Town of Enfield, New Hampshire

Wastewater Planning Project

Draft Report

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1. INTRODUCTION AND BACKGROUND

1.1 PROJECT OVERVIEW

The Town of Enfield owns and operates a wastewater collection system that currently serves approximately 619 sewer users in Enfield. The Town does not own and operate a wastewater treatment facility, but instead discharges wastewater to the Lebanon Wastewater Treatment Plant (WWTP) for treatment. Wastewater flows are conveyed to Lebanon via a force main (FM), and flows travel through the City of Lebanon's collection system before reaching the Lebanon WWTP for treatment and disposal.

1.2 PLANNING AREA BACKGROUND

1.2.1 Background

The Town is located in the southwestern corner of Grafton County, New Hampshire, a part of the Upper Valley Region of the State, approximately 11 miles east of the Connecticut River and the State of Vermont. The Town is approximately 43.1 square miles is size, with a population of approximately 4,582 as of the 2010 United States Census.

The Town is bordered to the west by Lebanon, the regional commercial and population center. The Sullivan County Towns of Plainfield, Grantham and Springfield lie to the south, while Canaan and Hanover are to the north, and Grafton to the east. Interstate 89 travels through the relatively undeveloped southwestern portion of Town and State Highways 4 and 4A form the major arteries for the various villages that comprise Enfield. Mascoma Lake represents Enfield's lowest elevation at 751 feet above sea level, while the highest elevation is over 2,000 feet in a small area near Halfmile Pond.

The Route 4 and Route 4A corridors are served by the Town's sanitary sewer collection system which conveys wastewater to the City of Lebanon's WWTP. The Enfield collection system was constructed in 1988. Prior to construction of the wastewater collection system, untreated sewage from Enfield was a major source of pollution to the Mascoma River and Lake.

1.2.2 Organizational Profile

The Town is governed by an elected three-member Board of Selectmen. The Board of Selectmen meets regularly to review budgets, capital projects, and hold public hearings. The Town also has several other Boards, Committees and Departments of both elected and appointed members that carry out municipal activities, set policies, and hold public forums to solicit resident and business input. Town Meetings are held throughout the year to approve the budget and other warrant articles.

Town Departments and Boards directly involved in wastewater asset management planning include the Board of Selectmen, the Town Manager, and the Department of Public Works. The responsibility of the Department of Public Works is oversight, management and operation of the Sanitary Sewer Collection System and Wastewater Pump Stations. For parcels not served by the sanitary sewer system, property owners are responsible for the operation and maintenance of their on-site wastewater disposal systems (septic systems).

1.2.3 Geographic Profile

The Town is intersected by Interstate 89 as it travels North/South through the southwestern portion of Town. The nearest major urban population centers in the State of New Hampshire include the City of Concord, which is 55 miles to the southeast, and the City of Manchester, which is 75 miles to the southeast.

The Town was incorporated in 1761. The total land area is approximately 40.3 square miles. The Town has mostly been developed in the vicinity of the Route 4 and Route 4A corridors. The Town is primarily a rural residential community with some commercial development centered along the Route 4 and Route 4A corridors. The majority of undeveloped areas are zoned for agricultural use and a large portion of the agricultural land is permanently protected from development.

1.2.4 Demographic Profile

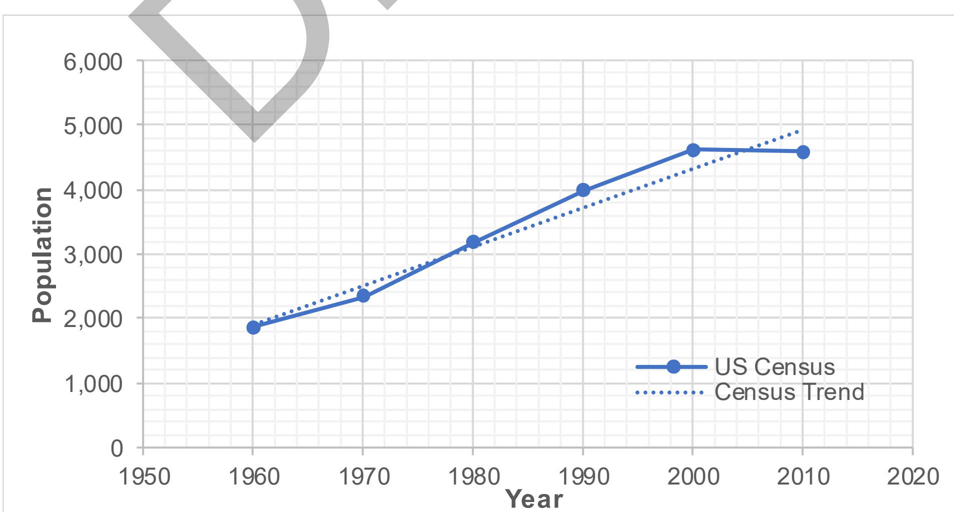
Historical population information provided by the United States Census Bureau from 1960 to 2010 is provided in **Table 1-1**. The Town experienced a 15.8% increase in population in the 1960s, followed by a 25.6% increase in population in the 1970s and a 35.4% increase in the 1980s. The population increased again during the 1990s by 25.3% and by 16.1% in the 2000s. Over the past 60-years the United States Census Bureau data indicates that the Town has an increasing population trend, which is contrary to the population trends for other rural communities throughout New England as a whole. A summary of the population trends for the Town based on the populations reported in the United States Census Bureau are presented below in **Table 1-1**.

Table 1-1: Population Trends (1960 – 2010)

Year	Population	% Change
1960	1,867	15.8%
1970	2,345	25.6%
1980	3,175	35.4%
1990	3,979	25.3%
2000	4,618	16.1%
2010	4,582	- 0.8%

A graph of the population trends for the Town is presented below in **Figure R1**.

Figure R1: Population Trends (1960 – 2010)



1.3 PLANNING PERIOD

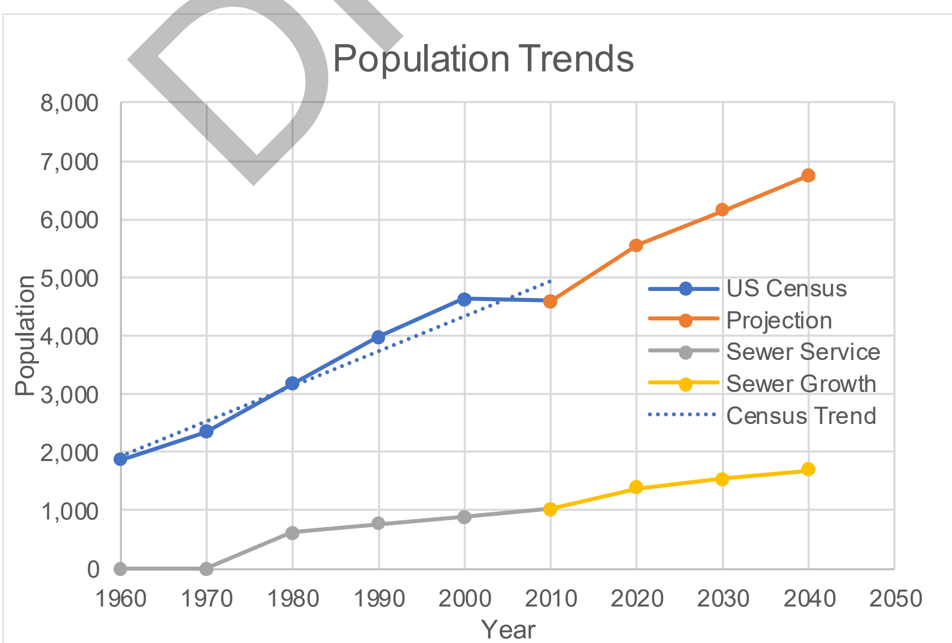
The planning period for this Project is from 2020 to 2040. To date, the collection system expansion has been limited to the areas in the vicinity of Route 4 and Route 4A. The current sewer service population is estimated at 1,387. Based on historical population trends provided by the United States Census Bureau, it is estimated that the population will increase 47.5% by the year 2040. This projected population increase may result in an estimated sewer service population of 1,689 for the sanitary sewer service area. A summary of the Town population and the sewer service population projections is presented below in **Table 1-2**.

Table 1-2: Town and Sewer Service Area Population Trends

Year	Town Population	Estimated Sewer Service Population
1960	1,867	0
1970	2,345	0
1980	3,175	614
1990	3,979	770
2000	4,618	893
2010	4,582	1,017
2020	*5,548*	1,387
2030	*6,154*	*1,538*
2040	*6,760*	*1,689*

A graph of the Town and sewer service population projections are presented in **Figure R2**.

Figure R2: Town and Sewer Service Area Population Trends



The projected sewer service population shown on **Figure R2** includes infill with limited sewer extensions within the existing sanitary sewer system. The projected sewer service population does not include major expansions of the collection system.

1.4 SCOPE OF WORK

The scope of work of the Wastewater Planning Project focuses on the following components:

Background Information:

1. Review current wastewater IMA with Lebanon
2. Review past planning documents.

Local Wastewater Alternatives:

1. Evaluate sites in Town for the conceptual local WWTP.
2. Evaluate two wastewater treatment systems, including membrane bioreactor (MBR) and sequencing batch reactor (SBR) configurations.
3. Evaluate conceptual sewer needs to redirect the Town's wastewater flows to the in-Town site.
4. Develop a capital improvement plan to integrate the proposed alternative.
5. Prepare an implementation plan for the recommendations, including funding/finance options, schedule and annualized cost projections.

Wastewater Financial Model:

1. Develop benchmarking for similar wastewater utilities.
2. Review current operation expenses, debt service, capital plan, and reserve funds.
3. Integrate the recommendations for the recommended local wastewater alternative
4. Develop a cash flow and revenue projections for the next 5 fiscal years.
5. Evaluate the anticipated sewer rates for the next 5 fiscal years.

2. WASTEWATER INFRASTRUCTURE

2.1 SANITARY SEWER SYSTEM

2.1.1 Sanitary Sewer Collection System

The Enfield sanitary sewer collection system includes approximately 45,260 linear feet (LF) of gravity sewer and 226 manholes. The collection system converges to the Route 4A Pump Station, before being pumped into the Lebanon collection system, flowing by gravity to the Lebanon WWTP for treatment and disposal. There are six (6) pump stations in the Enfield collection system. The collection system, shown in **Figure 2-1**, is comprised of 6 to 16-inch diameter gravity sewers, constructed of DI and PVC pipe materials. The majority of the Enfield collection system was constructed in the late 1980s with extensions in 1992 and 1997 to serve the Flanders Street area and Prospect Hill area. Overall, the collection system is comprised of approximately 12% ductile iron (DI) gravity sewer mains, and 88% polyvinyl chloride (PVC) gravity sewer mains. A summary of the collection system by pipe type and pipe diameter is presented in **Table 2-1**.

Table 2-1: Enfield Collection System Composition

Pipe Type	Pipe Diameter (in)	Pipe Length (lf)	Percent of Total System
DI	6	1,052	2.5%
	8	778	1.8%
	12	2,630	6.2%
	16	838	2.0%
PVC	8	30,679	72.1%
	10	1,355	3.2%
	12	3,076	7.2%
	15	2,151	5.0%
	Total =	**42,560**	**100.0%**

The collection system was GIS mapped and evaluated as part of the Wastewater Asset Management Plan, and a summary of the flow monitoring, manhole inspections, and sonar testing can be found in the Wastewater Asset Management Plan (Final Report) dated April 2020. The recommended capital improvements and implementation plan for the collection system are reflected in the Wastewater Financial Model presented in Section 5.

2.1.2 Wastewater Pump Stations

The Town owns and operates six (6) pump stations, listed in **Table 2-2**. The pump stations were evaluated as part of the Wastewater Asset Management Plan, and a summary of the existing conditions assessment, needs, and recommended capital improvements can be found in the Wastewater Asset Management Plan (Final Report) dated April 2020. The recommended capital improvements and implementation plan for the pump stations are reflected in the Wastewater Financial Model presented in Section 5.

Table 2-2: Enfield Pump Stations

Pump Station Name	Location (Street)
Lakeview PS	Route 4A
Lower Shaker Village PS	Route 4A
McConnell Road PS	McConnel Road
Route 4A Enfield PS	Route 4A
Shaker Bridge PS	Main Street
Wells Street PS	Wells Street

2.2 WASTEWATER TREATMENT AND DISPOSAL

The Town does not own and operate a wastewater treatment facility, but instead discharges wastewater to the Lebanon WWTP for treatment. Wastewater flows are conveyed to Lebanon via a force main, and flows travel through the City of Lebanon's collection system before reaching the Lebanon WWTP for treatment and disposal. The Town has an intermunicipal agreement (IMA) with Lebanon that allows for 300,000 GPD. The Lebanon WWTP is designed for 3.18 million gallons per day (MGD), with peak flows up to 6 MGD.

2.2.1 Intermunicipal Agreement

The IMA between the Town and the City was first executed in 2005. The IMA allows for a yearly average flow of 300,000 GPD of wastewater to be conveyed from the Town to the Lebanon WWTP for treatment and disposal. The IMA also included provisions to allow Enfield residents to have their septic waste hauled to the Lebanon WWTP. The Town agreed to pay the City quarterly based on the amount of wastewater (flow), as well as the wastewater characteristics, measured by biological oxygen demand (BOD) and total suspended solids (TSS). A late payment charge of 9% was agreed upon if the City did not receive payment within 45 days. An update to the IMA was executed in 2019. The IMA stipulates that the Town's sewer ordinances are updated when changes to the City's sewer regulations are imposed. This puts the Town at a disadvantage regarding management of its sewer system, and the fees it pays to Lebanon.

2.2.2 Recent Upgrades to the Lebanon WWTP & Collection System

The City of Lebanon completed a $10.6 million-dollar upgrades project at their WWTP in 2016. Major components of the upgrades included a new influent screen, influent pumps, upgrades to the primary clarifiers, primary sludge pumps, chemical feed systems, SCADA and HVAC, dewatering, odor control, and biological nutrient removal (BNR) for nitrogen and phosphorous.

Lebanon is currently in the process of completing a $75 million-dollar combined sewer overflow (CSO) sewer separation project. The sewer separation project includes separation of approximately 15 miles of combined sewers in the City. The City is the midst of a 5-year sewer rate increase at 7.2% per year to fund the debt service for the projects

3. LOCAL VERSUS REGIONAL ALTERNATIVES

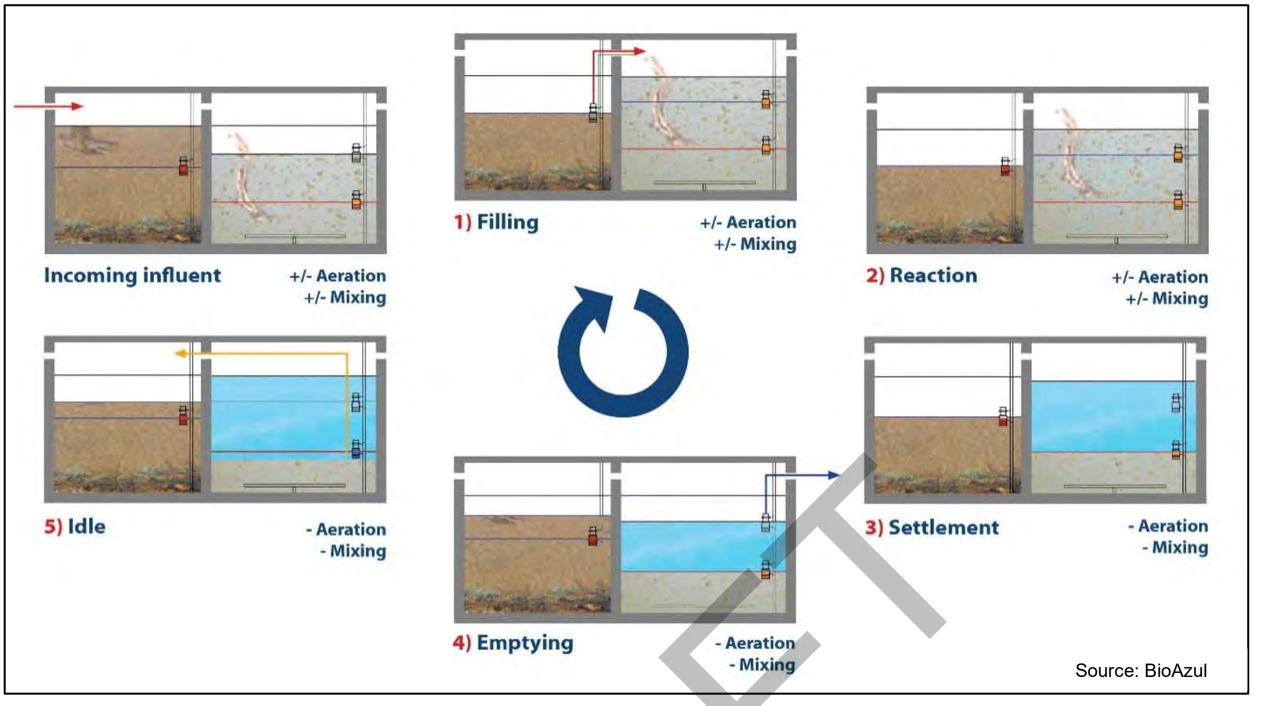
3.1 ALTERNATIVE 1 – SEQUENCING BATCH REACTOR LOCAL ALTERNATIVE

3.1.1 General Process Description

The Sequencing Batch Reactor (SBR) process is an activated sludge process that utilizes batch (fill/draw) operations for treatment. The system batch operations can be configured with the treatment and clarification of the wastewater occurring within one reactor which acts as both the aeration basin and the secondary clarifier. The use of one reactor to accomplish multiple operational tasks allows for an increased treatment capacity within the same footprint. The batch reactor is sized to provide an aerobic zone that provides an oxygen rich environment necessary for organic carbon removal. The reactor sequencing and process operations can also be configured to provide enhanced treatment for nutrient removal if required. The same reactor also provides quiescent conditions ideal for settling and separation of biological solids. A simple process flow schematic is provided below. A general overview of the typical SBR cycles is provided in **Table 3-1**.

Table 3-1: SBR Cycle Descriptions

Cycle	Description
Mix – Fill	The mix fill is the first cycle in the SBR process. During this cycle the reactor is fed influent wastewater while the mixed liquor suspended solids (MLSS) inventory within the reactor is mixed.
React – Fill	During this cycle the reactor is fed influent wastewater while the MLSS inventory within the reactor is mixed and a dissolved oxygen concentration of 2.0 mg/L is maintained within the reactor. During this cycle the reactor operates in a similar manner to an aeration basin.
React	During this cycle the reactor is operating in an identical manner to the React-Fill cycle with the exception that no influent wastewater is being fed to the reactor. During this cycle the reactor operates in a similar manner to an aeration basin.
Settle	During this cycle the reactor turbulence has stopped and a quiescent reactor surface has been created. The quiescent reactor surface allows for effective Type III and Type IV settling of the MLSS via gravity. During this cycle the reactor operates in a similar manner to a secondary clarifier.
Decant/Idle	The decant cycle is the last cycle in the SBR process. During this cycle the reactor volume is being decanted by gravity to the downstream processes for further treatment. During this cycle the reactor operates in a similar manner to a secondary clarifier. If the decant is completed before the cycle time is completed it enters an idle phase while it waits for the next cycle to begin.



3.1.2 Nitrogen Removal Capabilities

The efficiency of nitrogen removal in SBR process is a function primarily of the amount of readily degradable organic carbon available in the influent and the reactor cycle times / hydraulic retention times. With typical municipal wastewater influent characteristics, the SBR process, when properly designed and operated has been demonstrated to achieve effluent nitrogen levels in the range of 4.0 to 10.0 mg/L.

3.1.3 Phosphorous Removal Capabilities

The SBR process when operated as noted above does not provide for any biological phosphorous removal except for the phosphorous required for cell growth. The SBR process operations can be modified to optimize for biological phosphorous removal if needed.

3.1.4 Conceptual Process Design and Projected Performance

A desktop analysis and associated preliminary process calculations were completed for this alternative. The desktop analysis anticipates that with proper operation and the anticipated influent characteristics noted above the WWTP can achieve the following effluent requirements of:

- 20 mg/L effluent biological oxygen demand (BOD) / total suspended solids (TSS)
- 1.0 mg/L effluent ammonia nitrogen
- 10 mg/L effluent total nitrogen (TN) with a 6-hour total cycle time.

3.1.5 Proposed Operating Parameters

This section provides additional details of the proposed operating parameters necessary for implementation of this process. The operating parameters form the basis utilized for the development of the planning level opinion of probable costs and outline the capabilities of this alternative to be constructed for the current needs and expanded in the future should additional treatment capacity be required. Based on the analysis completed the planning level current day and buildout operating conditions for this alternative are provided in **Table 3-2**. The current average daily flow is approximately 0.075 MGD with a theoretical buildout condition average daily flow of 0.300 MGD. The buildout condition includes the current average daily flow of approximately 0.075 MGD.

Table 3-2: Alternative 1 – Planning Level Operating Process Conditions

Component	Current Conditions	Buildout Conditions
Average Daily Flow, MGD	0.075	0.300
Design Average Daily Flow, MGD	0.150	0.300
Equalization Basins Operational, each	1	1
Equalization Basins Volume, gal each	180,000	180,000
SBR Basins Operational, each	2	4
Reactor Volume, gal each	180,000	180,000
Total Reactor Volume in Service, gal	360,000	720,000
Operating MLSS, mg/L	4,500	4,500
SBR Cycles, per day	4	4
SBR Cycle Times, hrs	6	6

3.1.6 Cost Estimate

The current day planning level opinion of probable costs for this alternative is approximately $39,580,000. A summary of the planning level opinion of probable costs is provided in **Table 3-3**.

Table 3-3: Alternative 1 – Planning Level Opinion of Probable Project Cost

Unit Process	Opinion of Probable Cost
Headworks Screening	$940,000
Headworks Grit Removal	$1,490,000
Influent Pump Station	$770,000
SBR Process Equipment	$5,100,000
SBR Concrete	$8,450,000
Effluent Dosing Tank	$2,110,000
Drip Dispersal System	$600,000
Solids Processing System	$1,070,000
Plant Water System	$680,000
Main Electrical Gear	$1,300,000
Emergency Generator	$650,000
Process Building Area	$1,170,000
Land Acquisition	$3,900,000
Land Clearing and Preparation	$520,000

Unit Process	Opinion of Probable Cost
Site Fencing	$320,000
Site Restoration and Pavement	$460,000
Construction Sub-Total	**$29,530,000**
Allowance for Contingency, Engineering, Legal, Bond Counsel, and Short-Term Interest (34%)	$10,050,000
Opinion of Probable Project Cost (CY2021)	**$39,580,000**

3.1.7 O&M Estimate

The current day planning level opinion of the annual operations and maintenance (O&M) costs for this alternative is $984,000 per year. This estimate includes the costs associated with operating the SBR WWTP, and the costs associated with operating the Town's sanitary sewer collection system. A summary of the planning level annual O&M costs for the SBR local alternative is provided in **Table 3-4**.

Table 3-4: Alternative 1 – Planning Level Opinion of Probable Annual O&M Costs

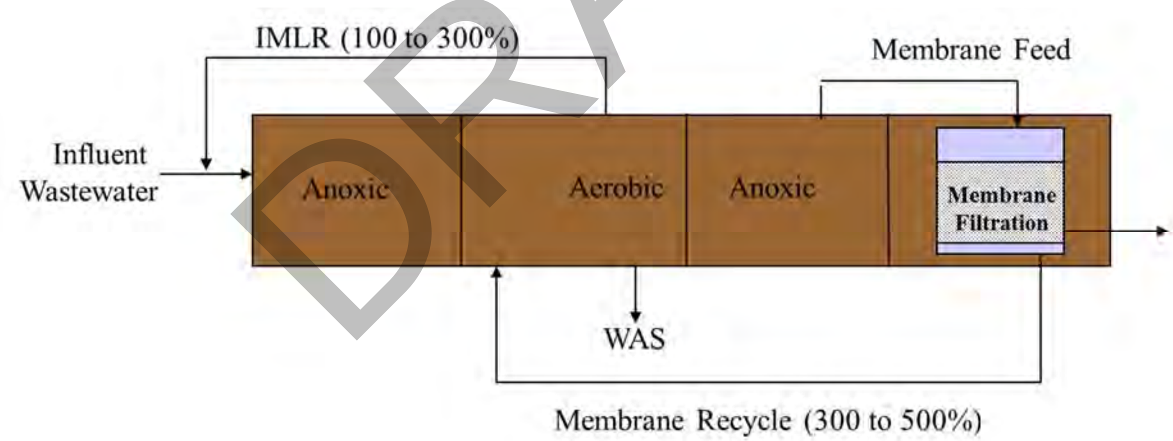
Component	Opinion of Probable Cost
Operations Staff	$408,000
Sewer Fund Administration	$12,000
Process Electrical	$110,000
Non-Process Electrical	$11,000
Sludge Disposal	$51,000
Solids Handling Operations	$74,000
Supplemental Carbon Allowance	$103,000
Alkalinity Allowance	$28,000
Polymer Allowance	$25,000
Fuel Allowance	$12,000
Sub-Total of Annual O&M Costs	**$834,000**
Equipment Maintenance Fund	$50,000
Long-term Equipment Replacement/Capital Fund	$100,000
Sub-Total of Annual Capital Funds	**$150,000**
Opinion of Probable Annual O&M Cost (CY2021)	**$984,000**

3.2 ALTERNATIVE 2 – MEMBRANE BIOREACTOR LOCAL ALTERNATIVE

3.2.1 General Process Description

The Four-Stage Bardenpho Process with a Membrane Bioreactor (MBR) is an activated sludge-based nitrogen removal process with four distinct zones; a pre-anoxic zone, an aerobic zone, a post anoxic zone and a re-aeration zone. The Four Stage Bardenpho process is configured to take advantage of the typically high readily degradable organic carbon found in the influent wastewater. The use of the high readily degradable organic carbon within the influent wastewater provides an efficient and cost-effective source of organic carbon to drive the de-nitrification process in the pre-anoxic zone. The pre-anoxic zone provides de-nitrification (reduction of nitrate and nitrite (NOx) to Nitrogen gas) using the available readily degradable organic carbon in the influent wastewater effectively removing the nitrogen returned to it (in the form of NOx), from the end of the aerobic zone by way of an Internal Mixed Liquor Recycle (IMLR). The aerobic zone provides the oxygen necessary for both organic carbon removal as well as nitrification (a two-step biological process for the conversion of ammonia to nitrite and then nitrate). The IMLR typically ranges from 100% to as much as 300% of the design flow and returns a portion of the nitrified aerobic zone effluent to the pre-anoxic zone for de-nitrification. Because all of the aerobic zone effluent cannot physically be returned to the pre-anoxic zone the aerobic zone effluent will contain some residual nitrate.

Ultrafiltration membranes are submerged within the aeration basin and the aeration basin MLSS is double or triple the concentration of a normal activated sludge system. The increase in the MLSS effectively increases the biomass within the aeration basin allowing for an increased treatment capacity within the same footprint. A simple process flow schematic is provided below.



3.2.2 Ultrafiltration Membranes

The ultrafiltration membranes are an engineered solids separation technology, which are carefully designed to utilize a nominal pores size in the range of 20 – 40 nm for solids separation. Ultrafiltration membranes utilize a solids flux along a pressurized membrane barrier to produce a high purity water. The pressurized membrane acts as a physical barrier for suspended solids, non-soluble organics, bacteria, viruses, endotoxins and other pathogens. In wastewater treatment the ultrafiltration membranes are immersed in an aeration tank, in direct contact with mixed liquor. Through the use of a permeate pump, a vacuum is applied across membranes. The vacuum draws the treated water through the hollow fiber ultrafiltration membranes. Permeate is then discharged to downstream processes for further treatment (usually to disinfection). Periodically scour air is introduced into the membrane module to scour the external surface of the membrane fibers. The scour air produces turbulence within the membrane and transfers rejected solids away from the membrane surface as part of a recycle to the aerobic zone. Ultrafiltration membranes are typically operated at MLSS concentration in the range of 8,000 to 12,000 mg/L (typically 2,000 to 4,000 mg/L for conventional systems). In its simplest form the ultrafiltration membrane process combines the unit operations of aeration, secondary clarification and filtration systems into a single process, thus simplifying operations and significantly reducing the overall system space requirements. One of the benefits of an ultrafiltration membrane system is that it is possible to handle extremely high organic loads in a compact footprint.

3.2.3 Nitrogen Removal Capabilities

The efficiency of nitrogen removal in pre-anoxic zone of the Four-Stage Bardenpho process is a function primarily of the amount of readily degradable organic carbon available in the influent and the IMLR rate. The efficiency of nitrogen removal in post-anoxic zone of the Four-Stage Bardenpho process is a function primarily of the amount of available readily degradable organic and the hydraulic retention time within the post anoxic zone. With typical municipal wastewater influent characteristics, the Four-Stage Bardenpho process, when properly designed and operated has been demonstrated to achieve effluent TN levels approaching the limits of technology in the range of 2.5 to 3.0 mg/L.

3.2.4 Phosphorous Removal Capabilities

The Four-Stage Bardenpho process when operated as noted above does not provide for any biological phosphorous removal except for the phosphorous required for cell growth. The Four-Stage Bardenpho process operations can be modified to optimize for biological phosphorous removal if needed.

3.2.5 Conceptual Process Design and Projected Performance

A desktop analysis and associated preliminary process calculations were completed for this alternative. The desktop analysis anticipates that with proper operation and the anticipated influent characteristics noted above the WWTP can achieve the following effluent requirements of:

- 20 mg/L effluent BOD / TSS
- 1.0 mg/L effluent Ammonia Nitrogen
- 2.0 mg/L effluent TN

3.2.6 Proposed Operating Parameters

This section provides additional details of the proposed operating parameters necessary for implementation of this process. The operating parameters form the basis utilized for the development of the planning level opinion of probable costs and outline the capabilities of this alternative to be constructed for the current needs and expanded in the future should additional treatment capacity be required. Based on the analysis completed the planning level current day and build out operating conditions for this alternative are provided in **Table 3-5**. The current average daily flow is approximately 0.075 MGD with a theoretical buildout condition average daily flow of 0.300 MGD. The buildout condition includes the current average daily flow of approximately 0.075 MGD.

Table 3-5: Alternative 2 – Planning Level Operating Process Conditions

Component	Current Conditions	Buildout Conditions
Average Daily Flow, MGD	0.075	0.300
Design Average Daily Flow, MGD	0.150	0.300
Equalization Basins Operational, each	1	1
Equalization Basins Volume, gal each	180,000	180,000
MBR Basins Operational, each	1	2
Aerobic Volume, gal each	100,000	100,000
Total Aerobic Volume in Service, gal	100,000	200,000
Anoxic Volume, gal each	100,000	100,000
Total Anoxic Volume in Service, gal	100,000	200,000
Operating MLSS, mg/L	8,000	12,000

3.2.7 Cost Estimate

The current day planning level opinion of probable costs is approximately $35,180,000. A summary of the planning level opinion of probable costs is provided in **Table 3-6**.

Table 3-6: Alternative 2 – Planning Level Opinion of Probable Project Cost

Unit Process	Opinion of Probable Cost
Headworks Screening	$940,000
Headworks Grit Removal	$1,490,000
Influent Pump Station	$770,000
MBR Process Equipment	$4,160,000
MBR Concrete	$5,440,000
Effluent Dosing Tank	$2,110,000
Drip Dispersal System	$600,000
Solids Processing System	$1,070,000
Plant Water System	$680,000
Main Electrical Gear	$1,300,000
Emergency Generator	$650,000
Process Building Area	$1,950,000
Land Acquisition	$3,900,000
Land Clearing and Preparation	$520,000
Site Fencing	$210,000

Unit Process	Opinion of Probable Cost
Site Restoration and Pavement	$460,000
Construction Sub-Total	**$26,250,000**
Allowance for Contingency, Engineering, Legal, Bond Counsel, and Short-Term Interest (34%)	$8,930,000
Opinion of Probable Project Cost (CY2021)	**$35,180,000**

3.2.8 O&M Estimate

The current day planning level opinion of the annual O&M costs for this alternative is $1,210,000 per year. This estimate includes the costs associated with operating the MBR WWTP, and the costs associated with operating the Town's sanitary sewer collection system. A summary of the planning level annual O&M costs for the MBR local alternative is provided in **Table 3-7**.

Table 3-7: Alternative 2 – Planning Level Opinion of Probable Annual O&M Costs

Component	Opinion of Probable Cost
Operations Staff	$408,000
Sewer Fund Administration	$12,000
Process Electrical	$180,000
Non-Process Electrical	$12,000
Sludge Disposal	$61,000
Solids Handling Operations	$64,000
Supplemental Carbon Allowance	$256,000
Alkalinity Allowance	$55,000
Polymer Allowance	$0
Fuel Allowance	$12,000
Sub-Total of Annual O&M Costs	**$1,060,000**
Equipment Maintenance Fund	$50,000
Long-term Equipment Replacement/Capital Fund	$100,000
Sub-Total of Annual Capital Funds	**$150,000**
Opinion of Probable Annual Cost (CY2021)	**$1,210,000**

3.3 ALTERNATIVE 3 – OPTIMIZE ENFIELD INFRASTRUCTURE REGIONAL ALTERNATIVE

The third alternative is a "no-action" alternative, or continuing to rely on the City of Lebanon for wastewater treatment and disposal. There would be no additional capital costs associated with this alternative, aside from those presented in the Wastewater Asset Management Plan (Final Report) dated April 2020, for the renewal of existing wastewater infrastructure.

3.3.1 O&M Estimate

The current day planning level O&M estimate is approximately $742,000 per year. This estimate includes the costs associated with operating the Town's sanitary sewer collection system, and payment to the City of Lebanon for wastewater treatment and disposal. A summary of the planning level annual O&M costs for Alternative 3 is provided in **Table 3-8**.

Table 3-8: Alternative 3 – Opinion of Probable Annual Costs

Component	Opinion of Probable Cost
Sewer Fund Personnel Administration	$32,000
Sewer Fund Administration	$66,500
Contracted Services	$800
Survey & Engineering	$4,300
Electrical Utilities	$14,900
Heating Oil	$100
Heating Gas	$400
Collection System Maintenance	$25,600
Pump Station Maintenance	$16,000
Equipment Rental	$400
Supplies	$2,200
Odor Control	$2,600
Water Meters	$2,200
Gasoline	$1,100
Diesel Fuel	$100
Grounds & Easement Maintenance	$1,100
Vehicle/Equip Repairs/Maintenance	$600
New & Replacement Equipment	$1,100
Wastewater Treatment Fees to Lebanon	$520,000
Sub-Total of Annual O&M Costs =	**$692,000**
Equipment Maintenance Fund	$50,000
Sub-Total of Annual Capital Funds =	**$50,000**
Opinion of Probable Annual Cost =	**$742,000**

3.4 LOCAL WASTEWATER SITE EVALUATION

Implementation of a local wastewater alternative will require a location in Town for the proposed WWTP and disposal system. Based on discussion with New Hampshire Department of Environmental Services (NHDES), it is unlikely that EPA will issue a new NPDES permit for surface water disposal, requiring a groundwater discharge permit for a local alternative. Fourteen potential sites in Town were evaluated as potential locations for a local WWTP. These sites, shown in **Figure 3-1**, included Town-owned parcels and private parcels (which would require purchase by the Town, an easement, or land taking) that are large enough to construct both a WWTP and groundwater disposal system.

Each site was evaluated and scored from 1 through 5, with 5 being optimal and 1 being sub-optimal, on the criteria listed in **Table 3-9**.

Table 3-9: Wastewater Site Evaluation Criteria

Evaluation Criteria	Minimum Score	Maximum Score
Lot Size	1	5
Soils	1	5
Proximity to Existing Sewer System	1	5
Environmental/Permitting	1	5
Land Availability/Ownership	1	5
Social/Public Acceptance	1	5

Based on the evaluation criteria, two sites were selected by Town staff for further evaluation. These sites include Site A (Parcel #010-010-000-000) Evenchance Road and Site J (Parcel #014-069-000-000) 453 US Route 4. The costs associated with construction of a local wastewater treatment and disposal system at Site A (Site Alternative A) and Site J (Site Alternative J) are discussed in **Section 3.5**.

3.5 IMPACT TO THE COLLECTION SYSTEM (LOCAL ALTERNATIVES)

Implementation of a local wastewater alternative will require reconfiguration of the Town's existing wastewater collection system. The proposed collection system reconfiguration for each of the two site alternatives is shown in **Figure 3-2**. Both alternatives require construction of a new pump station at the Enfield/Lebanon Town line to redirect wastewater flows that currently discharge into the City of Lebanon's collection system. Site Alternative A requires construction of approximately 450 LF of force main to convey flows to the proposed site. The planning level opinion of probable costs is $3,146,000. Site Alternative J requires construction of approximately 16,200 LF of force main, as well as modifications to the Shaker Bridge PS, to convey flows to the site. The planning level opinion of probable costs is $24,532,000. Detailed OPCs for the collection system reconfigurations for Site A and Site J are provided in **Appendix A**.

3.6 GROUNDWATER DISPOSAL SYSTEM (LOCAL ALTERNATIVES)

Implementation of a local wastewater alternative will require construction of a means to dispose of the treated wastewater back into the natural environment. NHDES has published *Land Treatment and Disposal of Reclaimed Wastewater: Guidance for Groundwater Discharge Permitting*, which provides guidance for obtaining permits to develop new groundwater discharges. In New Hampshire, the use of reclaimed wastewater has been limited to discharges to the land surface to: 1) recharge aquifers; 2) irrigate turf at golf courses; or 3) make snow. Discharge to the local groundwater bodies is most feasible for Enfield.

The NHDES groundwater discharge guidance is broken into four (4) main reclaimed wastewater disposal methods: 1) rapid infiltration (RI) systems; 2) slow rate (SR) infiltration systems; 3) spray irrigation of turf at golf courses; and 4) snow making. As discussed prior, discharge directly to groundwater is the most feasible option for Enfield. RI systems require highly permeable soils, while SR systems can be successful on moderately permeable or forested land. At this stage of the planning process, the more conservative design approach is to assume the use of a SR system.

Typical Effluent Disposal System Installation

SR systems can include spray irrigation or drip irrigation/drip dispersal methods. Based on the requirement of year-round disposal, drip dispersal was selected as the alternative to be considered for Enfield. Drip dispersal is operable throughout the year and is useful where slopes or soils may not support any other conventional method of wastewater disposal. These subsurface SR disposal systems require pretreatment and filtration and are operated under pressure. The treated wastewater is applied to soil slowly and uniformly using a network of narrow tubing placed below ground at shallow depth. Drip dispersal systems are also typically less disruptive to construct.

While treatment systems can be constructed in relatively small footprints, the effluent groundwater disposal systems require multiple acres of land. As such, land acquisition (and improvement of the land prior to construction) is a major cost consideration of effluent disposal systems.

3.7 ALTERNATIVES EVALUATION

3.7.1 Selection of a Local Site

Based on the costs presented in Section 3.5, Site Alternative A is the only practicable alternative. Construction of a force main from the Enfield/Lebanon Town line to Site Alternative J would be cost prohibitive, and is not economically viable for the Town.

3.7.2 Summary of Alternatives and Opinion of Probable Project Costs

Three alternatives were evaluated for wastewater disposal. The alternatives were:

- Alternative 1 –SBR Local Alterative at Alternative Site A
- Alternative 2 –MBR Local Alternative at Alternative Site A
- Alternative 3 – Optimize Enfield Infrastructure Regional Alternative

The planning level opinion of the probable construction costs for each alternative is provided below. The planning level opinions of the probable costs were developed without the benefit of final design drawings and may not reflect actual installed costs. These costs are to be used for planning purposes, only. Opinions of probable costs have been developed based on similar recent projects and equipment manufacturers' cost data. The current day (CY2021) opinion of probable cost includes soft costs such as engineering and contingency, and are shown in **Table 3-10**.

Table 3-10: Opinion of Probable Costs for Comparison

Component	Alternate 1 Local - SBR	Alternate 2 Local - MBR	Alternate 3 Regional
Opinion of Capital Costs - WWTP	$39,650,000	$35,340,000	$0
Opinion of Capital Costs - FM	$3,146,000	$3,146,000	$0
Annual O&M Costs	$834,000	$1,060,000	$692,000
Annual Capital Costs	$150,000	$150,000	$50,000

3.7.3 Comparison of Alternative and Impacts to Sewer Costs

The opinions of probable project costs were escalated to the years of implementation for the comparison of alternatives. Three financing sources were evaluated for the two local projects: conventional financing at 3% per year over 20 years, NHDES Clean Water State Revolving Fund (CWSRF) financing at 2% over 20 years, and United State Department of Agriculture Rural Development (USDA-RD) financing at 3% over 40 years (assuming no grant). These funding/financing programs are discussed in detail in Section 5. For the regional alternative, it was assumed that the wastewater treatment and disposal costs to Lebanon will continue to rise at a rate of 8% per year. A summary of the cost per EDU and annual sewer cost as a percent of MHI in CY2024 are shown in **Table 3-11** and **Table 3-12**.

Table 3-11: Alternatives Summary Table – Annual Sewer Cost per EDU

Alternative	Conventional	NHDES CWSRF	USDA-RD
Alternative 1 - SBR	$6,628	$6,202	$4,414
Alternative 2 -MBR	$6,373	$5,994	$4,401
Alternative 3 – Regional	$1,612	$1,612	$1,612

Table 3-12: Alternatives Summary Table – Annual Sewer Cost as a Percent of MHI

Alternative	Conventional	NHDES CWSRF	USDA-RD
Alternative 1 - SBR	14.1%	13.3%	9.6%
Alternative 2 -MBR	14.6%	13.7%	10.1%
Alternative 3 – Regional	3.8%	3.8%	3.8%

3.7.4 Alternative Evaluation Matrix

The matrix analysis utilized to determine the recommend alternative is summarized in **Table 3-13**. The matrix has been provided to compare key criteria including compatibility of the alternative with the existing infrastructure, project capital and operational costs, and develop a recommendation of a preferred alternative for implementation.

Table 3-13: Matrix Analysis – Alternative Recommendation

Criteria	Alternative 1 Local - SBR Score	Alternative 2 Local - MBR Score	Alternative 3 Regional Score
Capital Costs	1	1	5
Yearly Operational Costs	4	3	5
Operational Flexibility	5	5	1
Future Expansion Sustainability	5	5	3
Site Constraint Requirements	1	1	5
Impact to the Collection System	2	2	5
Management/Control Flexibility	5	5	1
Chemical Consumption	3	3	5
Electrical Consumption	2	2	5
Permitting	1	1	5
Resiliency	5	5	5
Total	**34**	**33**	**45**

The ranking criteria range from 5, being good, to 1, being poor. At a planning level Alternative 1 and Alternative 2 have similar capital costs. Based on the capital and operational costs, site constraints, and permitting challenges, **Alternative 3 - Optimize Enfield Infrastructure Regional Alternative** is recommended.

4. IMPLEMENTATION PLAN

4.1 WASTEWATER COLLECTION SYSTEM

As summarized in the Wastewater Asset Management Plan, the Enfield collection system is in fair condition. The majority of the existing infrastructure is in good condition; however, access is difficult throughout a significant portion of the collection system. We recommended that the Town implement the recommended plan as summarized in the Wastewater Asset Management Plan (Final Report) dated April 2020, including improvement of access to the collection system, and further evaluation of the infrastructure.

4.2 WASTEWATER PUMP STATIONS

As summarized in the Wastewater Asset Management Plan, the majority of the mechanical equipment and components in operation at the pump stations are approximately 20-30 years old, and the typical useful life of mechanical equipment is 20 years. We recommended that the Town implement the recommended plan as summarized in the Wastewater Asset Management Plan (Final Report) dated April 2020, including upgrades to the mechanical equipment and components as well as the physical structures of the Town's pump stations.

4.3 WASTEWATER TREATMENT AND DISPOSAL

Based on the alternative's evaluation of the local versus regional treatment alternatives presented in Section 3, we recommended that the Town implement Alternative 3 – Optimize Enfield Infrastructure Regional Alternative, and continue to utilize the City of Lebanon's WWTP for treatment and disposal. The costs associated with the local alternatives are unaffordable absent a major grant from USDA-RD or other funding sources. Pending any major changes to the fee that the Town pays the City for treatment and disposal, the Town should continue its relationship with the City of Lebanon, and revisit this evaluation should the fee rise significantly. Another factor that could affect the affordability of the local alternatives is the number of sewer customers. If the Town of Enfield is able to grow the number of sewer customers significantly, it could decrease the cost per household and warrant the consideration of a local treatment alternative.

4.4 PLANNING LEVEL OPINION OF PROBABLE COSTS

The current day planning level opinion of probable costs for the Recommended Implementation Plan are provided in **Table 4-1**, and include costs carried forward from the Wastewater Asset Management Plan for the sanitary sewer collection system and pump stations. The recommended plan by calendar year is provided in **Table 4-2**.

Table 4-1: Recommended Improvements Plan and OPPC (CY2021)

Component	OPPC
Sanitary Sewer System (Years 1 through 5)	$388,000
Pump Stations	$11,254,000
Wastewater Treatment and Disposal	$0
Total =	**$11,642,000**

The costs presented in **Table 4-1** were developed without benefit of final design drawings and may not reflect actual installed costs; these costs are to be used for planning purposes only. Opinions of probable costs have been developed based on similar recent projects and preliminary equipment manufacturers' cost data. Line-item costs are to be considered installed costs, including contractor overhead and profit and start-up and operator training. The opinion of cost includes soft costs such as engineering and contingency. The costs for the Project provided in **Table 4-1** have not been escalated to the years of construction. All project costs are presented in current dollars and need to be escalated to the midpoint of construction. The recommended improvements phasing by calendar year and proposed implementation plan are shown in **Table 4-2**.

Table 4-2: Recommended Improvements Phasing Plan by Calendar Year

Component	OPPC (CY2021)	Starting Calendar Year	Ending Calendar Year
Sanitary Sewer System	$388,000	2022	2026
Pump Stations	$11,254,000	2022	2041
Wastewater Treatment and Disposal	$0	N/A	N/A
Total =	**$11,642,000**	**2021**	**2040**

5. WASTEWATER FINANCIAL MODEL

5.1 EXISTING RATE STRUCTURE

The Town utilizes an Enterprise Fund for its wastewater utility. The revenues for the Enterprise Fund are generated through a sewer user fee system based on the water consumption of each customer. The revenues are utilized for funding the annual operation and maintenance (O&M) costs of the wastewater utility as well as capital expenditures and debt service. Sewer customers are categorized into seven tiers based on their quarterly sewer consumption, and are charged a variable fixed cost share, sewer consumption per 1000 gallons, and sewer deficit charge per 1000 gallons based on their tier. The sewer deficit charge is a temporary charge to offset the sewer deficit. The Town plans to recoup the deficit and remove the charge by the end of CY2023. A summary of the sewer tiers is shown in **Table 5-1**.

Table 5-1: Summary of Sewer Customers Tiers (CY2021)

Sewer Tier	Consumption (gal/quarter)	Fixed Cost Share	Sewer Rate per 1000 gal	Sewer Deficit Rate per 100 gal
S1	0-1,999	$27.00	$20.64	$6.15
S2	2,000-5,999	$54.00	$20.64	$6.15
S3	6,000-14,999	$76.00	$20.64	$6.15
S4	15,000-23,999	$108.00	$20.64	$6.15
S5	24,000-44,999	$146.00	$28.81	$8.57
S6	45,000-59,999	$227.00	$28.81	$8.57
S7	60,000+	$308.00	$28.81	$8.57

5.2 BENCHMARKING ANALYSIS

A benchmarking analysis was completed to help the Town understand how it compares to its peers in terms of its current sewer rates. A number of similar sized communities and wastewater utilities were evaluated for the rate comparison, and a number of factors were considered including: population, geography, size of the sewer system, median household income, and method of treatment. Sewer consumption was normalized for the comparison, and based on an average usage of 72,000 gallons per year. Four communities were chosen for comparison and summarized in **Table 5-2**.

Table 5-2: Sewer Rate Comparison

Community	Average Annual Sewer Bill[1]	% of MHI
Statewide	$679	1.13%
Enfield	$1,651[2]	2.00%
Lebanon	$953	1.48%
Wolfeboro	$1,113	2.18%
Holderness (Plymouth Village W&S District)	$926	1.38%

Community	Average Annual Sewer Bill[1]	% of MHI
Conway (Conway Village Fire District)	$1,277	2.14%

Notes:
1. Based on usage of 200 gal/day (6,000 gal/month; 72,000 gal/year).
2. Excludes temporary sewer deficit charge.

5.3 CURRENT SEWER BUDGET

The Town's sewer budget can be designated into three categories: O&M, capital projects, and debt service. O&M represents the expenses required to operate and maintain the sewer system on a daily basis. This includes fixed costs such as staffing salaries to variable costs such as electricity. Capital projects are projects that are required to evaluate, updated, and maintain the sewer infrastructure, and can be either one time or recurring costs. Debt service includes all debt payments that have been taken on by the Sewer Enterprise Fund.

5.4 SEWER CAPITAL PLAN

The Town carries an allowance for capital in its sewer budget for small capital projects. Larger capital projects are presented to the Town and voted on at the Annual Town Meeting. Most recently, the Town voted against the proposed $1.9 million dollar project to make improvements to the sewer system at the 2020 Annual Town Meeting. The Town prepares a capital improvements plan (CIP) every five years. The most recent CIP, which includes CY2020-2025, includes one recommended sewer capital project for the replacement of the generator at the Shaker Bridge PS in CY2022. This capital project, along with the recommended capital improvements as presented in the Wastewater Asset Management Plan (Final Report) dated April 2020, were integrated into the Wastewater Financial Model.

5.5 SEWER RATES AND REVENUES PROJECTIONS

Impacts to the sewer rates were modeled based on the current rate structure. The impacts of the regional and local wastewater alternatives to the sewer rates and are shown in **Table 3-12** and **Table 3-13** in Section 3. Based on the recommended alternative, Alternative 3 – Optimize Enfield Infrastructure Regional Alternative, the projected sewer rates were modeled over the next 5 years. These sewer rate projections include the Town's current O&M budget, increased at 3% per year, the CIP recommended by the Town, the CIP as recommended in the Wastewater Asset Management Plan, and the existing sewer debt service. The temporary sewer deficit charge was not included in this evaluation, as the Town already has a plan in place to recoup the deficit.

A summary of the revenue and expense projections for CY2022 to CY2026 are shown in **Table 5-3**, and a summary of the projected sewer rates and average sewer costs for CY2022 to CY2026 are shown in **Table 5-4**. The same percent increase to the sewer rate per 1,000 gallons and fixed sewer cost share was used for all sewer tiers. Based on recent sewer revenues that average sewer consumption is 42,000 gallons per year. The rate projections shown are for sewer customers that fall into the S3 tier (6,000 – 14,999 gallons/quarter), which is where the majority of residentials sewer users fall.

Table 5-3: Sewer Budget Revenue and Expense Projections

	CY2022	CY2023	CY2024	CY2025	CY2026
Expenses					
Sewer Fund Personnel Administration	$(33,000)	$(34,000)	$(36,000)	$(38,000)	$(40,000)
Sewer Fund Administration	$(70,000)	$(73,000)	$(76,000)	$(79,000)	$(82,000)
Sewer Fund Collection and Disposal	$(76,000)	$(79,000)	$(82,000)	$(85,000)	$(88,000)
Wastewater Treatment Payment to Lebanon	$(558,000)	$(599,000)	$(643,000)	$(690,000)	$(740,000)
Capital – Town CIP	$(30,000)				
Capital – Collection System (Asset Management Plan)	$(62,000)	$(99,000)	$(108,000)	$(118,000)	$(131,000)
Capital – Pump Stations (Asset Management Plan)	$-	$-	$(11,000)	$(38,000)	$(119,000)
Sewer Fund Debt Service	$(12,139)	$(12,139)	$(12,139)	$(12,139)	$(12,139)
Contribution to Retained Earnings	$(12,554)	$(82,378)	$(106,077)	$(119,345)	$(83,140)
Total Expenses =	**$(853,693)**	**$(978,517)**	**$(1,074,216)**	**$(1,179,484)**	**$(1,295,279)**
Revenues					
Use of Retained Earnings	$-	$-	$-	$-	$-
Sewer User Fees (per 1000 gal)	$832,161	$956,985	$1,052,684	$1,157,952	$1,273,747
Sewer User Fees (Fixed Cost Share)	$16,507	$16,507	$16,507	$16,507	$16,507
Sewer Late Fees	$5,025	$5,025	$5,025	$5,025	$5,025
Sewer Hookup Fees	$-	$-	$-	$-	$-
Total Revenues =	**$853,693**	**$978,517**	**$1,074,216**	**$1,179,484**	**$1,295,279**

Table 5-4: Sewer Rate and Average Annual Sewer Cost for Residential Sewer Users (Tier S3)

	CY2022	CY2023	CY2024	CY2025	CY2026
Projected Sewer Rate per 1,000 (S3)	$23.74	$27.30	$30.03	$33.03	$36.33
Projected Fixed Sewer Cost Share (S3)	$350	$402	$442	$486	$535
Percent Increase from Previous CY	15%	15%	10%	10%	10%
Average Annual Sewer Cost	$1,347	$1,548	$1,703	$1,874	$2,061

Implementation of Alternative 3 will require the Town to raise the sewer rates by 10 to 15% per year over the next 5 years. This increase includes the amount needed to pay the estimated increase in payment to Lebanon of 8% per year, as well as the capital plan as recommend in the Wastewater Asset Management Plan. Should the Town choose to pursue either of the local alternatives (Alternative 1 or Alternative 2), the Town would need to raise the rates 40 to 50% per year over the same time period, depending on the method of financing.

5.6 FUNDING ALTERNATIVES

Funding and financing of the proposed recommendations can be raised through sewer user fees, borrowing, and grants. This section provides a brief description of various funding and financing alternatives.

5.6.1 Sources of Funding

Capital costs to build the required infrastructure will be significant. Potential funding sources for the project include:

1. Municipal Sewer Enterprise Fund
2. Municipal Bonding
3. Clean Water State Revolving Fund (NHDES)
4. United States Department of Agriculture – Rural Development
5. Development-targeted funding programs

Potential funding programs are discussed in more detail the following subsections. Generally, State and Federal earmarked appropriations and grant funding are limited for municipal wastewater projects in New Hampshire.

5.6.2 Municipal Sewer Enterprise Fund

Municipalities typically have sewer enterprise funds. The money collected from sewer users is used for the payment of operational expenses as well as capital improvements to the system. Short term and/or recurring capital improvement expenses are typically budgeted for in each calendar year and funded directly from the annual sewer enterprise funds. The annualized debt payments associated with large capital expenses are typically funded directly from the annual sewer enterprise funds. However, some communities include all or a portion of these annualized debt payments on the general fund.

5.6.3 Municipal Bonding

Municipalities have the ability to borrow funds for capital projects through bonds. Issues that can impact municipal borrowing capacity are existing debt, the length of borrowing period, the structure of the debt service, and opportunities to modify short-term impacts of the debts service. Careful planning for municipal borrowing that takes into account other capital expenditures in Town is imperative to maximize ability to borrow for major capital projects and minimize adverse fiscal impacts to the Town's bond rating and budgets. Municipal bonds are typically issued at an interest rate of 4%.

5.6.4 Clean Water State Revolving Fund

The New Hampshire Clean Water State Revolving Fund (CWSRF) is administered by NHDES. The fund provides low-interest loans to communities, nonprofits and other local government entities for qualifying planning and construction projects. Currently, 2% loans are available for 5, 10, 15 and 20-year terms.

The SRF Program does offer limited principal forgiveness. This Program was continued in the current Intended Use Plan.

To be considered for SRF funding, a community must submit a pre-application, which typically has an annual deadline in mid-June. Based on the forms, applicants are ranked based on a set of criteria that rates the project's impact on public health and state and federal water quality.

Applicants also receive points for incorporating green infrastructure, energy efficiency and renewable energy components, as well as sustainability aspects, in the project. The ranked projects are published in the Intended Use Plan (IUP) Project Listing, which is typically released in July.

Once a project has been placed on the IUP Project List, the municipality needs to complete a loan application. The loan applications are due by May 1 (for communities with town meeting/local funding authority votes by March 31) or June 30 (for communities with town meeting/local funding authority votes on or after April 1), of the upcoming year and must include information about funding authorization, repayment ability, and project schedule.

The following are additional subsidy opportunities through the CWSRF program:

5.6.4.1 Planning

New Hampshire CWSRF will award loan recipients 100% principal forgiveness, up to $75,000, for wastewater planning evaluations that address conveyance and treatment needs while considering solutions that promote energy efficiency, water conservation and flood resiliency. Planning efforts included in a final design project may also be eligible, typically through 30% design.

5.6.4.2 Energy Audits

NHDES has an auditor specializing in water and wastewater process energy audits under contract. Using CWSRF funding, NHDES will allow for the completion of pre-approved comprehensive process energy audits for wastewater treatment facilities and pumping stations. The Town is not required to take a loan or submit paperwork to receive an audit.

5.6.4.3 Comprehensive Energy Audit Measure Implementation

New Hampshire CWSRF will award loan recipients 50% principal forgiveness, up to $200,000, for project components that implement recommendations from a comprehensive energy audit conducted within the past three years. Applications for electric and gas utility incentives are required to qualify for NH CWSRF principal forgiveness, and this forgiveness will be calculated on project costs prior to utility company incentives being applied.

5.6.5 United States Department of Agriculture – Rural Development

The United States Department of Agriculture - Rural Development (USDA) provides grants and loans to rural communities, counties, special-purpose districts and Indian tribes with populations less than 10,000 people. Based on population, the Town qualifies for the Rural Utilities Services - Water and Waste Disposal program (RUS). The USDA – RUS program provides a combination of grants and low interest loans for wastewater projects.

Eligibility for grants is dependent upon the current sewer rates as well as the median household income for the Town relative to the poverty line and the state non-metropolitan median household income. Typically, the underwriting threshold to maximize grant eligibility is to have the current sewer rates at or above 1% of median household income for the Town. For entities that do not qualify for grants because their median income is too high, USDA offers below market rate low interest loans. Similar to the grant program, the median household income for the Town is used to determine the loan category that the entity is eligible for. The Town's eligibility in comparison to the USDA metrics is presented below in **Table 5-5**.

Table 5-5: USDA Funding Eligibility Guidelines

Category	Town	USDA Guideline	Eligibility
Population (2010 Census)	4,582	Less than 10,000	Eligible
Median Household Income (MHI)	$45,577 (CDP)	$82,128	Eligible
Annual Sewer Rate	$921	-	-
Annual Sewer Rate as a Percent of MHI	2.02%	1.0%	Eligible

Based on the metrics provided in **Table 5-5**, the Town is eligible for grants. The USDA loan categories and percentages are presented below in **Table 5-6**.

Table 5-6: USDA Loan Categories

Category	Income Threshold	Income Threshold	Interest Rate
Poverty Rate	-	Less than $49,144	1.750%
Intermediate Rate	$49,145	$82,128	2.375%
Market	-	-	3.000%

Based on the metrics provided in **Table 5-6**, the Town (Enfield CDP) falls into the "poverty" interest rate category for loans, which are rates reduced below market rate. The interest rates are adjusted quarterly. USDA may offer a lower Interest Rate Category to communities to improve project affordability.

5.6.6 Development-Targeted Grant Programs

Many grant programs that are targeted toward development allow for funding to be used for wastewater infrastructure upgrades associated with the project. These programs are not anticipated to be a primary source of funding, but there may be opportunities to take advantage of this funding when it can be associated with specific development projects in town.

5.6.6.1 Community Development Block Grants (CDBG)

Community Development Block Grants (CDBG) are overseen by the Department of Housing and Community Development (DHCD) Division of Community Services. These are competitive grants that address a broad range of community development needs including infrastructure. Funds can be used for housing, community, and economic development projects that assist low and moderate-income residents, or that revitalize areas of slum or blight. Funds may also be used for the construction, reconstruction, or installation (including design features and improvements with respect to such construction, reconstruction, or installation that promote energy efficiency) of infrastructure facilities.

5.7 NEXT STEPS

One of the recommended next steps in the recommended plan is to evaluate and secure funding for the infrastructure improvements. In addition to the SRF program, it is recommended that the Town meet with USDA to discuss opportunities for funding for the projects. USDA funding applications can be submitted throughout the year. Often, USDA funding is pursued in tandem with SRF funding. It also is recommended that the Town work with NHDES to take advantage of energy efficiency and rebate programs that may be available.

Another recommended next step is to communicate this Wastewater Planning Report to the interested parties, including Town boards and departments, the rate payers, regulatory agencies and the interested public through public meetings.

It is expected that the proposed implementation of the capital improvements may change based on available funding, Town priorities, input from stakeholders, and changing conditions within the system.

Figures

Town of Enfield, NH

Figure 2-1
Sanitary Sewer Collection System
Wastewater Planning Project

DPC Engineering, LLC

JOB NO: Enfield, NH	DRAWN BY: GF
DATE:February 2021	

Town of Enfield, NH

Figure 3-1
Local WWTP Site Evaluation
Wastewater Planning Project

DPC Engineering, LLC

JOB NO: Enfield, NH	DRAWN BY: GF
DATE:February 2021	


0 500 1,000 2,000 3,000 Feet
N
Canaan
Lebanon
Enfield
DRAFT
A
J
Alternative J: Proposed WWTP
Proposed Town Line Pump Station (Alternatives A & J) Redirect Flows to Proposed Force Main Alternatives
Proposed Force Main Route Offset for Visual Clarity
Alternative A: Proposed WWTP & Disposal System
Alternative J: Rebuild Existing Shaker Bridge Pump Station with New Force Main to Proposed WWTP "J"
Proposed Force Main Route Offset for Visual Clarity
PS
US Route 4
NH Route 4A
Evenchance Rd
Brady Rd
Maple St
May St
Stark Ln
Anderson Hill Rd
Chester Ln
Prospect Pines Rd
Lovejoy Brook Rd
Baltic St
Shedd St
Flanders St
C More Farm Dr
High St
Oak Grove St
Wells St
Stevens St
Pillsbury St
Mill St
Lake St
Shaker Hill Rd
Margery Rd
Lapan Cir
Melinda Rd
Georgia Ave
Wescott Rd
Russell Ln
Livingston Lodge Rd
Goodwin Rd
Bay Dr
Estey Ln
Main St
Sargent St
Crate St
Lacroix Ln
Brendan Ln
Adams Rd
Morhouse Ln
Daniels Dr
Braley Dr
Bocash Dr
Hewitt Dr
Johnston Dr
No Name
Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Legend
Manhole
Existing Pump Station
Existing Gravity Sewer
Existing Force Main
Parcel
Proposed Pump Station
Force Main Alternative A
Force Main Alternative J
Proposed Site/Parcel
Proposed Treatment Plant/Disposal Area
Town of Enfield, NH
Figure 3-2
Local WWTP
Collection System Alternatives
Wastewater Planning Project
DPC Engineering, LLC
JOB NO: Enfield, NH
DRAWN BY: GF
DATE: February 2021

Appendix A
Force Main Alternative
Opinion of Probable Costs

Table 1
Opinion of Probable Project Cost
Recommended Plan - Wastewater Treatment Alternatives
Town of Enfield, NH
Prepared on February 18, 2021

Bid Item #	Description	Units	Estimated Unit Price	Alternative A		Alternative J	
				Quantity	Sub-Total	Quantity	Sub-Total
1	Contractor Mobilization, Bonds, and Insurance	Percentage	10%	1	$ 192,000	1	$ 1,497,000
2	Police Detail	Hours	$ 40	100	$ 4,000	3,380	$ 135,200
3	Haybales and Silt Fence	Lump Sum	$ 25,000	1	$ 25,000	1	$ 25,000
4	Clearing & Grubbing	Lump Sum	$ 25,000	1	$ 25,000	1	$ 25,000
5	Catch Basin Inlet Protection	Each	$ 120	5	$ 600	85	$ 10,200
6	Test Pit Excavation & Backfill	Cubic Yards	$ 80	100	$ 8,000	100	$ 8,000
7	Mainline Pipe Dewatering	Linear Feet	$ 10	230	$ 2,300	8,100	$ 81,000
8	Unsuitable Material Excavation	Cubic Yards	$ 50	100	$ 5,000	100	$ 5,000
9	Rock Excavation	Cubic Yards	$ 100	50	$ 5,000	1,500	$ 150,000
10	Ordinary Borrow	Cubic Yards	$ 40	100	$ 4,000	100	$ 4,000
11	Gravel Borrow	Cubic Yards	$ 40	100	$ 4,000	100	$ 4,000
12	Crushed Stone	Cubic Yards	$ 50	100	$ 5,000	100	$ 5,000
13	Controlled Density Fill	Cubic Yards	$ 150	-	-	11,790	$ 1,768,500
14	Material Disposal	Cubic Yards	$ 40	340	$ 13,600	12,150	$ 486,000
15	Thrust Blocks	Each	$ 1,000	1	$ 1,000	20	$ 20,000
16	Mainline Pipe Trench Dams	Each	$ 800	5	$ 4,000	35	$ 28,000
17	8" C900 PVC DR18 Force Main	Linear Feet	$ 105	450	$ 47,250	16,200	$ 1,701,000
18	Shaker Bridge Pump Station Upgrades; Alt "J"	Lump Sum	$ 350,000	-	-	1	$ 350,000
19	Submersible Pump Station	Each	$ 1,500,000	1	$ 1,500,000	1	$ 1,500,000
20	Force Main Back Pressure Valve Structure	Each	$ 200,000	-	-	1	$ 200,000
21	Force Main Air Release Structure	Each	$ 150,000	1	$ 150,000	3	$ 450,000
22	Force Main Cleanout Structure	Each	$ 100,000	-	-	11	$ 1,100,000
23	Force Main Bends and Fittings	Each	$ 750	5	$ 3,750	100	$ 75,000
24	Temporary Trench Repair	Square Yards	$ 57	330	$ 18,810	11,700	$ 3,861,000
25	Permanent Trench Repair	Square Yards	$ 74	440	$ 32,560	15,300	$ 1,132,200
26	2" Full-Width Milling	Square Yards	$ 6	1,500	$ 9,000	54,000	$ 324,000
27	2" Full-Width Overlay	Square Yards	$ 17	1,500	$ 25,500	54,000	$ 918,000
28	Loam and Seed	Lump Sum	$ 25,000	1	$ 25,000	1	$ 25,000
29	Mascoma Lake Crossing	Lump Sum	$ 500,000	-	-	1	$ 500,000
30	Temporary Pumping	Day	$ 5,000	-	-	15	$ 75,000
	Anticipated Current-Day (CY2021) Construction Sub-Total =				**$ 2,111,000**		**$ 16,464,000**
	Allowance for Contingency, Engineering, Legal, Bond Counsel & Administrative =				**$ 1,035,000**		**$ 8,068,000**
	Current-Day (CY2021) Opinion of Probable Project Cost (Each Phase) =				**$ 3,146,000**		**$ 24,532,000**