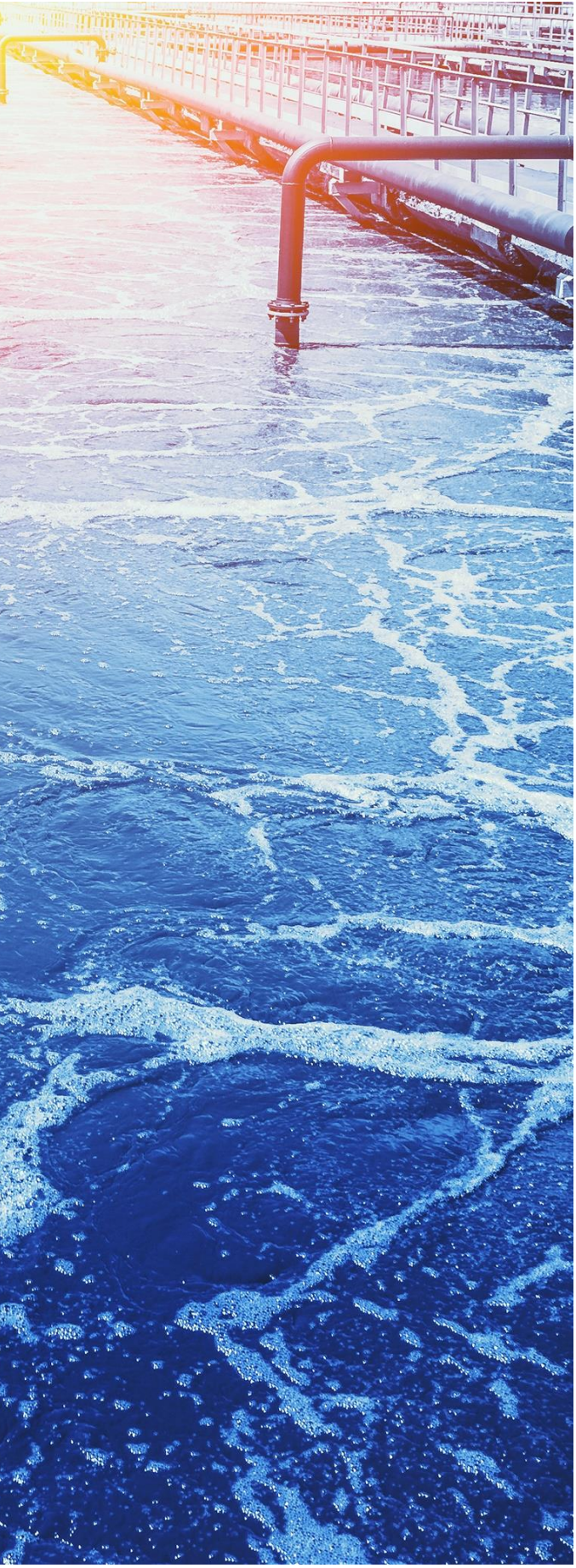


Town of Salem
New Municipal Sanitary Sewer System

Preliminary Engineering Report

TOWN OF SALEM
WASHINGTON COUNTY, NEW YORK

FIRST EDITION, JUNE 2023

DELAWARE ENGINEERING, D.P.C.
CIVIL AND ENVIRONMENTAL ENGINEERING
ALBANY • ONEONTA • RED HOOK • MONTICELLO • GOSHEN

TABLE OF CONTENTS

APPENDICES

I. EXECUTIVE SUMMARY

The Town of Salem, located in Washington County, is a small scenic community situated along the eastern border of New York near the Green Mountains of Vermont. The Hamlet area of the Town is a densely populated area comprised of residences, businesses, schools, public offices, etc. The Hamlet area is currently served by a municipal water supply; however, there is currently no public sewer system. Each property owner is responsible for their own on-site treatment system.

The Town has noted a multitude of problems stemming from the lack of public sewer system. The small lot sizes with strict spatial constraints make it difficult for property owners to update or install new on-site septic systems that meet regulatory standards. This has caused the health department to place water usage restrictions on business owners, causing economic strain, and slowing potential business development. Town staff have noted the presence of what appears to be illicit discharges from on-site septic systems into Beaver Brook and White Creek, creating the potential for significant contamination of the local waterways.

The Town has attempted to bring a municipal sanitary sewer system to the Hamlet area on multiple occasions with no success due to the lack of support and funding opportunities. In an effort to revive the project and pursue new funding opportunities available, the Town has procured the services of Delaware Engineering, DPC (Delaware) to advance a Preliminary Engineering Report (PER) that evaluates viable alternatives for wastewater treatment and sanitary sewer collection systems to serve the residents and businesses within the Hamlet area of the Town (the former Village of Salem). The Town Sewer Committee agreed upon a service area that includes approximately 345 users, and generally encompasses the Hamlet area. Please refer to the Appendices for a service area map.

There were two collection system alternatives evaluated: conventional gravity sewer system, and a low-pressure sewer system. Both collection system alternatives were evaluated based on capital improvement costs, life-cycle costs, constructability, operation and maintenance considerations, and property owner burden. It was determined that the low-pressure sewer system (LPSS) was the more affordable alternative based on capital improvement costs and operation and maintenance costs. The

estimated net present value for the low-pressure sewer alternative converted to 2026 dollars was approximately $13.8M. In addition to being the more affordable option, the low-pressure sewer system is also considered to be the more resilient option to prevent negative impacts from flood waters or high groundwater. For an area that is prone to flooding and high groundwater, safeguarding the system is critical in delivering a successful project.

There were three wastewater treatment plant (WWTP) alternatives evaluated: sequencing batch reactor (activated sludge), moving bed bioreactor (fixed film), and an algal rotating contactor (Alagewheel). All three alternatives can confidently meet the draft effluent limits, therefore consideration based on treatment capabilities was rendered moot. With respect to costs; based on a life-cycle costs analysis, the Algaewheel was found to be the most cost effective based on a net present value of approximately $7.8M in 2026 dollars. In addition to being the more cost-effective options, the fixed film Algaewheel does not require the Operator to have a class "A" license designation, which reduces operator experience and costs.

Considering costs associated with capital improvements, life-cycle costs, and non-monetary factors, the recommended alternatives for the development of a new municipal sanitary sewer collection system and wastewater treatment plant are a low-pressure sewer sewer system and an Algaewheel Rotating Algal Contactor. These recommendations include the following major infrastructure improvements, please refer to the body of the report for more detail on the recommended alternatives:

- ~4.5 miles of small diameter HDPE pressure sewer piping,
- ~345 simplex grinder pump stations,
- ~10 duplex grinder pump stations,
- All asphalt, sidewalk, lawn, and other restoration as required.

- Headworks facility with primary treatment,
- Two (2) circular primary clarifiers,
- Algaewheel packaged treatment plant including; flow equalization system, algae wheel treatment process, recirculation tank, secondary rectangular clarifiers, greenhouse, all tankage, equipment and controls required for these processes.
- UV disinfection system,
- Chemical supplementation equipment for alkalinity,
- Aerated sludge holding tanks,

- Operation and lab building,
- Site access, fencing, lighting, grading, etc.

The capital improvement costs for the recommended alternatives including construction (inflated to 2026), contingency (20%), and soft costs (15%), were determined to be approximately **$21,635,000** in 2026 dollars. To finance the project, the Town should pursue all available funding options.

II. PROJECT PLANNING

A. LOCATION

Known for its scenic beauty and rolling farmland, the Town of Salem (the "Town") is located in eastern Washington County, New York along the Vermont border. It was first settled in 1761, during the French and Indian War, and is home to many historic features. The Study Area and proposed Sewer District include properties located within the former Village of Salem boundary. According to the ACS 2020 data, the Town has a population of 2,627, median household income (MHI) of $72,948 and an individual poverty rate of 13.2%. A 2021 Income Survey of the proposed sewer district (61.6% return rate) showed the MHI to be $40,000 with 62.12% low-to-moderate income.

The Study Area/proposed Sewer District consists of properties along Main Street between Park Place and Vail Street, in addition to properties along East and West Broadway from Main Street to the Salem Courthouse. Main Street is the chief commercial artery of the Town. A potential site for a community wastewater treatment plant is being considered in the northwest area of the Village.

B. ENVIRONMENTAL RESOURCES PRESENT

1. Geologic Conditions

There are no unique geologic features within the Study Area according to the NYSDEC Environmental Resource Mapper. Soils in the Study Area are primarily gravelly sandy loam and silt loam. Depth to groundwater is very shallow and is currently a limiting factor in development of individual subsurface sewage treatment systems. The table below summarizes the soil types according to the NRCS Soil Survey for the project site.

Surficial Geology is classified as kame deposits (k), till (t) and outwash sand and gravel (og). Bedrock Geology of the surrounding areas consists of undivided Ordovician and Cambrian pelite (OCu).

Table 1. Town of Salem Study Area Soils

Soil	Slope	Depth to Bedrock	Depth to Water Table	Drainage Class	Farmland	Hydric	% of Study Area
BnD - Bernardston gravelly silt loam	15-25%	18-30 inches	17-30 inches	Well Drained	-	-	0.3%
FL - Fluvaquents	0-3%	>80 inches	0-18 inches	Poorly Drained	-	Yes	0.2%
Fr - Fredon silt loam	0-2%	>80 inches	0-12 inches	Poorly Drained	Prime Farmland	-	17.6%
HoA - Hoosic gravelly sandy loam	0-3%	>80 inches	>80 inches	Excessively Drained	Statewide Importance	-	21.5%
HoB - Hoosic gravelly sandy loam	3-8%	>80 inches	>80 inches	Excessively Drained	Statewide Importance	-	9.7%
Lm - Limerick silt loam	0-2%	>80 inches	0-12 inches	Poorly Drained	-	Yes	3.4%
NAC - Nassau shaly sil loam	3-15%	10-20 inches	>80 inches	Excessively Drained	-	-	0.9%
NBC - Nassau-Rock outcrop association	3-15%	0-20 inches	>80 inches	Excessively Drained	-	-	18.6%
Sa - Saco silt loam	0-2%	>80 inches	0-6 inches	Poorly Drained	-	Yes	2.4%
Te - Teel silt loam	0-2%	>80 inches	18-24 inches	Well Drained	Prime Farmland	-	23.9%
Wa - Wallington silt loam	0-2%	15-24 inches	6-18 inches	Poorly Drained	Prime Farmland	-	1.6%

2. Environmental Resources

Agricultural Districts: Portions of the Study Area are located within Washington County Agricultural District 8.

Critical Environmental Areas: The Study Area is not located in the vicinity of any NYSDEC Critical Environmental Areas.

Wetlands: The project is not located in the vicinity of Regulatory Tidal Wetlands. The Study Area is traversed by NYSDEC Classified Wetlands and Checkzones along with NWI Classified Wetlands, primarily along streams and waterbodies.

A smaller 18.5-acre, Class 2 NYSDEC Wetland (SA-3) is located along County Route 4, south of its intersection with State Route 22/Main Street. A second 192-acre, Class 1 NYSDEC Wetland (SA-8) is located in the northwestern portion of the Study Area. This larger wetland spans from Stanton Hill Road to Bowers Lane along the western side of State Route 22/Main Street.

NWI Classified Wetlands are scattered throughout the Study Area and primarily follow streams, waterbodies and NYSDEC Wetland areas. They consist of Riverine, Freshwater Emergent, Freshwater Pond and Freshwater Forested/Shrub wetlands.

Waterbodies: Two streams flow through the Town within the Study Area: Beaver Brook and White Creek. Beaver Brook, a NYSDEC Class C(TS) Stream, joins the White Creek, a NYSDEC Class C(T) Stream, in the southwestern corner of the Study Area. Both streams are listed on the NYSDEC Priority Waterbody List (PWL). The White Creek discharges (PWL 1103-0004) to the Black Creek (1103-0017) and ultimately to the Batten Kill. Both streams are located in the Upper Hudson River Drainage Basin. NYSDEC sampling of both waterbodies indicate they are non-impacted or slightly impacted as a result of nearby agricultural activities.

Aquifers/Groundwater: Portions of the Study Area are located directly over a principal aquifer. This aquifer is categorized as a sand and gravel aquifer (N100GLCIAL) and as a local aquifer categorized as outwash (112OTSH). The USGS has an active monitoring well (W-533/431030073192101) near the Study Area for measuring groundwater levels. This monitoring well is located on the Salem Central School District property. Historic monitoring data shows an average annual water table depth of approximately 6.5-feet. USGS water data for this location dates back to 1965.

Endangered Species: According to the US FWS IPaC resources report for the Town, the following species may be present:

- Indiana Bat (E)
- Northern Long-Eared Bat (T)
- Monarch Butterfly (C)

There are no Critical Habitats, National Wildlife Refuge Lands or Fish Hatcheries within the Town boundary. According to the NYSDEC Environmental Resource

Mapper there are no Significant Natural Communities or Rare Plants or Rare Animals in the proposed service area.

Historic and Archaeological Resources: The former Village of Salem is located in an archaeologically sensitive area. The Salem Historic District, listed on the State and National Register in 1974 and 1975, respectively, encompasses properties along East Broadway, West Broadway and Main Street (NYS Route 22). The District contains over 80 residences, commercial buildings and churches that have a historic significance in the community.

3. Floodplain Considerations

The Study Area is located in flood-prone areas, especially along the Beaver Brook and White Creek within the bounds of the former Village of Salem. The White Creek has been subject to historical channel and floodplain manipulation including channel straightening, dredging, berming and extensive floodplain encroachment.

The existing Flood Insurance Rate Map (FIRM) for the former Village, effective date 4/17/1985, does not map most of the Village, including the potential WWTP location, as in the 1%-return flood Special Flood Hazard Area. New flood studies are underway in Washington County; the draft FIRM maps the majority of the former Village as in the SFHA, Zone AE.

In 2016, a Watershed Infrastructure Flood Vulnerability Study was completed of the Town of Salem which identified areas of concern and provided for an expanded 100-year flood plain map based on updated flows and water levels.

C. POPULATION TRENDS

The Town of Salem is located in Washington County, New York. Agricultural and residential development patterns found in the Town are characteristic of many rural New York Towns. According to the ACS 2019 data, the Village has a population of 2,650, median household income (MHI) of $61,875 and a family poverty rate of 6.3. The Town has seen increases in population throughout its history until the most recent Census. The following population trends were obtained from census.gov and cover a period of the project's PPU:

Table 2. Town of Salem Population Estimates

Year	Population	% Change
1980	2,377	9.7 (Actual)
1990	2,608	3.6 (Actual)
2000	2,702	0.5 (Actual)
2010	2,715	-3.0 (Actual)
2020	2,633	2.7 (Est.)
2030	2,704	2.7 (Est.)
2040	2,777	2.7 (Est.)
2050	2,852	2.7 (Est.)
2060	2,929	2.7 (Est.)

Other facts and figures for the Town of Salem:

- Census Tract: 900
- Population Density: 49.9 persons/mi^2
- Total Housing Units: 1,362
  - Total Occupied: 1,111
  - Total Vacant: 251
- Employment Rate: 61.1%
- Median Age: 46.7
- Veteran Population: 5.4%
- Median Monthly Rent: $857
- Average Family Size: 3.01

D. INCOME SURVEY

In 2021, RCAP solutions conducted an income survey that included surveying 336 occupied households (including multi-family dwellings) that general comprise the existing water district. The survey yielded a 61.61% response rate. The results of the survey showed the median household income (MHI) of the service area to be $40,000 with a low-to-moderate income (LMI) of approximately 62.12%. Please refer to Appendix D for a copy of the income survey.

E. COMMUNITY ENGAGEMENT

The Town will host Public Information Meetings, prepare fliers and handouts with pertinent information regarding the project, and generally engage the public in discourse to discuss the project.

III. EXISTING FACILITIES

A. LOCATION MAP

Please refer to Appendix B for a copy of the overall system location map and proposed wastewater treatment plant location.

B. HISTORY

1. Ownership, Service Area, and EDU Determination

There will be no outside users in the Sewer District. All users will be located within the bounds of the Town of Salem. The proposed sewer district was determined through a preliminary cost analysis that explored the financial impact of expanding the sewer system to various areas in and around the Hamlet. The proposed sewer district generally meets the extents of the Hamlet area of the Town. Within the proposed sewer district, there are 345 identified users. Please refer to Appendix B for a copy of the sewer district mapping. In general, the property use types are categorized as shown in the table below:

Table 3. User Count and EDU Determination

PROPERTY USE TYPE	QTY	EDU
Single Family Residential	245	245.5
Multi-Family Residential	23	40.5
Commercial/Business	37	48.5
School	2	6
Public Service	6	3.5
Religious	5	24
Dairy/Agriculture	2	4
Utility	6	5
Vacant	19	1.5
TOTAL	**345**	**378.5**

The equivalent dwelling units (EDUs) were calculated using the Town's current EDU determination method as set forth in the Water System Regulations.

2. State Pollutant Discharge Elimination System (SPDES)

The Town of Salem does not currently have a finalized SPDES permit. Discharge limits will be determined with the outfall design plan and mixing zone model. The Town engaged NYSDEC early on in the planning process and requested proposed effluent limits. Those limits are summarized in the table below. The draft effluent limits assume a one-to-one dilution ratio, which is the most conservative estimate, based upon expected low flow conditions in the potential receiving stream. Please refer to Appendix A for a copy of the Draft Effluent Limits.

Table 4. Draft Effluent Limits

PARAMETER	DISCHARGE LIMITS	
Flow	75,000 gpd	Monthly Average
BOD_5	30 mg/l (19 lbs/day) 45 mg/l (28 lbs/day)	Monthly Average 7-Day Average
TSS	30 mg/l (19 lbs/day) 45 mg/l (28 lbs/day)	Monthly Average 7-Day Average
Settleable Solids	0.1 or 0.3 ml/l	Daily Maximum
pH	6.5-8.5	
Temperature	70°F	Daily Maximum
Ammonia*	0.9 mg/l (Summer Months) 1.9 mg/l (Winter Months)	Monthly Average
Fecal Coliform	200 No./100 ml 400 No./100 ml	30-Day Geometric Mean 7-Day Geometric Mean
Chlorine, Total Residual**	0.03 mg/l	Daily Maximum

3. Design Flows and Waste Loads

a) Design Hydraulic Loadings

The average daily water usage for 2018 through 2020 was found to be approximately 55,000 gallons per day. This represents the usage for all users within the water district. *The proposed sewer district does not match the existing water district; however, for planning purposes the water usage will be used as the basis of design for establishing hydraulic loadings*. To account for future growth, the average daily water usage should be increased by an additional 10% or 5,500 gpd. In the event that the collection system used to serve the sewer district is a conventional gravity sewer, inflow and infiltration will need to be accounted for. Based on limits set forth in TR-16 for extraneous inflow and

infiltration, an allowance of 12,000 gallons per day will be added to the average daily water usage. Therefore, the revised proposed hydraulic loading or average daily flow (ADF) for the Town is calculated as follows:

$$55{,}000\ gpd + 5{,}500\ gpd + 12{,}000\ gpd = 72{,}500\ gpd\ (\boldsymbol{round\ to\ 75{,}000\ gpd})$$

Table 5 summarizes the design hydraulic loadings for the new WWTP. The max month daily flow, max day flow, and peak hourly flows were all calculated utilizing multiplication factors applied to the ADF. The multiplication factors were applied to the daily water usage and 10% growth fraction of the ADF.

Table 5: Design Hydraulic Loadings

Parameter	Value	Value	Source
Average Daily Flow (ADF)	75,000 gpd	52 gpm	Calculated Above
Max Month Daily Flow (MMDF)	84,600 gpd	59 gpm	1.2 x ADF
Max Day Flow (MDF)	120,900 gpd	84 gpm	2.0 x ADF
Peak Hourly Flow (PHF)	254,000 gpd	176 gpm	4.0 x ADF

**ADF=Average daily flow over a calendar year.*

***MMDF=Maximum monthly daily flow (maximum 30-day average flow). The SPDES permit flow limit is based on the MMDF.*

b) Design Influent Wastewater Characteristics

The wastewater generated within the service area will be domestic in nature which is generally considered to be medium strength. The following table presents wastewater characteristics pertinent to the design of the wastewater treatment plant:

Table 6: Design Influent Wastewater Characteristics

Parameter	Value
BOD_5 Conc.	250 mg/L
BOD_5 Loading	156 lbs/day
TSS Conc.	250 mg/L
TSS Loading	156 lbs/day
TKN Conc	34 mg/L
Alkalinity – as CaCO3	75 mg/L

4. Industrial Discharges or Hauled Waste

There are no industrial discharges or hauled waste associated with the proposed Sewer District.

C. FINANCIAL STATUS

In 2022, the Town of Salem took a significant step towards making a sewer system in the downtown/business district a reality by engaging the services of RCAP Solutions, a non-profit agency, to assist the Town in conducting an income survey. The income survey, which included residents of the Study Area, indicated that the MHI was $40,000 with 62.76% persons categorized as low to moderate income. While the environmental need for a public sewer system was well understood, these figures documented the financial need for funding support for the implementation of a sewer system in the Town of Salem.

The Town of Salem does not have a centralized sewer system and therefore does not have current rates or debts.

IV. NEED FOR THE PROJECT

A. HEALTHY, SANITATION, AND SECURITY

The densely populated Hamlet area of the Town that will serve as the proposed sewer district, has several shortcomings that impact the health, sanitation, and security of the residents and surrounding environment.

The nature of the small lot sizes within the area makes it difficult for a property owner to have a new septic system installed. This is due to the regulatory standards that require septic systems have adequate separation from buildings, property lines, and other physical features. Absorption beds (leach fields) are also required to have adequate vertical distance between the bottom of the absorption bed and the local groundwater table, bedrock, or other impermeable layer. These constraints are required to be met in order to receive approval by Washington County for an engineered individual on-site septic system. If the property or site cannot meet the requirements of regulatory standards, the user is left with a failed/failing septic system, or a new lot cannot be developed with adequate sanitary sewer treatment.

The health department has limited water usage for various commercial businesses within the community, in order to prevent overloading of undersized and failing septic systems. As previously mentioned, the property owners are not able to resize or replace their septic systems due to inadequate spatial availability. This "moratorium" is currently placing financial constraint on businesses, one that could be relieved with the installation of a new municipal sanitary sewer.

Beaver Brook and White Creek both bisect the Town. There have been noted illicit discharges to the waterbodies from privately owned on-site septic systems. Although exact source of the various discharges is unknown, they expose the receiving waterbodies to immeasurable contamination.

B. LETTERS OF SUPPORT

The Town has sought out support for the project from various entities with a vested interest in the success of the community. The following is a list of letters of support for the project that have been obtained. Please refer to Appendix E for copies of the letters:

- Michael Yevoli, Capital Region Regional Economic Development Council (REDC)
- Beth Gilles, Lake Champlain – Lake George Regional Planning Board (LCLGRPB)
- Seán Philpott-Jones, Hudson Headwaters Healthcare Network (HHHN)
- Senator Kirsten Gillibrand, U.S. Senate (submitting directly to NBRC)
- Congresswoman Elise Stefanik, U.S. House of Representatives
- Senator Jacob Ashby, NYS Senate
- Assemblyman Matthew Simpson, NYS Assembly
- Laura Oswald, Washington County Planning & Economic Development
- Donald McPhee, Attorney at Law
- Thomas Clary, Aspire Accounting
- David Linendoll, Salem Hardware and Supply Company
- Hebert Perkins, Historic Salem Courthouse
- Peter Thomas, Salem Washington Academy School Board
- John Bardwell, Economic Development Committee
- Salem Area Chamber of Commerce

V. ALTERNATIVE ANALYSIS – NO-ACTION ALTERNATIVE

This alternative would provide for no new sanitary sewer collection system or wastewater treatment plant, and leave the existing on-site wastewater treatment systems as-is. As the desired outcome of the project is the development of new municipal sanitary sewer system, this alternative would not achieve the Town's goal. Furthermore, the lack of municipal sanitary sewer system prevents economic development within the community, hindering growth and opportunity. The no-action alternative is not considered viable for this project.

VI. ALTERNATIVE ANALYSIS - COLLECTION SYSTEM

The following systems were evaluated for the collection system alternative analysis:

A. Conventional Gravity Sewer System
B. Low-Pressure Sewer System (Grinder pumps)

A. CONVENTION GRAVITY SEWER SYSTEM

1. Description

Convention gravity sewer systems utilize a pipe network to carry wastewater from the individual users to the centralized wastewater treatment plant. The pipe network is designed utilizing specific pipe size, material, and pipe slope to adequately convey the wastewater without causing surcharges, back-ups, or other hydraulic restrictions. The most common pipe material utilized in current construction methods is polyvinyl chloride (PVC) due to its lower costs, corrosion and chemical resistance, and ease of construction. Manholes are installed throughout the system at pipe junctions, locations of pipe slope change, and locations of pipe direction change. Manholes come in a variety of materials (e.g., concrete, fiberglass reinforced plastic) which are selected based upon characteristics of the wastewater. Pre-cast concrete manholes are the most commonly used manholes in the northeast due to their price, ease of installation, and strength against compaction and hydrostatic pressure.

Conventional gravity sewers often require pump stations to adjust the hydraulic grade line or traverse obstructions such as rivers, railroads, major highways etc. Typical pump stations consist of a wet well that receives wastewater, pumps (a minimum of two to allow for redundancy), a control system such as a level transducer or floats, a programmable logic control and control panel, backup power system, etc.

2. Design Criteria

The preliminary layout for a conventional gravity sewer will consist of 4-inch diameter sewer lateral with a cleanout located at the right-of-way. The sewer lateral will convey wastewater from the individual users to the municipal sanitary sewer collection system. The collection system will consist of 8-inch diameter SDR35 PVC sewer mains. The sanitary sewer piping will have the following general design parameters:

Item	Parameter
Pipe Type	SDR35 PVC
Estimated Pipe Length	25,000 ft
Manning's N	0.013
Minimum Slope	0.5%
Min Capacity	384 gpm (0.5 mgd)

The collection system will require approximately seventy (70) 4-ft diameter pre-cast concrete manholes. All manholes will be provided with watertight ring sealants, cast-iron manhole castings, ballast to prevent against floatation where necessary, and watertight lid inserts for manholes located in the flood hazard areas.

The collection system will also require three (3) pump stations. The first pump station will be located near the Salem Volunteer Fire Department to pump flows from the service area along South Main Street to Archibald Street. Due to the relatively flat grade along this area and the length of sewer main required, a pump station will be necessary to raise the hydraulic gradient. The second pump station will be located on the south side of the White Creek Bridge on Archibald Street. This pump station will be required to pump all flows from the service areas south of White Creek

north toward the wastewater treatment plant. The receiving manhole will be located on the north side of white creek where flows will continue toward the WWTP via gravity sewer. The third pump station will be located at the western edge of West Broadway where the grade within the service area is approximately 10-ft below the WWTP site elevation. This pump station will collect flows from the service area south of the railroad and pump them directly to the WWTP. For planning purposes, the pump stations will be designed as follows:

Item	Parameter
Number of Pump Stations	3
Pump Station Type	Duplex Submersible Pump Station
Number of Pumps per Station	2 (One Duty One Standby)
Forcemain Pipe Type	PE4710
Forcemain Diameter (nom)	4-inch
Motor	VFDs
Controls	Level transducer with backup floats
Minimum Velocity	2 ft/s
Backup Power	Fixed Generator

3. Map

Please refer to Appendix F for a general layout of the conventional gravity sewer collection system alternative.

4. Environmental Impacts

No adverse environmental impacts will result from this alternative. All construction means and methods will adhere to environmental regulations.

B. LOW-PRESSURE SEWER SYSTEM

1. Description

Low pressure sanitary sewer systems consist of individual pump stations dedicated to each user that collect and pump wastewater through a forcemain network to the WWTP. The individual pump stations are typically comprised of a simplex grinder pump installed within a combination wet well/dry well. The grinder pump macerates the raw influent wastewater to avoid clogging of the small diameter forcemain pipes. The pumps are hard wired to a control panel that is equipped with pump controls, alarms, etc. The pump stations receive wastewater from the user via a gravity pipe, and discharges through a small diameter forcemain to the low-pressure sewer main. Shut off valves are located at the property right of way to isolate users during maintenance periods.

The forcemain network generally consists of small diameter forcemains (less than 8-inches). The most common pipe type utilized is high-density polyethylene (HDPE) which is installed via horizontal directional drill method. Comprehensive underground utility locating and survey of utilities will be required to avoid any potential directional drilling conflicts.

2. Design Criteria

The preliminary layout for a low-pressure sewer system will consist of 1.25-inch lateral from the invidual grinder pump stations to the transmission main. The transmission main will consist of forcemain piping that vary in size from 1.5-inches up to 4-inches. There will be flushing valves located throughout the system to allow for periodic flushing of the system.

Item	Parameter
Pipe Type	HDPE
Estimated Forcemain Length	25,000 ft
Pump Type	Progressive Cavity (eONE)
Minimum scouring velocity	2 fps

3. Map

Please refer to Appendix F for a general layout of the conventional gravity sewer collection system alternative.

4. Environmental Impacts

No adverse environmental impacts will result from this alternative. All construction means and methods will adhere to environmental regulations.

5. Land Requirements

This alternative will be constructed primarily within right-of-way limits. The most common method of installation is directional drill, which significantly reduces the land requirements necessary for construction.

6. Potential Construction Problems

There is potential for pipeline installation due to conflicts between directional drilling and existing utilities. Strict and comprehensive underground utility locating and surveying will be required.

VII. ALTERNATIVE ANALYSIS – WASTEWATER TREATMENT PLANT

The following systems were evaluated for the wastewater treatment plant alternatives:

A. Activated Sludge System – Sequencing Batch Reactor
B. Fixed Film System – Moving Bed Biofilm Reactor
C. Fixed Film System – Rotating Algal Contactor (RAC)™

The sections below describe, in general, the processes and infrastructure requirements for each alternative. There are redundancies between the alternatives, as certain processes are required for more than one alternative (headworks, UV disinfection, settling, etc.).

Due to the relatively small size of the WWTP, on-site sludge thickening was not evaluated. Each alternative has a provision for an aerated sludge holding tank. It is assumed that the Town will contract with a local sludge hauler and have sludge periodically pumped and hauled to a regional facility.

A. ACTIVATED SLUDGE SYSTEM - SEQUENCING BATCH REACTOR

1. Overall Alternative Description

This alternative proposes to utilize activated sludge as the secondary biological treatment process in a sequencing batch reactor (SBR) configuration. In addition to the SBR reactors this alternative will include primary treatment, disinfection, and chemical addition (alkalinity supplementation).

The following items generally describe improvements/work necessary to accommodate this alternative:

1. Headworks System – CMU building, odor control, mechanical fine screen, vortex grit removal system, grit washer/compactor, manual bar screen in bypass channel, influent pump station;
2. Sequencing Batch Reactor - SBR system including; cast-in-place concrete tankage, diffusers and blowers, decant arm, WAS pumps, all automated control valves and piping, control panel and MCC with D.O. probes;

3. Post-Equalization (Post-EQ) – Post-EQ system including; cast-in-place concrete tankage, diffusers and blowers, post-eq pumps with variable frequency drives (VFDs), all automated control valves and piping, level transducer with back-up float system;
4. Effluent Disinfection – Ultraviolet Disinfection system,
5. CMU wastewater treatment plant control building and lab,
6. Chemical feed systems for alkalinity supplementation,
7. Backup generator,
8. Misc. yard piping and electrical work as necessary,
9. Misc. site improvements as necessary (e.g. sidewalks, paving, landscaping);
10. All improvements necessary to support proper construction, operation, and function of the WWTP.

2. Headworks – Mechanical Fine Screen, Grit Removal, and Pump Station

a) Description

This alternative proposes to utilize a mechanical bar screen, grit removal system, and washer/compactor to provide for preliminary treatment. The purpose of the headworks system is two-fold; the screen removes large solids from the influent wastewater to prevent clogging or damage to downstream equipment, and the grit removal system removes refractory solids (e.g., sand) that can build up within the downstream tanks. Regulatory standards require preliminary treatment ahead of all activated sludge treatment processes.

The mechanical bar screen would be situated in a concrete channel where flow enters via gravity. As the screen captures influent solids, the screen would start to clog raising the water level in the channel. The screen would be equipped with upstream and downstream level sensors, when the change in water level across the screen reaches a pre-set point the screen would turn and rake the screenings into the washer/compactor for dewatering prior to disposal. There will be a bypass channel with manual bar screen for use in the event that the mechanical screen is out of service.

The screened flows would then flow through a vortex grit removal system for deposition of grit. Vortex grit removal systems utilizes a tangential flow into the

system to create a vortex current allowing grit and other fine solids to settle out into a hopper while the degritted water passes forward to the next treatment process. The grit that accumulates within the hopper will be periodically pumped out and washed of organics within the washer/compactor before being disposed of at the local landfill.

Screened and degritted flow will enter into an influent pump station to be pumped into the SBR system. The pump station will be equipped with two (2) duplex pumps, controlled via a level sensor and back-up float system. The pumps will be controlled by VFDs and be capable of pump the peak hourly flow with one pump out of service. The wet well will provide an effective volume to provide a maximum fill time of 30 minutes at the average daily flow rate.

b) Design Criteria

The following table summarizes the preliminary basis of design for the system headworks:

HEADWORKS BASIS OF DESIGN		
No. of Mechanical Screens	1	
No. of Manual Screens	1	*Bypass screen*
Clear opening	0.25-inch	
Peak Hourly Flow	0.254 mgd	
Slot Velocity (PHF)	3 ft/s	*TR-16 suggest 2-4 ft/s*
No. of Grit Removal Systems	1	
Vortex System Diameter	7-ft	
Peak Hourly Flow	0.254 mgd	
Percent Removal	95% for 150 micron	*TR-16 suggest 95% for 235 micron*
No. of Pumps	2	*One duty, one standby*
Capacity per Pump	176 gpm @ ~15ft TDH	
Wet Well Capacity	~1,500 gal	*52 gpm x 30 min = 1,562 gal*

3. Sequencing Batch Reactor

a) Description

An SBR system employs a fill/draw technique that allows the equalization, aeration, and clarification of influent wastewater to occur in a single reactor as a "batch." This activated sludge system reduces the overall footprint of the WWTP by incorporating several treatment processes into a single reactor.

The SBR system selected for preliminary design is the Sanitaire Intermittent Cycle Extended Aeration System (ICEAS). The ICEAS system allows for continuous filling of the reactor basins independent of cycle timing. For the Salem WWTP treatment needs, there are only three (3) cycles required for each treated batch: fill/react, settle, and decant. During the fill/react cycle the diffused aeration system is turned on to introduce air into the biomass and allow for the degradation of the influent wastewater. The air is then turned off and the system enters into the settle phase where solids are settled out into the sludge layer of the basin. Once the settle phase is complete, the decant phase begins. During the decant phase, a mechanical decant arm with v-notch weir system lowers into water surface at a controlled speed to allow for decanting of the wastewater at a pre-set rate. The SBR operates with two modes: normal mode, and storm mode. During a storm event or period of high flows, storm mode is activated. Storm mode shortens the batch cycle by 60-minutes to ensure adequate treatment of the higher volumes. The following table summarizes the proposed cycle times for both operational modes for the Salem WWTP:

CYCLE	NORMAL MODE (MIN)	STORM MODE (MIN)
Fill (Air on)	120	90
Settle	48	36
Decant	72	54
Total	240	180
Cycles per Day	6	8

The decant arm operates between preset high and low water levels. Not every batch will reach high water level; therefore, batch volumes may vary throughout daily cycles. As the v-notch weir is unchanged, the speed at which the decant arm is lowered during storm mode will be greater than that of the normal flow mode. This is referred to as the peak decant rate and will dictate sizing of the downstream post-eq tank.

Influent wastewater will be pumped from the influent pump station into a splitter box at the head of the SBR tankage. The splitter box will split flows between the two (2) reactor tanks. Flows will enter into a pre-react stilling well chamber that directs all flow into the sludge layer of the reactor basins. The basins will be equipped with a fine bubble diffuser system to introduce air into the biomass. Blowers will operate on a timer according to the batch cycle, and airflow will be controlled via a dissolved oxygen sensor located in each reactor. There will be a waste activated sludge pump dedicated to each reactor for sludge wasting.

b) Basis of Design

The preliminary basis of design for the Salem WWTP SBR is summarized in the following tables.

BASIS OF DESIGN CRITERIA		
Number of Basins	2	
F/M	0.049	BOD_5/d/MLSS
Sludge Volume Index	150	ml/g
MLSS @ in Sludge Blanket	4,911	mg/L
WAS Concentration	0.85%	lbs/day
Sludge Produced	1,620	gpd
Hydraulic Retention Time	1.16	days
Sludge Age	26.6	days
Normal Decant Rate	220	gpm
Peak Decant Rate	294	gpm
Decant Volume (max)	15,876	gal

4. Post Equalization Tank and Effluent Pumps

a) Description

The peak decant rates from the SBR can increase sizing of downstream treatment processes, such as the disinfection system and the outfall piping. Utilization of a post-eq tank system with effluent pumps can dampen decant rates from the SBR, subsequently reducing the size of downstream processes.

This alternate proposes the use of two (2) post-eq tanks, each dedicated to an SBR reactor. Each post-eq tank will be equipped with a final bubble diffuser aeration system to provide mixing and increase dissolved oxygen as necessary. The post-eq tanks shall have a submersible duplex pump system controlled by level sensors with a backup float system.

The post-eq tanks will each be sized to hold the decant volume of 20,000 gallons. The post-eq pumps will be required to discharge the decant volume over a 90-minute period, which is approximately 110 gallons per minute.

b) Design Criteria

POST-EQ BASIS OF DESIGN		
Number of Basins	2	EA
Effective Holding Volume per Basin	10,000	gal
Discharge Rate	110	gpm
Pump Power Requirements	2.5	HP
Mixing Air Required	80	scfm
Blower Power Requirements	5.3	HP

5. Effluent Disinfection – UV Disinfection

a) Description

Effluent disinfection is required for the destruction of pathogenic organisms in order to prevent the spread of waterborne diseases within the receiving water body. There are several methods available for disinfection of effluent

wastewater, including; chlorine disinfection, ultraviolet radiation, and ozone. Ozone is rarely used in these applications due to their high construction costs and complex operating requirements.

Chlorine is available in gaseous (Cl_2 gas), solid (tablets), or liquid (e.g. NaOCL) solution. In addition to chlorine as a disinfectant, additional chemicals such as sodium thiosulfate or sodium bisulfate would be required to dechlorinate the wastewater and reduce the residual chlorine to below the draft effluent limit threshold of 0.03 mg/l. To avoid the need for facilities related to chemical handling, the use of chlorine was not considered optimal for this project.

Ultraviolet (UV) disinfection systems utilize ultraviolet radiation to penetrate cell walls of the pathogen destroying its ability to reproduce. The efficacy of a UV system is dependent upon characteristics of the wastewater. The effluent wastewater requires low total suspended solids and a high ultraviolet transmittance level (UVT). The high-quality effluent from SBR treatment processes is suitable for the use of UV disinfection systems.

There are several configurations available for the use of UV disinfection systems, for planning purposes it is assumed that the UV system will be an open-channel contact system. Effluent wastewater will be discharged from the post-eq tank into a concrete splitter box that will direct flow into the UV disinfection channels. There will be two (2) channels in parallel each capable of treating the peak hourly flow. This will allow for continued treatment in the event one UV system is under maintenance.

b) Design Criteria

UV SYSTEM BASIS OF DESIGN		
Number of UV Reactors	2	EA
Peak Hourly Flow Rate	110	gpm
UVT %	65%	
Total Suspended Solids (Max)	30	mg/L

6. Sludge Holding Tanks

a) Description

Sludge holding tanks (SHT) are required for storage of wasted sludge. There will be two (2) pre-cast concrete aerated sludge holding tanks. The SHTs will be aerated with coarse bubble diffusers and a blower system. Each SHT shall be equipped with a decant mechanism to decant supernatant back to the head of the plant.

The sludge holding tanks are sized based on design recommendations for aerobic sludge digesters.

b) Basis of Design

SLUDGE HOLDING TANK BASIS OF DESIGN		
Population Equivalent (P.E.)	750	*Assumes 100 gpd/P.E.for 75,000 gpd MMDF*
Storage Volume per P.E.	4.5 ft^3/P.E.	*From 10SS for aerobic sludge holing tanks*
Storage Volume Required	3,375 ft3 25,245 (gal)	
Number of Tanks	2	
Volume per Tank	15,150 gal	*Includes 20% increase for conservativism*
Mixing Air Required	6.7 scfm/1,000 gal	*Max required from 10SS*
Air Provided	1 Tank - 100 scfm 2 Tank - 200 scfm	
Blowers Provided	2	*One duty, one standby*
Blower Requirements	200 scfm, 9.3 HP	

7. Environmental Impacts

No adverse environmental impacts will result from this alternative. All construction means and methods will adhere to environmental regulations.

8. Land Requirements

The Town has identified a ~7.3-acre parcel suitable for the construction of a municipal wastewater treatment plant.

9. Potential Construction Problems

Due to the proximity of the WWTP relative to Beaver Brook, and the flood prone nature of the region, the presence of high groundwater in the area can be expected. The contractor should be prepared to provide for adequate dewatering during excavation.

B. FIXED FILM SYSTEM – MOVING BED BIOFILM REACTOR

1. Overall Alternate Description

This alternative proposes to utilize fixed film treatment as the secondary biological treatment process in a moving bed biofilm reactor (MBBR) configuration. In addition to the MBBR reactors this alternative will include primary treatment, settling, disinfection, and chemical addition.

The following items generally describe improvements/work necessary to accommodate this alternative:

1. Headworks System – CMU building, odor control, mechanical fine screen, vortex grit removal system, grit washer/compactor, manual bar screen in bypass channel, influent pump station;
2. Two (2) 15-ft diameter primary clarifiers including all associated mechanical, electrical, structural, and site work,
3. Moving Bed Biofilm Reactor System - Construction of new MBBR system (e.g. cast-in-place concrete tankage, diffusers and blowers, carrier media, retention screens, all automated control valves and piping, control panel and MCC with D.O. probes)
4. Two (2) new 18-ft diameter secondary clarifiers including all associated mechanical, electrical, structural, and site work,
5. Effluent Disinfection – Ultraviolet Disinfection system,
6. CMU Wastewater Treatment Plant Control Building and Lab,
7. Chemical feed systems for alkalinity supplementation,
8. Misc. yard piping and electrical work as necessary,
9. Misc. site improvements as necessary (e.g. sidewalks, paving, landscaping),

10. All improvements necessary to support proper construction, operation, and function of the WWTP.

2. Headworks – Coarse Screening, Grit Removal, and Pump Station

a) Description

This alternative proposes to utilize a mechanical bar screen, grit removal system, and washer/compactor to provide for primary treatment. Regulatory standards require primary treatment ahead of all MBBR treatment processes.

The mechanical bar screen would be situated in a concrete channel where flow enters via gravity. There will be a bypass channel with manual bar screen for use in the event that the mechanical screen is out of service.

The screened flows would then flow through a vortex grit removal system for deposition of grit. The grit that accumulates within the hopper will be periodically pumped out and washed of organics within the washer/compactor before being disposed of at the local landfill.

Screened and degritted flow will enter into an influent pump station to be pumped into the MBBR system. The pump station will be equipped with two (2) duplex pumps, controlled via a level sensor and back-up float system. The pumps will be controlled by VFDs and be capable of pump the peak hourly flow with one pump out of service. The wet well will provide an effective volume to provide a maximum fill time of 30 minutes at the average daily flow rate.

b) Basis of Design Table

HEADWORKS BASIS OF DESIGN		
No. of Mechanical Screens	1	
No. of Manual Screens	1	*Bypass screen*
Clear opening	0.25-inch	
Peak Hourly Flow	0.254 mgd	
Slot Velocity (PHF)	3 ft/s	*TR-16 suggest 2-4 ft/s*
No. of Grit Removal Systems	1	
Vortex System Diameter	7-ft	
Peak Hourly Flow	0.254 mgd	
Percent Removal	95% for 150 micron	*TR-16 suggest 95% for 235 micron*

3. Primary Clarifier

a) Description

This alternative proposes to construct two (2) new 15-ft diameter circular center feed clarifiers in parallel. Each clarifier will include construction of a cast-in-place clarifier tank, and installation of a circular mechanical drive, skimmer arm, sludge scraper, cat walk, and weir and baffle system.

The design of the primary clarifiers is based upon the influent peak hourly flow rate of 176 gpm (0.254 mgd).

Flow from the influent pump station will pump into a splitter box which will divert flows to either clarifier. The splitter box will be equipped with adjustable weirs to allow for balancing of flows between the clarifiers, and clarifier isolation during periods of maintenance.

Clarified flow will be conveyed downstream to the MBBR system. Sludge will be periodically drawn off and sent to the sludge holding tank.

b) Basis of Design Table

PRIMARY CLARIFIER BASIS OF DESIGN		
Number of Units	2	
Clarifier Diameter	15 ft	
Water Surface Area	177 ft2	per clarifier
Weir Length	47 LF	per clarifier
Surface Overflow Rate (ADF)	479 gpd/ft^2	1,000 gpd/ft^2 max (10SS)
Surface Overflow Rate (PHF)	1,437 gpd/ft^2	1,500 gpd/ft^2 max (10SS)
Weir Loading Rate (PHF)	5,390 gpd/LF	20,000 gpd/LF max (10SS)

4. Moving-Bed Biofilm Reactors

a) Description

This alternative proposes to utilize a moving-bed biofilm reactor (MBBR) for the secondary biological treatment process. An MBBR system employs a fixed film technology to provide treatment of BOD_5, TSS, and ammonia. The MBBR process utilizes reactor tanks that are partially (50%-70%) filled with neutrally buoyant media that offer surface for fixed-film microorganisms to grow. Oxygen for mixing is introduced through coarse bubble diffusers or an aeration grid to continuously circulate the media throughout the tank. Influent wastewater comes in contact with the microorganisms allowing for the consumption of the organic matter. The media is maintained within the reactor tanks by mesh effluent retention screens that allow for passage of flow but are sized to retain all media.

The Salem WWTP will consist of three (3) trains of one (1) tank each. Each tank will be sized to handle 50% of the max month daily flow to allow for adequate treatment in the event one of the tanks is out of service. MBBR systems do not require recycling of wastewater; therefore, there will be no recycle pump station. Each tank will be equipped with a fine bubble diffuser system, biofilm carriers (media), and a stainless-steel retention screen.

b) Basis of Design

MBBR BASIS OF DESIGN	
Number of Trains	3
Tanks per Train	1
Effective Volume per Tank	37,500 gals
Media Fill Fraction	40%
Media Volume per Tank	706 ft^3

AERATION SYSTEM REQUIREMENTS		
Number of Blowers	3	*2 Duty, 1 Standby*
AOR Requirements	7.98 lbs-O_2/HR	
Air Req'd per Tank	25.7 scfm	
Diffusers per Tank	16	
Blower Pressure	8.0 psi	

5. Secondary Clarifiers

a) Description

This alternative proposes to construct two (2) new 18-ft diameter circular center feed secondary clarifiers in parallel. Each clarifier will include construction of a cast-in-place clarifier tank, and installation of a circular mechanical drive, skimmer arm, sludge scraper, cat walk, and weir and baffle system.

The design of the secondary clarifiers is based upon the peak hourly flow rate of 176 gpm (0.254 mgd).

Flow from the MBBR system will flow via gravity into a splitter box which will divert flows to either clarifier. The splitter box will be equipped with adjustable weirs to allow for balancing of flows between the clarifiers, and clarifier isolation during periods of maintenance.

Clarified flow will be conveyed downstream to the disinfection system and secondary sludge will be drawn off as necessary for further sludge processing.

b) Basis of Design Table

SECONDARY CLARIFIER BASIS OF DESIGN		
Number of Units	2	
Clarifier Diameter	18 ft	
Water Surface Area	254 ft2	*per clarifier*
Weir Length	57 LF	*per clarifier*
Surface Overflow Rate (PHF)	998 gpd/ft^2	*1,200 gpd/ft^2 max (10SS)*
Weir Loading Rate (PHF)	4,492 gpd/LF	*20,000 gpd/LF max (10SS)*

6. Effluent Disinfection – UV Disinfection

a) Description

Effluent disinfection is required for the destruction of pathogenic organisms in order to prevent the spread of waterborne diseases within the receiving water body. There are several methods available for disinfection of effluent wastewater, including; chlorine disinfection, ultraviolet radiation, and ozone. Ozone is rarely used in these applications due to their high construction costs and complex operating requirements.

Chlorine is available in gaseous (Cl_2 gas), solid (tablets), or liquid (e.g. NaOCL) solution. In addition to chlorine as a disinfectant, additional chemicals such as sodium thiosulfate or sodium bisulfate would be required to dechlorinate the wastewater and reduce the residual chlorine to below the draft effluent limit threshold of 0.03 mg/l. To avoid the need for facilities related to chemical handling, the use of chlorine was not considered optimal for this project.

Ultraviolet (UV) disinfection systems utilize ultraviolet radiation to penetrate cell walls of the pathogen destroying its ability to reproduce. The efficacy of a UV system is dependent upon characteristics of the wastewater. The effluent wastewater requires low total suspended solids and a high ultraviolet

transmittance level (UVT). The high-quality effluent from MBBR treatment processes is suitable for the use of UV disinfection systems.

There are several configurations available for the use of UV disinfection systems, for planning purposes it is assumed that the UV system will be an open-channel contact system. Effluent wastewater will be discharged from the post-eq tank into a concrete splitter box that will direct flow into the UV disinfection channels. There will be two (2) channels in parallel each capable of treating the peak hourly flow. This will allow for continued treatment in the event one UV system is under maintenance.

b) Design Criteria

UV SYSTEM BASIS OF DESIGN		
Number of UV Reactors	2	*EA*
Peak Hourly Flow Rate	110	*gpm*
UVT %	65%	
Total Suspended Solids (Max)	30	*mg/L*

7. Sludge Holding Tanks

a) Description

Sludge holding tanks (SHT) are required for storage of wasted sludge. There will be two (2) pre-cast concrete aerated sludge holding tanks. The SHTs will be aerated with coarse bubble diffusers and a blower system. Each SHT shall be equipped with a decant mechanism to decant supernatant back to the head of the plant.

The sludge holding tanks are sized based on design recommendations for aerobic sludge digesters.

b) Basis of Design

SLUDGE HOLDING TANK BASIS OF DESIGN		
Population Equivalent (P.E.)	750	*Assumes 100 gpd/P.E.for 75,000 gpd MMDF*
Storage Volume per P.E.	4.5 ft^3/P.E.	*From 10SS for aerobic sludge holing tanks*
Storage Volume Required	3,375 ft3 25,245 (gal)	
Number of Tanks	2	
Volume per Tank	15,150 gal	*Includes 20% increase for conservativism*
Mixing Air Required	6.7 scfm/1,000 gal	*Max required from 10SS*
Air Provided	1 Tank - 100 scfm 2 Tank - 200 scfm	
Blowers Provided	2	*One duty, one standby*
Blower Requirements	200 scfm, 9.3 HP	

8. Environmental Impacts

No adverse environmental impacts will result from this alternative. All construction means and methods will adhere to environmental regulations.

9. Land Requirements

The Town has identified a ~7.3-acre parcel suitable for the construction of a municipal wastewater treatment plant.

10. Potential Construction Problems

Due to the proximity of the WWTP relative to Beaver Brook, and the flood prone nature of the region, the presence of high groundwater in the area can be expected. The contractor should be prepared to provide for adequate dewatering during excavation.

C. FIXED FILM SYSTEM – ROTATING ALGAL CONTACTOR™

1. Overall Alternate Description

This alternative proposes a Rotating Algal Contactor™ (Algaewheel) hybrid fixed film treatment system as the secondary biological treatment process. In addition to the Algaewheel system this alternative will include primary treatment, settling, disinfection, and chemical supplementation.

The Algaewheel system is supplied as a "package" system

The following items generally describe improvements/work necessary to accommodate this alternative: It should be noted that items included

1. Headworks System – CMU building, odor control, mechanical fine screen, vortex grit removal system, grit washer/compactor, manual bar screen in bypass channel, influent pump station;
2. Two (2) 15-ft diameter primary clarifiers including all associated mechanical, electrical, structural, and site work,
3. Algaewheel System – Construction of a new Algaewheel treatment system with greenhouse building, pre-cast flow equalization tanks and pumps, pre-cast secondary rectangular secondary clarifiers, pre-cast sludge holding tanks, recirculation structure, and all other components as provided within the Algaewheel package system (diffusers and blowers, media, all automated control valves and piping, control panel and MCC)
4. Effluent Disinfection – Ultraviolet Disinfection system,
5. CMU Wastewater Treatment Plant Control Building and Lab,
6. Chemical feed systems for alkalinity supplementation,
7. Backup generator,
8. Misc. yard piping and electrical work as necessary,
9. Misc. site improvements as necessary (e.g., sidewalks, paving, landscaping).
10. All improvements necessary to support proper construction, operation, and function of the WWTP.

2. Headworks – Mechanical Bar Screen and Grit Removal System

a) Description

This alternative proposes to utilize a mechanical bar screen, grit removal system, and washer/compactor to provide for primary treatment. Regulatory standards require preliminary treatment ahead of all fixed film treatment processes.

The mechanical bar screen would be situated in a concrete channel where flow enters via gravity. There will be a bypass channel with manual bar screen for use in the event that the mechanical screen is out of service.

The screened flows would then flow through a vortex grit removal system for deposition of grit. The grit that accumulates within the hopper will be periodically pumped out and washed of organics within the washer/compactor before being disposed of at the local landfill.

Flow from the grit removal system will enter into a splitter box which will divert flows between the two (2) primary clarifiers.

b) Basis of Design Table

HEADWORKS BASIS OF DESIGN		
Number of Mechanical Screens	1	
Number of Manual Screens	1	*Bypass screen*
Clear opening	0.25-inch	
Peak Hourly Flow	0.254 mgd	
Slot Velocity (PHF)	3 ft/s	*TR-16 suggest 2-4 ft/s*
No. of Grit Removal Systems	1	
Vortex System Diameter	7-ft	
Peak Hourly Flow	0.254 mgd	
Percent Removal	95% for 150 micron	*TR-16 suggest 95% for 235 micron*

3. Primary Clarifier(s)

a) Description

This alternative proposes to construct two (2) 15-ft diameter circular center feed clarifiers in parallel. Each clarifier will include construction of a cast-in-place clarifier tank, and installation of a circular mechanical drive, skimmer arm, sludge scraper, cat walk, and weir and baffle system. The design of the primary clarifiers is based upon the influent peak hourly flow rate of 176 gpm (0.254 mgd).

Flow from the headworks, screened flow will enter into a splitter box which will divert flows to either clarifier. The splitter box will be equipped with adjustable weirs to allow for balancing of flows between the clarifiers, and clarifier isolation during periods of maintenance. Clarified flow will be conveyed downstream to the flow equalization tanks. Sludge will be periodically drawn off and sent to the sludge holding tank for further processing.

b) Basis of Design Table

PRIMARY CLARIFIER BASIS OF DESIGN		
Number of Units	2	
Clarifer Diameter	15 ft	
Water Surface Area	177 ft2	*per clarifier*
Weir Length	47 LF	*per clarifier*
Surface Overflow Rate (ADF)	479 gpd/ft^2	*1,000 gpd/ft^2 max (10SS)*
Surface Overflow Rate (PHF)	1,437 gpd/ft^2	*1,500 gpd/ft^2 max (10SS)*
Weir Loading Rate (PHF)	5,390 gpd/LF	*20,000 gpd/LF max (10SS)*

4. Flow Equalization (Algaewheel Package)

a) Description

Downstream of the primary clarifiers will be two (2) flow equalization tanks (flow EQ). The flow EQ tanks will receive flows from the primary clarifiers as well as a recirculation tank. Each flow EQ tank will be equipped with a duplex submersible pump system (controlled by level sensors with backup floats and operated by

VFDs). The flow EQ pumps will pump flows into the Algaewheel system evenly over a 24-hour period to ensure consistent hydraulic and organic loading.

Each flow EQ tank will be provided with an aeration grid for mixing. The tanks will be interconnected with an equalization pipe to maintain a consistent level of water between the two tanks, allowing for the full volume of both tanks to act as the effective equalization volume. The interconnect pipe will be equipped with a plug valve to allow for flow EQ tank isolation.

b) Basis of Design Table

FLOW EQUALIZATION BASIS OF DESIGN		
Number of Tanks	2	*Precast concrete tanks*
Effective Volume per Tank	12,000 gal	
Total Effective Volume	24,000 gal	
Number of Pumps	4	*Two (2) per tank; one duty, one standby*
Capacity Rate per Pump	104 gal	*From Algaeweel*
Mixing Air Required	50 scfm/tank	*4 scfm/1,000 gal*
Number of Blowers	2	*One duty, one standby*
Blower Size	3HP	*Capable of discharging up to 100 scfm against 6.2 psi*

5. Algaewheel System (Algaewheel Package)

a) Description

The Algaewheel is a Rotating Algal Contactor (RAC)™ treatment process. The treatment process is a hybrid system that combines the mechanical features of a rotating biological contactor (RBC) with the treatment pathways of an MBBR. To provide for an enhanced treatment environmental, an algal population is promoted on the exterior surface of the wheels due to their location within a green house and exposure to UV light. The algae produce oxygen and sugars, consume CO_2, and assimilate ammonia. The bacteria in the wastewater consume the oxygen and sugar, and produce CO_2, creating a synergistic treatment process. The following lists the key features of the Algaewheel system:

- As opposed to using fewer larger diameter wheels as typically employed in an RBC system, the Algaewheel uses a high number of small diameter wheels (<3 ft dia.)

- The wheels are buoyant and float in a shallow process tank with partial submergence (kept in place with an axel system). The wheels rotate freely about the axel due to the current of the influent wastewater. There is a small HP blower that provides air into the process tanks to keep axels rotating during periods when the pumps are not discharging into the process tanks.

- The Algaewheels are made of high-density polyethylene and have an open core that houses MBBR media. As the wheels rotate, the algae is introduced into the bacterial population within the wastewater, promoting the synergistic cycle previously discussed.

Equalized flow is pumped into the end of the Algaewheel process tank(s) where it passes through the Algaewheels coming in contact with the wheels and the MBBR media (algal and bacterial populations). From the Algaewheel process tanks, flow enters a recirculation tank where a fraction of the flow is returned to the flow equalization tanks, and the remaining fraction flows to the secondary clarifiers.

b) Basis of Design

ALGAEWHEEL BASIS OF DESIGN		
Number of Trains	2	
Tanks per Train	1	
Number of Shafts	56	*23 per tank*
Wheels per Axel	5	
Total Number of Wheels	280	
Organic Loading Rate	1.5-3.0 $lbBOD_5/ft_2$	
Ammonia Loading Rate	0.15-0.30 $lbNH_3$-N/ft_2	
Hydraulic Loading Rate	0.75-2.0 gpd/ft_2	

6. Secondary Clarifiers (Algaewheel Package)

a) Description

The Algaewheel package system includes three (3) precast rectangular secondary settling tanks in parallel. Each tank is a dual hopper style tank with a width of 9ft, a length of 15ft, and a side water depth of 12ft. The drive, skimmer arm, sludge scraper, cat walk, and weir and baffle system.

The design of the secondary clarifiers is based upon the influent peak hourly flow rate of 176 gpm (0.254 mgd).

Flow from the MBBR system will flow via gravity into a splitter box which will divert flows to either clarifier. The splitter box will be equipped with adjustable weirs to allow for balancing of flows between the clarifiers, and clarifier isolation during periods of maintenance.

Clarified flow will be conveyed downstream to the disinfection system and secondary sludge will be drawn off as necessary for further sludge processing.

b) Basis of Design Table

SECONDARY CLARIFIER BASIS OF DESIGN		
Number of Units	3	
Water Surface Area	135 ft^2	*per clarifier*
Weir Length	18 LF	*per clarifier*
Surface Overflow Rate (PHF)	998 gpd/ft^2	*1,200 gpd/ft^2 max (10SS)*
Weir Loading Rate (PHF)	4,492 gpd/LF	*20,000 gpd/LF max (10SS)*

7. Effluent Disinfection – UV Disinfection

a) Description

Effluent disinfection is required for the destruction of pathogenic organisms in order to prevent the spread of waterborne diseases within the receiving water body. There are several methods available for disinfection of effluent

wastewater, including; chlorine disinfection, ultraviolet radiation, and ozone. Ozone is rarely used in these applications due to their high construction costs and complex operating requirements.

Chlorine is available in gaseous (Cl_2 gas), solid (tablets), or liquid (e.g. NaOCL) solution. In addition to chlorine as a disinfectant, additional chemicals such as sodium thiosulfate or sodium bisulfate would be required to dechlorinate the wastewater and reduce the residual chlorine to below the draft effluent limit threshold of 0.03 mg/l. To avoid the need for facilities related to chemical handling, the use of chlorine was not considered optimal for this project.

Ultraviolet (UV) disinfection systems utilize ultraviolet radiation to penetrate cell walls of the pathogen destroying its ability to reproduce. The efficacy of a UV system is dependent upon characteristics of the wastewater. The effluent wastewater requires low total suspended solids and a high ultraviolet transmittance level (UVT). The high quality effluent from algaewheel treatment processes are suitable for the use of UV disinfection systems.

There are several configurations available for the use of UV disinfection systems, for planning purposes it is assumed that the UV system will be an open-channel contact system. Effluent wastewater will be discharged from the post-eq tank into a concrete splitter box that will direct flow into the UV disinfection channels. There will be two (2) channels in parallel each capable of treating the peak hourly flow. This will allow for continued treatment in the event one UV system is under maintenance.

b) Design Criteria

UV SYSTEM BASIS OF DESIGN		
Number of UV Reactors	2	EA
Peak Hourly Flow Rate	104	gpm
UVT %	65%	
Total Suspended Solids (Max)	30	mg/L

8. Aerobic Sludge Holding Tanks

a) Description

Sludge holding tanks (SHT) are required for storage of secondary and primary sludges. There will be two (2) pre-cast concrete aerated sludge holding tanks. The SHTs will be aerated with coarse bubble diffusers and a blower system. Each SHT shall be equipped with a decant mechanism to decant supernatant back to the head of the plant.

b) Basis of Design

SLUDGE HOLDING TANK BASIS OF DESIGN		
Population Equivalent (P.E.)	750	*Assumes 100 gpd/P.E.for 75,000 gpd MMDF*
Storage Volume per P.E.	4.5 ft^3/P.E.	*From 10SS for aerobic sludge holing tanks*
Storage Volume Required	3,375 ft3 25,245 (gal)	
Number of Tanks	2	
Volume per Tank	15,150 gal	*Includes 20% increase for conservativism*
Mixing Air Required	6.7 scfm/1,000 gal	*Max required from 10SS*
Air Provided	1 Tank - 100 scfm 2 Tank - 200 scfm	
Blowers Provided	2	*One duty, one standby*
Blower Requirements	200 scfm, 9.3 HP	

9. Environmental Impacts

No adverse environmental impacts will result from this alternative. All construction means and methods will adhere to environmental regulations.

10. Land Requirements

The Town has identified a ~7.3-acre parcel suitable for the construction of a municipal wastewater treatment plant.

11. Potential Construction Problems

Due to the proximity of the WWTP relative to Beaver Brook, and the flood prone nature of the region, the presence of high groundwater in the area can be expected. The contractor should be prepared to provide for adequate dewatering during excavation.

VIII. COST ESTIMATES

A. COLLECTION SYSTEM ALTERNATIVES

1. Capital Improvement Costs

The following table summarizes capital improvements costs for the evaluated collection system alternatives. Please refer to Appendix H for a full Opinion of Probable Cost for both alternatives.

	GRAVITY SEWER	LOW PRESSURE SEWER
Estimated Construction Costs (2026)*	$13,396,297	$9,750,473
Project Contingency (20%)	$2,679,259	$1,950,095
Engineering Fees/Soft Costs (15%)	$2,411,333	$2,106,102
Total Capital Improvement Costs (2026)	$18,486,889	**$13,806,669**

**Future value of construction costs based on an interest rate of 5% over 3 years.*

2. Operation and Maintenance Costs

The following table summarizes operation and maintenance costs for the evaluated collection system alternatives. It is assumed that all required operator and contractual expenses will be covered under the WWTP O&M costs. The LPSS alternative should have minimal standard O&M requirements, as all equipment responsibility is borne by the individual user.

	GRAVITY SEWER	LOW PRESSURE SEWER
Electrical	$1,500	$-
Short Lived Assets	$750	$-
Annual O&M Costs	$2,250	$-

3. Life Cycle Cost Analysis

The following table presents the total net present value for each alternative. As per the Office of Management and Budget (OMB) Circular No. A-94, the real discount rates for 2023 on a 30-year maturity are 2%. The net present value was calculated utilizing a 30% return period at 2%.

	GRAVITY SEWER	LOW PRESSURE SEWER
Annual O&M	$2,250	$-
Present Worth O&M*	$50,392	$-
Capital Improvement Costs	$18,486,890	$15,199,577
Total Net Present Value (2026)	$18,537,282	$15,199,577

B. WASTEWATER TREATMENT PLANT ALTERNATIVES

1. Capital Improvement Costs

The following table summarizes capital improvements costs for the evaluated collection system alternatives. Please refer to Appendix I for a full Opinion of Probable Cost for each alternative.

	SBR	MBBR	ALGAEWHEEL (RAC)
Estimated Construction Costs (2026)*	$5,511,834	$6,064,013	$5,672,683
Project Contingency (20%)	$1,102,367	$1,212,803	$1,134,537
Engineering Fees/Soft Costs (15%)	$992,130	$1,091,522	$1,021,083
Total Capital Improvement Costs (2026)	**$7,606,331**	$8,368,338	$7,828,302

**Future value of construction costs based on an interest rate of 5% over 3 years.*

2. Operation and Maintenance Costs

The following table summarizes annual operating costs for the evaluated collection system alternatives. Please refer to Appendix I for a full Opinion of Probable Cost for each alternative.

	SBR	MBBR	Algaewheel (RAC)
Operator Expenses	$90,000	$72,000	$72,000
Misc Contracts	$5,000	$5,000	$5,000
Telephone/Internet	$1,200	$1,200	$1,200
Electrical	$14,853	$11,408	$8,881
Short Lived Assets	$18,835	$19,455	$14,865
Water Payment	$600	$600	$600
Fuel	$500	$500	$500
Sludge Hauling	$35,000	$35,000	$35,000
Annual O&M Costs	$165,987	$110,163	**$103,046**

3. Life Cycle Cost Analysis

The following table presents the total net present value for each alternative. As per the Office of Management and Budget (OMB) Circular No. A-94, the real discount rates for 2023 on a 30-year maturity are 2%. The net present value was calculated utilizing a 30% return period at 2%.

	SBR	MBBR	Algaewheel (RAC)
Annual O&M	$165,987	$110,163	$103,046
Present Worth O&M*	$3,717,526	$2,467,256	$2,307,865
Capital Improvement Costs	$7,606,331	$8,368,338	$7,828,302
Total Net Present Value (2026)	$11,323,857	$10,835,594	**$10,136,167**

IX. RECOMMENDED ALTERNATIVES

Upon completion of the alternative evaluation, and consideration of all monetary and non-monetary factors, the following alternatives are recommended:

- Collection System: Low-Pressure Sewer System
- Wastewater Treatment Plant: Algaewheel Rotating Algal Contactor

The low-pressure sewer system was found to be the most cost-effective collection system alternative. In addition to the cost benefits, low-pressure sewers have a much greater resiliency to infiltration and inflow due to the method of installation and the ability of the sewer system to be installed above the water table. As pressure piping can be installed via horizontal directional drill, the disturbance would be limited.

The Rotating Algal Contactor wastewater treatment plant was determined to be the most cost-effective wastewater treatment solution. The technology is relatively simple to operate, does not require a Class A license, and can confidently meet the anticipated effluent limits.

The total capital improvement costs for both recommended alternatives is approximately $21.6M. At this time it is recommended that the Town Board, if it so chooses, proceeds with the project as per the schedule in the following section.

X. PROJECT SCHEDULE AND NEXT STEPS

Action	Timeframe Start to Complete	Anticipated or Target Date
LCLGRPB submits Northern Borders Regional Commission Grant	Completed	June 2, 2023
Submit Engineering Report to NYSEFC and USDA	Point in Time	By June 16, 2023*
Public Engagement and Education	5 months	June – November 2023
Initiate and conduct SEQR (**28-day lead agency circulation in the notice**)	2 months	June 21, 2023 – July 19, 2023
Town Board Adopts Map Plan and Report for District Formation and Schedules Public Hearing (10-day notice)	Point in Time	July 19, 2023
Town Board conduct Public Hearing on District Formation **SPECIAL MEETING**	Point in Time	July 31, 2023
Town Board Adopts District Formation Resolution Subject to Mandatory Referendum	**Point in Time**	**August 4, 7, 8, or 9****
Referendum Vote	**Point in Time**	**November 7, 2023**
Assuming a positive vote, submit to NYSOSC	4-6 months	November 2023 – April 2024
Receive OSC Approval, District Formed, Adopt Bond Resolution	**Point in Time**	**April or May 2024**
Secure BAN	1 month	May 2024
Apply to EFC for CWSRF/BIL Financing	2 months	June 2024
NYSOCR CDBG and WIIA Applications	Point in Time	Summer 2024
Design and permitting	12 months	June 2024 – June 2025
Close on SRF Financing	Point in Time	December 2024
Bidding and Award	3 months	Fall 2025
Construction	24 months	Fall 2025 – Fall 2027
Start-up and Close Out	3 months	Winter 2028

The proposed project will require multiple permits and approvals. Involved agencies may include the Town of Salem, New York State Department of Environmental Conservation (NYSDEC), New York State Environmental Facilities Corporation (NYSEFC). The following table summarizes the preliminary list of permit and approval requirements for the project:

Agency	Permit/Approval	Status
Town of Salem	SEQR Negative Declaration	Anticipated
SHPO Review	Letter of No Impact	Anticipated
Town of Salem	MPR/202-B Proceedings	Anticipated
Town of Salem	Bond Resolution	Anticipated
USDA RD	Regulatory Approval	Anticipated
NYSEFC	WIIA/CWSRF Approval	Anticipated
NYSDEC	SPDES Permit Approval/Issuance	Anticipated
NYSDEC	Design Approval	Anticipated

XI. SMART GROWTH ASSESSMENT FORM (EFC)

Please refer to **Appendix J** for a copy of the Smart Growth Assessment Form.

XII. ENGINEERING REPORT CERTIFICATION (EFC)

This Preliminary Engineering Report has been prepared in conformance with requirements for Engineering Reports as outlined in Recommended Standards for Wastewater Facilities – Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (Ten States Standards). Please refer to **Appendix K** for a copy of the stamped and signed Engineer's Certification.

APPENDIX A: DRAFT EFFLUENT LIMITS

Preliminary Effluent Limits Proposed Salem Sanitary Sewer

The limits provided below are not guaranteed for this facility. It is important to note that limits will change based on the dilutions achieved, below there are a range of typical dilutions that can be expected to be achieved but not guaranteed. The final limits can only be determined with the development of mixing zone model which can only be determined with a finalized outfall design plan. NYSDEC will either develop a mixing zone model upon receiving the complete SPDES application or verify a mixing zone model provided upon receiving the SPDES application.

Parameter	Unit	Type	Max Dilution (60:1)	30:1	10:1	5:1	1:1
Design Flow	gpd	Daily Max	75,000	75,000	75,000	75,000	75,000
pH	SU	Range	6.0-9.0	6.0-9.0	6.0-9.0	6.5-8.5	6.5-8.5
Temperature	deg F	Daily Max	70° F	70° F	70° F	70° F	70° F
Dissolved Oxygen	mg/L	Daily Min	5.0	5.0	5.0	5.0	5.0
BOD_5	mg/L	Monthly Average	30	30	30	30	30
BOD_5	mg/L	7-Day Average	45	45	45	45	45
Settleable Solids	ml/L	Daily Max	0.1 or 0.3	0.1 or 0.3	0.1 or 0.3	0.1 or 0.3	0.1 or 0.3
Total Suspended Solids (TSS)	mg/L	Monthly Average	30	30	30	30	30
Total Suspended Solids (TSS)	mg/L	7-Day Average	45	45	45	45	45
(Trout) Ammonia as N Summer (June 1st-October 31st)	mg/L	Monthly Average	No Limit	No Limit	8.6	4.3	0.9
(Trout) Ammonia as N Winter (November 1st-May 31st)	mg/L	Monthly Average	No Limit	No Limit	17.8	8.9	1.9
Fecal Coliform	No./100 mL	30-day Geometric Mean	200	200	200	200	200
Fecal Coliform	No./100 mL	7-Day Geometric	400	400	400	400	400

TRC if Chlorine is used as Disinfectant	mg/L	Daily Max	1.5	0.15	0.05	0.03	0.03
Mercury	ng/L	One Sample	One time sample see explanation below.	One time sample see explanation below.	One time sample see explanation below.	One time sample see explanation below.	One time sample see explanation below.

* As per TOGS 1.3.10, approximately 6 months after the facility is operational one mercury sample will be taken and provided to NYSDEC. If the mercury sample is less than 12 ng/L, the facility can fill out a Conditional Exclusion Certification. If the Conditional Exclusion Certification identifies a source NYSDEC will then determine the appropriate permit limit(s) and mercury minimization plan requirements. If the Conditional Exclusion Certification does not identify a source a mercury minimization plan will not be required. If the mercury sample comes back greater than 12 ng/L, the facility will be required to take an additional three samples to verify the concentration of mercury in the effluent. NYSDEC will then determine the appropriate permit limit(s) and mercury minimization plan requirements.

APPENDIX B: PROPOSED SERVICE AREA MAP

Proposed Sewer District

Town of Salem, New York

0 215 430 860 Feet

N

Prepared By: Delaware Engineering, DPC
Date: June 16, 2023
Sources: Washington County 2020 Parcels, Salem Zoning 2017, ESRI Imagery

Legend

- Parcels (white lines)
- Streams
- Proposed Sewer Area

APPENDIX C: ENVIRONMENTAL RESOURCES PRESENT

NRCS SOILS REPORT

United States Department of Agriculture

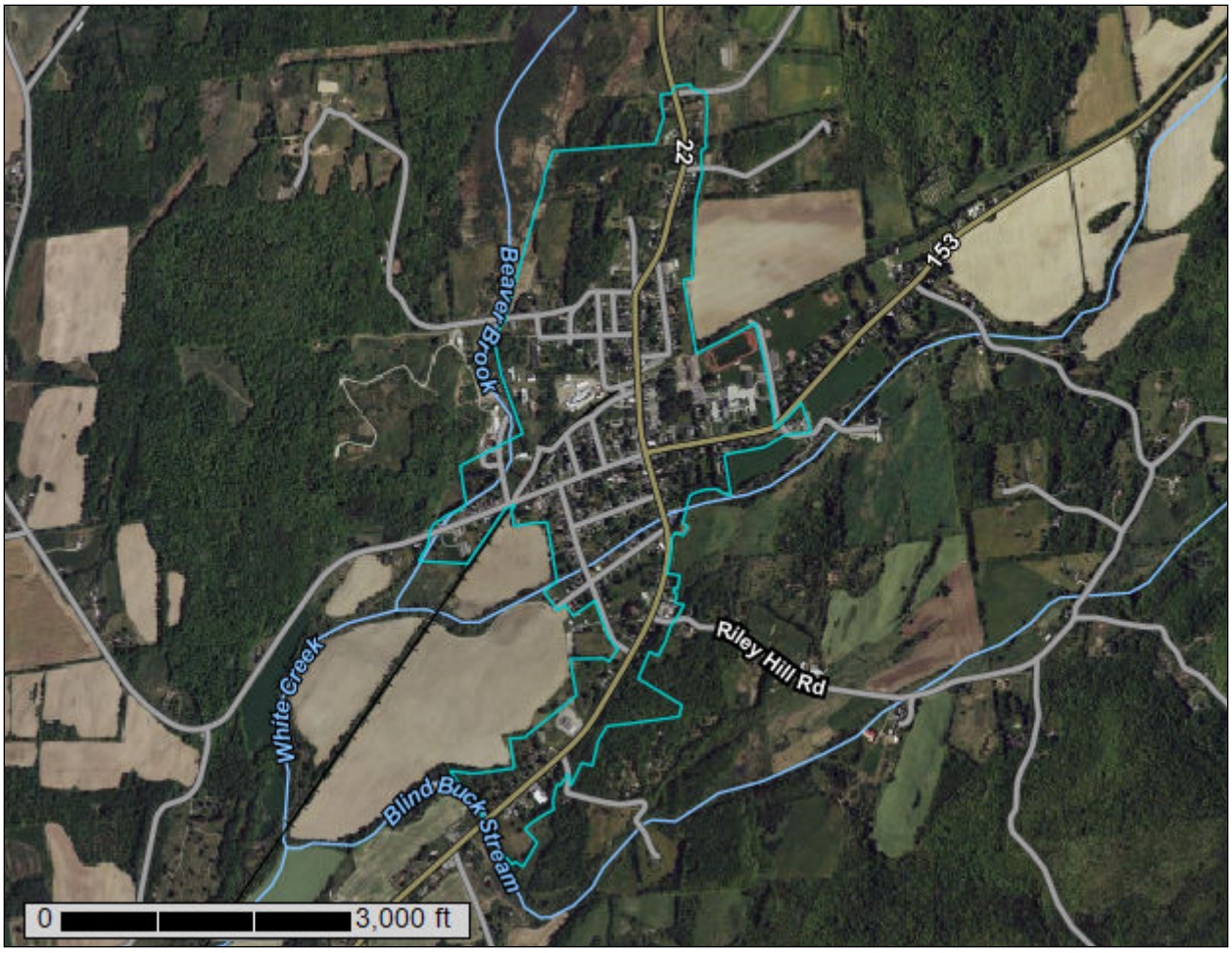
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Washington County, New York

Proposed_Sewer_Service_Area_11.2022



December 1, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

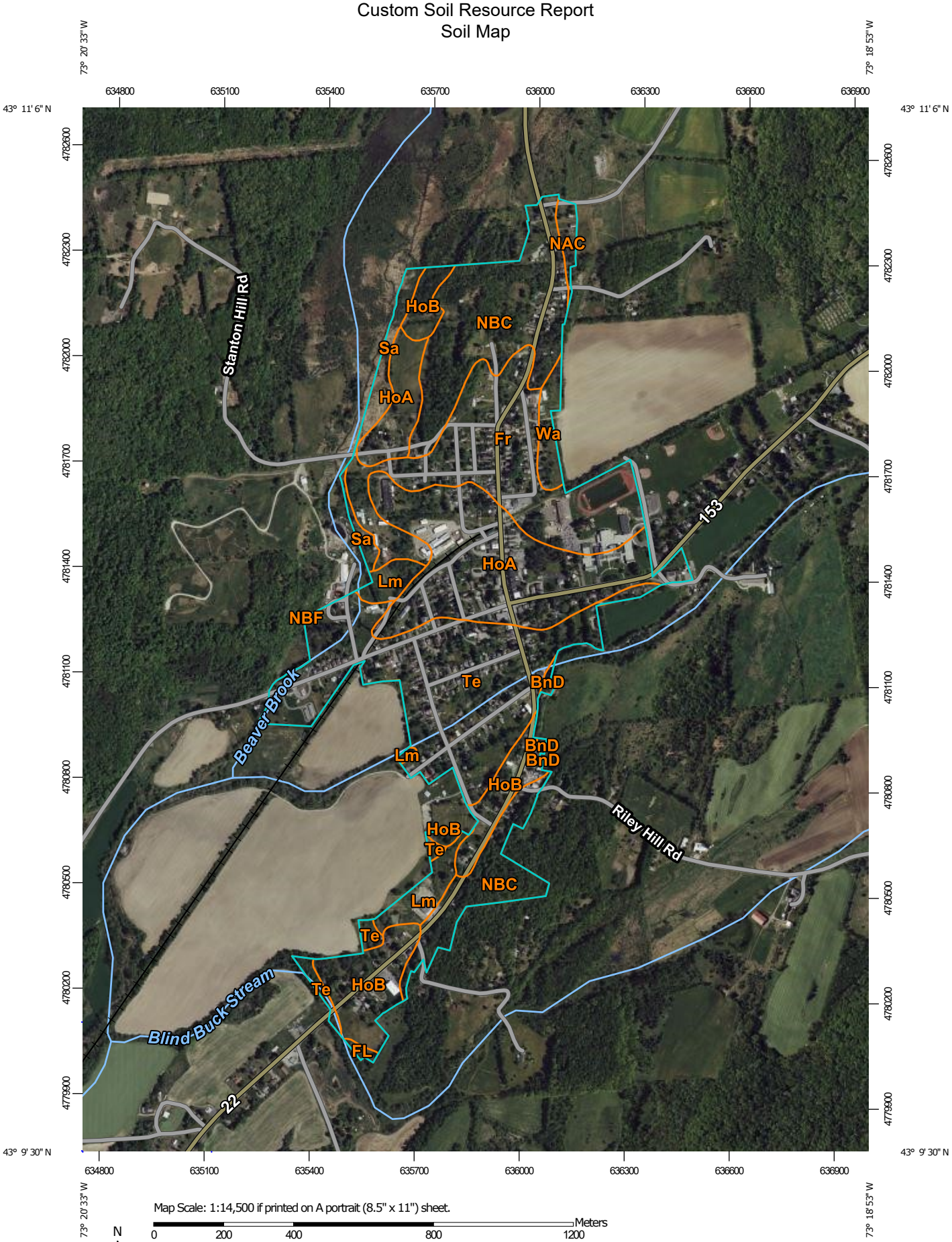
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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 1:20,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Washington County, New York
Survey Area Data: Version 22, Sep 10, 2022

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

Date(s) aerial images were photographed: Apr 1, 2020—Oct 1, 2020

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BnD	Bernardston gravelly silt loam, 15 to 25 percent slopes	0.8	0.3%
FL	Fluvaquents	0.6	0.2%
Fr	Fredon silt loam	49.5	17.6%
HoA	Hoosic gravelly sandy loam, 0 to 3 percent slopes	60.6	21.5%
HoB	Hoosic gravelly sandy loam, 3 to 8 percent slopes	27.3	9.7%
Lm	Limerick silt loam	9.6	3.4%
NAC	Nassau shaly silt loam, undulating through hilly	2.4	0.9%
NBC	Nassau-Rock outcrop association, undulating through hilly	52.4	18.6%
NBF	Nassau-Rock outcrop association, steep and very steep	0.0	0.0%
Sa	Saco silt loam	6.8	2.4%
Te	Teel silt loam	67.3	23.9%
Wa	Wallington silt loam, sandy substratum	4.6	1.6%
Totals for Area of Interest		**281.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called

noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can

be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Washington County, New York

BnD—Bernardston gravelly silt loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 9xyr
Elevation: 0 to 1,000 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: Not prime farmland

Map Unit Composition

Bernardston and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bernardston

Setting

Landform: Drumlinoid ridges, till plains, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy, acid, dense till derived mainly from phyllite, shale, slate, and schist

Typical profile

H1 - 0 to 9 inches: gravelly silt loam
H2 - 9 to 28 inches: gravelly silt loam
H3 - 28 to 42 inches: gravelly loam
H4 - 42 to 72 inches: gravelly loam

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 18 to 30 inches to fragipan
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 17 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

FL—Fluvaquents

Map Unit Setting

National map unit symbol: 9xz4
Elevation: 300 to 1,800 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: Not prime farmland

Map Unit Composition

Fluvaquents and similar soils: 75 percent
Minor components: 14 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fluvaquents

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium with highly variable texture

Typical profile

H1 - 0 to 11 inches: mucky silt loam
H2 - 11 to 72 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 5.95 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: NoneFrequent
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D
Ecological site: F144AY014CT - Wet Sandy Low Floodplain
Hydric soil rating: Yes

Minor Components

Limerick

Percent of map unit: 6 percent

Landform: Flood plains
Hydric soil rating: Yes

Saco

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

Palms

Percent of map unit: 3 percent
Landform: Swamps, marshes
Hydric soil rating: Yes

Fr—Fredon silt loam

Map Unit Setting

National map unit symbol: 9xz6
Elevation: 250 to 1,200 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Fredon, poorly drained, and similar soils: 50 percent
Fredon, somewhat poorly drained, and similar soils: 30 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fredon, Poorly Drained

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy over sandy and gravelly glaciofluvial deposits

Typical profile

H1 - 0 to 7 inches: silt loam
H2 - 7 to 22 inches: gravelly fine sandy loam
H3 - 22 to 60 inches: stratified very gravelly sand to gravelly loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches

Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Ecological site: F144AY029NY - Semi-Rich Wet Outwash
Hydric soil rating: Yes

Description of Fredon, Somewhat Poorly Drained

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy over sandy and gravelly glaciofluvial deposits

Typical profile

H1 - 0 to 7 inches: silt loam
H2 - 7 to 22 inches: gravelly fine sandy loam
H3 - 22 to 60 inches: stratified very gravelly sand to gravelly loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Ecological site: F144AY029NY - Semi-Rich Wet Outwash
Hydric soil rating: No

Minor Components

Halsey

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

HoA—Hoosic gravelly sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9xzn
Elevation: 100 to 1,100 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hoosic and similar soils: 75 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hoosic

Setting

Landform: Terraces, outwash plains, deltas
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glaciofluvial deposits

Typical profile

H1 - 0 to 8 inches: gravelly sandy loam
H2 - 8 to 35 inches: very gravelly loamy sand
H3 - 35 to 80 inches: very gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.98 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Halsey
Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Fredon
Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

HoB—Hoosic gravelly sandy loam, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 9xzp
Elevation: 100 to 1,100 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Hoosic and similar soils: 75 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hoosic

Setting
Landform: Terraces, outwash plains, deltas
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glaciofluvial deposits

Typical profile
H1 - 0 to 8 inches: gravelly sandy loam
H2 - 8 to 35 inches: very gravelly loamy sand
H3 - 35 to 80 inches: very gravelly sand

Properties and qualities
Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.98 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Fredon

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Lm—Limerick silt loam

Map Unit Setting

National map unit symbol: 9xzx
Elevation: 50 to 500 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: Not prime farmland

Map Unit Composition

Limerick and similar soils: 80 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Limerick

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium that is dominantly silt and very fine sand

Typical profile

H1 - 0 to 3 inches: silt loam
H2 - 3 to 26 inches: silt loam
H3 - 26 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very high (about 13.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F144AY015NY - Wet Silty Low Floodplain
Hydric soil rating: Yes

Minor Components

Saco

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

NAC—Nassau shaly silt loam, undulating through hilly

Map Unit Setting

National map unit symbol: 9xzz
Elevation: 600 to 1,800 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: Not prime farmland

Map Unit Composition

Nassau and similar soils: 75 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nassau

Setting

Landform: Ridges, till plains, benches
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Channery loamy till derived mainly from local slate or shale

Typical profile

H1 - 0 to 9 inches: channery silt loam
H2 - 9 to 19 inches: very channery loam
H3 - 19 to 23 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Minor Components

Palms

Percent of map unit: 2 percent
Landform: Swamps, marshes
Hydric soil rating: Yes

NBC—Nassau-Rock outcrop association, undulating through hilly

Map Unit Setting

National map unit symbol: 9y00
Elevation: 600 to 1,800 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: Not prime farmland

Map Unit Composition

Nassau and similar soils: 40 percent
Rock outcrop: 20 percent
Minor components: 12 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nassau

Setting

Landform: Till plains, ridges, benches
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Channery loamy till derived mainly from local slate or shale

Typical profile

H1 - 0 to 9 inches: channery silt loam
H2 - 9 to 19 inches: very channery loam
H3 - 19 to 23 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Minor Components

Sun

Percent of map unit: 8 percent
Landform: Depressions
Hydric soil rating: Yes

Palms

Percent of map unit: 4 percent
Landform: Swamps, marshes
Hydric soil rating: Yes

NBF—Nassau-Rock outcrop association, steep and very steep

Map Unit Setting

National map unit symbol: 9y01
Elevation: 600 to 1,800 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: Not prime farmland

Map Unit Composition

Nassau and similar soils: 50 percent
Rock outcrop: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nassau

Setting

Landform: Till plains, ridges, benches
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Channery loamy till derived mainly from local slate or shale

Typical profile

H1 - 0 to 9 inches: channery silt loam
H2 - 9 to 19 inches: very channery loam
H3 - 19 to 23 inches: unweathered bedrock

Properties and qualities

Slope: 25 to 50 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Properties and qualities

Slope: 25 to 50 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Sa—Saco silt loam

Map Unit Setting

National map unit symbol: 9y0r
Elevation: 80 to 950 feet
Mean annual precipitation: 35 to 42 inches

Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: Not prime farmland

Map Unit Composition

Saco and similar soils: 80 percent
Minor components: 7 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Saco

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Silty alluvium derived mainly from crystalline rock, shale, and sandstone

Typical profile

H1 - 0 to 12 inches: silt loam
H2 - 12 to 30 inches: silt loam
H3 - 30 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very high (about 13.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B/D
Ecological site: F142XB004VT - Wet Outwash Depression
Hydric soil rating: Yes

Minor Components

Limerick

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

Fluvaquents

Percent of map unit: 2 percent
Landform: Flood plains
Hydric soil rating: Yes

Te—Teel silt loam

Map Unit Setting

National map unit symbol: 9y0w
Elevation: 600 to 1,800 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Teel and similar soils: 80 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Teel

Setting

Landform: Flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Silty alluvium

Typical profile

H1 - 0 to 11 inches: silt loam
H2 - 11 to 25 inches: silt loam
H3 - 25 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Ecological site: F101XY002NY - Low Floodplain
Hydric soil rating: No

Minor Components

Limerick

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

Saco

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

Wa—Wallington silt loam, sandy substratum

Map Unit Setting

National map unit symbol: 9y10
Elevation: 80 to 850 feet
Mean annual precipitation: 35 to 42 inches
Mean annual air temperature: 45 to 48 degrees F
Frost-free period: 110 to 175 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Wallington, sandy substratum, and similar soils: 80 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wallington, Sandy Substratum

Setting

Landform: Lake plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Glaciolacustrine or eolian deposits high in silt and very fine sand

Typical profile

H1 - 0 to 9 inches: silt loam
H2 - 9 to 17 inches: silt loam
H3 - 17 to 48 inches: silt loam
H4 - 48 to 80 inches: stratified loamy fine sand to very gravelly coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 15 to 24 inches to fragipan
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 18 inches

Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: D
Ecological site: F144AY018NY - Moist Lake Plain
Hydric soil rating: No

Minor Components

Madalin

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

US FISH AND WILDLIFE SERVICE IPaC

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

New York and Vermont

Local offices

New England Ecological Services Field Office

(603) 223-2541
(603) 223-0104

70 Commercial Street, Suite 300
Concord, NH 03301-5094

New York Ecological Services Field Office

(607) 753-9334
(607) 753-9699
fw5es_nyfo@fws.gov

3817 Luker Road
Cortland, NY 13045-9385

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

---

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Indiana Bat Myotis sodalis Wherever found There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat Myotis septentrionalis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Threatened

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Dec 1 to Aug 31

Belted Kingfisher *Megaceryle alcyon* — Breeds Mar 15 to Jul 25

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Black-billed Cuckoo *Coccyzus erythropthalmus* — Breeds May 15 to Oct 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9399

Blue-winged Warbler *Vermivora pinus* — Breeds May 1 to Jun 30

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Bobolink *Dolichonyx oryzivorus* — Breeds May 20 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Canada Warbler *Cardellina canadensis* — Breeds May 20 to Aug 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Cape May Warbler *Setophaga tigrina* — Breeds Jun 1 to Jul 31

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Chimney Swift *Chaetura pelagica* — Breeds Mar 15 to Aug 25

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Eastern Meadowlark *Sturnella magna* — Breeds Apr 25 to Aug 31

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Evening Grosbeak *Coccothraustes vespertinus* — Breeds May 15 to Aug 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Golden Eagle Aquila chrysaetos This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31
Golden-winged Warbler Vermivora chrysoptera This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8745	Breeds May 1 to Jul 20
Lesser Yellowlegs Tringa flavipes This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Olive-sided Flycatcher Contopus cooperi This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3914	Breeds May 20 to Aug 31
Prairie Warbler Dendroica discolor This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Red-headed Woodpecker Melanerpes erythrocephalus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Wood Thrush Hylocichla mustelina This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

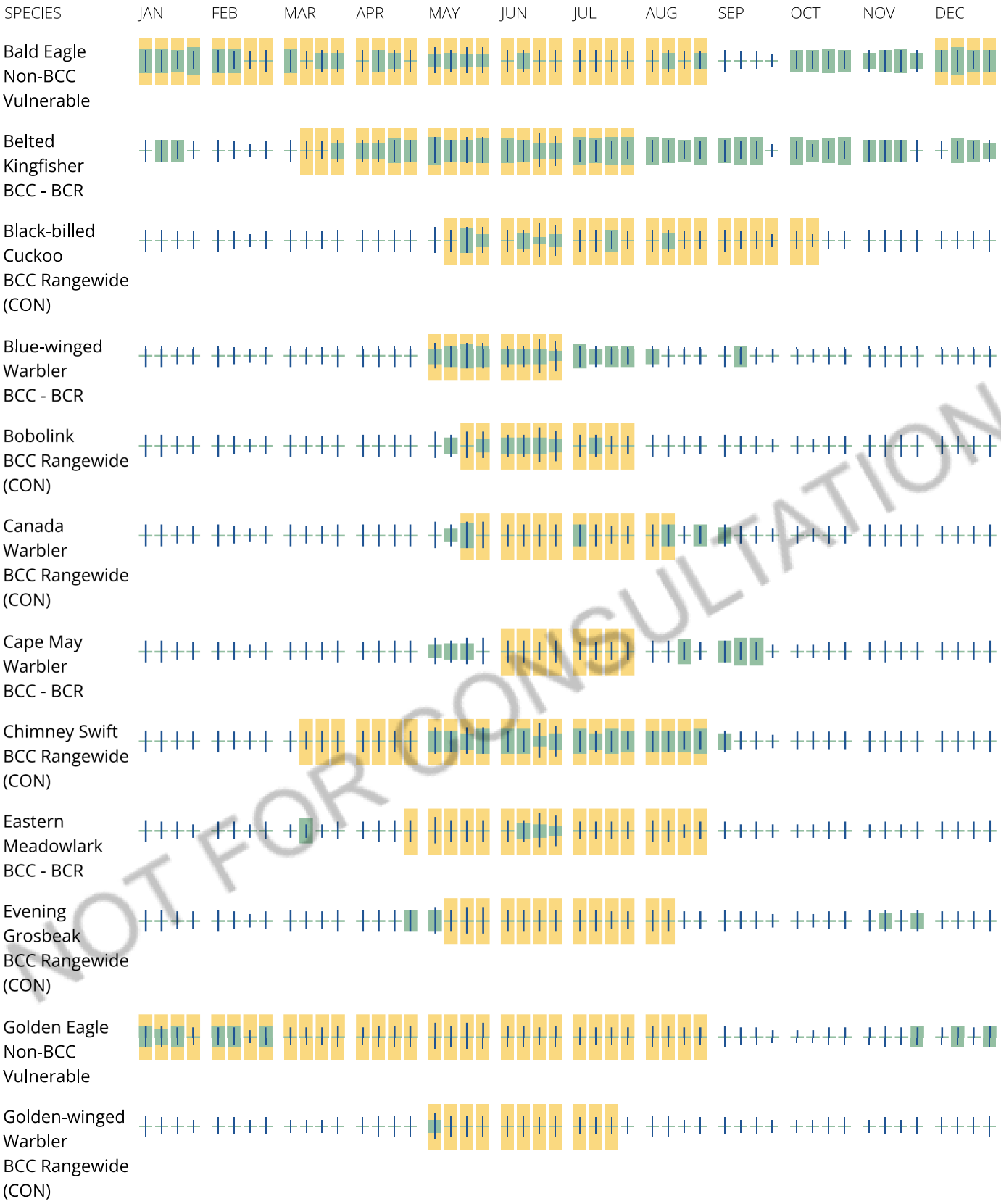
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

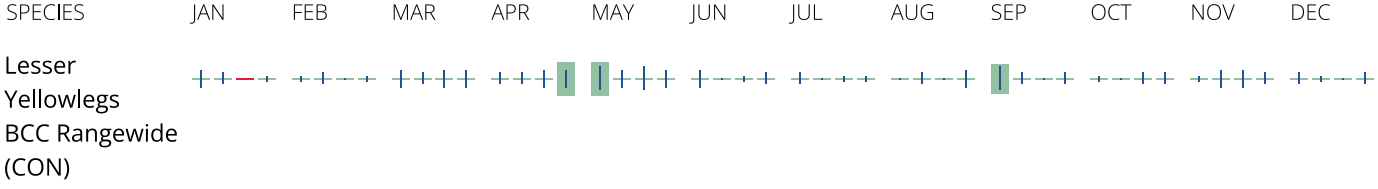
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

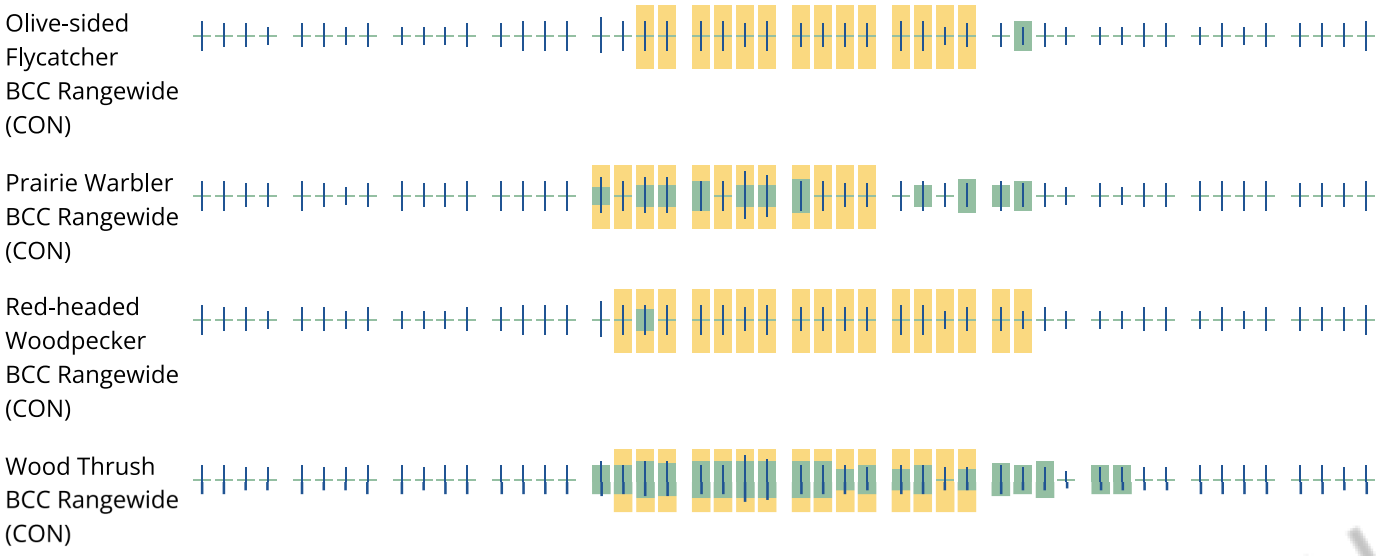
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.







Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Coastal Barrier Resources System

Projects within the John H. Chafee Coastal Barrier Resources System (CBRS) may be subject to the restrictions on Federal expenditures and financial assistance and the consultation requirements of the Coastal Barrier Resources Act (CBRA) (16 U.S.C. 3501 et seq.). For more information, please contact the local Ecological Services Field Office or visit the CBRA Consultations website. The CBRA website provides tools such as a flow chart to help determine whether consultation is required and a template to facilitate the consultation process.

There are no known coastal barriers at this location.

Data limitations

The CBRS boundaries used in IPaC are representations of the controlling boundaries, which are depicted on the official CBRS maps. The boundaries depicted in this layer are not to be considered authoritative for in/out determinations close to a CBRS boundary (i.e., within the "CBRS Buffer Zone" that appears as a hatched area on either side of the boundary). For projects that are very close to a CBRS boundary but do not clearly intersect a unit, you may contact the Service for an official determination by following the instructions here: https://www.fws.gov/service/coastal-barrier-resources-system-property-documentation

Data exclusions

CBRS units extend seaward out to either the 20- or 30-foot bathymetric contour (depending on the location of the unit). The true seaward extent of the units is not shown in the CBRS data, therefore projects in the offshore areas of units (e.g., dredging, breakwaters, offshore wind energy or oil and gas projects) may be subject to CBRA even if they do not intersect the CBRS data. For additional information, please contact CBRA@fws.gov.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Wetland information is not available at this time

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

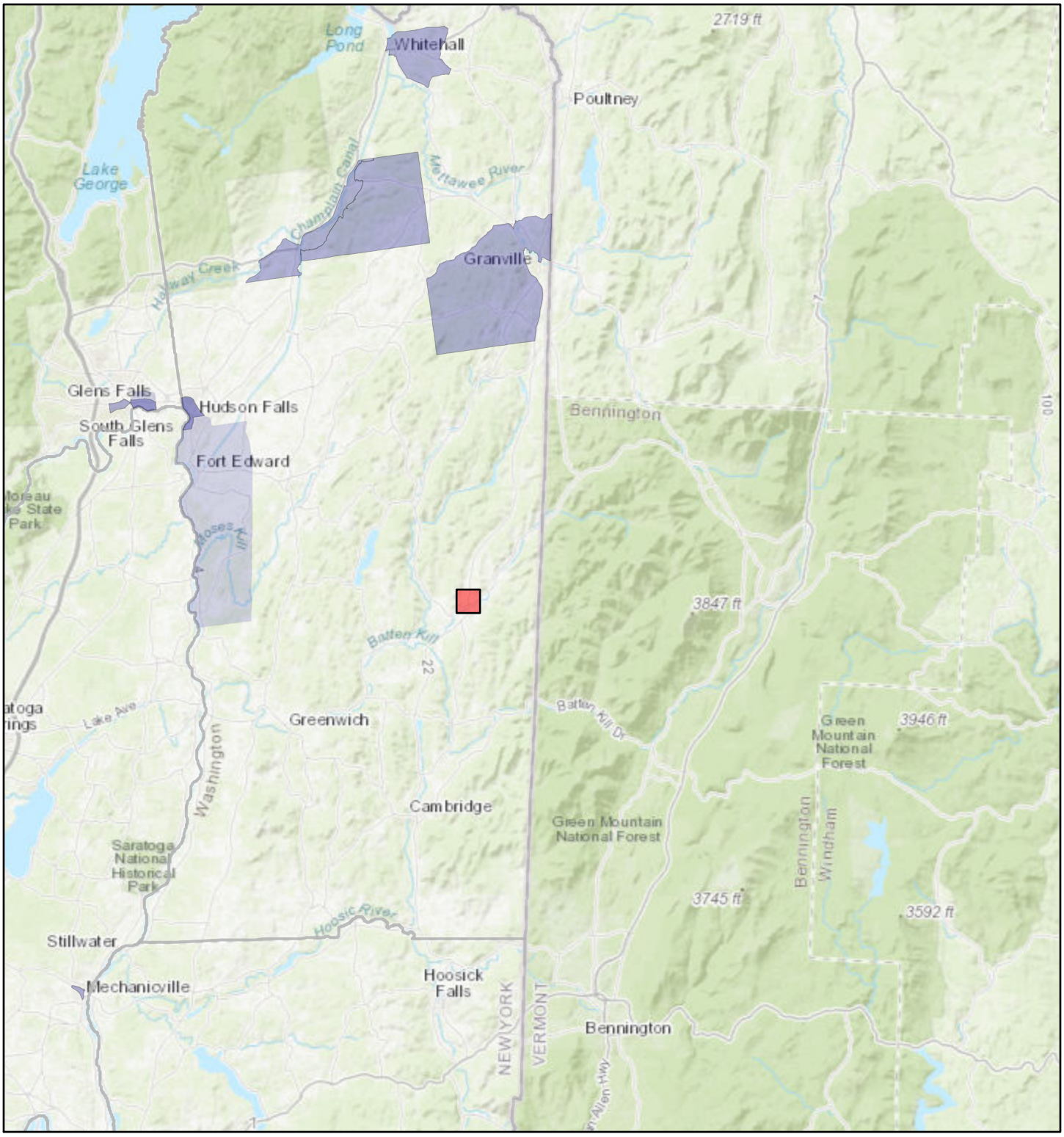
Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

ENVIRONMENTAL JUSTICE MAPPING

Town of Salem



November 30, 2022

1:577,791

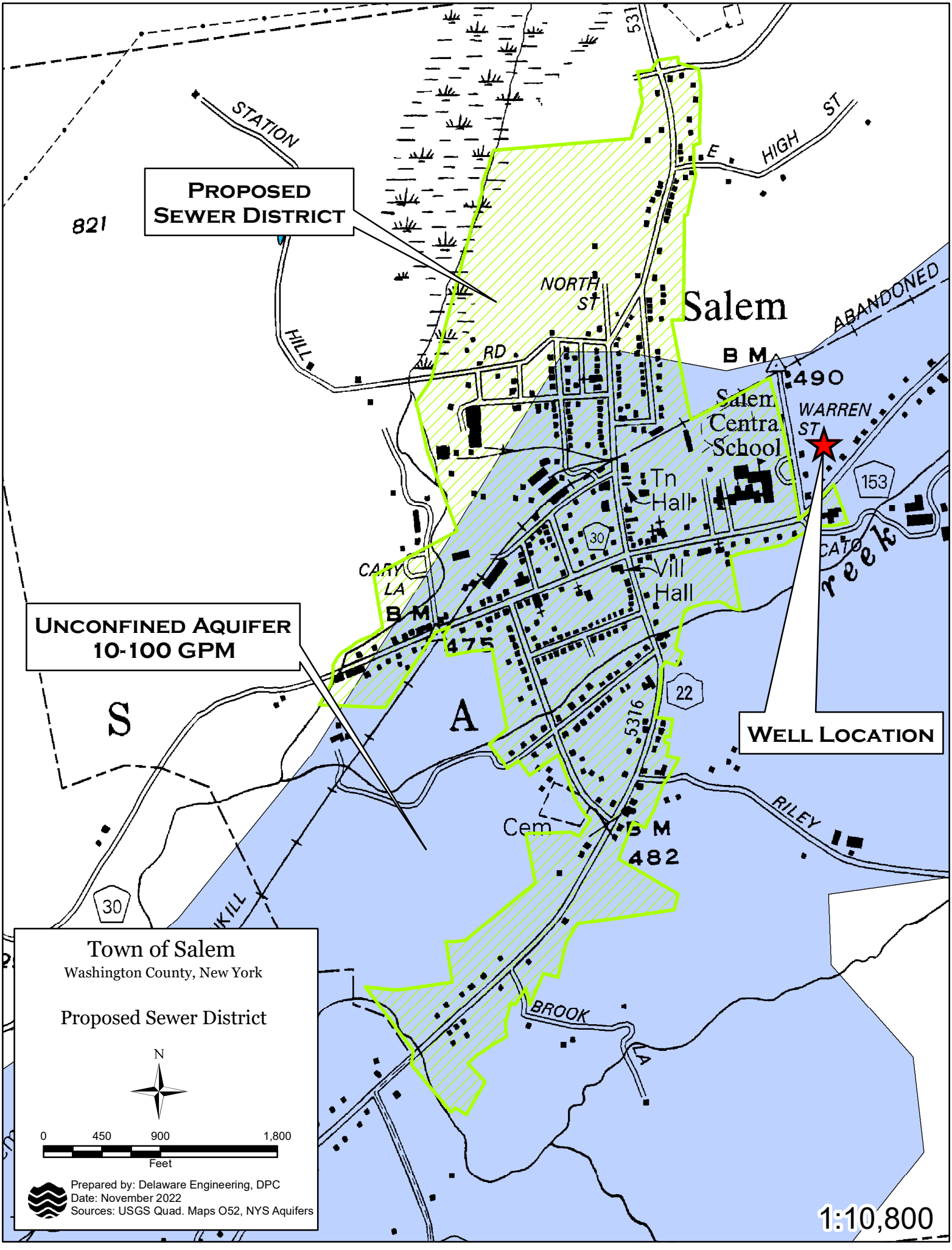
0 3.5 7 14 mi

0 5 10 20 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

NYS Department of Environmental Conservation
Not a legal document

AQUIFER MAPPING


PROPOSED SEWER DISTRICT
UNCONFINED AQUIFER 10-100 GPM
WELL LOCATION
Salem
STATION
HILL
RD
NORTH ST
E HIGH ST
ABANDONED
B M 490
Salem Central School
WARREN ST
153
Tn Hall
Vill Hall
30
CARY LA
B M 475
22
5316
Cem
B M 482
RILEY
BROOK
821
531
S
A
Town of Salem
Washington County, New York
Proposed Sewer District
N
0 450 900 1,800
Feet
Prepared by: Delaware Engineering, DPC
Date: November 2022
Sources: USGS Quad. Maps O52, NYS Aquifers
1:10,800

PWS REPORTS

Black Creek and minor tribs (1103-0017) NoKnownImpct

Waterbody Location Information

Revised: 07/06/2005

Water Index No:	H-301-20			**Drain Basin:**	Upper Hudson River
Hydro Unit Code:	02020003/080	**Str Class:**	C		Upper Hudson-Hoosic
Waterbody Type:	River			**Reg/County:**	5/Washington Co. (58)
Waterbody Size:	98.5 Miles			**Quad Map:**	COSSAYUNA (I-27-1)
Seg Description:	entire stream and selected/smaller tribs				

Water Quality Problem/Issue Information

(CAPS indicate MAJOR Use Impacts/Pollutants/Sources)

Use(s) Impacted	Severity	Problem Documentation
NO USE IMPAIRMNT		

Type of Pollutant(s)

Known: - - -
Suspected: - - -
Possible: - - -

Source(s) of Pollutant(s)

Known: - - -
Suspected: - - -
Possible: - - -

Resolution/Management Information

Issue Resolvability: 8 (No Known Use Impairment)
Verification Status: (Not Applicable for Selected RESOLVABILITY)
Lead Agency/Office: n/a **Resolution Potential:**
TMDL/303d Status: n/a ())

Further Details

A biological (macroinvertebrate) assessment of Black Creek in Fitch Point (at Cemetery Road) was conducted in 2001. Sampling results indicated slightly impacted water quality conditions. Nonpoint source nutrient enrichment was identified as the primary stressor. This site was assessed as non-impacted in a 1999 sampling. Despite this decline, aquatic life is considered to be fully supported in the stream, and there are no other apparent water quality impacts to designated uses. (DEC/DOW, BWAR/SBU, June 2005)

This segment includes the entire stream and selected/smaller tribs. The waters of the stream are Class C. Tribs to this reach/segment, including West Beaver Brook (-3) and West Branch Black Creek, are Class C,C(T),C(TS). White Creek (-1) and larger lakes in the watershed are listed separately.

White Creek and tribs (1103-0004) NoKnownImpct

Waterbody Location Information

Revised: 07/06/2005

Water Index No:	H-301-20- 1			**Drain Basin:**	Upper Hudson River
Hydro Unit Code:	02020003/070	**Str Class:**	C*		Upper Hudson-Hoosic
Waterbody Type:	River			**Reg/County:**	5/Washington Co. (58)
Waterbody Size:	45.8 Miles			**Quad Map:**	SALEM (I-27-2)
Seg Description:	entire stream and tribs				

Water Quality Problem/Issue Information

(CAPS indicate MAJOR Use Impacts/Pollutants/Sources)

Use(s) Impacted	Severity	Problem Documentation
NO USE IMPAIRMNT		

Type of Pollutant(s)

Known: - - -
Suspected: - - -
Possible: - - -

Source(s) of Pollutant(s)

Known: - - -
Suspected: - - -
Possible: - - -

Resolution/Management Information

Issue Resolvability: 8 (No Known Use Impairment)
Verification Status: (Not Applicable for Selected RESOLVABILITY)
Lead Agency/Office: n/a **Resolution Potential:**
TMDL/303d Status: n/a ())

Further Details

NYSDEC Rotating Integrated Basin Studies (RIBS) monitoring of White Creek in Salem/Greenwich (Hanks Road) was conducted in 2001 and 2002. Biological screening in 2001 found water quality to be non-impacted, with fauna that contained many species of clean-water mayflies, stoneflies, and caddisflies. Community assessment conducted as part of Intensive Network sampling in 2002 revealed water quality to be slightly impacted, with nutrient enrichment indicated as a primary stressor. The surrounding land is highly agricultural. Water column sampling revealed no parameters of concern. Macroinvertebrate tissue samples analyzed for pesticides, PCBs, and PAHs showed no contaminants to be above levels of concern. Based on sediment quality guidelines developed for freshwater ecosystems, overall sediment quality is not likely to cause chronic toxicity to sediment-dwelling organisms. Chronic toxicity testing using water from this location showed no significant mortality or reproductive effects on the test organism. Based on the consensus of these established assessment methods, overall aquatic life support is considered to be fully supported in the river despite minor effects on the fauna and there are no other apparent water quality impacts. (DEC/DOW, BWAR/RIBS, January 2005)

A previous biological assessment of White Creek in Salem (at Hanks Road) was conducted in 1999. Sampling results indicated non-impacted water quality conditions. The fauna contained many species of clean-water mayflies, stoneflies, and caddisflies. An intensive study of White Creek by Hudson Basin River Watch in 2001 found elevated

levels of nitrogen and fecal coliforms at most sites. These results are likely the result of agricultural activity in the watershed and are not known to be causing violations of water quality standards and/or impairment to uses in the stream. (DEC/DOW, BWAR/SBU, June 2005)

This segment includes the entire stream and all tribs. The waters of the stream are Class C(T). Tribs to this reach/segment, including Blind Buck Stream (-1), Beaver Brook (-2) and Buttermilk Falls Brook (-3), are primarily Class C,C(T),C(TS); portions of Blind Buck Stream (-1) are Class B,B(T).

APPENDIX D: INCOME SURVEY

Summary of Income Survey Results and Methodology

Town of Salem Proposed Wastewater System
September, 2021

SURVEY RESULTS FOR SALEM WATER SYSTEM

Number of Occupied Households in Service Area	336
Number of Completed Surveys Returned	207
Number of Vacant Households	34
Number of Seasonal Households (subset of Occupied Households)	4
Survey Response Rate	61.61%
Median Household Income (MHI) - USDA RD and SRF*	$40,000
Percent Low-to-Moderate Income (LMI) Individuals (CDBG)*	62.12%

*Seasonal and vacant residences are processed slightly differently for the CDBG program than in the RCAP database. As such, the % LMI above may be slightly different than that presented in the RCAP Income Survey Results Report.

FUNDING PROGRAM ELIGIBILITY SUMMARY

Community Development Block Grant (CDBG) Program

The Community Development Block Grant (CDBG) program is administered by the NYS Office of Community Renewal. In order to compete for CDBG funds, the proposed service area must meet the income eligibility criterion of 51.0% or greater low-to-moderate income (LMI) individuals residing in the service area. The proposed Salem sewer district has met this criterion with 61.61% LMI individuals. The MHI as calculated according to CDBG program guidance is $40,000.

USDA Rural Development (RD)

The income survey documented a Median Household Income (MHI) of $40,000. The survey data indicate that the proposed service area meets the income eligibility criterion for RD's Poverty Category Reduced Interest Rate Loan and Grant Program (MHI less than $45,506). The Poverty Category confers eligibility for the lowest interest rate offered by RD, which is market-based and varies quarterly, but is statutorily required not to exceed 4.5%. The Poverty Category interest rate in the last quarter was 1.375%. Under the Poverty Category, the Town may also be eligible for supplemental RD grant assistance. The Town would need to document health and sanitary violations to be eligible for Poverty Category grant assistance. (Without this documentation, the project is still eligible for Intermediate Category grant assistance).

Clean Water State Revolving Loan Fund (CWSRF)

The New York State Environmental Facilities Corporation (EFC) uses the Median Household Income (MHI) information as one of the criteria for determining funding eligibility. The survey findings show that the proposed Salem sewer district meets the income eligibility criterion for the CWSRF Hardship program (for 0% loan eligibility, the MHI must be less than $50,212 or meet other requirements). However other criteria also apply, e.g. the Project Priority Score on the Intended Use Plan must be above EFC's CWSRF Funding Line.

SURVEY METHODOLOGY

Survey Rationale

The Town of Salem is proposing to create a sewer district to serve the downtown hamlet and business district. The Town wished to document income eligibility for funding under RD's Water and Environment Loan/Grant Program (WEP), EFC's Clean Water State Revolving Fund (CWSRF) program, and the CDBG program.

CDBG Program

In almost all instances, the CDBG Program requires that an income survey of a special improvement district be conducted in order to document income eligibility to compete for CDBG grant funds.

USDA RD and CWSRF

The Town believed that the American Communities Survey Census (ACS) 5-year Estimates for 2010 (used by RD) and 2017 (used by SRF) may not accurately represent the MHI of the proposed service area because the proposed service area is a smaller subset of the larger Town, and also contains most of the apartment buildings and apartments in the Town.

Survey Instrument

RCAP Solutions uses a survey instrument which has been reviewed and deemed acceptable by the three major infrastructure funding agencies in New York State: USDA Rural Development; the New York State Environmental Facilities Corporation (EFC), that administers the NYS Revolving Loan Funds (SRF's); and the NYS Office for Community Renewal (OCR), that administers the Community Development Block Grant (CDBG) program.

Survey Procedure

The Town of Salem compiled a Master List of Households for the proposed wastewater system users. The Master List included owner and/or tenant name, mailing address, and service address. The Master List identified known occupied, vacant and seasonal households.

The Town mailed surveys to all homeowners and renters known to reside at the service address, including a self-addressed stamped envelope in which to return completed surveys to RCAP Solutions. The Town community volunteers, with some assistance from RCAP Solutions, conducted door-to-door

canvassing of non-respondents to achieve the CDBG-required-return-rate of at least 60%. Door-to-door canvassing was also used to field – verify and refine the initial Master List with respect to identifying vacant units and verifying property status. RCAP Solutions provided example survey materials, processed the survey returns, provided periodic updates, and generated the final reports and supporting documentation.

Required Return Rate
For a survey universe of 336 occupied residences, the CDBG program requires a minimum return rate of 60%. USDA RD and the CWSRF program require a minimum return rate of 50%. A return of 207 surveys or 61.61% was achieved through mailings and door-to-door canvassing of all residences served by the proposed sewer district in order to meet the most restrictive return rate, that is, 60% for the CDBG program.

Recordkeeping
In the event that the income survey results and supporting documentation are used in support of a successful CDBG funding application, all records generated for the income survey are the property of the Town of Salem and will be transmitted to them for storage according to municipal rules for storage of confidential files.

Survey Data Analysis
See the attached supporting documentation for the CDBG program, including:

1. The RCAP Solutions database summary report of the survey findings, entitled "Income Survey Report ID Page, Salem Proposed Wastewater System" and "Income Survey Results Report, Salem Proposed Wastewater System",
2. The final master list of residential households and returns, entitled "Master List of Survey Returns, No Income No Names, Salem Proposed Wastewater System",
3. A CDBG program – specific spreadsheet entitled: "CDBG Calculations, Salem Proposed Wastewater System",
4. A list of incomes in income order, required by USDA and the SRF, entitled "Survey Incomes in Income Order, Salem Proposed Wastewater System",
5. Five randomly selected example completed surveys entitled "Example Completed Surveys, Salem Proposed Wastewater System"; (please note that the five example income question pages (p1) are from completely different survey forms than the four example signature pages (p2)), and
6. The survey instrument used, entitled: "Income Survey Form, Salem Proposed Wastewater System".

Please note that other supporting documentation is required for funding applications to USDA and the SRF program. Please reach out to RCAP Solutions to discuss.

INCOME SURVEY RESULTS: Town of Salem

50% EFC; 50% RD; 60% CDBG

MOST RECENT UPDATE:	9/24/2021
TOTAL NUMBER OF HOUSEHOLDS:	336
TOTAL NUMBER OF RESPONSES:	207
RESPONSE RATE:	**61.61%**
NUMBER LOW/MOD INCOME HOUSEHOLDS:	126
NUMBER HOUSEHOLDS ABOVE LOW/MOD:	81
PERCENT LOW/MOD HOUSEHOLDS:	60.87%
PERCENT NON LOW/MOD HOUSEHOLDS:	39.13%
NUMBER OF INDIVIDUALS:	478
NUMBER OF LOW/MOD INDIVIDUALS:	300
NUMBER OF NON LOW/MOD INDIVIDUALS:	178
PERCENT LOW/MOD INDIVIDUALS:	**62.76%**
AVERAGE LOW/MOD HOUSEHOLD SIZE:	2.31
AVERAGE NON LOW/MOD HOUSEHOLD SIZE:	2.20
ESTIMATED TOTAL LOW/MOD HOUSEHOLDS:	205
ESTIMATED TOTAL ABOVE LOW/MOD HOUSEHOLDS:	131
ESTIMATED TOTAL LOW/MOD INDIVIDUALS:	487
ESTIMATED TOTAL ABOVE LOW/MOD INDIVIDUALS:	289
NUMBER LOW INCOME HOUSEHOLDS:	77
PERCENT LOW INCOME HOUSEHOLDS:	37.20%
NUMBER LOW INCOME INDIVIDUALS:	182
PERCENT LOW INCOME INDIVIDUALS:	38.08%
ESTIMATED TOTAL INDIVIDUALS:	776
MEDIAN HOUSEHOLD INCOME:	**$40,000**

RCAP Solutions
Resources for Communities And People

INCOME SURVEY RESULTS: Town of Salem

50% EFC; 50% RD; 60% CDBG

ADDITIONAL INCOME SURVEY DATA REQUIRED FOR SMALL CITIES REPORTING:

VERY LOW INCOME POPULATION:

NUMBER OF HOUSEHOLDS SURVEYED @ 0- 30% OF HAMFI:	34
PERCENT OF HOUSEHOLDS @ 0-30% OF HAMFI:	16.43%
ESTIMATED TOTAL HOUSEHOLDS @ 0-30% OF HAMFI:	**55**
NUMBER OF INDIVIDUALS SURVEYED @ 0-30% OF HAMFI:	83
PERCENT OF INDIVIDUALS @ 0-30% OF HAMFI:	17.36%
ESTIMATED TOTAL INDIVIDUALS @ 0-30% OF HAMFI:	**135**

LOW INCOME POPULATION:

NUMBER OF HOUSEHOLDS SURVEYED @ 31-50% OF HAMFI:	43
PERCENT OF HOUSEHOLDS @ 31-50% OF HAMFI:	20.77%
ESTIMATED TOTAL HOUSEHOLDS @ 31-50% OF HAMFI:	**70**
NUMBER OF INDIVIDUALS SURVEYED @ 31-50% OF HAMFI:	99
PERCENT OF INDIVIDUALS @ 31-50% OF HAMFI:	20.71%
ESTIMATED TOTAL INDIVIDUALS @ 31-50% OF HAMFI:	**161**

MODERATE INCOME POPULATION:

NUMBER OF HOUSEHOLDS SURVEYED @ 51-80% OF HAMFI:	49
PERCENT OF HOUSEHOLDS @ 51-80% OF HAMFI:	23.67%
ESTIMATED TOTAL HOUSEHOLDS @ 51-80% OF HAMFI:	**80**
NUMBER OF INDIVIDUALS SURVEYED @ 51-80% OF HAMFI:	118
PERCENT OF INDIVIDUALS @ 51-80% OF HAMFI:	24.69%
ESTIMATED TOTAL INDIVIDUALS @ 51-80% OF HAMFI:	**192**

ABOVE LOW/MOD INCOME POPULATION:

NUMBER OF HOUSEHOLDS SURVEYED @ =>81% OF HAMFI:	81
PERCENT OF HOUSEHOLDS @ =>81% OF HAMFI:	39.13%
ESTIMATED TOTAL HOUSEHOLDS @ =>81% OF HAMFI:	**131**
NUMBER OF INDIVIDUALS SURVEYED @ =>81% OF HAMFI:	178
PERCENT OF INDIVIDUALS @ =>81% OF HAMFI:	37.24%
ESTIMATED TOTAL INDIVIDUALS @ =>81% OF HAMFI:	**289**

INCOME SURVEY RESULTS: Town of Salem

(Proposed WW System)

ADDITIONAL INCOME SURVEY DATA REQUIRED FOR SMALL CITIES REPORTING:

	# of Persons	# who are Hispanic
WHITE	333	19
BLACK/AFRICAN AMERICAN & WHITE	4	0
ASIAN & WHITE	1	0
AMERICAN INDIAN/ALASKAN NATIVE	2	0
NATVE HAWAIIAN/OTHER PACIFIC ISLANDER	0	0
AMERICAN INDIAN/ALASKAN NATIVE & WHITE	0	0
ASIAN & WHITE	0	0
BLACK/AFRICAN AMERICAN & WHITE	0	0
AMER. INDIAN/ALASKAN NATIVE & BLACK/AFRICAN AMER.	4	0
OTHER MULTI-RACIAL	0	0
TOTALS*	344	19 *

# of disabled individuals among responding households:	38
# of female heads of household among responding households:	70

* Racial/ethnic totals will not necessarily equal the total the total number of individuals reported on Page 1 because some households may decline to respond to this survey question.

APPENDIX E: LETTERS OF SUPPORT

Northern Border Regional Commission
2023 Catalyst Program
Letters of Support

Project: Town of Salem Wastewater Improvements

Applicant: Town of Salem

Letters of Support Attached:

1. Michael Yevoli, Capital Region Regional Economic Development Council (REDC)
2. Beth Gilles, Lake Champlain – Lake George Regional Planning Board (LCLGRPB)
3. Seán Philpott-Jones, Hudson Headwaters Healthcare Network (HHHN)
4. Senator Kirsten Gillibrand, U.S. Senate (submitting directly to NBRC)
5. Congresswoman Elise Stefanik, U.S. House of Representatives
6. Senator Jacob Ashby, NYS Senate
7. Assemblyman Matthew Simpson, NYS Assembly
8. Laura Oswald, Washington County Planning & Economic Development
9. Donald McPhee, Attorney at Law
10. Thomas Clary, Aspire Accounting
11. David Linendoll, Salem Hardware and Supply Company
12. Hebert Perkins, Historic Salem Courthouse
13. Peter Thomas, Salem Washington Academy School Board
14. John Bardwell, Economic Development Committee
15. Salem Area Chamber of Commerce

NEW YORK STATE OF OPPORTUNITY. | Empire State Development

May 24, 2023

Evera Sue Clary, Town Supervisor
214 Main Street
Salem, NY 12865

Dear Northern Border Commissioners:

On behalf of the Capital Region Regional Economic Development Council (CRREDC), please accept this letter of support for funding from the Northern Border Regional Commission (NBRC) Infrastructure Investment program to install a new municipal wastewater collection and treatment system in the Town of Salem's historic downtown. The proposed project has been identified as a necessity to foster business attraction and expansion opportunities. Additionally, construction of the municipal wastewater system will support construction of a new $5.3MM medical facility and support approximately 20 new jobs.

Please accept our letter of support for the consideration of a $3,000,000 infrastructure grant for the Town of Salem.

Sincerely,

Michael Yevoli
Executive Director, CRREDC

LAKE CHAMPLAIN–LAKE GEORGE
REGIONAL PLANNING

BETH GILLES
DIRECTOR
PO BOX 765
LAKE GEORGE, NY 12845
518-668-5773
WWW.LCLGRPB.ORG

May 19, 2023

Evera Sue Clary
Town Supervisor
Town of Salem
214 Main Street
Salem, NY 12865

RE: Letter of Support & Commitment
Town of Salem Wastewater Improvement Project

Dear Supervisor Clary,

Please accept this letter of support for the Town of Salem's request to the Northern Border Regional Commission – Catalyst Program to advance the *Town of Salem Wastewater Improvement Project*.

The proposed project will complete design and construction of the Town of Salem's first public wastewater system. The community possesses significant economic development potential that can be unlocked with access to affordable public infrastructure.

The Lake Champlain – Lake George Regional Planning Board (LCLGRPB) is one of nine Economic development Administration (EDA) designated Economic Development Districts (EDDs) operating in New York State. The LCLGRPB also serves as Local Development District (LDD) for the 5-county region. The LCLGPRB is responsible for maintenance and implementation of the five-county region's Comprehensive Economic Development Strategy (CEDS). The proposed project will advance *CEDS Strategy 1.2A – Assist local governments access funding for regionally significant municipal drinking water and wastewater improvements*. The CEDS includes *Priority Project ID#28 – Feasibility study to support installation of municipal sewer system, Salem*, which has been completed. This proposed project will advance this regional priority.

The LCLGRPB fully supports this initiative and looks forward to assisting the Town of Salem with implementation of the project.

Sincerely,

Elizabeth Gilles, Executive Director
Lake Champlain – Lake George Regional Planning Board

HUDSON HEADWATERS
HEALTH NETWORK

GEORGE PURDUE
ADMINISTRATIVE BUILDING

9 CAREY ROAD
QUEENSBURY, NY 12804

518-761-0300
WWW.HHHN.ORG

May 31, 2023

Evera Sue Clary
Town Supervisor
Town of Salem
214 Main Street
Salem, NY 12865

RE: Letter of Support for Town of Salem Wastewater Improvement Project

Dear Supervisor Clary,

On behalf of Hudson Headwaters Health Network, I am pleased to provide this letter of support for your application to the Northern Border Regional Commission – Catalyst Program for funding for the Town of Salem Wastewater Improvement Project.

As you know, Hudson Headwaters Health Network, a not-for-profit 501(c)3 organization, has served the Adirondack and North Country regions of Upstate New York as a Federally Qualified Community Health Center (FQHC) since 1981.

Hudson Headwaters provides comprehensive primary care and select specialty services to the entire community in its service area, emphasizing addressing the needs of the uninsured and those covered under the Medicaid and Medicare programs.

In 2022, Hudson Headwaters served 105,430 unique patients through 404,063 in-person and telehealth visits at our one mobile and 21 brick-and-mortar service sites.

Hudson Headwaters mobile unit is currently deployed to the Town of Salem regularly, and we are exploring opportunities to establish a permanent facility in that town to address the problem of primary care access in Salem and the surrounding region.

Moreover, as a healthcare organization, we understand the importance of modern sewage and waste management to ensure the health and safety of the community.

For these reasons, we strongly support the Town of Salem application to the Northern Border Regional Commission – Catalyst Program for funding for its Wastewater Improvement Project.

Sincerely,

Seán Philpott-Jones, PhD, MSBe
Vice President for Government Relations and Grant Management
Hudson Headwaters Health Network

ELISE M. STEFANIK
21ST DISTRICT, NEW YORK
REPUBLICAN CONFERENCE CHAIR
2211 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515
(202) 225-4611
stefanik.house.gov

Congress of the United States
House of Representatives
Washington, DC 20515-3221

HOUSE ARMED SERVICES COMMITTEE
HOUSE PERMANENT SELECT COMMITTEE ON INTELLIGENCE
HOUSE COMMITTEE ON EDUCATION AND THE WORKFORCE
HOUSE SELECT SUBCOMMITTEE ON THE WEAPONIZATION OF THE FEDERAL GOVERNMENT

May 23, 2023

Evera Sue Clary
Town Supervisor
Town of Salem
214 Main Street
Salem, NY 12865

Dear Supervisor Clary,

I am writing to express my strongest support for the Town of Salem's request to the Northern Border Regional Commission's Catalyst Program to advance the Town of Salem Wastewater Improvement Project.

The proposed wastewater system in the Town of Salem will provide much needed infrastructure to a rural and economically distressed community in my district. The availability of this system will provide greater opportunities for business attraction, retention and expansion, as well as support job growth among the Salem constituency and neighboring municipalities.

I fully support the Town of Salem's application and strongly recommend funding for this initiative. I ask that you give this application your most serious consideration. If you have any questions or concerns, please do not hesitate to contact Josh Williams in my East Greenbush district office at 518-242-4707.

Sincerely,

Elise M. Stefanik

ELISE STEFANIK
Member of Congress

EAST GREENBUSH
99 TROY ROAD
SUITE 312
EAST GREENBUSH, NY 12061
(518) 242-4707

HERKIMER
108 COURT STREET
SUITE 102
HERKIMER, NY 13350
(315) 219-8005

OGDENSBURG
330 FORD STREET
SUITE B8
OGDENSBURG, NY 13669
(315) 541-2670

PLATTSBURGH
137 MARGARET STREET
SUITE 100
PLATTSBURGH, NY 12901
(518) 561-2324

RANKING MINORITY MEMBER
AGING
VETERANS, HOMELAND SECURITY AND MILITARY AFFAIRS

COMMITTEE MEMBER
CHILDREN AND FAMILIES
DISABILITIES
HEALTH

SENATOR
JACOB C. ASHBY
43RD SENATE DISTRICT

ALBANY OFFICE
ROOM 517
LEGISLATIVE OFFICE BUILDING
ALBANY, NY 12247
PHONE: 518-455-2381

E-MAIL
ASHBY@NYSENATE.GOV

May 24, 2023

Evera Sue Clary
Town Supervisor
Town of Salem
214 Main Street
Salem, NY 12865

RE: Letter of Support
Town of Salem Wastewater Improvement Project

Dear Supervisor Clary,

I write today to express my strong support for the Town of Salem's request to the Northern Border Regional Commission – Catalyst Program to advance the **Town of Salem Wastewater Improvement Project**.

The proposed project will help the Town of Salem, NY advance a critical infrastructure project to transform economic development in a rural community. Assistance from the Northern Border Regional Commission will improve business development opportunities and job creation. As Senator for the 43rd district, I want to help communities not only survive but thrive. I want to help give them opportunities for growth, and their wastewater improvement project is a vital component.

Gratefully,

Jake Ashby
Senator- 43rd District

MATTHEW J. SIMPSON
Assemblyman 114th District

THE ASSEMBLY
STATE OF NEW YORK
ALBANY

RANKING MINORITY MEMBER
Environmental Conservation
COMMITTEES
Local Governments
Social Services
Tourism

May 19, 2023

Evera Sue Clary
Supervisor, Town of Salem
214 Main Street
Salem, NY 12865

RE: Letter of Support - Town of Salem Wastewater Improvement Project

Dear Supervisor Clary,

Please accept this letter of support for the Town of Salem's request to the Northern Border Regional Commission – Catalyst Program to advance the Town of Salem Wastewater Improvement Project.

Public infrastructure unlocks opportunities for new and existing businesses to grow. The Salem Wastewater Improvement Project will advance construction of a new wastewater system in the historic, former Village of Salem. This initiative will support economic development opportunities in our region.

I fully support this application and strongly recommend funding.

Sincerely,

Matthew J. Simpson
114th Assembly District

ALBANY OFFICE: Room 721, Legislative Office Building, Albany, New York 12248 • 518-455-5565, FAX: 518-455-5710
DISTRICT OFFICE: 4 Southwestern Ave, Suite 3, Queensbury, NY 12804 • 518-792-4546, FAX: 518-792-5584
EMAIL: simpsonm@nyassembly.gov

WASHINGTON COUNTY PLANNING DEPARTMENT
Washington County Municipal Center
383 Broadway
Fort Edward, New York 12828
Tel: (518) 746-2290 Fax: (518) 746-2293

May 19, 2023

Evera Sue Clary
Town Supervisor
Town of Salem
214 Main Street
Salem, NY 12865

RE: Letter of Support
Town of Salem Wastewater Improvement Project

Dear Supervisor Clary,

Please accept this letter of support for the Town of Salem's request to the Northern Border Regional Commission – Catalyst Program to advance the Town of Salem Wastewater Improvement Project.

Rural communities depend on infrastructure to grow opportunities for economic and community development. Communities vested in their own future development are particularly suited to partner with other resources to achieve their goals, and Salem has consistently taken a proactive approach to designing the Town's future. The Salem Wastewater Improvement Project will support efforts to revitalize local businesses, the community, and a new regional healthcare facility. With several businesses already committed to opening or expanding and a can-do attitude if given access to wastewater treatment the town will continue to trend from decline to thrive.

I fully support this application and strongly recommend funding support from NBRC.

Sincerely,

Laura Oswald
Director of Economic Development

March 6, 2023

Evera Sue Clary
Town Supervisor
Town of Salem
214 Main Street
Salem, NY 12865

RE: Letter of Support
Town of Salem Wastewater Improvement Project

Dear Supervisor Clary,

Please accept this letter of support for the Town of Salem's FY24 Congressionally Directed Spending Request relating to the *Town of Salem Wastewater Improvement Project.*

The Town of Salem is seeking funding assistance to design and construct a new public wastewater collection and treatment system. The availability of a municipal sewer system in downtown Salem would greatly benefit my business and bring about transformative economic development opportunities for vacant and underutilized properties along Main Street.

I fully support this application and strongly recommend funding for this project.

Sincerely,

NAME Donald P. McPhee
ORGANIZATION/BUSINESS - Donald P. McPhee, Attorney At Law

March 6, 2023

Evera Sue Clary
Town Supervisor
Town of Salem
214 Main Street
Salem, NY 12865

RE: Letter of Support
Town of Salem Wastewater Improvement Project

Dear Supervisor Clary,

Please accept this letter of support for the Town of Salem's FY24 Congressionally Directed Spending Request relating to the *Town of Salem Wastewater Improvement Project.*

The Town of Salem is seeking funding assistance to design and construct a new public wastewater collection and treatment system. The availability of a municipal sewer system in downtown Salem would greatly benefit my business and bring about transformative economic development opportunities for vacant and underutilized properties along Main Street.

I fully support this application and strongly recommend funding for this project.

Sincerely,

T Thomas Clary
aspire - accounting, consulting, tax

NAME
ORGANIZATION/BUSINESS owner

March 6, 2023

Evera Sue Clary
Town Supervisor
Town of Salem
214 Main Street
Salem, NY 12865

RE: Letter of Support
Town of Salem Wastewater Improvement Project

Dear Supervisor Clary,

Please accept this letter of support for the Town of Salem's FY24 Congressionally Directed Spending Request relating to the *Town of Salem Wastewater Improvement Project.*

The Town of Salem is seeking funding assistance to design and construct a new public wastewater collection and treatment system. The availability of a municipal sewer system in downtown Salem would greatly benefit my business and bring about transformative economic development opportunities for vacant and underutilized properties along Main Street.

I fully support this application and strongly recommend funding for this project.

Sincerely,

NAME
ORGANIZATION/BUSINESS

Salem Hardware + Supply Co.

March 6, 2023

Evera Sue Clary
Town Supervisor
Town of Salem
214 Main Street
Salem, NY 12865

RE: Letter of Support
Town of Salem Wastewater Improvement Project

Dear Supervisor Clary,

Please accept this letter of support for the Town of Salem's FY24 Congressionally Directed Spending Request relating to the *Town of Salem Wastewater Improvement Project.*

The Town of Salem is seeking funding assistance to design and construct a new public wastewater collection and treatment system. The availability of a municipal sewer system in downtown Salem would greatly benefit my business and bring about transformative economic development opportunities for vacant and underutilized properties along Main Street.

I fully support this application and strongly recommend funding for this project.

Sincerely,

Herbert Perkins

NAME Herbert Perkins, Board President
ORGANIZATION/BUSINESS Historic Salem Courthouse

March 6, 2023

Evera Sue Clary
Town Supervisor
Town of Salem
214 Main Street
Salem, NY 12865

RE: Letter of Support
Town of Salem Wastewater Improvement Project

Dear Supervisor Clary,

Please accept this letter of support for the Town of Salem's FY24 Congressionally Directed Spending Request relating to the *Town of Salem Wastewater Improvement Project.*

The Town of Salem is seeking funding assistance to design and construct a new public wastewater collection and treatment system. The availability of a municipal sewer system in downtown Salem would greatly benefit my business and bring about transformative economic development opportunities for vacant and underutilized properties along Main Street.

I fully support this application and strongly recommend funding for this project.

Sincerely,

NAME
ORGANIZATION/BUSINESS
Peter G. Thomas
Salem Washington Academy School Board

John Bardwell <2bwell12@att.net>
Mon 3/6/2023 8:36 AM

To: Evera Clary <eclary@washingtoncountyny.gov>

To: Elise Stefanik

My name is John Bardwell register republican living in Salem, NY. In Salem I serve on the tax grievance committee and the economic development committee. I also spend a significant amount of time in Florida. I live the tale of two significantly different economies one with out of control growth and one struggling with growth.

As I'm sure you know Salem, is strategically situated on a very active passage way to Vermont, Connecticut, and NYC. One of the most significant issue Salem faces is a waste water system. Business struggle with the 1800's septics and dense buildings in the downtown preventing expansion. We do have people willing to invest in business, but when faced with the additional cost , even if possible the willingness fads.

I am writing asking for your support/help in finding funding to revive the Salem. Funding that would lead to adding a tax base to the North country that you represent. Thank you for your consideration.

John Bardwell

March 6, 2023

Evera Sue Clary
Town Supervisor
Town of Salem
214 Main Street
Salem, NY 12865

RE: Letter of Support
Town of Salem Wastewater Improvement Project

Dear Supervisor Clary,

Please accept this letter of support for the Town of Salem's FY24 Congressionally Directed Spending Request relating to the *Town of Salem Wastewater Improvement Project.*

The Town of Salem is seeking funding assistance to design and construct a new public wastewater collection and treatment system. The availability of a municipal sewer system in downtown Salem would greatly benefit my business and bring about transformative economic development opportunities for vacant and underutilized properties along Main Street.

I fully support this application and strongly recommend funding for this project.

Sincerely,

Christine Rusle For the Salem Area Chamber of Commerce

NAME
ORGANIZATION/BUSINESS

APPENDIX F: COLLECTION SYSTEM SCHEMATIC

Village of Salem

Washington County, NY

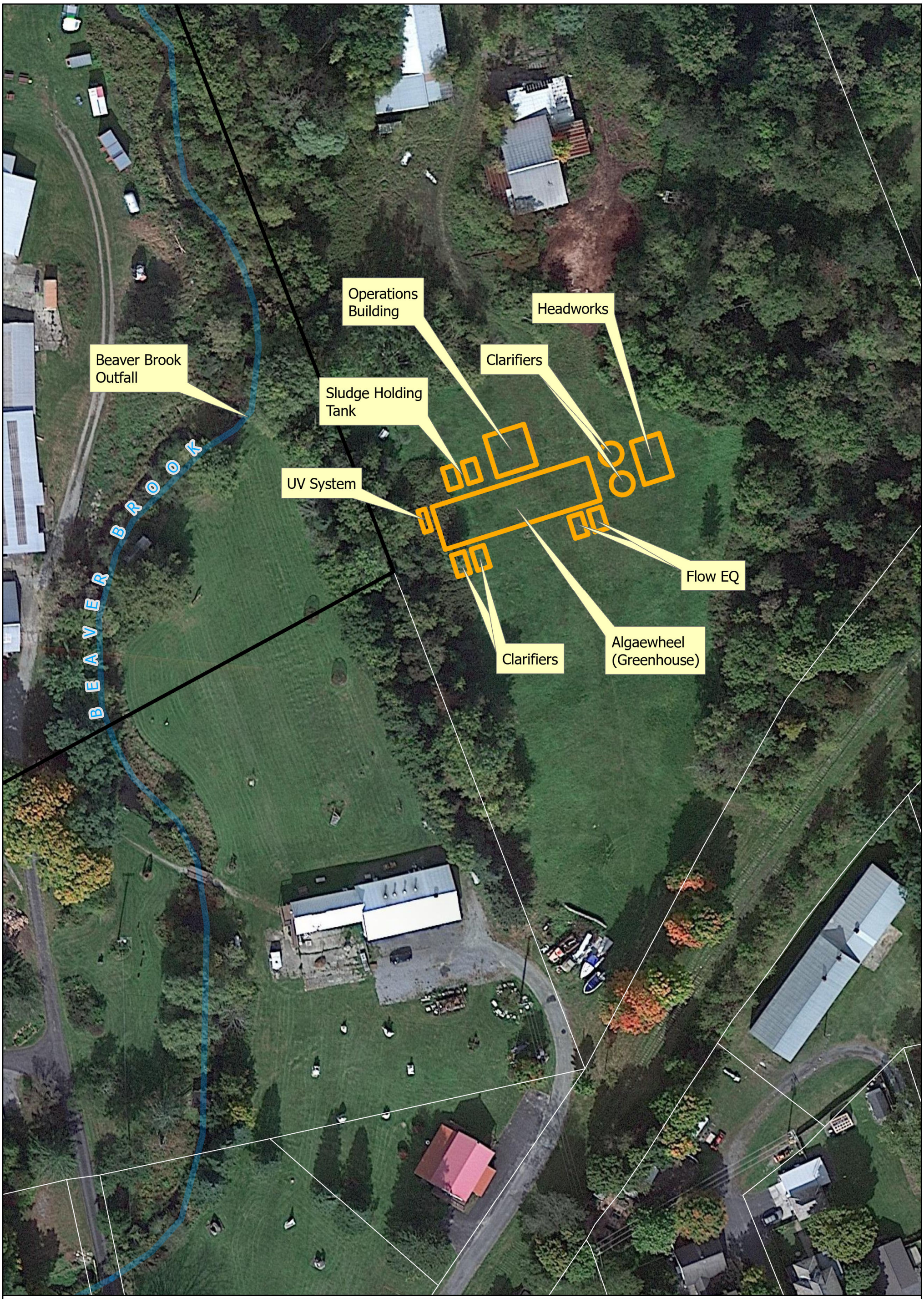
- Proposed Sewer Service Area
- Proposed Sewerline
- Waterline
- Streams

N

0 500 1,000 2,000 3,000 4,000 Feet

Prepared by: Delaware Engineering, DPC
Date: April 2023

APPENDIX G: WWTP SCHEMATIC



Proposed Waste Water Treatment Plant

Village of Salem, Washington County

0 75 150 300 Feet

Legend

Streams

Proposed Sewer Area

Parcels (white lines)

WWTP

N

Prepared by: Delaware Engineering, DPC
Date: June 16, 2023
Source: Google Earth Imagery, Washington County, NYSDEC

APPENDIX H: COLLECTION SYSTEM ALTERNATIVE COST ESTIMATES

New Sanitary Sewer Collection System
Alternative 1 - Conventional Gravity Sewer
Opinion of Probable Cost

Prepared by Delaware Engineering, DPC

Town of Salem
Washington County, New York

Date: 6/2/2023 | Project Number: 22-2570
Design Stage: Preliminary | Calculated By: PFM
Revision: 1st | Checked By:

Item No.	Item	Quantity	Unit	COSTS $/Unit	COSTS Total	Subtotals
	GENERAL CONDITIONS					***$ 337,055.10***
1	MOB (3%)	1	LS	$ 337,055.10	$ 337,055.10	
	CONVENTIONAL GRAVITY SEWER					***$ 5,656,670.00***
2	8-Inch Diameter SDR 35 PVC Direct Bury	23566	LF	$ 120.00	$ 2,827,920.00	
3	4-ft Dia PreCast Concrete Manholes (Avg 8 ft deep)	70	EA	$ 35,000.00	$ 2,450,000.00	
4	Cleanouts	345	EA	$ 750.00	$ 258,750.00	
5	4-inch direct bury sewer lateral to ROW	3450	LF	$ 25.00	$ 86,250.00	
6	Watertight Lid Inserts	45	EA	$ 750.00	$ 33,750.00	
	PUMP STATIONS					***$ 1,490,000.00***
7	Duplex Submersible Pump Stations (7.5 HP)	3	EA	$ 400,000.00	$ 1,200,000.00	
8	4-Inch Dia HDPE Forcemain (Direct Bury)	2000	LF	$ 70.00	$ 140,000.00	
9	4-Inch Dia HDPE Forcemain (HDD)	750	LF	$ 100.00	$ 75,000.00	
10	Back Up Generators	3	EA	$ 25,000.00	$ 75,000.00	
	RESTORATION					***$ 4,088,500.00***
11	NYSDOT Roadway Restoration	15000	T	$ 180.00	$ 2,700,000.00	
12	NYSDOT FILL	23150	CY	$ 55.00	$ 1,273,250.00	
13	Lawn/Yard Restoration	1	EA	$ 75,000.00	$ 75,000.00	
14	5-ft Sidewalk Replacement	230	CY	$ 175.00	$ 40,250.00	

Subtotal Construction Costs (2023 Dollars)	$ 11,572,225.10
Subtotal Construction Costs (2026 Dolllars, i=5%)	**$ 13,396,297.08**
Project Contingency (20%)	**$ 2,679,259.42**
Engineering, Construction Inspection, Legal, Administrative (15%)	**$ 2,411,333.47**
TOTAL ESTIMATED PROJECT COSTS (2026 Dollars)	**$ 18,486,889.97**

New Sanitary Sewer Collection System
Alternative 2 - Low Pressure Sewer System
Opinion of Probable Cost

Prepared by Delaware Engineering, DPC

Town of Salem
Washington County, New York

Date: 6/2/2023 | Project Number: 22-2570
Design Stage: Preliminary | Calculated By: PFM
Revision: 1st | Checked By:

Item No.	Item	Quantity	Unit	COSTS $/Unit	COSTS Total	Subtotals
	GENERAL CONDITIONS					***$ 245,325.00***
1	MOB (3%)	1	LS	$ 245,325.00	$ 245,325.00	
	LOW PRESSURE SANITARY SEWER SYSTEM					***$ 7,497,500.00***
2	1.25" HDPE LPSS (Pipe, trenching, subgrade, backfill)	15000	LF	$ 100.00	$ 1,500,000.00	
3	2" HDPE LPSS (Pipe, trenching, subgrade, backfill)	2500	EA	$ 95.00	$ 237,500.00	
4	4" HDPE LPSS (Pipe, trenching, subgrade, backfill)	8000	LF	$ 45.00	$ 360,000.00	
5	Simplex Grinder Pump Stations	345	EA	$ 6,000.00	$ 2,070,000.00	
6	Duplex Grinder Pump Stations	10	EA	$ 12,000.00	$ 120,000.00	
7	Installation of Pump Stations (40% Purchase Costs)	1	LS	$ 547,500.00	$ 547,500.00	
8	1.5" HDPE Lateral (Pipe, trenching, subgrade, backfill)	26625	LF	$ 100.00	$ 2,662,500.00	
	RESTORATION					***$ 680,000.00***
11	NYSDOT Roadway Restoration	2500	T	$ 180.00	$ 450,000.00	
12	NYSDOT FILL	2500	CY	$ 55.00	$ 137,500.00	
13	Lawn/Yard Restoration	1	EA	$ 75,000.00	$ 75,000.00	
14	5-ft Sidewalk Replacement	100	CY	$ 175.00	$ 17,500.00	

Subtotal Construction Costs (2023 Dollars)	$ 8,422,825.00
Subtotal Construction Costs (2026 Dolllars, i=5%)	**$ 9,750,472.79**
Project Contingency (20%)	**$ 1,950,094.56**
Engineering, Construction Inspection, Legal, Administrative (15%)	**$ 2,106,102.12**
TOTAL ESTIMATED PROJECT COSTS (2026 Dollars)	**$ 13,806,669.47**

APPENDIX I: WWTP ALTERNATIVE COST ESTIMATES

New Wastewater Treatment Plant
WWTP Alternative 1 - Sequencing Batch Reactor
Opinion of Probable Cost

Prepared by Delaware Engineering, DPC

Town of Salem
Washington County, New York

Date: 6/2/2023 | Project Number: 22-2570
Design Stage: Preliminary | Calculated By: PFM
Revision: 1st | Checked By:

Item No.	Item	Quantity	Unit	COSTS $/Unit	COSTS Total	Subtotals
	GENERAL CONDITIONS					***$ 138,679.50***
1	MOB (3%)	1	LS	$ 138,679.50	$ 138,679.50	
	HEADWORKS					***$ 1,197,800.00***
2	Mechanical Coarse Bar Screen w/ Washer Compactor (1/4-inch)	1	EA	$ 148,000.00	$ 148,000.00	
3	Vortex Grit Removal Retrofit (6-ft dia)	1	EA	$ 260,000.00	$ 260,000.00	
4	Equipment Installation (60% of Purchase Cost)	1	LS	$ 244,800.00	$ 244,800.00	
5	Influent Pump Station	1	LS	$ 250,000.00	$ 250,000.00	
6	Odor Control System	1	EA	$ 25,000.00	$ 25,000.00	
7	Alkalinity Chem Feed System	1	EA	$ 15,000.00	$ 15,000.00	
8	Misc Equipment	1	LS	$ 45,000.00	$ 45,000.00	
9	New CMU Headworks Building (20ft X 30ft)	600	SF	$ 350.00	$ 210,000.00	
	NEW SBR SYSTEM					***$ 1,645,500.00***
9	New SBR System -(2) Decanters with 1/4 HP drive units -(2) 25HP Positive Displacement Blowers -(2) Fine Bubble Aeration Grids -(2) Automated Air Control Valves -(2) Waste Activated Sludge Pumps -(1) Control Panel with MCC, DO Probes, and HME Accessibility	1	EA	$ 500,000.00	$ 500,000.00	
10	Equipment Installation (60% of Purchase Cost)	1	LS	$ 300,000.00	$ 300,000.00	
11	Concrete Tankage and Structures	328	CY	$ 2,250.00	$ 738,000.00	
12	Misc. Yard Piping (e.g. air, WAS, Influent, Effluent)	250	LF	$ 250.00	$ 62,500.00	
13	Railing and Access Steps	1	LS	$ 45,000.00	$ 45,000.00	
	POST-EQ TANK					***$ 566,250.00***
14	New 15,000 gal Concrete Post-EQ Tank	165	CY	$ 2,250.00	$ 371,250.00	
15	Post-EQ Tank Discharge Pumps and Controls	2	EA	$ 75,000.00	$ 150,000.00	
16	Post-EQ Tank Air Grid and (2) 1 HP Blowers	1	LS	$ 45,000.00	$ 45,000.00	
	DISINFECTION SYSTEM					***$ 309,150.00***
17	UV System	2	EA	$ 54,000.00	$ 108,000.00	
18	Equipment Installation (60% of Purchase Cost)	1	LS	$ 32,400.00	$ 32,400.00	
19	Concrete Channel Structure	75	CY	$ 2,250.00	$ 168,750.00	
	SLUDGE HANDLING IMPROVEMENTS					***$ 150,000***
31	Pre-Cast Aerobic Sludge Holding Tanks	2	EA	$ 25,000.00	$ 50,000.00	
32	Coarse Bubble Diffuser Grid	2	EA	$ 35,000.00	$ 70,000.00	
33	Rotary Lobe Blowers (8HP)	2	EA	$ 15,000.00	$ 30,000.00	
	SITE IMPROVEMENTS					***$ 753,950.00***
20	Operations Building and Lab (40ft X 20ft)	800	SF	$ 350.00	$ 280,000.00	
21	Misc Electrical Work for All Buildings and Site	1	LS	$ 73,500.00	$ 73,500.00	
22	Misc HVAC Work for All Improvements	1	LS	$ 39,200.00	$ 39,200.00	
23	Asphalt Paving	1250	SF	$ 45.00	$ 56,250.00	
24	Fencing	1200	LF	$ 150.00	$ 180,000.00	
45	Generator Set (Diesel, 250 kW)	1	LS	$ 125,000.00	$ 125,000.00	

Subtotal Construction Costs (2023 Dollars)	$ 4,761,329.50
Subtotal Construction Costs (2026 Dolllars, i=5%)	**$ 5,511,834.06**
Project Contingency (20%)	**$ 1,102,366.81**
Engineering, Construction Inspection, Legal, Administrative (15%)	**$ 992,130.13**
TOTAL ESTIMATED PROJECT COSTS (2026 Dollars)	**$ 7,606,331.01**

Short Lived Assets
WWTP Alternative 1 - Sequencing Batch Reactor
June 2023

	Year																			
Description	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Headworks																				
Washer/Compacter Brushes										$ 11,000										
Grit Pump Replacement							$ 4,500													
Oil, Belts, Misc Consumables	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250
Influent Pumps										$ 7,500										$ 7,500
Sequencing Batch Reactor																				
Diffusers																				$ 35,000
Oil, Belts, Misc Consumables	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250
Blower Components					$ 1,500					$ 1,500					$ 1,500					$ 1,500
WAS Pumps										$ 5,500										$ 5,500
Post-EQ Pumps										$ 7,500										$ 7,500
UV System																				
Replacement Bulbs					$ 3,500					$ 3,500					$ 3,500					$ 3,500
Controls and Ballast																				12500
Sludge Holding Tank																				
Diffusers																				$ 15,000
Oil, Belts, Misc Consumables	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250
Blower Components					$ 1,500					$ 1,500					$ 1,500					$ 1,500
Sludge Pumps										$ 7,500										$ 7,500
Miscellaneous Items																				
Analyzer Probe Replacement						$ 500						$ 500						$ 500		
Electrical Controls															$ 15,000					
Misc. Maintenance Items	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000
Total Costs	$1,750	$1,750	$1,750	$1,750	$8,250	$2,250	$6,250	$1,750	$1,750	$47,250	$1,750	$2,250	$1,750	$1,750	$23,250	$1,750	$1,750	$2,250	$1,750	$98,750
Sinking Fund interest	1																			
Sinking Fund Factor	1.000	0.498	0.330	0.246	0.196	0.163	0.139	0.121	0.107	0.096	0.086	0.079	0.072	0.067	0.062	0.058	0.054	0.051	0.048	0.045
Annual Costs for Short Term Asset Replacement	$1,750.00	$870.65	$577.54	$430.99	$1,617.33	$365.73	$866.43	$211.21	$186.80	$4,516.25	$151.29	$177.41	$126.73	$117.08	$1,444.38	$101.40	$94.95	$114.71	$84.09	$4,484.76

Annual Reserved Deposit	**$18,290**

WWTP Alternative 1 - SBR System

Estimated Electrical Usage Summary

Town of Salem
Washington County, New York

Date:	6/2/2023	Project Number:	22-2570
Design Stage:	Preliminary	Calculated By:	PFM
Revision:	1st	Checked By:	

Process	Equipment	HP	TOTAL UNITS	OPERATING UNITS	RUN TIME hrs/day	RUN TIME (% OF DAY)	TOTAL (KwHrs/day)
HEADWORKS	MECHANICAL BAR SCREEN	0.25	1	1	12	50%	2.24
	WASHER/COMPACTOR	0.5	1	1	3	13%	1.12
	GRIT PUMP	0.5	1	1	3	13%	1.12
	INFLUENT PUMPS	5	2	1	16	67%	59.66
SBR	DECANT DRIVE UNIT	0.2	2	2	7	29%	2.09
	AIR BLOWERS	5.3	2	1	24	100%	94.85
	WAS PUMP	1.9	2	2	0.1	0%	0.28
POST EQ	AIR BLOWERS	10	2	1	18	75%	134.23
	POST EQ PUMP	2.5	1	1	12	50%	2.08
UV SYSTEM	UV SYSTEM	0.2	2	1	24	100%	3.58
SLUDGE HANDLING	AIR BLOWERS	8	2	1	18	75	107.38
OPERATION BUILDING/SITE	MISC (Lights, outlets, etc.)						35.00

TOTAL KwHrs/Day:	**444**
Cost/KwHr:	**$0.09**
Estimated Cost/Mo:	**$1,238**
Estimated Cost/yR:	**$14,853**

New Wastewater Treatment Plant
WWTP Alternative 2 - Moving Bed BioReactor
Opinion of Probable Cost

Prepared by Delaware Engineering, DPC

Town of Salem
Washington County, New York

Date: 6/2/2023 | Project Number: 22-2570
Design Stage: Preliminary | Calculated By: PFM
Revision: 1st | Checked By:

Item No.	Item	Quantity	Unit	COSTS $/Unit	COSTS Total	Subtotals
	GENERAL CONDITIONS					***$ 152,573***
1	MOB (3%)	1	LS	$ 152,572.50	$ 152,572.50	
	HEADWORKS					***$ 1,197,800***
2	Mechanical Coarse Bar Screen w/ Washer Compactor (1/4-inch)	1	EA	$ 148,000.00	$ 148,000.00	
3	Vortex Grit Removal Retrofit (6-ft dia)	1	EA	$ 260,000.00	$ 260,000.00	
4	Equipment Installation (60% of Purchase Cost)	1	LS	$ 244,800.00	$ 244,800.00	
5	Influent Pump Station	1	LS	$ 250,000.00	$ 250,000.00	
6	Odor Control System	1	EA	$ 25,000.00	$ 25,000.00	
7	Alkalinity Chem Feed System	1	EA	$ 15,000.00	$ 15,000.00	
8	Misc Equipment	1	LS	$ 45,000.00	$ 45,000.00	
9	New CMU Headworks Building (20ft X 30ft)	600	SF	$ 350.00	$ 210,000.00	
	NEW PRIMARY CLARIFIERS					***$ 691,500***
11	(2) New 15-ft Dia. Mechanical Clarifier Unit	2	EA	$ 95,000.00	$ 190,000.00	
12	Equipment Installation (60% of Purchase Cost)	1	LS	$ 114,000.00	$ 114,000.00	
13	Concrete Tankage and Structures	125	CY	$ 2,500.00	$ 312,500.00	
14	Misc Yard Piping	1	LS	$ 75,000.00	$ 75,000.00	
	NEW MBBR SYSTEM					***$ 615,600***
15	New MBBR System -(3) Fine Bubble Diffuser and Saddle Sets - MBBR Biofilm Carriers -(3) Effluent Retention Screens	3	EA	$ 19,500.00	$ 58,500.00	
16	(3) - 6 HP Blowers	3	EA	$ 15,000.00	$ 45,000.00	
17	Equipment Installation (60% of Purchase Cost)	1	LS	$ 62,100.00	$ 62,100.00	
18	Concrete Tankage and Structures	130	CY	$ 2,500.00	$ 325,000.00	
19	Misc. Yard Piping (e.g. air, Influent, Effluent)	200	LF	$ 250.00	$ 50,000.00	
20	Railing and Access Steps	1	LS	$ 75,000.00	$ 75,000.00	
	NEW SECONDARY CLARIFIERS					***$ 1,536,000***
22	(2) New 18-ft Dia. Mechanical Clarifier Unit	2	EA	$ 105,000.00	$ 210,000.00	
23	Equipment Installation (60% of Purchase Cost)	1	LS	$ 126,000.00	$ 126,000.00	
24	Concrete Tankage and Structures	450	CY	$ 2,500.00	$ 1,125,000.00	
25	Misc Yard Piping	1	LS	$ 75,000.00	$ 75,000.00	
	DISINFECTION SYSTEM					***$ 226,000***
17	UV System	2	EA	$ 35,000.00	$ 70,000.00	
18	Equipment Installation (60% of Purchase Cost)	1	LS	$ 21,000.00	$ 21,000.00	
19	Concrete Channel Structure	60	CY	$ 2,250.00	$ 135,000.00	
	SLUDGE HANDLING IMPROVEMENTS					***$ 150,000***
31	Pre-Cast Aerobic Sludge Holding Tanks	2	EA	$ 25,000.00	$ 50,000.00	
32	Coarse Bubble Diffuser Grid	2	EA	$ 35,000.00	$ 70,000.00	
33	Rotary Lobe Blowers (10HP)	2	EA	$ 15,000.00	$ 30,000.00	
	SITE IMPROVEMENTS					***$ 668,850***
20	Operations Building and Lab (40ft X 20ft)	800	SF	$ 350.00	$ 280,000.00	
21	Misc Electrical Work for All Buildings and Site	1	LS	$ 18,000.00	$ 18,000.00	
22	Misc HVAC Work for All Improvements	1	LS	$ 9,600.00	$ 9,600.00	
23	Asphalt Paving	1250	SF	$ 45.00	$ 56,250.00	
24	Fencing	1200	LF	$ 150.00	$ 180,000.00	
45	Generator Set (Diesel, 250 kW)	1	LS	$ 125,000.00	$ 125,000.00	

Subtotal Construction Costs (2023 Dollars)	$ 5,238,323
Subtotal Construction Costs (2026 Dolllars, i=5%)	**$ 6,064,013**
Project Contingency (20%)	**$ 1,212,803**
Engineering, Construction Inspection, Legal, Administrative (15%)	**$ 1,091,522**
TOTAL ESTIMATED PROJECT COSTS (2026 Dollars)	**$ 8,368,338**

TOWN OF SALEM, WASHINGTON COUNTY, NY
NEW WWTP AND SANITARY SEWER SYSTEM

Short Lived Assets
WWTP Alternative 2 - Moving Bed BioReactor
June 2023

Description	Year 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Headworks																				
Washer/Compacter Brushes										$ 11,000										
Grit Pump Replacement							$ 4,500													
Oil, Belts, Misc Consumables	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250
Influent Pumps										$ 7,500										$ 7,500
Primary Clarifier Drives																				
Oil, Belts, Misc Consumables	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250
Refurbished Motor																				$ 30,000
MBBR																				
Media Retention Screens										$ 8,000										$ 8,000
Aeration Grids																				$ 10,000
Secondary Clarifier Drives																				
Oil, Belts, Misc Consumables	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250
Refurbished Motor																				$ 30,000
UV System																				
Replacement Bulbs					$ 3,500					$ 3,500					$ 3,500					$ 3,500
Controls and Ballast																				12500
Sludge Holding Tank																				
Diffusers																				$ 15,000
Oil, Belts, Misc Consumables	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250
Blower Components					$ 1,500					$ 1,500					$ 1,500					$ 1,500
Sludge Pumps										$ 7,500										$ 7,500
Miscellaneous Items																				
Analyzer Probe Replacement						$ 500						$ 500						$ 500		
Electrical Controls															$ 15,000					
Misc. Maintenance Items	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000
Total Costs	$2,000	$2,000	$2,000	$2,000	$7,000	$2,500	$6,500	$2,000	$2,000	$41,000	$2,000	$2,500	$2,000	$2,000	$22,000	$2,000	$2,000	$2,500	$2,000	$127,500
Sinking Fund interest	1																			
Sinking Fund Factor	1.000	0.498	0.330	0.246	0.196	0.163	0.139	0.121	0.107	0.096	0.086	0.079	0.072	0.067	0.062	0.058	0.054	0.051	0.048	0.045
Annual Costs for Short Term Asset Replacement	$2,000	$995	$660	$493	$1,372	$406	$901	$241	$213	$3,919	$173	$197	$145	$134	$1,367	$116	$109	$127	$96	$5,790

Annual Reserved Deposit	**$19,455**

WWTP Alternative 2 - MBBR System

Estimated Electrical Usage Summary

Town of Salem
Washington County, New York

Date:	6/2/2023	Project Number:	22-2570
Design Stage:	Preliminary	Calculated By:	PFM
Revision:	1st	Checked By:	

Process	Equipment	HP	TOTAL UNITS	OPERATING UNITS	RUN TIME hrs/day	RUN TIME (% OF DAY)	TOTAL (KwHrs/day)
HEADWORKS	MECHANICAL BAR SCREEN	0.25	1	1	12	50%	2.24
	WASHER/COMPACTOR	0.5	1	1	3	13%	1.12
	GRIT PUMP	0.5	1	1	3	13%	1.12
	INFLUENT PUMPS	5	2	1	16	67%	59.66
PRIMARY CLARIFIER	CLARIFIER DRIVE	1	2	2	24	100	35.79
MBBR	AIR BLOWERS	5.3	2	1	24	100%	94.85
UV SYSTEM	UV SYSTEM	0.2	2	1	24	100%	3.58
SLUDGE HANDLING	AIR BLOWERS	8	2	1	18	75	107.38
OPERATION BUILDING/SITE	MISC (Lights, outlets, etc.)						35.00

TOTAL KwHrs/Day:	**341**
Cost/KwHr:	**$0.09**
Estimated Cost/Mo:	**$951**
Estimated Cost/yR:	**$11,408**

New Wastewater Treatment Plant
WWTP Alternative 3 - Algaewheel System
Opinion of Probable Cost

Prepared by Delaware Engineering, DPC

Town of Salem
Washington County, New York

Date: 6/2/2023 | Project Number: 22-2570
Design Stage: Preliminary | Calculated By: PFM
Revision: 1st | Checked By:

Item No.	Item	Quantity	Unit	COSTS $/Unit	COSTS Total	Subtotals
	GENERAL CONDITIONS					***$ 142,727***
1	MOB (3%)	1	LS	$ 142,726.50	$ 142,726.50	
	HEADWORKS					***$ 1,197,800***
2	Mechanical Coarse Bar Screen w/ Washer Compactor (1/4-inch)	1	EA	$ 148,000.00	$ 148,000.00	
3	Vortex Grit Removal Retrofit (6-ft dia)	1	EA	$ 260,000.00	$ 260,000.00	
4	Equipment Installation (60% of Purchase Cost)	1	LS	$ 244,800.00	$ 244,800.00	
5	Influent Pump Station	1	LS	$ 250,000.00	$ 250,000.00	
6	Odor Control System	1	EA	$ 25,000.00	$ 25,000.00	
7	Alkalinity Chem Feed System	1	EA	$ 15,000.00	$ 15,000.00	
8	Misc Equipment	1	LS	$ 45,000.00	$ 45,000.00	
9	New CMU Headworks Building (20ft X 30ft)	600	SF	$ 350.00	$ 210,000.00	
	NEW PRIMARY CLARIFIERS					***$ 691,500***
10	(2) New 15-ft Dia. Mechanical Clarifier Unit	2	EA	$ 95,000.00	$ 190,000.00	
11	Equipment Installation (60% of Purchase Cost)	1	LS	$ 114,000.00	$ 114,000.00	
12	Concrete Tankage and Structures	125	CY	$ 2,500.00	$ 312,500.00	
13	Misc Yard Piping	1	LS	$ 75,000.00	$ 75,000.00	
	NEW ALGAEWHEEL SYSTEM					***$ 2,071,000***
14	New AlgaeWheel System -(2) Precast modular process tanks -(56) Shafts each with (5) Type 3 Algaewheels (280 wheels in total) -(3) 10 HP Regenerative Blowers and VFDs -(1) Control Panel, HMI, Etc.	1	EA	$ 600,000.00	$ 600,000.00	
15	Ancillary Treatment Package -(2) Precast Flow EQ Tanks with pumps and blowers -(56) Shafts each with (5) Type 3 Algaewheels (280 wheels in total) -(1) Recirculation Structure with recirc pumps -(3) Precast	1	EA	$ 200,000.00	$ 200,000.00	
16	Algaewheel Greenhouse Structure	1	EA	$ 260,000.00	$ 260,000.00	
17	Equipment Installation (60% of Purchase Cost)	1	LS	$ 636,000.00	$ 636,000.00	
18	Concrete Tankage and Structures	130	CY	$ 2,500.00	$ 325,000.00	
19	Misc. Yard Piping (e.g. air, Influent, Effluent)	200	LF	$ 250.00	$ 50,000.00	
	DISINFECTION SYSTEM					***$ 226,000***
20	UV System	2	EA	$ 35,000.00	$ 70,000.00	
21	Equipment Installation (60% of Purchase Cost)	1	LS	$ 21,000.00	$ 21,000.00	
22	Concrete Channel Structure	60	CY	$ 2,250.00	$ 135,000.00	
	SLUDGE HANDLING IMPROVEMENTS					***$ 150,000***
23	Pre-Cast Aerobic Sludge Holding Tanks	2	EA	$ 25,000.00	$ 50,000.00	
24	Coarse Bubble Diffuser Grid	2	EA	$ 35,000.00	$ 70,000.00	
25	Rotary Lobe Blowers (10HP)	2	EA	$ 15,000.00	$ 30,000.00	
	SITE IMPROVEMENTS					***$ 421,250***
26	Operations Building and Lab (40ft X 20ft)	800	SF	$ 350.00	$ 280,000.00	
27	Misc Electrical Work for All Buildings and Site	1	LS	$ 112,500.00	$ 112,500.00	
28	Misc HVAC Work for All Improvements	1	LS	$ 60,000.00	$ 60,000.00	
29	Asphalt Paving	1250	SF	$ 45.00	$ 56,250.00	
30	Fencing	1200	LF	$ 150.00	$ 180,000.00	
31	Generator Set (Diesel, 250 kW)	1	LS	$ 125,000.00	$ 125,000.00	

Subtotal Construction Costs (2023 Dollars)	$ 4,900,277
Subtotal Construction Costs (2026 Dolllars, i=5%)	**$ 5,672,683**
Project Contingency (20%)	**$ 1,134,537**
Engineering, Construction Inspection, Legal, Administrative (15%)	**$ 1,021,083**
TOTAL ESTIMATED PROJECT COSTS (2026 Dollars)	**$ 7,828,302**

TOWN OF SALEM, WASHINGTON COUNTY, NY
NEW WWTP AND SANITARY SEWER SYSTEM

Short Lived Assets
WWTP Alternative 3 - AlgaeWheel
June 2023

	Year																			
Description	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Headworks																				
Washer/Compacter Brushes										$ 11,000										
Grit Pump Replacement							$ 4,500													
Oil, Belts, Misc Consumables	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250
Influent Pumps										$ 7,500										$ 7,500
Primary Clarifier Drives																				
Oil, Belts, Misc Consumables	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250
Refurbished Motor																				$ 30,000
AlgaeWheel																				
Wheel/Media Replacement										$ 5,000										$ 5,000
Recirc Pump										$ 3,500										$ 3,500
Sludge Holding Tank																				
Diffusers																				$ 15,000
Oil, Belts, Misc Consumables	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250
Blower Components					$ 1,500					$ 1,500					$ 1,500					$ 1,500
Sludge Pumps										$ 7,500										$ 7,500
Miscellaneous Items																				
Analyzer Probe Replacement						$ 500						$ 500						$ 500		
Electrical Controls															$ 15,000					
Misc. Maintenance Items	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000
Total Costs	$1,750	$1,750	$1,750	$1,750	$3,250	$2,250	$6,250	$1,750	$1,750	$37,750	$1,750	$2,250	$1,750	$1,750	$18,250	$1,750	$1,750	$2,250	$1,750	$71,750
Sinking Fund interest	1																			
Sinking Fund Factor	1.000	0.498	0.330	0.246	0.196	0.163	0.139	0.121	0.107	0.096	0.086	0.079	0.072	0.067	0.062	0.058	0.054	0.051	0.048	0.045
Annual Costs for Short Term Asset Replacement	$1,750	$871	$578	$431	$637	$366	$866	$211	$187	$3,608	$151	$177	$127	$117	$1,134	$101	$95	$115	$84	$3,259

Annual Reserved Deposit	**$14,865**

WWTP Alternative 3 - Algaewheel System
Estimated Electrical Usage Summary

Town of Salem
Washington County, New York

Date:	6/2/2023	Project Number:	22-2570
Design Stage:	Preliminary	Calculated By:	PFM
Revision:	1st	Checked By:	

Process	Equipment	HP	TOTAL UNITS	OPERATING UNITS	RUN TIME hrs/day	RUN TIME (% OF DAY)	TOTAL (KwHrs/day)
HEADWORKS	MECHANICAL BAR SCREEN	0.25	1	1	12	50%	2.24
	WASHER/COMPACTOR	0.5	1	1	3	13%	1.12
	GRIT PUMP	0.5	1	1	3	13%	1.12
	INFLUENT PUMPS	5	2	1	16	67%	59.66
PRIMARY CLARIFIER	CLARIFIER DRIVE	1	2	2	24	100	35.79
ALGAEWHEEL	AIR BLOWERS	0.25	2	1	24	100%	4.47
UV SYSTEM	UV SYSTEM	0.2	2	1	24	100%	3.58
SLUDGE HANDLING	AIR BLOWERS	8	2	1	18	75%	107.38
	SLUDGE HANDLING PUMPS	5	2	1	4	17%	14.91
OPERATION BUILDING/	MISC (Lights, outlets, etc.)						35.00

TOTAL KwHrs/Day:	**265**
Cost/KwHr:	**$0.09**
Estimated Cost/Mo:	**$740**
Estimated Cost/yR:	**$8,881**

APPENDIX J: SMART GROWTH ASSESSMENT FORM

NEW YORK STATE OF OPPORTUNITY. | Department of Health | Environmental Facilities Corporation

Smart Growth Assessment Form

This form should be completed by the applicant's project engineer or other design professional.[1]

Applicant Information

Applicant: Town of Salem Project No.:

Project Name: Town of Salem Wastewater System Development

Is project construction complete? ☐ Yes, date: ☑ No

Project Summary: (provide a short project summary in plain language including the location of the area the project serves)

The Town will implement construction of a public sewer collection system and treatment facility to serve areas within the former Village of Salem.

Section 1 – Screening Questions

1. Prior Approvals

1A. Has the project been previously approved for EFC financial assistance? ☐ Yes ☑ No

1B. If so, what was the project number(s) for the prior approval(s)? Project No.:

Is the scope of the project substantially the same as that which was approved? ☐ Yes ☐ No

IF THE PROJECT WAS PREVIOUSLY APPROVED BY EFC'S BOARD AND THE SCOPE OF THE PROJECT HAS NOT MATERIALLY CHANGED, THE PROJECT IS **NOT** SUBJECT TO SMART GROWTH REVIEW. SKIP TO SIGNATURE BLOCK.

2. New or Expanded Infrastructure

2A. Does the project add new wastewater collection/new water mains or a new wastewater treatment system/water treatment plant? ☑ Yes ☐ No

Note: A new infrastructure project adds wastewater collection/water mains or a wastewater treatment/water treatment plant where none existed previously

2B. Will the project result in either: ☑ Yes ☐ No

An increase of the State Pollutant Discharge Elimination System (SPDES) permitted flow capacity for an existing treatment system;

OR

An increase such that a NYSDEC water withdrawal permit will need to be obtained or modified, or result in the NYSDOH approving an increase in the capacity of the water treatment plant?

Note: An expanded infrastructure project results in an increase of the SPDES permitted flow capacity for the wastewater treatment system, or an increase of the permitted water withdrawal or the permitted flow capacity for the water treatment system.

[1] If project construction is complete and the project was not previously financed through EFC, an authorized municipal representative may complete and sign this assessment.

IF THE ANSWER IS "NO" TO BOTH "2A" and "2B" ON THE PREVIOUS PAGE, THE PROJECT IS NOT SUBJECT TO FURTHER SMART GROWTH REVIEW. SKIP TO SIGNATURE BLOCK.

3. Court or Administrative Consent Orders

3A. Is the project expressly required by a court or administrative consent order? ☐ Yes ☑ No

3B. If so, have you previously submitted the order to NYS EFC or DOH? If not, please attach. ☐ Yes ☐ No

Section 2 – Additional Information Needed for Relevant Smart Growth Criteria

EFC has determined that the following smart growth criteria are relevant for EFC-funded projects and that projects must meet each of these criteria to the extent practicable:

1. Uses or Improves Existing Infrastructure

1A. Does the project use or improve existing infrastructure? ☐ Yes ☑ No

Please describe:

The project will create new wastewater infrastructure system where one did not previously exist.

2. Serves a Municipal Center

Projects must serve an area in either 2A, 2B or 2C to the extent practicable.

2A. Does the project serve an area **limited** to one or more of the following municipal centers?

i. A City or incorporated Village	☐Yes ☑No
ii. A central business district	☑Yes ☐No
iii. A main street	☑Yes ☐No
iv. A downtown area	☑Yes ☐No
v. A Brownfield Opportunity Area (for more information, go to www.dos.ny.gov & search "Brownfield")	☐Yes ☑No
vi. A downtown area of a Local Waterfront Revitalization Program Area (for more information, go to www.dos.ny.gov and search "Waterfront Revitalization")	☐Yes ☑No
vii. An area of transit-oriented development	☐Yes ☑No
viii. An Environmental Justice Area (for more information, go to www.dec.ny.gov/public/899.html)	☐Yes ☑No
ix. A Hardship/Poverty Area ***Note: Projects that primarily serve census tracts and block numbering areas with a poverty rate of at least twenty percent according to the latest census data***	☑Yes ☐No

Please describe all selections:

2B. If the project serves an area located outside of a municipal center, does it serve an area located adjacent to a municipal center which has clearly defined borders, designated for concentrated development in a municipal or regional comprehensive plan and exhibit strong land use, transportation, infrastructure and economic connections to an existing municipal center? ☐Yes ☑No

Please describe:

2C. If the project is not located in a municipal center as defined above, is the area designated by a comprehensive plan and identified in zoning ordinance as a future municipal center? ☐Yes ☑No

Please describe and reference applicable plans:

3. Resiliency Criteria

3A. Was there consideration of future physical climate risk due to sea-level rise, storm surge, and/or flooding during the planning of this project? ☑Yes ☐No

Please describe:

Signature Block: By entering your name in the box below, you agree that you are authorized to act on behalf of the applicant and that the information contained in this Smart Growth Assessment is true, correct and complete to the best of your knowledge and belief.

Applicant: Town of Salem	Phone Number: 518-452-1290
Kevin Schwenzfeier, Planner	
(Name & Title of Project Engineer or Design Professional or Authorized Municipal Representative)	
	09/11/20
(Signature)	(Date)

APPENDIX K: ENGINEERING REPORT CERTIFICATION

Engineering Report Certification

To Be Provided by the Professional Engineer Preparing the Report

During the preparation of this Engineering Report, I have studied and evaluated the cost and effectiveness of the processes, materials, techniques, and technologies for carrying out the proposed project or activity for which assistance is being sought from the New York State Clean Water State Revolving Fund. In my professional opinion, I have recommended for selection, to the maximum extent practicable, a project or activity that maximizes the potential for efficient water use, reuse, recapture, and conservation, and energy conservation, taking into account the cost of constructing the project or activity, the cost of operating and maintaining the project or activity over the life of the project or activity, and the cost of replacing the project and activity.

Title of Engineering Report: "Town of Salem New Municipal Sanitary Sewer System – Preliminary Engineering Report"

Date of Report: June 16, 2023

Professional Engineer's Name: Peter F. Martin, PE

Signature: 

Date: June 16, 2023