Discharges of wastewater from any other point sources, including sanitary sewer overflows (SSOs), are not authorized by this permit and shall be reported to EPA and MassDEP in accordance with Section D.1.e.(1) of the General Requirements of this permit (Twenty-four hour reporting).

Notification of SSOs to MassDEP shall be made on its SSO Reporting Form (which includes DEP Regional Office telephone numbers). The reporting form and instruction for its completion may be found on-line at http://www.mass.gov/dep/water/approvals/surffms.htm#sso.

C. OPERATION AND MAINTENANCE OF THE SEWER SYSTEM

Operation and maintenance of the sewer system shall be in compliance with the General Requirements of Part II and the following terms and conditions. The permittee is required to complete the following activities for the collection system which it owns:

1. Maintenance Staff

The permittee shall provide an adequate staff to carry out the operation, maintenance, repair, and testing functions required to ensure compliance with the terms and conditions of this permit. Provisions to meet this requirement shall be described in the Collection System O & M Plan required pursuant to Section C.5. below.

2. Preventive Maintenance Program

The permittee shall maintain an ongoing preventive maintenance program to prevent overflows and bypasses caused by malfunctions or failures of the sewer system infrastructure. The program shall include an inspection program designed to identify all potential and actual unauthorized discharges. Plans and programs to meet this requirement shall be described in the Collection System O & M Plan required pursuant to Section C.5. below.

3. Infiltration/Inflow

The permittee shall control infiltration and inflow (I/I) into the sewer system as necessary to prevent high flow related unauthorized discharges from their collection systems and high flow related violations of the wastewater treatment plant's effluent limitations. Plans and programs to control I/I shall be described in the Collection System O & M Plan required pursuant to Section C.5. below.

4. Collection System Mapping

Within 30 months of the effective date of this permit, the permittee shall prepare a map of the sewer collection system it owns (see page 1 of this permit for the effective date). The map shall be on a street map of the community, with sufficient detail and at a scale to allow easy interpretation. The collection system information shown on the map shall be based on current conditions and shall be kept up to date and available for review by federal, state, or local agencies. Such map(s) shall include, but not be limited to the following:

a. All sanitary sewer lines and related manholes;
b. All combined sewer lines, related manholes, and catch basins;
c. All combined sewer regulators and any known or suspected connections between the sanitary sewer and storm drain systems (e.g. combination manholes);
d. All outfalls, including the treatment plant outfall(s), CSOs, and any known or suspected SSOs, including stormwater outfalls that are connected to combination manholes;
e. All pump stations and force mains;
f. The wastewater treatment facility(ies);
g. All surface waters (labeled);
h. Other major appurtenances such as inverted siphons and air release valves;
i. A numbering system which uniquely identifies manholes, catch basins, overflow points, regulators and outfalls;
j. The scale and a north arrow; and

k. The pipe diameter, date of installation, type of material, distance between manholes, and the direction of flow.

5. Collection System Operation and Maintenance Plan

The permittee shall develop and implement a Collection System Operation and Maintenance Plan.

a. **Within six (6) months of the effective date of the permit**, the permittee shall submit to EPA and MassDEP:

(1) A description of the collection system management goals, staffing, information management, and legal authorities;
(2) A description of the collection system and the overall condition of the collection system including a list of all pump stations and a description of recent studies and construction activities; and
(3) A schedule for the development and implementation of the full Collection System O & M Plan including the elements in paragraphs b.1. through b.8. below.

b. The full Collection System O & M Plan shall be completed, implemented and submitted to EPA and MassDEP within twenty four (24) months from the effective date of this permit. The Plan shall include:

(1) The required submittal from paragraph 5.a. above, updated to reflect current information;
(2) A preventive maintenance and monitoring program for the collection system;
(3) Description of sufficient staffing necessary to properly operate and maintain the sanitary sewer collection system and how the operation and maintenance program is staffed;
(4) Description of funding, the source(s) of funding and provisions for funding sufficient for implementing the plan;
(5) Identification of known and suspected overflows and back-ups, including manholes. A description of the cause of the identified overflows and back-ups, corrective actions taken, and a plan for addressing the overflows and back-ups consistent with the requirements of this permit;
(6) A description of the permittee's programs for preventing I/I related effluent violations and all unauthorized discharges of wastewater, including overflows and by-passes and the ongoing program to identify and remove sources of I/I. The program shall include an inflow identification and control program that focuses on the disconnection and redirection of illegal sump pumps and roof down spouts; and
(7) An educational public outreach program for all aspects of I/I control, particularly private inflow.

(8) An Overflow Emergency Response Plan to protect public health from overflows and unanticipated bypasses or upsets that exceed any effluent limitation in the permit.

6. Annual Reporting Requirement

The permittee shall submit a summary report of activities related to the implementation of its Collection System O & M Plan during the previous calendar year. The report shall be submitted to EPA and MassDEP annually by March 31. The summary report shall, at a minimum, include:

a. A description of the staffing levels maintained during the year;
b. A map and a description of inspection and maintenance activities conducted and corrective actions taken during the previous year;
c. Expenditures for any collection system maintenance activities and corrective actions taken during the previous year;
d. A map with areas identified for investigation/action in the coming year;
e. If treatment plant flow has reached 80% of its design flow (*i.e.*, 3.04 mgd) based on the annual average flow during the reporting year, or there have been capacity related overflows, submit a calculation of the maximum daily, weekly, and monthly infiltration and the maximum daily, weekly, and monthly inflow for the reporting year; and
f. A summary of unauthorized discharges during the past year and their causes and a report of any corrective actions taken as a result of the unauthorized discharges reported pursuant to the Unauthorized Discharges section of this permit.

7. Alternate Power Source

In order to maintain compliance with the terms and conditions of this permit, the permittee shall provide an alternative power source(s) sufficient to operate the portion of the publicly owned treatment works[1] it owns and operates.

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.

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

a. Land application - the use of sewage sludge to condition or fertilize the soil

b. Surface disposal - the placement of sewage sludge in a sludge only landfill

c. Sewage sludge incineration in a sludge only incinerator

4. The requirements of 40 CFR Part 503 do not apply to facilities which dispose of sludge in a municipal solid waste landfill. 40 CFR § 503.4. These requirements also do not apply to facilities which do not use or dispose of sewage sludge during the life of the permit but rather treat the sludge (e.g. lagoons, reed beds), or are otherwise excluded under 40 CFR § 503.6.

5. The 40 CFR. Part 503 requirements including the following elements:

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

Which of the 40 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 than 1,500	1 /quarter
1,500 to less than 15,000	6 /year
15,000 +	1 /month

Sampling of the sewage sludge shall use the procedures detailed in 40 CFR 503.8.

2 This guidance document is available upon request from EPA Region 1 and may be found at: http://www.epa.gov/region1/npdes/permits/generic/sludgeguidance.pdf

7. Under 40 CFR § 503.9(r), the permittee is a "person who prepares sewage sludge" because it "is … the person who generates sewage sludge during the treatment of domestic sewage in a treatment works …." If the permittee contracts with *another* "person who prepares sewage sludge" under 40 CFR § 503.9(r) – i.e., with "a person who derives a material from sewage sludge" – for use or disposal of the sludge, then compliance with Part 503 requirements is the responsibility of the contractor engaged for that purpose. If the permittee does not engage a "person who prepares sewage sludge," as defined in 40 CFR § 503.9(r), for use or disposal, then the permittee remains responsible to ensure that the applicable requirements in Part 503 are met. 40 CFR § 503.7. If the ultimate use or disposal method is land application, the permittee is responsible for providing the person receiving the sludge with notice and necessary information to comply with the requirements of 40 CFR Part 503 Subpart B.

8. The permittee shall submit an annual report containing the information specified in the 40 CFR Part 503 requirements (§ 503.18 (land application), § 503.28 (surface disposal), or § 503.48 (incineration)) by **February 19** (*see also* "EPA Region 1 - NPDES Permit Sludge Compliance Guidance"). Reports shall be submitted to the address contained in the reporting section of the permit. If the permittee engages a contractor or contractors for sludge preparation and ultimate use or disposal, the annual report need contain only the following information:

    a. Name and address of contractor(s) responsible for sludge preparation, use or disposal
    b. Quantity of sludge (in dry metric tons) from the POTW that is transferred to the sludge contractor(s), and the method(s) by which the contractor will prepare and use or dispose of the sewage sludge.

E. INDUSTRIAL USERS AND PRETREATMENT PROGRAM

1. The permittee shall develop and enforce specific effluent limits (local limits) for Industrial User(s), and all other users, as appropriate, which together with appropriate changes in the POTW Treatment Plant's Facilities or operation, are necessary to ensure continued compliance with the POTW's NPDES permit or sludge use or disposal practices. Specific local limits shall not be developed and enforced without individual notice to persons or groups who have requested such notice and an opportunity to respond. Within (120 days of the effective date of this permit), the permittee shall prepare and submit a written technical evaluation to the EPA analyzing the need to revise local limits. As part of this evaluation, the permittee shall assess how the POTW performs with respect to influent and effluent of pollutants, water quality concerns, sludge quality, sludge processing concerns/inhibition, biomonitoring results, activated sludge inhibition, worker health and safety and collection system concerns. In preparing this evaluation, the permittee shall complete and submit the attached form (see **Attachment C –** Reassessment of Technically Based Industrial Discharge Limits) with the technical evaluation to assist in determining whether existing local limits need to be revised. Justifications and conclusions should be based on actual plant data if available and should be included in the report. Should the evaluation reveal the need to revise local limits, the permittee shall complete the revisions within 120 days of notification by EPA and submit the revisions to EPA for approval. The

Permittee shall carry out the local limits revisions in accordance with EPA's Local Limit Development Guidance (July 2004).

2. The permittee shall implement the Industrial Pretreatment Program in accordance with the legal authorities, policies, procedures, and financial provisions described in the permittee's approved Pretreatment Program, and the General Pretreatment Regulations, 40 CFR 403. At a minimum, the permittee must perform the following duties to properly implement the Industrial Pretreatment Program (IPP):

   a. Carry out inspection, surveillance, and monitoring procedures which will determine independent of information supplied by the industrial user, whether the industrial user is in compliance with the Pretreatment Standards. At a minimum, all significant industrial users shall be sampled and inspected at the frequency established in the approved IPP but in no case less than once per year and maintain adequate records.

   b. Issue or renew all necessary industrial user control mechanisms within 90 days of their expiration date or within 180 days after the industry has been determined to be a significant industrial user.

   c. Obtain appropriate remedies for noncompliance by any industrial user with any pretreatment standard and/or requirement.

   d. Maintain an adequate revenue structure for continued implementation of the Pretreatment Program.

3. The permittee shall provide the EPA and MassDEP with an annual report describing the permittee's pretreatment program activities for the twelve (12) month period ending 60 days prior to the due date in accordance with 403.12(i). The annual report shall be consistent with the format described in **Attachment D** (NPDES Permit Requirement for Industrial Pretreatment Annual Report) of this permit and shall be submitted no later than **November 1** of each year.

4. The permittee must obtain approval from EPA prior to making any significant changes to the industrial pretreatment program in accordance with 40 CFR 403.18(c).

5. The permittee must assure that applicable National Categorical Pretreatment Standards are met by all categorical industrial users of the POTW. These standards are published in the Federal Regulations at 40 CFR 405 et. seq.

6. The permittee must modify its pretreatment program, if necessary, to conform to all changes in the Federal Regulations that pertain to the implementation and enforcement of the industrial pretreatment program. The permittee must provide EPA, in writing, within 180 days of this permit's effective date proposed changes, if applicable, to the permittee's pretreatment program deemed necessary to assure conformity with current Federal Regulations. At a minimum, the permittee must address in its written submission the following areas: (1) Enforcement response plan; (2) revised sewer use ordinances; and (3)

slug control evaluations. The permittee will implement these proposed changes pending EPA Region I's approval under 40 CFR 403.18. This submission is separate and distinct from any local limits analysis submission described in Part I.E.1.

F. SPECIAL CONDITIONS

In the 2007 permit, the facility was required to complete an evaluation of alternative methods of operating the existing wastewater treatment facility to optimize the removal of nitrogen and submit a report to EPA and MassDEP documenting this evaluation and presenting a description of recommended operational changes. This report was completed and submitted to EPA and MassDEP in 2008. The permittee shall update, if necessary, its evaluation of alternative methods of operating the existing water pollution control facility to optimize the removal of nitrogen, and maintain a copy of the report to be available to EPA and MassDEP upon request. The methods to be evaluated include, but are not limited to, operational changes designed to enhance nitrification (seasonal and year round), incorporation of anoxic zones, septage receiving policies and procedures, and side stream management. The permittee shall implement the recommended operational changes in order to maintain the mass discharge of total nitrogen less than the existing annual discharge load. The existing mass loading of **304.6 lb/day** is based on the maximum measured annual average load (2011) during the previous permit cycle (2008-2012).

The permittee shall also submit an annual report to EPA and MassDEP, by **April 1** each year, that summarizes activities related to optimizing nitrogen removal efficiencies, documents the annual nitrogen discharge load from the facility, and tracks trends relative to the previous year.

G. MONITORING AND REPORTING

1. **For a period of one year from the effective date of the permit**, the permittee may either submit monitoring data and other reports to EPA in hard copy form or report electronically using NetDMR, a web-based tool that allows permittees to electronically submit discharge monitoring reports (DMRs) and other required reports via a secure internet connection. **Beginning no later than one year after the effective date of the permit**, the permittee shall begin reporting using NetDMR, unless the facility is able to demonstrate a reasonable basis that precludes the use of NetDMR for submitting DMRs and reports. Specific requirements regarding submittal of data and reports in hard copy form and for submittal using NetDMR are described below:

   a. Submittal of Reports Using NetDMR

      NetDMR is accessed from: http://www.epa.gov/netdmr. **Within one year of the effective date of this permit**, the permittee shall begin submitting DMRs and reports required under this permit electronically to EPA using NetDMR, unless the facility is able to demonstrate a reasonable basis, such as technical or administrative infeasibility, that precludes the use of NetDMR for submitting DMRs and reports ("opt-out request").

      DMRs shall be submitted electronically to EPA no later than the 15th day of the month following the completed reporting period. All reports required under the permit shall be submitted to EPA, including the MassDEP Monthly Operations and Maintenance Report, as an electronic attachment to the DMR. Once a permittee begins submitting reports using NetDMR, it will no longer be required to submit hard copies of DMRs or other reports to EPA and will no longer be required to submit hard copies of DMRs to MassDEP. However, permittees shall continue to send hard copies of reports other than DMRs (including Monthly Operation and Maintenance Reports) to MassDEP until further notice from MassDEP.

b. Submittal of NetDMR Opt-Out Requests

Opt-out requests must be submitted in writing to EPA for written approval at least sixty (60) days prior to the date a facility would be required under this permit to begin using NetDMR. This demonstration shall be valid for twelve (12) months from the date of EPA approval and shall thereupon expire. At such time, DMRs and reports shall be submitted electronically to EPA unless the permittee submits a renewed opt-out request and such request be approved by EPA. All opt-out requests should be sent to the following addresses:

Attn: NetDMR Coordinator
U.S. Environmental Protection Agency, Water Technical Unit
5 Post Office Square, Suite 100 (OES04-4)
Boston, MA 02109-3912

And

Massachusetts Department of Environmental Protection
Surface Water Discharge Permit Program
627 Main Street, 2nd Floor
Worcester, Massachusetts 01608

c. Submittal of Reports in Hard Copy Form

Monitoring results shall be summarized for each calendar month and reported on separate hard copy Discharge Monitoring Report Form(s) (DMRs) postmarked no later than the 15th day of the month following the completed reporting period. All reports required under this permit, including MassDEP Monthly Operation and Maintenance Reports, shall be submitted as an attachment to the DMRs. Signed and dated originals of the DMRs, and all other reports or notifications required herein or in Part II shall be submitted to the Director at the following address:

U.S. Environmental Protection Agency
Water Technical Unit (OES04-SMR)
5 Post Office Square - Suite 100
Boston, MA 02109-3912

Duplicate signed copies of all reports or notifications required above shall be submitted to the State at the following addresses:

MassDEP – Western Region
Bureau of Resource Protection (Municipal)
436 Dwight Street, Suite 402
Springfield, MA 01103

Copies of toxicity tests and nitrogen optimization reports only to:

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

H. STATE PERMIT CONDITIONS

1. This authorization to discharge includes two separate and independent permit authorizations. The two permit authorizations are (i) a federal National Pollutant Discharge Elimination System permit issued by the U.S. Environmental Protection Agency (EPA) pursuant to the Federal Clean Water Act, 33 U.S.C. §§1251 et seq.; and (ii) an identical state surface water discharge permit issued by the Commissioner of the Massachusetts Department of Environmental Protection (MassDEP) pursuant to the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53, and 314 C.M.R. 3.00. All of the requirements contained in this authorization, as well as the standard conditions contained in 314 CMR 3.19, are hereby incorporated by reference into this state surface water discharge permit.

2. This authorization also incorporates the state water quality certification issued by MassDEP under § 401(a) of the Federal Clean Water Act, 40 C.F.R. 124.53, M.G.L. c. 21, § 27 and 314 CMR 3.07. All of the requirements (if any) contained in MassDEP's water quality certification for the permit are hereby incorporated by reference into this state surface water discharge permit as special conditions pursuant to 314 CMR 3.11.

3. Each agency shall have the independent right to enforce the terms and conditions of this permit. Any modification, suspension or revocation of this permit shall be effective only with respect to the agency taking such action, and shall not affect the validity or status of this permit as issued by the other agency, unless and until each agency has concurred in writing with such modification, suspension or revocation. In the event any portion of this permit is declared invalid, illegal or otherwise issued in violation of state law such permit shall remain in full force and effect under federal law as a NPDES Permit issued by the U.S. Environmental Protection Agency. In the event this permit is declared invalid, illegal or otherwise issued in violation of federal law, this permit shall remain in full force and effect under state law as a permit issued by the Commonwealth of Massachusetts.

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^{o}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 (°C)	20 ± 1° C or 25 ± 1°C
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	≥ 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^{o}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

<u>LC50 Median Lethal Concentration (Determined at 48 Hours)</u>

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.

<u>No Observed Acute Effect Level (NOAEL)</u>

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.

Procedures for a pH Adjustment Demonstration Project

This document describes the procedures to be undertaken by any permittee requesting an adjustment of the pH limits in their NPDES permit. These limits may be adjusted as long as the pH of the effluent remains between 6.0-9.0 (standard units) and the pH of the receiving water remains between 6.5-8.0 or as naturally occurs. Please note that a pH limits adjustment is valid only for the duration of the existing NPDES permit. A subsequent pH limits adjustment demonstration project can be conducted and submitted with a NPDES permit reapplication or anytime thereafter.

Freshwater

For discharges to fresh water receiving waters each demonstration project must be conducted twice over the period of a year, once during the spring months (between March and April when receiving water flows are high) and once during the summer months (between July and August when receiving water flows are low).

Marine Waters

For discharges to marine /estuarine receiving waters the demonstration project must be completed only once during a 1% occurrence spring tide, which is a tide with a maximum range of depths between the high and low tides.

- When the requested pH limit is low (down to 6.0) the study must be conducted when runoff conditions are the greatest (during March/April or October /November) and during the last 2 hours of ebb tide (just before slack low tide).
- When the requested pH limit is high (up to 9.0) the study must be conducted when runoff conditions are lowest (during July and August) and during the last 2 hours of flood tide (just prior to slack high tide.)

The project calls for use of grab and composite samples of the effluent, and grab samples of the receiving water. The procedure is as follows:

1. Calibrate the pH meter using two-point calibration (per the manufacturer's procedure) and verify the calibration using a pH standard close to either pH 6.0 or pH 9.0 (depending on whether you are conducting the pH demonstration project to lower permit limit to pH 6.0 or raise the permit limit to pH 9.0) Record the results on a lab bench sheet. Also record on the lab bench sheet all sampling dates and times, the name of the sampler(s), the name of the analyst(s), and the start and end times for each analysis.

2. Collect a grab and a 24-hour composite sample of the effluent and a grab sample of the receiving water (up gradient of the outfall location). Five liter sample bottles typically suffice. Facilities with secondary treatment by sand filtration or lagoons need not collect a 24-hour composite sample of the effluent because of the relative uniformity of effluent quality.

3. Record the collection date and time for each sample. Work as rapidly as possible to minimize sample holding time.

4. Measure the pH of all samples (effluent grab sample, effluent composite sample, if needed and receiving water grab sample) using the method described in Standard Methods, 18th, 19th, or 20th Edition (or a method allowed in 40 CFR 136), and record the pH of samples on the attached form. The samples must be stirred, but the rate of stirring should minimize the air transfer rate at the air water interface of the sample.

5. Adjust the pH of the effluent sample(s) (either the effleuent grab sample or both the grab and composite effluent samples) to either a pH of 6.0 or 9.0 depending on whether you are seeking to adjust the pH to 6.0 or 9.0. The pH of a sample can be adjusted with either sulfuric acid or sodium hydroxide of such strength that the quantity of reagent does not dilute the sample by more than 0.5%.

6. Taking precautions to minimize sample agitation, mix the receiving water and effluent samples in four separate (glass) containers in the following proportions:
   a. 1 @ the facility's dilution factor
   b. 1 @ 20% above the facility's dilution factor (1.2 x dilution factor)
   c. 1 @ 20% below the facility's dilution factor (0.8 x dilution factor)
   d. 1 @ 40% below the facility's dilution factor (0.6 x dilution factor)

For example, if the facility's dilution factor is 100:1, then the four dilution factors used for the study would be as follows: 100:1, 120:1, 80:1 and 60:1. The volume of each effluent/receiving water mixture should be no less than 500 ml to provide adequate volume for proper mixing and measurement of pH. To calculate the volume of effluent needed to prepare each of the four mixtures, divide the total mixture volume (500 ml) by the dilution factor/ For example, for a dilution factor of 100, divide 500 ml by 100 to calculate the effluent volume that will be needed (5 ml). The 5 ml of effluent should then be diluted (using receiving water) to 500 ml to prepare a mixture representative of the 100:1 dilution factor. The following effluent and receiving water volumes would be combined to prepare each of the four mixtures in the above example:

Dilution Factor	Effluent Volume (ml)	Receiving Water Volume (ml)	Combined Volume (ml)
60	8.33	491.67	500
80	6.25	493.75	500
100	5.0	495.0	500
120	4.17	495.83	500

7. Measure the pH of each mixture per Standard Methods, 18^{th}, 19^{th} or 20^{th} Edition (or a method allowed in 40 CFR 136) and record the information on the attached form.

8. Recheck the calibration of the pH meter by measuring the pH of a standard (again, either pH 6.0 or pH 9.0) and record the information on the lab bench sheet.

9. For discharges to fresh water receiving waters, repeat Steps 1-8 for samples collected during the second season.

10. Submit a report with a copy (or copies) of the attached form (one for each sampling date) and the lab bench sheets to EPA and MassDEP. The report must include a narrative justification for adjusting the pH range and an interpretation/ conclusion about the data.

Attachment B

Date:		Start Time:		End Time:	
		pH of Receiving Water Grab Sample		(1)	
		pH of Effluent Grab Sample		(2)	
		pH of Effluent Composite Sample		(3)	
				Effluent Grab Sample	Effluent Composite Sample
		pH (after pH adjustment)		(4)	(5)
Serial Dilution		Volume of pH Adjusted Effluent (ml)	Volume of Receiving Water (ml)	Resultant pH Data	
				Effluent Grab/Receiving Water Mixture	Effluent Composite/Receiving Water Mixture
D1: 40% below actual dilution factor	(6)	(10)	(14)	(18)	(22)
D2: 20% below actual design dilution factor	(7)	(11)	(15)	(19)	(23)
D3: at actual design dilution factor	(8)	(12)	(16)	(20)	(24)
D4: 20% above actual design dilution factor	(9)	(13)	(17)	(21)	(25)

(1)Record the pH of a representative upstream receiving water grab sample; for marine waters also note salinity
(2)Record the pH of a representative effluent grab sample
(3)Record the pH of a representative effluent composite sample
(4)Record the pH of the representative effluent grab sample after pH adjustment (should be either pH 6.0 or 9.0)
(5)Record the pH of the representative effluent composite sample after pH adjustment (should be either 6.0 or 9.0)
(6)-(9) Record the four dilutions, and note the volumes used to make up the dilutions (10)-(17); record the resultant pH of each mixture (18)-(25).

Notes/Comments:____

EPA - New England

Reassessment of Technically Based Industrial Discharge Limits

Under 40 CFR §122.21(j)(4), all Publicly Owned Treatment Works (POTWs) with approved Industrial Pretreatment Programs (IPPs) shall provide the following information to the Director: a written evaluation of the need to revise local industrial discharge limits under 40 CFR §403.5(c)(1).

Below is a form designed by the U.S. Environmental Protection Agency (EPA - New England) to assist POTWs with approved IPPs in evaluating whether their existing Technically Based Local Limits (TBLLs) need to be recalculated. The form allows the permittee and EPA to evaluate and compare pertinent information used in previous TBLLs calculations against present conditions at the POTW.

Please read direction below before filling out form.

ITEM I.

* In Column (1), list what your POTW's influent flow rate was when your existing TBLLs were calculated. In Column (2), list your POTW's present influent flow rate. Your current flow rate should be calculated using the POTW's average daily flow rate from the previous 12 months.

* In Column (1) list what your POTW's SIU flow rate was when your existing TBLLs were calculated. In Column (2), list your POTW's present SIU flow rate.

* In Column (1), list what dilution ratio and/or 7Q10 value was used in your old/expired NPDES permit. In Column (2), list what dilution ration and/or 7Q10 value is presently being used in your new/reissued NPDES permit.

  The 7Q10 value is the lowest seven day average flow rate, in the river, over a ten year period. The 7Q10 value and/or dilution ratio used by EPA in your new NPDES permit can be found in your NPDES permit "Fact Sheet."

* In Column (1), list the safety factor, if any, that was used when your existing TBLLs were calculated.

* In Column (1), note how your bio-solids were managed when your existing TBLLs were calculated. In Column (2), note how your POTW is presently disposing of its biosolids and how your POTW will be disposing of its biosolids in the future.

ITEM II.

* List what your existing TBLLs are - as they appear in your current Sewer Use Ordinance (SUO).

ITEM III.

* Identify how your existing TBLLs are allocated out to your industrial community. Some pollutants may be allocated differently than others, if so please explain.

ITEM IV.

* Since your existing TBLLs were calculated, identify the following in detail:

(1) if your POTW has experienced any upsets, inhibition, interference or pass-through as a result of an industrial discharge.

(2) if your POTW is presently violating any of its current NPDES permit limitations - include toxicity.

ITEM V.

* Using current sampling data, list in Column (1) the average and maximum amount of pollutants (in pounds per day) received in the POTW's influent. Current sampling data is defined as data obtained over the last 24 month period.

All influent data collected and analyzed must be in accordance with 40 CFR §136. Sampling data collected should be analyzed using the lowest possible detection method(s), e.g. graphite furnace.

* Based on your existing TBLLs, as presented in Item II., list in Column (2), for each pollutant the Maximum Allowable Headwork Loading (MAHL) values derived from an applicable environmental criteria or standard, e.g. water quality, sludge, NPDES, inhibition, etc. For more information, please see EPA's Local Limit Guidance Document (July 2004).

Item VI.

* Using current sampling data, list in Column (1) the average and maximum amount of pollutants (in micrograms per liter) present your POTW's effluent. Current sampling data is defined as data obtained during the last 24 month period.

(Item VI. continued)

All effluent data collected and analyzed must be in accordance with 40 CFR §136. Sampling data collected should be analyzed using the lowest possible detection method(s), e.g. graphite furnace.

* List in Column (2A) what the Water Quality Standards (WQS) were (in micrograms per liter) when your TBLLs were calculated, please note what hardness value was used at that time. Hardness should be expressed in milligram per liter of Calcium Carbonate.

List in Column (2B) the current WQSs or "Chronic Gold Book" values for each pollutant multiplied by the dilution ratio used in your new/reissued NPDES permit. For example, with a dilution ratio of 25:1 at a hardness of 25 mg/l - Calcium Carbonate (copper's chronic WQS equals 6.54 ug/l) the chronic NPDES permit limit for copper would equal 156.25 ug/l.

ITEM VII.

* In Column (1), list all pollutants (in micrograms per liter) limited in your new/reissued NPDES permit. In Column (2), list all pollutants limited in your old/expired NPDES permit.

ITEM VIII.

* Using current sampling data, list in Column (1) the average and maximum amount of pollutants in your POTW's biosolids. Current data is defined as data obtained during the last 24 month period. Results are to be expressed as total dry weight.

All biosolids data collected and analyzed must be in accordance with 40 CFR §136.

In Column (2A), list current State and/or Federal sludge standards that your facility's biosolids must comply with. Also note how your POTW currently manages the disposal of its biosolids. If your POTW is planing on managing its biosolids differently, list in Column (2B) what your new biosolids criteria will be and method of disposal.

In general, please be sure the units reported are correct and all pertinent information is included in your evaluation. If you have any questions, please contact your pretreatment representative at EPA - New England.

REASSESSMENT OF TECHNICALLY BASED LOCAL LIMITS (TBLLs)

POTW Name & Address : ______________________________

NPDES PERMIT # : ______________________________

Date EPA approved current TBLLs : ______________________________

Date EPA approved current Sewer Use Ordinance : ______________________________

ITEM I.

In Column (1) list the conditions that existed when your current TBLLs were calculated. In Column (2), list current conditions or expected conditions at your POTW.

	Column (1) EXISTING TBLLs	Column (2) PRESENT CONDITIONS
POTW Flow (MGD)		
Dilution Ratio or 7Q10 (from NPDES Permit)		
SIU Flow (MGD)		
Safety Factor		N/A
Biosolids Disposal Method(s)		

ITEM II.

EXISTING TBLLs			
POLLUTANT	NUMERICAL LIMIT (mg/l) or (lb/day)	POLLUTANT	NUMERICAL LIMIT (mg/l) or (lb/day)

ITEM III.

Note how your existing TBLLs, listed in Item II., are allocated to your Significant Industrial Users (SIUs), i.e. uniform concentration, contributory flow, mass proportioning, other. Please specify by circling.

ITEM IV.

Has your POTW experienced any upsets, inhibition, interference or pass-through from industrial sources since your existing TBLLs were calculated?
If yes, explain.

____

____

Has your POTW violated any of its NPDES permit limits and/or toxicity test requirements?

If yes, explain.

____

____

ITEM V.

Using current POTW influent sampling data fill in Column (1). In Column (2), list your Maximum Allowable Headwork Loading (MAHL) values used to derive your TBLLs listed in Item II. In addition, please note the Environmental Criteria for which each MAHL value was established, i.e. water quality, sludge, NPDES etc.

Pollutant	Column (1) Influent Data Analyses Maximum (lb/day)	Average (lb/day)	Column (2) MAHL Values (lb/day)	Criteria
Arsenic				
Cadmium				
Chromium				
Copper				
Cyanide				
Lead				
Mercury				
Nickel				
Silver				
Zinc				
Other (List)				

ITEM VI.

Using current POTW effluent sampling data, fill in Column (1). In Column (2A) list what the Water Quality Standards (Gold Book Criteria) were at the time your existing TBLLs were developed. List in Column (2B) current Gold Book values multiplied by the dilution ratio used in your new/reissued NPDES permit.

Pollutant	Column (1) Effluent Data Analyses Maximum (ug/l)	Average (ug/l)	Columns (2A) (2B) Water Quality Criteria (Gold Book) From TBLLs (ug/l)	Today (ug/l)
Arsenic				
*Cadmium				
*Chromium				
*Copper				
Cyanide				
*Lead				
Mercury				
*Nickel				
Silver				
*Zinc				
Other (List)				

*Hardness Dependent (mg/l - $CaCO_3$)

ITEM VII.

In Column (1), identify all pollutants limited in your new/reissued NPDES permit. In Column (2), identify all pollutants that were limited in your old/expired NPDES permit.

Column (1) NEW PERMIT Pollutants	Limitations (ug/l)	Column (2) OLD PERMIT Pollutants	Limitations (ug/l)

ITEM VIII.

Using current POTW biosolids data, fill in Column (1). In Column (2A), list the biosolids criteria that was used at the time your existing TBLLs were calculated. If your POTW is planing on managing its biosolids differently, list in Column (2B) what your new biosolids criteria would be and method of disposal.

Pollutant	Column (1) Biosolids Data Analyses Average (mg/kg)	Columns (2A) Biosolids Criteria From TBLLs (mg/kg)	Columns (2B) Biosolids Criteria New (mg/kg)
Arsenic			
Cadmium			
Chromium			
Copper			
Cyanide			
Lead			
Mercury			
Nickel			
Silver			
Zinc			
Molybdenum			
Selenium			
Other (List)			

NPDES PERMIT REQUIREMENT
FOR
INDUSTRIAL PRETREATMENT ANNUAL REPORT

The information described below shall be included in the pretreatment program annual reports:

1. An updated list of all industrial users by category, as set forth in 40 C.F.R. 403.8(f)(2)(i), indicating compliance or noncompliance with the following:
   - baseline monitoring reporting requirements for newly promulgated industries
   - compliance status reporting requirements for newly promulgated industries
   - periodic (semi-annual) monitoring reporting requirements,
   - categorical standards, and
   - local limits;

2. A summary of compliance and enforcement activities during the preceding year, including the number of:
   - significant industrial users inspected by POTW (include inspection dates for each industrial user),
   - significant industrial users sampled by POTW (include sampling dates for each industrial user),
   - compliance schedules issued (include list of subject users),
   - written notices of violations issued (include list of subject users),
   - administrative orders issued (include list of subject users),
   - criminal or civil suits filed (include list of subject users) and,
   - penalties obtained (include list of subject users and penalty amounts);

3. A list of significantly violating industries required to be published in a local newspaper in accordance with 40 C.F.R. 403.8(f)(2)(vii);

4. A narrative description of program effectiveness including present and proposed changes to the program, such as funding, staffing, ordinances, regulations, rules and/or statutory authority;

5. A summary of all pollutant analytical results for influent, effluent, sludge and any toxicity or bioassay data from the wastewater treatment facility. The summary shall include a comparison of influent sampling results versus threshold inhibitory concentrations for the Wastewater Treatment System and effluent sampling results versus water quality standards. Such a comparison shall be based on the sampling program described in the paragraph below or any similar sampling program described in this Permit.

At a minimum, annual sampling and analysis of the influent and effluent of the Wastewater Treatment Plant shall be conducted for the following pollutants:

a.) Total Cadmium	f.) Total Nickel
b.) Total Chromium	g.) Total Silver
c.) Total Copper	h.) Total Zinc
d.) Total Lead	i.) Total Cyanide
e.) Total Mercury	j.) Total Arsenic

The sampling program shall consist of one 24-hour flow-proportioned composite and at least one grab sample that is representative of the flows received by the POTW. The composite shall consist of hourly flow-proportioned grab samples taken over a 24-hour period if the sample is collected manually or shall consist of a minimum of 48 samples collected at 30 minute intervals if an automated sampler is used. Cyanide shall be taken as a grab sample during the same period as the composite sample. Sampling and preservation shall be consistent with 40 CFR Part 136.

6. A detailed description of all interference and pass-through that occurred during the past year;

7. A thorough description of all investigations into interference and pass-through during the past year;

8. A description of monitoring, sewer inspections and evaluations which were done during the past year to detect interference and pass-through, specifying parameters and frequencies;

9. A description of actions being taken to reduce the incidence of significant violations by significant industrial users; and,

10. The date of the latest adoption of local limits and an indication as to whether or not the permittee is under a State or Federal compliance schedule that includes steps to be taken to revise local limits.

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. Upset

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. <u>Monitoring and Records</u>

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 <u>except for the information concerning storm water discharges which must be retained for a total of 6 years</u>. 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 NO: **MA0101478**

PUBLIC NOTICE PERIOD: April 30, 2013 – May 29, 2013

NAME AND ADDRESS OF APPLICANT:

City of Easthampton, Board of Public Works
50 Payson Avenue, Easthampton, Massachusetts 01027

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Easthampton Wastewater Treatment Plant
10 Gosselin Drive, Easthampton, Massachusetts 01027

RECEIVING WATERS: **Connecticut River (MA34-04) and Manhan River (MA34-11)**

CLASSIFICATION: **Class B - Warm Water Fishery**

TABLE OF CONTENTS

I. Proposed Action, Type of Facility and Outfall Locations

A. Proposed Action

The above named applicant has applied to the U.S. Environmental Protection Agency (EPA) for the reissuance of its NPDES permit to discharge to the Connecticut River and Manhan River, the designated receiving waters, through two outfalls. Outfall 001 is the main outfall and discharges into the Connecticut River; Outfall 002 is the auxiliary outfall and discharges into the Manhan River when flows exceed the capacity of Outfall 001. The facility is engaged in the collection and treatment of municipal, commercial and industrial wastewater. A figure showing the wastewater treatment facility and outfall location is included as **Attachment A**.

B. Wastewater Treatment Plant and Collection System Description

The Easthampton Wastewater Treatment Plant (WWTP) is a 3.8 MGD secondary wastewater treatment plant serving approximately 15,600 people in Easthampton, and receiving a total of about 10,000 gallons per day of wastewater from Northampton, Southampton and Holyoke. In addition, there is one categorical industrial user (CIU) and two non-categorical, significant industrial users (SIUs) in the sewered community (see Industrial Pre-Treatment Section in Part VI).

The WWTP consists of the following treatment units:

- preliminary treatment:
  - mechanically cleaned bar screen
  - manually cleaned bar rack (bypass)
  - aerated grit chamber
  - grit screw and bucket elevator
- primary treatment:
  - rectangular primary clarifiers (2)
- secondary treatment:
  - aeration basins with mechanical aeration (2)
  - center feed secondary clarifiers (2)
- disinfection/dechlorination
  - chlorination with sodium hypochlorite (flow paced);
  - chlorine contact chambers
  - dechlorination with sodium bisulfite (for discharge #002)
- outfalls
  - discharge to Connecticut River via outfall pipe (Outfall #001) or to Manhan River (Outfall #002) when hydraulic capacity of 001 is exceeded
- sludge treatment
  - gravity thickeners
  - odor control with potassium permanganate
  - chemical sludge condition polymer
  - belt filter press
  - sludge disposed off-site (Synagro-Northeast, Waterbury, CT)

The sewerage collection system has approximately 78.8 miles of sewers and includes 16 pump stations. The collection system is completely separate (there are no storm water collection pipes tied into the sewage collection system).

C. Outfall Locations and Capacity

The main effluent pipe is approximately 2.1 miles long and discharges to the Connecticut River by gravity. The outfall is located near shore, just downstream of the confluence of the Connecticut and Manhan Rivers. During periods when discharge flows exceed the capacity of Outfall 001, flow is discharged to the Manhan River through Outfall 002. The hydraulic capacity of Outfall 001 varies based on the hydraulic regime in the Connecticut River. The permittee estimates that the peak capacity is 3.1 mgd at normal river level (101 ft.), 2.7 mgd at the ten year flood level and 1.2 mgd at the 50 year flood level (124 ft.). A more recent study submitted to EPA in 2009 by Tighe and Bond, verified these approximate flow capacities and is discussed in more detail below. Based upon the data in Attachment B1, the average monthly flow (as opposed to the peak capacities listed above) from Outfall 001 has often approached 3 mgd with a small number of months above 3 mgd, as measured by the plant's influent flow meter. The chief operator of the facility (Carl Williams) confirmed this flow capacity, stating that Outfall 001 is able to handle approximately 3 mgd under normal river conditions and the remaining flow goes to Outfall 002. Hence, the capacity in this permit reissuance for Outfall 001 is set at 3 mgd. The capacity for Outfall 002 is set at 0.8 mgd, the difference between the design flow (3.8 mgd) and the capacity of Outfall 001 (3 mgd).

The 2007 permit contained a special condition requiring the permittee to evaluate the hydraulic capacity of Outfall 001, maximize the flow through Outfall 001, and evaluate the feasibility of eliminating flow to Outfall 002. This evaluation was completed and a report from Tighe & Bond, Inc. was submitted to EPA on November 30, 2009. This report recommended short-term and long-term improvements. Short-term improvements included raising the overflow weir to the Manhan River outfall as well as cleaning the siphon section of the Connecticut River outfall. Long-term improvements included construction of a pump station to the Connecticut River outfall, eliminating flow to the Manhan River.

As of January 2013, the chief operator of the facility (Carl Williams) indicated that the overflow weir has been set to a maximum level and a large segment of the Connecticut River outfall has been cleaned within the last 2 years. The effect of this can be seen in the reduction in flows to Outfall 002 since May of 2010 (see Attachment B2). However, the City of Easthampton (the City) is not planning to construct a pump station to the Connecticut River. Instead, the City is considering diverting the entire flow to the Manhan River outfall in order to avoid the cost of maintaining the Connecticut River outfall pipe.

Should the City decide to alter the flow capacity or distribution to its outfalls, the permittee must inform EPA and the Massachusetts Department of Environmental Protection (MassDEP) and the permit may be reopened and adjusted accordingly. However, the City of Easthampton should note that an increased flow to the Manhan River could face certain complications, including more stringent effluent limits as well as antidegradation issues. Hence, it is recommended that the City coordinate well in advance with EPA and MassDEP regarding this matter.

II. Description of Discharge

A quantitative description of the discharge in terms of significant effluent parameters based on recent discharge monitoring reports (DMRs) from January 2008 through September 2012 may be found in **Attachment B** of this fact sheet.

III. Limitations and Conditions

The effluent limitations and monitoring requirements may be found in the draft NPDES permit.

IV. Permit Basis and Explanation of Effluent Limitation Derivation

A. Overview of Federal and State Regulations

Pursuant to 40 C.F.R. § 122.44 (d), permittees must achieve water quality standards established under Section 303 of the Clean Water Act (CWA), including state narrative criteria for water quality. Additionally, under 40 C.F.R. § 122.44 (d)(1)(i), "Limitations must control all pollutants or pollutant parameters which the Director 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." When determining whether a discharge causes, or has the reasonable potential to cause or contribute to an in-stream excursion above a narrative or numeric criterion, the permitting authority shall use procedures which account for existing controls on point and non-point sources of pollution, and where appropriate, consider the dilution of the effluent in the receiving water.

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 the CWA. EPA's anti-backsliding provisions generally restrict the relaxation of permit limits, standards, and conditions. Therefore effluent limits in the reissued permit generally must be at least as stringent as those of the previous permit. Effluent limits based on technology, water quality, and state certification requirements must meet anti-backsliding provisions found under Section 402 (o) and 303 (d) of the CWA, and in 40 CFR 122.44 (1).

In accordance with regulations found at 40 CFR Section 131.12, MassDEP has developed and adopted a statewide antidegradation policy to maintain and protect existing in-stream water quality. The Massachusetts Antidegradation Policy is found at 314 CMR 4.04. No lowering of water quality is allowed, except in accordance with the antidegradation policy. All existing uses of the Connecticut River and Manhan River must be protected. This draft permit is being reissued with allowable discharge limits as, or more, stringent than those in the current permit and with the same parameter coverage. There is no change in the outfall locations. The public is invited to participate in the antidegradation finding through the permit public notice procedure.

Under Section 301(b)(1) of the CWA, publicly owned treatment works (POTWs) must have achieved effluent limitations based upon secondary treatment by July 1, 1977. The secondary treatment requirements are set forth at 40 C.F.R. Part 133.102. In addition, Section 301(b)(1)(C) of the CWA requires that effluent limitations based on water quality considerations be established for point source discharges when such limitations are necessary to meet state or federal water quality standards that are applicable to the designated receiving water.

B. Water Quality Standards and Designated Uses

The Easthampton WWTP discharges to the Connecticut River Segment MA34-04 and to the Manhan River Segment MA34-11. Segment MA34-04 runs from the confluence with the Deerfield River, Greenfield/Montague/Deerfield to the Holyoke Dam, Holyoke/South Hadley, a length of 34.4 miles. Segment MA34-11 runs from the outlet of Tighe Carmody Reservoir in Southampton to the confluence with the Connecticut River in Easthampton, a length of 19.2 miles.

The Connecticut River and Manhan River have been designated as Class B warm water fisheries. The Massachusetts Surface Water Quality Standards, 314 Code of Massachusetts Regulations (CMR) 4.05(3) (b) states that Class B waters are designated as habitat for fish, other aquatic life and wildlife including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. They shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. The waters shall have consistently good aesthetic value.

A warm water fishery is defined in the Massachusetts Surface Water Quality Standards (MA SWQS) at 314 CMR 4.02 as waters in which the maximum mean monthly temperature generally exceeds 68° F (20° Celsius) during the summer months and are not capable of supporting a year-round population of cold water stenothermal aquatic life.

Segment MA34-04 of the Connecticut River is classified in the State’s 2010 Integrated List of Waters as Category 5, as not in attainment and requiring a total maximum daily load (TMDL). The listed impairments for this segment are PCBs in fish tissue and *Escherichia coli (E. coli)*.

Segment MA34-11 of the Manhan River is classified in the State’s 2010 Integrated List of Waters as Category 5, as not in attainment and requiring a TMDL. The listed impairment for this segment is *E. coli*.

C. Available Dilution

The 7Q10, or the 7-day mean stream low flow with 10-year recurrence interval, is the base flow used to calculate the effluent limits in NPDES permits (314 CMR 4.03(3)(a)).

<u>7Q10 for the Connecticut River Outfall</u>

The 7Q10 flow in the Connecticut River at the point of the Easthampton WWTP discharge is calculated using the 7Q10 value at the Montague USGS gage (01170500) (see table below) and using a proportion of drainage area at the gage and at the outfall site.

USGS Gage Data

USGS Gage Number and location	Drainage Area [sq. miles]	Period of Record	Annual Mean Flow [cfs]	90 % flow exceedance [cfs]	7Q10 [cfs]*
01170500 Connecticut River at Montague City	7,860	1904-2004	13,970	3,030	1,727

* USGS low flow statistics updated 1998

The drainage area at the Montague City gage is 7,860 square miles; the drainage area at the Easthampton WWTP discharge location is approximately 8,228 square miles. Therefore, the Connecticut River 7Q10 value at the discharge (Outfall 001) is:

7Q10 flow/drainage area = flow factor cfs/sq. mi.
1727/7860 = 0.22 cfs/sq. mi.
7Q10 = 8,228 x 0.22 = **1810 cfs**

The dilution factor for Outfall 001 is based upon the 7Q10 and the 3.8 mgd (5.9 cfs) design flow of the WWTP. The dilution factor is therefore:

(7Q10 {river} + effluent design flow)/ effluent flow =
(1810 + 5.9)/ 5.9 = **308**

Note that this factor assumes the total design flow from the Easthampton WWTP will go to Outfall 001. The available data seems to show that the long term average and maximum daily flows actually discharged are less than the design flow due to the hydraulic limitations of the effluent pipe, thus, the dilution factor under most scenarios would be greater than the 308 using the total design flow. A dilution factor based on actual flow was not calculated because the dilution factor at design flow is so high that the facility does not require any dilution-based water quality limitations.

<u>7Q10 for the Manhan River Discharge</u>

The Manhan River 7Q10 was calculated using an adjacent watershed, the Mill River in Northampton, with a USGS gage (01171500) (see table below) and developing a proportional evaluation of flows.

USGS Gage Data

USGS Gage Number and location	Drainage Area [sq. miles]	Period of Record	Annual Mean Flow [cfs]	90 % flow exceedance [cfs]	7Q10 [cfs]*
01171500 Mill River at Northampton	52.6	1938-2004	98.9	14	6.31

* USGS low flow statistics updated 1998

As shown above, the Mill River in Northampton has a drainage area of 52.6 square miles. The drainage area of the Manhan River at the location of Outfall 002 is 84 square miles. The 7Q10 value for the Mill River is 6.31 cfs, therefore the proportional 7Q10 for the Manhan River is 10.1 cfs (6.31 cfs x 84/52.6). However, it should be noted that discharges from Outfall 002 do not appear to occur during low flow periods, thus the 7Q10 will not be used as the river flow to determine effluent limitations for Outfall 002.

In the 2007 permit, daily flow data for the Mill River gage (U.S. Geological Survey: Water Years 2004 and 2005) were compared with dates on which there was an overflow from Outfall 002. The data indicated that overflows occurred when the Mill River flows were approximately 20 cfs or greater. In the development of the draft permit, the daily flow data for the Mill River gage was reevaluated. Since the time that the facility increased the proportion of flow to Outfall 001 (May of 2010), the discharge through Outfall 002 has decreased significantly and has only been active on days when Mill River flows were approximately 73 cfs or greater. Extrapolating flows in the Manhan River results in flows of **117 cfs** (approximately 73 cfs x 84/52.6) or greater in the Manhan River when overflows from Outfall 002 occur. This baseline flow condition of 117 cfs will be used in determining required effluent limitations for Outfall 002.

As discussed earlier, the maximum daily flow capacity of Outfall 001 is about 3 mgd during normal Connecticut River levels. The effluent conditions and limitations for Outfall 002 will therefore be based upon a flow of 0.8 mgd (1.2 cfs), the difference between the wastewater treatment plant design capacity (3.8 mgd) and the capacity of Outfall 001 (3 mgd).

Therefore, the dilution factor for Outfall 002 is:

(7Q10 {river} + effluent design flow) / effluent flow = (117 cfs + 1.2 cfs)/ 1.2 cfs = **98.5**

Daily effluent flow data and corresponding daily river flow data were analyzed to confirm that these flow assumptions were sufficiently conservative under both acute and chronic conditions. Hence, these flow assumptions will be applied to all Manhan River water quality-based calculations in this fact sheet.

D. Flow

The design flow of the plant is 3.8 mgd. During the period from January 2008 to September 2012 (Attachment B3), the long term monthly average plant flow measured at the influent flow meter was 2.0 mgd (average of the monthly averages for the review period), with a maximum daily average flow of 3.4 mgd (average of the maximum daily flows each month for the review period). The monthly average influent flows ranged from 0.8 mgd to 8.0 mgd and the maximum daily flows ranged from 1.1 mgd to 10.1 mgd during the review period.

As discussed in Section I.C. above, the discharge from Outfall 001 to the Connecticut River is limited by the hydraulic capacity of the effluent discharge pipe, which is controlled in part by the stage of the Connecticut River. Flows greater than the hydraulic capacity of Outfall 001 are discharged to the Manhan River via Outfall 002.

As shown in Attachment B2, Outfall 002 discharges into the Manhan River with a monthly average flow of 0.55 mgd from January 2008 to September 2012. Prior to May of 2010, this outfall was active in almost every month during the review period. Since May of 2010, however, Outfall 002 was active in only 13 of 29 months (45%) and the average monthly discharge ranged from 0.04 mgd to 1.6 mgd, with an average of 0.35 mgd. This reduction in flow from Outfall 002 corresponds to the increase in flow capacity to Outfall 001 due to the weir adjustment and cleaning mentioned in Section I.C. above.

The flow limit for the combined discharge from Outfall 001 and Outfall 002 will be 3.8 mgd as measured at the plant's influent flow meter, and will be reported as an annual average flow, using monthly average flows from the previous eleven months and the reporting month. Monthly average and maximum daily flow for each outfall will also be required to be reported on the facility's monthly discharge monitoring report (DMR). In addition, flows from Outfall 002 are required to be recorded for each day that effluent is discharged through the outfall and submitted each month in an attachment to the DMR.

E. Conventional Pollutants

1. Biochemical Oxygen Demand (BOD_5) and Total Suspended Solids (TSS)

The draft permit includes average monthly and average weekly limits for BOD_5 and TSS and average monthly percent removal which are based on the secondary treatment requirements in 40 CFR 133.102(a); 40 CFR 133.102(b); and 40 CFR 122.45 (f). The draft permit includes average monthly and average weekly concentration limits of 30 mg/l and 45 mg/l respectively, and mass monthly average and weekly average limitations. The draft permit also includes maximum daily reporting requirements for both Outfalls 001 and 002 based on state water quality certification requirements. The calculations for the mass-based limits are shown below. The frequency of monitoring for BOD_5 and TSS are set at 1/week.

BOD_5 and TSS mass-based limit calculations (total for Outfalls 001 & 002):

Mass limit [lbs/day] = flow [mgd] x limit [mg/l] x 8.34 [conversion factor]
Flow = 3.8 mgd
Limit = 30 mg/l [average monthly] and 45 mg/l [average weekly]
Mass limits [Outfall 001 and 002] = 3.8 x 30 x 8.34 = 951 lb/day [average monthly]
Mass limits [Outfall 001 and 002] = 3.8 x 45 x 8.34 = 1426 lb/day [average weekly]

These limits shall be applied to the sum of the discharge from both outfalls 001 and 002.

The provisions of 40 CFR § 133.102(a)(3) and 133.103(b)(3) require that the 30 day average percent removal for BOD_5 and TSS be not less than 85%. These limits are maintained in the draft permit.

2. Dissolved Oxygen (DO)

A minimum concentration of DO is needed for fish and other aquatic life. As such and consistent with the requirements of the existing permit, the DO levels must not be less than 6.0 mg/l.

3. pH

The pH limits for Outfall 001 are 6.0-8.3 standard units (S.U.) with daily monitoring required. The minimum value of 6.0 S.U. was part of the 1995 permit and is a reflection of pH levels that occur in the treatment process due to nitrification in the aeration system. Due to the high dilution factor in the Connecticut River, EPA and MassDEP feel this is acceptable and will not cause any in-stream water quality violations of the in-stream state water quality standard for Class B waters [314 CMR 4.05(3)(b)], which is 6.5-8.3 S.U.

The pH limits for Outfall 002 are 6.5-8.3 S.U., in accordance with state water quality standards.

During the review period, of the 40 monitoring results there were 10 violations of the daily minimum limit and no violations of the maximum daily limit. In order to address this, the draft permit requires an option for the permittee to obtain an adjustment of its pH limits for Outfall 002 by conducting a pH adjustment demonstration project. The pH limits may be adjusted as long as the pH of the effluent remains between 6.0 – 9.0 SU and the pH of the receiving water remains between 6.5-8.3 S.U.

For discharges to freshwater receiving waters, a demonstration project must be conducted twice over the period of a year, once during the spring months (between March and April, when receiving water flows are high) and once during the summer months (between July and August, when receiving water flows are low). Detailed procedures for conducting a pH Adjustment Demonstration Project can be found in Attachment B of the draft permit.

4. *Escherichia coli* bacteria

The bacterial limits have been changed to conform to the Class B water quality criteria for bacteria found in the MA SWQS (314CMR 4.05(3)(b)4.). Massachusetts adopted these new criteria on December 29, 2006, which were approved by EPA on September 19, 2007. Accordingly, the monthly average and maximum daily E. coli limits are set at 126 cfu/100ml and 409 cfu/100ml (this is the 90% distribution of the geometric mean of 126 cfu/100 ml) respectively in the draft permit. These limits apply to both Outfall 001 and Outfall 002. Monitoring data collected by the permittee shows that the facility does not consistently achieve the proposed limits (see Attachment B1 and B2). Of the 28 months recording *E. coli* discharge results from Outfall 001, there have been 4 monthly average violations and 19 daily maximum violations. Of the 11 months recording *E. coli* discharge results from Outfall 002, there have been 8 monthly average violations and 9 daily maximum violations. The facility should ensure the disinfection system can adequately treat the effluent from both outfalls to eliminate any future *E. coli* violations.

These are seasonal limits that apply from April 1 through November 30, the months in which primary and secondary contact recreation are expected to occur. The limits are based on state certification requirements under section 401 (a) (1) of the CWA, as described in 40 CFR 124.53 and 124.55

F. Non-Conventional Pollutants

1. Total Residual Chlorine

Chlorine compounds produced by the chlorination of wastewater, as well as chlorine, can be extremely toxic to aquatic life. The instream chlorine water quality criteria for Massachusetts waters are defined in the National Recommended Water Quality Criteria: 2002, EPA822-R-02-047, as adopted by the MassDEP into the state water quality standards [314 CMR 4.05(5)(e)], The recommended criteria include a total residual chlorine (TRC) chronic criteria of 11 ug/l and an acute criteria of 19 ug/l. The following is the calculation of water quality-based TRC limits:

Total Residual Chlorine Limitations for **Outfall 001**:

Average monthly limit = {criteria}{dilution factor}

= (11 ug/l)(308) = 3388 ug/l = 3.39 mg/l

Maximum daily limit = (19 ug/l) (308) = 5852 ug/l = 5.85 mg/l

The draft permit has a more protective TRC limit of 1.0 mg/l based on the Massachusetts Water Quality Standards Implementation Policy For The Control Of Toxic Pollutants In Surface Waters, February 23, 1990. The Implementation Policy states that: "Waters shall be protected from unnecessary discharges of excess chlorine. In segments with dilution factors greater than 100, the maximum effluent concentration of chlorine shall not exceed 1.0 mg/l." The maximum daily TRC limit of 1.0 mg/l will be carried forward from the 2007 permit. The period of applicability will continue as in the current permit from April 1 through November 30.

Total Residual Chlorine Limitations for **Outfall 002**:

Average monthly limit = {criteria}{dilution factor}
= (11 ug/l)(98.5) = 1,084 ug/l = 1.08 mg/l

Maximum daily limit = (19 ug/l) (98.5) = 1,872 ug/l = 1.87 mg/l

The draft permit has a more protective TRC limit of 1.0 mg/l based on the Massachusetts Water Quality Standards Implementation Policy For The Control Of Toxic Pollutants In Surface Waters, February 23, 1990. The Implementation Policy states that: "Waters shall be protected from unnecessary discharges of excess chlorine. In segments with dilution factors greater than 100, the maximum effluent concentration of chlorine shall not exceed 1.0 mg/l." Although the dilution factor in this case is 98.5, the more protective maximum daily TRC limit of 1.0 mg/l will be applied. The period of applicability will be from April 1 through November 30.

The 2007 permit included a TRC limit of 0.05 mg/l (for Outfall 002) for both monthly average and daily maximum discharge. Since the less stringent limits calculated above will meet water quality standards, they will replace the limits from the 2007 permit. This is in accordance with antibacksliding regulations found at CWA Section 402(o) based upon the availability of new information regarding dilution in the Manhan River. Due to the periodic flow from Outfall 002 and the fact that the discharge occurs primarily during precipitation events when stream flow is higher than base flow, the chlorine limit is protective and should result in compliance with the water quality criteria for chlorine in the Manhan River.

The permittee is required to have an alarm system to warn of a chlorination system malfunction. This is a best management practice (BMP), and is being required under authority of 40 CFR § 122.44(k)(4). The permit requires the submission of the results to EPA of any additional testing done than that required in the permit, if it is conducted in accordance with EPA approved methods, consistent with the provisions of 40 CFR § 122.41(l)(4)(ii).

2. Nitrogen

It has been determined that excessive nitrogen loadings are causing significant water quality problems in Long Island Sound, including low dissolved oxygen. In December 2000, the Connecticut Department of Environmental Protection (CT DEP) completed a TMDL for addressing nitrogen-driven eutrophication impacts in Long Island Sound. The TMDL included a waste load allocation (WLA) for point sources and a load allocation (LA) for non-point sources. The point source WLA for out-of-basin sources (Massachusetts, New Hampshire and Vermont wastewater facilities discharging to the Connecticut, Housatonic and Thames River watersheds) requires an aggregate 25 percent reduction from the baseline total nitrogen loading estimated in the TMDL.

The baseline total nitrogen point source loadings estimated for the Connecticut, Housatonic, and Thames River watersheds were 21,672 lbs/day, 3,286 lbs/day, and 1,253 lbs/day respectively (see table below). The estimated current point source total nitrogen loadings for the Connecticut, Housatonic, and Thames Rivers respectively are 13,836 lbs/day, 2,151 lbs/day, and 1,015 lbs/day, based on recent information and including all POTWs in the watershed. The following table summarizes the estimated baseline loadings, TMDL target loadings, and estimated current loadings:

Basin	Baseline Loading* (lbs/day)	TMDL Target** (lbs/day)	Current Loading*** (lbs/day)
Connecticut River	21,672	16,254	13,836
Housatonic River	3,286	2,464	2,151
Thames River	1,253	939	1,015
Totals	26,211	19,657	17,002

* Estimated loading from TMDL (see Appendix 3 to CT DEP "Report on Nitrogen Loads to Long Island Sound", April 1998).
** Reduction of 25% from baseline loading.
*** Estimated current loading from 2004 – 2005 DMR data.

The TMDL target of a 25 percent aggregate reduction from baseline loadings is currently being met.

As shown in Attachment C, the estimated current loading for the Easthampton WWTP used in the above analysis was 493.7 lb/day, based upon a total nitrogen concentration of 19.6 mg/l (average of MA secondary treatment facilities) and the average flow of 3.02 mgd (19.6 mg/L * 3.02 mgd * 8.34). In order to get a more accurate assessment of the facilities nitrogen discharge, the 2007 permit required the facility to maintain the mass discharge loading of total nitrogen, based on the levels monitored over the first year of the permit term (2008). In 2008, the facility discharged an average of 284.6 lb/day. This baseline load is being carried forward in the draft permit.

A review of the DMRs from January 2008 through September 2012 indicate that the monthly average total nitrogen load (from Outfall 001 and 002 combined) varied from 85 lb/d to 574 lb/d with an average value of 275 lb/d (refer to Attachment B1 and B2). Note that data represents both maximum daily and average monthly values since nitrogen was measured only once per month. Since compliance with the baseline load is calculated on an annual basis, the annual average nitrogen loads were calculated as follows: 284.6 lb/d in 2008, 266.1 lb/d in 2009, 242.2 lb/d in 2010, 304.6 lb/d in 2011 and 281.1 lb/d in 2012 (Jan. through Sept. only). These loadings indicate that the facility has been under the baseline in all years except 2011 and will need to optimize nitrogen removal in order to comply with the nitrogen loading requirement in the draft permit.

In order to ensure that the aggregate nitrogen loading from out-of-basin point sources does not exceed the TMDL target of a 25 percent reduction over baseline loadings, EPA has included a condition in the draft permit requiring the permittee to evaluate alternative methods of operating its plant to optimize the removal of nitrogen, and to describe previous and ongoing optimization efforts. Specifically, Part I.F. of the draft permit requires an evaluation of alternative methods of operating the existing wastewater treatment facility in order to control total nitrogen levels, including, but not limited to, operational changes designed to enhance nitrification (seasonal and year round), incorporation of anoxic zones, septage receiving policies and procedures, and side stream management. This evaluation is required to be completed and submitted to EPA and MassDEP within one year of the effective date of the permit, along with a description of past and ongoing optimization efforts. The permit requires annual reports to be submitted that summarize progress and activities related to optimizing nitrogen removal efficiencies, document the annual nitrogen discharge load from the facility, and track trends relative to previous years.

The agencies intend to annually update the estimate of all out-of-basin total nitrogen loads and may incorporate total nitrogen limits in future permit modifications or reissuances as may be necessary to address increases in discharge loads, a revised TMDL, or other new information that may warrant the incorporation of numeric permit limits. There have been significant efforts by the New England Interstate Water Pollution Control Commission (NEIWPCC) work group and others since completion of the 2000 TMDL, which are anticipated to result in revised wasteload allocations for in-basin and out-of-basin facilities. Although not a permit requirement, it is strongly recommended that any facilities planning that might be conducted for this plant would consider alternatives for further enhancing nitrogen reduction.

3. Phosphorus

Excessive phosphorus in a water body can interfere with water uses by promoting excessive plant growth that can interfere with recreational activities and can also to reduce instream dissolved oxygen concentrations below levels necessary to support aquatic life.

MA SWQS include narrative nutrient criteria at 314 CMR 4.05(5)(c), requiring that "unless naturally occurring, all surface waters shall be free from nutrients in concentrations that would cause or contribute to impairment of existing or designated uses and shall not exceed the site specific criteria established in a TMDL or as otherwise established by the Department pursuant to 314 CMR 4.00. Any existing point source discharge containing nutrients in concentrations that would cause or contribute to cultural eutrophication, including the excessive growth of aquatic plant 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 practicable treatment for POTWs…"

EPA has published national guidance documents that contain recommended total phosphorus criteria and other indicators of eutrophication. EPA's Quality Criteria for Water 1986 (the Gold Book) recommends, to control eutrophication, that in-stream phosphorus concentrations should be less than 100 μg/l (0.100 mg/l) in streams or other flowing waters not discharging directly to lakes or impoundments.

More recently, EPA released Ecoregional Nutrient Criteria, established as part of an effort to reduce problems associated with excess nutrients in water bodies in specific areas of the country. The published ecoregion-specific criteria represent conditions in waters minimally impacted by human activities, and thus representative of water without cultural eutrophication. The Easthampton Wastewater Treatment Plant is within Ecoregion XIV, Eastern Coastal Plain, Northeastern Coastal Zone. Recommended criteria for this Ecoregion are found in Ambient Water Quality Criteria Recommendations, Information Supporting the Development of State and Tribal Nutrient Criteria, Rivers and Streams in Ecoregion XIV, published in December, 2001, and includes a total phosphorus criterion of 23.75 μg/l (0.024 mg/l).

EPA has employed the Gold Book-recommended concentration (0.1 mg/l) to interpret the state's narrative standards for nutrients. The Gold Book value is based on effects as opposed to the ecoregional criterion, which was developed on the basis of reference conditions. EPA opted for the effects-based approach because it is often more directly associated with an impairment to a designated use (i.e. fishing, swimming). The effects-based approach provides a threshold value above which adverse effects (i.e. water quality impairments) are likely to occur. It applies empirical observations of a causal variable (i.e. phosphorus) and a response variable (i.e. chlorophyll a) associated with designated use impairments. Reference-based values are statistically derived from a comparison within a population of rivers in the same ecoregion class. Specifically, reference conditions presented are based on the 25th percentile of *all* nutrient data, including a comparison of reference conditions for the aggregate ecoregion versus subecoregions. *See* Ecoregional Nutrient Criteria at vii. They are a quantitative set of river characteristics (physical, chemical, and biological) that represent minimally impacted conditions. Thus, while reference conditions, which reflect minimally disturbed conditions, may meet the requirements necessary to support designated uses, they may also *exceed* the water quality necessary to support such requirements.

EPA has performed a reasonable potential analysis to determine whether, at the current effluent phosphorus concentration, there is reasonable potential for the discharge to cause or contribute to an exceedance of water quality criteria. The analyses below describe whether there is reasonable potential for Outfall 001 and 002 discharging into the Connecticut River and Manahan River, respectively.

For **Outfall 001**, EPA has taken the upstream concentration of phosphorus into account in its analysis. The 2003 Connecticut River Watershed Water Quality Assessment (Appendix B) presented ambient phosphorus concentrations for samples taken during April 2003 through September 2003 at Station 04A, upstream of the Easthampton WWTP's Outfall 001 on the Connecticut River. Five samples were taken, with results varying from 0.008 mg/l to 0.029 mg/l with a median value of 0.016 mg/l. Because permit limits must protect receiving water during low flow conditions, 7Q10 flow of 1810 cfs, and the median background value of 0.016 mg/l were used in the equation below. The following data is also used in the calculations: the treatment plant maximum discharge total phosphorus concentration of 4.1 mg/l as reported in the DMRs (see Attachment B1), and the design flow of 3.8 mgd. EPA used this data to calculate an instream concentration downstream of the discharge. If the calculated concentration exceeds 100 ug/l (the EPA-recommended Gold Book concentration) there is reasonable potential for the discharge to exceed water quality standards and a phosphorus limit must be included in the permit.

Reasonable Potential Analysis for Outfall 001

$$C_r = \frac{Q_eC_e + Q_sC_s}{Q_r}$$

Q_e = effluent flow	= 3.8 mgd
C_e = effluent pollutant concentration	= 4.1 mg/l
Q_s = 7Q10 flow of receiving water	= 1,810 cfs = 1170 mgd
C_s = upstream concentration	= 0.016 mg/l
Q_r = receiving water flow = $Q_s + Q_e$	= (1170 + 3.8) mgd = 1173.8 mgd
C_r = receiving water concentration	compare to 100 µg/l (Gold Book)

$$C_r = \frac{(3.8 \text{ mgd} \times 4.1 \text{ mg/l}) + (1173.8 \text{ mgd} \times 0.016 \text{ mg/l})}{1173.8 \text{ mgd}}$$

$$C_r = 29\ \mu g/l < 100\ \mu g/l$$

Since the calculated instream concentration is less than the EPA-recommended Gold Book value, there is no reasonable potential to cause or contribute to an exceedance of water quality standards in the Connecticut River. The monthly average and maximum daily monitoring requirements for total phosphorus from Outfall 001 will be carried forward from the 2007 permit, as described in the draft permit.

For **Outfall 002**, EPA has taken the upstream concentration of phosphorus into account in its analysis. The 2003 Connecticut River Watershed Water Quality Assessment (Appendix B) presented ambient phosphorus concentrations for samples taken during April 2003 through October 2003 at Station 11A, upstream of the Easthampton WWTP's Outfall 002 on the Manhan River. Six samples were taken, with results varying from 0.018 mg/l to 0.061 mg/l with a median value of 0.033 mg/l. Because permit limits must protect receiving water during low flow conditions, expected low flow of 117 cfs (described in Section IV.C. above), and the median background value of 33 ug/l were used in the equation below. The maximum TP discharge concentration during the review period was 4.1 mg/l as reported in the DMRs (see Attachment B2). However, the discharge from Outfall 002 was reduced from around May of 2010 to present, as described in Section I.D. above and corresponding to effluent data in Attachment B2. Between May of 2010 and September of 2012, the maximum TP discharge concentration was 1.2 mg/l (based on the 5 reported values shown in Attachment B2). To better characterize the current discharge of TP, this more recent data is used in the calculation below. EPA believes that the recent decrease in phosphorus content is valid because the higher flows to the treatment plant (when Outfall 002 was in use more recently) are due to inflow and infiltration (I/I) which has little phosphorus content, resulting in a decrease in effluent concentration. The portion of the treatment plant design flow designated to Outfall 002 is 0.8 mgd (described in Section IV.C. above). EPA used this data to calculate an instream concentration downstream of the discharge. If the calculated concentration exceeds 100 ug/l (the EPA-recommended Gold book concentration) there is reasonable potential for the discharge to exceed water quality standards and a phosphorus limit must be included in the permit.

<u>Reasonable Potential Analysis for Outfall 002</u>

$$C_r = \frac{Q_e C_e + Q_s C_s}{Q_r}$$

Q_e = effluent flow	= 0.8 mgd
C_e = effluent pollutant concentration	= 1.2 mg/l
Q_s = 7Q10 flow of receiving water	= 117 cfs = 75.6 mgd
C_s = upstream concentration	= 0.033 mg/l
Q_r = receiving water flow = $Q_s + Q_e$	= (75.6 + 0.8) mgd = 76.4 mgd
C_r = receiving water concentration	compare to 100 µg/l (Gold Book)

$$C_r = \frac{(0.8 \text{ mgd x } 1.2 \text{ mg/l}) + (75.6 \text{ mgd x } 0.033 \text{ mg/l})}{76.4 \text{ mgd}}$$

$$C_r = 45\ \mu g/l < 100\ \mu g/l$$

Since the calculated instream concentration is less than the EPA-recommended Gold Book value, there is no reasonable potential to cause or contribute to an exceedance of water quality standards in the Manhan River. The monthly average and maximum daily monitoring requirements for total phosphorus from Outfall 002 will be carried forward from the 2007 permit, as described in the draft permit.

4. Metals

Certain metals in water can be toxic to aquatic life. There is a need to limit toxic metal concentrations in the effluent where aquatic life may be impacted. An evaluation of metals concentrations in the facility's effluent (from Whole Effluent Toxicity reports for tests performed on the discharges from outfalls 001 and 002 submitted between January 2008 and September 2012) was performed to determine reasonable potential for toxicity caused by aluminum, cadmium, copper, lead, nickel and zinc. The 2007 did not contain any metals limits.

Metals may be present in both dissolved and particulate forms in the water column. However, extensive studies suggest that it is the dissolved fraction that is biologically available, and therefore, presents the greatest risk of toxicity to aquatic life inhabiting the water column. This conclusion is widely accepted by the scientific community both within and outside of EPA (*Water Quality Standards Handbook: Second Edition*, Chapter 3.6 and Appendix J, EPA 1994 [EPA 823-B-94-005a]. Also see http://www.epa.gov/waterscience/standards/ handbook/chapter03.html#section6). As a result, water quality criteria are established in terms of dissolved metals.

However, many inorganic components of domestic wastewater, including metals, are in the particulate form, and differences in the chemical composition between the effluent and the receiving water affects the partitioning of metals between the particulate and dissolved fractions as the effluent mixes with the receiving water, often resulting in a transition from the particulate to dissolved form (*The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion* (USEPA 1996 [EPA-823-B96-007]). Consequently, quantifying only the dissolved fraction of metals in the effluent prior to discharge may not accurately reflect the biologically-available portion of metals in the receiving water. Regulations at 40 CFR 122.45(c) require, with limited exceptions, that metals limits in NPDES permits be expressed as total recoverable metals.

The analyses below describe whether there is reasonable potential for metals from Outfall 001 and 002 discharging into the Connecticut River and Manahan River, respectively, to cause or contribute to exceedances of water quality standards.

The effluent from **Outfall 001** (into Connecticut River, see Attachment B4) was characterized assuming a lognormal distribution in order to determine the estimated 95th percentile of the daily maximum. For metals with hardness-based water quality criteria, the criteria were determined using the equations in EPA's *National Recommended Water Quality Criteria: 2002*, using the appropriate factors for the individual metals (see table below). The downstream hardness was calculated to be 37.9 mg/l as $CaCO_3$, using a mass balance equation with the design flow (3 mgd), receiving water 7Q10, an upstream median hardness of 37.8 mg/l as $CaCO_3$ and an effluent median hardness of 98.9 mg/l as $CaCO_3$. The calculated value of 38 mg/l was used to determine the total recoverable metals criteria. The following table presents these acute and chronic total recoverable criteria, including the factors and equations used for each metal.

Metal	Parameters				Total Recoverable Criteria	
	m_a	b_a	m_c	b_c	Acute Criteria (CMC)* (ug/L)	Chronic Criteria (CCC)** (ug/L)
Aluminum	—	—	—	—	750	87
Cadmium	1.0166	-3.924	0.7409	-4.719	0.80	0.13
Copper	0.9422	-1.7000	0.8545	-1.702	5.61	4.07
Lead	1.273	-1.46	1.273	-4.705	23.74	0.92
Nickel	0.846	2.255	0.846	0.0584	206.47	22.96
Zinc	0.8473	0.884	0.8473	0.884	52.66	52.66

*Acute Criteria (CMC) = $\exp\{m_a*\ln(\text{hardness})+b_a\}$

**Chronic Criteria (CCC) = exp{m_c*ln(hardness)+b_c}

In order to determine whether the effluent has the reasonable potential to cause or contribute to an exceedence above the in-stream water quality criteria for each metal, the following mass balance is used to project in-stream metal concentrations downstream from the discharge.

$$Q_d C_d + Q_S C_S = Q_r C_r$$

rewritten as:

where:

> Q_d = effluent flow (design flow = 3.0 mgd = 4.64 cfs)
> C_d = effluent metals concentration in ug/L (95th percentile)
> Q_S = stream flow upstream (7Q10 upstream = 1810 cfs)
> C_S = background in-stream metals concentration in ug/L (median)
> Q_r = resultant in-stream flow, after discharge (Q_S + Q_d = 1814.64 cfs)
> C_r = resultant in-stream concentration in ug/L

Reasonable potential is then determined by comparing this resultant in-stream concentration (for both acute and chronic conditions) with the criteria for each metal. In EPA's Technical Support Document for Water Quality Based Toxics Control, EPA/505/2-90-001, March 1991, commonly known as the "TSD", box 3-2 describes the statistical approach in determining if there is reasonable potential for an excursion above the maximum allowable concentration (*i.e.*, the criterion). If there is reasonable potential (for either acute or chronic conditions), the appropriate limit is then calculated by rearranging the above mass balance to solve for the effluent concentration (C_d) using the criterion as the resultant in-stream concentration (C_r). See the table below for the results of this analysis with respect to aluminum, cadmium, copper, lead, nickel and zinc. Also, see Attachment D for a sample calculation of reasonable potential determination.

Metal	Qd	Cd[1] (95th Percentile)	Qs	Cs[2] (Median)	Qr = Qs + Qd	Cr = (QdCd+QsCs)/Q_R	Criteria		Reasonable Potential	Limit = (QrCr*0.9-QsCs)/Qd	
	cfs	ug/l	cfs	ug/l	cfs	ug/l	Acute (ug/l)	Chronic (ug/l)	Cr > Criteria	Acute (ug/l)	Chronic (ug/l)
Aluminum	4.6	191.6	1810	123.5	1814.6	123.7	750	87	Y	N/A	87[3]
Cadmium		0		0		0	0.80	0.13	N	N/A	N/A
Copper		27.4		3.5		3.6	5.61	4.07	N	N/A	N/A
Lead		17.8		0		0.05	23.74	0.93	N	N/A	N/A
Nickel		2.1		1		1.0	206.47	22.96	N	N/A	N/A
Zinc		57.8		4.5		4.6	52.66	52.66	N	N/A	N/A

[1] Values calculated using 10 toxicity measurements from the 2008-2012 Whole Effluent Toxicity (WET) testing (see Attachment D).
[2] Median upstream data taken from WET testing on the Connecticut River just upstream of the Easthampton WWTF outfall (see Att. B)
[3] The chronic limit for Al is set at the chronic criterion since the upstream median concentration exceeds the criterion

As indicated in the table above, there is no reasonable potential (for either acute or chronic conditions) that the discharge of cadmium, copper, lead, nickel or zinc will cause or contribute to an exceedance of applicable water quality criteria. However, there is reasonable potential that the discharge of aluminum would cause of contribute to an exceedence of the chronic criterion. Since the upstream median concentration is above the criterion (87 ug/l), the draft permit includes a total recoverable aluminum limit of 87 ug/l for Outfall 001. Monitoring for the other metals will continue to be required as part of the WET tests.

The effluent from **Outfall 002** (into Manhan River, see Attachment B4) was characterized assuming a lognormal distribution in order to determine the estimated 95th percentile of the daily maximum. For metals with hardness-based water quality criteria, the criteria were determined using the equations in EPA's *National Recommended Water Quality Criteria: 2002*, using the appropriate factors for the individual metals (see table below). The downstream hardness was calculated to be 23.9 mg/l as $CaCO_3$, using a mass balance equation with the design flow (0.8 mgd), receiving water low flow of 117 cfs, an upstream median hardness of 23.4 mg/l as $CaCO_3$ and an effluent median hardness of 79.9 mg/l as $CaCO_3$. The calculated value of 23.9 mg/l was used to determine the total recoverable metals criteria. The following table presents these acute and chronic total recoverable criteria, including the factors and equations used for each metal.

Metal	Parameters				Total Recoverable Criteria	
	m_a	b_a	m_c	b_c	Acute Criteria (CMC)* (ug/L)	Chronic Criteria (CCC)** (ug/L)
Aluminum	—	—	—	—	750	87
Cadmium	1.0166	-3.924	0.7409	-4.719	0.50	0.09
Copper	0.9422	-1.7000	0.8545	-1.702	3.63	2.75
Lead	1.273	-1.46	1.273	-4.705	13.20	0.51
Nickel	0.846	2.255	0.846	0.0584	139.78	15.54
Zinc	0.8473	0.884	0.8473	0.884	35.63	35.63

*Acute Criteria (CMC) = exp{m_a*ln(hardness)+b_a}
**Chronic Criteria (CCC) = exp{m_c*ln(hardness)+b_c}

In order to determine whether the effluent has the reasonable potential to cause or contribute to an exceedence above the in-stream water quality criteria for each metal, the following mass balance is used to project in-stream metal concentrations downstream from the discharge.

$$Q_d C_d + Q_S C_S = Q_r C_r$$

rewritten as:

where:

Q_d = effluent flow (design flow = 0.8 mgd = 1.24 cfs)
C_d = effluent metals concentration in ug/L (95th percentile)
Q_S = stream flow upstream (low flow upstream = 117 cfs)

C_S = background in-stream metals concentration in ug/L (median)
Q_r = resultant in-stream flow, after discharge (Q_S + Q_d = 118.24 cfs)
C_r = resultant in-stream concentration in ug/L

Reasonable potential is then determined by comparing this resultant in-stream concentration (for both acute and chronic conditions) with the criteria for each metal. In EPA's Technical Support Document for Water Quality Based Toxics Control, EPA/505/2-90-001, March 1991, commonly known as the "TSD", box 3-2 describes the statistical approach in determining if there is reasonable potential for an excursion above the maximum allowable concentration (*i.e.*, the criterion). If there is reasonable potential (for either acute or chronic conditions), the appropriate limit is then calculated by rearranging the above mass balance to solve for the effluent concentration (C_d) using the criterion as the resultant in-stream concentration (C_r). See the table below for the results of this analysis with respect to aluminum, cadmium, copper, lead, nickel and zinc. Also, see Attachment E for a sample calculation of reasonable potential determination.

Metal	Qd	Cd[1] (95th Percentile)	Qs	Cs[2] (Median)	Qr = Qs + Qd	Cr = (QdCd+QsCs)/Q_R	Criteria		Reasonable Potential	Limit = (QrCr*0.9-QsCs)/Qd	
	cfs	ug/l	cfs	ug/l	cfs	ug/l	Acute (ug/l)	Chronic (ug/l)	Cr > Criteria	Acute (ug/l)	Chronic (ug/l)
Aluminum	1.2	140.7	117	467	118.2	463.6	750	87	Y	N/A	87[3]
Cadmium		0		0		0	0.50	0.09	N	N/A	N/A
Copper		21		2.5		2.69	3.63	2.75	N	N/A	N/A
Lead		8.4		0		0.1	13.20	0.51	N	N/A	N/A
Nickel		6.3		1.2		1.3	139.78	15.54	N	N/A	N/A
Zinc		48.3		8.5		8.9	35.63	35.63	N	N/A	N/A

[1] Values calculated using 6 toxicity measurements from the 2008-2012 Whole Effluent Toxicity (WET) testing (see Attachment E).
[2] Median upstream data taken from WET testing on the Manhan River just upstream of the Easthampton WWTF outfall (see Att. B)
[3] The chronic limit for Al is set at the chronic criterion since the upstream median concentration exceeds the criterion

As indicated in the table above, there is no reasonable potential (for either acute or chronic conditions) that the discharge of cadmium, copper, lead, nickel or zinc will cause or contribute to an exceedance of applicable water quality criteria. However, there is reasonable potential that the discharge of aluminum would cause or contribute to an exceedence of the applicable chronic water quality criterion. Hence, the draft permit contains a total recoverable aluminum limit of 87 ug/l (monthly average). Monitoring for the other metals will continue to be required as part of the annual WET tests.

G. Whole Effluent Toxicity

National studies conducted by the Environmental Protection Agency have demonstrated that domestic sources contribute toxic constituents to POTWs. These constituents include metals, chlorinated solvents and aromatic hydrocarbons, among others.

Based on the potential for toxicity resulting from domestic and industrial contributions, 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's Technical Support Document for Water Quality-Based Toxics Control). EPA Region I has developed a toxicity control policy which requires wastewater treatment facilities to perform toxicity bioassays on their effluents. 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.

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.

In order to evaluate the potential toxicity of the effluent and in conformance with EPA and MassDEP policy, both Outfall 001 and Outfall 002 require acute (LC50) toxicity testing. The LC50 testing for Outfall 001 will be required twice per year, in June and September with a limit of ≥50%, in accordance with the MassDEP toxicity policy for dischargers with dilution factors greater than 100. The LC50 testing for Outfall 002 is required twice per year, in March and December, with a limit of 100% based upon a dilution factor of 98.5. Chronic toxicity testing for Outfall 002, as required in the 2007 permit, is no longer required due to the increased dilution factor. All toxicity testing shall be done using a single species, the daphnid (*Ceriodaphnia dubia*).

Results from tests during the 2008-2012 review period are shown in Attachment B1 and B2. All toxicity results for both outfalls were in compliance with 2007 limits. Given this record of compliance, the monitoring frequencies have been carried forward in the draft permit.

V. Sludge

Section 405(d) of the CWA requires that EPA develop technical standards regulating the use and disposal of sewage sludge. These regulations were signed on November 25, 1992, published in the Federal Register on February 19, 1993, and became effective on March 22, 1993. Domestic sludge that is land applied, disposed of in a surface disposal unit, or fired in a sewage sludge incinerator is subject to Part 503 technical standards and to State Env-Wq 800 standards. Part 503 regulations have a self-implementing provision, however, the CWA requires implementation through permits. Domestic sludge which is disposed of in municipal solid waste landfills are in compliance with Part 503 regulations provided the sludge meets the quality criteria of the landfill and the landfill meets the requirements of 40 CFR Part 258.

The draft permit has been conditioned to ensure that sewage sludge use and disposal practices meet the CWA Section 405(d) Technical Standards. In addition, EPA-New England has prepared a 72-page document entitled "EPA Region I NPDES Permit Sludge Compliance Guidance" for use by the permittee in determining their appropriate sludge conditions for their chosen method of sewage sludge use or disposal practices. This guidance document is available upon request from EPA Region 1 and may be found at: http://www.epa.gov/region1/npdes/permits/generic/sludgeguidance.pdf. The permittee is required to submit an annual report to EPA Region 1 and MassDEP, by February 19th each year, containing the information specified in the Sludge Compliance Guidance document for their chosen method of sewage sludge use or disposal practices.

VI. Pretreatment

The facility accepts industrial wastewater from one categorical industrial user (CIU) and two significant industrial users (SIUs) including:

- Chemetal {CIU} [flow = 250 gpd]
- Nonwovens, Mechanic Street {SIU} [flow = 40,000 gpd]
- City of Easthampton Landfill {SIU} [flow = 5,940 gpd]

Chemetal is involved in metal working to produce interior metal sheets and laminates and discharges 250 gpd of wastewater intermittently. They are subject to local limits and categorical pretreatment standards found at 40 CFR 433.15. *National Nonwovens* is involved in manufacturing and dying non-woven textiles and discharges 40,000 gpd of wastewater intermittently. They are subject to local limits under the pretreatment standards. *The City of Easthampton Landfill* is a solid waste landfill and discharges 5,940 gpd of leachate intermittently. They are subject to local limits under the pretreatment standards.

The permittee is required to administer a pretreatment program based on the authority granted under 40 CFR §122.44(j), 40 CFR Part 403 and Section 307 of the Act. The permittee's pretreatment program received EPA approval on September 24, 1984 and, as a result, appropriate pretreatment program requirements were incorporated into the 2007 permit which were consistent with that approval and federal pretreatment regulations in effect when the permit was issued.

The Federal Pretreatment Regulations in 40 CFR Part 403 require the permittee to: (1) develop and enforce EPA approved specific effluent limits (technically-based local limits); (2) revise the local sewer-use ordinance or regulation, as appropriate, to be consistent with Federal Regulations; (3) develop an enforcement response plan; (4) implement a slug control evaluation program; (5) track significant noncompliance for industrial users; and (6) establish a definition of and track significant industrial users.

These requirements are necessary to ensure continued compliance with the POTW's NPDES permit and its sludge use or disposal practices. In addition to the requirements described above, the draft permit requires the permittee to submit to EPA in writing, within 180 days of the permit's effective date, a description of proposed changes, if applicable, to the permittee's pretreatment program deemed necessary to assure conformity with current federal pretreatment regulations. These requirements are included in the draft permit to ensure that the pretreatment program is consistent and up-to-date with all pretreatment requirements in effect. The permittee must also continue to submit, by March 1st each year, an annual pretreatment report detailing the activities of the program for the previous year.

VII. Anti-degradation

This draft permit is being reissued with an allowable waste-load identical to the current permit and there has been no change in outfall location. The State of Massachusetts has indicated that there will be no lowering of water quality and no loss of existing water uses and that no additional anti-degradation review is warranted.

VIII. Essential Fish Habitat

Under the 1996 Amendments (PL 104-267) to the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 et seq. (1998)), EPA is required to consult with the National Fisheries Services (NOAA Fisheries) if EPA's action or proposed action that it funds, permits, or undertakes, may adversely impact any essential fish habitat (EFH). The Amendments broadly define "essential fish habitat" as: waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 U.S.C. § 1802 (10)). "Adversely impact" means any impact which reduces the quality and/or quantity of EFH (50 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.

Essential fish habitat is only designated for species for which federal fisheries management plans exist (16 U.S.C. § 1855(b)(1)(A)). EFH designations for New England were approved by the U.S. Department of Commerce on March 3, 1999.

The Atlantic salmon (*Salmo salar)* is the only managed species with designated EFH in the Connecticut River, which is classified in the MA SWQS at 314 CMR 4.00 as a Class B - warm water fishery. Class B waters are designated as a habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth and other crucial functions, and for primary and secondary contact recreation.

Atlantic salmon are expected to be present during one or more lifestages within the area which encompasses the discharge site. Although the last remnant stock of Atlantic salmon indigenous to the Connecticut River was believed to have been extirpated over 200 years ago, an active effort has been underway throughout the Connecticut River system since 1967 to restore this historic run (HG&E/MMWEC, 1997). Atlantic salmon may pass in the vicinity of the discharge either on the migration of juveniles downstream to Long Island Sound or on the return of adults to upstream areas. The area of the discharge on the Connecticut River mainstem, approximately 31 miles downstream from the Turners Falls Dam and approximately 6.5 miles upstream from the Holyoke Dam, is not judged to be suitable for spawning, which is likely to occur in tributaries where the appropriate gravel or cobble riffle substrate can be found.

EPA has determined that the limits and conditions contained in this draft permit minimize adverse effects to Atlantic Salmon EFH for the following reasons:

- This is a reissuance of an existing permit;
- The Connecticut River dilution factor (308) is high;
- The Connecticut River is approximately 500 feet wide in the vicinity of the Easthampton discharge, providing a large zone of passage for migrating Atlantic salmon that is unaffected by the discharge;
- Acute toxicity tests will be conducted twice per year on the daphnid (*Ceriodaphnia dubia*);
- The draft permit prohibits violations of the state water quality standards;
- Limits specifically protective of aquatic organisms have been established for total residual chlorine and total recoverable aluminum based on state water quality criteria;
- The facility withdraws no water from the Connecticut River, so no life stages of Atlantic salmon are vulnerable to impingement or entrainment from this facility;
- The effluent limitations and conditions in the draft permit were developed to be protective of all aquatic life.

EPA believes that the conditions and limitations contained within the draft permit adequately protects all aquatic life, including those with designated EFH in the receiving water, and that further mitigation is not warranted. NMFS will be notified and an EFH consultation will be reinitiated 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 conclusions.

As the federal agency charged with authorizing the discharge from this facility, EPA has submitted the draft permit and fact sheet, along with a cover letter, to NMFS Habitat Division for their review.

IX. Endangered Species

Section 7(a) of the Endangered Species Act of 1973, as amended (ESA) 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.

EPA has reviewed the federal endangered or threatened species of fish, wildlife, or plants to determine if any listed species might potentially be impacted by the re-issuance of this NPDES permit. The two listed species that have the potential to be present in the vicinity of the Easthampton WWTF discharge are the shortnose sturgeon (*Acipenser brevirostrum*) and the Atlantic sturgeon (*Acipenser oxyrinchus*).

Based on the expected distribution of the species, EPA has determined that there are no Atlantic sturgeon in the action area and that the reissuance of the permit will have no effect on the species. Therefore, consultation under Section 7 of the ESA with NMFS for Atlantic sturgeon is not required.

Based on the analysis of potential impacts to shortnose sturgeon presented in Attachment E to this fact sheet, EPA has made the preliminary determined that impacts to shortnose sturgeon from the discharge at the Easthampton WWTF, if any, will be insignificant or discountable and not likely to adversely affect shortnose sturgeon. EPA has judged that a formal consultation pursuant to Section 7 of the ESA is not required. EPA is seeking concurrence from NMFS regarding this determination through the information in this fact sheet and the draft permit, as well as a letter under separate cover.

Attachment E provides the complete discussion of EPA's Endangered Species Act assessment as it relates to the renewal of the Easthampton WWTF's NPDES permit.

X. 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). I/I in a collection system can pose a significant environmental problem because it may displace wastewater flow and thereby cause, or contribute to causing, SSOs. Moreover, I/I could reduce the capacity and efficiency of the treatment plant and cause bypasses of secondary treatment. Therefore, reducing I/I will help to minimize any SSOs and maximize the flow receiving proper treatment at the treatment plant. There is presently estimated to be approximately 1.1 mgd of I/I in the sewer system. In its September 6, 2001 Infiltration and Inflow Policy, MassDEP specified that certain conditions related to I/I control be established in NPDES municipal permits

Therefore, specific permit conditions have been included in Parts 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. The City has an I/I plan last updated in 2008 including flow monitoring, TV inspection, a prioritized removal plan, a private inflow source removal program, and a public education program.

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 includes new provisions related to Discharge Monitoring Report (DMR) submittals to EPA and the State. The draft permit requires that, no later than one year after the effective date of the permit, the permittee submit all monitoring data and other reports required by the permit to EPA using NetDMR, unless the permittee is able to demonstrate a reasonable basis, such as technical or administrative infeasibility, that precludes the use of NetDMR for submitting DMRs and reports ("opt-out request").

In the interim (until one year from the effective date of the permit), the permittee may either submit monitoring data and other reports to EPA in hard copy form, or report electronically using NetDMR.

NetDMR is a national web-based tool for regulated Clean Water Act permittees to submit discharge monitoring reports (DMRs) electronically via a secure Internet application to U.S. EPA through the Environmental Information Exchange Network. NetDMR allows participants to discontinue mailing in hard copy forms under 40 CFR § 122.41 and § 403.12. NetDMR is accessed from the following url: http://www.epa.gov/netdmr. Further information about NetDMR, including contacts for EPA Region 1, is provided on this website.

EPA currently conducts free training on the use of NetDMR, and anticipates that the availability of this training will continue to assist permittees with the transition to use of NetDMR. To participate in upcoming trainings, visit http://www.epa.gov/netdmr for contact information for New Hampshire.

The draft permit requires the permittee to report monitoring results obtained during each calendar month using NetDMR, no later than the 15th day of the month following the completed reporting period. All reports required under the permit shall be submitted to EPA as an electronic attachment to the DMR. Once a permittee begins submitting reports using NetDMR, it will no longer be required to submit hard copies of DMRs or other reports to EPA or to NHDES.

The draft permit also includes an "opt-out" request process. Permittees who believe they cannot use NetDMR due to technical or administrative infeasibilities, or other logical reasons, must demonstrate the reasonable basis that precludes the use of NetDMR. These permittees must submit the justification, in writing, to EPA at least sixty (60) days prior to the date the facility would otherwise be required to begin using NetDMR. Opt-outs become effective upon the date of written approval by EPA and are valid for twelve (12) months from the date of EPA approval. The opt-outs expire at the end of this twelve (12) month period. Upon expiration, the permittee must submit DMRs and reports to EPA using NetDMR, unless the permittee submits a renewed opt-out request sixty (60) days prior to expiration of its opt-out, and such a request is approved by EPA.

Until electronic reporting using NetDMR begins, or for those permittees that receive written approval from EPA to continue to submit hard copies of DMRs, the Draft Permit requires that submittal of DMRs and other reports required by the permit continue in hard copy format. Hard copies of DMRs must be postmarked no later than the 15th day of the month following the completed reporting period.

XII. State Certification Requirements

EPA may not issue a permit unless MassDEP with jurisdiction over the receiving waters certifies that the effluent limitations contained in the permit are stringent enough to assure that the discharge will not cause the receiving water to violate MA SWQS. The staff of MassDEP have reviewed the draft permit. EPA has requested permit certification by the state pursuant to 40 CFR 124.53 and expects that the draft permit will be certified.

XIII. Public Comment Period, Public Hearing, and Procedures for Final Decision

All persons, including applicants, who believe any condition of the draft permit is inappropriate must raise all issues and submit all available arguments and a supporting material for their arguments in full by the close of the public comment period, to Michael Cobb, U.S. EPA, MA Office of Ecosystem Protection, 5 Post Office Square, Suite 100, Boston, Massachusetts 02109-3912. Any person, prior to such date, may submit a request in writing to EPA and MassDEP for a public hearing to consider the draft permit. Such requests shall state the nature of the issues proposed to be raised in the hearing. A public hearing may be held after at least thirty days public notice whenever the Regional Administrator finds that response to this notice indicates significant public interest. In reaching a final decision on the draft permit, the Regional Administrator will respond to all significant comments and make these responses available to the public at EPA's Boston Office. Following the close of the comment period, and after a public hearing, if such hearing is held, the Regional Administrator will issue a final permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice.

XIV. EPA Contact

Additional information concerning the draft permit may be obtained between the hours of 9:00 a.m. and 5:00 p.m., Monday through Friday, excluding holidays from:

Michael Cobb
Municipal Permits Branch
U.S. Environmental Protection Agency
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April 2013
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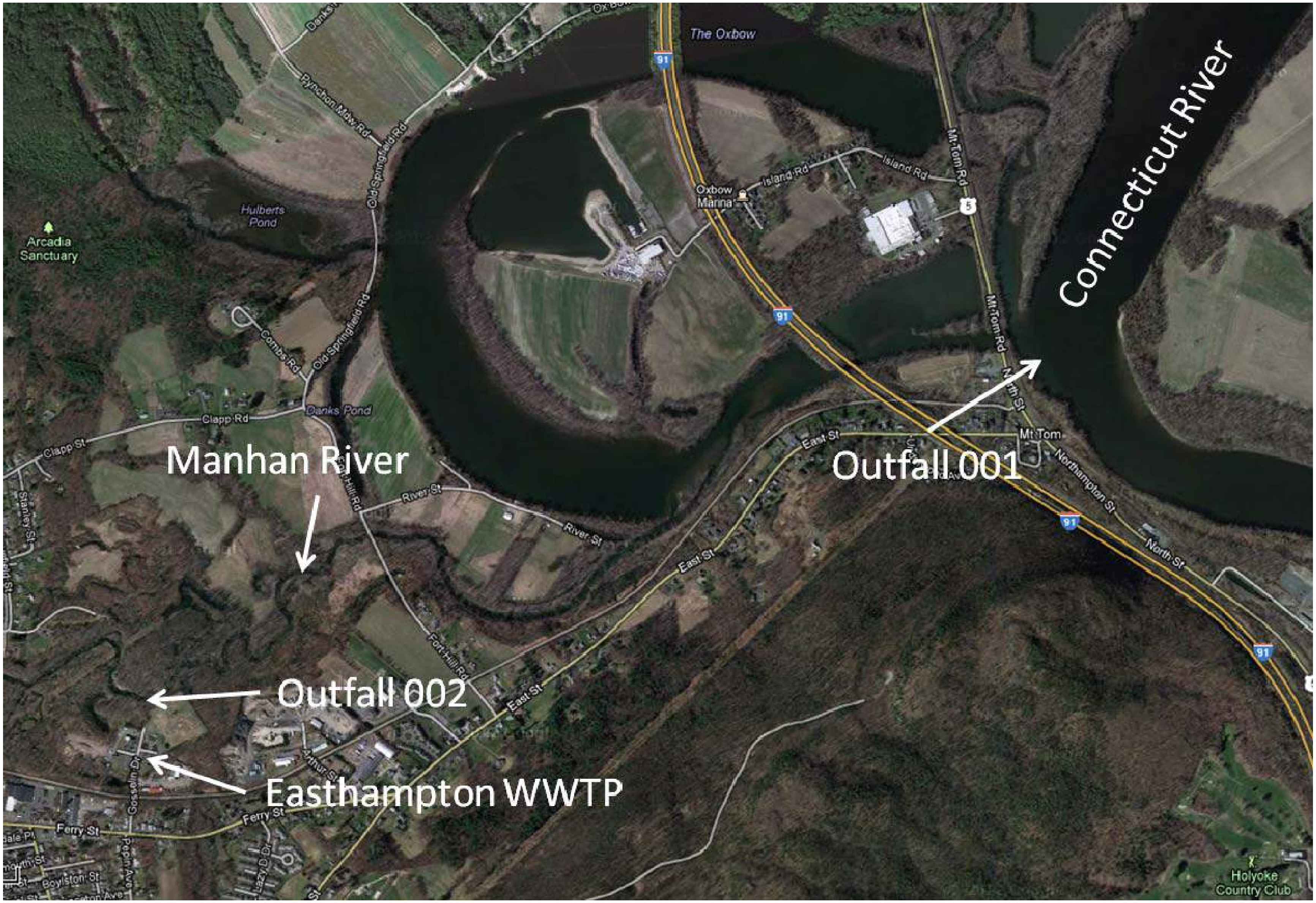
Date

Ken Moraff, Acting Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency
Boston, MA

Attachment A – Aerial View of Facility, Receiving Waters and Outfall Locations



(Aerial view obtained from maps.google.com)

Attachment B – Discharge Monitoring Report Summary

PART B1 – OUTFALL 001

Monitoring Period End Date	BOD5				TSS				Flow		TRC		pH	
	MO AVG	WKLY AVG	DAILY MX	MO AV MN	MO AVG	WKLY AVG	DAILY MX	MO AV MN	MO AVG	DAILY MX	MO AVG	DAILY MX	MIN	MAX
	30 mg/L	45 mg/L	Req. Mon. mg/L	85 %	30 mg/L	45 mg/L	Req. Mon. mg/L	85 %	Req. Mon. MGD	Req. Mon. MGD	1 mg/L	1 mg/L	6 SU	8.3 SU
01/31/2008	14.8	30.1	44.	90.7	13.8	27.2	92.	92.4	1.4	1.9	--	--	6.7	7.
02/29/2008	10.1	15.3	15.3	87.2	8.	9.5	16.6	92.3	3.1	5.2	--	--	6.4	6.9
03/31/2008	20.2	42.1	70.5	68.8	13.7	22.2	46.	79.	3.7	5.4	--	--	6.5	6.9
04/30/2008	13.7	20.	21.5	85.3	9.5	24.9	27.5	91.8	2.6	3.6	0.81	1.	6.6	6.9
05/31/2008	13.7	21.3	33.3	90.5	8.8	13.2	30.5	94.5	1.6	2.4	0.79	0.98	6.7	7.1
06/30/2008	24.5	45.4	58.	86.2	13.6	25.8	47.	94.2	1.2	1.5	0.69	1.	6.8	7.5
07/31/2008	23.5	41.9	42.8	86.9	17.3	26.1	41.	91.3	1.2	1.5	0.45	1.	6.5	7.2
08/31/2008	21.9	31.2	36.6	81.1	11.8	13.9	22.5	91.8	1.6	2.8	0.34	0.98	6.5	7.
09/30/2008	13.4	21.	22.8	89.6	6.5	11.3	16.5	95.8	1.7	3.1	0.43	1.	6.4	6.9
10/31/2008	21.7	36.3	50.4	85.1	13.	19.6	30.	92.1	1.3	1.8	0.37	0.93	6.5	7.7
11/30/2008	17.1	22.4	26.1	89.2	8.7	11.5	14.5	94.6	1.4	1.8	0.38	0.58	6.4	6.9
12/31/2008	16.9	13.6	30.6	85.3	10.6	18.8	39.	89.8	2.4	4.1	--	--	6.5	6.9
01/31/2009	23.6	38.6	51.	84.5	13.5	26.8	64.	90.	1.7	2.6	--	--	6.6	7.8
02/28/2009	13.1	15.	16.6	92.5	6.1	8.7	11.5	96.4	1.4	1.9	--	--	6.9	7.1
03/31/2009	9.	12.3	19.	92.5	7.	7.6	12.6	94.4	2.2	3.	--	--	6.7	7.
04/30/2009	10.5	13.5	13.6	92.3	7.4	8.4	11.	94.8	1.8	2.2	0.68	0.82	6.7	7.
05/31/2009	22.6	34.6	40.8	84.2	14.7	22.	27.	91.3	1.5	2.1	0.47	1.	6.7	7.
06/30/2009	14.4	18.2	19.5	90.3	5.5	6.6	7.6	96.8	1.6	2.4	0.56	1.	6.6	7.1
07/31/2009	11.9	15.5	18.2	91.7	6.5	7.7	19.	96.5	1.6	2.6	0.47	0.89	6.6	7.
08/31/2009	11.4	13.1	17.1	92.4	4.9	6.	8.	97.1	1.5	2.4	0.29	0.93	6.4	7.
09/30/2009	9.4	10.1	12.1	93.5	5.9	6.1	7.	96.4	1.1	1.4	0.5	0.82	6.5	6.9
10/31/2009	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11/30/2009	--	--	--	--	--	--	--	--	--	--	--	--	--	--
12/31/2009	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01/31/2010	16.4	23.4	25.6	89.6	6.2	7.1	13.5	96.2	2.	3.2	--	--	6.5	6.9
02/28/2010	18.8	23.3	24.1	90.1	11.6	15.9	27.	93.5	1.6	3.6	--	--	6.5	7.2
03/31/2010	13.3	15.7	27.	86.3	9.6	11.4	28.	91.7	2.9	5.5	--	--	6.3	6.9
04/30/2010	9.9	11.4	14.5	91.7	6.2	8.	27.	95.8	2.6	4.8	0.3	0.86	6.4	6.9

Monitoring Period End Date	BOD5				TSS				Flow		TRC		pH	
	MO AVG	WKLY AVG	DAILY MX	MO AV MN	MO AVG	WKLY AVG	DAILY MX	MO AV MN	MO AVG	DAILY MX	MO AVG	DAILY MX	MIN	MAX
	30 mg/L	45 mg/L	Req. Mon. mg/L	85 %	30 mg/L	45 mg/L	Req. Mon. mg/L	85 %	Req. Mon. MGD	Req. Mon. MGD	1 mg/L	1 mg/L	6 SU	8.3 SU
05/31/2010	12.5	14.7	20.1	92.6	9.	14.3	31.	95.9	1.4	1.6	0.46	1.	6.8	7.
06/30/2010	29.7	34.8	58.	86.2	19.2	34.	95.	92.7	1.2	1.4	0.52	0.94	6.5	7.1
07/31/2010	16.6	21.1	25.	93.9	9.6	12.	17.	97.	0.96	1.19	0.41	1.	6.4	6.9
08/31/2010	14.1	20.6	24.3	94.3	7.2	16.3	24.	97.3	0.88	1.1	0.61	0.95	6.7	7.
09/30/2010	12.	14.7	17.4	94.9	3.6	3.7	5.6	98.5	0.83	1.2	0.56	1.	6.4	7.1
10/31/2010	16.	23.6	33.6	91.	9.7	15.8	28.	95.3	1.29	2.2	0.68	1.	6.2	6.9
11/30/2010	22.	29.	30.8	86.6	13.5	16.4	20.	92.6	1.4	1.8	0.67	1.	6.2	6.9
12/31/2010	20.9	32.5	40.5	85.	18.	19.	66.	86.	1.88	3.5	--	--	6.4	7.1
01/31/2011	3.	**76.5**	110.	**84.**	19.6	**46.7**	100.	90.	1.3	1.8	--	--	6.8	7.1
02/28/2011	15.6	25.8	28.3	92.3	8.7	19.3	22.	95.5	1.25	1.99	--	--	6.9	7.1
03/31/2011	8.	11.4	16.7	90.1	9.4	16.2	30.5	91.4	3.8	5.7	--	--	6.	7.1
04/30/2011	21.4	34.5	51.	**75.1**	10.2	13.5	30.5	91.3	2.8	4.2	0.43	0.77	6.5	7.1
05/31/2011	9.1	12.	13.8	91.1	5.5	6.5	10.	95.7	2.4	4.	0.44	0.86	6.7	7.2
06/30/2011	16.9	28.7	41.	88.8	9.6	14.5	23.	94.9	1.7	2.1	0.4	0.84	6.2	6.9
07/31/2011	7.9	8.9	11.6	95.3	5.3	6.5	9.2	97.4	1.24	1.6	0.62	**1.8**	6.2	7.
08/31/2011	16.6	34.5	40.7	90.3	15.7	31.4	46.	91.9	1.43	4.6	0.41	0.97	6.3	6.8
09/30/2011	9.9	23.1	23.1	87.8	7.9	12.8	17.5	94.1	2.6	5.	0.41	0.91	6.3	6.8
10/31/2011	8.3	10.4	14.2	92.7	6.4	7.6	12.	94.4	3.	5.1	0.51	1.	6.2	6.8
11/30/2011	6.9	8.1	10.3	94.6	4.8	6.5	8.8	96.5	2.3	2.9	0.63	0.93	6.1	7.
12/31/2011	10.9	15.5	19.8	92.2	6.1	8.2	12.2	95.3	2.6	4.5	--	--	6.	6.9
01/31/2012	12.7	14.9	19.2	91.8	8.9	10.9	14.	93.9	1.92	2.44	--	--	6.3	7.3
02/29/2012	19.6	19.3	42.	88.9	14.8	12.9	53.	90.9	2.11	1.56	--	--	6.7	7.3
03/31/2012	15.8	37.	27.3	91.4	11.4	32.6	27.	94.1	1.64	2.08	--	--	6.8	7.3
04/30/2012	23.6	42.8	43.2	87.9	9.3	15.4	23.	95.4	1.32	1.83	0.65	1.	6.9	7.4
05/31/2012	**45.2**	**83.4**	98.6	**77.6**	19.3	38.7	64.	91.2	1.34	1.55	0.47	**1.54**	6.4	7.3
06/30/2012	**32.1**	**53.1**	62.4	**78.8**	16.4	23.9	33.	91.3	1.4	2.03	0.43	1.	6.4	7.1
07/31/2012	11.6	16.5	17.8	95.2	9.7	8.1	53.5	96.2	0.96	1.44	0.53	1.	6.2	7.
08/31/2012	9.3	12.6	15.	95.9	4.7	6.2	10.4	98.1	1.01	1.87	0.36	0.58	6.	6.7
09/30/2012	24.7	**50.1**	70.2	87.7	13.2	20.5	40.	94.5	1.08	1.42	0.25	0.46	6.3	6.9
Minimum	3.	8.1	10.3	68.8	3.6	3.7	5.6	79.	0.83	1.1	0.25	0.46	6.	6.7
Maximum	45.2	83.4	110.	95.9	19.6	46.7	100.	98.5	3.8	5.7	0.81	1.8	6.9	7.8
Average	16.09	25.84	32.91	88.73	10.13	15.86	29.86	93.70	1.77	2.71	.50	.95	6.48	7.05

Monitoring Period End Date	Fecal Coliform		E. coli		E. coli, thermotol, MF, MTEC		Nitrite + Nitrate	Ammonia	TKN	TN		TP		LC50 Acute Ceriodaphnia
	MO GEO	DAILY MX	MOAV GEO	DAILY MX	MOAV GEO	DAILY MX	DAILY MX	DAILY MX	DAILY MX	DAILY MX	DAILY MX	MO AVG	DAILY MX	DAILY MN
	200 CFU/100mL	400 CFU/100mL	126 CFU/100mL	409 CFU/100mL	126 CFU/100mL	409 CFU/100mL	Req. Mon. mg/L	Req. Mon. mg/L	Req. Mon. mg/L	Req. Mon. lb/d	Req. Mon. mg/L	Req. Mon. mg/L	Req. Mon. mg/L	50 %
01/31/2008	--	--	--	--	--	--	1.1	18.	24.	291.9	25.	3.4	3.4	--
02/29/2008	--	--	--	--	--	--	1.75	10.	10.	78.3	12.	1.1	1.1	--
03/31/2008	--	--	--	--	--	--	1.9	5.4	6.5	286.9	8.	0.93	0.93	--
04/30/2008	2.7	47.	33.9	75.9	14.6	**2420.**	0.81	11.	9.	220.7	9.8	1.1	1.1	--
05/31/2008	1.49	6.	118.	**2419.6**	4.7	129.6	0.4	18.	17.	241.	17.	1.2	1.2	--
06/30/2008	12.2	152.	21.	**2419.6**	**178.5**	**2419.6**	2.3	12.	13.	160.1	16.	2.4	2.4	100.
07/31/2008	66.8	200.	23.4	330.	45.1	275.5	2.5	14.	17.	174.3	19.	3.2	3.2	--
08/31/2008	40.2	172.	88.	**1986.3**	**303.7**	**2419.6**	5.2	3.4	5.4	229.4	11.	4.1	4.1	--
09/30/2008	21.8	387.	**202.4**	**2419.6**	53.7	**1553.1**	3.6	3.3	3.9	114.1	7.6	1.5	1.5	100.
10/31/2008	13.2	260.	--	--	55.1	**2419.6**	9.5	4.2	4.8	140.1	14.	2.6	2.6	--
11/30/2008	--	--	--	--	79.9	**1986.3**	--	--	--	--	--	--	--	--
12/31/2008	--	--	--	--	--	--	11.	11.	11.	281.9	13.	1.1	1.1	--
01/31/2009	--	--	--	--	--	--	1.2	17.	20.	245.2	21.	2.1	2.1	--
02/28/2009	--	--	--	--	--	--	1.	20.	19.	200.2	20.	2.3	2.3	--
03/31/2009	--	--	--	--	--	--	1.2	12.	13.	327.	14.	1.	1.	--
04/30/2009	--	--	12.6	98.7	--	--	0.88	15.	16.	311.9	17.	1.4	1.4	--
05/31/2009	--	--	34.7	161.6	--	--	0.95	21.	19.	233.5	20.	2.2	2.2	--
06/30/2009	--	--	46.5	**1553.1**	--	--	0.86	29.	22.	183.5	22.	2.7	2.7	83.
07/31/2009	--	--	22.4	**2419.6**	--	--	2.8	13.	15.	180.1	18.	2.4	2.4	--
08/31/2009	--	--	16.4	**1553.1**	--	--	6.5	3.7	4.3	156.	11.	1.6	1.6	--
09/30/2009	--	--	8.97	67.	--	--	7.6	5.5	5.9	151.8	14.	2.4	2.4	100.
10/31/2009	--	--	35.96	**461.1**	--	--	--	--	--	--	--	--	--	--
11/30/2009	--	--	69.5	**2419.**	--	--	--	--	--	--	--	--	--	--
12/31/2009	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01/31/2010	--	--	--	--	--	--	--	--	--	--	--	--	--	--
02/28/2010	--	--	--	--	--	--	0.63	16.	19.	284.	20.	1.9	1.9	--
03/31/2010	--	--	--	--	--	--	1.1	11.	12.	314.4	13.	1.1	1.1	--
04/30/2010	--	--	54.8	**2419.6**	--	--	0.41	8.7	9.1	277.3	9.5	0.65	0.65	--
05/31/2010	--	--	36.9	**410.6**	--	--	0.56	17.	20.	262.7	21.	0.54	0.54	--
06/30/2010	--	--	**386.06**	**2419.6**	--	--	1.6	24.	28.	314.4	29.	2.3	2.3	100.
07/31/2010	--	--	23.2	**770.1**	--	--	11.	2.6	4.2	122.6	15.	1.7	1.7	--

Monitoring Period End Date	Fecal Coliform		E. coli		E. coli, thermotol, MF, MTEC		Nitrite + Nitrate	Ammonia	TKN	TN		TP		LC50 Acute Ceriodaphnia
	MO GEO	DAILY MX	MOAV GEO	DAILY MX	MOAV GEO	DAILY MX	DAILY MX	DAILY MX	DAILY MX	DAILY MX	DAILY MX	MO AVG	DAILY MX	DAILY MN
	200 CFU/100mL	400 CFU/100mL	126 CFU/100mL	409 CFU/100mL	126 CFU/100mL	409 CFU/100mL	Req. Mon. mg/L	Req. Mon. mg/L	Req. Mon. mg/L	Req. Mon. lb/d	Req. Mon. mg/L	Req. Mon. mg/L	Req. Mon. mg/L	50 %
08/31/2010	--	--	**181.5**	**2419.6**	--	--	16.	10.	13.	212.5	28.	2.7	2.7	--
09/30/2010	--	--	**138.2**	**2419.6**	--	--	0.05	12.	12.	85.1	12.	1.8	1.8	100.
10/31/2010	--	--	28.96	73.8	--	--	9.5	7.2	6.7	161.5	16.	1.5	1.5	--
11/30/2010	--	--	23.5	240.	--	--	11.	13.	12.	211.	23.	1.6	1.6	--
12/31/2010	--	--	--	--	--	--	11.	5.3	8.6	360.3	27.	2.	2.	--
01/31/2011	--	--	--	--	--	--	0.25	23.	25.	291.9	25.	1.3	1.3	--
02/28/2011	--	--	--	--	--	--	0.42	31.	33.	309.1	34.	2.3	2.3	--
03/31/2011	--	--	--	--	--	--	1.3	5.3	8.3	352.3	9.6	0.6	0.6	--
04/30/2011	--	--	12.3	**648.8**	--	--	1.	16.	18.	470.3	19.	1.2	1.2	--
05/31/2011	--	--	110.6	**2419.6**	--	--	1.	14.	15.	320.3	16.	1.	1.	--
06/30/2011	--	--	29.	**816.4**	--	--	0.05	10.	12.	210.2	12.	1.2	1.2	?
07/31/2011	--	--	2.8	44.3	--	--	17.	0.32	1.	185.7	17.	1.2	1.2	--
08/31/2011	--	--	9.4	365.4	--	--	18.	1.9	3.7	179.6	22.	2.	2.	--
09/30/2011	--	--	28.8	**2419.6**	--	--	9.9	1.9	1.6	370.3	12.	1.2	1.2	100.
10/31/2011	--	--			--	--	6.7	0.09	0.9	195.6	6.7	0.89	0.89	--
11/30/2011	--	--	--	--	--	--	4.9	1.3	1.5	154.8	64.	0.74	0.74	--
12/31/2011	--	--	--	--	--	--	15.	1.7	2.4	269.	15.	0.9	1.1	--
01/31/2012	--	--	--	--	--	--	6.6	7.1	7.1	232.4	14.	1.	1.	--
02/29/2012	--	--	--	--	--	--	1.7	17.	18.	278.6	20.	3.5	3.5	--
03/31/2012	--	--	--	--	--	--	0.91	25.	24.	377.4	25.	1.2	1.2	--
04/30/2012	--	--	--	--	--	--	1.	28.	29.	322.8	30.	1.6	1.6	--
05/31/2012	--	--	--	--	--	--	1.5	36.	35.	413.5	37.	3.1	3.1	--
06/30/2012	--	--	--	--	--	--	3.8	13.	13.	255.2	17.	0.74	0.74	70.7
07/31/2012	--	--	--	--	--	--	24.	0.3	0.05	186.1	24.	1.3	1.3	--
08/31/2012	--	--	--	--	--	--	30.	0.46	1.	227.7	30.	1.7	1.7	--
09/30/2012	--	--	--	--	--	--	27.	1.4	1.	236.4	27.	3.2	3.2	100.
Minimum	1.49	6.	2.8	44.3	4.7	129.6	0.05	0.09	0.05	78.3	6.7	0.54	0.54	70.7
Maximum	66.8	387.	386.06	2419.6	303.7	2420.	30.	36.	35.	470.3	64.	4.1	4.1	100.
Average	22.63	174.86	64.28	1295.40	91.91	1702.91	5.73	11.69	12.52	243.33	19.22	1.74	1.74	94.86

PART B2 – OUTFALL 002

Monitoring Period End Date	BOD5				TSS				Flow		TRC		pH		TP	
	MO AVG	WKLY AVG	DAILY MX	MO AV MN	MO AVG	WKLY AVG	DAILY MX	MO AV MN	MO AVG	DAILY MX	MO AVG	DAILY MX	MIN	MAX	MO AVG	DAILY MX
	30 mg/L	45 mg/L	Req. Mon. mg/L	85 %	30 mg/L	45 mg/L	Req. Mon. mg/L	85 %	Req. Mon. MGD	Req. Mon. MGD	.05 mg/L	.05 mg/L	6.5 SU	8.3 SU	Req. Mon. mg/L	Req. Mon. mg/L
01/31/2008	15.4	30.1	25.	90.5	10.7	13.7	44.	93.8	0.07	0.25	--	--	6.7	7.	3.4	3.4
02/29/2008	10.1	15.3	15.3	87.2	8.	9.5	16.6	92.3	1.4	3.2	--	--	6.4	6.9	1.1	1.1
03/31/2008	20.2	42.1	70.5	68.8	13.7	22.2	46.	79.	2.25	4.64	--	--	6.5	6.9	0.9	0.93
04/30/2008	13.7	20.	21.5	85.3	9.5	24.9	27.5	91.8	0.92	2.02	0.	0.03	6.6	6.9	1.4	1.8
05/31/2008	13.7	21.3	33.3	90.5	8.8	13.2	30.5	94.5	0.27	2.09	0.	0.01	6.7	7.1	1.8	2.8
06/30/2008	25.	39.1	49.2	85.3	13.	33.	45.	95.2	0.006	0.017	--	--	6.8	7.	2.4	2.4
07/31/2008	12.2	12.2	12.2	93.7	11.8	16.5	18.	91.8	0.05	0.13	--	--	6.8	6.9	--	--
08/31/2008	20.8	31.2	36.6	79.5	12.9	13.9	22.5	90.1	0.3	0.86	0.01	0.03	6.6	6.8	4.1	4.1
09/30/2008	11.	13.5	13.7	90.4	5.9	16.5	16.5	95.6	0.19	1.2	0.01	0.01	6.4	6.9	1.5	1.5
10/31/2008	21.4	39.3	39.3	83.	10.4	16.2	28.	93.	0.03	0.04	--	--	6.7	6.8	--	--
11/30/2008	17.2	17.3	21.	88.5	9.	10.	12.	94.2	1.4	2.	0.02	0.05	6.5	6.8	1.45	1.5
12/31/2008	14.2	18.8	30.6	88.4	9.1	13.6	39.	91.7	1.3	3.5	--	--	6.5	7.	2.	2.1
01/31/2009	21.4	21.3	22.9	83.4	10.2	11.5	14.	91.7	0.1	0.2	--	--	6.7	6.9	--	--
02/28/2009	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
03/31/2009	9.	12.3	19.	92.5	7.	7.6	12.6	94.4	0.19	0.8	--	--	6.7	7.	1.	1.
04/30/2009	10.5	13.5	13.6	92.3	7.4	8.4	11.	94.8	0.05	0.18	--	--	6.7	7.	1.4	1.4
05/31/2009	16.3	17.3	19.9	88.	11.7	22.	18.	92.6	0.03	0.15	0.01	0.01	6.7	7.	2.2	2.2
06/30/2009	12.7	14.2	17.	89.7	5.	7.6	7.6	96.7	0.502	2.6	0.01	0.02	6.6	7.	1.3	1.3
07/31/2009	8.3	8.9	9.2	91.7	5.9	7.1	19.	95.9	0.051	0.113	0.01	0.01	6.7	7.	--	--
08/31/2009	10.9	10.9	10.9	90.	4.9	5.	6.	96.6	0.042	0.093			6.6	7.	--	--
09/30/2009	10.2	12.	12.5	94.2	4.9	6.2	8.4	97.	1.27	1.48	0.02	0.04	6.7	7.2	2.7	2.9
10/31/2009	20.6	34.6	44.4	89.1	10.1	15.8	24.	95.3	1.29	1.88	0.	0.5	6.5	7.1	2.5	3.
11/30/2009	20.4	27.2	40.	86.7	12.	13.7	21.	92.3	1.41	1.81	0.01	0.04	6.6	7.	1.8	2.1
12/31/2009	31.3	40.7	51.	79.1	12.6	17.2	38.5	90.6	1.61	2.72			6.5	6.9	1.6	2.2
01/31/2010	16.4	23.4	25.6	89.6	6.2	7.1	13.5	96.4	1.26	1.7			6.7	7.1	2.	2.4
02/28/2010	--	--	--	--	10.1	10.1	13.5		--	--			6.5	6.9	--	--
03/31/2010	13.3	15.7	27.	86.3	9.6	11.4	28.	91.7	0.4	3.1			6.3	6.9	1.1	1.2
04/30/2010	8.8	11.1	12.1	91.1	6.7	8.	27.	94.4	0.52	2.06	0.01	0.02	6.4	6.9	0.65	0.65
05/31/2010	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
06/30/2010	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
07/31/2010	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
08/31/2010	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
09/30/2010	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
10/31/2010	--	--	--	--	6.6	6.6	6.6	96.7	0.171	0.171	--	--	6.9	6.9	--	--
11/30/2010	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
12/31/2010	--	--	--	--	--	--	--	--	0.43	0.96	--	--	6.4	6.8	--	--
01/31/2011	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
02/28/2011	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
03/31/2011	9.5	11.4	16.7	84.	11.5	16.2	30.5	86.6	1.6	4.4	--	--	6.	6.9	0.66	0.83
04/30/2011	11.7	11.7	12.1	85.7	11.3	11.7	13.5	88.4	0.41	1.75	0.	0.	6.5	7.1	0.8	0.8
05/31/2011	6.8	6.8	7.5	92.1	4.4	4.5	5.4	95.8	0.31	1.34	0.	0.01	6.7	7.1	--	--

Monitoring Period End Date	BOD5				TSS				Flow		TRC		pH		TP	
	MO AVG	WKLY AVG	DAILY MX	MO AV MN	MO AVG	WKLY AVG	DAILY MX	MO AV MN	MO AVG	DAILY MX	MO AVG	DAILY MX	MIN	MAX	MO AVG	DAILY MX
	30 mg/L	45 mg/L	Req. Mon. mg/L	85 %	30 mg/L	45 mg/L	Req. Mon. mg/L	85 %	Req. Mon. MGD	Req. Mon. MGD	.05 mg/L	.05 mg/L	6.5 SU	8.3 SU	Req. Mon. mg/L	Req. Mon. mg/L
06/30/2011	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
07/31/2011	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
08/31/2011	18.9	18.9	18.9	**79.9**	16.1	16.1	21.	87.1	0.65	1.5	0.	0.	**6.4**	6.8	--	--
09/30/2011	14.4	14.4	20.7	**76.8**	7.1	7.1	9.	93.9	0.37	2.32	0.01	0.04	6.5	6.6	1.2	1.2
10/31/2011	4.	4.	4.	**77.8**	6.2	6.2	9.	92.6	0.29	1.02	0.	0.01	**6.2**	6.8	0.89	0.89
11/30/2011	--	--	--	--	--	--	--	--	0.05	0.25	0.03	0.04	6.9	7.	--	--
12/31/2011	8.8	8.8	10.4	92.5	4.9	4.9	6.4	96.5	0.16	1.49	--	--	**6.**	6.3	0.78	0.78
01/31/2012	--	--	--	--	--	--	--	--	0.07	0.27	--	--	**6.3**	7.3	--	--
02/29/2012	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
03/31/2012	--	--	--	--	--	--	--	--	0.04	0.07	--	--	6.8	7.2	--	--
04/30/2012	--	--	--	--	--	--	--	--	0.06	0.06	--	--	6.9	6.9	--	--
05/31/2012	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
06/30/2012	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
07/31/2012	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
08/31/2012	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
09/30/2012	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Minimum	4.	4.	4.	68.8	4.4	4.5	5.4	79.	0.01	0.02	0.	0.	6.	6.3	0.65	0.65
Maximum	31.3	42.1	70.5	94.2	16.1	33.	46.	97.	2.25	4.64	0.03	0.5	6.9	7.3	4.1	4.1
Average	14.52	19.37	23.75	86.78	9.01	12.43	20.26	92.97	0.55	1.4	0.01	0.05	6.57	6.94	1.64	1.79

Monitoring Period End Date	Fecal Coliform		E. coli		E. coli, thermotol, MF, MTEC		Nitrite plus Nitrate		TKN	TN		LC50 Acute Ceriodaphnia	NOEL Chronic Ceriodaphnia
	MO GEO	DAILY MX	MOAV GEO	DAILY MX	MOAV GEO	DAILY MX	DAILY MX	DAILY MX	DAILY MX	DAILY MX	DAILY MX	DAILY MN	DAILY MN
	200 #/100mL	400 #/100mL	126 CFU/100mL	409 CFU/100mL	126 CFU/100mL	409 CFU/100mL	Req. Mon. mg/L	Req. Mon. mg/L	Req. Mon. mg/L	Req. Mon. lb/d	Req. Mon. mg/L	100 %	Req. Mon. %
01/31/2008	--	--	--	--	--	--	1.1	18.	24.	26.3	25.	--	--
02/29/2008	--	--	--	--	--	--	1.75	10.	10.	250.2	12.	--	--
03/31/2008	--	--	--	--	--	--	1.9	5.4	6.5	286.9	8.	100.	100.
04/30/2008	1.85	8.	--	--	**450.5**	**2419.6**	0.81	11.	9.	88.8	9.8	--	--
05/31/2008	1.52	8.	--	--	121.99	**2419.6**	0.4	18.	17.	10.63	17.	--	--
06/30/2008	--	--	--	--	--	--	2.3	12.	13.	1.3	16.	--	--
07/31/2008	--	--	--	--	--	--	0.	--	--	--	--	--	--
08/31/2008	--	--	--	--	--	--	5.2	3.4	5.4	56.4	11.	--	--
09/30/2008	50.	50.	--	--	**209.8**	209.8	3.6	3.3	3.9	2.2	7.6	--	--
10/31/2008	--	--	--	--	--	--	--	--	--	--	--	--	--
11/30/2008	17.6	22.	--	--	**1393.1**	**1733.**	12.	4.8	5.	241.	17.	--	--
12/31/2008	--	--	--	--	--	--		16.	14.	232.7	15.	100.	100.
01/31/2009	--	--	--	--	--	--						--	--
02/28/2009	--	--	--	--	--	--	--	--	--	--	--	--	--
03/31/2009	--	--	--	--	--	--	1.2	12.	13.	65.6	14.	100.	100.
04/30/2009	--	--	--	--	--	--	0.88	15.	16.	20.	17.	--	--
05/31/2009	--	--	**2419.6**	**2419.6**	--	--	0.95	21.	19.	3.3	20.	--	--
06/30/2009	--	--	**325.5**	325.5	--	--	2.1	12.	13.	324.3	15.	--	--
07/31/2009	--	--	--	--	--	--	--	--	--	--	--	--	--
08/31/2009	--	--	--	--	--	--	--	--	--	--	--	--	--
09/30/2009	--	--	41.8	**2419.6**	--	--	11.	10.	9.5	144.9	20.	--	--
10/31/2009	--	--	50.44	**2419.6**	--	--	7.2	5.8	7.	162.3	14.	--	--
11/30/2009	--	--	**128.4**	**2419.6**	--	--	5.5	11.	13.	235.7	18.	--	--
12/31/2009	--	--	--	--	--	--	3.4	14.	14.	248.1	17.	100.	100.
01/31/2010	--	--	--	--	--	--	1.4	15.	16.	208.4	17.	--	--
02/28/2010	--	--	--	--	--	--	--	--	--	--	--	--	--
03/31/2010	--	--	--	--	--	--	1.1	11.	12.	49.9	13.	100.	50.
04/30/2010	--	--	3.38	**2419.6**	--	--	0.41	8.7	9.1	42.5	9.5	--	--
05/31/2010	--	--	--	--	--	--	--	--	--	--	--	--	--
06/30/2010	--	--	--	--	--	--	--	--	--	--	--	--	--
07/31/2010	--	--	--	--	--	--	--	--	--	--	--	--	--
08/31/2010	--	--	--	--	--	--	--	--	--	--	--	--	--
09/30/2010	--	--	--	--	--	--	--	--	--	--	--	--	--
10/31/2010	--	--	--	--	--	--	--	--	--	--	--	--	--
11/30/2010	--	--	--	--	--	--	--	--	--	--	--	--	--
12/31/2010	--	--	--	--	--	--	--	--	--	--	--		
01/31/2011	--	--	--	--	--	--	--	--	--	--	--		
02/28/2011	--	--	--	--	--	--	--	--	--	--	--		
03/31/2011	--	--	--	--	--	--	1.3	5.3	8.3	146.5	9.6	100.	50.
04/30/2011	--	--	**1880.8**	**2419.6**	--	--	--	--	--	--	--	--	--
05/31/2011	--	--	**942.3**	**1732.9**	--	--	--	--	--	--	--	--	--

Monitoring Period End Date	Fecal Coliform		E. coli		E. coli, thermotol, MF, MTEC		Nitrite plus Nitrate		TKN	TN		LC50 Acute Ceriodaphnia	NOEL Chronic Ceriodaphnia
	MO GEO	DAILY MX	MOAV GEO	DAILY MX	MOAV GEO	DAILY MX	DAILY MX	DAILY MX	DAILY MX	DAILY MX	DAILY MX	DAILY MN	DAILY MN
	200 #/100mL	400 #/100mL	126 CFU/100mL	409 CFU/100mL	126 CFU/100mL	409 CFU/100mL	Req. Mon. mg/L	Req. Mon. mg/L	Req. Mon. mg/L	Req. Mon. lb/d	Req. Mon. mg/L	100 %	Req. Mon. %
06/30/2011	--	--	--	--	--	--	--	--	--	--	--	--	--
07/31/2011	--	--	--	--	--	--	--	--	--	--	--	--	--
08/31/2011	--	--	866.4	866.4	--	--	--	--	--	--	--	--	--
09/30/2011	--	--	325.2	2429.6	--	--	9.9	1.9	1.6	76.1	12.	--	--
10/31/2011	--	--	--	--	--	--	6.7	0.09	0.9	27.9	6.7	--	--
11/30/2011	--	--	238.2	238.2	--	--	--	--	--	--	--	--	--
12/31/2011	--	--	--	--	--	--	5.3	1.7	2.4	95.7	7.7	--	--
01/31/2012	--	--	--	--	--	--	--	--	--	--	--	--	--
02/29/2012	--	--	--	--	--	--	--	--	--	--	--	--	--
03/31/2012	--	--	--	--	--	--	--	--	--	--	--	--	--
04/30/2012	--	--	--	--	--	--	--	--	--	--	--	--	--
05/31/2012	--	--	--	--	--	--	--	--	--	--	--	--	--
06/30/2012	--	--	--	--	--	--	--	--	--	--	--	--	--
07/31/2012	--	--	--	--	--	--	--	--	--	--	--	--	--
08/31/2012	--	--	--	--	--	--	--	--	--	--	--	--	--
09/30/2012	--	--	--	--	--	--	--	--	--	--	--	--	--
Minimum	1.52	8.	3.38	238.2	121.99	209.8	0.	0.09	0.9	1.3	6.7	100.	50.
Maximum	50.	50.	2419.6	2429.6	1393.1	2419.6	12.	21.	24.	324.3	25.	100.	100.
Average	17.74	22.	656.55	1828.2	543.85	1695.5	3.5	9.86	10.5	121.91	13.96	100.	83.33

PART B3 – SUM OF OUTFALLS 001 AND 002

Monitoring Period End Date	BOD5		TSS		Flow		
	MO AVG	DAILY MX	MO AVG	DAILY MX	MO AVG	DAILY MX	ANNL AVG
	951 lb/d	1426 lb/d	951 lb/d	1426 lb/d	Req. Mon. MGD	Req. Mon. MGD	3.8 MGD
01/31/2008	163.6	403.7	155.9	997.5	1.5	2.2	1.9
02/29/2008	298.	545.	216.	595.	4.5	8.4	2.
03/31/2008	624.	**1823.**	439.	1189.	6.	10.	2.1
04/30/2008	290.3	528.4	198.2	733.9	3.5	5.6	2.
05/31/2008	172.3	361.	112.7	330.7	1.9	3.1	1.9
06/30/2008	246.1	580.5	136.9	470.4	1.206	1.117	1.9
07/31/2008	227.3	439.1	166.3	379.5	1.25	1.63	1.8
08/31/2008	333.	763.	163.	469.	1.9	3.7	1.8
09/30/2008	161.6	230.2	93.9	357.8	1.9	4.3	1.8
10/31/2008	240.6	588.5	135.1	350.3	1.33	1.84	1.8
11/30/2008	219.8	304.7	112.7	191.8	1.4	2.	1.8
12/31/2008	293.7	612.5	197.7	780.6	3.4	6.3	1.9
01/31/2009	332.	638.	187.8	854.	1.8	2.8	2.
02/28/2009	154.8	221.5	72.9	163.	1.4	1.9	1.8
03/31/2009	161.7	294.7	127.7	212.7	2.39	3.8	1.7
04/30/2009	159.	231.2	112.7	165.1	1.85	2.38	1.6
05/31/2009	279.3	442.4	187.5	360.3	1.53	2.25	1.6
06/30/2009	187.	326.1	72.7	115.1	2.1	2.42	1.7
07/31/2009	151.9	227.7	86.5	364.5	1.65	2.71	1.7
08/31/2009	132.9	199.7	60.8	120.1	1.54	2.49	1.7
09/30/2009	105.5	150.1	55.3	77.1	1.2	1.5	1.6
10/31/2009	217.8	385.4	110.7	280.2	1.29	1.88	1.6
11/30/2009	239.	483.7	142.1	257.1	1.41	1.81	1.6
12/31/2009	409.2	697.6	167.4	500.9	1.61	2.72	1.6
01/31/2010	202.9	311.7	83.3	360.3	1.6	3.7	1.6
02/28/2010	218.8	280.2	156.	405.3	2.37	4.66	1.6
03/31/2010	342.6	578.	236.2	871.5	3.3	8.6	1.6
04/30/2010	185.6	237.9	145.8	185.6	3.12	6.86	1.7
05/31/2010	148.1	251.5	108.2	413.7	1.4	1.6	1.7
06/30/2010	292.4	580.5	184.7	950.8	1.2	1.4	1.7
07/31/2010	131.4	202.2	77.7	146.	0.96	1.19	1.6
08/31/2010	104.3	188.5	53.4	186.1	0.88	1.1	1.55
09/30/2010	84.1	129.2	24.7	56.	0.83	1.2	1.52
10/31/2010	171.9	364.3	103.	303.6	1.46	2.37	1.52
11/30/2010	269.2	444.4	159.6	274.	1.4	1.8	1.41
12/31/2010	113.1	324.3	88.6	232.	2.31	4.46	1.5
01/31/2011	308.	1009.	200.	917.	1.3	1.8	1.5
02/28/2011	183.5	236.	83.8	182.8	1.25	1.99	1.48
03/31/2011	263.3	752.1	341.1	1236.	5.4	10.1	1.56
04/30/2011	511.3	1233.5	249.5	689.3	3.21	6.95	1.58
05/31/2011	179.5	287.7	110.4	253.4	2.71	5.34	1.67
06/30/2011	230.8	444.5	135.	281.5	1.7	2.1	1.71
07/31/2011	81.9	124.1	56.	99.7	1.31	1.67	1.74

Monitoring Period End Date	BOD5		TSS		Flow		
	MO AVG	DAILY MX	MO AVG	DAILY MX	MO AVG	DAILY MX	ANNL AVG
	951 lb/d	1426 lb/d	951 lb/d	1426 lb/d	Req. Mon. MGD	Req. Mon. MGD	3.8 MGD
08/31/2011	177.5	427.7	195.	805.6	2.08	6.1	1.78
09/30/2011	231.6	863.2	165.4	375.3	2.97	7.32	1.9
10/31/2011	182.4	296.1	157.	319.8	3.29	6.02	2.1
11/30/2011	132.9	184.6	89.2	205.5	2.35	3.15	2.14
12/31/2011	128.2	258.4	244.2	419.4	2.76	5.99	2.2
01/31/2012	197.5	363.5	140.1	203.5	1.99	2.71	2.25
02/29/2012	187.2	513.5	187.2	685.1	2.11	1.56	2.28
03/31/2012	215.3	343.8	156.9	331.	1.68	2.15	2.28
04/30/2012	276.3	634.1	108.6	337.6	1.38	1.89	1.97
05/31/2012	531.2	1274.6	218.6	736.8	1.34	1.55	1.88
06/30/2012	199.1	427.8	402.7	936.7	1.4	2.03	1.86
07/31/2012	88.8	130.6	80.1	446.2	0.96	1.44	1.83
08/31/2012	72.3	130.1	39.6	90.2	1.01	1.87	1.8
09/30/2012	224.8	720.1	122.3	410.3	1.08	1.42	1.67
Minimum	72.3	124.1	24.7	56.	0.83	1.1	1.41
Maximum	624.	1823.	439.	1236.	6.	10.1	2.28
Average	222.2	456.6	147.6	432.7	2.	3.4	1.8

PART B4 – METALS DATA (from WET test reports)

		Effluent							Background						
Test Date	River	Al	Cd	Cu	Pb	Ni	Zn	Hardness	Al	Cd	Cu	Pb	Ni	Zn	Hardness
6/13/2008	Connecticut	0.14	0	0.016	0	0	0.025	106	0.162	--	0.003	0	0.001	0.004	45
9/16/2008	Connecticut	0.033	0	0.008	0	0	0.029	75.6	0.171	0	0.004	0	0	0.005	34.3
6/10/2009	Connecticut	0	0	0.006	0	0.002	0.022	102	0.038	--	0.002	0	0	0	35.2
9/17/2009	Connecticut	0	0	0.008	0	0	0.025	95.8	0.06	0	0	0	0	0.002	42.4
6/16/2010	Connecticut	0	0	0.012	0.019	0	0.028	105	0.085	0	0.002	0	0	0.002	33.4
9/29/2010	Connecticut	0	0	0.01	0	0	0.026	104	0.059	0	0.007	0	0.001	0.009	53.1
6/8/2011	Connecticut	0.085	0	0.033	0	0.002	0.052	105	0.401	0	0.005	0	0.001	0.013	40.4
9/27/2011	Connecticut	0.009	0	0.0073	0	0.0012	0.02	79.4	0.623	0.0003	0.0052	0.0014	0.0019	0.0132	33.4
6/13/2012	Connecticut	0.075	0	0.0185	0.001	0.0014	0.0355	85.8	0.258	0	0.0042	0.0007	0.0012	0.0056	28.9
9/12/2012	Connecticut	0	0	0.0146	0	0.0015	0.0678	90	0.072	0	0.0007	0	0.0007	0.0038	43.7
Maximum		0.14	0	0.033	0.019	0.002	0.0678	106	0.623	0.0003	0.007	0.0014	0.0019	0.0132	53.1
Average		0.0342	0	0.013	0.0020	0.0008	0.0330	94.9	0.1929	0	0.0033	0.0002	0.0007	0.00576	38.98
Median		0.0045	0	0.011	0	0.0006	0.027	98.9	0.1235	0	0.0035	0	0.001	0.0045	37.8
3/24/2008	Manhan	0.04	0	0.009	0	0.003	0.018	73.1	0.185	0	0.003	0	0.002	0.008	23.9
12/16/2008	Manhan	0.032	0	0.006	0	0	0.015	67.3	0.426	0	0.001	0	0	0.005	22.8
3/18/2009	Manhan	0.043	0	0.005	0.004	0.002	0.02	84.6	0.21	0	0	0	0	0.023	30.7
12/14/2009	Manhan	0	0	0.01	0	0.001	0.023	83.5	0.508	0	0.003	0	0.001	0.008	31.4
3/15/2010	Manhan	0.01	0	0.007	0	0	0.02	83.4	0.956	0	0.002	0	0.002	0.011	17.2
3/14/2011	Manhan	0.067	0	0.0079	0.0009	0.0009	0.0189	76.4	0.992	0	0.003	0.001	0.0014	0.0089	19.1
Maximum		0.067	0	0.01	0.004	0.003	0.023	84.6	0.992	0	0.003	0.001	0.002	0.023	31.4
Average		0.032	0	0.007	0.001	0.001	0.019	78.050	0.546	0	0.002	0	0.001	0.011	24.2
Median		0.036	0	0.00745	0	0.00095	0.01945	79.9	0.467	0	0.0025	0	0.0012	0.0085	23.4

Attachment C – Nitrogen Loads

NH, VT, MA Discharges to Connecticut River Watershed

NAME	NUMBER	DESIGN FLOW (MGD)[1]	AVERAGE FLOW (MGD)[2]	TOTAL NITROGEN (mg/l)[3]	TOTAL NITROGEN (lbs/day)[4]	Exp. Date
Bethlehem	NH0100501		0.19	19.6	31.1	
Charlestown	NH0100765		0.38	19.6	62.1	
Claremont	NH0101257		1.60	14.0[6]	186.8	2005
Colebrook	NH0100315		0.22	19.6	36.0	
Groveton	NH0100226		0.49	19.6	80.1	
Woodsville	NH0100978		0.19	16.0[6]	25.4	
Hinsdale	NH0100382		0.27	19.6	44.1	
Lancaster	NH0100145		0.98	8.8[6]	71.9	2005
Lisbon	NH0100421		0.17	19.6	27.8	
Littleton	NH0100153		0.77	10.0[6]	64.2	
Newport	NH0100200		0.65	19.6	106.2	2006
Keene	NH0100790	6.0	3.47	12.7	367.5	1999
Northumberland	NH0101206		0.06	19.6	9.8	
Sunapee	NH0100544		0.35	15.5	44.7	
Troy	NH0101052		0.10	19.6	16.3	
Lebanon	NH0100366		1.87	19.0[6]	296.3	2011
Swanzey	NH0101150		0.09	19.6	14.7	
Whitefield	NH0100510		0.12	19.6	19.6	
Winchester	NH0100404		0.23	19.6	37.6	
Hanover	NH0100099		1.5	19.6	245.2	
			13.70		**1,787.4**	
Bellows Falls	VT010013	1.40[5]	0.61	21.0[6]	~~1~~06.8	
Bethel	VT0100048	0.12[5]	0.12	19.6	19.6	
Bradford	VT0100803	0.14[5]	0.14	19.6	22.9	
Brattleboro	VT010064	3.00[5]	1.64	20.0[6]	273.6	2009
Bridgewater	VT0100846	0.04[5]	0.04	19.6	6.5	
Canaan	VT0100625	0.18[5]	0.18	19.6	29.4	
Cavendish	VT0100862	0.15[5]	0.15	19.6	24.5	
Chelsea	VT0100943	0.06[5]	0.06	19.6	9.8	
Chester	VT010081	0.18[5]	0.18	19.6	29.4	
Danville	VT0100633	0.06[5]	0.06	19.6	9.8	
Lunenberg	VT0101061	0.08[5]	0.08	19.6	13.1	
Hartford	VT0100978	0.30[5]	0.3	19.6	49.0	
Ludlow	VT0100145	0.70[5]	0.36	15.5	46.5	
Lyndon	VT0100595	0.75[5]	0.75	19.6	122.6	2007
Putney	VT0100277	0.08[5]	0.08	19.6	13.1	
Randolph	VT0100285	0.40[5]	0.4	19.6	65.4	
Readsboro	VT0100731	0.75[5]	0.75	19.6	122.6	2007
Royalton	VT0100854	0.07[5]	0.07	19.6	11.4	

NAME	NUMBER	DESIGN FLOW (MGD)[1]	AVERAGE FLOW (MGD)[2]	TOTAL NITROGEN (mg/l)[3]	TOTAL NITROGEN (lbs/day)[4]	Exp. Date
ST. Johnsbury	VT0100579	1.60	1.14	12.0[6]	114.1	2009
Saxtons River	VT0100609	0.10[5]	0.1	19.6	16.3	
Sherburne Fire Dist.	VT0101141	0.30[5]	0.3	19.6	49.0	
Woodstock WWTP	VT0100749	0.05[5]	0.05	19.6	8.2	
Springfield	VT0100374	2.20	1.25	12.0[6]	125.1	2003
Hartford	VT0101010	1.22[5]	0.97	30.0[6]	242.7	2006
Whitingham	VT0101109	0.01[5]	0.01	19.6	1.6	
Whitingham Jacksonville	VT0101044	0.05[5]	0.05	19.6	8.2	
Cold Brook Fire Dist.	VT0101214	0.05[5]	0.05	19.6	8.2	
Wilmington	VT0100706	0.14[5]	0.14	19.6	22.9	
Windsor	VT0100919	1.13[5]	0.45	19.6	73.6	
Windsor-Weston	VT0100447	0.02[5]	0.02	19.6	3.3	
Woodstock WTP	VT0100757	0.45[5]	0.45	19.6	73.6	
Woodstock-Taftsville	VT0100765	0.01[5]	0.01	19.6	1.6	
			10.96		**1724.4**	
Huntington	MA0101265	0.20[5]	0.12	19.6	19.6	
Russell	MA0100960	0.24	0.16	19.6	26.2	
Westfield	MA0101800	6.10[5]	3.78	20.4	643.1	2005
Woronoco Village	MA0103233	0.02	0.01	19.6	1.6	
Charlemont	MA0103101	0.05[5]	0.03	19.6	4.9	
Greenfield	MA0101214	3.20	3.77	13.6	427.6	2007
Monroe	MA0100188	0.02	0.01	19.6	1.6	
Old Deerfield	MA0101940	0.25[5]	0.18	9.2	13.8	
Shelburne Falls	MA0101044	0.25[5]	0.22	16.9	31.0	
Amherst	MA0100218	7.10	4.28	14.1	503.3	2005
Barre	MA0103152	0.30[5]	0.29	26.4	63.8	
Belchertown	MA0102148	1.00	0.41	12.7	43.4	
Easthampton	MA0101478	3.80	3.02	19.6	493.7	2000
Hadley	MA0100099	0.54	0.32	25.9	69.1	
Hatfield	MA0101290	0.50[5]	0.22	15.6	28.6	
Holyoke	MA0101630	17.50[5]	9.70	8.6	695.7	2005
Montague	MA0100137	1.83[5]	1.60	12.9	172.1	2006
Northampton	MA0101818	8.60[5]	4.40	22.1	811.0	2005
Northfield School	MA0032573	0.45	0.10	19.6	16.3	
Northfield	MA0100200	0.28	0.24	16.8	33.6	

NAME	NUMBER	DESIGN FLOW (MGD)[1]	AVERAGE FLOW (MGD)[2]	TOTAL NITROGEN (mg/l)[3]	TOTAL NITROGEN (lbs/day)[4]	Exp. Date
South Deerfield	MA0101648	0.85	0.70	7.9	46.1	
South Hadley	MA0100455	4.20[5]	3.30	28.8	792.6	2005
Sunderland	MA0101079	0.50[5]	0.19	8.7	13.8	
Athol	MA0100005	1.75[5]	1.39	17.2	199.4	2007
Erving #2	MA0101052	2.70[5]	1.80	3.2	48.0	2007
Erving #1	MA0101516	1.02[5]	0.32	29.3	78.2	
Erving #3	MA0102776	0.01	0.01	19.6	1.6	
Gardner	MA0100994	5.00[5]	3.70	14.6	450.5	2007
Orange	MA0101257	1.10[5]	1.20	8.6	86.1	
Royalston	MA0100161	0.04[5]	0.07	19.6	11.4	
Templeton	MA0100340	2.80[5]	0.40	26.4	88.1	
Winchendon	MA0100862	1.10[5]	0.61	15.5	78.9	
Chicopee	MA0101508	15.50[5]	10.0	19.4	1,618.0	2010
Hardwick W	MA0102431	0.04[5]	0.01	12.3	1.0	
Hardwick G	MA0100102	0.23[5]	0.14	14.6	17.0	
N Brookfield	MA0101061	0.76[5]	0.62	23.1	119.4	2005
Palmer	MA0101168	5.60[5]	2.40	18.8	376.3	2005
Spencer	MA0100919	1.08[5]	0.56	13.6	63.5	
Ware	MA0100889	1.00[5]	0.74	9.4	58.0	
Warren	MA0101567	1.50	0.53	14.1	62.3	
Springfield			45.4	4.3	1,628.1	2006
			104.05		**9,938.3**	

1. Design flow – typically included as a permit limit in MA and VT but not in NH.

2. Average discharge flow for 2004 – 2005. If no data in PCS, average flow was assumed to equal design flow.

3. Total nitrogen value based on effluent monitoring data. If no effluent monitoring data, total nitrogen value assumed to equal average of MA secondary treatment facilities (19.6 mg/l), average of MA seasonal nitrification facilities (15.5 mg/l), or average of MA year round nitrification facilities (12.7 mg/l). Average total nitrogen values based on a review of 27 MA facilities with effluent monitoring data. Facility is assumed to be a secondary treatment facility unless ammonia data is available and indicates some level of nitrification.

4. Current total nitrogen load.

5. Flow limit is based on an annual average rather than a monthly average.

6. Effluent total nitrogen data from USGS study.

Attachment D – Example Calculation of Reasonable Potential Determination (Outfall 001)

The following is an example for determining reasonable potential, using aluminum (Al) and the relevant water quality criteria, for Outfall 001. For Al, the resultant in-stream concentration (C_r) is calculated as follows:

$$C_r = \frac{Q_d C_d + Q_S C_S}{Q_r}$$

where:

Q_d = effluent flow (design flow = 2.0 mgd = 3.09 cfs)
C_d = effluent metals concentration, in ug/L (95^{th} percentile, see calculation below)
Q_S = stream flow upstream (7Q10 upstream = 1810 cfs)
C_S = background in-stream metals concentration, in ug/L (median, see Attachment B4)
Q_r = resultant in-stream flow, after discharge ($Q_S + Q_d$ = 1813.1 cfs)
C_r = resultant in-stream concentration, in ug/L

The 95^{th} percentile estimated effluent daily maximum concentration (C_d) is calculated as follows:

See Attachment B for the effluent results of the toxicity measurements for Al. Since the sample size for aluminum as well as the other metals from Outfall 001 in this fact sheet is not less than 10, the 95^{th} percentile of the effluent data is calculated using EPA's *Technical Support Document For Water Quality-based Toxics Control* (TSD) chapter 3 and box 3-2, as well as Appendix E "Lognormal Distribution and Permit Limit Derivations" of the TSD. Also, note that non-detects are considered to be equal to 0.

In this case, the 95^{th} percentile effluent concentration for aluminum is 191.6 ug/l.

Hence, the resultant in-stream aluminum concentration is:

C_r = [(3.09 cfs)(191.6 ug/l) + (1810 cfs)(123.5 ug/l)] / 1813.1 cfs = **<u>123.5 ug/l</u>**

Reasonable potential is then determined by comparing this resultant downstream concentration with the relevant criterion. In this case, the acute criterion is 750 ug/l and the chronic criterion is 87 ug/l. Since 123.5 ug/l is less than 750 ug/l but greater than 87 ug/l, there is no reasonable potential for an acute (daily maximum) limit but there is reasonable potential for a chronic (monthly average) aluminum limit.

The monthly average limit would then be determined by rearranging the above mass balance to solve for the effluent concentration (C_d), as follows:

$$C_d = \frac{Q_r C_r - Q_S C_S}{Q_d}$$

The terms would be the same as above with the exception of the resultant in-stream concentration (C_r) being replaced with the relevant criterion.

However, since the background median concentration is greater than the chronic criterion in this case, the calculated limit would be lower than the criterion, and potentially a negative number. In such cases, the monthly average limit is to be set at the relevant criterion. Hence, the monthly average aluminum limit is **87 ug/l**.

Attachment E – Example Calculation of Reasonable Potential Determination (Outfall 002)

The following is an example for determining reasonable potential, using aluminum (Al) and the relevant water quality criteria, for Outfall 002. For aluminum (Al), the resultant in-stream concentration (C_r) is calculated as follows:

$$C_r = \frac{Q_d C_d + Q_S C_S}{Q_r}$$

where:

Q_d = effluent flow (design flow = 1.8 mgd = 2.78 cfs)
C_d = effluent metals concentration, in ug/L (95^{th} percentile, see calculation below)
Q_S = stream flow upstream (7Q10 upstream = 30 cfs)
C_S = background in-stream metals concentration, in ug/L (median, see Attachment B)
Q_r = resultant in-stream flow, after discharge ($Q_S + Q_d$ = 32.8 cfs)
C_r = resultant in-stream concentration, in ug/L

The 95^{th} percentile estimated effluent daily maximum concentration (C_d) is calculated as follows:

The results of the toxicity measurements of Al are:

Date	River	Al (mg/l)
3/24/2008	Manhan	0.04
12/16/2008	Manhan	0.032
3/18/2009	Manhan	0.043
12/14/2009	Manhan	0
3/15/2010	Manhan	0.01
3/14/2011	Manhan	0.067
Maximum		0.067
Average		0.032
Median		0.036

See TSD chapter 3 and box 3-2 for a more detailed description of the steps below:

Step 1) The maximum value of these samples is 0.067 mg/l (67 ug/l).
Step 2) CV = 0.6, when there are less than 10 measurements.
Step 3) Using table 3-2 in the TSD, the reasonable potential multiplication factor (RPMF) for the 95% percentile is 2.1. (6 samples with CV=0.6)
Step 4) The 95^{th} percentile of the distribution is the maximum effluent value multiplied by the RPMF: 67 ug/l * 2.1 = 140.7 ug/l

In this permit (for Outfall 002) all the metal sample sizes are less than 10. However, if the number of samples were greater than 10, then EPA uses box 3-2 , as well as Appendix E "Lognormal Distribution and Permit Limit Derivations" of the TSD. Also, note that non-detects are considered to be equal to 0.

Hence, the resultant downstream concentration is:

C_r = [(2.78 cfs)(140.7 ug/l) + (30 cfs)(467 ug/l)] / 32.78 cfs = **439.3 ug/l**

Reasonable potential is then determined by comparing this resultant downstream concentration with the relevant criteria. In this case, the acute criterion is 750 ug/l and the chronic criterion is 87 ug/l. Since 439.3 ug/l is less than 750 ug/l but greater than 87 ug/l, there is no reasonable potential for an acute (daily maximum) limit but there is reasonable potential for a chronic (monthly average) aluminum limit.

The monthly average limit would then be determined by rearranging the above mass balance to solve for the effluent concentration (C_d), as follows:

$$C_d = \frac{Q_r C_r - Q_S C_S}{Q_d}$$

The terms would be the same as above with the exception of the resultant in-stream concentration (C_r) being replaced with the relevant criterion.

However, since the background median concentration is greater than the chronic criterion in this case, the calculated limit would be lower than the criterion, and potentially a negative number. In such cases, the monthly average limit is to be set at the relevant criterion. Hence, the monthly average aluminum limit is **87 ug/l**.

Attachment F – Endangered Species

Section 7(a) of the Endangered Species Act (ESA) of 1973, as amended (the "Act"), grants authority to and imposes requirements upon federal agencies regarding endangered or threatened species of fish, wildlife, or plants ("listed species") and the habitats of such species that has been designated as critical ("critical habitat").

Section 7(a)(2) of the Act requires every federal agency in consultation with and with the assistance of the Secretary of the Interior, to ensure that any action it authorizes, funds, or carries out, in the United States or upon the high seas, is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. The United States Fish and Wildlife Service (USFWS) administers Section 7 consultations for freshwater species. The National Marine Fisheries Service (NMFS) administers Section 7 consultations for marine species and anadromous fish.

EPA is monitoring regulatory activities regarding the protection of Atlantic sturgeon (*Acipenser oxyrinchus*). The following information was taken from a NMFS Letter to EPA, dated September 6, 2011, concerning the repermitting of the Easthampton WWTP.

> "On October 6, 2010, NMFS published two proposed rules to list five distinct population segments (DPS) of Atlantic sturgeon under the ESA. NMFS is proposing to list four DPSs as endangered (New York Bight, Chesapeake Bay, Carolina and South Atlantic) and one DPS of Atlantic sturgeon as threatened (Gulf of Maine DPS). Once a species is proposed for listing, as either endangered or threatened, the conference provisions of the ESA may apply (see ESA Section 7(a)(4) and 50 CFR 402.10). As stated at 50 CFR402.1O, "Federal agencies are required to confer with NMFS on any action which is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat."
>
> "Atlantic sturgeon have some potential to travel up the mainstem of the Connecticut River into the state of Massachusetts. Atlantic sturgeon are a longlived, late maturing, estuarine-dependent, anadromous species, feeding predominantly on benthic invertebrates (ASSRT 2007). They have been historically reported in the Connecticut River as far upstream as Hadley, MA. However, significant evidence that Atlantic sturgeon moved past Enfield, CT into the upper Connecticut River was previously rare since this species tends to remain in the lower river in the range of the salt wedge (River mile 6-16) (Savoy and Shake 1993). In 2006, an adult Atlantic sturgeon was observed in the spillway lift at the Holyoke Dam, providing some indication that this species may move further upstream into the freshwater reaches of the Connecticut River. However, extensive sampling and the lack of any strong evidence of Atlantic sturgeon spawning indicates that the presence of this species in the vicinity of the discharges is unlikely."

Based on the above information and EPA's assessment, the only endangered species potentially influenced by the reissuance of this permit is the shortnose sturgeon (*Acipenser brevirostrum*). It is EPA's preliminary determination that the operation of this facility, as governed by the permit action, is not likely to adversely affect the species of concern. It is our position that this permit action does not warrant a formal consultation under Section 7 of the ESA. The reasoning to support this position follows.

A. Environmental Setting

Effluent from the Easthampton WWTP is discharged to the segment MA34-04 of the Connecticut River and the segment MA34-11 of the Manhan River, both of which are classified in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00 as a Class B - warm water fishery. Class B waters are designated as a habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth and other crucial functions, and for primary and secondary contact recreation. The Standards define a warm water fishery as waters in which the maximum mean monthly temperatures generally exceed 68° F (20° C) during the summer months and are not capable of sustaining a year-round population of cold water stenothermal aquatic life.

B. Outfall Descriptions

Outfall 001 discharges to the mainstem of the Connecticut River and is located approximately 31 miles downstream of the Turners Falls Dam and approximately 6.5 miles upstream from the Holyoke Dam. The main effluent pipe is approximately 2.1 miles long and discharges to the Connecticut River by gravity. The outfall is located near shore, just downstream of the confluence of the Connecticut and Manhan Rivers. The Connecticut River is approximately 500 feet wide in the vicinity of the discharge. The current expected dilution factor in the Connecticut River is 308 (see Section IV of this Fact Sheet). During periods when discharge flows exceed the capacity of Outfall 001, flow is discharged to the Manhan River through Outfall 002. The hydraulic capacity of Outfall 001 varies based on the hydraulic regime in the Connecticut River.

C. Shortnose Sturgeon Information

Update information presented in this section on the life history and known habitat of shortnose sturgeon (SNS) in the Connecticut River was obtained from, among other sources, "The Connecticut River IBI Electrofishing NMFS Biological Opinion, Connecticut and Merrimack River Bioassessment Studies" (NMFS BO, July 30, 2009) and the Draft Endangered Species Act Section 7 Consultation Biological Opinion (BO) for the Holyoke Hydroelectric Project (Federal Energy Regulatory Commission (FERC) Permit #2004), issued to FERC by NOAA Fisheries on January 27, 2005 (NMFS BO 2005). Information dealing with the potential effects of pollutants on SNS was obtained from, among other sources, a detailed ESA response letter from NMFS to EPA regarding the Montague Water Pollution Control Facility, dated September 10, 2008 (Montague Letter).

Information gathered from a variety of sources confirms the presence of shortnose sturgeon in the Connecticut River. The population is largely divided by the Holyoke Dam, although limited successful downstream passage does occur. Modifications to the dam are currently ongoing to ensure the safe and successful upstream and downstream passage of fish, including shortnose sturgeon, at the Dam (Montague Letter).

The Holyoke Dam separates shortnose sturgeon in the Connecticut River into an upriver group (above the Dam) and a lower river group that occurs below the Dam to Long Island Sound. The abundance of the upriver group has been estimated by mark-recapture techniques using Carlin tagging (Taubert 1980) and PIT tagging (Kynard unpublished data). Estimates of total adult abundance calculated in the early 1980s range from 297 to 516 in the upriver population to 800 in the lower river population. Population estimates conducted in the l990s indicated populations in the same range. The total upriver population estimates ranged from 297 to 714 adult shortnose sturgeon, and the size of the spawning population was estimated at 47 and 98 for the years 1992 and 1993 respectively. The lower Connecticut River population estimate for sturgeon >50 cm TL was based on a Carlin and PIT tag study from 1991 to 1993. A mean value of 875 adult shortnose sturgeon was estimated by these studies. Savoy estimated that the lower river population may be as high as 1000 individuals, based on tagging studies from 1988-2002. It has been cautioned that these numbers may overestimate the abundance of the lower river group because the sampled area is not completely closed to downstream migration of upriver fish (Kynard 1997). Other estimates of the total adult population in the Connecticut River have reached 1200 (Kynard 1998) and based on Savoy's recent numbers the total population may be as high as 1400 fish (Montague Letter). Regardless of the actual number of SNS in the river, the effective breeding population consists of only the upriver population, as no lower river fish are successfully passed upstream at the present time. This effective breeding population is estimated at approximately 400 fish (NMFS BO 2009).

Several areas of the river have been identified as concentration areas. In the downriver segment, a concentration area is located in Agawam, MA which is thought to provide summer feeding and over-wintering habitat. Other concentration areas for foraging and over wintering are located in Hartford, Connecticut, at the Head of Tide (Buckley and Kynard 1985) and in the vicinity of Portland, Connecticut (CTDEP 1992). Shortnose sturgeon also make seasonal movements into the estuary, presumably to forage (Buckley and Kynard 1985; Savoy in press). Above the Dam, there are also several concentration areas. During summer, shortnose sturgeon congregate near Deerfield (NMFS BO), which is approximately 26 miles upstream of the facility discharge. Many SNS overwinter at Whitmore.

Two areas above Holyoke Dam, near Montague, have more consistently been found to provide spawning habitat for SNS. This spawning habitat is located at river km 190-192 and is the most upstream area of use. It is located just downstream of the species' historical limit in the Connecticut River at Turners Falls (river km 198). This area is approximately 31 miles upstream of the Easthampton discharge. Across the latitudinal range of the species, spawning adults typically travel to approximately river km 200 or further upstream where spawning generally occurs at the uppermost point of migration within a river (Kynard 1997; NMFS 1998). The Montague sites have been verified as spawning areas based on successful capture of sturgeon eggs and larvae in 1993, 1994, and 1995, that were 190 times the number of fertilized eggs and 10 times the number of embryos found in the Holyoke site (Vinogradov 1997). In seven years of study (1993-1999), limited successful spawning, as indicated by capture of embryos or late stage eggs, occurred only once (1995) at Holyoke Dam (Vinogradov 1997; Kynard et al. 1999c). Using this same measure, successful spawning occurred at Montague during 4 of 7 years. Both Montague and Holyoke sites have been altered by hydroelectric dam activities, but all information suggests that females spawn successfully at Montague, not at Holyoke Dam. Thus, it appears that most, if not all, recruitment to the population comes from spawning in the upriver segment (NMFS BO).

The effects of the Holyoke Project on the shortnose sturgeon's ability to migrate in the Connecticut River have likely adversely affected the shortnose sturgeon's likelihood of surviving in the river. An extensive evaluation of shortnose sturgeon rangewide revealed that shortnose sturgeon above Holyoke Dam have the slowest growth rate of any surveyed (Taubert 1980, Kynard 1997) while shortnose sturgeon in the lower Connecticut River have a high condition factor and general robustness (Savoy, in press). This suggests that there are growth advantages associated with foraging in the lower river or at the fresh-and salt-water interface. There are four documented foraging sites downstream of the Holyoke Dam, while only one exists upstream. The presence of the Holyoke Dam has likely resulted in depressed juvenile and adult growth due to inability to take advantage of the increased productivity of the fresh/salt water interface. This likely has negatively impacted the survival of the Connecticut River population of shortnose sturgeon and impeded recovery. This has also likely made the spawning periodicity of females greater (NMFS BO 2005).

D. Pollutant Discharges Permitted

1. Biochemical Oxygen Demand (BOD$_5$)

The draft permit proposes the same BOD$_5$ concentration limits as in the 2007 permit, which are based on the secondary treatment requirements set forth at 40 CFR 133.102 (a)(1), (2), (4) and 40 CFR 122.45 (f). The secondary treatment limitations are a monthly average BOD$_5$ concentration of 30 mg/l and a weekly average concentration of 45 mg/l. The draft permit also requires the permittee to report the maximum daily BOD$_5$ value each month, but does not establish an effluent limit. The monitoring frequency is two per week.

Shortnose sturgeon are known to be adversely affected by dissolved oxygen (DO) levels below 5 mg/L (Jenkins et. al 1994, Niklitschek 2001). The permit conditions above are designed to ensure that the discharge meets the MA SQWS for Class B waterbodies, which requires that waters attain a minimum DO of 5 mg/L. Discharges meeting these criteria are not likely to have any negative impacts on SNS.

2. Total Suspended Solids (TSS)

TSS can affect aquatic life directly by killing them or reducing growth rate or resistance to disease, by preventing the successful development of fish eggs and larvae, by modifying natural movements and migration, and by reducing the abundance of available food (EPA 1976). These effects are caused by TSS decreasing light penetration and by burial of the benthos. Eggs and larvae are most vulnerable to increases in solids.

The draft permit proposes the same TSS concentration limitations as in the 2007 permit. The average monthly and average weekly limits are based on the secondary treatment requirements set forth at 40 CFR 133.102 (b)(1), (2) and 40 CFR 122.45 (f) and are a monthly average TSS concentration of 30 mg/l and a weekly average concentration of 45 mg/l. The permittee has been able to achieve consistent compliance with those limits in the past. The draft permit requires the permittee to report the maximum TSS value each month, but does not establish a maximum daily effluent limit. The monitoring frequency is two per week.

Studies of the effects of turbid waters on fish suggest that concentrations of suspended solids can reach thousands of milligrams per liter before an acute toxic reaction is expected (Burton 1993). The studies reviewed by Burton demonstrated lethal effects to fish at concentrations of 580mg/L to 700,000mg/L depending on species. Sublethal effects have been observed at substantially lower turbidity levels. For example, prey consumption was significantly lower for striped bass larvae tested at concentrations of 200 and 500 mg/L compared to larvae exposed to 0 and 75 mg/L (Breitburg 1988 in Burton l993). Studies with striped bass adults showed that pre-spawners did not avoid concentrations of 954 to 1,920 mg/L to reach spawning sites (Summerfelt and Moiser 1976 and Combs 1979 in Burton l993). While there have been no directed studies on the effects of TSS on shortnose sturgeon, SNS juveniles and adults are often documented in turbid water. Dadswell (1984) reports that shortnose sturgeon are more active under lowered light conditions, such as those in turbid waters. (Montague Letter) As such, shortnose sturgeon are assumed to be as least as tolerant to suspended sediment as other estuarine fish such as striped bass.

As noted above, shortnose sturgeon eggs and larvae are less tolerant to sediment levels than juveniles and adults. Several studies have examined the effects of suspended solids on fish larvae. Observations in the Delaware River indicated that larval populations may be negatively affected when suspended material settles out of the water column (Hastings 1983). Larval survival studies conducted by Auld and Schubel (1978) showed that striped bass larvae tolerated 50 mg/l and 100 mg/l suspended sediment concentrations and that survival was significantly reduced at 1000 mg/L. According to Wilber and Clarke (2001), hatching is delayed for striped bass and white perch eggs exposed for one day to sediment concentrations of 800 and 1000 mg/L, respectively (Montague Letter).

In a study on the effects of suspended sediment on white perch and striped bass eggs and larvae performed by the ACOE (Morgan et al. 1973), researchers found that sediment began to adhere to the eggs when sediment levels of over 1000 parts per million (ppm) were reached. No adverse effects to demersal eggs and larvae have been documented at levels at or below 50 mg/L (Montague Letter). This is above the highest level authorized by this permit. Based on this information, it is likely that the discharge of sediment in the concentrations allowed by the permit will have an insignificant effect on shortnose sturgeon .

3. pH

The draft permit requires that the pH of the Easthampton WWTP effluent from Outfall 001 shall not be less than 6.0 or greater than 8.3 standard units at any time and the effluent from Outfall 002 shall not be less than 6.5 or greater than 8.3 standard units at any time. Since a pH from 6.0 to 8.3 is considered harmless to most marine organisms (Ausperger 2004), no adverse effects to SNS are likely to occur as a result of a discharge meeting the above pH range.

4. Escherichia coli (E. coli)

E. coli bacteria are indicators of the presence of fecal wastes from warm-blooded animals. The primary concern regarding elevated levels of these bacteria is for human health and exposure to pathogen-contaminated recreational waters. Fecal bacteria are not known to be toxic to aquatic life. *E. coli* limits are therefore designed to ensure compliance with human health criteria and are seasonal, corresponding to the recreational use season, consistent with the MA SWQS.

5. Total Residual Chlorine

The acute and chronic water quality criteria for chlorine defined in the 2002 EPA National Recommended Water Quality Criteria for freshwater are 19 ug/l and 11 ug/l, respectively. Given the very high dilution factor of 308 at Outfall 001 of the Easthampton WWTP, the total residual chlorine limits have been calculated as 5.85 mg/l maximum daily and 3.39 mg/l average monthly. However, the Massachusetts Implementation Policy for the Control of Toxic Pollutants in Surface Waters stipulates that the maximum effluent concentration of chlorine shall not exceed 1.0 mg/l for discharges with dilution factors greater than 100. Consequently, the 2007 permit included a maximum daily effluent limitation for TRC of 1.0 mg/l and in compliance with that policy. Based upon this analysis, the TRC maximum daily limit of 1.0 mg/l is being carried forward in the draft permit, in accordance with anti-backsliding requirements. The sampling frequency has been maintained as once per day.

For Outfall 002 of the Easthampton WWTP into the Manhan River, the total residual chlorine limits have been calculated as 1.87 mg/l maximum daily and 1.08 mg/l average monthly based on a dilution factor of 98.5. Hence, the draft permit also contains maximum daily and average monthly limits of 1.0 mg/l for Outfall 002 as well. The sampling frequency has been maintained as once per day.

There are a number of studies that have examined the effects of TRC (Post 1987; Buckley 1976; EPA 1986) on fish; however, no directed studies that have examined the effects of TRC on shortnose sturgeon. The EPA has set the Criteria Maximum Concentration (CMC or acute criteria; defined in 40 CFR 131.36 as equals the highest concentration of a pollutant to which aquatic life can be exposed for a short period of time (up to 96 hours) without deleterious effects) at 0.019 mg/L, based on an analysis of exposure of 33 freshwater species in 28 genera (EPA 1986) where acute effect values ranged from 28 ug/L for *Daphia magna* to 710 ug/L for the threespine stickleback. The CMC is set well below the minimum effect values observed in any species tested. As the water quality criteria levels have been set to be protective of even the most sensitive of the 33 freshwater species tested, it is reasonable to judge assumes that the criteria are also protective of shortnose sturgeon.

The anticipated TRC level at the outfall satisfies the EPA's ambient water quality criteria and is lower than TRC levels known to effect aquatic life. As such, the discharges of the permitted concentrations of TRC are likely to have an insignificant effect on shortnose sturgeon.

6. <u>Nitrogen</u>

DO levels in the Long Island Sound estuary, approximately 88 miles downstream from the Easthampton WWTP, have been determined to be impacted by nitrogen discharges from wastewater treatment plants on the Connecticut River and other tributaries. A TMDL has been developed that includes, *inter alia*, a Waste Load Allocation for Massachusetts, New Hampshire and Vermont wastewater facilities discharging to those receiving waters that is design to achieve the DO criteria. That WLA is currently being met, and the draft permit contains conditions to ensure that the WLA continues to be met by requiring optimization of nitrogen removal, in order to ensure that nitrogen loads do not increase over the 2004-2005 baseline of 16,254 lbs/day. Please see the nitrogen section of Part IV of this fact sheet for a detailed explanation.

A review of the DMRs from January 2008 through September 2012 indicate that the monthly average total nitrogen load (from Outfall 001 and 002 combined) varied from 85 lb/d to 574 lb/d with an average value of 275 lb/d (refer to Attachment B1 and B2). Note that data represents both maximum daily and average monthly values since nitrogen was measured only once per month. Since compliance with the baseline load is calculated on an annual basis, the annual average nitrogen loads were calculated as follows: 284.6 lb/d in 2008, 266.1 lb/d in 2009, 242.2 lb/d in 2010, 304.6 lb/d in 2011 and 281.1 lb/d in 2012 (Jan. through Sept. only). These loadings indicate that the facility has been under the baseline in all years except 2011 and will need to optimize nitrogen removal in order to comply with the nitrogen loading requirement in the draft permit.

In order to ensure that the aggregate nitrogen loading from out-of-basin point sources does not exceed the TMDL target of a 25 percent reduction over baseline loadings, EPA has included a condition in the draft permit requiring the permittee to evaluate alternative methods of operating its plant to optimize the removal of nitrogen, and to describe previous and ongoing optimization efforts. Specifically, Part I.F. of the draft permit requires an evaluation of alternative methods of operating the existing wastewater treatment facility in order to control total nitrogen levels, including, but not limited to, operational changes designed to enhance nitrification (seasonal and year round), incorporation of anoxic zones, septage receiving policies and procedures, and side stream management. This evaluation is required to be completed and submitted to EPA and MassDEP within one year of the effective date of the permit, along with a description of past and ongoing optimization efforts. The permit requires annual reports to be submitted that summarize progress and activities related to optimizing nitrogen removal efficiencies, document the annual nitrogen discharge load from the facility, and track trends relative to previous years.

The agencies intend to annually update the estimate of all out-of-basin total nitrogen loads and may incorporate total nitrogen limits in future permit modifications or reissuances as may be necessary to address increases in discharge loads, a revised TMDL, or other new information that may warrant the incorporation of numeric permit limits. There have been significant efforts by the New England Interstate

Water Pollution Control Commission (NEIWPCC) work group and others since completion of the 2000 TMDL, which are anticipated to result in revised wasteload allocations for in-basin and out-of-basin facilities. Although not a permit requirement, it is strongly recommended that any facilities planning that might be conducted should consider alternatives for further enhancing nitrogen reduction.

*7. **Phosphorus***

State water quality standards require any existing point source discharge containing nutrients in concentrations which encourage eutrophication or growth of weeds or algae shall be provided with the highest and best practical treatment to remove such nutrients. Phosphorus interferes with water uses and reduces instream dissolved oxygen. The draft permit includes a once per month monitoring requirement for effluent phosphorus from Outfall 001 and a total phosphorus limit of 0.82 mg/l from Outfall 002. If a Total Maximum Daily Load (TMDL) or other data demonstrates that the WWTP is contributing to eutrophication of the river, EPA and MassDEP may reopen the permit under Part II.A.4. of the permit and modify the limit. In order to modify the limit, a formal public review process would be required.

EPA has employed the Gold Book-recommended concentration (0.1 mg/l) to interpret the state's narrative standards for nutrients EPA also performed a reasonable potential analysis to determine whether, at the current effluent phosphorus concentration, there is reasonable potential for the discharge to cause or contribute to an exceedance of water quality criteria. EPA has taken the upstream concentration of phosphorus into account in its analysis.

Based on the reasonable potential calculation, the draft permit does not require a TP limit for Outfall 001 (Connecticut River) or Outfall 002 (Manhan River). The monthly average and daily maximum monitoring requirements for both outfalls from the 2007 permit will continue in the draft permit. Please refer to the phosphorus Section of Part IV of this fact sheet for a full discussion of the reasonable potential analysis performed.

8. ***Metals***

Certain metals in water can be toxic to aquatic life, including SNS. There is a need to limit most toxic metal concentrations in the effluent where aquatic life may be impacted. An evaluation (see the Metals discussion in Part IV of this fact sheet) of the concentration of metals in the facility's effluent (from June 2008 to September 2012 toxicity testing reports) shows that there only reasonable potential for toxicity caused by aluminum in the Connecticut River and Manhan River but not any other reported metals, including cadmium, copper, lead, nickel, and zinc. To address the potential for toxicity caused by aluminum, a monthly average limit of 87 ug/l for Outfall 001 and outfall 002 has been placed in the draft permit (as described in the Metals discussion in Part IV of this fact sheet).

*9. **Whole Effluent Toxicity (WET)***

Under Section 301(b)(1)(C) of the CWA, discharges are subject to effluent limitations based on water quality standards. The MA SWQS include the following narrative statement and requires that EPA criteria established pursuant to Section 304(a)(1) of the CWA be used as guidance for interpretation of the following narrative criteria:

> *"All surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life or wildlife."*

National studies conducted by the EPA have demonstrated that domestic sources contribute toxic constituents to WWTPs. These constituents include metals, chlorinated solvents, aromatic hydrocarbons and others. Based on the potential for toxicity from domestic and industrial sources, the state narrative water quality criterion, and in accordance with EPA national and regional policy and 40 C.F.R. § 122.44(d), the draft permit includes a whole effluent acute toxicity limitation (LC_{50} = 50%). (See also "Policy for the Development of Water Quality-Based Permit Limitations for Toxic Pollutants", 49 Fed. Reg. 9016 March 9, 1984, and EPA's "Technical Support Document for Water Quality-Based Toxics Control", September, 1991.)

Pursuant to EPA Region I policy, and MassDEP's Implementation Policy for the Control of Toxic Pollutants in Surface Waters (February 23, 1990), discharges having a dilution factors greater than 100 require acute toxicity testing two times per year and an acute LC50 limit of 50 percent. The dilution factor for the discharge from Outfall 001 is greater than 100, so in accordance with EPA and MassDEP policy the draft permit includes an LC50 limit of 50 percent and requires acute toxicity testing twice per year on the daphnid *(Ceriodaphnia dubia)*. The dilution factor for the discharge from Outfall 002 is less than 100, so in accordance with EPA and MassDEP policy the draft permit includes both an LC50 limit of 100 percent and a chronic toxicity (C-NOEC) monitoring requirement, both of which are required twice per year on the daphnid *(Ceriodaphnia dubia)*.

The permit shall be modified or alternatively revoked and reissued, to incorporate additional toxicity testing requirements, including chemical specific limits, if the results of the toxicity tests indicate the discharge causes an exceedance of any state water quality criterion. Results from these toxicity tests are considered "New Information" and the permit may be modified pursuant to 40 CFR 122.62(a)(2).

E. Finding

Based on the above analysis, including (1) the location of the Outfall 001 discharge along the west bank of a wide, channelized portion of the Connecticut River (approximately 500 feet wide); (2) the extremely high dilution factor; (3) the proposed permit limits; and (4) the minimal water quality effects of the permit action, EPA has made the preliminary determined that impacts to shortnose sturgeon from the discharge at the Easthampton WWTF, if any, will be insignificant or discountable and not likely to adversely affect shortnose sturgeon. EPA has judged that a formal consultation pursuant to Section 7 of the ESA is not required. EPA is seeking concurrence from NMFS regarding this determination through the information in this fact sheet and the draft permit, as well as a letter under separate cover.

Reinitiation of consultation will take place: (a) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in the consultation; (b) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the consultation; or (c) If a new species is listed or critical habitat is designated that may be affected by the identified action.

RESPONSE TO COMMENTS – AUGUST 5, 2013
REISSUANCE OF NPDES PERMIT NO. MA0101478
TOWN OF EASTHAMPTON
EASTHAMPTON WASTEWATER TREATMENT FACILITY
EASTHAMPTON, MASSACHUSETTS

From April 30, 2013 through May 29, 2013 the U.S. Environmental Protection Agency (EPA-New England) and the Massachusetts Department of Environmental Protection (MassDEP) solicited public comments on the draft National Pollutant Discharge Elimination System (NPDES) permit to be reissued to the Town of Easthampton, MA.

EPA-New England and MassDEP received comments from the Town of Easthampton, dated May 28, 2013 and from the Connecticut River Watershed Council, dated May 29, 2013. The comments, EPA's responses to those comments, and any corrections made to the public-noticed permit as a result of those comments are shown below.

A copy of the final permit may be obtained by writing or calling Michael Cobb, United States Environmental Protection Agency, 5 Post Office Square, Suite 100 (Mail Code: OEP06-1), Boston, Massachusetts 02109-3912; Telephone (617) 918-1369. Copies may also be obtained from the EPA Region 1 web site at http://www.epa.gov/region1/npdes/index.html.

I. COMMENTS FROM THE TOWN OF EASTHAMPTON

Comment I.A.

Permit Pages 2 of 19 and 4 of 19, Table A.1. *Total Residual Chlorine and E Coli Compliance dates of April 1 to November 30 for Outfalls 001 and 002*

Based on the existing NPDES permit and proposed renewal, seasonal E. Coli and Total Residual Chlorine (TRC) limits are in effect from April 1 to November 30. This seasonal timeframe is not consistent with other dischargers to the same Connecticut River segment (MA34-04), including Northampton, Hadley, Hatfield, and Sunderland, or dischargers in the next downstream segment (MA34-05), including Holyoke, South Hadley, and Chicopee. All of these dischargers have seasonal disinfection limits from April 1 through October 31. We request that Easthampton seasonal disinfection period be modified to April 1 to October 31.

Response I.A.

EPA acknowledges that the NPDES permits for the facilities listed above have bacteria limits from April 1 to October 31. However, in the 2007 permit reissuance, EPA received a comment documenting recreational uses of the Manhan River and the Oxbow, downstream of this discharge after October 31. Accordingly, EPA made the decision at that time to extend the bacteria limits for Easthampton to include the month of November, acknowledging that recreational use during the period of December 1 through March 31 is likely to be limited. EPA will carry forward these seasonal limits for Outfall 002 (Manhan River) from April 1 through November 30 in this permit reissuance to continue to be protective of all recreational uses of the receiving water and the Oxbow. However, there does not appear to be any recreational activities in the Connecticut River after October 31, and the discharge from Outfall 001 (Connecticut River) does not affect the Oxbow. Hence, the seasonal *E. coli* and TRC limits for Outfall 001 will be April 1 through October 31, consistent with other nearby facilities. Should the facility need to discharge from Outfall 002 during the month of November, the disinfection system must be operative and given adequate start-up time to comply with the bacteria limits.

Comment I.B.

Permit Pages 2 of 19 and 4 of 19, Table A.1. *New Dissolved Oxygen limit of Not Less Than 6.0 mg/L for Outfalls 001 and 002*

The Fact Sheet mistakenly noted that the dissolved oxygen requirement was continued from the existing permit. However, the Easthampton Wastewater Treatment Plant does not currently have an effluent dissolved oxygen limit. Based on the very high dilution factors (greater than 300 to the Connecticut River and almost 100 to the Manhan River), it does not appear that Easthampton's effluent dissolved oxygen has the potential to impact the in-stream dissolved oxygen concentrations and thus we believe this is the reason that the current permit does not contain a limit. We request that this error be corrected and the dissolved oxygen limit be removed from the NPDES permit.

Response I.B.

Dissolved oxygen (DO) limits were not included in the previous permit, and upon further review EPA agrees that DO limits should not be included in the final permit. Data submitted by the facility show that effluent discharge DO concentrations are less than the state water quality DO criterion (5.0 mg/L for warm water fisheries), but available information indicates that the receiving water does not violate the water quality criterion upstream or downstream of the discharges. EPA believes that discharge concentrations less than 5.0 mg/l will not cause, have the reasonable potential to cause, or contribute to violations of the state DO criteria because of the high dilution and rapid mixing of the discharges.

Comment I.C.

Permit Page 2 of 19, Table A.1 *New aluminum limit 87 ug/L*

The new aluminum limit based on a determination of "reasonable potential", as discussed in the Fact Sheet (pages 16 – 22 and Attachments B4, D, and E). The equation used to determine reasonable potential is: $Q_dC_d + Q_sC_s = Q_rC_r$. Flows in the rivers (Q_s) relative to the effluent (Q_d) are high, and the median background in-stream aluminum concentrations (C_s) in the Connecticut River and Manhan River, 123.5 ug/L and 467 ug/L, respectively, exceed the chronic criteria of 87 ug/L. Therefore, even if the effluent aluminum concentration from the WWTP (C_s) was zero, the methodology would still result in a determination of reasonable potential.

Another approach, including review of the effluent data, consideration of the treatment processes at the WWTP, and consideration of the buffering capacities of the rivers is requested. The WWTP does not add aluminum-based coagulants to the treatment process and currently has an industrial pre-treatment program in place. The WWTP is designed for secondary treatment without tertiary treatment process and chemical addition. As presented in Part B4 of Attachment B of the Fact Sheet, of the ten samples for Outfall 001 to the Connecticut River, only one exceeded the proposed limit of 87 ug/L. However, this exceedance was the oldest test result, from 6/13/2008, and may be an outlier. Half of the results were non-detect. All of the six samples of effluent to the Manhan River (Outfall 002) were less than 87 ug/L.

In addition, there is no clear detrimental effect to the receiving water, and it is burdensome for the WWTP to meet such a strict aluminum limit. The ambient water quality criteria used in the evaluation of the aluminum permit limit was based on a survey conducted in 1988 of available aluminum toxicity literature[1]. Since that time it has been shown by several aluminum speciation and toxicity studies that aluminum alone is not sufficient to cause toxicity to aquatic organisms. Rather, it is the type of aluminum species present in the water that is the key factor in determining its toxicity. Aluminum speciation, bioavailability, and toxicity are dependent on diverse water quality parameters such as the buffering capacity, dissolved organic carbon content, and pH of the water[2]. Both the Connecticut River and the Manhan River, to which the WWTP discharges, have high buffering capacities (median of 38 mg/L and 23 mg/L of hardness, respectively, according to the fact sheet). Several studies have concluded that aluminum toxicity is only present in poorly buffered streams when the pH becomes acidic resulting in increased speciation of aluminum into bioavailable and toxic forms[2].
As indicated in Footnote (L) of the table that includes the Federal Water Quality Standard of 87 ug/L, based on the acute toxicity standard for aluminum:

"There are three major reasons why the use of Water-Effect Ratios might be appropriate.

1. *The value of 87 μg/l is based on a toxicity test with the striped bass in water with pH = 6.5–6.6 and hardness <10 mg/L. Data in "Aluminum Water-Effect Ratio for the 3M Plant Effluent Discharge, Middleway, West Virginia" (May 1994) indicate that aluminum is substantially less toxic at higher pH and hardness, but the effects of pH and hardness are not well quantified at this time.*

2. *In tests with the brook trout at low pH and hardness, effects increased with increasing concentrations of total aluminum even though the concentration of dissolved aluminum was constant, indicating that total recoverable is a more appropriate measurement than dissolved, at least when particulate aluminum is primarily aluminum hydroxide particles. In surface waters, however, the total recoverable procedure might measure aluminum associated with clay particles, which might be less toxic than aluminum associated with aluminum hydroxide.*

3. *EPA is aware of field data indicating that many high quality waters in the U.S. contain more than 87 ug aluminum/L, when either total recoverable or dissolved is measured."*

Both the Connecticut River and the Manhan River have higher buffering capacities than the 10 mg/L suggested, as indicated in the Fact Sheet.

<u>We request that the aluminum limit be removed and replaced with a requirement for monitoring only.</u> Due to the significant burden of imposing limits using inappropriate methodology, we request that imposition of any future limits be deferred until such time as a site specific study is completed, as has been the practice for the adoption of copper limits for a number of receiving streams in MA.

[1] USEPA, 1988. Ambient water quality criteria for aluminum — 1988. EPA 440/5–86–008. Washington, D.C., U.S. Environmental Protection Agency.

[2] Robert W. Gensemer & Richard C. Playle (1999): The Bioavailability and Toxicity of Aluminum in Aquatic Environments, Critical Reviews in Environmental Science and Technology, 29:4, 315-450.

Response I.C.

The analysis done in the Fact Sheet determined that there was reasonable potential for aluminum to cause or contribute to an exceedance of water quality standards. The median background aluminum concentration reported for both the Connecticut River and the Manhan River exceeded the chronic criterion of 87 ug/l. Based upon this, any discharge above the criterion would clearly contribute to this exceedance of standards and justify a permit limit. As described above, the test result dated 6/13/2008 for Outfall 001 was such an exceedance (140 ug/l > 87 ug/l). However, there was not such an exceedance for the Outfall 002 data. Hence, the permit limit remains for Outfall 001, but the limit has been removed for Outfall 002 and replaced with a quarterly monitoring requirement. This monitoring requirement is established in order to better characterize the discharge and provide a more robust data set for future permitting decisions

EPA continues to review and update its methodology for determining reasonable potential, but believes that the analysis done for this discharge was appropriate. If MassDEP chooses to develop and adopt a site-specific aluminum criterion based upon the water effects ratio (or any other site-specific criterion) using the referenced literature and site-specific conditions described in this comment, and EPA approves such a criterion, this permit may be reopened and reasonable potential for aluminum may be reevaluated.

Comment I.D.

Permit Page 7 of 19, Table A.1 Footnote 9: *Acute toxicity test for Outfall 002 during second week of March and December*

Because Outfall 002 to the Manhan River is only in use during high flow events, it may not be discharging during the second week of March and December. Therefore, we request that acute toxicity testing for Outfall 002 be required during the second week of March and December only if the outfall is active.

Response I.D.

EPA agrees that toxicity testing is only required if the outfall is active. If the discharge is not active during either of those two weeks, then toxicity testing should be done on the first day that discharge does occur following those weeks. If the discharge is not active for the remainder of the months of March or December, no toxicity test is required for that quarter. A footnote has been included in the final permit describing this requirement.

Comment I.E.

Permit Page 16 of 19, Part E.3: *Date for annual industrial pretreatment program reporting*

During renewal of the existing NPDES permit (2007), the date for submission of the Annual Industrial Pretreatment Report was accidentally moved by EPA from November 1 to March 1. We request that the date be moved back to November 1 in this renewed permit.

Response I.E.

The annual Industrial Pretreatment Report will be due on November 1, as reflected in the final permit.

Comment I.E.

Permit Page 17 of 19, Part F: *Nitrogen optimization report requirement*

The existing NPDES permit (2007) required the City to conduct a Nitrogen Optimization Study to evaluate alternative methods of operating the existing wastewater treatment facility to optimize the removal of nitrogen and submit a report to EPA and MassDEP. This report was submitted in November 2008 and to date neither agency has responded to the submittal. The requirements for a Nitrogen Optimization Report are repeated in this draft renewal. Since the City already completed the evaluation in 2008 and the treatment processes at the WWTP have not changed, we request that Part F. Special Conditions be modified to remove the requirement to repeat the nitrogen optimization study and eliminate the unnecessary expenditure of the City's limited funds.

Response I.F.

EPA received the City of Easthampton's Nitrogen Optimization Study report in 2008, however, these reports are not typically reviewed. The permit requirement to evaluate alternative methods of nitrogen removal is intended to benefit the City in developing its options for meeting the nitrogen requirements set forth in the permit. Based upon this recent submittal, the special condition to submit another Nitrogen Optimization Study report has been modified in the final permit. The facility is instead required to update the existing report, if necessary, and maintain a copy to be available upon request.

Comment I.F.

Permit Page 17 of 19, Part F: *Baseline loading for nitrogen*

According to the Fact Sheet:

> *"In December 2000, the Connecticut Department of Environmental Protection (CT DEP) completed a TMDL for addressing nitrogen-driven eutrophication impacts in Long Island Sound. The TMDL included a waste load allocation (WLA) for point sources and a load allocation (LA) for non-point sources. The point source WLA for out-of-basin sources (Massachusetts, New Hampshire and Vermont wastewater facilities discharging to the Connecticut, Housatonic and Thames River watersheds) requires an aggregate 25 percent reduction from the baseline total nitrogen loading estimated in the TMDL. The baseline total nitrogen point source loadings estimated for the Connecticut, Housatonic, and Thames River watersheds were 21,672 lbs/day, 3,286 lbs/day, and 1,253 lbs/day respectively (see table below). The estimated current point source total nitrogen loadings for the Connecticut, Housatonic, and Thames Rivers respectively are 13,836 lbs/day, 2,151 lbs/day, and 1,015 lbs/day, based on recent information and including all POTWs in the watershed. The following table summarizes the estimated baseline loadings, TMDL target loadings, and estimated current loadings:*

	Basin Baseline Loading* (lbs/day)	***TMDL Target** (lbs/day)***	***Current Loading*** (lbs/day)***
Connecticut River	*21,672*	*16,254*	*13,836*

Housatonic River	*3,286*	*2,464*	*2,151*
Thames River	*1,253*	*939*	*1,015*
Totals	*26,211*	*19,657*	*17,002*

** Estimated loading from TMDL (see Appendix 3 to CT DEP "Report on Nitrogen Loads to Long Island Sound", April 1998).*
*** Reduction of 25% from baseline loading.*
**** Estimated current loading from 2004 – 2005 DMR data.*
The TMDL target of a 25 percent aggregate reduction from baseline loadings is currently being met.

According to the Fact Sheet, the baseline loading for the Easthampton WWTP used in the above analysis was 493.7 lbs/day, and 2008 loading was 284.6 lbs/day. The existing benchmark total nitrogen mass loading estimate included in Part F. Special Conditions is 284.6 lbs/day based on 2008 effluent data from the WWTP.

As summarized in the Fact Sheet, the average annual loads from 2008-2012 (partial) ranged from 242.2 lbs/day to 304.6 lbs/day; all were below the baseline load used for the TMDL calculation of 493.7 lbs/day. As discussed in the 2008 Nitrogen Optimization Report, the Easthampton WWTP does not have the ability to modify operations to removal additional nitrogen; the WWTP was designed for secondary treatment of BOD and TSS and does not include nitrification and denitrification processes. Therefore, without total nitrogen removal, effluent total nitrogen loads are expected to be largely a function of influent flows and loads. Fluctuations above the 2008 annual average are possible, as seen in 2011. Because the current loads are less than 60% of the baseline used in the TMDL, it is not expected that any of these fluctuations will exceed that baseline.

<u>We request that total nitrogen monitoring requirements continue, but that the baseline load of 493.7 lbs/day used in the TMDL be the benchmark load for comparison rather than the 2008 load of 284.6 lbs/day since EPA has not demonstrated that the lower load is necessary to achieve compliance with the TMDL.</u>

Response I.F.

The load of 493.7 lb/day used in the TMDL was an <u>estimate</u> based on average MA secondary treatment plant effluent concentrations and the average flow from this facility for 2004-2005. In order to get a more accurate assessment of the facility's nitrogen discharge, the 2007 permit required the facility to maintain the mass discharge loading of total nitrogen, based on the <u>actual load</u> monitored over the first year of the permit term (2008). In 2008, the facility discharged an average of 284.6 lb/day. As discussed in the Fact Sheet, the average annual loads from 2008-2012 (partial) ranged from 242.2 lb/day to 304.6 lb/day. Given the variability in the actual data, EPA has reevaluated the baseline load to be included in the final permit and decided to use **304.6 lbs/day**. This is the maximum measured annual average load (2011) during the previous permit cycle (2008-2012) and is well below the 493.7 lbs/day assumed in the 2008 permit. Hence, this load is in accordance with the TMDL and should be achievable by the facility through nitrogen optimization. The facility is required to optimize nitrogen removal to the extent necessary to maintain this load, on an annual average basis.

II. COMMENTS FROM THE CONNECTICUT RIVER WATERSHED COUNCIL

Comment II.A.

The Connecticut River in the vicinity of outfall 001 is heavily used for recreation. A busy state-owned boat launch is located on the Oxbow near Easthampton's outfall 001. Across from where the Oxbow connects with the River is a state-owned beach called Hockanum Beach (formerly called Tent City). This beach has a rope swing and a sandy area that attracts swimmers and boaters. The section upstream of the Holyoke Dam is very heavily used by all kinds of motor boaters (including jet skis).

Response II.A.

EPA acknowledges the existing uses described in this comment. The uses listed are consistent with the designated uses included in the Massachusetts Surface Water Quality Standards for Class B waters, which are "habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. Where designated they shall be suitable as a source of public water supply with appropriate treatment. They shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value."

Comment II.B.

The Oxbow section of the Connecticut River, into which the Manhan River flows, is heavily used by several recreational groups. The Oxbow marina is a commercial marina for motor boats. The Northampton crew team operates a row house on the Oxbow, and has community rowing programs. A water ski jump ramp lies in the Oxbow and professional water skiing teams perform in front of an audience in bleachers near the Northampton rowing building. The Easthampton Rod & Gun Club has a building on the banks of the Oxbow, and they have motor boats docked there.

Response II.B.

EPA acknowledges the existing uses described in this comment. See response II.A. above.

Comment II.C.

In 2012, CRWC volunteers conducted water quality monitoring at the Oxbow boat ramp, testing for E. coli once a week between late May and early October. Testing is resuming tomorrow for the 2013 season. Results from 2012 and 2013 are available online at www.connecticutriver.us.

Response II.C.

EPA has reviewed the data collected from 2012 and 2013 in the vicinity of the Easthampton discharge (Connecticut River Oxbow, Easthampton at State Boat Ramp). The most recent data indicates that the receiving water is currently "clean" for both swimming and boating (< 235 cfu/100ml). However, since May of 2012 five out of 22 samples indicated the river was only "clean" for boating (between 235 and 575 cfu/ml) and two out of those 22 samples indicated the receiving water was not "clean" for swimming or boating (> 575 cfu/ml). It is unclear whether the discharge from Easthampton caused any of these elevated levels of bacteria, but the final permit requires the facility to adequately disinfect the effluent to meet E. coli limits of 126 cfu/ml (monthly average) and 409 cfu/ml (daily maximum). These limits are considered to be protective of existing uses, including both swimming and boating. EPA appreciates the CRWC volunteers who are able to conduct the referenced bacteria monitoring and make it available for public use.

Comment II.D.

CRWC supports the addition of a dissolved oxygen limit and a total recoverable aluminum limit for outfalls 001 and 002.

Response II.D.

Upon further review, the dissolved oxygen limits for both outfalls and the aluminum limit for Outfall 002 were determined to be unnecessary. Refer to responses I.B. and I.C. above.

Comment II.E.

Page 4 of the Fact Sheet indicates that the peak capacity of outfall 001 is 3.1 million gallons per day (mgd) at "normal river level." The capacity in this permit reissuance for outfall 001 is set at 3 mgd, and the capacity for outfall 002 is set at 0.8 mgd, which is the difference between the 3.8 mgd design flow and the capacity of outfall 001. We are glad to see that there has been a reduction of flows to outfall 002 since May 2010. For the record, we are not in favor of the City of Easthampton diverting the entire WWTP discharge to the Manhan River in the future, and we're not sure how this could be done without seriously degrading water quality in the Manhan River and the Oxbow.

Response II.E.

Your comments are noted and are part of the administrative record for the permit. Any increase in authorized flow to the Manhan would have to be consistent with antidegradation, to ensure that existing water quality would not be degraded.

Comment II.F.

We don't understand why the USGS gage data used for the 7Q10 calculation at 001 is a period of record 1904-2004. The most recent decade should be incorporated, and the period of time prior to installation of the U.S. Army Corps of Engineer flood control dams upstream (after the 1936 and 1938 floods) should be taken out.

Response II.F.

The 7Q10 was calculated in the 2007 permit reissuance using the data available at that time. In this permit reissuance, it was determined that the most recent data would not significantly affect the 7Q10 calculation for the Connecticut River (Outfall 001) or any relevant permit limits or requirements.

It should also be noted that the 7Q10 of the Manhan River was not used because the facility does not discharge to the Manhan River during times of low flow.

Comment II.G.

We have reviewed the Manhan River dilution factor calculation and rationale. The Fact Sheet explains that a flow of 117 cfs is being used, based on Mill River flows for the times of year that outfall 002 tends to be used. For comparison purposes, we used the map of the outfall 002 location in the Fact Sheet and USGS's Streamstats to look at calculated flow statistics for the Manhan River at that location. For one thing, the program would not calculate flow based on nearby USGS gages, because no nearby gage was within 50% of the basin size of the Manhan. That may indicate a flaw in using the nearby Mill River gage. Using regression equations, Streamstats calculated a 7Q10 of 12.6 cubic feet per second (cfs) and a D50 of 85.6 cfs. CRWC believes that using 117 cfs is not conservative enough, since it is higher than the D50 for the Manhan River at this location. We understand that outfall 002 tends to be used during high flow events, but as recently as late 2009 a blockage in 001 caused all flow to be diverted to outfall 002 for more than a month. I don't know the flow of the Manhan River during that time, but it seems entirely possible that flows may have been average for that time of year. In addition, the draft permit sets no flow limits on 002, so circumstances could change at any time and water quality would suffer. Local tributary flows also do not always mimic flow increases or decreases on the mainstem Connecticut River due to the scale of the Connecticut River. Chronic toxicity testing for outfall 002 should not be eliminated until outfall 002 is eliminated.

Response II.G.

In the Fact Sheet, EPA's reevaluation of the Manhan River low flow (for Outfall 002) was done using actual daily discharge data since May of 2010, not merely "flows for the times of year that outfall 002 tends to be used" as described in the comment above. Each day that Easthampton discharged into the Manhan River, corresponding flow data in the Mill River was determined. The minimum Mill River flow on any single day when a discharge to the Manhan River occurred was 73 cfs. This flow was extrapolated for the Manhan River based upon the drainage area of the two basins, resulting in a low flow in the Manhan River of 117 cfs. It should be noted that the drainage area of the Manhan River is 84 sq. miles and that of the Mill River is 52.6 sq. miles, within 50% of the size of the Manhan River basin. Although there is not a flow limit for Outfall 002, it is expected that under normal operation the facility will maximize flow to Outfall 001 and the limits will be protective of both receiving waters. Accordingly, a permit condition has been added to the final permit requiring the facility to maximize flow through Outfall 001.

Regarding toxicity testing for Outfall 002, EPA's policy is to require chronic toxicity testing for discharges with a dilution factor of 20 or less. As shown in the Fact Sheet, Outfall 002 to the Manhan River has a dilution factor of 98.5, well above this threshold. Hence, only acute toxicity testing is required.

Comment II.H.

The permit sets mass-based limits on BOD and TSS for the sum of outfalls 001 and 002. Since the two outfalls discharge to two different water bodies, this does not make sense. Outfall 002 discharges to the Manhan River and then the Oxbow, which is impaired for turbidity. There should be a mass-based limit specific to the Manhan that is protective of the Manhan and the Oxbow.

Response II.H.

As shown in the Fact Sheet, EPA applied secondary treatment technology-based limits for BOD and TSS (30 mg/l monthly average, 45 mg/l weekly average, and 85% removal based on 40 CFR 133.102(a), 40 CFR 133.102(b), and 40 CFR 122.45(f), respectively). The concentration-based limits were converted to mass-based limits and applied to the sum of the flow from Outfalls 001 and 002 in order to account for the total load being discharged from the facility each monitoring period. According to the commenter and the Massachusetts Year 2012 Integrated List of Waters, the Oxbow (Segment ID MA34066) is impaired for turbidity. Hence, EPA has reevaluated this discharge to determine whether it has the reasonable potential to cause or contribute to the turbidity impairment. Note that the narrative aesthetics criterion in the Massachusetts Surface Water Quality Standards states that surface waters should be "*free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life.*"

Based on a review of the facility's TSS monitoring, the maximum recorded discharge into the Manhan River was 46 mg/l (03/31/2008). Dividing this effluent concentration by the dilution factor (98.5) results in a downstream TSS concentration of 0.47 mg/l (46/98.5) before entering the Oxbow. Although the criterion is narrative, EPA believes that this very small contribution of TSS into the Manhan River does not have the reasonable potential to cause or contribute to the turbidity impairment in the Oxbow. Additionally, the secondary treatment limitations for TSS are sufficient to ensure that TSS loads do not increase in the future.

Comment II.I.

We note that there have been frequent E. coli violations at both outfalls, and we would like to know how the facility plans to comply with limits better in the future, given that both outfalls are in bacteria-impaired waters.

Response II.I.

EPA acknowledges the frequent *E. coli* violations. Should the facility be unable to comply with the *E. coli* limits included in this permit reissuance through adequate disinfection, the permittee will be in violation of its NPDES permit and at risk of enforcement action and penalties. Also see response II.C above.

Comment II.J.

The reasonable potential analysis for phosphorus at outfall 002 shown on pages 15-16 in the Fact Sheet does not consider that the Manhan River discharges into the Oxbow, which is impaired for turbidity and non-native aquatic vegetation. A separate calculation that treats the Oxbow as a lake should be done.

Response II.J.

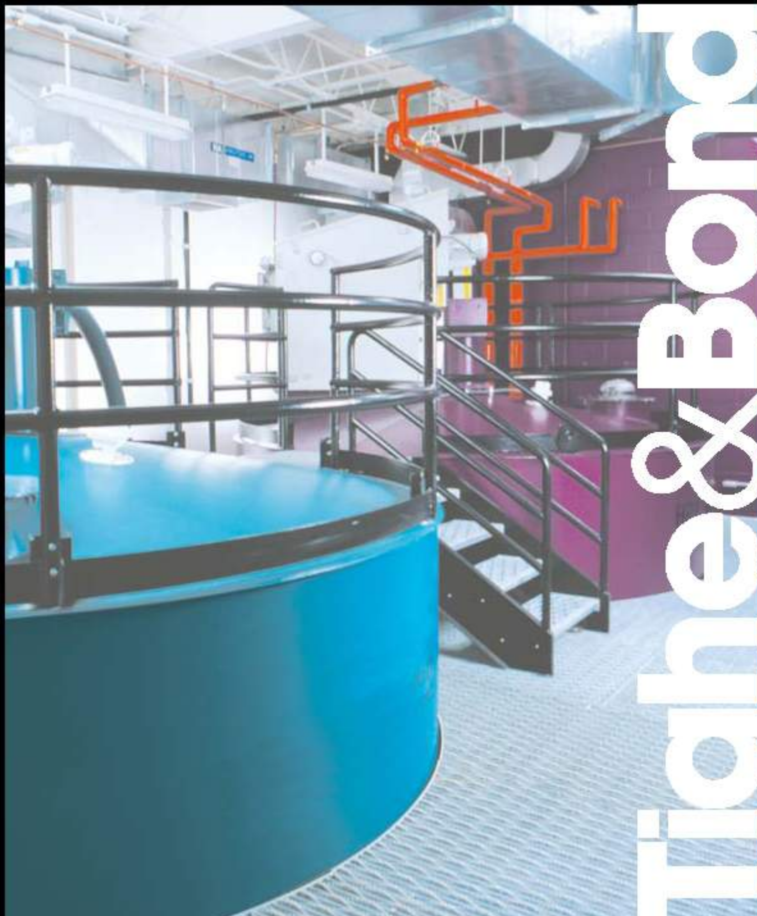
EPA agrees that the phosphorus analysis should be reevaluated to consider the presence of the Oxbow as a lake or impoundment just downstream of Outfall 002 into the Manhan River. The Fact Sheet references EPA's Quality Criteria for Water 1986 (the Gold Book) in selecting the target in-stream phosphorus concentration of 100 ug/l. However, the Gold Book also states that total phosphorus “should not exceed 50 ug/l in any stream at the point where it enters any lake or reservoir” (such as the point where the Manhan River enters the Oxbow). In this case, the analysis in the Fact Sheet demonstrates that the discharge from Outfall 002 only has the reasonable potential to result in an instream concentration of 45 ug/l (< 50 ug/l). Hence, there is no reasonable potential to contribute to a violation of water quality standards in the Manhan River or in the Oxbow, and a phosphorus limit is not required.

Comment II.K.

We would like to see Fact Sheets describe the actual reductions in I/I accomplished by the permittee since the last permit renewal. In the case of Easthampton, we understand that an unpermitted CSO was recently fixed in a sewershed that is subject to excessive inflow and infiltration and we would like to see that EPA and MassDEP checks on the progress of I/I reduction by each permittee.

Response II.K.

EPA and MassDEP are actively involved in working with municipalities to reduce I/I and unpermitted overflows. In the case of Easthampton, an Administrative Consent Order (ACO) was issued by MassDEP on April 16, 2010 regarding the elimination of two unauthorized overflows from manholes just upstream of pump stations within their sewershed. EPA confirmed with MassDEP that one of these overflows was eliminated in May of 2010 and the second was eliminated in March of 2013, in accordance with the ACO. Additionally, the City has an I/I removal plan last updated in 2008 which includes flow monitoring, TV inspection, a prioritized removal plan, a private inflow source removal program, and a public education program. In their recent application, Easthampton estimated current I/I as 1.1 MGD. EPA will continue to monitor the progress and implementation of this I/I removal plan during the coming permit cycle.



APPENDIX D

From: erik.morgan@nu.com on behalf of wmecodg@nu.com
To: Dennis G. Moran
Subject: Pre-Applicaiton Report PAR 60 City of Easthampton
Date: Monday, January 27, 2014 2:04:12 PM

Thank you for contacting WMECO DG and submitting a request for a Pre-Application Report.

Pre-Application Report ID Number: PAR 60 Request Received: 1/3/2014 Report Sent: 1/27/2014

Location: Gosselin Drive Easthampton
Facility: 600 kW Biogas Cogen

Interconnecting Customer: The City of Easthampton

The Company is providing the following information for the proposed Facility interconnection location(s) in the Pre-Application Report:

1) Circuit voltage at the substation: 23 kV

2) Circuit name: 15A5

3) Circuit voltage at proposed Facility: 23 kV

4) Whether Single or three phase is available near site: The Customer currently has three phase service.

5) If single phase – distance from three phase service: N/A

6) Aggregate connected Facilities (kW) on circuit: 98.235 kW

7) Submitted complete applications of Facilities (kW) on circuit that have not yet been interconnected: 6 kW

8) Whether the Interconnecting Customer is served by an area network, a spot network, or radial system: radial

9) Identification of feeders within ¼ mile of the proposed interconnection site through a snap-shot of GIS map or other means: The 19B3 and 19B4 three phase 13.8 kV feeders are in a right of way behind the facility and cross Ferry St just east of Pleasant St.

10) Other potential system constraints or critical items that may impact the proposed Facility: The facility is currently fed by a 300 kVA transformer. The facility is located electrically downstream of two reclosers and in a loop scheme.

- **DISCLAIMER**: Be aware that this Pre-Application Report is simply a snapshot in time and is non-binding. Systems conditions can and do change frequently.
- **DPU Net Metering Requirements:** The Department of Public Utilities has a website dedicated to net metering which contains important information relative to net metering eligibility, including a *Fact Sheet: Rules on Net Metering*, and Frequently Asked Questions. Please visit: http://www.mass.gov/dpu/netmetering or call 617-305-3500. The System of Assurance is (www.MassACA.org) responsible for determining net metering eligibility and granting cap

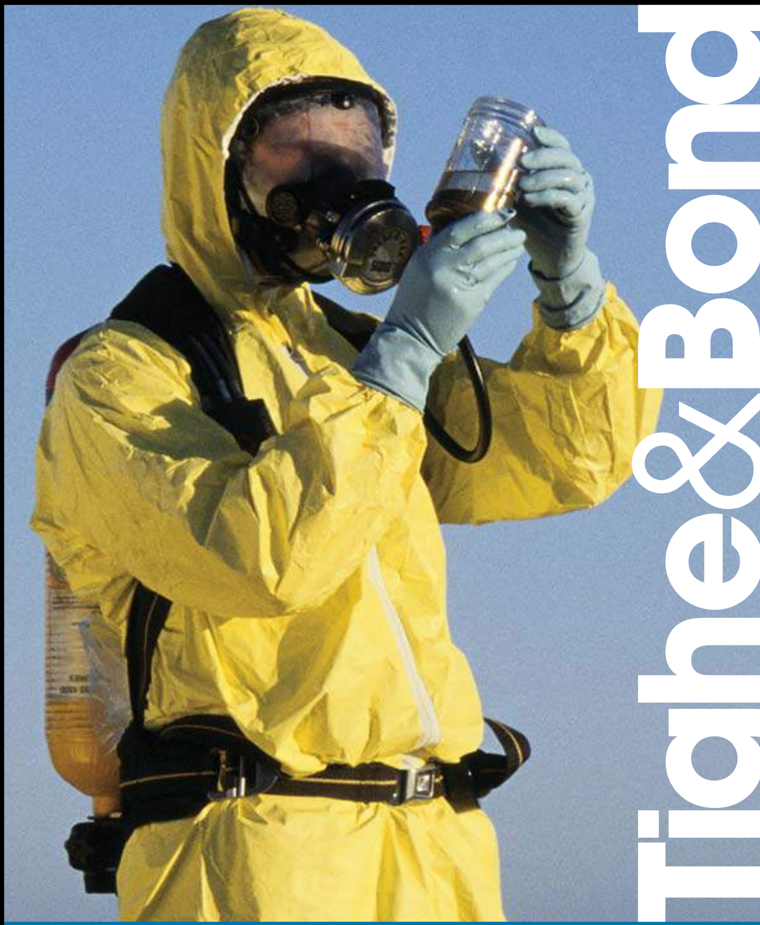
allocations. The MassACA can be reached at administrator@massaca.org or 877-357-9030. To be considered a Public Facility, the Host Customer and any customers they are allocating to must apply to the DPU for certification as a Municipality or Other Governmental Entity (http://www.env.state.ma.us/dpu/docs/electric/12-01/7912dpuordapc.pdf). The DPU can be reached at dpu.netmetering@state.ma.us or 617-305-3500.

-
- Please see WMECO's distributed generation website for a copy of the DG Tariff along with interconnection applications: www.wmeco.com/distributedgeneration

- Please see WMECO's net metering website for a copy of the Net Metering Tariff along with the Schedule Z form: www.wmeco.com/netmetering
-

Thanks

Erik Morgan
Associate Engineer
WMECO Asset Management - DG
erik.morgan@nu.com
(413) 585-1745
Hadley AWC



APPENDIX E

Attachment 1: Bioferm Equipment Specifications

Tighe&Bond

COCCUS® Plant System

Biogas Systems for Feedstock with Low Solids Content



COCCUS® is a complete mix anaerobic digester that is operated at the mesophillic temperature range. It is designed for input materials with low solids content (between 8 – 12%). The tank is a reinforced concrete design with 2 or 3 large REMEX® paddle mixers. The drive motor of the mixer is mounted onto the outside wall of COCCUS® so that only the polyamide bearings are located inside the fermenter. The tank is heated through hydronic heating installed onto the interior tank wall. Biological desulfurization is integrated into the wooden roof structure of the gas storage which provides for a cost effective removal of a large part of the hydrogen sulfide.

Technical Components

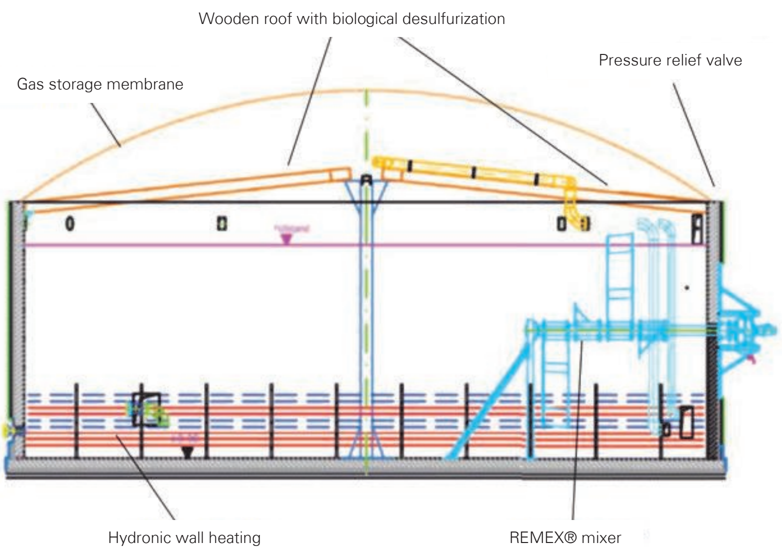
- Paddle mixers with energy efficient drive units for optimal mixing to support continuous gas production
- Hydronic heat distribution on interior of digester tank wall uniformly heats substrate
- Concrete coating in gas space protects concrete and reduces maintenance cost
- Integrated biological desulfurization in wooden roof structure
- Dual membrane roof system provides gas storage at constant pressure
- Robust feeder for individually tailored feedstock charging
- All technical equipment installed in one building
- Frost-proof and low maintenance pressure relief valve

System Advantages

- Integrated biological desulfurization
- Low parasitic energy consumption
- Industrial grade components
- Fully automated operation
- Professional plant control systems with PLC technology
- Short construction time
- Quality components result in low maintenance
- Scalable

About BIOFerm™

BIOFerm™ Energy Systems is a member of the Viessmann Group, a $2.5 billion family owned business since 1917. Viessmann has installed over 30 dry AD and 250 wet AD facilities through the biogas companies of the Viessmann Group. BIOFerm™ Energy Systems was founded in Madison, WI in 2007 and now offers all biogas technologies of the Viessmann Group.



BIOFERM™
ENERGY SYSTEMS
VIESSMANN Group

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Email info@BiofermEnergy.com
www.BiofermEnergy.com

Agricultural Applications

Biogas Plants Starting at 85 kW

The COCCUS® system provides the ideal technology to treat dairy manure and other liquid waste streams from animal farming applications. The system is fully scalable starting with different tank sizes and the option to combine multiple tanks. The smallest COCCUS® tank can treat manure from approximately 500 dairy cows and has a minimum electric capacity of 85 kW.

Nutrient Management

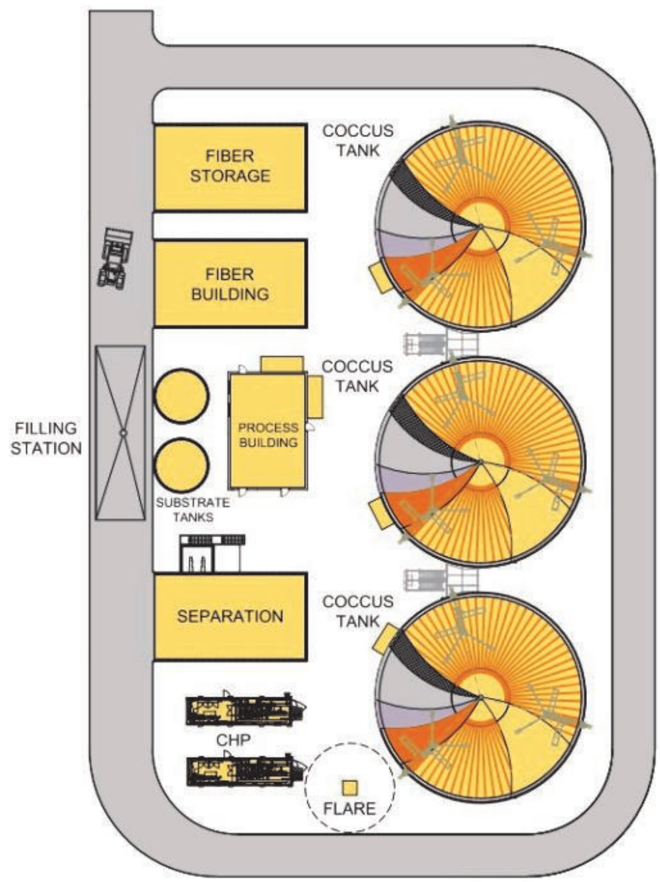
Nutrients are conserved and improved through the digestion process and protein degradation results in a more readily available nitrogen for plants. Organic nitrogen is converted to ammoniacal nitrogen and organic phosphorous is converted into orthophosphate making it a superior fertilizer than untreated manure. The NPK ratio in the effluent is consistent with that of the untreated manure. The solid and liquid effluent can be separated to concentrate streams of phosphorus and nitrogen and the solids can either be used as a fertilizer or as bedding for barns.

Energy Independence

Creating renewable electricity and heat makes a farm operation energy independent and protects from fluctuating energy prices. Electricity can be used to power farm equipment and adjacent buildings. The process heat can be used to further dry the solids into a saleable compost material and generate additional revenue for the operation.

Optional Equipment

- Liquid digestate separator
- Final storage for liquid and solids
- Solids dryer
- Gas upgrading for LNG
- Chopper pump
- Co-substrate (food waste and FOG reception and dosing equipment to boost gas production)



Animal	# of Animals	Estimated continuous kW Output	Plant Size
1400 lbs Dairy Cow[1]	500	85 - 140	1 COCCUS Tank
1400 lbs Dairy Cow[1]	1,000	165 - 265	1 COCCUS Tank
1400 lbs Dairy Cow[1]	5,000	820 -1,320	2-3 COCCUS Tanks
420 lbs Swine[2]	5,000	75 - 120	1 COCCUS Tank
420 lbs Swine[2]	10,000	150 - 240	1 COCCUS Tank

[1] Typical COD conversion efficiency of 50 - 60%
[2] Typical COD conversion efficient of 50 - 70%

EUCO® Plant System

Biogas Systems for Feedstock with High Solids Content



Plant Systems

EUCO® is a horizontal plug flow digester that is operated at the mesophillic temperature range. It is designed for input materials with higher solids content and runs at an average TS value of 17%.

EUCO® has a rectangular footprint and a horizontal paddle mixer than runs the full length of the tank. The mixer is powered by planetary drive units at both ends. The tank is heated through the horizontal mixer shaft. Solid material is loaded into the tank via the PASCO® feeder system. The main function of the EUCO® is to liquefy (hydrolyze) the solid feedstock to provide the second-stage digester with well broken down material. Gas production also occurs during the hydrolysis stage in EUCO® and makes up about 50% of the total production when combined with a second stage digester, such as COCCUS®.

Technical Components

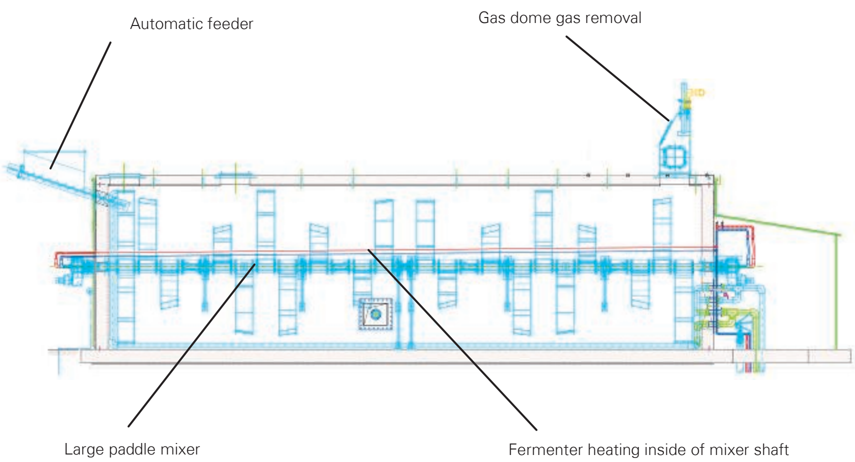
- Horizontal paddle mixer ensure even temperature distribution
- Concrete coating in gas space protects concrete and reduces maintenance cost
- Robust feeder for individually tailored feedstock charging
- All technical equipment installed in one building
- Frost-proof and low maintenance safety pressure valve

System Advantages

- Suitable for feedstock with high solids content
- Handles high organic load
- Proprietary design paddle mixer prevent floating layer build up and continual gas extraction
- Heating integrated into mixer shaft
- Low parasitic energy consumption
- Industrial grade components
- Fully automated operation
- Professional plant control system with PLC technology
- Short construction time
- Scalable

EUCO Titan®

The EUCO® Titan plant system is a combination of the EUCO® plug flow digester and the COCCUS® complete mix digester. It is well suited to extract energy from material with a higher solids content.



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Industrial Application

Plant Systems with Flexible Feedstock Options

The EUCO® Titan plant system has the flexibility to accept a wide range of solid or liquid materials from various industrial and municipal sources. It has the potential to co-digest waste from the following industries:

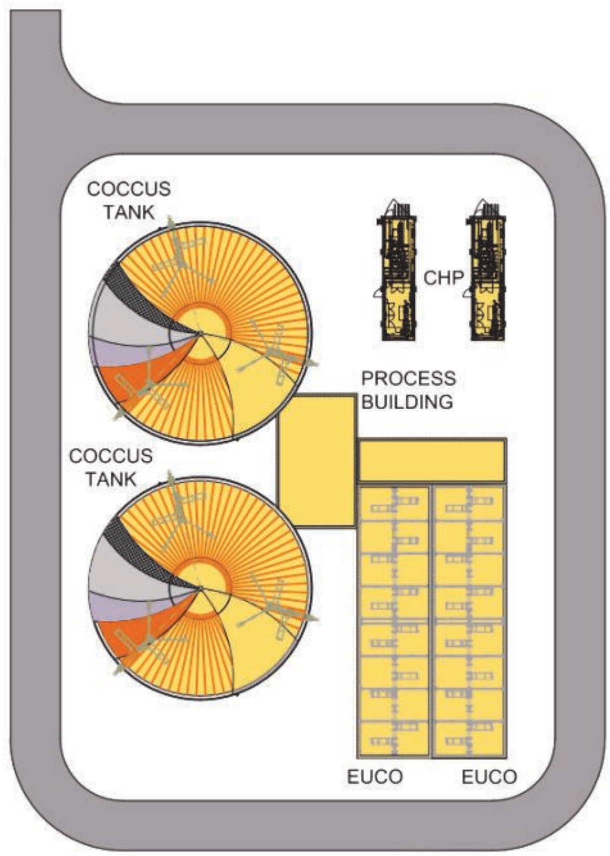
- Beverage industry, including breweries and wineries
- Food processors including vegetable and meat processors, and bakeries
- Municipal waste water treatment applications, including sludge and biosolids

Systems can be tailored to suit the unique attributes of an individual waste stream to maximize treatment efficiency and biogas output.

Waste Treatment
EUCO® Titan plant system can be implemented as a waste treatment solution. Treating waste on site is a more cost effective solution than hauling it away as transportation costs are avoided.

Auxiliary Systems
Many options exist to tie EUCO® Titan into an existing process flow such as an existing waste treatment operation. Additional systems can be connected to provide effluent storage, feedstock separation and tanks for supplementary feedstock.

Energy Independence
Creating renewable electricity and heat makes an operation energy independent and protects from fluctuating energy prices. Electricity can be used to power the processing operation and office building. The process heat can be used to heat buildings or the water in food processing applications.



Substrates	EUCO	COCCUS	Potential Continuous kW Output
10,000 tpy Corn Silage	EUCO 600	COCCUS 2400	~450 kW
25,000 tpy Corn Silage	2x EUCO 1000	2x COCCUS 4000	~1300 kW
6,000 tpy Mixed Food Waste & 4,000 tpy Vegetable Waste	EUCO 250	COCCUS 1600	~190 kW
10,000 tpy Cattle Manure w/ bedding (~15% TS)	EUCO 250	COCCUS 1200	~105 kW
50,000 tpy Cattle Manure w/ bedding (~15% TS)	EUCO 1000	2x COCCUS 4000	~650 kW

Customer: Dennis Moran

Dear Mr. Moran,

BIOFerm Energy Systems is pleased to provide this Project Snapshot for your review. The following tables provide plant parameters that fit the input material amount and energy values that could be generated from the input materials your project has available. This is a general overview, and all values are subject to change with the specific variables of your project.

Initial Recommendations:

From the feedstock information you provided me with, BIOFerm recommends a COCCUS 3000 complete mix digester. Using standard values for energy production from each of these feedstocks it is estimated that a plant of this size could produce approximately 250 kW continuous. Please see table below for outputs.

If you would like to move forward with this project, BIOFerm would be pleased to perform a more detailed analysis of your available inputs. This would allow us to generate a proposal with detailed and specific information for a realistic project created around your energy and waste management needs. A design and construction contract would also be available after this process. Proposal documents include:

- Project Description and Summary
- Feasibility Study
- Material Flow
- Additional Needed Material Analysis
- 3-D Plant Design
- Plant Layout Diagram
- Profit and Loss Calculation
- Detailed Cost Estimation
- Project Schedule and Timeline

We look forward to working with you in the future. Please do not hesitate to contact us if we can be of further assistance.

Sincerely,

BIOFerm Energy Systems

Project Snapshot

Customer: Dennis Moran

Option 1: Food Waste and WWT Sludge			
Substrate	Amount (tons/yr)	Total Solids (%)	Volatile Solids (%)
Food Waste	18,200 (i.e. 50tons/day)	18%	86%
WWT Sludge	15,000	3%	77%

Energy Generation	
Biogas Production (m^3/y)	1,860,000
Average Methane Content (%)	55%
Methane Production (m^3/y)	1,025,000
Combined Heat And Power Unit (CHP)	600 kW
Average Electric Power for Utilization (kWh_e)	4,222,000
Average Thermal Power for Utilization (mmBtu)	11,000
Natural Gas Substitute (CNG)	
Average Fuel Production (gge)	177,000

Plant Parameters	
Anaerobic Digestion Technology	One COCCUS 3000 (complete mix digester)
Digestate (tons/y)	30,840 @ 4.3% TS

Attachment 2: Cenergy Equipment Specifications

Tighe&Bond

2G CENERGY®

Advanced Clean Energy Technologies

CHP Modules | 64 kW/h up to 3,000 kW/h

Cogeneration – Energy with Added Value

2G Innovative Technologies

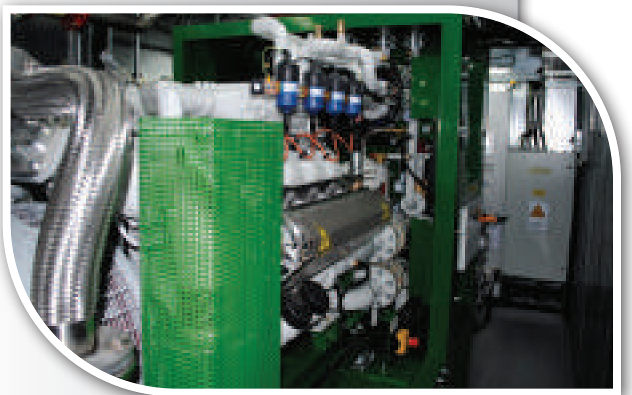
Renewable Energy Production for a Wide Range of Biogas and Specialty Gaseous Fuels

BIO GAS

BEST IN CLASS BIOGAS TECHNOLOGIES
COGENERATION MODULES WITH A HIGHER DEGREE OF EXCELLENCE

2G® Biogas and Specialty Gaseous Fuel CHP
Designed, developed, and manufactured for reliable energy conversion.

Genuine "Plug & Play" All-In-One Modules
Connection-ready systems and adequate technology with unmatched functionality.



High Flexibility with Maximum Efficiency
The most advanced Biogas & Specialty Gas Cogeneration Technology available.

BIO GAS

A New Generation of Renewable Energy Generation Technology

Our advanced 2G® Biogas energy conversion technology utilizes a variety of biogases derived from the fermentation process (anaerobic digestion) in natural biodegradable materials (wet or dry digestion), from the bacterial decomposition process of organic material contained in landfills (LFG), or from the fermentation and incineration process of sewage sludge at waste water treatment plants, to generate electricity and heat. A fuel that is efficient and providing many economic benefits.

2G® Biogas CHP cogeneration modules are specifically developed for a wide variety of biogas and specialty gaseous fuel applications. A compact modular CHP design with integrated controls-and switchgear, thermal energy distribution system, and advanced enclosure options.

2G® Biogas CHP systems are composed of advanced and optimized biogas engines, components, and materials skillfully incorporated into one connection-ready cogeneration module to be more efficient, stronger and longer-lasting than ordinary and conventional CHP designs. We created the next generation of energy efficient CHP modules for the biogas and specialty gaseous fuel industry. Manufacturing biogas CHP systems requires more know-how than just packaging a standard gas engine.

- ❑ **Ag Biogas**
  Agricultural & Dairy Farm Biogas Applications
- ❑ **W2E Biogas**
  Waste Management & Municipal Biogas Projects
- ❑ **WWTP Biogas**
  Waste Water Treatment Plant Biogas Applications
- ❑ **LFG Biogas**
  Landfill Gas to Energy Projects

BIO GAS

Biogas Product Line

2G® provides efficient Energy Conversion Technology in various system configurations sized between 64kWh and 3,000kWh. Larger cogeneration modules are available upon special request. We manufacture a diverse product portfolio suitable for a wide range of conditions and uses - from small Biogas CHP's, to large gaseous fuel Energy Conversion Systems for complex applications. Explore our product line to find out how 2G® leads the industry with the most innovative and technologically advanced Cogeneration Systems.

Model	Configuration	Electrical Capacity	Thermal Capacity	Frequency	Voltage	BTU/ ekW
2G ***filius®*** 204 BG	Base Module or Container	64kW/h 80kVA	90kW	60Hz 50Hz	480V 400V	9,787
filius® 106 BG	Base Module or Container	100kW/h 125kVA	136kW	60Hz 50Hz	480V 400V	9,390
filius® 206 BG	Base Module or Container	150kW/h 188kVA	193kW	60Hz 50Hz	480V 400V	9,512
patruus® 190 BG	Base Module or Container	190kW/h 237kVA	235kW	60Hz 50Hz	480V 400V	9,341
patruus® 250 BG	Base Module or Container	250kW/h 312kVA	322kW	60Hz 50Hz	480V 400V	9,465
patruus® 370 BG	Base Module or Container	370kW/h 462kVA	474kW	60Hz 50Hz	480V 400V	9,217
agenitor® 206 BG*	Base Module or Container	220kW/h 275kVA	244kW	60Hz 50Hz*	480V 400V	8,858
agenitor® 306 BG*	Base Module or Container	250kW/h 312kVA	273kW	60Hz 50Hz*	480V 400V	8,769
agenitor® 208 BG*	Base Module or Container	265kW/h 331kVA	295kW	60Hz 50Hz*	480V 400V	9,192
agenitor® 212 BG*	Base Module or Container	400kW/h 500kVA	474kW	60Hz 50Hz*	480V 400V	8,874
agenitor® 312 BG*	Base Module or Container	450kW/h 562kVA	500kW	60Hz 50Hz*	480V 400V	8,738
twin-pack® 500 BG* with ***agenitor®***	Container Module	500kW/h 625kVA	546kW	60Hz 50Hz*	480V 400V	8,769
twin-pack® 500 BG with ***patruus®***	Container Module	500kW/h 625kVA	644kW	60Hz 50Hz	480V 400V	9,465
avus® 540 BG	Base Module or Container	540kW/h 675kVA	706kW	60Hz 50Hz	480V 400V	9,171
avus® 600 BG	Base Module or Container	600kW/h 750kVA	642kW	60Hz 50Hz	480V 400V	8,456
avus® 800 BG	Base Module or Container	800kW/h 1000kVA	841kW	60Hz 50Hz	480V 400V	8,384
avus® 1059 BG	Base Module or Container	1059kW/h 1324kVA	1274kW	60Hz 50Hz	480V 400V	8,747
avus® 1200 BG	Base Module or Container	1200kW/h 1500kVA	1225kW	60Hz 50Hz	480V 400V	8,273
avus® 1426 BG	Base Module or Container	1426kW/h 1782kVA	1533kW	60Hz 50Hz	480V 400V	8,453
avus® 1550 BG	Base Module or Container	1550kW/h 1938kVA	1801kW	60Hz 50Hz	480V 400V	8,292
avus® 2000 BG	Base Module or Container	2000kW/h 2500kVA	2289kW	60Hz 50Hz	480V 400V	8,216

**agenitor®* in 60Hz / 1800rpm / 480V configuration only available upon special request and prior approval.*

filius® - series

patruus - series

agenitor® - series

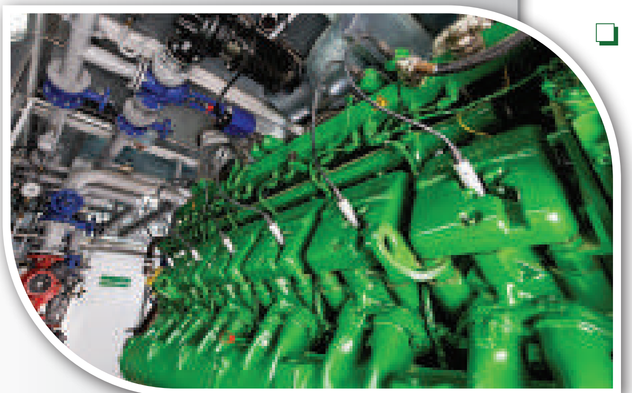
avus® - series

BEST IN CLASS BIOGAS TECHNOLOGIES
COGENERATION MODULES WITH A HIGHER DEGREE OF EXCELLENCE

Comprehensive Standard Scope of Supply

- Advanced & Solid Frame Structure
- High Efficiency Biogas Baseload Engine
- Extra Large Oil Capacity Sump
- Auto Makeup Lubrication System
- Double-Bearing Synchronous Generator
- Biogas Blower / Compressor w. Sensors
- Gas Train & Biogas Fuel System
- Advanced Two-Stage Fuel/Air Mixer
- Micro Process Digital Electronic Ignition
- Heat Value Fluctuation Detection
- Multi Level Heat Extraction System
- Thermal Circulation System with Pumps
- Thermo Hydronic System w. Exp. Tank
- Heat Exchanger (Jacket & Exhaust)
- Exhaust System / Silencer
- Ultra Low Emissions Capability
- Thermal Heat Extraction & Pumps
- Super Silent Advanced Cooling System
- General Digital Control System
- Utility Grade Switchgear
- Protection Devices & Relays
- Electronically operated Circuit Breaker
- On-Line Remote Control & Monitoring
- Comprehensive Factory Testing
- Manufactured, tested, and certified in Accordance with CSA, UL, NEMA, IEEE, and all applicable US Standards

Driven By Excellence
Patented Technology, Best in Class Service



Advanced Technology "Best in Class"

The overall design of 2G® CHP modules, with its trademark compact structure, is developed to convert biogas more efficiently into usable energy, much more reliable than other so-called biogas gensets or expensive and uneconomical ultra-low-efficient micro turbines. 2G®'s unique design allows it to generate higher revenues for the owner & operator, at the same time providing much higher reliability than other CHP systems of its size. 2G® cogeneration modules and its smart system controls are acknowledged as the most advanced in the industry - best designed and fully optimized for efficiency and above all, long-term durability.

Our biogas CHP systems can easily be integrated into any type of biogas plant. As leading manufacturer of CHP cogeneration power modules 2G® is a trusted equipment provider for most biogas plant specialists all over the world. We are working closely with many specialized bio energy developers, as well as with a wide variety of turnkey plant suppliers who are specialized in biogas plant design and construction.

❑ Designed and made for Biogas
Reliable – Tens of Millions of documented Run & Operating Hours ...and counting

❑ Detecting Energy Densities and Heat Value
Automatically adjusts to changing Energy Densities

❑ Ultra-Low Emissions Capability
Up to 90% lower Emissions can be reached

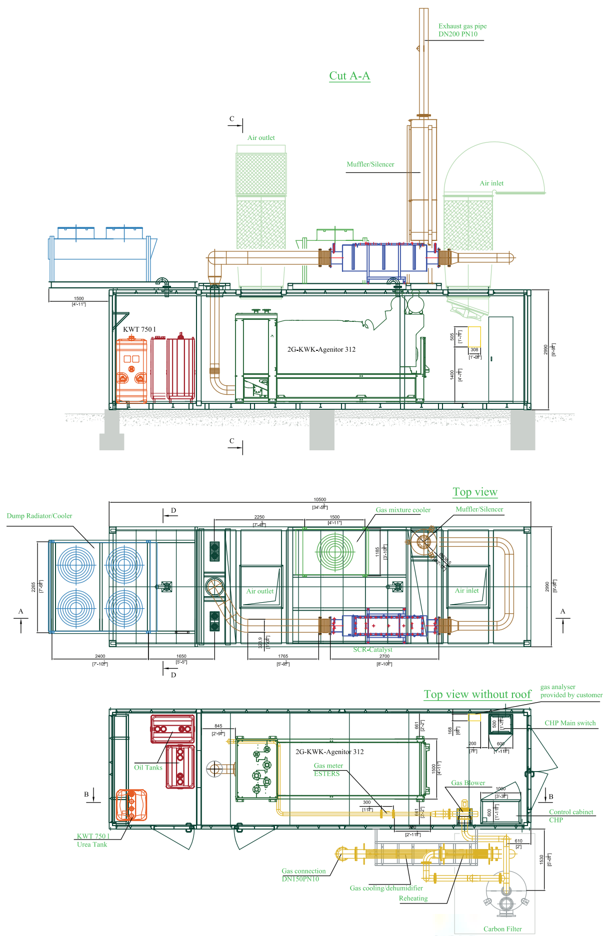
The profitability of biogas plants is directly related to the CHP energy conversion system installed. If the biogas cogeneration system isn't performing well, or is inefficient and consumes too much fuel, even the best anaerobic digester would not achieve the ROI it could provide with the most adequate CHP technology applied.

BIO GAS

BIO GAS

A Genuine "Plug & Play" Biogas CHP Solution

2G® advanced Container Modules are designed for easy operation, to minimize floor space, and to contain the entire CHP cogeneration plant in one unit "all-in-one". Due to a compact layout with integrated control-and switchgear equipment, as well as a ventilated noise protection enclosure, these modules can be placed anywhere, even in residential areas. A smart and economical alternative to traditional inside installations; highly efficient and much more cost-effective.



Your Benefits

- Reduced Cost and decreased Lead Time
- Reliability & Proven Top Performance
- All-In-One & Factory Tested
- Less technical Risk and more economical
- Versatile, flexible, and scalable
- Unrestrained Mobility

Containerized modular Systems from 2G® are guaranteed less expensive than a traditional Inside Building Installation

Containerized CHP modules provide many advantages. All heat exchanger and heat recovery systems are fully integrated. Heat circulation piping and distribution are an integral part of our containerized solutions. Insulated piping, pre-plumbing, all connection-ready.

The floor plan allows for easy access to all system components, comfortable movement, and efficient service & maintenance. 2G® modules are especially built and designed for purpose, not just modified shipping containers. Standard connections and terminations are used throughout to minimize the installation and connection effort. All units are designed for extreme fast integration and very easy operation. Installation time is typically 2 days.

A genuine walk-in container module and very convenient for service personnel. Multiple access doors, and unobstructed movement inside. Designed to perfection, with attention to detail, unmatched by any alternative.

BEST IN CLASS BIOGAS TECHNOLOGIES
COGENERATION MODULES WITH A HIGHER DEGREE OF EXCELLENCE

2G® Biogas CHP Technology The best Solution available

Skillfully incorporated into one Connection-ready Cogeneration Module.

Advanced Architecture Quality you can trust

Multi-Module Operation, fully synchronized and optimized for maximum Efficiency.

Unique Features & The Most Intelligent Control System

Fully integrated Controls with proprietary and innovative Electronic Management.

BIO GAS

A New Generation of Renewable Energy Generation Technology

We are committed to provide the most advanced, sound and proven cogeneration CHP technologies, as well as professional product support services to all our customers in North-and South America. Unlike biogas genset suppliers who are not really experienced in advanced biogas CHP applications, we are exclusively focusing on reliable, proven and complete cogeneration modules that are professionally engineered and manufactured. We are "The Experts" and CHP is all we do. Our main focus has always been to manufacture complete factory-designed and proven biogas CHP modules. This dedication and approach provides our customers with superior performance, higher reliability, value for money, decreased operating expenses and increased return on investment.

- **Proven Reciprocating Engine Technology**
  Low RPM compared to extreme high RPM axial or radial Turbines with transonic Velocities and increased Rotation Wear & Tear.
- **Low Maintenance and Minimal Downtime**
  Reduced O&M, minimized Wear & Tear, and very easy to service.
- **No Slagging, no Fouling or Plugging**
  No sensitive Turbine Components that are susceptible to uncontrolled precipitation.
- **50% higher Machine Life Expectancy**
  Longer useful System Life Expectancy resulting in elevated ROI (Return on Investment).
- **Trusted Excellence & Proven Reliability**
  Thousands of Installations and Tens of Millions of Operating Hours with high Uptime.
- **40% higher Efficiency & Fuel Economy**
  The most efficient and durable Biogas CHP in its Class, and by far much more efficient compared to ultra-low-efficient Micro Turbines that provide significantly less Efficiency than the Grid.
- **Unmatched Performance Guarantee**
  A superior System designed to perform.

AFTERSALES SERVICE & PRODUCT SUPPORT
WORLD CLASS MAINTENANCE

BIO GAS

Extensive Product Support & Customer Care

A multi-level service program designed to keep customer equipment and plants operating at peak performance. Product support is critical and 2G®'s comprehensive after-sales services are designed to protect the owner's investment during both in-warranty and post-warranty periods. Whenever assistance is required, 2G® offers experienced technicians, parts support, and flexible service options designed to meet our customer's specific needs.

Customized Service Support

2G® offers a menu of service levels, as well as a modular maintenance program that can be adapted and tailored to individual customer requirements. This includes preventive maintenance and 24/7 system monitoring. Service engineers can remotely diagnose possible problems, make on-line adjustments, and if necessary dispatch a qualified technician who is located closest to the customer.

Thousands of 2G® CHP's operating

Thousands of satisfied customers appreciate the reliability and high efficiency of 2G® cogeneration modules.

Service Contracts and Extended Warranty

Various service contract options, extended warranties, and tailor-made maintenance agreements are available.

Parts & Components

A comprehensive central parts warehouse located at 2G®'s U.S. factory in Florida guarantees high level parts availability. Regional service partners throughout the U.S. also carry spare parts. A comprehensive service network, with factory-trained and 2G certified technicians is available 24/7.

24/7 Monitoring & On-Line Diagnostics

Web-based State-of-the-Art Monitoring and Control Technology.

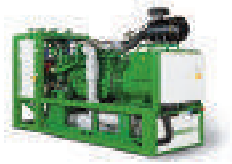
Top Quality Product Support and High System Availability

2G® Service Engineers and Highly Qualified Field Service Technicians 24/7 on Duty.

Customized Service Options and Operator Training

Whatever your Service Needs, 2G® has a Solution to maintain your Productivity.









2G CENERGY®

Advanced Clean Energy Technologies

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www.2G-CENERGY.com

2G Innovative Technologies

Renewable Energy Production for a Wide
Range of Biogas and Specialty Gaseous Fuels

2G CENERGY®
Advanced Clean Energy Technologies

Gas Treatment | Biogas - LFG | H_2S - Siloxanes & Dehumidification

Biogas Treatment

H_2S Removal - Extraction of Siloxanes Dehumidification

Cost-Effective and Intelligent Biogas Conditioning Solutions

Best In Class Technologies

Biogas Treatment & Conditioning especially designed for Biogas Plants

Gas Treatment — **Biogas - LFG | H_2S - Siloxanes & Dehumidification**

Environmentally Friendly and Efficient

Our advanced 2G® CHP technology utilizes biogas from the fermentation process (anaerobic digestion) in natural biodegradable material. The biogas, which is both efficient and economically beneficial, is used to generate electricity and heat. 2G® biogas cogeneration modules are specifically developed for biogas applications.

A strong Partner providing "Best-in-Class" Technology

Worldwide 2G® is the market leader for modular gaseous fuel CHP systems. 2G® biogas power generation plants have been tried and successfully operated for many years. Manufacturing biogas cogeneration systems and gas treatment technologies requires more know how than just packaging a standard engine generator. 2G® sets standards as technology leader. The company continues to lead the way with an unparalleled team of gas engine experts and significant research & development investments.

More than 3000 CHP & Gas Treatment Systems installed

Thousands of satisfied customers appreciate the reliability and high efficiency of 2G® cogeneration modules. A combination of added value, cost-effectiveness, and high system availability assure that customers enjoy the highest level of operational and economical results. When it comes to biogas and specialty gas power generation 2G® customers don't take chances.

Time after time the worlds leading biogas plant developers select 2G® to safeguard their investment and success. Why ? Because there is no higher level of quality, efficiency, and durability available. The number of installed 2G® units say it all.

2G® CHP
Biogas & LFG
Power Generation Systems
with fully integrated Gas
Treatment Technology

Your Benefits

- **Reduced Cost and higher ROI**
- **Reliability and Top Performance**
- **Less Risk, both Economically & Technically**
- **Overall better Economy and Added Value**

Advanced Clean Energy Technologies

Gas Treatment | Biogas - LFG | H_2S - Siloxanes & Dehumidification

Biogas Dehumidification Systems

Including Re-Heating Technology

Biogas Dehumidification - CHP Wall or Pad Mounted

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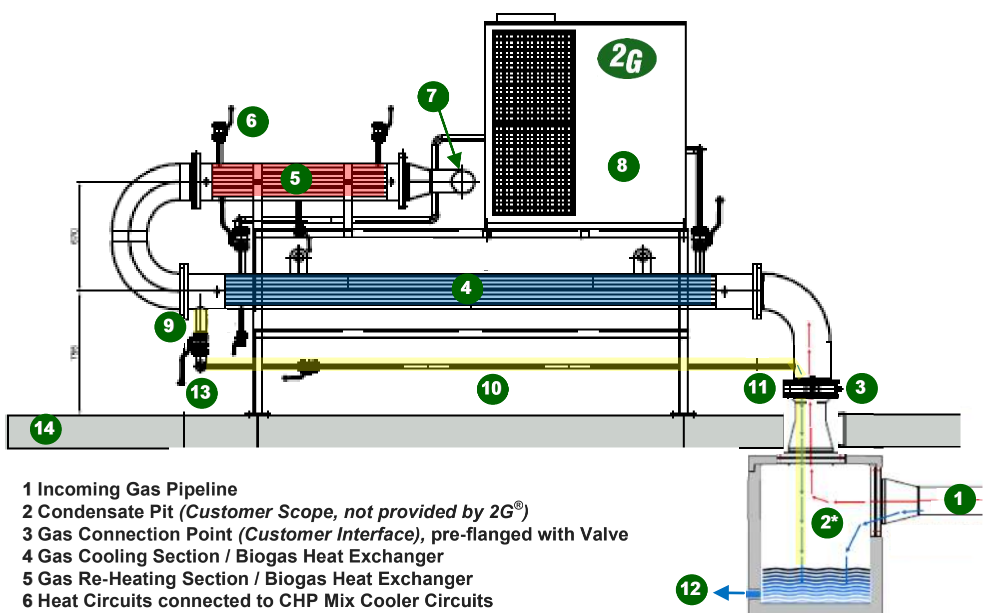


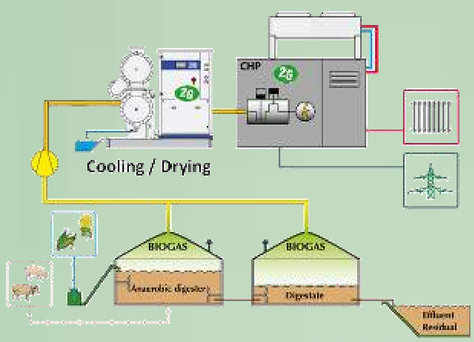
1 Incoming Gas Pipeline
2 Condensate Pit *(Customer Scope, not provided by 2G®)*
3 Gas Connection Point *(Customer Interface)*, pre-flanged with Valve
4 Gas Cooling Section / Biogas Heat Exchanger
5 Gas Re-Heating Section / Biogas Heat Exchanger
6 Heat Circuits connected to CHP Mix Cooler Circuits
7 Exit Flange Connection *(to H_2S or Siloxane Filter, or to Gas Blower)*
8 Chiller Unit for Gas Cooling
9 Condensate Return Exit
10 Condensate Return Pipe *(returning to Gas Inlet)*
10 Condensate Release *(by Gravity)*
12 Condensate Drain *(must be unobstructed)*
12 Alternative Condensate Drain *(optional)*
13 Light Concrete Pad *(Customer Scope, not provided by 2G®)*

**This is just an example of a possible Condensate Pit. Various different types and designs are available in the market.*

Biogas Dehumidification System

Protect your CHP Investment & Efficiency
Reduce Service & Maintenance Cost

Gas Treatment | Biogas - LFG | H_2S - Siloxanes & Dehumidification



Biogas at the digester or LFG well outlet usually has a very high water vapor content (between 30 to 100g water per m³ Gas, equal to 1.06 to 3.53 ounce per 35 ft³), depending on the ambient temperature. That's approx. 270,000 liter (72,000 gallon) water per year, equal to approx. two standard size swimming pools. During wintertime, at lower temperatures, the water vapor can easily condense inside the gas pipeline leading to the CHP. This condensate in combination with H_2S, NH_3 ,CO, and H_2, can cause accelerated corrosion. Further, condensate in the intake section automatically reduces engine efficiency. It also significantly reduces the effectiveness of H_2S carbon filter systems.

Why is Biogas Dehumidification important?

Gas drying optimizes the combustion process in the CHP engine, resulting in an increased engine efficiency and lower fuel gas consumption. Reducing the contamination of engine oil with condensate will reduce the number of oil changes required and save costs. In addition certain Methyl Cyclo Siloxane components, and Ammonia NH_3 are also harmful substances that are naturally partially released along with the condensate. Given that Ammonia is soluble in water, NH_3 contents are reduced during the water vapor removal / cooling & drying process.

Water (high moisture content) can be one of the most destructive contaminants for engine lubricants. It accelerates oil oxidation and interferes with oil film production. High moisture content should also be removed from biogas to prevent the formation of “Carbonic Acid”. These acids cause a rapid drop in the oil's alkalinity (base number), resulting in an unprotected corrosive environment and base oil oxidation. Presence of these acids, if unnoticed, will accelerate wear and possibly even corrode critical engine parts that could result in major unplanned repairs and downtime.

Gas Washer / Dryer Option for very large Biogas Volumes

The 2G - SD gas washer/dryer GST-1000-S is designed for the dehumidification of bio and LFG gases. The main component of the 2G-SD gas washer/dryer is a packaged column inside a reactor vessel, and the biogas streams upwards. In the opposite direction (downwards) flows very cold water. Within the reactor vessel an intensive exchange of heat and mass takes place between the cold water and the warm biogas. The gas cools down and the contained vaporous humidity condenses to fine fog droplets, which are captured by the cold water flow streaming downwards. The water is continuously recycled. No external water supply is required. Gas impurities like solid particles and certain harmful gas components are absorbed by the water according to their water solubility.

2G CENERGY®
Advanced Clean Energy Technologies

Gas Treatment | Biogas - LFG | H_2S - Siloxanes & Dehumidification




H_2S & Siloxane Filter Technologies

Innovations from the Market Leader



Why is H_2S and Siloxane Removal important?

Why is the Investment a very smart Idea? High Concentrations of Sulphur, especially Hydrogen Sulfide H_2S, and Volatile Methyl Siloxanes (VMS) often found in Biogas are harmful for any Engine or Turbine. VMS convert into Silicon Dioxide as Combustion takes place. The Silicon Dioxide combines with other Elements in the Gas, as well as with the Lubrication Oil, forming a hard Matrix that accumulates Surfaces, especially within the Combustion Chamber. As the Deposits accumulate, the Engines Efficiency reduces and causes irregular Detonation in the Combustion Chambers. The resultant unburned Fuel contaminates the Exhaust Gas increasing emissions. At this Point the Engine is at high Risk of significant Damage.

PLEASE NOTE: Certain Suppliers of Engines and Turbines state that up to 800ppmv H2S is acceptable and it would not affect your 1 Year Warranty. It is important to understand that most H_2S and Siloxane Damages occur “after Warranty Expiration”. At that time every engine owner operating without gas cleaning will experience significant Problems. As a Result, Service & Maintenance Costs are increasing quite significantly. We are aware that other Suppliers make potential Buyers to believe that it is OK to operate without Gas Treatment and that no H_2S Removal is required. Such misleading Statements are not representing the Truth and Facts. It is always more cost-effective and your long-term Service Cost will always be cheaper if H_2S and Siloxanes are removed and the Gas is treated.

Your Benefits and Advantages:

- **Fully integrated H_2S and Siloxane Treatment Systems**
- **Most cost-effective Solution**
- **Activated Carbon Filter Media specifically developed for H_2S and Siloxane Removal**
- **Maintenance Free Design**
- **Process optimized Configuration**
- **Proven Technology applied at Thousands of Biogas Plants**

Severe Damage can occur to Valves, Pistons, Piston Rings, Liners, Cylinder Heads, Spark Plugs and Turbochargers, necessitating premature Servicing and costly Repairs.



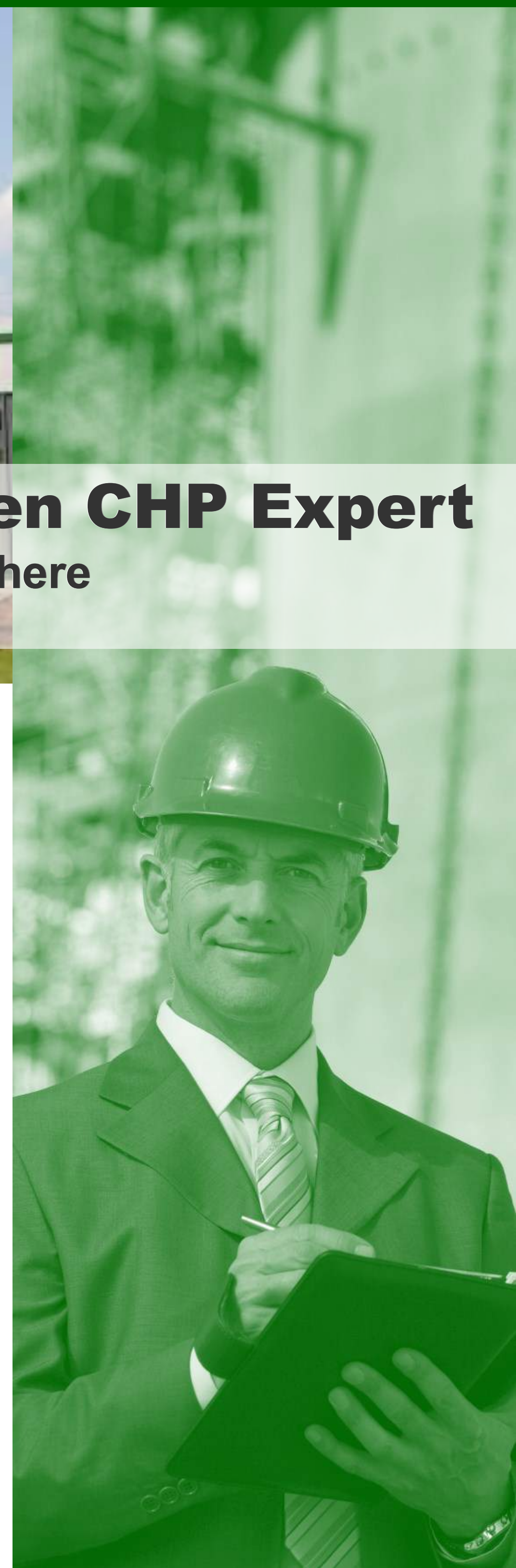
High Sulphur (H_2S) and Siloxane Content also damages the Exhaust Gas Heat Exchanger and the Exhaust System.


2G CENERGY®
Advanced Clean Energy Technologies

Gas Treatment | **Biogas - LFG | H_2S - Siloxanes & Dehumidification**

Contact the Cogen CHP Expert

No better Solutions anywhere



About 2G®

The 2G® group is a renowned manufacturer dedicated to the production of advanced CHP decentralized power generation systems, providing customers with genuine “plug & play”, highly efficient and dependable cogeneration modules. The company maintains a “Best-in-Class” product portfolio. 2G is a solid and financially strong corporation publically traded at the Frankfurt Stock Exchange. 2G® manufacturing plants are located in the USA and in Germany. Additional subsidiaries are operating in many countries. 2G®’s U.S. and South American distribution and service support headquarters 2G - CENERGY® is located in Florida.

For more Information

Please visit our website at: **http://www.2g-cenergy.com**

2G CENERGY®
Advanced Clean Energy Technologies

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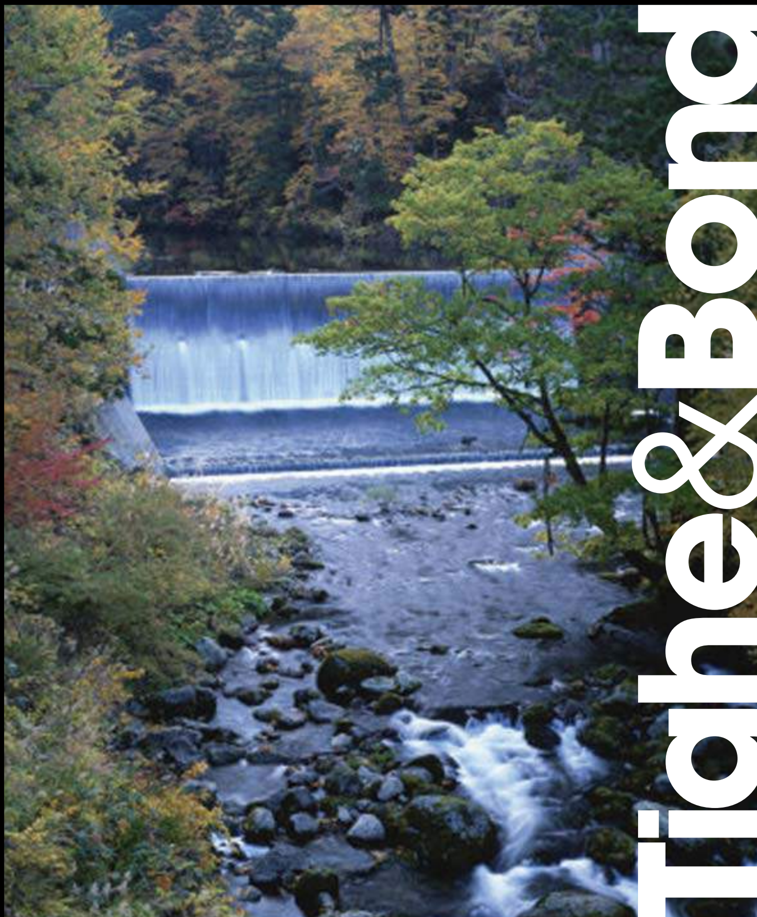
E-mail: info@2g-cenergy.com



APPENDIX F

City of Easthampton, Anaerobic Digestion Feasibility Study Community Engagement Plan

TO: Massachusetts Clean Energy Center – Amy Barad, Amanda Treat

FROM: Jessica Allan, City of Easthampton Planner, Briony Angus, Tighe & Bond

DATE: May 15, 2013

The City of Easthampton (City) and Tighe & Bond are currently conducting a Feasibility Study to evaluate the development of an anaerobic digestion (AD) system at the Ferry Street wastewater treatment facility (WWTF). The City has been approached by renewable energy developers interested in partnering with the City to develop a food waste/ wastewater sludge (AD) project in the City. The City is interested in becoming more educated regarding a potential facility and its accompanying benefits and public impacts prior to entering an agreement with a developer. To that end, the City and Tighe & Bond applied for and received funding from the Massachusetts Clean Energy Center (MassCEC) under the Commonwealth Organics to Energy program to conduct a comprehensive Feasibility Study for the project.

The goal of the Feasibility Study is to evaluate the technical and economic feasibility of the proposed project, to identify potential environmental and economic impacts to the community, and to educate the City so that it can better evaluate potential offers from developers. As part of the overall process and to comply with funding conditions, this Community Engagement Plan was created to assist in identifying and engaging stakeholders early in the feasibility study process. The purpose of the stakeholder involvement is to identify issues of concern to the community upfront so that they can be addressed during the study process.

The Community Engagement Plan presented below provides an update on public outreach activities and stakeholder engagement conducted to date. Specifically it includes description of how stakeholders were identified and how the Feasibility Study process was communicated to them, anticipated public impacts/mitigation, and a stakeholder education and involvement plan.

1. Stakeholder Identification

As noted earlier, the purpose of early stakeholder identification and involvement is to identify issues of concern at the beginning of the process so that they can be addressed during the study. Furthermore, it is important to keep the stakeholders informed about the project in order to gain their support and encourage their participation in ways that benefit both the community and the project. The stakeholders for this project involve a combination of neighbors, residents, elected officials, City staff, members of the City's various Boards and Committees, large generators of organic waste, and vendors.

A preliminary list of stakeholders was identified at the kick-off meeting for the project with City staff, held on April 11, 2013. The meeting was attended by representatives from Tighe & Bond and the following staff: Mayor, Michael Tautznik; City Planner, Jessica Allen; Assistant Planner, Jamie Webb; Director of Public Works, Joseph I. Pipczynski; Jim Gracia, City Engineer; and Carl Williams, Wastewater Plant. In consultation with this group, an initial list of project stakeholders was created. Table 1 below, provides a summary of the various types of stakeholders that were initially identified and their interests in respect to the project.

Table 1
Potential Stakeholders

Stakeholder	Interest in Project
Manhan Rail Trail Users	Potential visual and odor impacts
Adjacent Property Owners/Developers	Potential visual, truck traffic, and odor impacts
Local Breweries	Potential for organic waste disposal
Local Farms/Agricultural Operations	Potential for organic waste disposal and potential to use effluent from project as soil amendment
Other Large Producers of Organic Waste	Potential for organic waste disposal
All Municipal Boards/Commissions/City Council	Potential to reduce City's expenses and generate additional source of revenue.
Pascommuck Conservation Trust	Potential visual and odor impacts, potential support for environmental benefits of project
MassAudubon, Arcadia Sanctuary	Potential visual and odor impacts, potential support for environmental benefits of project
Vendors	Potential to Develop Project and Enter into a Power Purchase Agreement with the City
Community	Potential for reduced sewer rates and continued demonstration of City as clean energy leader. Potential for concern regarding visual, truck traffic, and odor impacts.
MassCEC	Provided source of grant funding. Desire to accelerate development of renewable technologies in MA.
MassDEP	Desire to utilize synergy of waste ban to reduce reliance on fossil fuel. Enforce air permitting and solid waste regulations.

As noted earlier, the above is a preliminary list of identified stakeholders. It is anticipated that additional stakeholders will be identified as the project progresses.

2. Public Information Session

A public information session for the project was held on May 7, 2013 at 6:30 PM at the Easthampton City Hall, 50 Payson Avenue, 2nd Floor Meeting Room, Easthampton, MA. The purpose of the meeting was to provide general information on anaerobic digestion, explain the City's interest in the project, describe the scope of the Feasibility Study, and to solicit initial reactions and input from the community. The intent was to obtain public comment at the beginning of the process to help focus on the issues that are most important to the community as the Feasibility Study progresses. The stakeholders identified in Section 1 and other community members were informed of the public meeting in a variety of methods. The below list provides a summary of the methods by which stakeholders and members of the public were notified of the public meeting. Note that copies of the materials referenced below are attached at the end of this document.

- **Meeting Notice/Flyer** – A flyer/meeting notice containing information about the meeting was created and distributed to all City departments. The flyer/meeting notice was also posted on the City's Facebook page and website approximately two weeks prior to the public meeting.

- **Email to Municipal Boards/Commissions** - The City Planner sent an email to members of municipal boards and commissions on April 25, 2013 that contained a description of the purpose of the meeting and the meeting time/date. The email also included the meeting flyer as an attachment.
- **Newspaper Articles –** Two newspaper articles were written on the proposed project. The articles provided background information and included the date/time and purpose of the public meeting. The newspaper articles were printed in *The Gazette* and *The Republican* on April 30, 2013 and May 2, 2013 respectively.
- **Easthampton Planning Department Facebook Post** – The City's Planning Department's Facebook page posted information on the meeting on April 25, 2013 (viewed by 90 individuals) and May 5, 2013 (viewed by 680 individual).

A copy of the presentation that was given at the May 7, 2013 public meeting and the sign-in sheet is appended to this report. In addition to the presentation, a two-page handout was created and provided at the public meeting. The handout provided an overview of Anaerobic Digestion and anticipated scope of the feasibility study and provided contact information for the City Planner and Tighe & Bond.

Hosting a public meeting at this stage of the process was challenging as the majority of the questions received from the public were related to project specifics that are currently unknown as the study is not yet underway. Questions and public input received at the public meeting are provided below and addressed in Section 3 (Anticipated Public Impacts/Mitigation).

- What types of waste will the project accept?
- How many tons per day will the project accept? What is the project size?
- How many truck trips will the project generate?
- How will odors be controlled?
- What are the health implications of biogas?
- Why isn't a larger facility being looked at?

The comments received on the project were generally supportive; however additional information regarding the specifics of the facility was desired. No comments were shared in opposition to the project or Feasibility Study scope. Despite significant advance notice in a variety of formats about the meeting, there was small attendance. Notably however, the meeting was attended by several City Councilors and the Mayor, indicating an interest from decision-makers. Also, note an email in support of the project from someone who was unable to attend the public meeting is attached following this report.

3. Anticipated Public Impacts/ Mitigation

The list below identifies potential community impacts (including those raised at the public meeting) and provides further information on potential mitigation measures and how the concern will be addressed as the Feasibility Study proceeds.

- **Types & Quantities of Materials to be Accepted**

The AD facility will accept sludge from the Wastewater Treatment Facility (WWTF) and other organic feedstock materials. Currently, the WWTF generates approximately 4.9 wet tons of sludge per day. The types and quantities of other available feedstock (including food waste, leaf and yard waste, and other commercial and industrial agricultural and/or organic waste) will be evaluated as part of the Feasibility Study.

- **Project Generated Traffic**

The types of vehicles and volume of vehicles used to deliver the feedstock to the site will depend on the type of system that the project can support economically. If a low solids/wet system is proposed the feedstock would be transported via a tanker truck; whereas a typical "box truck" would be used to transport feedstock for a high solids/dry system. Based on the approximate AD system size (provided in the MassCEC Grant Application) it is anticipated that truck traffic will be minimal. However, this will be confirmed as the Feasibility Study progresses and feedstock availability and project economics are further evaluated.

- **Odor and Air Quality**

If the proposed system is a wet system, the incoming feedstock will be pumped directly into the contained AD system – eliminating the potential for odor issues. If a dry system is proposed, the Feasibility Study will evaluate best management practices for the storage of feedstock such that potential odors are minimized or eliminated. As noted at the public meeting on May 7, 2013, existing odor issues at the WWTF are associated with the operation of the sludge thickening process and will not be impacted or exacerbated by the proposed AD project.

4. Stakeholder Education and Involvement Plan

To ensure the success of the project, issues of concern to key project stakeholders should be identified at the beginning of the Feasibility Study process. As noted above, the City has already initiated this process by hosting a public information meeting for the project. Based on the information obtained at this meeting, the City and Tighe & Bond now have a broader understanding of the potential community impact issues to consider as the Feasibility Study evaluations proceed. In addition, as it is likely that the City will partner with a private developer should the project proceed past the Feasibility Study stage, this information will now be memorialized and passed onto any future project developers.

Following the initial public meeting, the City and Tighe & Bond now intend to begin the Feasibility Study evaluations in earnest. As outlined in the MassCEC Task Order 13-1 between MassCEC and the City, a draft of the Feasibility Study is due to MassCEC by January 2014 and the final Feasibility Study is due in May 2014. When the draft Feasibility Study is complete and has been reviewed by the City, the City and Tighe & Bond will hold another public forum to present the findings and potential next steps. The outcome of this second public input meeting will be summarized in the Final Feasibility Study report to MassCEC.

Attachments:

- **Attachment A**: May 7, 2013 Community Meeting Notifications/ Correspondence
  - Meeting Notice – Posted at City Hall and distributed to all City Departments, sent to local press, posted on Facebook, and emailed to City Boards and Committees
  - Email re: Public Meeting sent to Municipal Board/Department Members on April 25, 2013, one response in support of project
  - Easthampton Planning Department Facebook posts regarding public meeting (April 25, 2013, Viewed by 90 people; May 5, 2013, Viewed by 680 people)

- **Attachment B**: May 7, 2013 Community Meeting Advance Press
  - Newspaper Article - *Digester Project* (Published in *The Gazette* on April 30, 2013)
  - Newspaper Article – *Easthampton Hearing to Explain, Take Comments on Proposed Waste Digester* (Published in *The Republican* on May 2, 2013)

- **Attachment C:** May 7, 2013 Community Meeting Hand-Out
- **Attachment D:** May 7, 2013 Community Meeting Presentation
- **Attachment E:** May 7, 2013 Community Meeting Sign-In

J:\E\E0702\Community Engagement\Community Engagement Plan.docx

Attachment A
May 7, 2013 Community Meeting
Notifications/ Correspondence

City of Easthampton – Organics to Energy

Anaerobic Digestion Feasibility Study

Public Meeting

May 7th, 2013, 6:30 pm

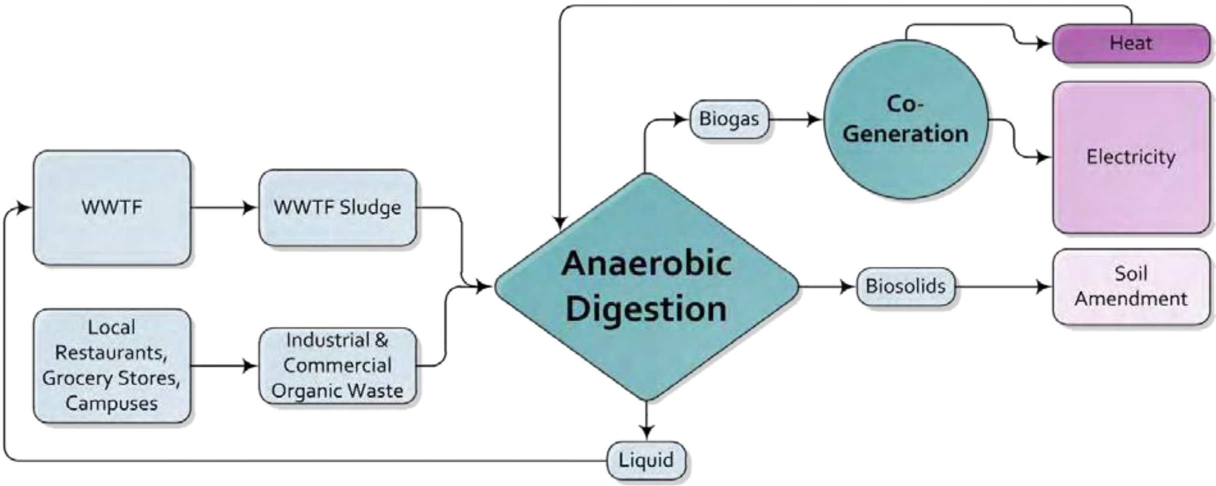
50 Payson Ave, 2nd Floor Meeting Room

- The City of Easthampton has been awarded a grant from the Massachusetts Clean Energy Center through the Organics to Energy Program to evaluate the feasibility of an Anaerobic Digestion (AD) project at the Ferry Street Wastewater Treatment Facility (WWTF).

- Tighe & Bond is working with the City to evaluate the technical and economic feasibility of a project that would use wastewater sludge and other organic materials to create biogas in an anaerobic digester that would then create heat and electricity.

- The project has the potential to reduce operating costs and generate revenue for the City, increase the amount of local renewable energy in Easthampton, and provide a useful outlet for organic waste that is currently being landfilled.

Come learn more about the project and ask questions of City officials and Tighe & Bond. The Feasibility Study will be completed over the next 12 months. This Public Meeting at the start of the project will help the City focus on those issues most important to the community.



Please contact Jessica Allan, City Planner at 413. 529.1406 or allanj@easthampton.org for more information about the meeting or the project.

Tighe&Bond www.tighebond.com

MASSACHUSETTS CLEAN ENERGY CENTER

From: Jessica Allan <allanj@easthampton.org>
To: 'Chester Ogulewicz' <ogulewicz@aol.com>; 'Dan Hagan' <haganprecinct1@yahoo.com>; 'Dan Rist' <drist55@msn.com>; 'Joe McCoy' <bonesjmc@aol.com>; 'Joy Winnie' <bjhawinn8@cs.com>; 'Justin Cobb' <cobb.precinct02@gmail.com>; 'Nate Ziegler' <npziegler@gmail.com>; 'Salem Derby' <salemstar@gmail.com>; Christopher Cockshaw <Christopher.Cockshaw@hatchmott.com>; Dan Buttrick <DRButtrick@tigheBond.com>; izbicki@gmail.com; Jay Ryan <jrryan201@aol.com>; Kelly Richey <krichey@albanolaw.net>; 'Kelly Richey (HOME)' <kellyrsranch@verizon.net>; Melissa Coady <MPCoady@tighebond.com>; Walter Hudzikiewicz <wally101470@gmail.com>; bgurney@msi1.com; canong@easthampton.k12.ma.us; eric snyder <eric.snyder@easthamptonchamber.org>; marilyn.cahill@florencebank.com; michael buehrle <buehrle1963@msn.com>; Ron Malouin <poppabear@malouin.com>; sue phillips <sue.pepinphillips@florencebank.com>; Tom Brown <tbrown@bankesb.com>; 'Bernard Gawle' <pinevalleyrealty@verizon.net>; Bill Canon <office@canonla.com>; chetsek@charter.net; David Boyle <azpropertieseasthampton@gmail.com>; 'David Garstka' <dsgbuilders@msn.com>; Don & Wendy Taylor-Jourdian <taylorjourdian@yahoo.com>; Eddie Fedor <eddiefedor@verizon.net>; Harry Schumann <bosshoss2005@gmail.com>; Jason Bachand <jason.bachand@doucet-mass.com>; 'John Courtney' <courtneyway@verizon.net>; 'Suzanne O'Donnell' <suzodo@yahoo.com>; 'Wolfsong' <wolfsong1234@yahoo.com>; Alison Keller <alison.weber9@gmail.com>; 'Erica Flood' <erica_flood1@yahoo.com>; 'Jim Zarvis' <jzcodelord@gmail.com>; John Bruner <jdbLO@hampshire.edu>; jz@americannewmedia.com; Kurt Zellen <kzellen@gmail.com>; Michael Czerwiec <michael.czerwiec@gmail.com>; Neal Parks <artist@nealparks.com>; jtimme@dwpm.com; RChateauneuf@Easthampton.org
Cc: 'Michael A. Tautznik' <miket@easthampton.org>; 'Joseph Pipczynski' <joepip@easthampton.org>; 'jgracia' <jgracia@easthamptonwater.com>; 'CARL WILLIAMS' <ewwtp@hotmail.com>; 'Jamie Benjamin Webb' <Planner@easthampton.org>; 'Briony Angus' <BAngus@tigheBond.com>
Sent: Thursday, April 25, 2013 12:20 PM
Subject: Anaerobic Digestion Feasibility Study Public Meeting

Good afternoon:

Please find attached information on a public meeting to be held on **Tuesday, May 7 at 6:30 p.m**. to discuss Anaerobic Digestion – what it is, how it works, and what are its impact. This meeting is part of the study currently underway to evaluate the technical and economic feasibility of this type of project in Easthampton. Public comments at the beginning of the study will help the consultant team focus on those AD issues that are most important to the community.

Meeting will be held at 50 Payson in the 2nd floor meeting area.

I hope that you will be able to join us.

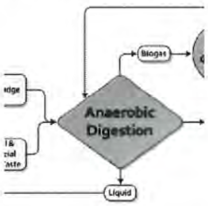
Thank you,
Jessica

Jessica Allan, AICP
City Planner
50 Payson Ave.
Easthampton, MA 01027
413/529-1406
allanj@easthampton.org

Search for people, places and things

Easthampton Planning Department · 192 like this
April 25 at 12:12pm ·

What is Anaerobic Digestion? How does it work? What are its impacts? Join us at this public meeting to find out more information about this renewable energy technology and help the City evaluate the technical and economic feasibility of a AD project in Easthampton.



Anaerobic Digestion Public Meeting
May 7 at 6:30pm
Easthampton Municipal Building in Easthampton, Massachusetts

Invite Friends · Easthampton Planning Department went

Like · Comment · Share

Jesse W. Belcher-Timme likes this.

Write a comment...

90 people saw this post

Boost Post

Search for people, places and things

Easthampton Planning Department · 192 like this
Monday at 4:52pm ·

REMINDER: public meeting tomorrow (5/7) to discuss the Ferry Street Wastewater Treatment Facility Anaerobic Digestion Project - 6:30 PM, 2nd Floor Meeting Area, 50 Payson Ave.

Like · Comment · Share 1

Melissa Coady likes this.

James P Sullivan Is that going to be up in 3rd floor meeting room to accommodate the crowds ?
Like · Reply · Monday at 5:35pm via mobile

Easthampton Planning Department Yes.
Like · Reply · Monday at 6:35pm

James P Sullivan Good I know new city neighborhood association will have a lot to offer
Like · Reply · Monday at 6:40pm via mobile

Write a comment...

680 people saw this post

Boost Post

From: Erica Ann Flood [mailto:erica_flood1@yahoo.com]
Sent: Tuesday, May 07, 2013 10:27 AM
To: Jessica Allan
Subject: Re: Anaerobic Digestion Feasibility Study Public Meeting

Hi Jessica,

I cannot make it to the public meeting this evening but I wanted to send along a note in support of this project overall.
This is a great opportunity for the city to meet the needs of the community and move in a greener direction.

My Best Regards,
Erica Ann

Yes! I am on the web: www.eafloodphotography.com

“Life can only be understood backwards;
but it must be lived forwards.”
Søren
Kierkegaard

From: Jessica Allan <allanj@easthampton.org>
To: 'Chester Ogulewicz' <ogulewicz@aol.com>; 'Dan Hagan' <haganprecinct1@yahoo.com>; 'Dan Rist' <drist55@msn.com>; 'Joe McCoy' <bonesjmc@aol.com>; 'Joy Winnie' <bjhawinn8@cs.com>; 'Justin Cobb' <cobb.precinct02@gmail.com>; 'Nate Ziegler' <npziegler@gmail.com>; 'Salem Derby' <salemstar@gmail.com>; Christopher Cockshaw <Christopher.Cockshaw@hatchmott.com>; Dan Buttrick <DRButtrick@tigheBond.com>; izbicki@gmail.com; Jay Ryan <jrryan201@aol.com>; Kelly Richey <krichey@albanolaw.net>; 'Kelly Richey (HOME)' <kellyrsranch@verizon.net>; Melissa Coady <MPCoady@tighebond.com>; Walter Hudzikiewicz <wally101470@gmail.com>; bgurney@msi1.com; canong@easthampton.k12.ma.us; eric snyder <eric.snyder@easthamptonchamber.org>; marilyn.cahill@florencebank.com; michael buehrle <buehrle1963@msn.com>; Ron Malouin <poppabear@malouin.com>; sue phillips <sue.pepinphillips@florencebank.com>; Tom Brown <tbrown@bankesb.com>; 'Bernard Gawle' <pinevalleyrealty@verizon.net>; Bill Canon <office@canonla.com>; chetsek@charter.net; David Boyle <azpropertieseasthampton@gmail.com>; 'David Garstka' <dsgbuilders@msn.com>; Don & Wendy Taylor-Jourdian <taylorjourdian@yahoo.com>; Eddie Fedor <eddiefedor@verizon.net>; Harry Schumann <bosshoss2005@gmail.com>; Jason Bachand <jason.bachand@doucet-mass.com>; 'John Courtney' <courtneyway@verizon.net>; 'Suzanne O'Donnell' <suzodo@yahoo.com>; 'Wolfsong' <wolfsong1234@yahoo.com>; Alison Keller <alison.weber9@gmail.com>; 'Erica Flood' <erica_flood1@yahoo.com>; 'Jim Zarvis' <jzcodelord@gmail.com>; John Bruner <jdbLO@hampshire.edu>; jz@americannewmedia.com; Kurt Zellen <kzellen@gmail.com>; Michael Czerwiec <michael.czerwiec@gmail.com>; Neal Parks <artist@nealparks.com>; jtimme@dwpm.com; RChateauneuf@Easthampton.org
Cc: 'Michael A. Tautznik' <miket@easthampton.org>; 'Joseph Pipczynski' <joepip@easthampton.org>; 'jgracia' <jgracia@easthamptonwater.com>; 'CARL WILLIAMS' <ewwtp@hotmail.com>; 'Jamie Benjamin Webb' <Planner@easthampton.org>; 'Briony Angus' <BAngus@tigheBond.com>
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Subject: Anaerobic Digestion Feasibility Study Public Meeting

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Meeting will be held at 50 Payson in the 2nd floor meeting area.

I hope that you will be able to join us.

Thank you,
Jessica

Jessica Allan, AICP
City Planner
50 Payson Ave.
Easthampton, MA 01027
413/529-1406
allanj@easthampton.org

Attachment B
May 7, 2013 Community Meeting
Advance Press

Town Hall lighting, digester project, open space on tap

Around **EASTHAMPTON**
Rebecca Everett

The possibility of the city building an anaerobic digester that would transform food waste and sludge from the wastewater treatment facility into energy is the topic of a public meeting May 7.

The city received a $38,000 grant from the Massachusetts Clean Energy Center to hire a consultant to evaluate the technical and economic viability of creating a digester at the wastewater treatment facility off Ferry Street. Tighe & Bond of Westfield will do the study over the next year.

City Planner Jessica Allan said the grant calls for public input in the beginning of the evaluation process.

"If anyone has questions about anaerobic digestion, what it is and how it works, this is the perfect opportunity to ask," Allan said. "We're hoping the public can help us to infer what considerations should be examined as we continue with the feasibility study."

A digester would combine food waste from commercial entities with sludge left over after the city's wastewater is treated and discharged. Inside the digester, microorganisms would break down the biodegradable material, producing methane that can be used to produce electricity. The process also creates a byproduct that can be used as a fertilizer.

Issues the city has already decided need to be vetted include possible site limitations, the effect of large trucks bringing in food waste and other potential impacts on the neighborhood.

Allan said a digester might cut the city's spending on sludge disposal and electricity. In the last fiscal year, the city spent $167,572 disposing of sludge off site and $80,711 to power the plant.

The meeting will take place at 6:30 p.m. in the Municipal Building at 50 Payson Ave.

• • •

is seeking community input through a survey and a visioning workshop at the Municipal Building May 29 at 7 p.m. The plan will direct city planning in terms of preserving and maintaining open spaces, water resources, plant and animal habitat and parks and recreation facilities.

"We're trying to identify our priorities and goals to update the Open Space and Recreation Plan," Allan said. The plan was last updated in 2006 and needs to be updated by July, she said. "The strategies we developed then may still be very relevant but there may be new issues to address."

The survey is available through May 17 on the city's website at www.easthampton.org. Paper copies are available at the Community Center, the Council on Aging and Enrichment Center and the Emily Williston Memorial Library.

• • •

New light display unveiled

Strollers at Art Walk May 11 can be among the first to see the new colorful light display on the facade of the Old Town Hall when it is illuminated at a lighting ceremony at 8:30 p.m.

The programmable, color-changing lighting system was designed and installed by Valley artist Wade Clement, who has been designing such lighting displays for homes, buildings and other spaces around the country since the 1980s, according to a press release from CitySpace, the nonprofit that runs the historic building.

The building houses Easthampton City Arts Plus, the Flywheel Arts Collective and the Elusie Gallery at Eastmont Custom Framing.

The installment will be

requires no maintenance for up to 25 years, both being good for CitySpace's budget and the environment," Clement said in a statement.

• • •

State official tours city

Undersecretary of Housing and Community Development Aaron Gornstein toured a downtown thoroughfare Monday that will benefit from a $10,000 grant from the state department.

The city received the grant to hire the Cecil Group of Boston to study Union Street and suggest possible design improvements, including some that may make the narrow stretch of Route 141 more bicycle and pedestrian friendly.

When the city did a similar grant-funded study of Cottage Street in 1999, suggested improvements included traffic-calming measures, better lighting and crosswalk placement and facade improvements.

Gornstein toured Union Street with Mayor Michael A. Tautznik before stopping into the former Dye Works building at 15 Cottage St., where a Boston developer plans to recreate the space as 50 units of affordable rental housing. The Department of Housing and Community Development contributed $2.5 million in housing subsidies to help the $15 million project get off the ground. It is expected to break ground later this year.

• • •

Northampton Street closed Wednesday

Northampton Street will be closed to traffic Wednesday from 6 a.m. to 5:30 p.m. as part of the reconstruction of the bridge over the Manhan River. The street, also known as Route 10, will be closed from the rotary at Main Street to the intersection with West Street. Traffic will be detoured down O'Neill, Lovefield and Pleasant streets and motorists may also use West

masslive.com

Easthampton hearing to explain, take comments on proposed waste digester

Diane Lederman, The Republican By Diane Lederman, The Republican

on May 02, 2013 at 12:54 PM, updated May 06, 2013 at 6:23 PM

EASTHAMPTON - The City of Easthampton is holding a public hearing Tuesday to explain the anaerobic digestion project that is being considered for the city.

The hearing will be held at 6:30 p.m. in the 2nd floor meeting room.

The city earlier this year received a $38,000 grant from the Massachusetts Clean Energy Center through the Organics to Energy Program to look at whether a parcel of land next to the wastewater treatment plant would be a viable site for the digester.

View Gosselin Drive, Easthampton, site of possible anaerobic digester in a larger map

Engineering firm Tighe & Bond of Westfield is working with the city to evaluate the technical and economic feasibility of the project that would use wastewater sludge and other organic materials to create biogas in an anaerobic digester that would then create heat and electricity. The study will be completed over the next 12 months.

The project has the potential to reduce operating costs and generate revenue for the city, increase the amount of local renewable energy in Easthampton, and provide a useful outlet for organic waste that is currently put in a landfill, Allan has said.

Such a business would also add another industry to the tax base, Allan has said.

The Clean Energy Center has funding available for construction and technical services as well as for feasibility studies.

Attachment C
May 7, 2013 Community Meeting Hand-Out

City of Easthampton – Organics to Energy

Anaerobic Digestion Feasibility Study

Public Meeting

May 7th, 2013, 6:30 pm

50 Payson Ave, 2nd Floor Meeting Room

The City of Easthampton has been awarded a grant from the Massachusetts Clean Energy Center through the Organics to Energy Program to evaluate the feasibility of an Anaerobic Digestion (AD) project at the Ferry Street Wastewater Treatment Facility (WWTF). Please see the other side of this handout for an overview of how Anaerobic Digestion technology works.

- **What is the Scope of the Feasibility Study?** Tighe & Bond is working with the City to evaluate the technical and economic feasibility of a project that would use wastewater sludge and other organic materials to create biogas in an anaerobic digester that would then create heat and electricity. The Feasibility Study will evaluate the suitability of the Ferry Street WWTF for the project; technical and engineering aspects of a potential AD system; the type and volume of available feedstock; and project economics. The Feasibility Study will be conducted during 2013. If the project is determined to be technically and economically feasible, the City may seek a private development partner through a Request for Proposals (RFP) process to develop, own, and operate the project.

- **Why is the City Interested in AD?** The project has the potential to reduce operating costs and generate revenue for the City, increase the amount of local renewable energy in Easthampton, and provide a useful outlet for organic waste that is currently being landfilled. In addition, the City has recently been approached by several private developers interested in developing AD projects at the WWTF. The grant-funded Feasibility Study will help the City evaluate whether the project is a good opportunity for the City and community.

- **Why is the State of Massachusetts interested in AD?** Anaeorobic Digestion presents an opportunity for the Commonwealth of Massachusetts to meet important goals related to renewable energy. Compared with other large scale renewable energy technologies, AD projects take advantage of existing infrastructure and sites, and are relatively straightforward in terms of permitting and construction. Numerous financial incentives are available for AD projects. Additionally, AD projects help meet goals related to organic waste diversion. In 2014, the Massachusetts Department of Environmental Protection will implement an organic waste ban applicable to commercial and industrial waste generators.

Please contact:

Jessica Allan, City Planner - 413. 529.1406 or allanj@easthampton.org

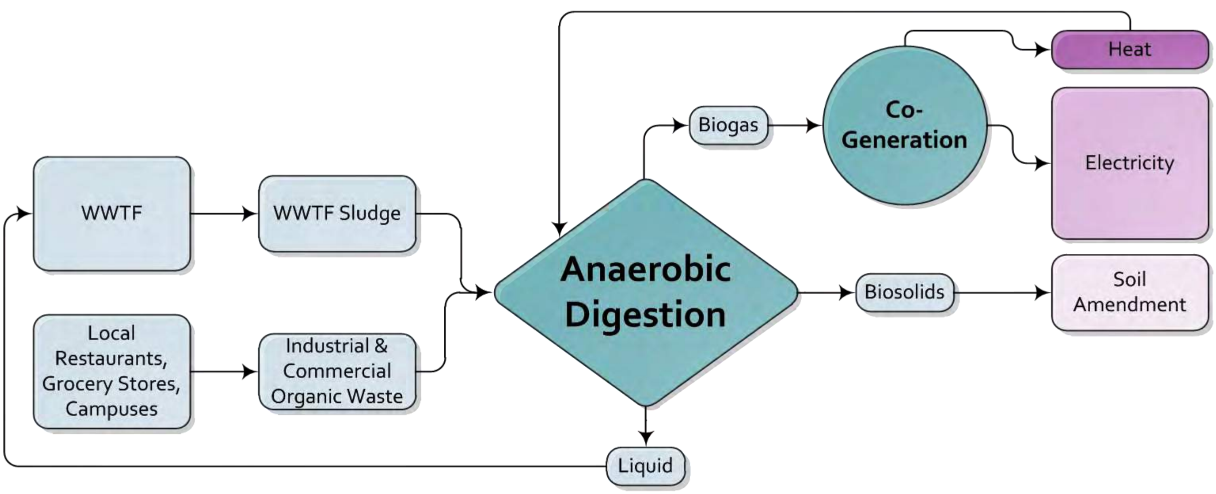
Briony Angus, Tighe & Bond - 413.562.1600 or bangus@tighebond.com

For more information about the project.

Anaerobic Digestion – How Does it Work?

Anaerobic digestion (AD) is a biological process in which micro-organisms break down or "digest" organic materials in the absence of oxygen and form biogas. In the "wet" version of AD, pumpable organic feedstocks (such as wastewater sludge or food processing waste) are placed in an enclosed vessel that is maintained at temperatures of 95 - 140 degrees Fahrenheit, typically for about three to four weeks. Naturally-occurring micro-organisms that thrive in this heated environment break down the organic solids and produce biogas, comprised primarily of methane (also known as natural gas) and carbon dioxide. "Dry" AD systems operate in a similar way, but can handle feedstocks with lower moisture content, such as table scraps or yard waste.

The biogas can be fed into a generator to create electricity, or used in a combined heat and power (CHP) system, also known as a co-generator, to simultaneously produce both electricity and heat.



In addition to WWTF sludge, a variety of other feedstock materials can be used in the AD process. As part of the Feasibility Study, the City and Tighe & Bond will evaluate the availability of food waste, leaf and yard waste, and other commercial and industrial agricultural and/or organic waste that could be used in the project. A specific focus will be on those organic waste generators that will be subject to the state's pending organic waste ban. The Feasibility Study will also evaluate potential uses for the digestate byproduct from the AD process, such as soil amendment.

Tighe&Bond www.tighebond.com

MASSACHUSETTS CLEAN ENERGY CENTER

Attachment D
May 7, 2013 Community Meeting Presentation

Organics to Energy – Sludge/Food Waste AD at Easthampton WWTF

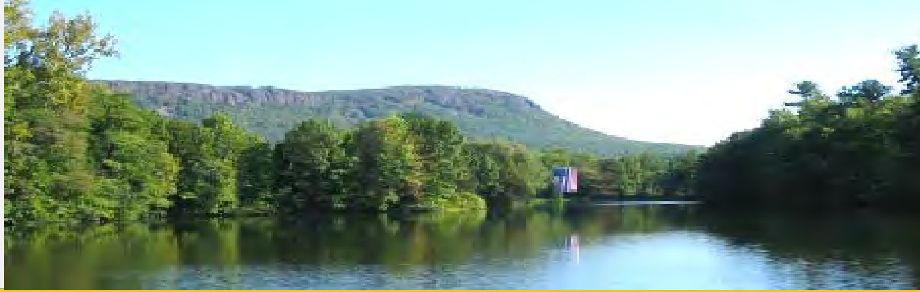
Anaerobic Digestion Feasibility Study Public Meeting

May 7, 2013

Jessica Allan, Planning Director

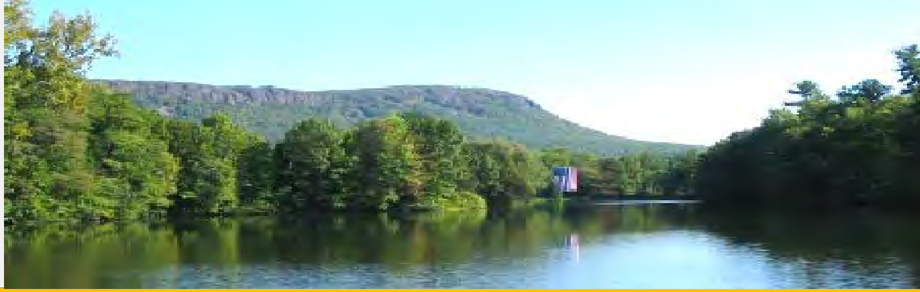
Briony Angus, Tighe & Bond

Presentation Goals/ Objectives



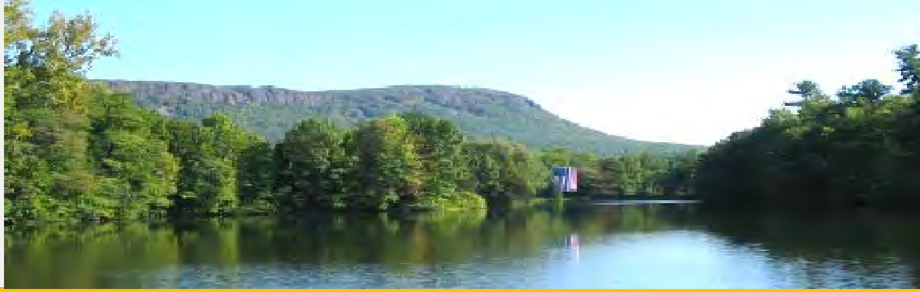
- **Overview of MassCEC Organics to Energy Program**
- **Overview of Anaerobic Digestion**
- **Regulatory Drivers for AD**
- **Financial Incentives for AD**
- **City of Easthampton Organics to Energy Project**
  - Development of a Project
  - Project Characteristics
  - Feasibility Study Tasks and Schedule
- **Discussion and Questions**

MassCEC Organics to Energy Program



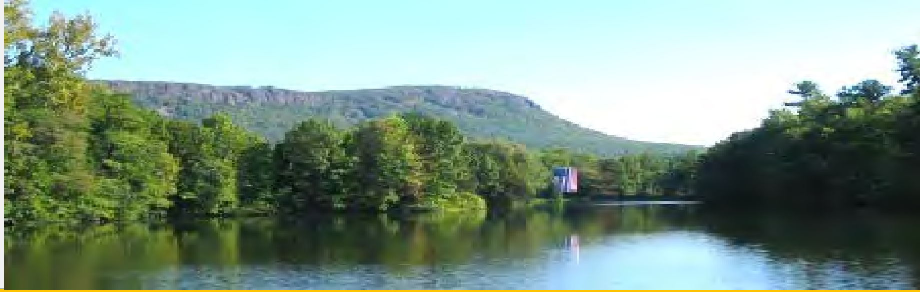
- **Massachusetts Clean Energy Center (MassCEC)**
  - Dedicated to accelerating the success of clean energy technologies, companies and projects in the Commonwealth
  - Funded by the Massachusetts Renewable Energy Trust
- **Organics to Energy Program**
  - Organics-to-Energy technologies convert source-separated organic materials into electricity and/or thermal energy without direct combustion.
  - Grants for Feasibility Studies and construction
  - Specific focus on food waste

City of Easthampton AD Project

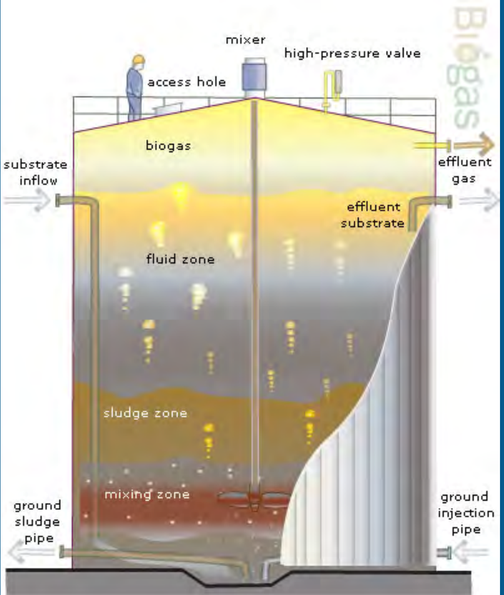


- **Easthampton is a clean energy leader**
  - Designated a Green Community in 2010
  - First ground-mounted PV project on a closed landfill in Massachusetts 2 MW of solar PV on the landfill
- **Supportive & motivated Mayor and Planning Director**
- **Ferry Street WWTF operators looking for a reduction in sludge management costs and electricity costs**
- **City and Tighe & Bond obtained $40,000 MassCEC grant for AD Feasibility Study**

Overview of AD – The Basics

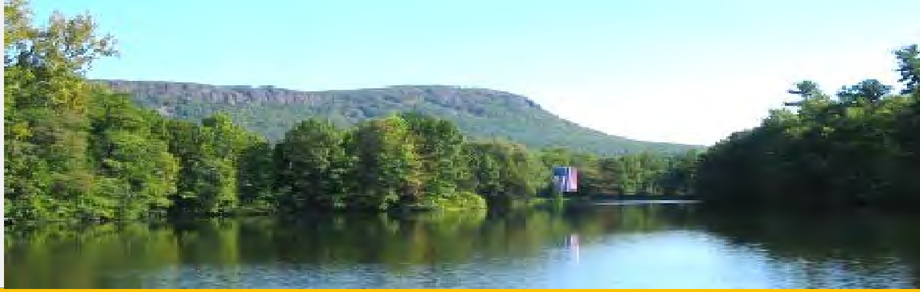


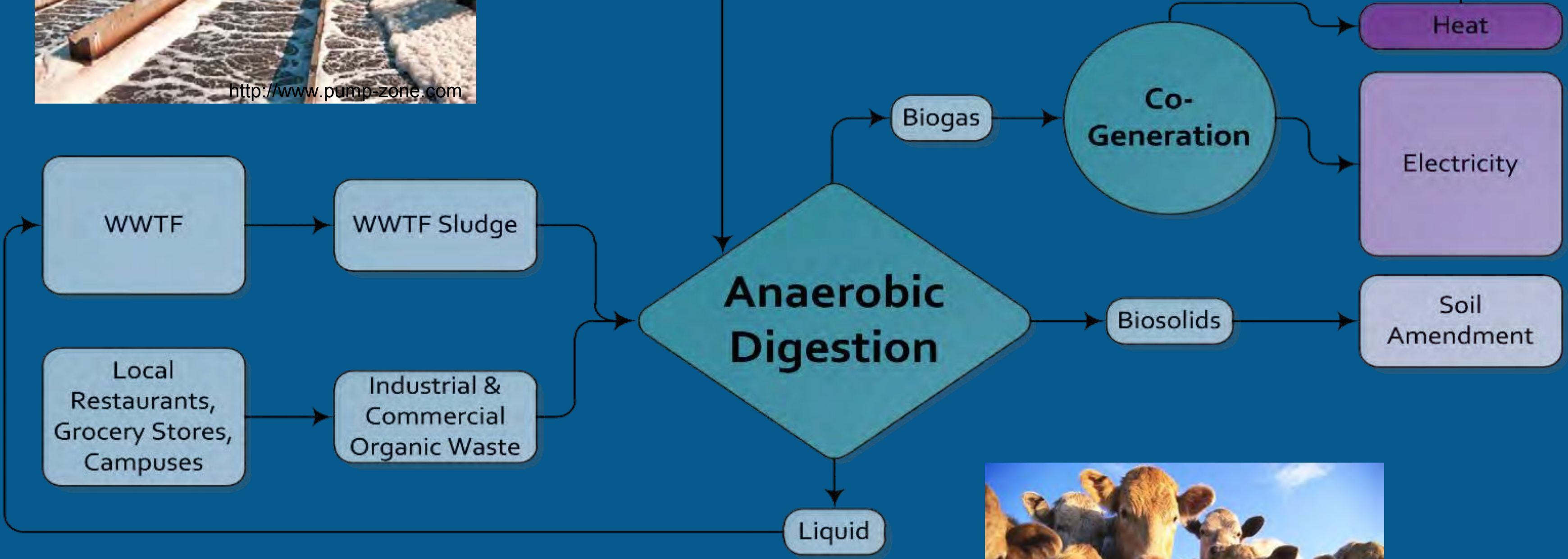
- **Anaerobic Digestion:** The breakdown of organic material in the absence of oxygen.
- **Biogas:** The gas produced from decomposition of organic material. Generally consists of 60 to 80% methane, 30 to 40% CO_2, and other trace gases.
- **Digester:** A sealed container or tank where biological digestion occurs and biogas is formed.
- **Effluent:** Organic material and solid material (slurry) leaving a digester.



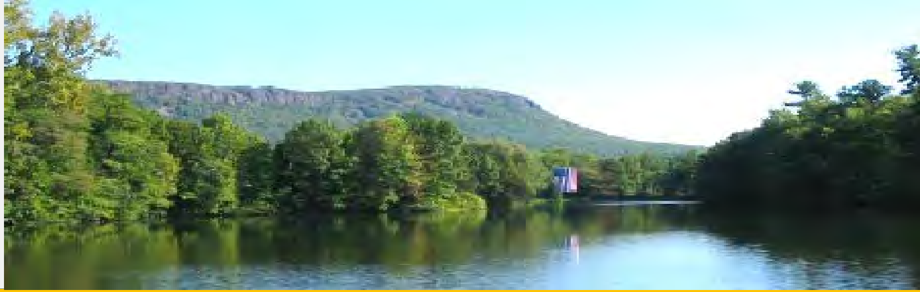
http://www.4enveng.com/edetails.php?id=61

Overview of AD - Process



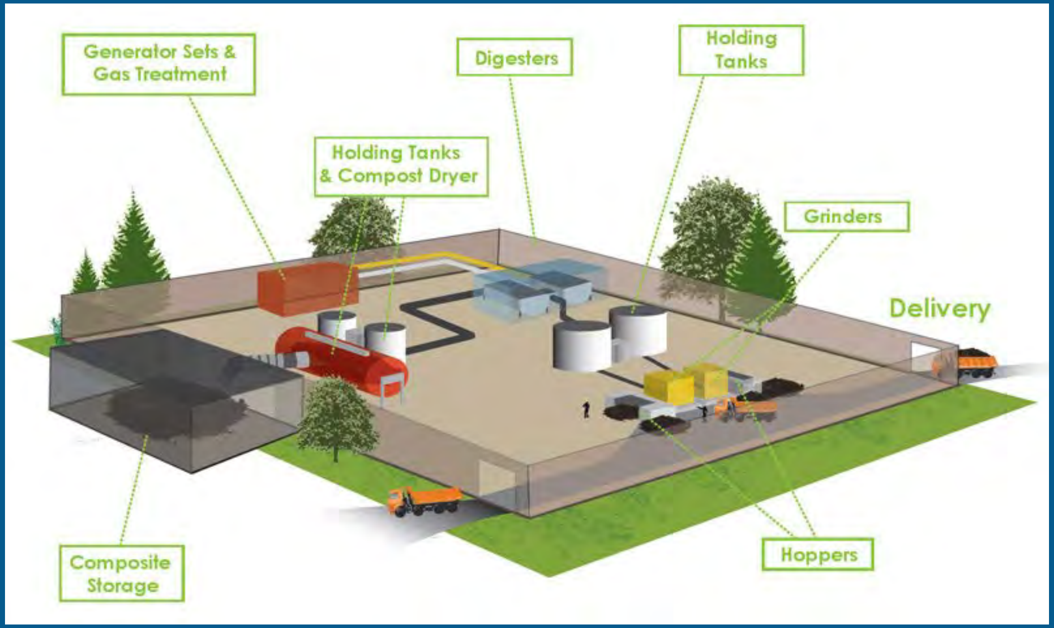


AD – System Components



- **Waste Collection and Transport**
- **Waste Receipt and Pre-Processing**
- **AD Process**
- **Biogas Utilization**
  - Thermal Energy and Electricity
- **Digestate and Wastewater Management**
- **Materials Storage**
- **Site Sanitation and Odor Control**

High Solids AD Site Layout



www.greenpointep.com/2011/04/organic-municipal-solid-waste/

Regulatory Drivers

- **Renewable Energy Goals**
  - MA Renewable Portfolio Standard
  - MA Clean Energy Results Program
- **Organic Waste Ban Development**
  - Organic materials count for 25% of disposal in MA
  - Massachusetts Organics Action Plan: Divert 350,000 tons per year or organic materials by 2020
  - Applicable to commercial and industrial organic waste generators in 2014
- **MassDEP Solid Waste and Wastewater Treatment Plant regulations changing to encourage AD**

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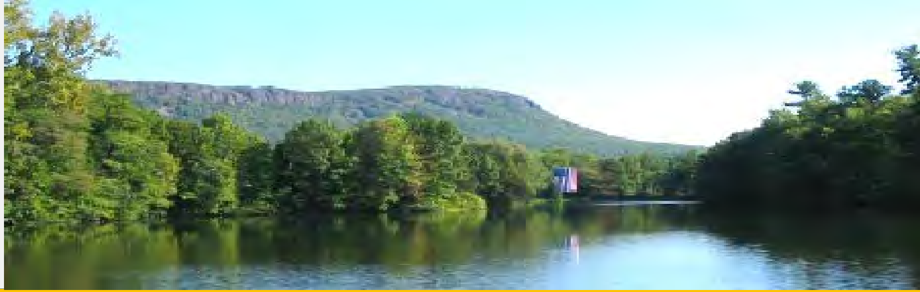
Financial Incentives



- **Avoided Cost Benefits**
  - Sludge disposal costs
  - Electricity and heating costs
- **New Revenue Streams**
  - Organic materials tipping fees
  - Sale of digestate/ soil amendment
- **Financial Incentives**
  - Additional MassCEC funding
  - MassDEP funding
  - Green Communities funding
  - Renewable Energy Credits
  - Net Metering

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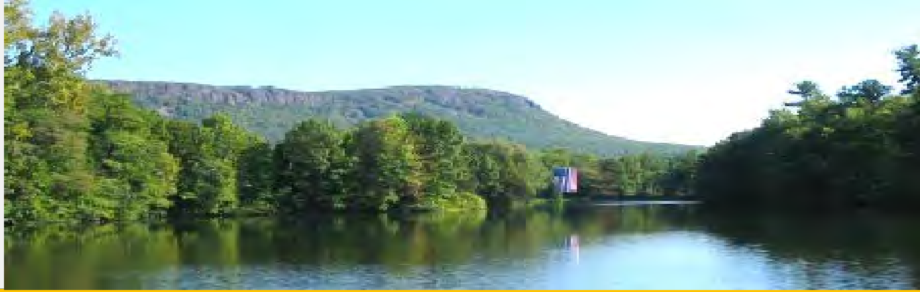
Existing AD Projects



- **AD plants use proven technology**
  - Nearly 9,000 AD plants in Europe with over 6,000 in Germany alone
  - Long operating history with high reliability
  - Over 1,600 AD plants in the US, recycling agricultural wastes and sewage sludge
  - Some AD facilities in the US are using food waste, some European facilities use only food waste

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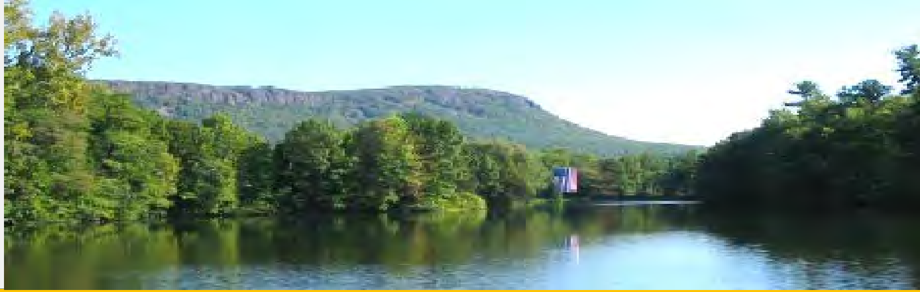
Existing Projects in Massachusetts



- **Agreen Energy/Jordan Dairy Farm**
  - Slurried Food Scraps/SSO/FOG
  - 550,000 gallon capacity
  - 2,280 MWh of electricity
  - Liquid Digester
- **Agreen Energy/ Hadley**
- **WWTP AD projects:**
  - Boston, Lawrence, Clinton, Rockland, Pittsfield, Fairhaven
- **Industrial WWTP Sites:**
  - Coca Cola – Northampton
  - Garelick Farms - Lynn

Jordan Dairy Farm Digester

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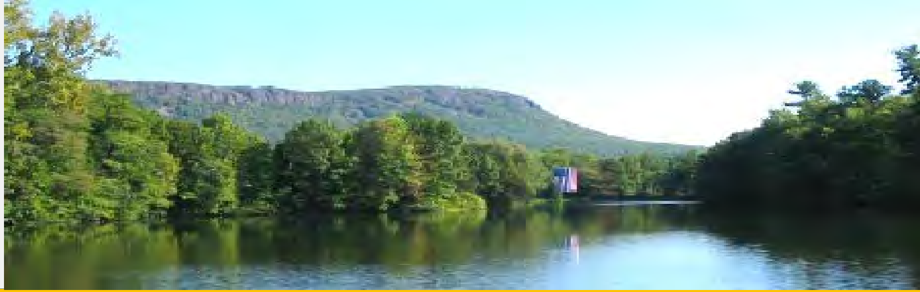
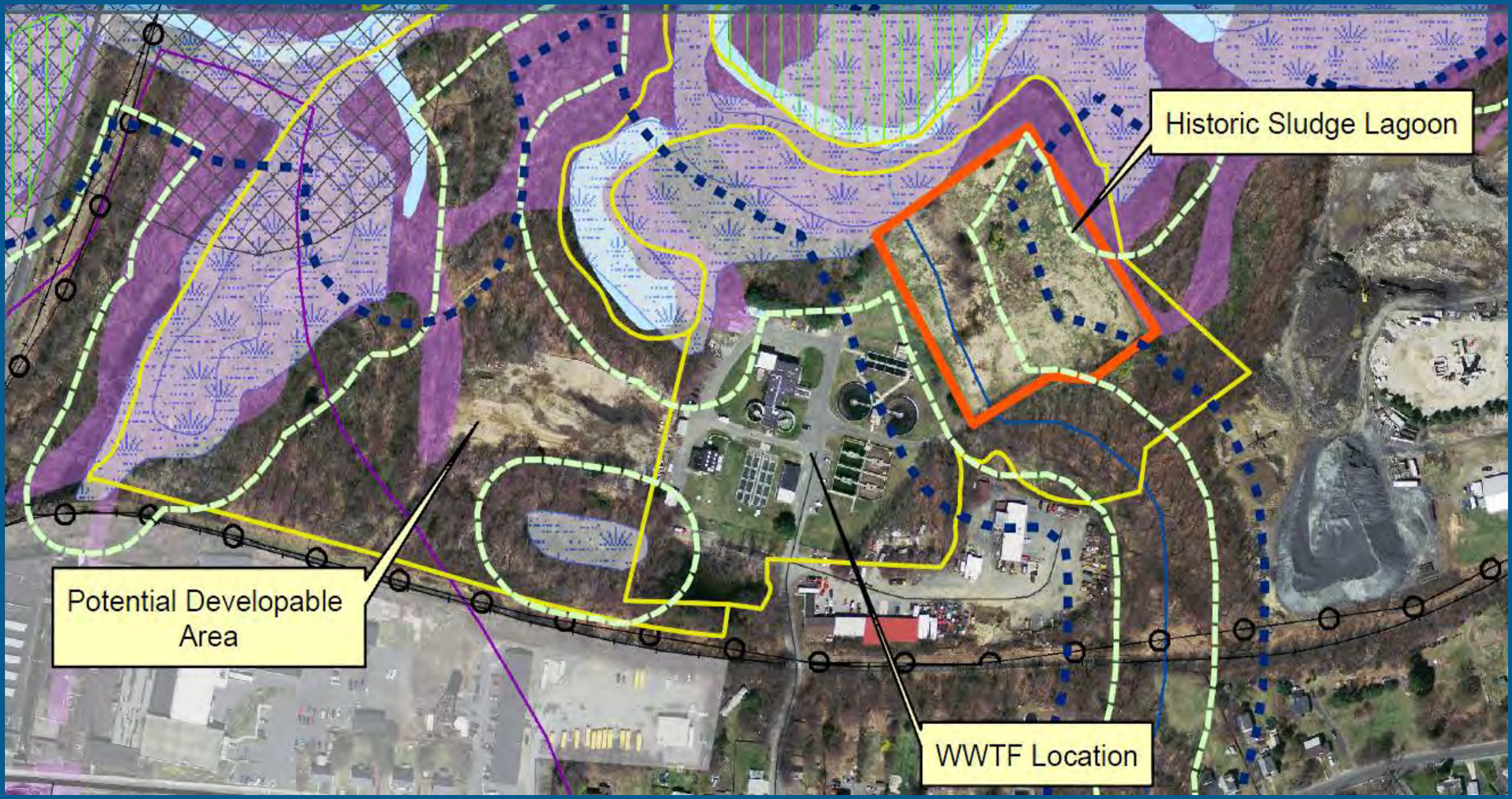
City of Easthampton AD Project



- On-site feedstock, on-site electric and thermal needs, minimal residential neighbors, ability to avoid environmental resources, favorable zoning



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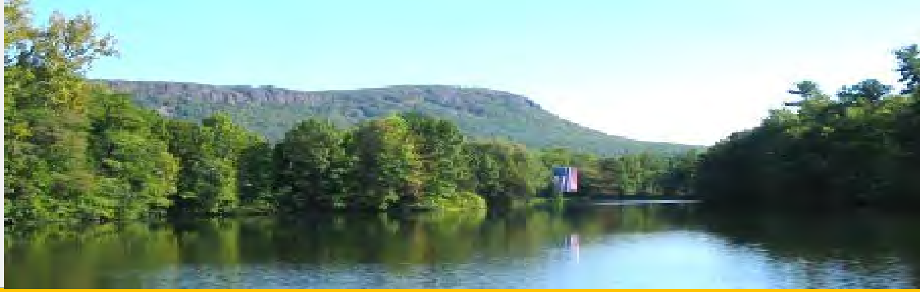
City of Easthampton AD Project



- **3.8 MGD WWTF**
  - Domestic and industrial wastewater
  - Gravity flow
  - Discharge to the CT river
- **Sludge management**
  - Septage received at headworks
  - Thickened and dewatered
  - Hauled to Waterbury, CT
  - Cost near $170,000 per year
- **Electricity use**
  - Almost 700,000 kWh annually
  - FY 2011 electricity cost $80,700

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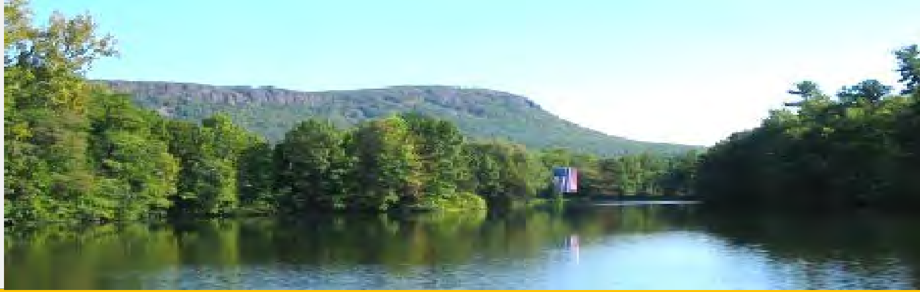
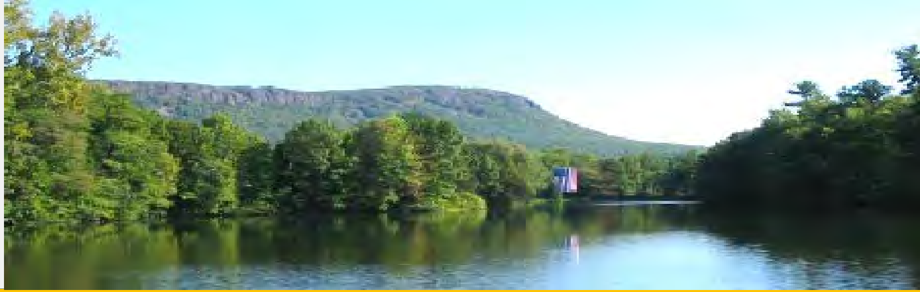
City of Easthampton AD Project



- **150 kW reciprocating engine cogeneration system**
- **Potential to meet 100% of electricity usage**
  - Net excess will be allocated to Easthampton accounts via net metering
- **Required Equipment:**
  - SSOM receiving and processing equipment
  - Digesters
  - Cogeneration equipment
  - Thermal exchanger
  - Electrical equipment

Feasibility Study Scope



- **Site Evaluation**
  - Environmental / Regulatory / Permitting
- **Community Engagement Plan**
  - Potential Concerns and Mitigation
  - Plan for Public Engagement
- **Technical Assessment**
  - Feedstock Availability
  - Technology Selection and Sizing
  - Estimate of Annual Energy Production (Heat and Electricity)
  - WWTF Operations
  - Electrical Interconnection
- **Economic Analysis**
  - Life-Cycle Analysis
  - Economic Pro Forma Analysis

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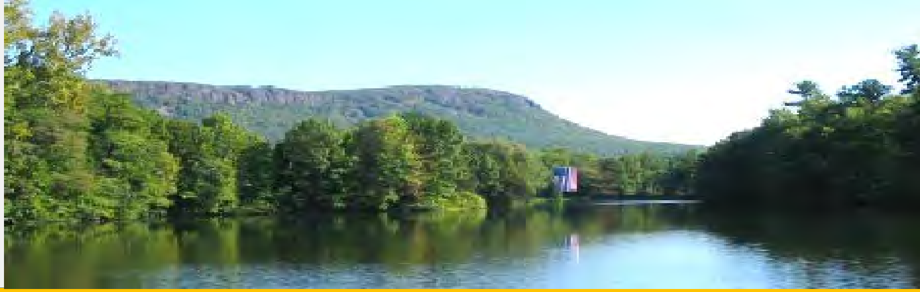
Community Impact Evaluation

- **Types & quantities of materials to be accepted**
- **Types of vehicles used to deliver materials**
- **Anticipated volume of truck traffic**
- **Potential for odor, visual, and noise issues**
- **Consideration of other community features:**
  - Community compost drop off
  - Use of leaf and yard waste

Feasibility Study Schedule



- **Community Meeting – May 2013**
- **Development of Community Engagement Plan – May 2013**
- **Conduct Feasibility Study Evaluations – June to December 2013**
- **Draft Feasibility Study report to MassCEC – due February 2014**
- **Final Feasibility Study report to MassCEC – due May 2014**
- **Additional Public Meeting to be held to discuss Feasibility Study findings**

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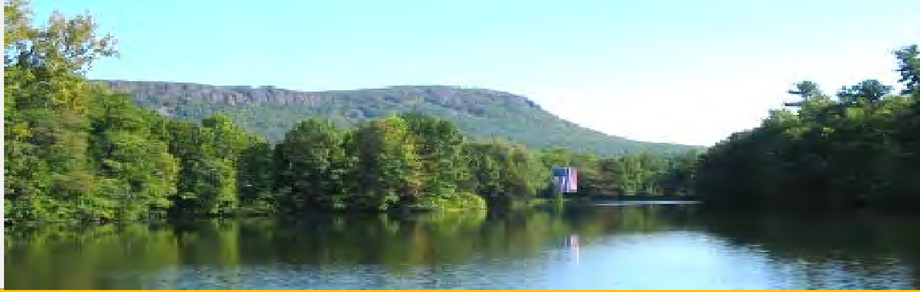
Post-Feasibility Study Next Steps



If Feasibility Study indicates project is technically and economically feasible:

– City may issue RFP for private developer to design/ construct/ own/ operate project
– Project design and permitting
– Project construction and operation

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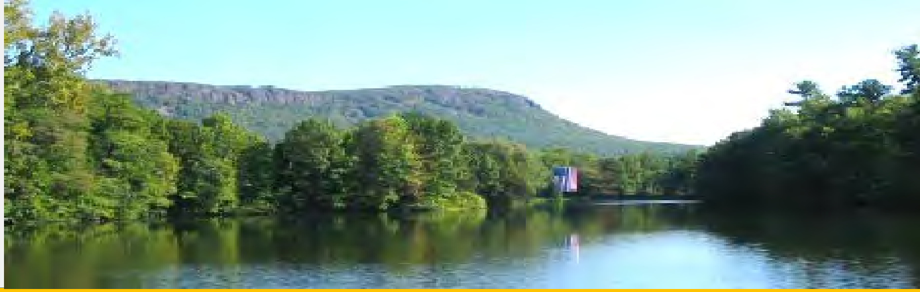
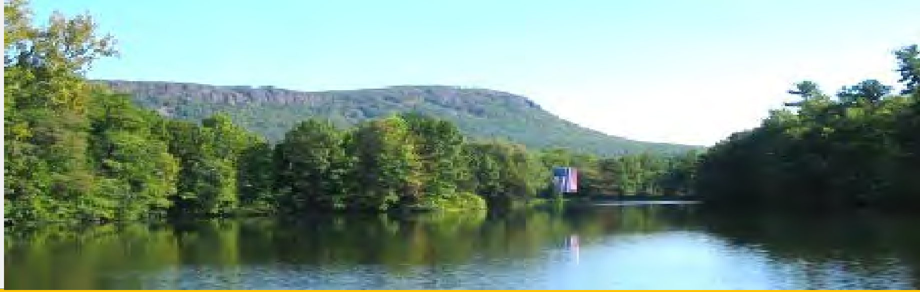
Summary



- Regulatory support and financial incentives for AD are abundant
- City could benefit in multiple ways from AD project
- Comprehensive Feasibility Study to determine whether project makes sense for City

Discussion and Questions



Thank You!

Briony Angus, AICP
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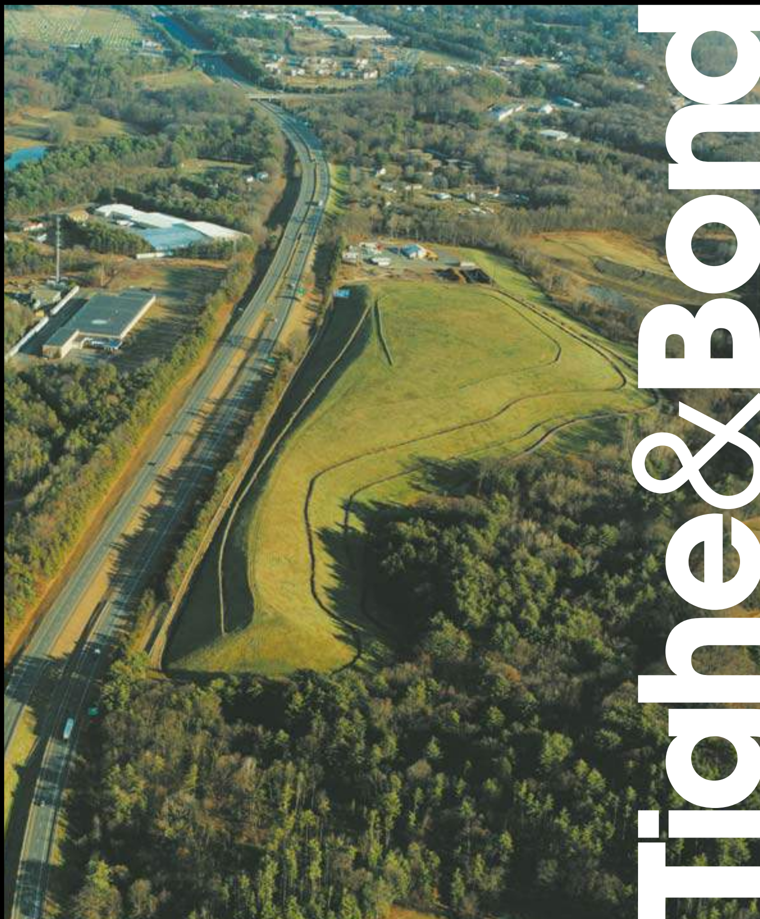
53 Southampton Road | Westfield, MA
413-562-1600
bangus@tighebond.com
www.tighebond.com

Attachment E
May 7, 2013 Community Meeting Sign-In

Anaerobic Digestion Feasbility Meeting -- May 7, 2013

Name	Address	Email	Phone
Nathan Ziegler	58 Maple Street	NPZiegler@gmail.com	413 977-3229
Chester Ogulewicz	18 Sandia Rd.	Ogulewicz@AOL.com	413-293-3289
DAN HAGAN	HIGHLAND AVE	haganpreecinct1@yahoo.com	527-6250
Jim Vachhaweourt	17 Summer ST	javaj691@charter.net	(413) 203-1871
Walter Hudzikiewicz	253 Main St	Wally101470@Gmail	413 5197284
MICHAEL TAUTZNIK	(H) 166 HENDRICK ST (W) 50 PAYSON AVE.	MIKET@EASTHAMPTON.ORG	413 529 1470
Jamie Webb	Planning Office	planner@easthampton.org	529-1405
JESSICA ALLAN	(H) 157 Everett St (W) 50 Payson Ave	allanj@easthampton.org	529-1406



APPENDIX G

Funding for Anaerobic Digestion Projects in Massachusetts

Massachusetts Clean Energy Center, Organics to Energy Projects

- Solicitations open for Construction and Pilot Projects (Issued September 2013, closes April 21, 2014).
- Construction and Pilot Projects: Funding available to public and private entities for design, permitting and construction of facilities; installation and commissioning of equipment. Construction Project grant awards capped at $400,000 or 25% of total contract budget. Pilot Project grant awards capped at $200,000 or 50% of total Contract Budget.
- Technical Services/ Studies: Available to public entities only, technical services for municipalities considering development and permitting of OtE facilities. Grant award up to $60,000 with a 5% match.
- Feasibility Studies: Available to public and private entities. Maximum grant level for public entities: $40,000 with a 5% match. Private entities: $40,000 with a 20% match.

Massachusetts Department of Energy Resources, Green Communities Program

- Annual competitive grant program for eligible Green Communities. For the 2013 program, awards of up to $250,000 were available.
- Funding available for AD projects including: Site Assessment, Feasibility Studies, Design Assistance, Construction Financing

MassDEP Sustainable Materials Recovery Program (SMRP) Municipal Grants

- Funding available for Waste Reduction/Organics Capacity Projects, including AD projects that accept source-separated food waste
- Funds can be used for Planning, Feasibility Studies, Site Assessment, Design, Engineering and Permitting, Construction, Capital Equipment
- Municipalities, regional governmental entities, and non-profits may apply for grants of $10,000 (minimum) to $100,000. Requests for projects that involve collection and/or processing of organics (food waste) are eligible for up to $500,000.
- Next round of available grants will be announced in Spring 2014. Grant information sessions will be provided. The schedule is not currently posted.

MassDEP State Revolving Fund (SRF) Loan Programs

- MassDEP incorporates the goals of energy efficiency, energy conservation and renewable energy generation into financing decisions for Massachusetts State Revolving Fund (SRF) loan programs.
- Renewable energy and energy efficiency projects may be eligible for SRF financing if done in conjunction with an SFR funded project (not a stand-alone energy project),

energy is intended to be used at the water treatment or wastewater facility, and excess revenues generated by the project will be used to offset rates.

MassDEP Recycling Loan Fund (RLF)

- Loans range from $50,000 to $500,000 for terms up to ten years
- Qualifying businesses include private recycling companies, subsidiaries, or units whose primary purpose involves:
    - Collecting or separating recyclable materials for resale
    - Reuse, processing, composting or converting of recyclable materials into marketable products
    - Manufacturing products that use recycled materials
    - Wholesaling or retailing of recycled feedstocks or products containing a significant percentage of recycled materials.
- Food Waste Projects:
    - Preferred terms for composting, anaerobic digestion, or other facilities that divert food waste from disposal.
    - Interest rates as low as 2% (depending on credit and risk factors).
    - Businesses such as food processors that are not recycling or composting businesses, but that generate food waste, may be eligible to develop on-site composting or digestion operations for food waste diversion.

State Production Based Incentives for AD

- Massachusetts Renewable Energy Credits (Class I RECs)
- Net Metering Credits
- Massachusetts Alternative Energy Credits (AECs), available for CHP systems
- Utility based rebates for Thermal Energy