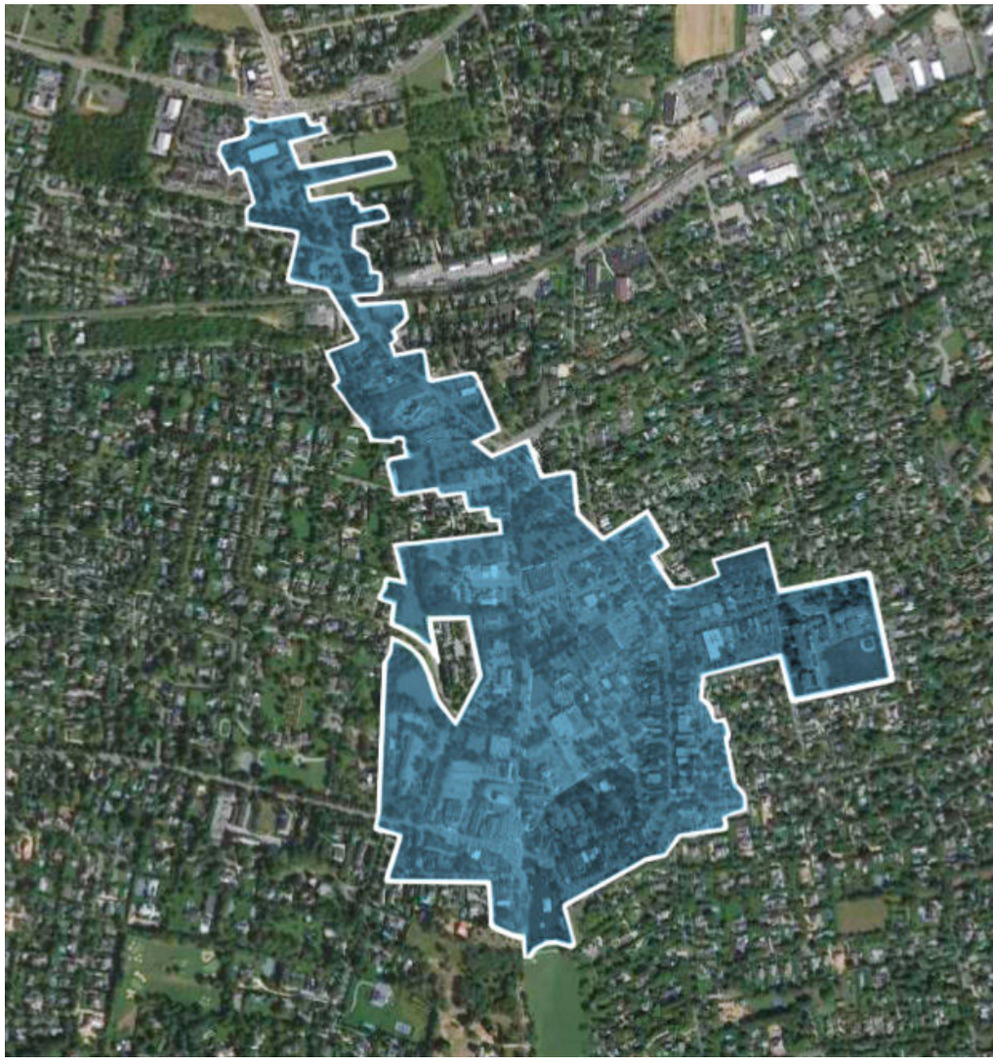

SEWER SYSTEM FOR THE VILLAGE OF SOUTHAMPTON

ENGINEERING DESIGN REPORT

D&B ENGINEERS AND ARCHITECTS

MAY 2022

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1.0 Executive Summary

The Village of Southampton intends to install a sewer system to collect, treat and dispose of sewage from the Village's downtown area. The proposed system will alleviate the environmental impact associated with the deterioration of on-site wastewater systems and will foster future economic revitalization of the area.

This report provides an overall description of the project as well an analysis of feasible alternatives available to sewer the area. Numerous studies have been completed in the recent past that document the environmental concerns; the current conditions of the existing sewer infrastructure; the proposed sewer system boundaries as well as options for wastewater treatment and disposal. However, based upon recent discussion with the Village, sewer system boundaries, and the options/locations for treatment have changed. In the development of this report applicable information from previous studies was utilized and subsequently modified based upon D&B's independent analysis of the potential alternatives to deliver an appropriate solution for sewering the area. The analysis resulted in revisions to the sewer boundaries, that focused on the inclusion of parcels that will provide the highest environmental benefits, and associated current and projected flow estimates, as well as a reassessment of viable sewer collection, treatment and disposal options.

The preferred approach for sewering the study area is utilizing a gravity type collection system for the downtown area. Flow generated in the area will be pumped (via a new pump station) to the new wastewater treatment plant at 1 Bowers Ln which is outside the Study Area. The treatment technology at the proposed wastewater plant is referred to as a Sequencing Batch Reactor biological system which will be followed by a filtration process. The resulting effluent will have a subsurface discharge field consisting of leaching pools. Originally consideration- was given to utilizing the nearby Southampton Hospital's treatment plant, however such factors as distance from the collection system, site spatial limitations that would reduce opportunities for expansion as well as issues with effluent disposal made this option less appealing for treating the sanitary sewer. Multiple sites were investigated closer to the collection system. These sites were evaluated based upon availability and each had varying issues including current ownership mandates; closeness to the collection system; parcel size including setback requirements; and site characteristics

that would favor effluent disposal. Ultimately, the vacant parcel located at 1 Bowers Lane, in the Town of Southampton was selected.

D&B's analysis focused on potential and practical wastewater systems. Our review of viable and cost-effective collection and treatment options, focused on the municipal portion of the sewer system. Quality treatment and approvable disposal methods were critical criteria in the selection process. Factored in were the utilization of treatment components that are technically proven and reliable with reasonable operational and maintenance costs. It is important to note, while our assessment considered parcel connection locations for the properties in the Study Area, a lot-by-lot assessment of the tie-in requirements and associated connection costs for each property was beyond the scope of this exercise. The proposed collection system design however will further investigate service connection points for each parcel.

The visual contamination of Lake Agawam has hampered the Village's efforts to promote preservation and conservation initiatives. This project represents a major step to promote community awareness of its needs to restore and to maintain the integrity of its local environment.

2.0 Project Background and History

The Village of Southampton is situated in the southeast corner of the Town of Southampton in Suffolk County, NY. The Village has an estimated population of 3,300 people and encompasses approximately 4,400 acres with approximately seven (7) miles of beach front.

The area proposed for the installation of sewers is characterized by high groundwater levels (in some areas less than eleven (11) feet from the ground surface) and consists mainly of commercial and multi-use properties that utilize on-site wastewater systems (cesspools) for the disposal of sewage. The cumulative impact of nitrogen and other contaminants being discharged from these subsurface disposal systems pose a real environmental and health concern and has contributed to the degradation of nearby surface waters.

The Suffolk County Department of Health Services (SCDHS) is responsible for monitoring and managing the overall water quality of Suffolk County's ground and surface waters which often means regulating development that may negatively impact water quality. The Suffolk County's Sanitary Code Article 6 limits discharges of wastewater from conventional onsite systems to 600 gallons a day/acre. Future development of the area is then constrained by these regulations.

The Village of Southampton has previously studied the feasibility of creating a new sewer system for the Village's downtown area. It has been concluded that the introduction of sanitary sewers and treatment facilities would provide the long-term solution required to address these present environmental and health concerns. Sewers would also provide positive and economic stimulus for enhancing local business opportunities.

2.1 Site Information

The proposed sewer system will include parcels within the downtown area and represent primarily commercial and multiuse properties. There is currently no municipal sewage collection system within the Village.

2.1.1 Groundwater and Floodplain

Groundwater elevations vary greatly within the project area. The depth to water in the vicinity of the business district in the south, ranges from less than 11 feet deep to 11-20 feet deep in the vicinity of Bowden Square and North Sea Road. As you travel North on North Sea

Road depth to groundwater continues to increase until it reaches approximately 31-50 feet below grade in the vicinity of the proposed wastewater treatment plant.

The relatively high groundwater table make use of on-site treatment systems problematic. This is particularly the case where groundwater is located less than 11-feet below grade, a particular concern in the vicinity of the business district. **Figure 2-1** shows the project area and the approximate groundwater depth by location.

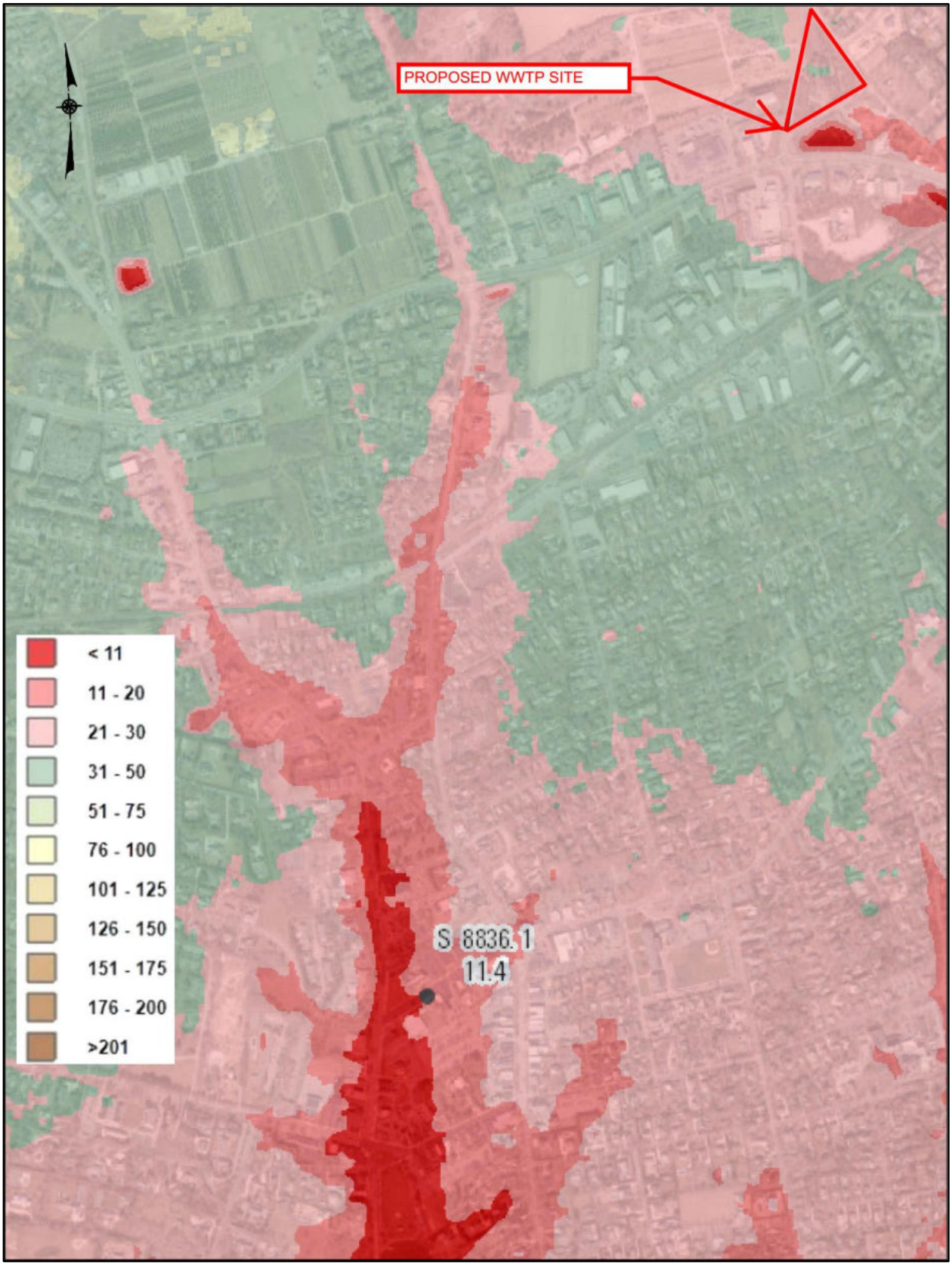

Figure 2-1 Sewer Area Groundwater Depth

Most of the project area is outside of the FEMA designated 100-year and 500-year floodplain areas; however, a small portion of the proposed sanitary piping system in the vicinity of Culver Street and Jobs Lane is within the FEMA's designated floodplain. **Figure 2-2** below indicates the FEMA Flood Insurance Rate Map. Proposed locations for both the sewage pump station and wastewater treatment plant are situated beyond FEMA designated floodplain limits.

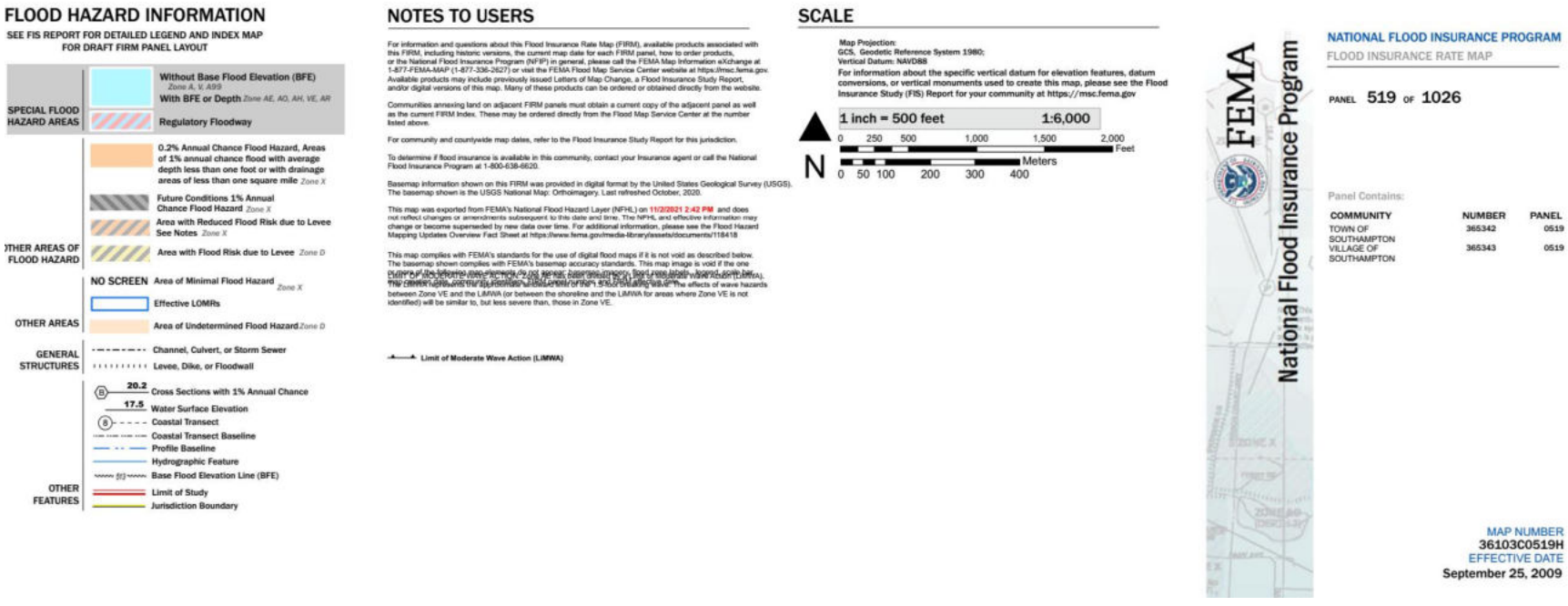

Figure 2-2 FEMA Flood Insurance Rate Map

2.1.2 Geotechnical/Soils/Topography

The surface topography of the study area ascends as you move from the southern business district to the northern region where a wastewater treatment plant is proposed to be located. The ground surface elevation in the vicinity of Agawam Park is approximately 10 feet (NAVD 88). As you continue North to the intersection of North Sea Road and Bowden Square the elevation increases to approximately 20 feet (NAVD88). The elevation continues to increase to approximately 40 feet (NAVD88) at the intersection of County Road 39 and North Sea Road, which is roughly the end of the proposed sewer system boundary. At the proposed location of the wastewater treatment plant, the elevation is approximately 40 feet (NAVD88).

No specific soil borings have been completed to date related to the proposed project area, however based upon regional data it is anticipated that the soil composition is comprised of sands, silts, and loam. **Figures 2-3** and **2-4** provide a classification of soils, in the vicinity of the proposed wastewater treatment plant and the sewer system boundaries, available from soil surveys completed by the USDA. The soil descriptions and percentages of each soil type by area can be found in **Appendix A-Soil Classifications**.

Soil borings should be undertaken during the design phase for areas where proposed facilities are to be located. At this point a geotechnical / soil investigation will be performed which will include subsurface soil information, verify groundwater elevations, percolation tests and environmental samplings as necessary.

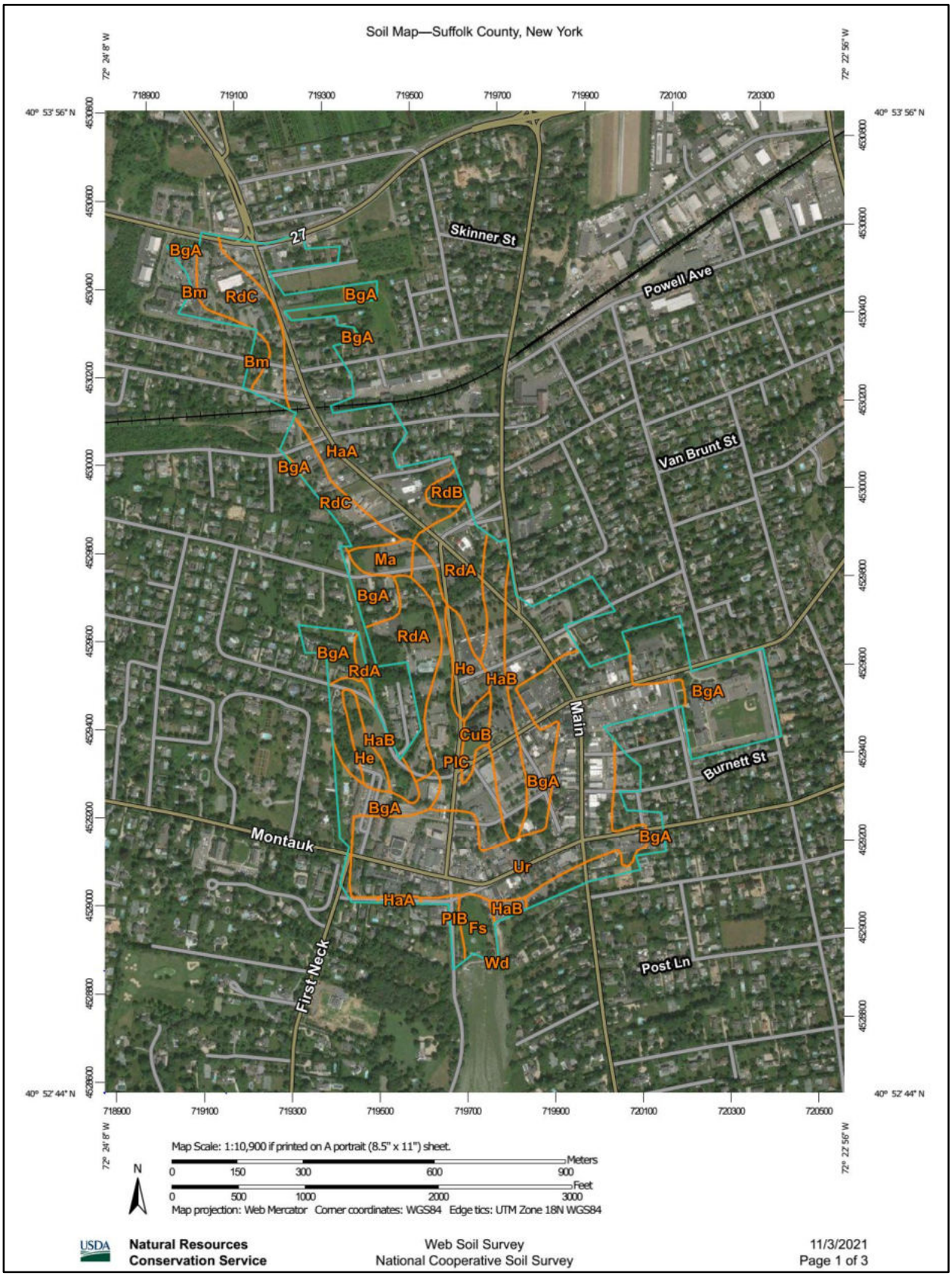

Figure 2-3 Sewer Area Soil Classification

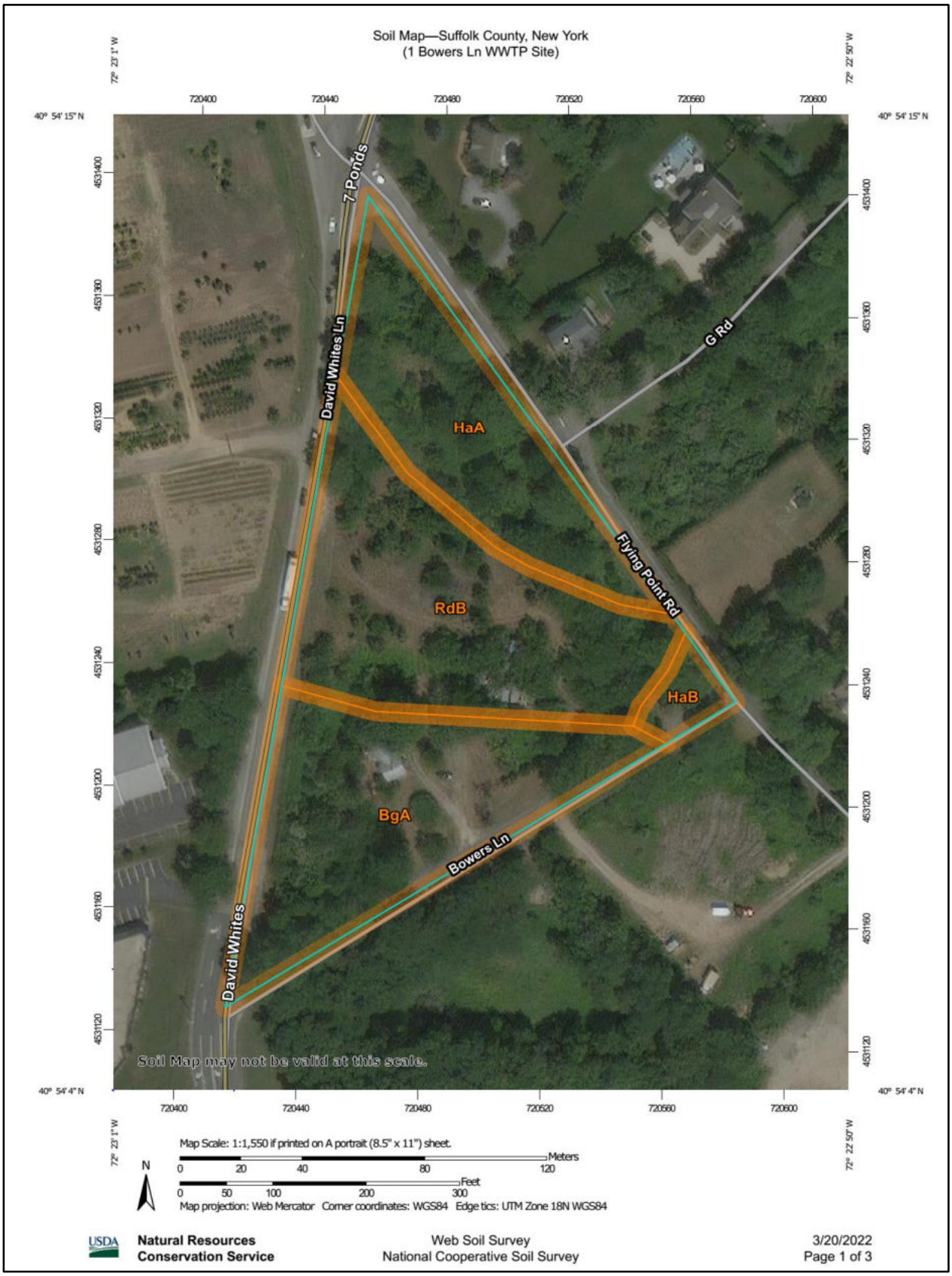

Figure 2-4 Soil Classification Wastewater Treatment Parcel

2.1.3 Environmental Resources

The proposed sewer system abuts state regulated freshwater wetlands and the buffer zone around lake Agawam. However, there will be no impact since the proposed sewer system is outside this area. There are no endangered species, rare plants or animals identified in the area according to the NYSDEC Environmental Resource Mapper.

The parcel where the wastewater treatment plant is proposed to be located is within an area identified as a Critical Environmental Area (CEA) and is situated within Town of Southampton boundaries. This CEA was designated as a Special Groundwater Protection Area (SPGA) by the Long Island Regional Planning office, the reason for the designation is to protect groundwater from potential contaminants. This designation however does not carry restrictions on use. The proposed project is not anticipated to have negative impacts to groundwater since effluent treatment levels will comply with the SCDHS parameters for subsurface discharge.

2.2 Ownership and Service Area

The proposed sewer system is located within the Village of Southampton and includes 254 parcels. The area extends north from Lake Agawam along Windmill Ln, Main St and North Sea Road to County Road 39, and east-west on Nugent St/ Hampton Rd, Jobs Ln and Hill Street. The parcels associated with the sewer system area are contiguous and can be seen in **Figure 2-5**. Most of the parcels of the proposed sewer system are zoned commercial, with the inclusion of only a few residential parcels that directly abut roadways where sewers are proposed to be installed.

The required proposed pump station which is part of the sewage conveyance system will be located at 55 Windmill Ln, a parcel owned by Verizon. This is situated at the corner of Windmill Ln and Coopers Farm Rd. The wastewater treatment plant proposed site is in the Town of Southampton on a privately owned parcel to be acquire by the Community Preservation Fund (CPF), located northeast of the proposed sewer system. The parcel, 1 Bowers Ln, comprises approximately 3.9 acres and is bound by Bowers Ln, David Whites Ln and Flying Point Rd.

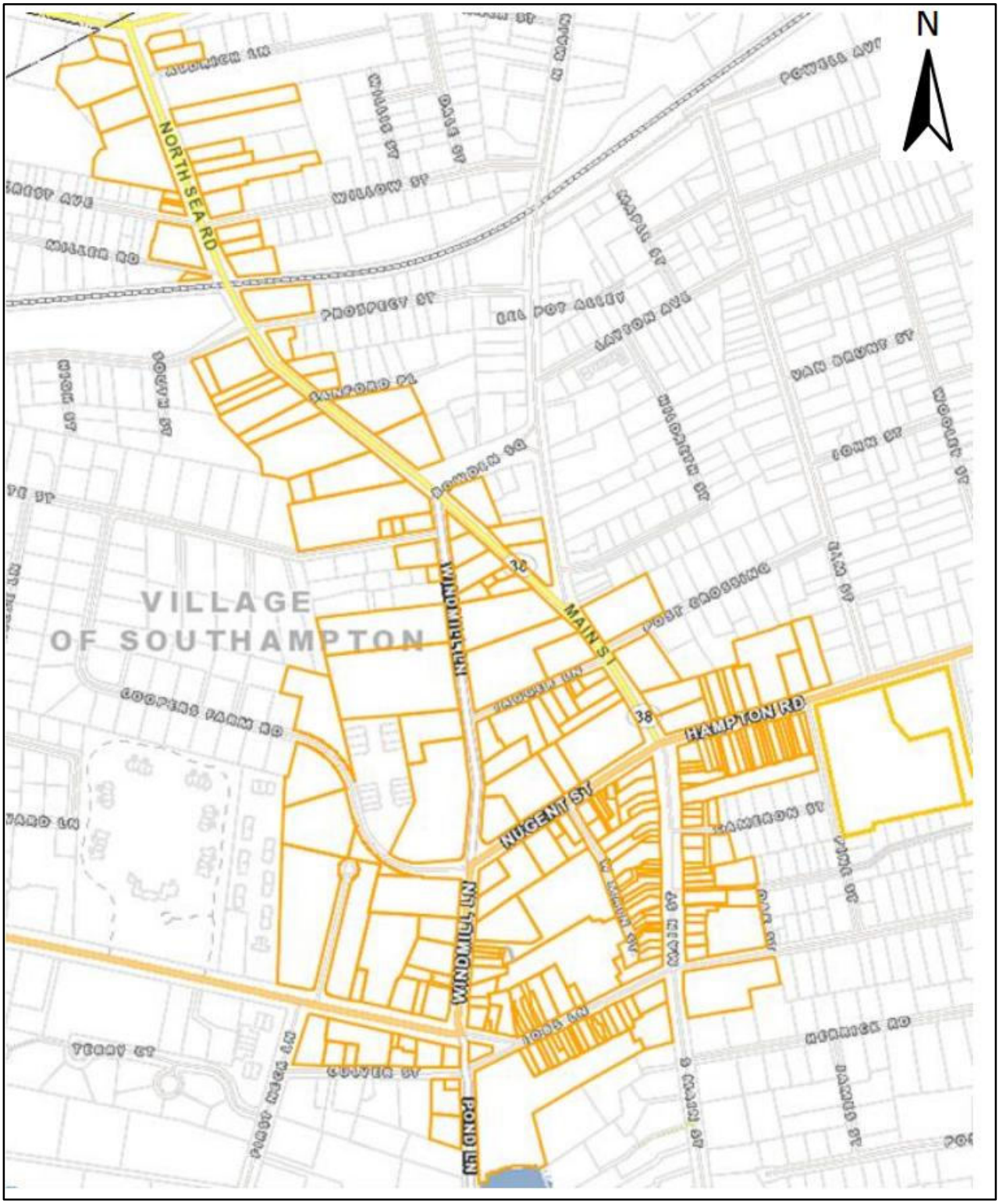

Figure 2-5 Sewer System Area

2.2.1 Population Trends and Growth

The Village has experienced one of the fastest growth rates in its recent history, according to the 2020 Census, with an increase of 46.3% or 1,441 new residents added within the last decade. With this surge in population comes the demand for increased services that must be provided by the Village and constitutes one of the main reasons to address infrastructure improvements including the creation of a sanitary sewer system. The need for a new sewer system in the downtown area is also driven by the need to satisfy the commercial demands originated by seasonal increases in summer population from a combination of seasonal residents and regional tourism, which are the economic base of the community.

While the Village's future development plans focuses on the preservation of the historic characteristic of the Village Center it also recognizes the need for mixed commercial opportunities that address both businesses and housing needs. Some of the plan development proposed for the area includes increased density office and residential parcels, two-story and three-story additions as well as increased wet uses (restaurants) establishments.

2.3 Existing Facilities and Present Conditions

Currently the area has no centralized sewer collection system. Sewage treatment and disposal consists of on-site sewerage systems situated at each parcel. These systems consist of cesspools that provide solid/liquid separation and leaching and/or septic tanks connected to leaching pipes to allow clarified effluent to seep into the ground.

The nearest area sewage treatment plant (STP) is privately owned and is operated by the Stony Brook Southampton Hospital, located at 212 Old Town Road. The design capacity of this STP is 105,000 gallons per day (gpd) but based upon recent records receives an average daily flow of approximately 40,000 gpd. The option of sending flow to the Stony Brook Southampton Hospital was considered in the Sewering Recommendations Report. However, several factors made this option less desirable, among those include:

- The need to provide an overall upgrade of the plant to bring its operations into compliance
- Insufficient effluent disposal capacity available

- Insufficient capacity to accept the full flow proposed for the new sewer system. Would require a separate treatment plant and pump station to be built to convey and treat the excess flow.
- Additional maintenance costs and labor logistics associated with having two (2) treatment plants

2.3.1 Design Flows and Loads

This section describes the process for estimating the sewage flow anticipated for the service area. Those values include existing flow and projected/future flow (based on anticipated development). Projected peak flows, which represent maximum hourly variations, are then calculated, and used as required by engineering design standards on different elements of design. This practice ensures that the sewer system is designed with sufficient capacity to convey and treat the anticipated flow.

Existing and projected wastewater flows were calculated based on current zoning laws and occupancy limitations, identified using GIS generated mapping data available from both Suffolk County and the Town of Southampton. The technical basis for determining both existing and future projected flow was the *Suffolk County Department of Health Services (SCDHS) Standards for Approval of Plans and Construction for Sewerage Disposal Systems for Other Than Single Family Residences dated 7/21/20 and the Suffolk County Department of Health Services (SCDHS) Standards for Approval of Plans and Construction for Sewerage Disposal Systems for Single Family Residences dated 12/29/17* (SCDHS Standards).

Wastewater flow calculations for the sewer system were divided into two (2) categories: Commercial and Residential. Below is the basis for the calculations completed on each of these categories.

Commercial

Commercial flow is generated by applying SCDHS Standards to each structure's specific utilization. The SCDHS Standards define the variables utilized for defining each commercial property type and the approximate current flow expected based upon the size of the lot; structure use, density load, kitchen/gray load, and hydraulic load.

- **Structure Use** will vary depending on zoning and intended service of each property. The zoning assigned to the property confines the structure use of the lot to specific

criterion. Structure use determines the density load to be utilized from the SCDHS Standards.

- **Density Load** defines the amount of sewage expected to be generated from the property. The density load is dependent on the structure use and is generally based on gallons per day per gross area. However, depending on the use of the structure, the amount of sewage was also assessed using the estimated occupants per property. Examples of this type of assessment include restaurants, fire houses, libraries, and churches. The number of occupants obtained in this analysis was estimated based on the physical area associated with each property. Density load by structure use is defined by the SCDHS Standards.
- **Kitchen/Gray Load** defines the volume of sewage discharged from food preparation and service areas, or other gray water uses from other construction projects (excluding residential uses such as, but not limited to, condominiums, two family residences, multi-family housing) expressed in terms of gallons per day per applicable unit, which has been omitted from the density load.
- **Hydraulic Load** defines the sum of the density load and kitchen/gray load for a particular use of building on a parcel expressed in terms of gallons per day per applicable unit.

Residential

Residential flow is also evaluated based on the SCDHS Standards. A flow of 300 gallons per day (gpd) was used per single family residence and 225 gpd for each apartment unit (defined as a housing unit between 601 and 1200 sf) based on SCDHS Standards. **Figure 2-6** presents the parcels within the project area and their Suffolk County land use classification.

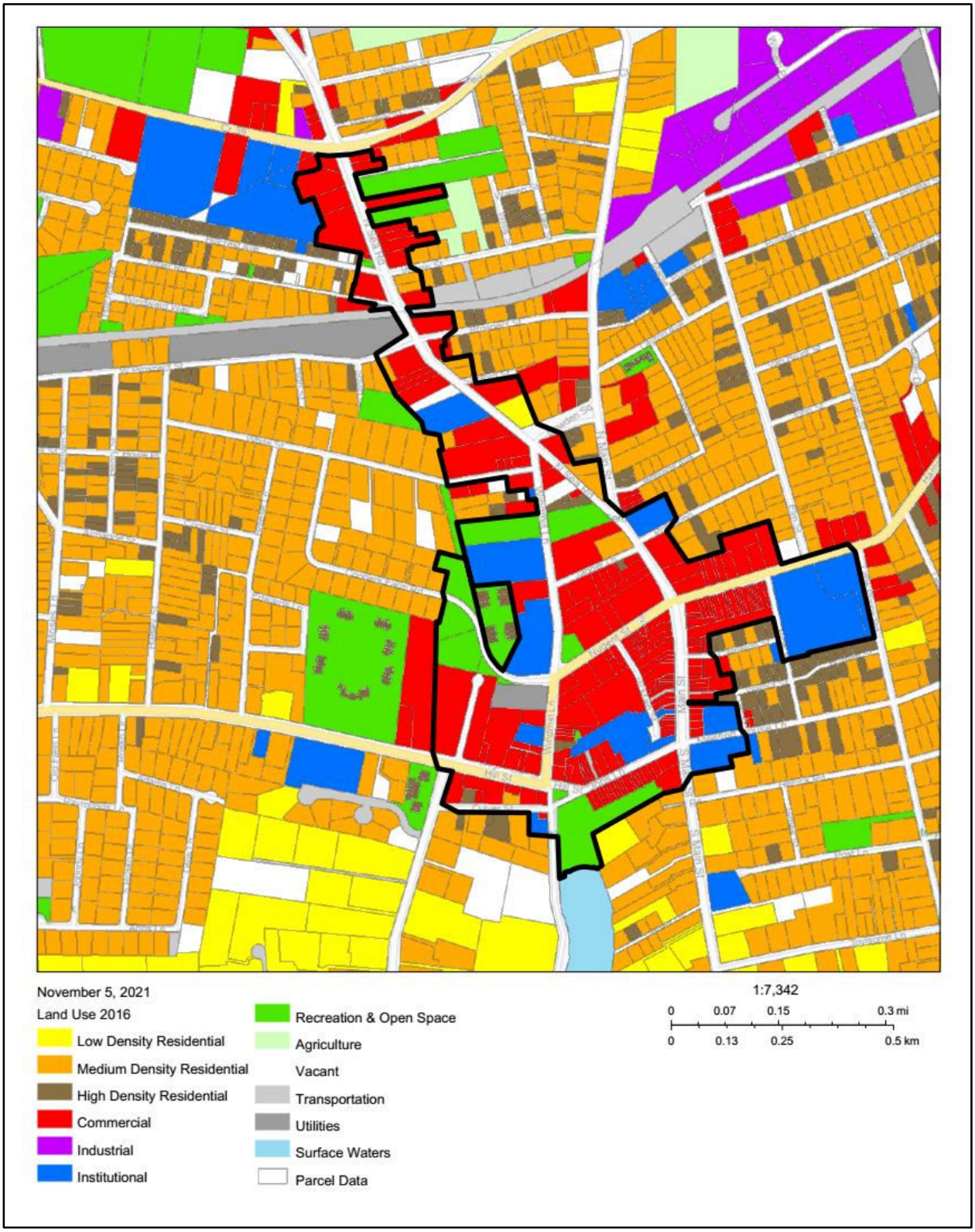

Figure 2-6 Land Use Sewer System Area

Property Type Breakdown

The Village of Southampton uses the *New York State Office of Real Property Services – Property Type Classification and Ownership Code Assessor's Manual dated 9/01/2006* to classify the different property types within the Village. Property type classification codes are used to describe the primary use of each parcel. The system of classification consists of numeric codes in nine categories as seen in **Table 2-1** below.

Table 2-1 - Property Type Classification Codes*

Category	Description
100 - Agricultural	Property used for the production of crops or livestock.
200 - Residential	Property used for human habitation. Living accommodations such as hotels, motels, and apartments are in the Commercial category - 400.
300 - Vacant Land	Property that is not in use, is in temporary use, or lacks permanent improvement.
400 - Commercial	Property used for the sale of goods and/or services.
500 - Recreation & Entertainment	Property used by groups for recreation, amusement, or entertainment.
600 - Community Services	Property used for the wellbeing of the community.
700 - Industrial	Property used for the production and fabrication of durable and nondurable man-made goods.
800 - Public Services	Property used to provide services to the general public
900 - Wild, Forested Conservation Lands & Public Parks	Reforested lands, preserves, and private hunting and fishing clubs.
N/A	Property Description is unavailable.
*The property type classification codes were derived from the New York State Office of Real Property Services – Property Type Classification and Ownership Code Assessor's Manual dated 9/01/2006, located in Southampton's GIS.	

Existing Flow

The existing average daily flow for the parcels within the proposed sewer district is estimated to be 158,014 gpd. This is based on SCDHS design criteria and is representative of the current land use for each property. The breakdown can be found below in **Table 2-2**

Table 2-2 - Existing Flow Summary

Property Type	Number of Parcels	Existing Flow (gpd)
100 - Agricultural	0	0
200 - Residential	14	4,878
300 - Vacant Land	9	0
400 - Commercial	192	134,495
500 - Recreation & Entertainment	5	5,664
600 - Community Services	26	12,557
700 - Industrial	0	0
800 - Public Services	2	420
900 - Wild, Forested Conservation Lands & Public Parks	1	0
N/A*	5	0
Total	**254**	**158,014**

A total of five parcels did not have a property type classification (N/A). These parcels contribute no flow to the system, they are mainly walkways or connecting alleys.

Future Flow Projection

Projected future flows were calculated based on the Village of Southampton's Sewer Task Force Teams anticipated building use changes for the Sewer District. D&B walked the defined sewer district area alongside the Village of Southampton's Sewer Task Force and discussed all possible revisions to the future flow projection to ensure that the Village needs were being accommodated. The changes proposed remained consistent with the Village's *Center Vision Plan.* It is also important to note that no modifications to the existing zoning were made to accommodate these changes. See **Table 2-3** below for the Sewer Task Force Team's recommended building use changes.

Table 2-3 - Building Use Changes*

Road	Sewer Task Force Team Recommendation
North Sea Road	Increase Density (Office and Residential)
Main Street	No Projected Change in Density
Nugent Street	Anticipated for 2 & 3 story buildings (1st floor commercial and 1 or 2 stories of residential), more wet uses
Windmill Street	Anticipated for 2 & 3 story buildings (1st floor commercial and 1 or 2 stories of residential), more wet uses
Jagger Street	Increase Density all 2 stories of residential
Jobs Lane	More wet uses
Hampton Road	North side no change, South side more wet uses
Culver Street	No Change
Hill Street	South side no change, North side increase density anticipated for 2 & 3 story buildings (1st floor commercial and 1 or 2 stories of residential)
Coopers Farm Road	No Change
Cameron Street	No Change
Meeting House Lane	No Change

*The purpose of this table is to categorize most building use changes for each street. Not every parcel on each street received the same recommendation for projected build out.

To accommodate the building use changes, additional commercial and residential flow was allocated, and this increased the projected flow within the sewer district. Flow anticipated from the commercial building use changes was calculated on a case-by-case basis using SCDHS Standards, while flow anticipated for building use changes that included additional residential stories was calculated using 300 gpd per projected residential unit. As displayed in **Table 2-4** below, the average daily projected flow was expanded to 198,330 gpd. The breakdown of the flow based upon property type is illustrated in **Table 2-4** below and is further elaborated on within the following paragraphs.

Table 2-4 - Projected Flow Summary

Property Type	Number of Parcels	Projected Residential Units	Projected Flow (gpd)
100 - Agricultural	0	0	0
200 - Residential	14	0	4,878
300 - Vacant Land	9	6	5,542
400 - Commercial	192	47	167,079
500 - Recreation & Entertainment	5	3	6,564
600 - Community Services	26	2	13,247
700 - Industrial	0	0	0
800 - Public Services	2	2	1,020
900 - Wild, Forested Conservation Lands & Public Parks	1	0	0
N/A	5	0	0
Total	**254**	**60**	**198,330**

Projected Peak Flow

Peak flow calculations are required to appropriately size the wastewater collection and pumping systems, since such data will reflect the largest volume of flow that can be expected to be transmitted within the system during a one-hour period. Note, in accordance with the *Recommended Standards for Wastewater Facilities Policies for the Design, Review, and Approval of Plans and Specifications for Wastewater Collection and Treatment Facilities, dated 2014* (a.k.a. "10 State Standards" or "GLUMRB"), peaking factors are only applied to "residential" portion of the overall flow.

Sewage from residential properties is projected using a constant flow rate per property. Additionally, a peaking factor is applied to residential flows in accordance with 10-State Standards recommendations. The following formula from 10-State Standards was used to find the design peak hourly flow factor, where P is the population in thousands and Q is sewage flow:

$$\frac{Q\ Peak\ Hourly}{Q\ Design\ Ave} = \frac{18 + \sqrt{P}}{4 + \sqrt{P}}$$

The population utilized in this analysis is based on the projected flow calculations. The population breakdown accounts for 3.5 people per single family residential home, 3 people per apartment unit, and 3.5 people per additional residential story, resulting in an estimated total population of 519 people for the sewer area. Based on the total population, a peaking factor of 3.97 was used. Applying this peaking factor to the projected flow results in the projected peak flow for the sewer district as 323,572 gpd. See **Table 2-5** and **2-6** below for the projected residential flow breakdown, total population, and projected peak flow.

Table 2-5 - Projected Residential Flow and Population

	Projected Residential Flow (gpd)	Estimated Number of People
Residential Property Types	4,800	56
Residential within other Property Types	4,800	58
Existing Apartments	14,625	195
Additional Residential Units	18,000	210
Total	42,225	519

Table 2-6 - Projected Flow and Projected Peak Flow

	Projected Flow (gpd)	Projected Peak Flow (gpd)
Residential	42,225	167,467*
Commercial	156,105	156,105
Total	198,330	323,572
*Peaking Factor only applies to Residential Flow		

For a complete analysis of current and future flow by parcel see **Appendix B**

2.4 Definition of the Problem

As explained previously, the study area is characterized by high groundwater levels (in some areas less than 11 feet from the ground surface) and consists mainly of commercial and multi-use parcels that utilize on-site wastewater systems (cesspools) for the disposal of sewage. The cumulative impact of nitrogen and other contaminants being discharged from

these subsurface disposal systems pose a real and documented environmental and health concern and has contributed to the degradation of nearby surface waters.

Lake Agawam, the nearest surface water body to the proposed sewer system, has experienced frequent harmful algal bloom (HAB) which has been documented and reported to the NYS Department of Environmental Conservation (NYSDEC) by the Stony Brook University, School of Marine and Environmental Science as well as other interested Lake Agawam stakeholders. A study completed by Stony Brook University in 2017[1] demonstrated that wastewater discharge was the largest source of nitrogen loading to Lake Agawam, and that the introduction of sewers could divert about 10,000 pounds of nitrogen from the lake annually reducing its nitrogen load by as much as fifty percent (50%).

[1] Quantifying Nitrogen Loading to from Southampton Village to Surrounding Water Bodies and Their Mitigation by Creating a Sewer District – Christopher Gobler PhD February 2017 – Stony Brook University School of Marine and Atmospheric Sciences

3.0 Alternatives Considered

Sewering of the Village Center will require the installation of a sewer collection system, and a sewage treatment and disposal system. This section includes a description of the options considered as well as the sites investigated for the installation.

3.1 Collection System

There is no existing sewer collection system in the Village, and as such, a new collection system is being proposed. Three (3) different options were considered: Low Pressure Sewer System, Gravity Sewers and a Vacuum Assisted system.

3.1.1 Low Pressure Sewers

Low pressure sewer (LPS) systems consist of a pressurized piping network designed to collect wastewater (via pumping at each individual property) which is transported to a common pressurized sewer main. Such systems use small diameter pipes, tend to be installed at shallower depths and are designed to follow the ground surface contour, thus reducing excavation and construction costs. These are especially desirable for the construction related benefits that are provided especially in areas where ground water conditions are high and on flat terrain. Each property connected to the system is provided with an individual (below ground) storage tank equipped with a submerged grinder pump. Each building's sanitary flow is conveyed via gravity from the building waste line to the storage tank generally located within the private property's limits, at which point the grinder pump grinds down large solids and pumps the sewage to the pressurized sewer main. Each grinder pump unit is connected to the municipal low pressure main (placed within adjacent streets) via a lateral assembly that consists of a 1 ¼ or 1 ½ inch piping and an isolation valve assembly that includes a shutoff and check valve.

System Layout and Design Standards

The projected flow from each parcel was used to determine the capacity of the grinder units required to handle the flow at each location. The estimated flow from each of the units and number of units operating based on probability was then used to size the municipal pressure main needed to convey the flow.

An analysis was completed utilizing data from a low pressure system manufacturer (E/One), which currently supplies such units for Suffolk County Department of Public Work (SCDPW) installations throughout its jurisdiction. This manufacturer utilizes s the grinder pump assembly being proposed at all their project locations, varying only in the number of pumps and/or size of the storage basin which is contingent of site-specific flow conditions. The pump utilizes a semi-positive displacement design that is coupled to a 1.0 HP motor capable of developing a range in pressure between 0 and 80 PSI and flows between 8 to 14 GPM (**Figure 3.1**). This low variability in flow over the entire system range of operating pressures allows for flexibility in the design of the system.

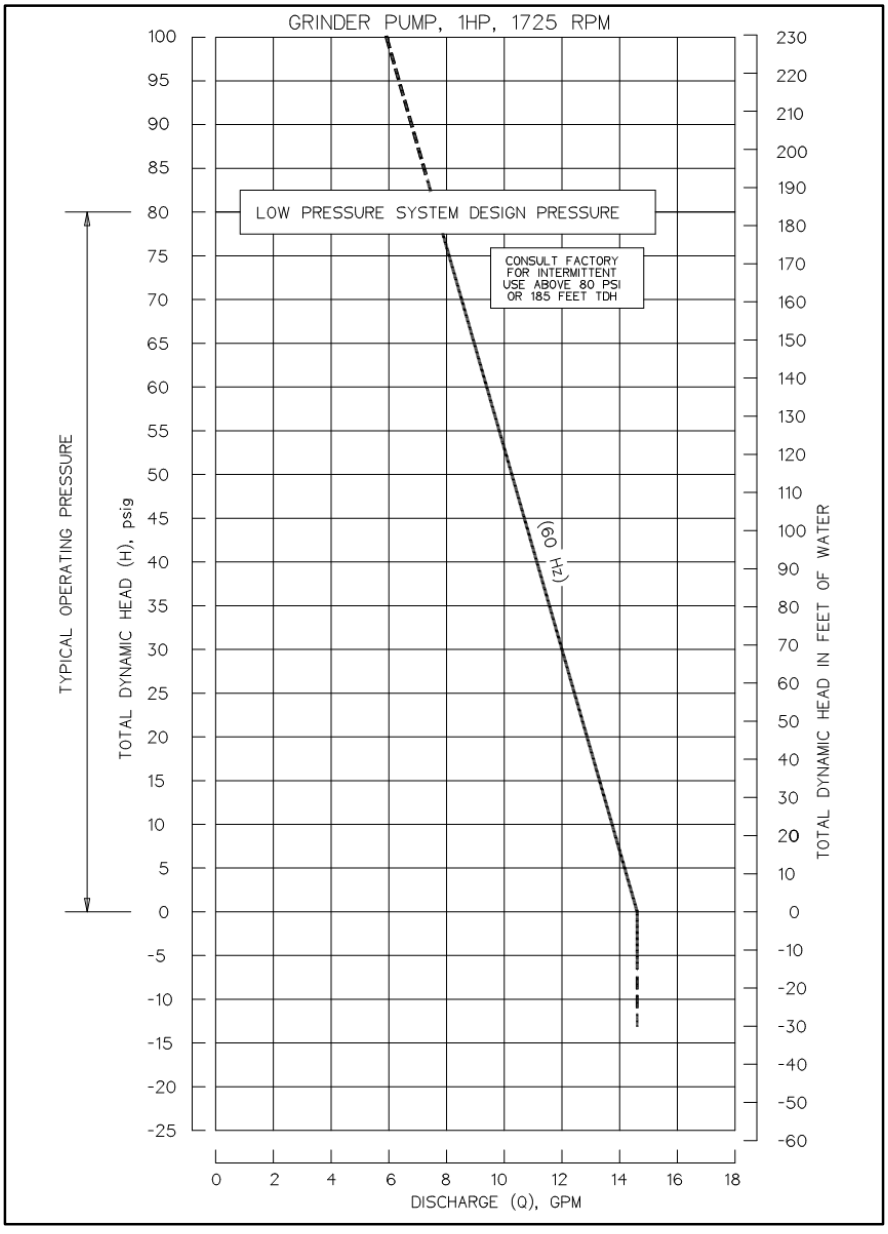

Figure 3-1 Grinder Pump Curve

The characteristics of each grinder pump unit (pumps and basin sizes) was identified for each parcel based on the projected flow. The majority of the units selected consist of a single pump with either a 70-gallon basin (123 units) or a 150-gallon basin (31 units), other units in the system include two pump units (43 units) and four pump units (12 units). The topography was evaluated to check for any abrupt changes in grade/elevation which could impact the positioning of the piping and the overall piping system alignment was designed considering the shortest routes, least changes in direction and avoiding loops that cause an uneven distribution of flow. Based on the flow and piping layout, the system proposed will consist of pipe sizes ranging from two to four inches in diameter. High density polyethylene (HDPE) is the piping material considered for this application. Additional details in the pre-design of the system including lateral assemblies, clean outs and air release valves are included in **Appendix C**

The system will also require a pumping station to bring the collected flow, via the low pressure system, to the proposed sewage treatment plant. This pump station will have the same characteristics as the one proposed in the gravity system alternative described in section 3.1.2 but with an estimated wet well depth of 20 ft.

3.1.2 Gravity System

Gravity sewers are the most widely used and considered the most reliable method for collecting and conveying wastewater. These systems utilize a network of sanitary sewer pipes installed underground to collect the wastewater from connected properties. Pipes are installed such that flow is conveyed naturally to a wastewater treatment facility. Often when the pipe depths are dropping and groundwater conditions are being experienced, a pumping station will be introduced to elevate the flow so that the next lengths of pipe can be placed at a shallower depth. The proposed layout considered for the Village of Southampton Sewer System, for example, utilizes a pump station to convey flow to the future treatment plant site located at a substantially higher elevation than the proposed sewer area.

System Layout and Design Standards

The conceptual layout was developed based on projected future flows; topographic information; assumptions as to the invert depths of existing building waste lines; and the utilization of “10 State Standards”. In addition, to meet Suffolk County requirements, the design follows the Suffolk County Department of Health Services (SCDHS) standards for the

design of gravity sewers, including minimum flow velocity, slope, pipe cover and number and location of manholes. Lateral connections from the sewer main to each parcel are not shown but are proposed to be 4-inch in diameter and assumed to be an average length of 35 feet in length for the purpose of estimating construction costs. The lateral pipe routing and depth will need to be determined during detailed design once additional information is collected from the area. This would include utility, topographic, and visual survey information, on-site systems, and depth of existing building waste-lines.

The gravity sewer layout will follow the natural ground contours within the proposed sewer district and the flow pattern will be generally from North to South. The descending sewers will discharge to the proposed pump station to be located at 55 Windmill Lane, which is positioned at a southerly point within the sewer area. In the north section of the proposed sewer system, gravity mains are proposed to run along North Sea Road, Windmill Lane, and Main Street. On the south section of the district, sewers will be routed in the back of the buildings to minimize disruption to roadways and local businesses, reduce the distance between the existing building waste line piping and the proposed sewer main, and avoid the need for internal building plumbing modifications. Refer to **Figure 3-2** below for a map that depicts the proposed gravity system layout and **Appendix D** for conceptual design calculations.

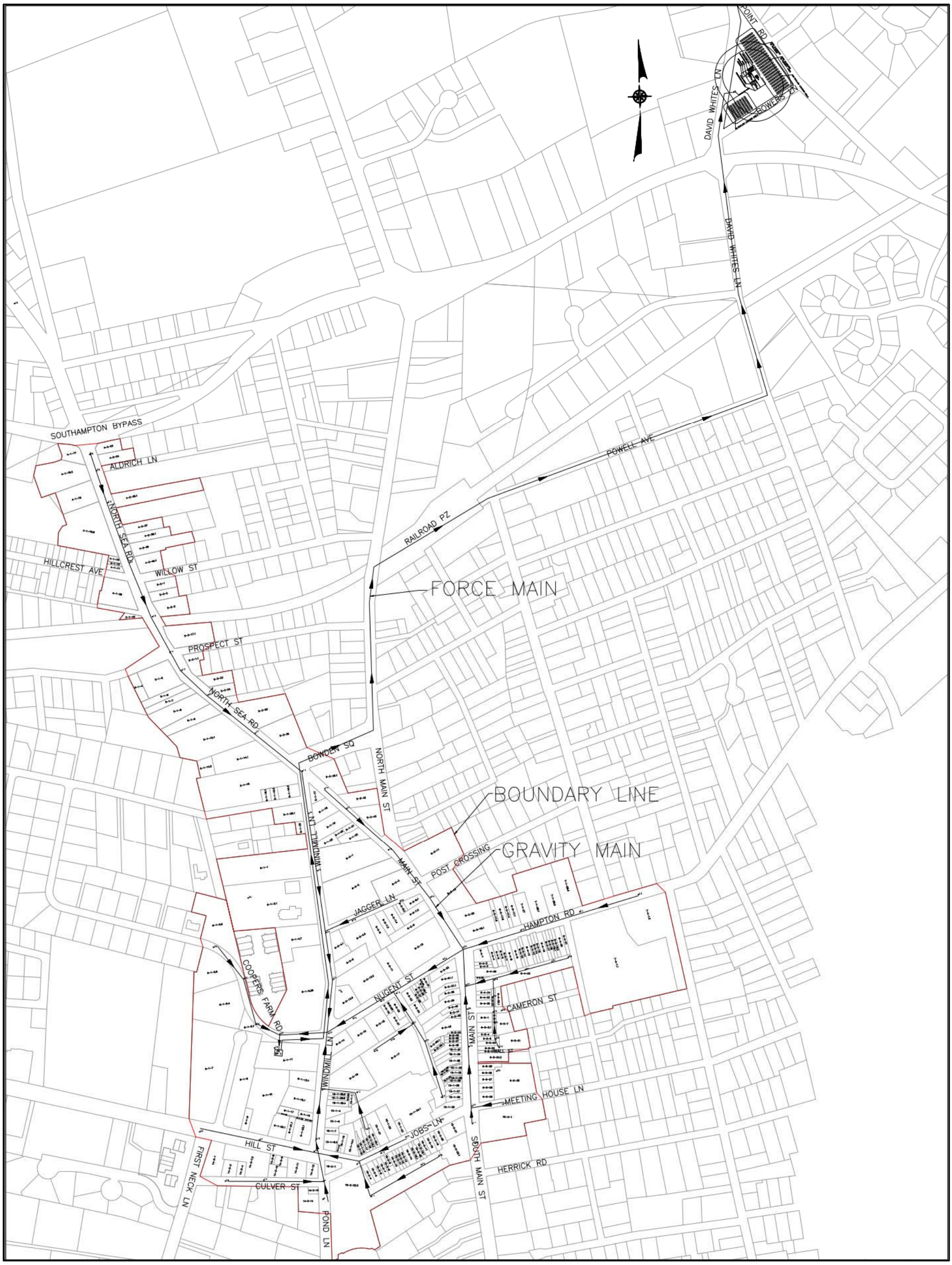

Figure 3-2 Conceptual Piping Layout

Pumping Station

A below grade pumping station was selected to pump flow from the collection system to the wastewater treatment plant. The pumping station will include a below grade wet well with submersible pumps and an above grade building to house electrical and control equipment, odor control and an emergency generator.

Multiple sites were considered for the location of the pumping station. Site selection included consideration for size, location with respect to the sewer collection system, ownership, and characteristics of the site. Following are the parameters used in identifying potential locations and subsequent selection of a parcel:

- An area of approximately 50 ft by 50 ft
- Preferably a lot owned by the Village
- Located at the low point of the system
- Situated outside of FEMA flood zones
- Deeper groundwater elevation

Four (4) locations were identified and evaluated in the Sewering Recommendations Report with a final recommendation to situate the pumping station at 55 Windmill Ln. Although this parcel is not owned by the Village, the parcel satisfies the identified technical parameters. More specifically, the elevation and location of this site within the collection system would facilitate a gravity collection option while maintaining the shallowest wet well among all sites investigated. The depth of the pumping station wet well is an important factor as this will impact construction costs and operation and maintenance of the facility.

The pumping station wet well was sized per SCDHS and the Suffolk County Department of Public Works standards. The size of the wet well's effective volume was determined considering the maximum time it would take to fill to avoid septicity (30 minutes at average flow as per 10-State Standards) and minimum volume to allow for proper operation of the pumps (maximum of 10 starts per hour as recommended by the manufacturer). The required depth for the pumping station was established based on a series of factors, including, setting the maximum water elevation below the invert of the incoming gravity pipe, providing

enough submergence to the pump as well as providing adequate effective volume to satisfy the requirements described previously. The result was a 30-ft deep pumping station.

The pumps were sized based on the projected peak flow estimated to be 225 gpm. The force main was sized for a velocity occurring under peak flow conditions greater than 2 fps and less than 8 fps. Velocity in both a 4-inch pipe and a 6-inch pipe will fall between this range (5.7 fps and 2.6 fps respectively); however, the larger 6-inch pipe was selected to reduce head losses and provide greater opportunities when selecting an appropriate pump - size/model. The system curve and the pump curve for the selected non-clog submersible pump NP 3153, 3-inch discharge diameter with a 17 horsepower is shown in **Figure 3-3** below.

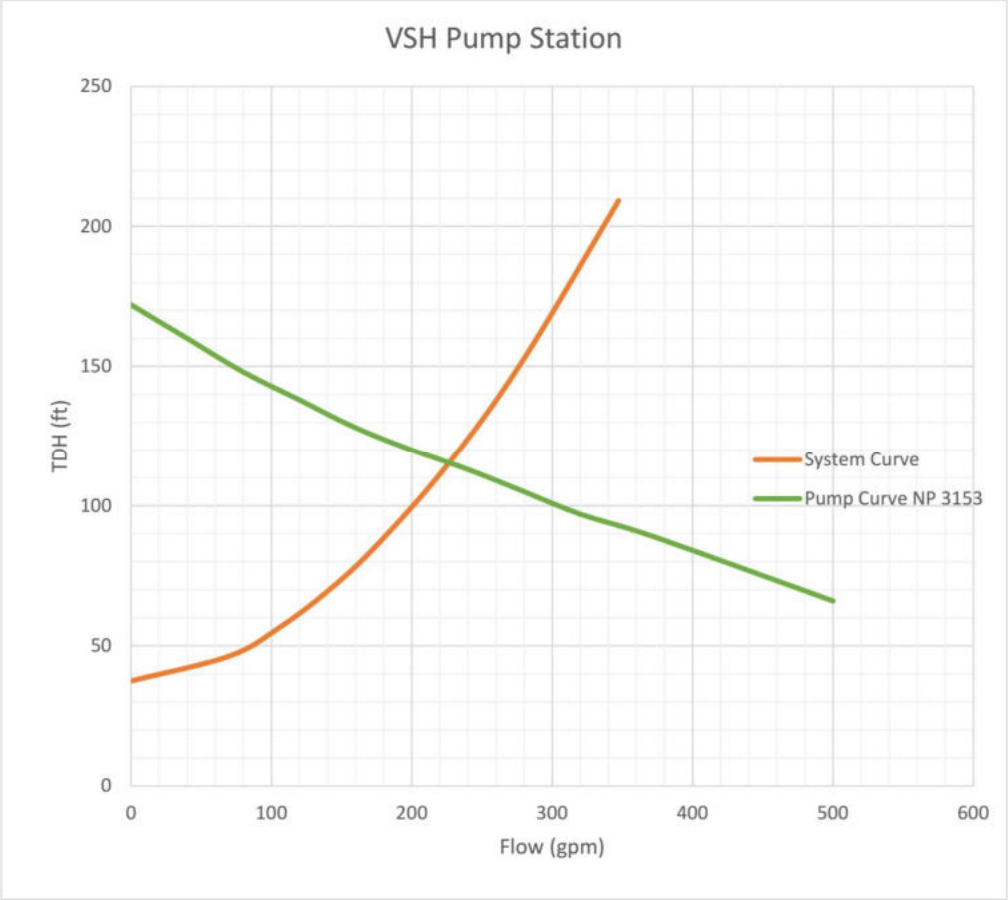

Figure 3-3 VSH Pumping Station Curve

Environmental Impacts and Mitigation Measures

Gravity sewers will be located within roadway corridors traversing developed areas and positioned either within the road or the adjacent municipal rights of way. The installation of the sewer main will have an impact on traffic, and most likely require trench dewatering due to the depth of the proposed installation and the elevation of the area groundwater. Dewatering may be limited by installing the pipe using horizontal directional drilling (HDD) techniques in lieu of traditional open cut trench methodology. This option will be considered during detailed design. Construction will be limited to off-season periods to minimize impacts on residents, businesses, and visitors.

3.1.3 Vacuum Assisted Sanitary System

Previously, Cameron Engineering & Associates, LLP completed a report titled "Vacuum Sewering of the Commercial District" dated September 2005, which was presented to the Village of Southampton recommending the use of vacuum sewer systems, an alternate to a traditional gravity system. The report presents this alternative system and elaborates on the specialized requirements for its operation. A vacuum assisted system would require a centralized vacuum/pump station which was proposed to be in the public parking lot adjacent to the Parrish Museum property. This proposed system was reviewed by the Village of Southampton Sewer Task Force, and it was determined that this system was not a viable option for the community. As such this system was not considered by D&B.

3.1.4 Hybrid System

Another option that is worth considering during the Design Phase is the utilization of a hybrid system that would primarily be a gravity sewer system that incorporates low pressure sewer elements where service by gravity may be found to be physically and/or financially infeasible. Utilizing low pressure sewer in lieu of gravity lines, particularly in low lying areas, could potentially reduce the installation depth of the gravity piping as well as the pumping station. Any opportunity to elevate the gravity system piping would be positive and could result in substantial cost savings. However, such options can only be speculated at this point and any significant modifications would require supporting field data/investigations. At this time, it is more prudent to base the conceptual design on a viable option and consider modifications where feasible to achieve cost saving as the design is being developed.

3.2 Wastewater Treatment

Raw sewage generated and collected from the proposed sewer district will require treatment prior to disposal. The options considered included conveying the flow to a newly constructed wastewater treatment facility or to direct the flow and treat it at the existing Southampton Hospital Sewage Treatment Plant (SH STP). The following sections will provide information related to each of these alternatives.

3.2.1 Southampton Hospital Sewage Treatment Plant

The SH STP plant was considered as an option to treat the sewer collected from the proposed sewer district. The plant is located east of the proposed sewer district boundaries. The plant is situated within the Town of Southampton, on Old Town Road, approximately 1 mile from the proposed pumping station. The rated capacity of the SH STP is 105,000 GPD per County records (NYSPDES permit No. NY0065374). The plant provides tertiary treatment, utilizing rotating biological contactors and denitrification filters. Treated flow is discharged to on-site subsurface leaching pools situated below the parking lot.

Figure 3-4 Rotating Biological Contactor SH STP

The plant, best upon recent information, treats on average 40,000 GPD and has an available excess capacity of 65,000 GPD. The excess capacity from the SH STP will only provide treatment for a portion of the district's flow. Early consideration was given to upgrading the plant to increase its capacity. A study completed previously[2] concluded that the introduction of membrane bioreactor treatment units could increase the capacity of the plant to 200,000 gpd. However, the plant site has insufficient space for additional leaching basins, required for the disposal of the treated effluent.

On September 2, 2021, the D&B team visited the SH STP. The plant was found to be running satisfactorily under its current loading conditions, and there were no reports reviewed that indicated major issues with the equipment; however, some items were noted that will require corrective action if the use of the plant is to be considered as a future option. As per SCDHS guidance, sewage treatment plant process units that are enclosed within a building that possesses adequate ventilation and odor control, must be positioned such that a separation of at least 150 feet is maintained with site property lines. However, the SH STP is located approximately 100 ft to the east and 80 ft to the south of property lines and the process building has no odor control. In addition, the SCDHS also requires the location of leaching pools to be easily accessible for maintenance and/or replacement. The exact placement, size and depth of the existing leaching pools is unknown, as they are located under the parking lot with no direct access. These issues will need to be addressed and/or a variance requested from the SCHDS prior to further consideration of utilizing this plant as a feasible treatment option.

3.2.2 New Sewage Treatment Facility and Treatment Systems

A newly constructed sewage treatment facility to treat the projected flow from the proposed sewer area was also considered. Several sites were investigated as options for locating the plant. The size of the parcel, the availability and proximity to the area were key factors considered in the site selection process.

The appropriateness of a site requires consideration of topography, soil and groundwater conditions and location of private/public wells, surface waters and wetlands as well as site configuration and closeness to property lines. During the design phase, consideration would

[2] Treatment Plant Upgrade at Southampton Hospital, January 2007 – Cameron Engineering & Associates
Sewer System Alternatives Analysis Report, October 2020 – H2M architects + engineers

be given to locating underground utilities, obstructions; piping, etc.; delineating adjacent property lines as well as identifying legal limitations/ restrictions/ covenants, etc. associated with the property.

The selection of the site for the VSH STP focused on available parcels within a reasonable distance with adequate size and accessibility. Sites containing water wells, surface water, wetlands and/or other regulated areas were avoided. The nearest public water supply well in the area is located on Prospect St., the distance to this well from any of the sites under consideration was greater than the minimum separation distance from a sewage treatment plant (200 ft) required by the Health Department. This is also true for the location of wetlands and surface waters (each a minimum requirement of 100 ft). Soil type and groundwater levels were critical elements when considering viable sites.

Several locations within the VSH sewer district boundaries, and one outside the area were considered for the location of the STP in the Sewering Recommendations Report. Following the preparation of this report, additional sites were included for investigation since the site selected was no longer available as the owner was not interested in selling. Space constraints and setback restrictions disqualified most of the sites, only one site at 1 Bowers Lane was large enough to accommodate a future plant. The viable sites that were considered for the location of the sewage treatment and disposal site, and advantages and challenges for each are shown on **Table 3-1** below.

Table 3-1 Sewage Treatment Plant Sites

Sewage Treatment Site	Address	Advantages	Challenges
1	449 North Sea Rd- 103 Route 39	• Three parcels that provide enough area • Not far from the sewer district • Appropriate soils for disposal • Low groundwater to allow good infiltration (31-50 below grade) • No residential neighbors	• Needs variance with cemetery property line • Land use may need to be changed • Owner no longer interested in selling the parcel

Sewage Treatment Site	Address	Advantages	Challenges
2	105 Willow St	• Owner interesting in selling • Other adjacent parcels vacant may be used for disposal of effluent • Low groundwater to allow good infiltration (31-50 below grade) • Appropriate soils for disposal	• Area not sufficient for the STP and effluent disposal • Surrounded by residential parcels • Property line setback and distance to buildings not in compliance • Land use may need to be changed
3	151-171 Windmill Ln	• Owned by the Village • Central location within the district, favoring flow by gravity • Adjacent parcel may be used for effluent disposal • Appropriate soils for disposal	• Parcel not large enough unless combined with adjacent parcel • Residential parcels adjacent to lot in the back • Needs relocation of parking lot
4	Coopers Farm Road	• Owned by the Village • Three lots with enough area for STP and disposal • Appropriate soils for disposal	• Surrounded by residential parcels • Groundwater may impact disposal capacity (11-20 below grade)
5	1 Bowers Ln	• Owner may be interested in selling • Lot big enough for STP and effluent disposal • Appropriate soils for disposal • Grade elevation provides good conditions for force main	• Land use may need to be changed • Needs to be purchased from landowner • Further than the rest of the sites • Some residential parcels nearby • Located within a Critical Environmental Area (CEA)

The selected site, 1 Bowers Lane, satisfies the considerations for sensitive environments and possesses the groundwater depth and soil characteristics that makes it favorable for effluent infiltration. As indicated in Section 2, soils in the area are generally well drained with a capacity to infiltrate water at a rate between 0.57 and 1.98 in/hr, providing ample capacity for water infiltration above groundwater levels. However, a percolation test of the selected site would need to be performed during detailed design to determine the treatment effectiveness to accept flows.

The site is located at the south end of the Suffolk County Groundwater Protection Area (SPGA), a Critical Environmental Area designated by the Long Island Regional Planning Office where groundwater protection must be considered, however, this designation does not preclude the utilization of a substantial portion of this parcel. In addition, the proposed

use will not cause a negative environmental impact to groundwater; the treated effluent produced at the new treatment plant and proposed for site discharge via leaching pools will comply with the requirements established by the SCDHS for subsurface discharge.

The Bowers Lane site is surrounded by roads with no adjacent lots. The parcel is zoned Low Density Residential, with Agricultural parcels positioned to the north, Industrial to the west, Medium Residential to the east and a county sump and a vacant commercial parcel to the south. A change in zoning classification will be required and coordinated with the Town of Southampton to locate a wastewater treatment plant on this lot.

An initial evaluation of this parcel, (**Figure 3-6**), indicated that an enclosed process building constructed in compliance with property line separation requirements could be accommodated and meet the requirements of the SCDHS as well as NYS Design Standards for Intermediate Sized Wastewater Treatment Systems. Parallel lines shown around the process building in **Figure 3-6** represent the 150 ft and 200 ft clearance to the property line and nearest occupied building as per SCDHS requirements.

There are several sewage treatment technologies that are acceptable and approvable by the SCDHS. Among these technologies are Membrane Biological Reactors, Sequencing Batch Reactors (SBR) and Rotating Biological Contactors. The County maintains a total of 201 operating sewage treatment plants, with most of them providing tertiary (advanced) treatment that would support subsurface discharge of treated effluent. The SBR process appears to be the most frequently utilized technology. To secure a SPDES permit, the chosen technology selected for sewage treatment, must achieve the minimum requirements for effluent discharge which include a Total Nitrogen limit of 10 mg/l, BOD (Biological Oxygen Demand) of 30 mg/l and TSS (Total Suspended Solids) of 30 mg/l. These values are monitored by the SCDHS for compliance.

3.2.2.1 Sequencing Batch Reactors Process

This treatment technology has been included as one of the alternatives to consider as it is approved by the SCDHS. The Sequencing Batch Reactor (SBR) process has been in use in Suffolk County for many years. This technology is effective at delivering the level of treatment required to obtain subsurface disposal permission. SBRs require a relatively small footprint and are relatively easy to operate often requiring only intermittent supervision.

This process can be described as a biological sewage treatment process happening in a single tank under separate stages resulting in the removal of high levels of carbon, nitrogen, and suspended solids. The SBR tanks are operated in five (5) different stages: Fill, React, Settle, Draw and Idle. These stages have specific duration time and treatment functions/purposes. During the Fill stage screened raw sewage enters the tank, the React stage initiates the biological process, the Settle stage allows solids to be deposited to the bottom of the tank, the Draw stage is when effluent is removed, and the last stage, Idle, is when waste is removed from the tanks. The duration of each stage, volume of the tanks, operation of the aeration system and air quantities are part of the system design that depends on the characteristics of the raw sewage and flow quantities.

The projected hourly peak flow calculated in **Section 2** was used to estimate the peak month flow and peak day flow. These values were used to estimate the volume necessary for the SBR tanks, and the digester volume to treat and store the sludge generated during the process. Raw sewage characteristics were estimated based on data from comparable facilities, "Ten State Standards" – GLUMRB values and values under the SCDPW standards.

Table 3-2 Raw Sewage Characteristics

	Comparable Facility Max*	Comparable Facility Average*	Ten State Standards Min**	Residential SCDPW	Design Values Used
BOD (mg/l)	300	170	204	272	270
TSS (mg/l)	320	240	240	320	320
TKN (mg/l)	85	50	43	65	70
* Based on weekly readings for two years					
** Based on equivalent population and min as per Ten State Standards					

Loading rates were then determined using the design flows and the assumed sewage characteristics. These loading rates were used to calculate the air requirements and detention time necessary to complete the biological treatment of the raw sewage, resulting in an effluent that complies with standard SPDES permits, and the requirements established by SCDHS for subsurface discharge.

A flow diagram for the STP using an SBR process is presented in **Figure 3-5.** The process tanks (SBR, Digesters, Equalization Tank and Filters) will be enclosed within a building provided with odor control; this allows to reduce the distance to adjacent property lines to a minimum of 150 ft. The support equipment for the process (blowers and electrical equipment) and a laboratory will be in a separate area adjacent to the process building. This area doesn't need the 150 ft setback required for the process tanks.

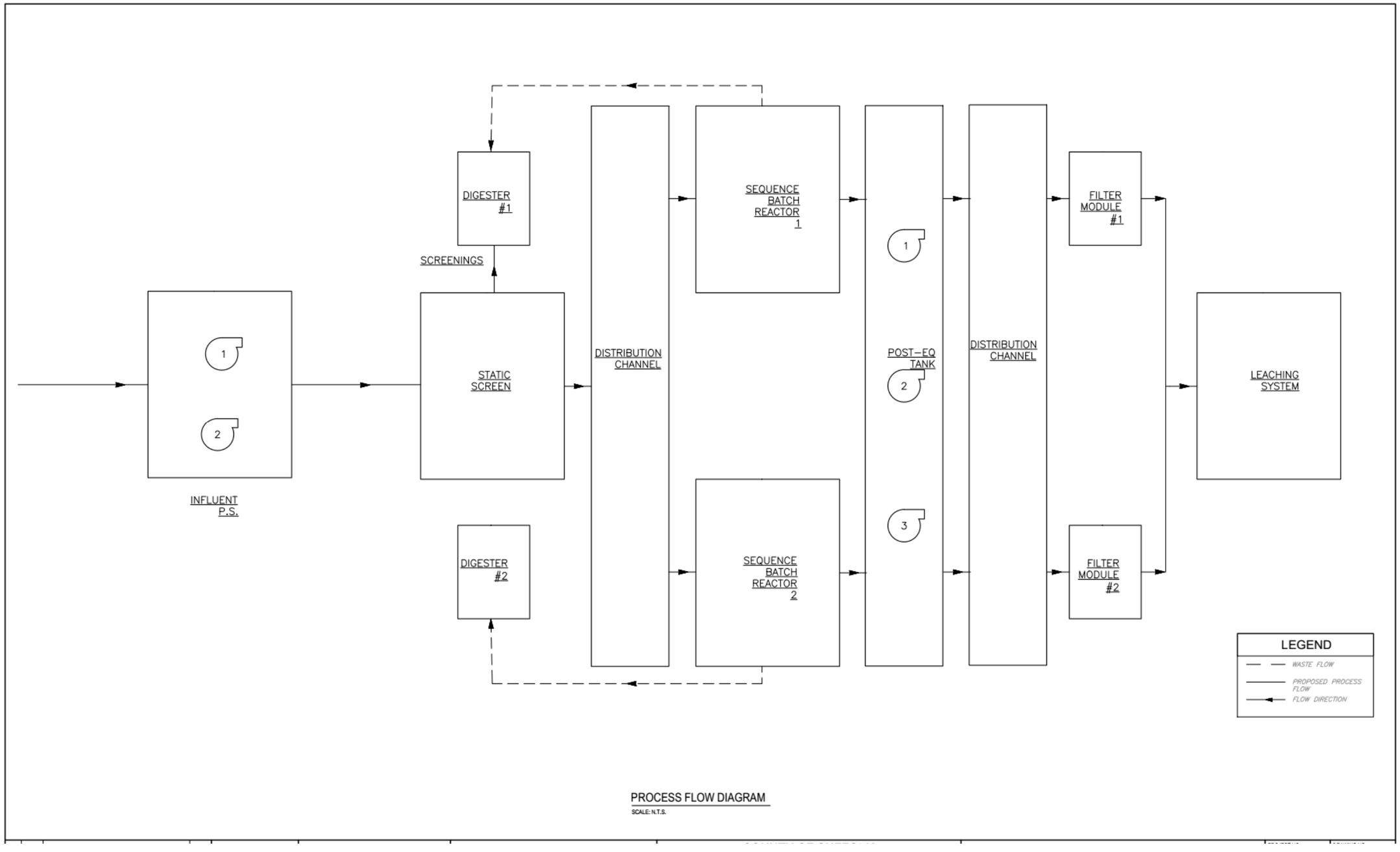

Figure 3-5 SBR Technology Process Flow Diagram

Treated effluent will be pumped to and distributed into 10-foot diameter shallow leaching pools (4 ft deep). The number of pools was calculated using the average design flow and the leaching rate per square foot (10 gpd/sf) used for filtered effluent. A total of 160 pools will be required to accommodate the projected effluent. In addition, an area must be set-aside on site to allow 100% expansion of the effluent recharge system (SCDHS design requirement). The design and construction cost estimate assumes that the additional leaching pools are installed at the time of initial construction.

The conceptual layout depicted in **Figure 3-6** represent both the sizing of the process units for the projected flow (solid line) and to accommodate future (100%) expansion (dashed line) as required by the SCDHS. Only supporting equipment such as blowers, pumps and static screen may need to be upsized to comply with future expansion requirement.

Details for the sizing of the process units and equipment used for the SBR plant layout are provided in **Appendix E.**

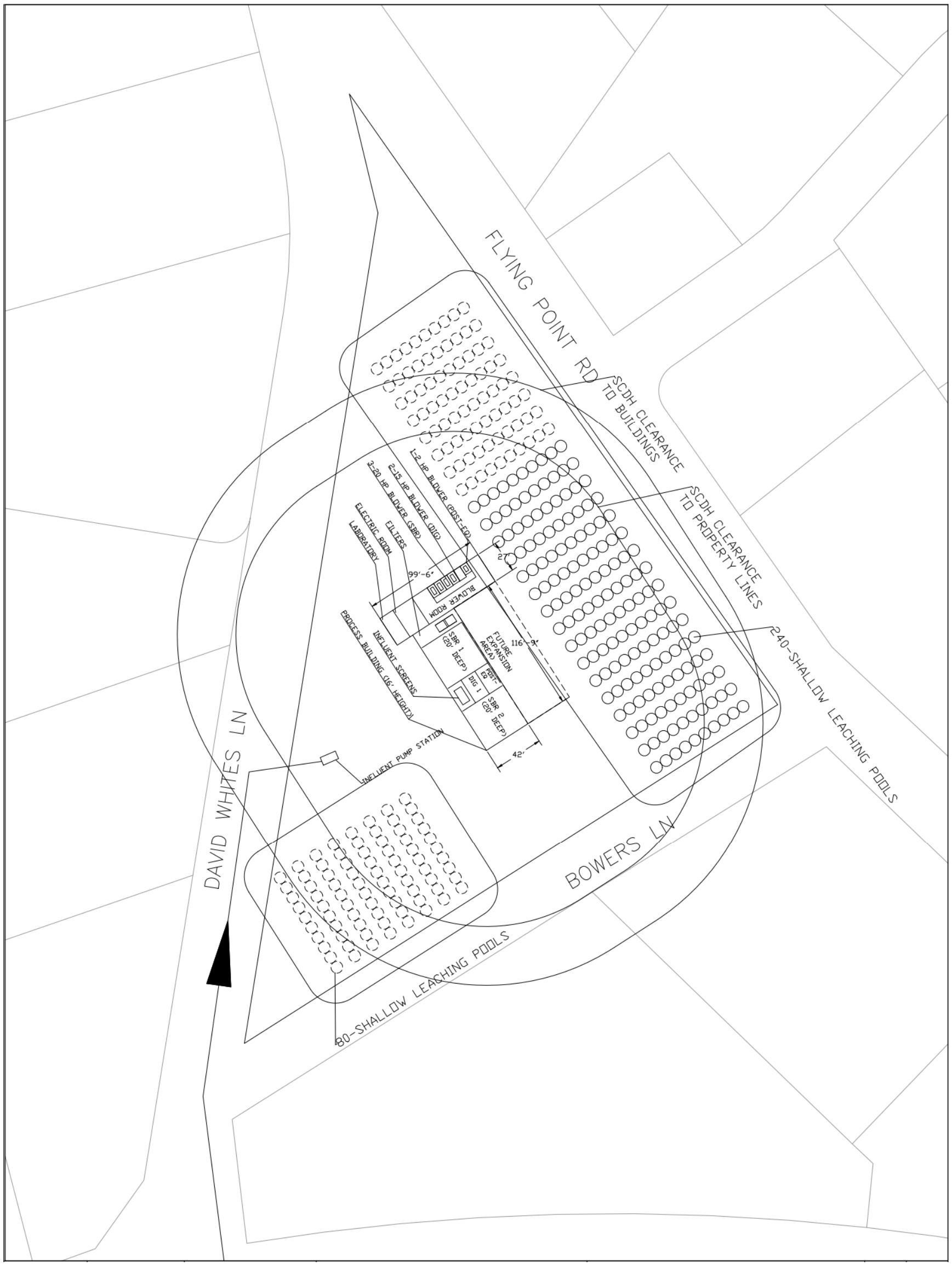

Figure 3-6 Southampton Wastewater Treatment Conceptual Layout

3.2.2.2 Membrane Biological Reactors

Another treatment technology under consideration is the use of a Membrane Biological Reactor (MBR) process. This system utilizes both bioreactor and microfiltration units. Microfiltration replaces the need for separate settling and filtration operations thus reducing the spatial requirements of the sewage treatment facility. The process produces a high-quality effluent with low turbidity, bacteria, TSS and BOD and can deliver total nitrogen concentrations less than 10 mg/l when operated at low DO (dissolved oxygen) and long retention times. This effluent is suitable for reuse following disinfection.

Two (2) different methods can be used in the MBR process one is an integrated system that combines bioreactor and microfiltration membranes within one tank. Membranes are immersed directly into the activated sludge and flow is pull through the membranes using a vacuum system. The result is that the solids remain within the reactor. The second method, which is being proposed, consists of separate process units for the bioreactor and the filtration membranes. In this system, air is provided to the units to activate the biological process and to scour the membranes. Some of the challenges of this process include the higher capital and maintenance/replacement cost of the equipment compared to the SBR process as well as higher process controls required to avoid membrane fouling. Advantages and challenges of the system are summarized on **Section 5.0 Comparison of Alternatives**

This system will consist of two bioreactor basins, three membrane tanks and two digesters. Supporting systems include air blowers for biological treatment, mixing and membrane scouring, transfer pumps, permeate pumps, membrane feed pumps, a waste activated sludge pump and a chemical feed system. In addition, a clean in place system needs to be included to clean the membranes, a coarse screening provided for the influent flow and fine screening following the bioreactors before sending the flow to the membranes. A flow diagram showing the MBR system is included in **Fig 3-7**.

Details for the sizing of the process units and equipment used for the MBR plant layout are provided in **Appendix F.**

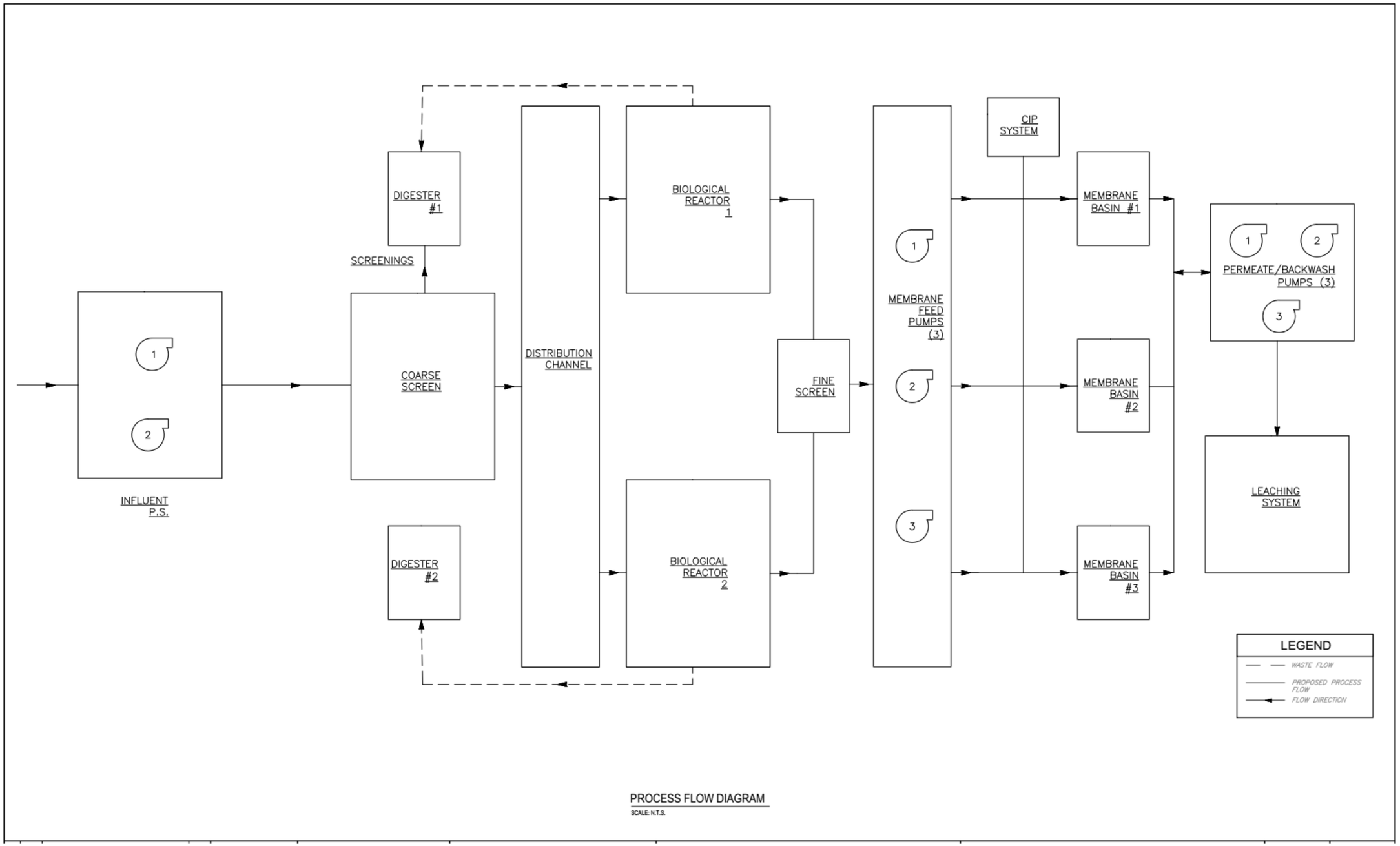

Figure 3-7 MBR Technology Process Flow Diagram

4.0 Alternatives Analysis

This section provides an analysis of the feasible alternatives for the sewage collection, treatment, and disposal for the proposed Village of Southampton sewer district. Sewer collection and treatment options described in Section 3 will be combined to provide a complete set of alternatives for managing the Study Area sewage.

4.1 Description of Alternatives

Sewer collection options considered included piping options that employ gravity and low pressure systems technologies or a combination of same. A vacuum system was not included in the alternative analysis as this system was previously reviewed by the Village of Southampton Task Force under a separate contract and was found not appropriate for the area.

Sewage treatment options included: treatment at the existing Southampton Hospital Sewage Treatment Plant (SH STP), Sequencing Batch Reactors and Membrane Biological Reactors. Treatment of the projected flow, estimated to be approximately 198,000 GPD, at the SH STP would require a major expansion of this plant. The expansion of the treatment process for the SH STP was found to be spatially feasible within the building, however, the site dimensions at this facility were assessed and the parcel lacks sufficient space for the disposal of effluent. This would not meet SCDHS setback requirements. The option of treating only partial flow at the SH STP, using the excess capacity currently available, was also considered in this analysis, however this option will still require the need of constructing a new sewage treatment plant to treat the remaining projected flow. Splitting the flow between two facilities will not only increase the costs associated with the additional pumping, but it will also increase the operating and maintenance costs and staffing logistics necessary to keep them both in operation.

Based on the above the following alternatives were included for the collection and treatment for the Village of Southampton sewer district.

Alternative 1: Gravity collection system and SBR treatment technology

Alternative 2: Low pressure system and SBR treatment technology

Alternative 3: Gravity collection system and MBR treatment technology

Alternative 4: Low pressure system and MBR treatment technology

Alternative 5: No Action

4.1.1 Alternative 1 – Gravity Collection System and SBR Treatment Technology

This alternative consists of the following:

- Gravity Collection System: a sewer collection system utilizing PVC DR18 pipes installed via open trench. The system includes manholes every 400 ft and at every change in direction, 4-inch laterals to each property line, but no connection of the sanitary line to each property or removal of the existing septic system (this would be the responsibility of the property owner when they hook into the system). The sewer main has a minimum 8-inch pipe diameter, with slopes and velocities as recommended in the GLUMBR.
- A Pumping Station: Consisting of a below grade sub-structure and an above grade building constructed within an estimated 2,500-sf area. The below grade structure would consist of a precast concrete wetwell and valve chamber approximately 30 feet deep. Two submersible pumps will be installed in the wetwell, each sized to handle the peak flow calculated for the study area. The above grade building will consist of a concrete block building, approximately 500 sf with precast roof. This building will house the electrical equipment, pump controls, odor control and an emergency generator.
- SBR Treatment: the system includes the aeration, mixing and process control equipment required to provide biological treatment of the sewer. The process tanks that comprise the system include the Reactor Tank, Equalization Tank, Digester and Filters. These units will be installed below grade, inside a building and possess odor control. Equipment installed outside of the process units include blowers, electrical equipment and a process laboratory, that will be installed next to the process tank but as an independent area. This area is not subject to setback limitations, as such it can be installed within the 150 ft and 200 ft distance to a property line and habitable structures.

4.1.2 Alternative 2 – Low Pressure System and SBR Treatment Technology

This alternative consists of the following:

- Low Pressure Collection System: a sewer collection system consisting of a network of low-pressure piping ranging from 1 ¼ inch in diameter for the laterals (pipe from each parcel property line to the street sewer), and 2 to 4 inches in diameter for the sewer main but no grinder pump units (GPU), connection to the building waste line or removal of the existing septic system (this would be the responsibility of the owner when they connect into the system) The system also includes 31 clean outs and 6 air release structures. Flow is conveyed by the low pressure sewer system to a pump station that will pump flow to the proposed sewage treatment plant. Details of the low pressure system design are included in **Appendix C**.
- A Pumping Station: Same design characteristics as the one described in the gravity system; however, the pumping station wet well will be much shallower (approximately 20 ft deep) as flow will be coming via force main. An alternate location for the pump station may also be considered to shorten the force main to the sewage treatment plant.
- SBR Treatment: as described under Alternative 1

4.1.3 Alternative 3 – Gravity Collection System and MBR Treatment Technology

This alternative consists of the following:

- Gravity Collection System as described in Alternative 1
- A Pumping Station as described in Alternative 1
- MBR Treatment: consists of a biological reaction and filtration system. The process includes coarse screens, biological reactors, fine screens and membrane filtration. Digesters are also provided for treating the sludge. A below grade influent pump station will be located ahead of the treatment units. The process tanks will be located inside a building with odor control and ventilation. The supporting equipment including blowers, membrane cleaning system, electrical equipment and the laboratory will be in an area adjacent to the process building, but independent, as such this area is not subject to setback limitations and may be installed within the 150 ft and 200 ft distance to property line and habitable structures.

4.1.4 Alternative 4 – Low Pressure System and MBR Treatment Technology

This alternative consists of the following:

- Low Pressure System as described in Alternative 2.

- A Pumping Station as described in Alternative 2.
- MBR Treatment as described in Alternative 3.

4.1.5 Alternative 5 – No Action

The creation of a new sewer system requires the design and construction of a collection and treatment facility. The no action alternative will preclude the formation of a sewer district for the Village. This will result in the continue leaching of nitrogen and other contaminants from the existing on-site sewering systems into the surrounding water bodies. The impact will be exacerbated by the increase in population density, deterioration of the existing on-site systems, and groundwater raising.

4.2 Cost Analysis

Different costs were considered in the analysis of the alternatives. Those costs include capital cost, maintenance and operation cost and soft costs. In order to compare the cost implication for each of the alternatives, a life cycle cost analysis was completed. This analysis helps in the determination of the most cost-effective alternative to construct, own, operate and maintain the facilities. This analysis uses discounted costs brought to a present-day value (Net Present Value) based on a planning period of 40 years. The analysis uses an inflation rate of 3.5% per year and a discount rate of 2%.

The cost associated with the operation of the pump station was not included in the O&M cost, since the value will have no impact on the comparison, as each of the alternatives include a pump station.

Aqua Aerobic Systems, one of the manufacturers for both the SBR and MBR technologies, provided the same number of estimated hours to operate the treatment plant with either technology based on numerous installations. In addition, two private sewer system operating companies provided similar feedback on the cost of operating the treatment plant with either technology. Therefore, the cost associated with the operation of the sewage plant was not included in the analysis.

A summary of the life cycle cost analysis is presented on **Table 4.1**. Additional details can be found in **Appendix G - Cost Estimate**.

Table 4.1 Life Cycle Cost Analysis

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Capital Cost*	$35,415,000	$34,407,000	$36,795,000	$35,787,000
O&M Cost**	$5,346,000	$4,918,000	$7,275,000	$6,847,000
Net Present Value	$40,761,000	$39,325,000	$44,070,000	$42,634,000

* Construction cost only
** Excludes costs associated with the O&M for the pump station and treatment plant

4.2.1 Capital Cost

A probable construction cost estimate was completed for each of the collection and treatment systems considered in the alternatives. This capital cost estimate was based on the conceptual design completed for each of the elements and quotes received by equipment manufacturers. The estimate was developed in general accordance with guidelines established by the Association for the Advancement of Cost Estimating International (AACEI) and is most accurately described as a Class 4 cost estimate. A detailed description of the estimate class is provided below.

> *AACE International CLASS 4 Cost Estimate – Class 4 estimates are generally prepared based on limited information and subsequently have fairly wide accuracy ranges. Typically, engineering is1% to 15% complete. They are typically used for project screening, determination of feasibility, concept evaluation, and preliminary budget approval. Virtually all Class 4 estimates use stochastic estimating methods such as cost curves, capacity factors, and other parametric and modeling techniques. Expected accuracy ranges are from –15% to –30% on the low side and +20% to 50% on the high side, depending on the technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Ranges could exceed those shown in unusual circumstances. As little as 20 hours or less to perhaps more than 300 hours may be spend preparing the estimate depending on the project and estimating methodology (AACE International Recommended Practices and Standards).*

Detailed construction cost estimates are provided in **Appendix G**.

4.2.2 Operation and Maintenance Costs

Costs associated with the maintenance and operation of the facility will be impacted by the contracting methodology used by the Village. This analysis assumes that a third-party entity will be hired to provide maintenance of operation of both the collection system and the treatment facility. Two private sewer system operators were contacted for cost proposals for the operation and maintenance of the system. Cost proposals have not been received at the conclusion of this report. However, feedback received from the operators established that the treatment technology (SBR or MBR) will not have an impact on the cost of the operation of the sewage treatment plant.

4.2.3 Other Costs

Other costs associated with each of the alternatives include soft costs including design and construction management fees and legal costs. Engineering fees were estimated as 20% of the capital cost and estimated legal costs were provided by the Village.

4.3 Non-Monetary Factors

Non-monetary factors were also considered in the alternative selection process. Among these factors are environmental benefits, increased development, construction considerations, availability for future expansion and operation and maintenance considerations.

4.3.1 Environmental Benefits

The creation of a new sewer system and removal of the existing on-site sewage treatment facilities reduces the risk of contamination of groundwater and surface water from nitrogen leaching from failing systems. This results in water quality improvement for Lake Agawam and prevents unsightly and harmful algae blooms. Better conditions of Lake Agawam will allow for recreational uses attracting more people to the area.

4.3.2 Increase Development

The creation of a new sewer system supports the development plan envision for the area. A new mix of commercial uses including restaurants, retail and multifamily housing was

considered for the future flows. The development of the area attracts business opportunities and increases the value of properties.

4.3.3 Future Expansion

Future expansion of the collection system is an important factor to be considered for the area; the ability to extend coverage with the least impact is desirable. The collection pipes and pumping system shall be able to adapt to flow increase resulting from future expansion. The conceptual gravity system has sufficient flexibility to carry additional flow under proper hydraulic conditions. During detailed design the depth of the pipe will be optimized to allow connection with parcels in the service area and possible future connections, as well as to avoid utility conflicts. The pumping station will be designed to handle peak flows for the area, considerations will be given to allow greater flows by increasing the size of the pumps or adding a pump without modifications to the wetwell or other structural elements.

4.3.4 Operation and Maintenance

Ease of operation and reduced maintenance are important features considered on a collection and treatment system. These factors influence the reliability of the system and the level and cost of maintenance. Gravity collection systems require the least amount of maintenance; pumped systems require more maintenance and depending on where the ownership of the system ends, additional maintenance may be required for individual systems within each property. Considerations for maintenance and operation costs were also evaluated for the treatment technologies, the equipment used, energy consumption and consumables required for the operation of the plant, impact cost and labor. The characteristics of the raw sewage, as well as restrictions imposed to users, are also considered when evaluating O&M, items like grease build-up coming from restaurants or the use of garbage disposal units impact the characteristics of the raw sewage. Some communities adopt specific regulations to reduce the impact of grease, like grease traps at the source and other measures to avoid upsetting the treatment process. The membranes in an MBR system require special attention, including periodical cleaning and replacement. Membranes also require fine screening of the flow as well as grease controls in the collection system to prevent fouling.

4.3.5 Construction Impact

Construction of the collection system may cause disruption of traffic and impacts to businesses. This disruption can be mitigated by using trenchless technologies for the installation of the sewer mains including horizontal directional drilling and by imposing seasonal restrictions for construction. The installation of the force main outside the Village limits may require additional permits and restrictions from the Town during construction as well as permanent easements.

4.3.6 Public Perception/ Acceptance

The creation of a new sewer system will benefit the public by allowing additional development of the area and by removing the source of nitrogen contamination. The creation of a sewer system also eliminates the burden associated with the maintenance of on-site treatment systems specially with a gravity collection system. The use of a less conventional system, like the low pressure, may find more public opposition. This is because the public is less familiar with the system and because the additional cost anticipated with the installation of the pump and associated maintenance and operation.

5.0 Comparison of Alternatives

The table below includes a summary description of each of the alternatives, advantages and challenges of the collection system and treatment technologies as well as other factors considered in the selection process.

Table 5.1 Comparison of Alternatives

Item	Alternative 1 – Gravity and SBR	Alternative 2 – LPS and SBR	Alternative 3 – Gravity and MBR	Alternative 4 - LPS and MBR
Description	A gravity collection system utilizing one pump station. A treatment plant utilizing Sequential Batch Reactor biological process.	A low pressure collection system utilizing one pump station. A treatment plant utilizing Sequential Batch Reactor biological process.	A gravity collection system utilizing one pump station. A treatment plant utilizing Membrane Biological Reactors process.	A low pressure collection system utilizing one pump station. A treatment plant utilizing Membrane Biological Reactors process.
Advantages	**Collection System (gravity):** Simple to operate Accepts flow variations Proven system Does not use electricity	**Treatment System (SBR):** Easy to maintain and operate Can be automated No consumables Adjustable to changing flows Proven system Easy to automate	**Treatment System (MBR):** Smaller footprint Greater removal capacity Ideal for water reuse applications Can be automated	**Collection System (LPS):** Depth can be adjusted to avoid utilities. Small pipes easily installed via HDD. Can be installed at shallow depths following the terrain.
Challenges	Larger pipe than pressure systems Difficult to adjust route to avoid obstructions Pipe installation deeper to comply with slope	Needs influent equalization tank Separate filtration needed	Membranes need periodic cleaning. Membranes are susceptible to clogging. Flow needs fine screening ahead of the membranes. Grease accumulations are problematic for the system. High energy cost Newer technology than SBR	Utilizes mechanical equipment. Needs power to operate Cost to the public to connect higher than gravity. Requires more maintenance.
Environmental Benefits	Good. Removes leaching nitrogen	Better. Removes leaching nitrogen and no leaking since it is a pressurized system	Good. Removes leaching nitrogen	Better. Removes leaching nitrogen and no leaking since it is a pressurized system

Item	Alternative 1 – Gravity and SBR	Alternative 2 – LPS and SBR	Alternative 3 – Gravity and MBR	Alternative 4 - LPS and MBR
Future Expansion	Better. Gravity system has capacity to convey more flow, depth may need to be adjusted during design. Treatment allows for some increase capacity by changing cycling time in the reactors	Fair. Additional loops to the LPS may be added or the design may incorporate some additional capacity by increasing pipe size. Treatment allows for some increase capacity by changing cycling time in the reactors	Good. Gravity system has capacity to convey more flow, depth may need to be adjusted during design. Treatment may allow the increase of flow as the membranes can accept more, however this may increase cleaning frequency.	Fair. Additional loops to the LPS may be added or the design may incorporate some additional capacity by increasing pipe size. Treatment may allow the increase of flow as the membranes can accept more, however this may increase cleaning frequency.
Operation and Maintenance	Easiest and the least labor.	Easy, more labor may be needed for the collection system compared to gravity.	Fair. More labor associated with treatment including membrane cleaning and additional screening; treatment is more sensitive to grease.	More labor associated with both the collection and treatment system.
Construction Impact	Traffic impact may be more if pipe installation is via open trench. Directional drilling may be possible.	Less impact to traffic or businesses. Pipe size smaller than gravity system, installation via directional drilling very likely.	Traffic impact may be more if pipe installation is via open trench. Directional drilling may be possible.	Less impact to traffic or businesses. Pipe size smaller than gravity system, installation via directional drilling very likely.
Public Perception / Acceptance	Better. Gravity collection system will reduce the cost to connect and will require little to no maintenance from the public. Traffic disruptions will need mitigation	Some opposition likely. More cost to connect and maintain, but less disruption likely during construction	Better. Gravity collection system will reduce the cost to connect and will require little to no maintenance from the public. Traffic disruptions will need mitigation	Some opposition likely. More cost to connect and maintain, but less disruption likely during construction

6.0 Recommended Alternative

Alternative 1 is the one recommended for the Village of Southampton sewer system. This alternative includes a gravity collection system and a sewage treatment plant utilizing the Sequential Biological Reactor (SBR) process. A description of the alternative is provided in **Section 4.1.1**.

6.1 Basis of Selection

A gravity collection system was analyzed first as this system provides the most advantages, eliminating the costs associated with pumping, providing flexibility in flow variation, and requiring less maintenance. The technical and economic feasibility of a gravity system for the area was determined based on the initial analysis completed, utilizing data from Geographic Information Systems including topography, groundwater elevation and parcels zoning/classification. This conceptual analysis supported the selection of a gravity system as most of the area requires a depth of installation less than 15 ft below grade. Additional analysis will be completed during detailed design following a topographic and utility survey. The gravity system may include some low-pressure areas to optimize the depth of the collection system.

A Sequencing Batch Reactor was selected for treatment of the raw sewage as this process offers ease of maintenance and operation and requires minor pretreatment of flow (screening). Reduced cost of operation compared to the MBR system including power and consumables were also some of the reasons for selecting this process. In addition, some concerns related to possible accumulation of grease due to the flows expected for the area (restaurants) were noted by operators.

For additional comparison of the treatment technologies and collection systems see **Section 5.0.**

6.2 Cost Estimate

As described in the analysis included in **Section 4.2** costs associated with the project include Capital Costs and Soft Costs. Below is a summary of the costs for Alternative 1.

Note: the cost associated with parcel hook-ups and the abandonment of existing on-site systems is not included in the cost of the collection system

Collection System*	$11,502,000
Pump Station	$1,890,000
Sewage Treatment Plant	$22,023,000
Total Construction Cost	**$35,415,000**

*Without asphalt milling and overlay of full road

Engineering Fees (20%)	$7,083,000
Local Counsel	$20,000
Bond Counsel	$864,000
Total Soft Costs	**$7,967,000**
Project Contingency (Owner 15%)	**$6,507,000**
Total Project to Finance	**$49,889,000**
Financing Insurance Costs (1.84%)	$918,000
Total Project Cost Including Financing	**$50,807,000**

- All prices are based on 2021 prevailing wage costs with escalation based on a mid-point of construction date of November 2024 at 3.5% per annum compounded.
- Land acquisition costs are not included
- An owner selected contingency of 15% was added to the total project cost

6.3 Project Implementation

The project will continue with the following steps:

1. **Map, Plan and Report** – this step is necessary to complete the formation of a sewer system for the Village. The report will include a legal description of the boundaries and parcels included in the area, the projected flows, description of the system and debt service calculations.
2. **State Environmental Quality Review (SEQR)** – The purpose of the SEQR is to include the consideration of all environmental factors into the planning, review and decision-making process at the beginning of the project. The SEQR process identifies and investigates potential adverse impacts, both short-term construction-related and

long-term. Specific conditions in the study area will be considered in the environmental review process, including planning and revitalization goals for the study area and environmental conditions of the Village's Main Street business area. For example, sewer installation methods, trenching or horizontal directional drilling present different environmental impacts during construction. These alternatives will be discussed in terms of short-term and long-term impacts and/or benefits as part of the environmental review.

a. The process starts with the classification of the action by the Village Board. Utilizing the environmental review initiated in the review of alternatives and selection process, the Village Board will classify the proposed action. We assume this action will be classified as an "Unlisted Action" thus requiring further review under SEQR.
b. The SEQRA process will be initiated by completing an Environmental Assessment Form (EAF) for the selected action. Consultation with the NYS Office of Parks, Recreation and Historic Preservation (NYS OPRHP) will be completed as part of the environmental review process.
c. The EAF "Long Form" will be completed to determine the potential for environmental impacts. The EAF will have enough information to describe the proposed action, its location, purpose, and potential impacts to the environment. The EAF will include a narrative description of existing conditions, a summary of impacts of the selected alternative, and a description of proposed mitigation measures for each impact identified as well as a discussion of the alternatives considered.
d. Once the EAF is completed, the Village Board will then review the completed EAF and provide a determination as to whether or not the proposed action would have significant adverse impacts on the environment and prepare a Declaration of Significance (a negative declaration is expected for this project).

3. Secure Project Funding

The process was already initiated with the Environmental Facilities Corporation (EFC) in order to apply for Clean Water State Revolving Funds. This report and additional information will be provided to the EFC to continue the process.

The Village intends to explore other local funding options.

4. Design Phase

The design will start with a topographical and utility survey and subsurface investigation for the collection system and the sewage treatment plant parcel. This information will be used in the detailed design and in support of the approval process with the Suffolk County Department of Health Services (SCDHS).

The utility survey will include the mark-out and investigation of utilities within the sewer collection route. Based on this information the design will be adjusted to avoid conflicts with other utilities during construction.

The subsurface investigation will include geotechnical borings for the sewer collection route and for the wastewater treatment facility area to support the foundation design. In addition, percolation tests will be completed for the subsurface disposal area.

The detailed design will advance in two stages preliminary and final design. Coordination with the SCDHS will continue to ensure the design complies with all requirements and to facilitate the approval process.

5. Easements

The majority of the project will be located within Village owned areas, and the right of way. However, based on the conceptual design, easements may be required for the force main on state and Town roads.

6. Permitting

Permitting efforts will be initiated at different stages of the project from design through construction. For permitting details See Section 6.4.

7. Construction

Construction will proceed following the review of the bids and award of the contract. This project is anticipated to include two separate construction contracts, General and Electrical, following the requirements of Wick's Law.

6.4 Permitting and Coordination

A variety of federal, state, and local permits, registrations and approvals will be required throughout the project from design through construction and commissioning. The following list represents the anticipated permits/approvals for the Project:

- SEQRA: as described in **Section 6.3**
- SWPPP: A stormwater pollution prevention plan to be submitted to the New York State Department of Environmental Conservation (NYSDEC)
- A dewatering permit (NYSDEC)
- SPDES: The SPDES permitting process will be initiated at the beginning of the design by scheduling a pre-application conference with NYSDEC. During this meeting the NYSDEC will provide additional guidance in the completion of the application (NY-2A updated March 2022) and review the proposed project. This meeting is important to receive feedback from the agency prior to proceeding with additional design details.

  It is important to note that New York state requires the formation of a "sewage works corporation" if a treatment facility is intended to serve a number of separately owned dwellings as may be the case for the Village's new sewer system. This "corporation" must be approved by the Village and the Suffolk County Department of Health.
- Road permits: NYS Department of Transportation.
- Suffolk County Department of Health Services

6.5 Project Schedule

A summary of the estimated project schedule is illustrated in **Table 6.1**. The schedule below assumes that design will commence before funding is finalized.

Table 6.1 Anticipated Project Schedule

Task	Duration (months)	Start Date	End Date
Map, Plan and Report	2	June 6, 2022	August 5, 2022
State Environmental Quality Review (SQR)	2	June 6, 2022	August 5, 2022
Village Board Approval	1		September 9, 2022
Design			
Topographic and Utility Survey	1	September 12, 2022	October 17, 2022
Preliminary Design	4		February 17, 2023
Final Design	4		June 23, 2023
Advertisement and Bidding	2		August 25, 2023
Award and Notice to Proceed	1		September 25, 2023
Construction	24		September 26, 2025

APPENDIX A – SOIL CLASSIFICATIONS

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.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Suffolk County, New York
Survey Area Data: Version 19, Sep 1, 2021

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

Date(s) aerial images were photographed: Dec 31, 2009—Sep 8, 2016

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
BgA	Bridgehampton silt loam, 0 to 2 percent slopes	1.7	34.2%
HaA	Haven loam, 0 to 2 percent slopes	1.2	25.1%
HaB	Haven loam, 2 to 6 percent slopes	0.1	2.9%
RdB	Riverhead sandy loam, 3 to 8 percent slopes	1.9	37.8%
Totals for Area of Interest		**4.9**	**100.0%**

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: Suffolk County, New York
Survey Area Data: Version 19, Sep 1, 2021

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

Date(s) aerial images were photographed: Dec 31, 2009—Sep 8, 2016

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
BgA	Bridgehampton silt loam, 0 to 2 percent slopes	44.8	23.9%
Bm	Bridgehampton silt loam, graded	2.7	1.4%
CuB	Cut and fill land, gently sloping	1.9	1.0%
Fs	Fill land, sandy	2.6	1.4%
HaA	Haven loam, 0 to 2 percent slopes	28.2	15.1%
HaB	Haven loam, 2 to 6 percent slopes	15.0	8.0%
He	Haven loam, thick surface layer	5.7	3.0%
Ma	Made land	2.3	1.2%
PlB	Plymouth loamy coarse sand, 3 to 8 percent slopes	1.2	0.7%
PlC	Plymouth loamy coarse sand, 8 to 15 percent slopes	10.8	5.8%
RdA	Riverhead sandy loam, 0 to 3 percent slopes	16.0	8.6%
RdB	Riverhead sandy loam, 3 to 8 percent slopes	1.2	0.7%
RdC	Riverhead sandy loam, 8 to 15 percent slopes	13.0	6.9%
Ur	Urban land	41.7	22.2%
Wd	Walpole sandy loam, coastal lowland, 0 to 3 percent slopes	0.0	0.0%
Totals for Area of Interest		**187.3**	**100.0%**

APPENDIX B – FLOW CALCULATIONS

South Hampton Tax Map Format D-S-B-L	Address	Acreage	Property Type Code	Property Classification	Existing Structure Use	Building/Unit SQ	Existing Apartment in Building	SCDHS Structure Use	Estimated Existing GPD	Projected Commercial Use	Projected Residential Stories (300 GPD per Story)	Projected Flow GPD
904-5-1-15	243 Windmill Ln	2.9	461	Standard Bank/Single Occupant	BNB Bank	2310	0	Non Medical Office	139	Non Medical Office	0	139
904-5-1-16.1	75 White St	0.1	480	Multiple Use or Multipurpose	Dinome Custom Painting, Inc	3450	0	Public Storage	138	Public Storage	0	138
904-5-1-16.2	73 White St	0.1	480	Multiple Use or Multipurpose	Dinome Custom Painting, Inc	3450	0	Public Storage	138	Public Storage	0	138
904-5-1-16.3	239 Windmill Ln	0.3	480	Multiple Use or Multipurpose	Bennett & Read, LLP Attorneys at Law	4060	0	Non Medical Office	244	Non Medical Office	0	244
904-5-1-17	53 North Sea Rd	0.1	450	Retail Services	English Country	4425	0	Dry Store	133	Dry Store	0	133
904-5-1-18	43 North Sea Rd	0.4	450	Retail Services	Tates Bake Shop	3000	0	Commercial Bakery	180	Commercial Bakery	0	219
					Building	985	0	Public Storage	39	Public Storage	0	
904-5-1-19	29 North Sea Rd	0.5	330	Vacant Land Located in Commercial Area	No Structure, Vacant Land	N/A	N/A	N/A	0	N/A	0	0
904-5-1-20	21 North Sea Rd	0.06	210	One Family Year Round Residence	Single Family Home		N/A	N/A	300	N/A	0	300
904-5-1-21	25 North Sea Rd	0.1	450	Retail Services	Stellar Union Furniture Store	2430	0	Dry Store	73	Dry Store	0	73
904-5-1-22	7 North Sea Rd	0.28	220	Two Family Year Round Residence	Two Family Home		N/A		600		0	600
904-5-1-23	200 Windmill Ln	0.2	281	Multiple Residence	Multiple Residence		N/A		600		0	600
904-5-1-28.1	74 White St	0.5	464	Office Building	Eastern Long Island Surgery with apartment on second floor	2000	1	Medical Office	425	Medical Office	0	425
904-5-3-40.1	40 Bowden Sq	0.6	421	Restaurants	Burger Bar and Restaurant	8840	0	Restaurant	8,840	Restaurant	0	9,140
				Residential Home	Residential Home		N/A	N/A	300	N/A	0	
904-5-3-42	33 N Main St	0.5	210	One Family Year Round Residence	Single Family Home		N/A	N/A	300	N/A	0	300
904-5-3-43	17 N Main St	0.5	210	One Family Year Round Residence	Single Family Home		N/A	N/A	300	N/A	0	300
904-6-1-4.7	135 Windmill Ln	1	464	Office Building	Newspaper Publisher	6600	0	Non Medical Office	396	Non Medical Office	0	396
904-6-1-7	91 Hill St	3.4	414	Hotel	Hotel with 75 units (assumed) and a Restaurant		N/A	Motel/Hotel unit > 400 sq. ft. gross floor area w/o kitchenette	11,250	Motel/Hotel unit > 400 sq. ft. gross floor area w/o kitchenette	0	11,250
904-6-1-8	71 Hill St	1.7	480	Multiple Use or Multipurpose	Nail and Hair Salon	1233	0	Wet Store w/o food	123	Wet Store w/o food	0	5,943
					Part of the Southampton Inn with an assumed 15 units			Motel/Hotel unit > 400 sq. ft. gross floor area w/o kitchenette	2,250	Motel/Hotel unit > 400 sq. ft. gross floor area w/o kitchenette	0	
						1233	0	Non Medical Office	74	Non Medical Office	0	
					Massage Spa	1233	0	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	123	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	0	
					Mortgage Company	1233	0	Non Medical Office	74	Non Medical Office	0	
					Moving Company	1233	0	Non Medical Office	74	Non Medical Office	0	
					Law Office	1233	0	Non Medical Office	74	Non Medical Office	0	
					Seafood Restaurant	3150	0	Restaurant	3,150	Restaurant	0	
904-6-1-9	51 Hill St	0.1	464	Office Building	Century 21 Agawam Town & Village	3700	0	Non Medical Office	222	Restaurant	1	4,000
904-6-1-10	43 Hill St	1.9	512	Motion Picture Theaters (excludes drive-in theaters)	Movie Theater	13800	0	Theater and Snack Bar	2,856	Theater and Snack Bar	0	2,856

South Hampton Tax Map Format D-S-B-L	Address	Acreage	Property Type Code	Property Classification	Existing Structure Use	Building/Unit SQ	Existing Apartment in Building	SCDHS Structure Use	Estimated Existing GPD	Projected Commercial Use	Projected Residential Stories (300 GPD per Story)	Projected Flow GPD
904-6-1-13.1	49 Windmill Ln	0.4	544	Health Spa	Nail and Hair Salon	680	?	Wet Store w/o food	68	Wet Store w/o food	1	368
					Chiropractor	650	?	Medical Office	65	Medical Office	1	365
					Yoga Studio	310	?	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	31	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	1	350
					Corporate Office for landscaping company	310	?	Non Medical Office	19	Non Medical Office		
904-6-1-16	21 Windmill Ln	0.1	482	Downtown Row Type (detached)	Exercise Equipment Store	2625	0	Dry Store	79	Dry Store	2	758
					Picture Frame Shop	2625	0	Dry Store	79	Dry Store		
904-6-1-20.1	25 Hill St	0.3	455	Dealerships - Sales and Service (other than auto with large sales operation)	Boxing Gym	7000	0	Spa/Fitness Center/Karate/Dance/etc. (w/	2,100	Spa/Fitness Center/Karate/Dance/etc. (w/	2	3,018
					Taxi service building	5300	0	Non Medical Office	318	Non Medical Office		
904-6-1-21.1	21 Hill St	0.1	481	Downtown Row Type (with common wall)	Restaurant	1750	2	Restaurant	2,200	Restaurant	1	2,500
904-6-1-23.1	15 Hill St	0.4	481	Downtown Row Type (with common wall)	Nail Salon with apartments on top	675	1	Wet Store w/o food	293	Wet Store w/o food	0	2,129
					Dry Cleaner with apartments on top	675	1	Wet Store w/o food	293	Wet Store w/o food	0	
					Pilates Studio (5 Windmill Ln)	3375	1	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	563	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	0	
					Consignment Shop	1500	1	Dry Store	270	Dry Store	0	
					Bakery (17 Windmill Ln)	1250	1	Commercial Bakery	300	Commercial Bakery	0	
					Vacant Office Building (15 Hill St)	6850		Non Medical Office	411	Non Medical Office	0	
904-6-2-2	167 Jagger Ln	2.4	454	Large Retail Food Stores	Grocery Store	25380	0	Convenience Store/Market	1,269	Convenience Store/Market	0	2,544
					Physical Therapy	2250	0	Spa/Fitness Center/Karate/Dance/etc. (w/ showers & amenities)	675	Spa/Fitness Center/Karate/Dance/etc. (w/ showers & amenities)	2	
904-6-2-4.1	60 Jagger Ln	0.3	461	Standard Bank/Single Occupant	Bank	2360	0	Non Medical Office	142	Non Medical Office	2	742
904-6-2-4.2	54 Jagger Ln	0.8	480	Multiple Use or Multipurpose	Dry Cleaner (56 Jagger Ln)	2775	0	Wet Store w/o food	278	Wet Store w/o food	2	1,965
					Drug Store (54 Jagger Ln)	1880	0	Convenience Store/Market	94	Convenience Store/Market	2	
					Barbershop (50 Jagger Ln)	1575	0	Wet Store w/o food	158	Wet Store w/o food		
					Restaurant (48 Jagger Ln)	1575	0	Wet Store w/ food	236	Wet Store w/ food		
904-6-2-5	120 Windmill Ln	0.5	417	Camps, Cottages, Bungalows	Office	1450	0	Non Medical Office	87	Non Medical Office	2	1,887
					Single Family Home		N/A	N/A	300	N/A	0	
					Cottage		N/A		225			
					Cottage		N/A		225			
					Cottage		N/A		225			
					Cottage		N/A		225			
904-6-2-6	30 Jagger Ln	0.3	483	Converted Residence	Cigar Shop	1250	1	Dry Store	263	Dry Store	1	563
904-6-2-7.2	137 Main St	0.3	450	Retail Services	Stationary Store	4650	0	Dry Store	140	Dry Store	2	740
904-6-2-7.3	26 Jagger Ln	0.2	450	Retail Services	Liquor Store	2285	0	Dry Store	69	Dry Store	2	669
904-6-2-7.4	24 Jagger Ln	0.2	480	Multiple Use or Multipurpose	Nail Salon and Spa	3200	0	Wet Store w/o food	320	Wet Store w/o food	2	988
					Grocery Store	1350	0	Convenience Store/Market	68	Convenience Store/Market		
904-6-2-8.1	143 Main St	0.1	481	Downtown Row Type (with common wall)	Art Gallery	1000	1	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	280	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	1	1,535
					Butcher Shop	1000	1	Wet Store w/ food	375	Wet Store w/ food		
					Medical Office	1000	1	Medical Office	325	Medical Office		
					Picture Frame Shop	1000	1	Dry Store	255	Dry Store		
904-6-2-8.2	116 Jagger Ln	0.08	210	One Family Year Round Residence	Single Family Home		N/A	N/A	300		0	300
904-6-2-9	131 Main St	0.3	483	Converted Residence	Indoor Lodging	3100	N/A	Rooming House	450	Rooming House	2	1,050
904-6-2-10	111 Main St	1.8	452	Area or Neighborhood Shopping Centers	CVS Pharmacy	16000	0	Convenience Store/Market	800	Convenience Store/Market	1	1,394
					Bank	4900	0	Non Medical Office	294	Non Medical Office		
904-6-2-11	39 Nugent St	0.4	482	Downtown Row Type (detached)	Vacant Building	6800	0	Non Medical Office	408	Restaurant	2	7,400

South Hampton Tax Map Format D-S-B-L	Address	Acreage	Property Type Code	Property Classification	Existing Structure Use	Building/Unit SQ	Existing Apartment in Building	SCDHS Structure Use	Estimated Existing GPD	Projected Commercial Use	Projected Residential Stories (300 GPD per Story)	Projected Flow GPD
904-6-2-13.2	65 Nugent St	1.4	461	Standard Bank/Single Occupant	Bank (might be vacant)	4250	0	Non Medical Office	255	Non Medical Office	1	555
904-6-2-14	60 Windmill Ln	0.3	464	Office Building	Gym	1400	0	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	140	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	2	740
904-6-2-15	82 Nugent St	1	453	Large Retail Outlets	Pharmacy	13500	0	Convenience Store/Market	675	Convenience Store/Market	1	975
904-6-2-16	46 Windmill Ln	1	461	Standard Bank/Single Occupant	Bank	4650	0	Non Medical Office	279	Non Medical Office	1	579
904-6-2-18	76 Nugent St	0.5	461	Standard Bank/Single Occupant	Mortgage Lender/Bank	1100	0	Non Medical Office	66	Non Medical Office	2	666
904-6-2-19	56 Nugent St	0.09	421	Restaurants	Restaurant	2100	0	Restaurant	2,100	Restaurant	1	2,400
904-6-2-21	15 W Main St	0.2	450	Retail Services	Furniture Store	3850	0	Dry Store	116	Dry Store	0	
904-6-2-22	50 Nugent St	0.1	482	Downtown Row Type (detached)	Real Estate Agency	3250	0	Non Medical Office	195	Non Medical Office	2	795
904-6-2-23	38 Nugent St	0.1	480	Multiple Use or Multipurpose	Landscape Designer	1500	1	Non Medical Office	315	Non Medical Office	0	315
904-6-2-24	16 West Main St	0.14	480	Multiple Use or Multipurpose	Money Transfer Service	1100	0	Non Medical Office	66	Non Medical Office	0	66
					Physical Therapy	700	0	Spa/Fitness Center/Karate/Dance/etc. (w/ showers & amenities)	70	Spa/Fitness Center/Karate/Dance/etc. (w/ showers & amenities)	0	70
					Hair Salon	700	0	Wet Store w/o food	70	Wet Store w/o food	0	70
904-6-2-25	36 Nugent St	0.07	481	Downtown Row Type (with common wall)	Environmental Organization	1550	0	Non Medical Office	93	Non Medical Office	0	93
904-6-2-27	34 Nugent St	0.08	481	Downtown Row Type (with common wall)	Laundromat	3600	0	Laundromat	4,208	Laundromat	0	4,208
904-6-2-28	32 Nugent St	0.06	481	Downtown Row Type (with common wall)								
904-6-2-29.1	30 Nugent St	0.17	481	Downtown Row Type (with common wall)	Construction Company Office	3250	0	Non Medical Office	195	Non Medical Office	0	195
904-6-2-30	28 Nugent St	0.01	481	Downtown Row Type (with common wall)								
904-6-2-31	22 Nugent St	0.06	481	Downtown Row Type (with common wall)	Clothing Store	1700	1	Dry Store	276	Dry Store	0	276
904-6-2-33	91 Main St	0.27	481	Downtown Row Type (with common wall)	Vegan Restaurant	2500	0	Wet Store w/ food	375	Wet Store w/ food	0	375
					Clothing Store	2500	0	Dry Store	75	Dry Store	0	75
					Café	1700	0	Wet Store w/ food	255	Wet Store w/ food	0	255
					Clothing Store	2500	0	Dry Store	75	Dry Store	0	75
904-6-2-37.1	79 Main St	0.23	481	Downtown Row Type (with common wall)	Sporting Goods Store	3100	1	Dry Store	318	Dry Store	0	318
904-6-2-38	75 Main St	0.1	421	Restaurants	Restaurant	4280	1	Restaurant	4,505	Restaurant	0	4,505
904-6-2-39	67 Main St	0.4	481	Downtown Row Type (with common wall)	Sporting Goods Store	1050	0	Dry Store	32	Dry Store	0	32
					Barber Shop	425	0	Wet Store w/o food	43	Wet Store w/o food	0	43
					Boutique Store	425	0	Dry Store	13	Dry Store	0	13
					Phone Store	425	0	Dry Store	13	Dry Store	0	13
					Candy Store	425	0	Wet Store w/ food	64	Wet Store w/ food	0	64
					Fireplace Store	2650	0	Dry Store	80	Dry Store	0	80
					Single Family Home		N/A	N/A	300	N/A	0	300
904-6-2-40	63 Main St	0.1	481	Downtown Row Type (with common wall)	Childrens Clothing Store	2250	1	Dry Store	293	Dry Store	0	293
904-6-2-41	61 Main St	0.2	481	Downtown Row Type (with common wall)	Jewelry Store	950	1	Dry Store	254	Dry Store	0	254
					Kids Clothing Store (May be closed)	950		Dry Store	29	Dry Store	0	29
904-6-2-42	57 Main St	0.05	481	Downtown Row Type (with common wall)	Clothing Store	2100	0	Dry Store	63	Dry Store	0	63
904-6-2-43	51 Main St	0.4	481	Downtown Row Type (with common wall)	Furniture Store	12000	1	Dry Store	585	Dry Store	0	585
904-6-2-44	49 Main St	0.03	481	Downtown Row Type (with common wall)	Womens clothing store	2000	0	Dry Store	60	Dry Store	0	60
904-6-2-45	47 Main St	0.05	481	Downtown Row Type (with common wall)	Jewelry Store	3000	0	Dry Store	90	Dry Store	0	90
904-6-2-46	45 Main St	0.05	481	Downtown Row Type (with common wall)	Clothing Store	1900	1	Dry Store	282	Dry Store	0	282
904-6-2-47	43 Main St	0.05	481	Downtown Row Type (with common wall)	Clothing Store	980	0	Dry Store	29	Dry Store	0	29
904-6-2-48	41 Main St	0.17	481	Downtown Row Type (with common wall)	Hardware Store	5000	1	Dry Store	375	Dry Store	0	375

South Hampton Tax Map Format D-S-B-L	Address	Acreage	Property Type Code	Property Classification	Existing Structure Use	Building/Unit SQ	Existing Apartment in Building	SCDHS Structure Use	Estimated Existing GPD	Projected Commercial Use	Projected Residential Stories (300 GPD per Story)	Projected Flow GPD
904-6-2-50.1	40 W Main St	0.09	482	Downtown Row Type (detached)	Thrift Shop	2400	0	Dry Store	72	Dry Store	0	72
904-6-2-51.1	87 Main St	0.3	481	Downtown Row Type (with common wall)	Mens Clothing Store	1900	1	Dry Store	282	Dry Store	0	282
					Fashion Accessories Store	1900	1	Dry Store	282	Dry Store	0	282
904-6-3-13	136 Main St	1.1	414	Hotel	Hotel/B&B with 18 assumed units	10000	0	Motel/Hotel unit > 400 sq. ft. gross floor area w/o kitchenette	2,700	Motel/Hotel unit > 400 sq. ft. gross floor area w/o kitchenette	0	2,700
904-6-3-17.1	31 Hampton Rd	0.2	481	Downtown Row Type (with common wall)	Aboffs Paint Store	2800	0	Dry Store	84	Dry Store	0	84
904-6-3-17.4	29 Hampton Rd	0.1	481	Downtown Row Type (with common wall)	Starbucks Coffee Shop	1500	0	Wet Store w/ food	225	Wet Store w/ food	0	225
904-6-3-17.5	27 Hampton Rd	0.2	481	Downtown Row Type (with common wall)	Womens clothing store	1250	0	Dry Store	38	Dry Store	0	38
					Hair Salon	1250	0	Wet Store w/o food	125	Wet Store w/o food	0	125
904-6-3-17.6	25 Hampton Rd	0.1	481	Downtown Row Type (with common wall)	Furniture Store	1750	0	Dry Store	53	Dry Store	0	53
904-6-3-19.1	1 Hampton Rd	0.5	484	One Story Small Structure	Art Gallery	6250	0	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	344	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	0	344
904-6-3-20	126 Main St	0.7	418	Inns, Lodges, Boarding and Rooming Houses, Tourist Homes, Fraternity and Sorority Houses	Bed and Breakfast		N/A	Motel/Hotel unit > 400 sq. ft. gross floor area w/o kitchenette	2,400	Motel/Hotel unit > 400 sq. ft. gross floor area w/o kitchenette	0	2,400
904-6-4-1	94 Main St	0.2	481	Downtown Row Type (with common wall)	Jewelry Store	850	0	Dry Store	26	Dry Store	0	116
					Rug Store	3000	0	Dry Store	90	Dry Store		
904-6-4-2	92 Main St	0.06	481	Downtown Row Type (with common wall)	Real Estate Agency	4250	0	Non Medical Office	255	Non Medical Office	0	255
904-6-4-3	88 Main St	0.06	481	Downtown Row Type (with common wall)								
904-6-4-5	16 Hampton Rd	0.1	481	Downtown Row Type (with common wall)	Real Estate Agency	1600	0	Non Medical Office	96	Non Medical Office	0	144
					Book Store	1600	0	Dry Store	48	Dry Store		
904-6-4-6	18 Hampton Rd	0.09	481	Downtown Row Type (with common wall)	Pharmacy	2350	0	Convenience Store/Market	118	Convenience Store/Market	0	118
904-6-4-7	20 Hampton Rd	0.08	481	Downtown Row Type (with common wall)	Grocery Store	11350	1	Convenience Store/Market	793	Convenience Store/Market	0	793
904-6-4-8	22 Hampton Rd	0.19	481	Downtown Row Type (with common wall)			0					
904-6-4-9	26 Hampton Rd	0.1	481	Downtown Row Type (with common wall)	Chinese Restaurant	2175	0	Wet Store w/ food	326	Wet Store w/ food	0	2,801
					Single Family Home		0	N/A	300		0	
					Vacant	2175	0	Commercial Bakery	131	Restaurant	0	
904-6-4-10	32 Hampton Rd	0.1	481	Downtown Row Type (with common wall)	Insurance Agency	2500	0	Non Medical Office	150	Non Medical Office	0	150
904-6-4-11	34 Hampton Rd	0.09	481	Downtown Row Type (with common wall)								
904-6-4-12	36 Hampton Rd	0.1	481	Downtown Row Type (with common wall)	Nail Salon	1250	0	Wet Store w/o food	125	Wet Store w/o food	0	250
					Hair Salon	1250	0	Wet Store w/o food	125	Wet Store w/o food		
904-6-4-13	38 Hampton Rd	0.09	481	Downtown Row Type (with common wall)	Real Estate Agency	2100	0	Non Medical Office	126	Non Medical Office	0	126
904-6-4-14	40 Hampton Rd	0.09	422	Diners and Luncheonettes	Ice Cream Shop	1550	0	Wet Store w/ food	233	Wet Store w/ food	0	233
904-6-4-15	42 Hampton Rd	0.09	481	Downtown Row Type (with common wall)	Mobile Phone Store	1600	0	Dry Store	48	Dry Store	0	48
904-6-4-16	44 Hampton Rd	0.1	421	Restaurants	Italian Restaurant	2800	0	Restaurant	2,800	Restaurant	0	2,800
904-6-4-17	50 Hampton Rd	0.09	481	Downtown Row Type (with common wall)		1200	0		300	Restaurant	0	1,500
904-6-4-18	52 Hampton Rd	0.09	481	Downtown Row Type (with common wall)	Florist	800	1	Wet Store w/o food	305	Wet Store w/o food	0	305
904-6-4-19.1	54 Hampton Rd	0.09	481	Downtown Row Type (with common wall)	Deli	1500	1	Wet Store w/ food	450	Wet Store w/ food	0	450
904-6-4-19.2	56 Hampton Rd	0.09	481	Downtown Row Type (with common wall)	Vacant	2000	0	Dry Store	60	Restaurant	0	2,000
904-6-4-20	60 Hampton Rd	0.18	481	Downtown Row Type (with common wall)	Mattress Store	5000	0	Dry Store	150	Dry Store	0	150
904-6-4-21	62 Hampton Rd	0.1	481	Downtown Row Type (with common wall)	Furniture Store	1900	0	Dry Store	57	Dry Store	0	57
904-6-4-30.1	17 Cameron St	0.1	421	Restaurants	American Restaurant	1850	0	Restaurant	1,850	Restaurant	0	1,850
904-6-4-32	64 Main St	0.1	481	Downtown Row Type (with common wall)	Women's Clothing Store	5250	0	Dry Store	158	Dry Store	0	158
					Health Food Store	2450	0	Convenience Store/Market	123	Convenience Store/Market	0	

South Hampton Tax Map Format D-S-B-L	Address	Acreage	Property Type Code	Property Classification	Existing Structure Use	Building/Unit SQ	Existing Apartment in Building	SCDHS Structure Use	Estimated Existing GPD	Projected Commercial Use	Projected Residential Stories (300 GPD per Story)	Projected Flow GPD
904-6-4-33	70 Main St	0.08	481	Downtown Row Type (with common wall)	Business Center	2450	0	Non Medical Office	147	Non Medical Office	0	270
904-6-4-34	72 Main St	0.07	481	Downtown Row Type (with common wall)	Clothing Store	2200	1	Dry Store	291	Dry Store	0	291
904-6-4-35	82 Main St	0.03	481	Downtown Row Type (with common wall)	Optician	800	0	Medical Office	80	Medical Office	0	80
904-6-4-36	84 Main St	0.2	481	Downtown Row Type (with common wall)	Laundromat	3300	0	Laundromat	4,199	Laundromat	0	4,319
					Clothing Store	4000	0	Dry Store	120	Dry Store	0	
904-6-5-1	60 Main St	0.1	461	Standard Bank/Single Occupant	Bank	4000	0	Non Medical Office	240	Non Medical Office	0	240
904-6-5-3.1	50 Main St	0.1	481	Downtown Row Type (with common wall)	Recruiting Company	2900		Non Medical Office	174	Non Medical Office	0	737
					Home Goods Store	1900	1	Dry Store	282	Dry Store		
					Clothing Store	1850	1	Dry Store	281	Dry Store		
904-6-5-4	46 Main St	0.05	481	Downtown Row Type (with common wall)	Cosmetics Store	2300	0	Dry Store	69	Dry Store	0	253
					Pyschiatry	1150	0	Medical Office	115	Medical Office		
					Law Office	1150	0	Non Medical Office	69	Non Medical Office		
904-6-5-5	44 Main St	0.08	481	Downtown Row Type (with common wall)	Sportswear Store	1200	0	Dry Store	36	Dry Store	0	72
					Clothing Store	1200	0	Dry Store	36	Dry Store		
904-6-5-7	Parking Area	0.3	438	Parking Lot	Parking Lot		0		0	N/A	N/A	0
904-6-5-22	40 Main St	0.1	481	Downtown Row Type (with common wall)	Clothing Store	1500	0	Dry Store	45	Dry Store	0	90
					Clothing Store	1500	0	Dry Store	45	Dry Store		
904-6-5-23	36 Main St	0.1	421	Restaurants	French Restaurant	3000	1	Restaurant	3,225	Restaurant	0	3,225
904-6-5-24.2	30 Main St	0.2	482	Downtown Row Type (detached)	Italian Restaurant	2300	0	Restaurant	2,300	Restaurant	0	3,578
					Photographer	1000	0	Non Medical Office	60	Non Medical Office		
					Law Office	1000	0	Non Medical Office	60	Non Medical Office		
					Clothing Store	2300	0	Dry Store	69	Dry Store		
					Construction Company Office	2300	1	Dry Store	294	Dry Store		
					Law Office	2300	1	Non Medical Office	363	Non Medical Office		
					Clothing Store	2300	0	Dry Store	69	Dry Store		
					Landscape Designer	2300	1	Non Medical Office	363	Non Medical Office		
904-6-5-25	24 Main St	0.1	481	Downtown Row Type (with common wall)	Real Estate Agency	2850	0	Non Medical Office	171	Non Medical Office	0	171
904-6-5-26	20 Main St	0.08	481	Downtown Row Type (with common wall)	Real Estate Agency	1000	0	Non Medical Office	60	Non Medical Office	0	90
					Childrens Clothing Store	1000	0	Dry Store	30	Dry Store	0	
904-6-5-27	14 Main St	0.1	481	Downtown Row Type (with common wall)	Business Center - Real Estate Agency	3200	0	Non Medical Office	192	Non Medical Office	0	192
904-6-5-28	10 Main St	0.1	481	Downtown Row Type (with common wall)	Consignment Shop	3000	0	Dry Store	90	Dry Store	0	270
					Financial consultant	3000	0	Non Medical Office	180	Non Medical Office		
904-6-5-29	2 Main St	0.1	481	Downtown Row Type (with common wall)	Furniture Store	3200	0	Dry Store	96	Dry Store	0	96
904-7-1-27	45 Hampton Rd	0.3	464	Office Building	Hot Tub Store	1100	0	Dry Store	33	Dry Store	0	75
					Swimming Pool Supply	1400	0	Dry Store	42	Dry Store		
904-7-1-28.1	57 Hampton Rd	1.4	465	Professional Building	Financial consultant	6800	0	Non Medical Office	408	Non Medical Office	0	408
904-7-1-28.2	67 Hampton Rd	0.4	465	Professional Building	Publisher	1200	0	Non Medical Office	72	Non Medical Office	0	696
					Facial Spa	1200	0	Wet Store w/o food	120	Wet Store w/o food	0	
					Dentist Office	1200	0	Medical Office	120	Medical Office	0	
					Investment Service	1200	0	Non Medical Office	72	Non Medical Office	0	
					Investment Service	1200	0	Non Medical Office	72	Non Medical Office	0	
					Pediatrician	1200	0	Medical Office	120	Medical Office	0	
					Opthalmologist	1200	0	Medical Office	120	Medical Office	0	

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904-7-1-28.3	77 Hampton Rd	0.7	464	Office Building	Dermatology Office	2400	1	Medical Office	465	Medical Office	0	465
904-14-3-1	10 First Neck Ln	0.6	418	Inns, Lodges, Boarding and Rooming Houses, Touriest Homes, Fraternity and Sorority Houses	Non-profit Organization	4880	0		900		0	900
904-14-3-3	61 Culver St	0.2	418	Inns, Lodges, Boarding and Rooming Houses, Touriest Homes, Fraternity and Sorority Houses		1900	0		1,125		0	1,125
904-14-3-4	49 Culver St	0.1	483	Converted Residence	Law Office	1550	1	Non Medical Office	318	Non Medical Office	0	318
904-14-3-7.2	50 Hill St	0.9	481	Downtown Row Type (with common wall)	Internet Service provider	1450	0	Non Medical Office	87	Non Medical Office	0	890
					Hair Salon	1450	0	Wet Store w/o food	218	Wet Store w/o food	0	
					Surf Shop	2900	0	Dry Store	87	Dry Store	0	
					Educational Arts Program for Children	1450	0	Day School	150	Day School	0	
					Investment Service	1450	0	Non Medical Office	87	Non Medical Office	0	
						1450	0	Non Medical Office	87	Non Medical Office	0	
						1450	0	Non Medical Office	87	Non Medical Office	0	
					Landscape design	1450	0	Non Medical Office	87	Non Medical Office	0	
904-14-3-8	28 Hill St	0.05	481	Downtown Row Type (with common wall)	Sporting Goods Store	1500	0	Dry Store	45	Dry Store	0	105
					Interior Designer	1000	0	Non Medical Office	60	Non Medical Office	0	
904-14-3-9	26 Hill St	0.1	481	Downtown Row Type (with common wall)	Shipping and Mailing Service	3000	0	Dry Store	90	Dry Store	0	90
904-14-3-11	16 Hill St	0.3	481	Downtown Row Type (with common wall)	Financial consultant	1500	0	Non Medical Office	90	Non Medical Office	0	1,035
					Day Spa	1500	0	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	150	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	0	
					Vacant Unit	1500	0	Dry Store	45	Dry Store	0	
					Day Spa	1500	0	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	150	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	0	
					Gym	1500	0	Spa/Fitness Center/Karate/Dance/etc. (w/ showers & amenities)	450	Spa/Fitness Center/Karate/Dance/etc. (w/ showers & amenities)	0	
					Personal Trainer	1500	0	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	150	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	0	
904-14-3-12	1 Pond Ln	0.1	433	Auto Body, Tire Shops, Other Related Auto Sales	Auto Repair Shop	6000	0	Car Maintenance Garage	240	Car Maintenance Garage	0	240
904-14-3-13	19 Pond Ln	0.07	484	One Story Small Structure	Furniture Store	2700	0	Dry Store	81	Dry Store	0	81
904-15-1-4	22 Windmill Ln	0.2	411	Apartments	Vacant Mixed Use Building	2600	2	Dry Store	528	Restaurant	2	3,200
904-15-1-6	18 Windmill Ln	0.2	483	Converted Residence	Nail Salon and Spa	3200	0	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	320	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	1	828
					Tanning Salon	1600	0	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	160	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)		
					Jewelery Store	1600	0	Dry Store	48	Dry Store		
904-15-1-7	16 Windmill Ln	0.1	481	Downtown Row Type (with common wall)	Beauty Salon	1200	1	Wet Store w/o food	345	Wet Store w/o food	0	642
					Rental Management	1200	1	Non Medical Office	297	Non Medical Office		
904-15-1-8.3	99 Jobs Ln	0.2	481	Downtown Row Type (with common wall)	Cigar Shop/Lounge	1500	0	Dry Store	45	Dry Store	0	2,078
					Flooring Store	1100	0	Dry Store	33	Dry Store		
					Italian Restaurant	2000	0	Restaurant	2,000	Restaurant		
904-15-1-9	91 Jobs Ln	0.03	481	Downtown Row Type (with common wall)	Real Estate Agency	400	1	Non Medical Office	249	Non Medical Office	0	249
904-15-1-10	89 Jobs Ln	0.1	481	Downtown Row Type (with common wall)	Picture Frame Shop	2900	1	Dry Store	312	Dry Store	0	312
					Clothing Store	700	0	Dry Store	21	Dry Store		
					Clothing Store	700	0	Dry Store	21	Dry Store		
					Vacant Unit	700	0	Dry Store	21	Dry Store		

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904-15-1-14.1	83 Jobs Ln	0.3	481	Downtown Row Type (with common wall)	Yoga Studio	2600	1	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	485	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	0	793
					Gift Shop	650	1	Dry Store	245	Dry Store		
904-15-1-15	75 Jobs Ln	0.06	481	Downtown Row Type (with common wall)	Continental Restaurant	1400	1	Restaurant	1,625	Restaurant	0	1,625
904-15-1-16	71 Jobs Ln	0.06	481	Downtown Row Type (with common wall)	Jewelery Store	1400	1	Dry Store	267	Dry Store	0	267
904-15-1-17	69 Jobs Ln	0.2	481	Downtown Row Type (with common wall)	Toy Store	2700	1	Dry Store	306	Dry Store	0	306
904-15-1-18	67 Jobs Ln	0.09	481	Downtown Row Type (with common wall)	Vacuum Cleaner Store	1900	0	Dry Store	57	Dry Store	0	57
904-15-1-20.1	63 Jobs Ln	0.1	481	Downtown Row Type (with common wall)	Liquor Store	3500	0	Dry Store	105	Dry Store	0	105
904-15-1-21	53 Jobs Ln	0.3	481	Downtown Row Type (with common wall)	Clothing Store	1280	0	Dry Store	38	Dry Store	0	154
					Clothing Store	1280	0	Dry Store	38	Dry Store	0	
					Clothing Store	1280	0	Dry Store	38	Dry Store	0	
					Clothing Store	1280	0	Dry Store	38	Dry Store	0	
904-15-1-22	43 Jobs Ln	0.4	481	Downtown Row Type (with common wall)	Home Goods Store	885	0	Dry Store	27	Dry Store	0	300
					Outlet Store	885	0	Dry Store	27	Dry Store	0	
					Interior Designer	885	0	Non Medical Office	53	Non Medical Office	0	
					Clothing Store	885	0	Dry Store	27	Dry Store	0	
					Vacant Unit	885	0	Dry Store	27	Dry Store	0	
					Linens Store	885	0	Dry Store	27	Dry Store	0	
					Skin Care	885	0	Dry Store	27	Dry Store	0	
					Flower Shop	400	0	Wet Store w/o food	40	Wet Store w/o food	0	
					Interior Designer	400	0	Non Medical Office	24	Non Medical Office	0	
					Attorney	400	0	Non Medical Office	24	Non Medical Office	0	
904-15-1-23	41 Jobs Ln	0.1	481	Downtown Row Type (with common wall)	Clothing Store	1800	1	Dry Store	279	Dry Store	0	279
904-15-1-25	11 Jobs Ln	0.3	681	Cultural Facilities - Museums, art galleries, etc	Art Museum	5800	0	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	319	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	0	319
904-15-1-26	5 S Main St	0.1	481	Downtown Row Type (with common wall)	Furniture Store	2500	1	Dry Store	300	Dry Store	0	300
904-15-1-27	9 S Main St	0.09	481	Downtown Row Type (with common wall)	Art Gallery	2900	0	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	160	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	0	160
904-15-1-28	11 Main St	0.1	481	Downtown Row Type (with common wall)	Cheese Shop	2150	0	Wet Store w/ food	323	Wet Store w/ food	0	323
					Clothing Store	1075	0	Dry Store	32	Dry Store	0	32
					Clothing Store	1075	0	Dry Store	32	Dry Store	0	32
					Mortgage Lender	1075	0	Non Medical Office	65	Non Medical Office	0	65
					Insurance Agency	1075	0	Non Medical Office	65	Non Medical Office	0	65
					Accounting Agency	1075	0	Non Medical Office	65	Non Medical Office	0	65
					Boutique Store	1075	0	Dry Store	32	Dry Store	0	32
904-15-1-29	13 Main St	0.05	481	Downtown Row Type (with common wall)	Restaurant	1400	0	Restaurant	1,400	Restaurant	0	1,400
					Party equipment rental services	1400	0	Dry Store	42	Dry Store	0	42
904-15-1-30	17 Main St	0.03	481	Downtown Row Type (with common wall)	Antique Shop	650	1	Dry Store	245	Dry Store	0	245
904-15-1-33	25 Main St	0.06	481	Downtown Row Type (with common wall)	Antique Shop	2200	0	Dry Store	66	Dry Store	0	66
904-15-1-36	35 S Main St	0.1	481	Downtown Row Type (with common wall)	Clothing Store	2600	0	Dry Store	78	Dry Store	0	78
904-15-1-38	27A Main St	0.1	481	Downtown Row Type (with common wall)	Jewelery Store	1000	0	Dry Store	30	Dry Store	0	30
					Womens clothing store	1000	0	Dry Store	30	Dry Store	0	30
					Real Estate Agency	1000	0	Non Medical Office	60	Non Medical Office	0	60
					Law Office	3000	0	Non Medical Office	180	Non Medical Office	0	180
904-15-1-39.4	32 Windmill Ln	0.1	481	Downtown Row Type (with common wall)	Bicycle Shop	4800	2	Dry Store	594	Dry Store	1	894
904-15-1-39.5	36 Windmill Ln	0.07	481	Downtown Row Type (with common wall)	German Restaurant	2000	1	Restaurant	2,225	Restaurant	2	2,825

South Hampton Tax Map Format D-S-B-L	Address	Acreage	Property Type Code	Property Classification	Existing Structure Use	Building/Unit SQ	Existing Apartment in Building	SCDHS Structure Use	Estimated Existing GPD	Projected Commercial Use	Projected Residential Stories (300 GPD per Story)	Projected Flow GPD
904-15-1-39.6	36 Windmill Ln	0.07	481	Downtown Row Type (with common wall)	Grass/bench area in between Shippys and Rotations	N/A	N/A		0	N/A	N/A	0
904-15-1-39.7	Landlocked	0.02	331	Commercial Vacant with minor improvements	asphalt lot for cars etc.	N/A	N/A		0	N/A	N/A	0
904-15-2-4	76 Jobs Ln	0.1	481	Downtown Row Type (with common wall)	Deli	700	0	Wet Store w/ food	105	Wet Store w/ food	0	2,175
					Massage Spa	700	0	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)	70	Spa/Fitness Center/Karate/Dance/etc. (w/o showers & amenities)		
					Asain Fusion Restaurant	2000	0	Restaurant	2,000	Restaurant		
904-15-2-5	70 Jobs Ln	0.1	481	Downtown Row Type (with common wall)	Real Estate Agency	4300	0	Non Medical Office	258	Non Medical Office	0	258
904-15-2-6	68 Jobs Ln	0.08	481	Downtown Row Type (with common wall)	Interior Designer	2400	0	Non Medical Office	144	Non Medical Office	0	144
904-15-2-7	66 Jobs Ln	0.1	481	Downtown Row Type (with common wall)	Mixed Use building with vacant downstairs commercial and residential unit on second floor	1750	1	Dry Store	278	Restaurant	0	1,750
904-15-2-8	62 Jobs Ln	0.1	421	Restaurants	Bar and Grill Pub	3600	0	Restaurant	3,600	Restaurant	0	3,900
					Single Family Home		N/A	N/A	300			
904-15-2-9	60 Jobs Ln	0.05	481	Downtown Row Type (with common wall)	Jewelery Store	2000	0	Dry Store	60	Dry Store	0	60
904-15-2-10	56 Jobs Ln	0.1	481	Downtown Row Type (with common wall)	Clothing Store	1250	1	Dry Store	263	Dry Store	0	525
					Interior Designer	1250	1	Dry Store	263	Dry Store		
904-15-2-11	54 Jobs Ln	0.08	481	Downtown Row Type (with common wall)	Deli	1300	0	Wet Store w/ food	195	Wet Store w/ food	0	195
904-15-2-12	52 Jobs Ln	0.08	481	Downtown Row Type (with common wall)	Clothing Store	900	1	Dry Store	252	Dry Store	0	252
904-15-2-13	50 Jobs Ln	0.09	481	Downtown Row Type (with common wall)	Clothing Store	800	0	Dry Store	24	Dry Store	0	24
904-15-2-14	44 Jobs Ln	0.1	481	Downtown Row Type (with common wall)	Clothing Store	1125	1	Dry Store	259	Dry Store	0	692
					Beauty Salon	1125	0	Wet Store w/o food	113	Wet Store w/o food	0	
					Art Dealer	1125	1	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	287	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	0	
					Clothing Store	1125	0	Dry Store	34	Dry Store	0	
904-15-2-15.1	42 Jobs Ln	0.09	481	Downtown Row Type (with common wall)	Interior Designer	2100	0	Non Medical Office	126	Non Medical Office	0	126
904-15-2-16.1	38 Jobs Ln	0.09	481	Downtown Row Type (with common wall)	Clothing Store	1300	0	Dry Store	39	Dry Store	0	339
					Single Family Home		N/A		300		0	
904-15-2-17	36 Jobs Ln	0.1	481	Downtown Row Type (with common wall)	Antique Shop	2000	0	Dry Store	60	Dry Store	0	60
904-15-2-18	30 Jobs Ln	0.1	481	Downtown Row Type (with common wall)	Art Gallery	2700	1	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	374	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	0	680
					Furniture Store	2700	1	Dry Store	306	Dry Store	0	
904-15-2-19	28 Jobs Ln	0.1	481	Downtown Row Type (with common wall)	Jewelery Store	725	0	Dry Store	22	Dry Store	0	83
					Art Gallery	725	0	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	40	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	0	
					Beauty Supply Store	725	0	Dry Store	22	Dry Store	0	
904-15-2-20	22 Jobs Ln	0.1	481	Downtown Row Type (with common wall)	Ice Cream Shop	1600	0	Wet Store w/ food	240	Wet Store w/ food	0	376
					Art Gallery	1600	0	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	88	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	0	
					Clothing Store	1600	0	Dry Store	48	Dry Store	0	
904-15-2-21	18 Jobs Ln	0.3	481	Downtown Row Type (with common wall)	Home Goods Store	1200	0	Dry Store	36	Dry Store	0	354
					Clothing Store	1200	0	Dry Store	36	Dry Store	0	
					Clothing Store	1200	0	Dry Store	36	Dry Store	0	
					Shoe Store	1200	0	Dry Store	36	Dry Store	0	
					Jewelery Store	1200	0	Dry Store	36	Dry Store	0	
					Clothing Store	1200	0	Dry Store	36	Dry Store	0	
					Clothing Store	1200	0	Dry Store	36	Dry Store	0	
					Clothing Store	1200	0	Dry Store	36	Dry Store	0	

South Hampton Tax Map Format D-S-B-L	Address	Acreage	Property Type Code	Property Classification	Existing Structure Use	Building/Unit SQ	Existing Apartment in Building	SCDHS Structure Use	Estimated Existing GPD	Projected Commercial Use	Projected Residential Stories (300 GPD per Story)	Projected Flow GPD
					Art Gallery	1200	0	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	66	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	0	
904-15-2-22.1	21 S Main St	0.6	464	Office Building	Law Office	2600	0	Non Medical Office	156	Non Medical Office	0	312
					Construction Company Office	2600	0	Non Medical Office	156	Non Medical Office		
904-15-2-40	40 Jobs Ln	0.08	481	Downtown Row Type (with common wall)	Interior Designer	500	0	Non Medical Office	30	Non Medical Office	0	30
904-3-1-46	20 North Sea Rd	0.09	380	Public Utility Vacant Land	Vacant Land next to train tracks	N/A	0	N/A	0	N/A	0	0
904-6-1-11	55 Windmill Ln	1.6	831	Telephone - telephone and telecommunications land, buildings, towers, antennae, etc.	Cell Phone Store/Homebase	14000	0	Dry Store	420	Dry Store	2	1,020
904-5-1-32	209 Windmill Ln	0.1	534	Social Organizations (Elks, Moose, Eagles, Veterans post, etc.)	Abandoned meeting place with historical presence	1000	0		0		0	0
904-6-1-1	185 Windmill Ln	2.4	682	Recreational Facilities - Nature trails, bike paths, etc.	No Structure	N/A	0	N/A	0	N/A	0	0
904-6-1-3.1	151 Windmill Ln	4	662	Police and Fire Protection, Electrical Signal Equipment and Other Facilities for Fire, Police, Civil Defense, etc.	Ambulance Building	7800	0	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	624	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	0	1,448
					Police Department	10300	0	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	824	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	0	
904-6-1-5.4	Drainage Area	1.8	821	Flood Control - Land used for the accumulation, storage or diversion of water for flood control purposes only.	Vacant Land	N/A	0	N/A	0	N/A	0	0
904-6-1-5.5	Park Area	1.6	311	Residential Vacant Lot	Vacant Land	N/A	0	N/A	0	N/A	0	0
904-6-1-5.6	Park Area	1.2	311	Residential Vacant Lot	Vacant Land	N/A	0	N/A	0	N/A	0	0
904-6-1-5.7	96 Coopers Farm Rd	0.3	311	Residential Vacant Lot	Vacant Land	N/A	0	N/A	0	N/A	0	0
904-6-1-5.26	91 Coopers Farm Rd	3.4	611	Library	Library	13500	0	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	743	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	0	1,043
					Single Family Home		0		300		0	
904-6-1-15.1	25 Windmill Ln	0.6	662	Police and Fire Protection, Electrical Signal Equipment and Other Facilities for Fire, Police, Civil Defense, etc.	Fire Station	3000	0	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	253	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	0	253
904-6-2-13.3	71 Nugent St	0.5	330	Vacant Land Located in Commercial Area	Vacant Land	N/A	0	N/A	0	Restaurant	2	3,400
904-6-2-17	27 West Main St	2.7	438	Parking Lot	Parking Lot	N/A	0	N/A	0	N/A	0	0
904-6-3-11	160 Main St	1.5	620	Religious	Church	7900	0	House of Worship	408	House of Worship	0	633
					Day School for Pre Schoolers	6500	0	Day School	225	Day School	0	
904-6-4-22	76 Main St	1.2	652	Government Office Building	Office Building for small business	750	0	Non Medical Office	45	Non Medical Office	0	45
904-6-5-21	20 Walnut St	0.5	653	Government Parking Lot	Parking Lot	N/A	0	N/A	0	N/A	0	0
904-6-5-30	17 Meeting House Ln	1.2	681	Cultural Facilities - Museums, art galleries, etc.	Museum	3600	0	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	198	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	0	198
904-14-3-14	25 Pond Ln	0.4	681	Cultural Facilities - Museums, art galleries, etc.	Cultural Center	10000	0	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	550	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	0	550
904-15-1-24.1	25 Jobs Ln	2.8	615	Other Educational Facility	Art Center	16200	0	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	891	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	0	891
904-15-1-32	23 Main St	0.1	652	Government Office Building	Government Office Building	4000	0	Non Medical Office	240	Non Medical Office	0	240
904-15-1-37	37 Main St	0.1	692	Roads, Streets, Highways and Parkways, Express or Otherwise (if listed) Including Adjoining Land	No Structure	N/A	0	N/A	0	N/A	0	0
904-15-2-1	90 Jobs Ln	0.1	963	City/Town/Village Public Parks and Recreation Areas	No Structure	N/A	0	N/A	0	N/A	0	0

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904-15-2-22.2	Agawam Park	4.8	590W	Park - with water frontage	bathroom	650	0	Recreation	2,625	Recreation	0	2,625
904-15-3-1	20 S Main St	1.9	620	Religious	Church	12400	0	House of Worship	633	House of Worship	0	933
					Single Family Home		N/A	N/A	300			
904-5-1-14.2	111 North Sea Rd	0.2	210	One Family Year Round Residence	Single Family Home		N/A	N/A	300		0	300
904-5-1-14.1	97 North Sea Rd	1.2	465	Professional Building	Bank	2100	0	Non Medical Office	126	Non Medical Office	0	378
					Bank	2100	0	Non Medical Office	126	Non Medical Office		
					Corporate Campus	2100	0	Non Medical Office	126	Non Medical Office		
904-5-3-35	116 North Sea Rd	1	480	Multiple Use or Multipurpose	Single Family Home		N/A	N/A	300		0	335
					Home Goods Store	1150	0	Dry Store	35	Dry Store		
904-5-3-25	120 North Sea Rd	1.2	454	Large Retail Food Stores	Produce Market	6200	0	Convenience Store/Market	310	Convenience Store/Market	0	310
904-5-1-12.1	127 North Sea Rd	2.2	652	Government Office Building	Post Office	11500	0	Dry Store	345	Dry Store	0	345
904-5-1-9	145 North Sea Rd	0.6	311	Residential Vacant Lot	Vacant Land	N/A	0	N/A	0	Non Medical Office	2	1,410
904-5-1-8	155 North Sea Rd	0.9	449	Other Storage, Warehouse and Distribution Facilities	Storage Buildings	7600	0	N/A	0	N/A	0	0
904-5-1-7	159 North Sea Rd	0.3	470	Miscellaneous Services	Storage Buildings	1200	0	N/A	0	N/A	0	0
904-5-1-6	161 North Sea Rd	0.3	470	Miscellaneous Services	N/A	0	0	N/A	0	N/A	0	0
904-5-1-5	175 North Sea Rd	1	470	Miscellaneous Services	Garden Center	9200	0	Wet Store w/o food	920	Wet Store w/o food	0	920
904-5-1-4	30 W Prospect St	0.2	210	One Family Year Round Residence	Single Family Home		N/A	N/A	300		0	300
904-5-3-24	146 North Sea Rd	0.2	210	One Family Year Round Residence	Single Family Home		N/A	N/A	300		0	300
904-5-3-23	168 North Sea Rd	0.3	210	One Family Year Round Residence	Single Family Home		N/A	N/A	300		0	300
904-5-3-1.1	176 North Sea Rd	0.3	480	Multiple Use or Multipurpose	Attorney	1000	0	Non Medical Office	60	Non Medical Office	0	385
					Chiropractor	1000	1	Medical Office	325	Medical Office		
904-5-2-17.1	200 North Sea Rd	0.9	465	Professional Building	Art Gallery	2200	0	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	121	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	0	374
					Law Office	2200	0	Non Medical Office	132	Non Medical Office	0	
					Art Gallery	2200	0	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	121	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	0	
904-5-2-3	214 North Sea Rd	0.5	464	Office Building	Pest Control Service	4900	0	Non Medical Office	294	Non Medical Office	0	294
904-5-2-2	224 North Sea Rd	0.2	210	One Family Year Round Residence	Single Family Home		N/A	N/A	300		0	300
904-5-2-1	4 Willow St (232 N Sea R	0.3	210	One Family Year Round Residence	Single Family Home		N/A	N/A	300		0	300
904-4-1-29	235 North Sea Rd	0.8	480	Multiple Use or Multipurpose	Chicken Restaurant	1800	1	Restaurant	2,025	Restaurant	0	2,865
					Butcher Shop	1800	1	Wet Store w/ food	495	Wet Store w/ food		
					Seafood Market	2300	0	Wet Store w/ food	345	Wet Store w/ food		
904-4-2-40.1	250 North Sea Rd	0.4	464	Office Building	Attorney	2750	0	Non Medical Office	165	Non Medical Office	0	165
904-4-2-39	264 North Sea Rd	0.9	464	Office Building	Real Estate Agency	1100	0	Non Medical Office	66	Non Medical Office	0	966
					Single Family Home		N/A	N/A	300			
					Single Family Home		N/A	N/A	300			

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					Single Family Home		N/A	N/A	300			
904-4-2-38.1	266 North Sea Rd	0.3	484	One Story Small Structure	Doctors Office	800	0	Medical Office	80	Medical Office	0	80
904-4-2-37	270 North Sea Rd	0.4	464	Office Building	Optometrist	1700	1	Medical Office	395	Medical Office	0	395
904-4-2-35.1	290 North Sea Rd	1	483	Converted Residence	Physical Therapy Clinic	1000	0	Medical Office	100	Medical Office	0	100
904-4-2-24	320 North Sea Rd	0.4	438	Parking Lot	Parking Lot	N/A	0	N/A	0	N/A	0	0
904-4-2-23	10 County Rd 39A	0.2	450	Retail Services	Convenience Store	2600	0	Convenience Store/Market	130	Convenience Store/Market	0	130
904-4-1-71	243 North Sea Rd	0.1	311	Residential Vacant Lot	Vacant Land	N/A	0	N/A	0	Non Medical Office	2	732
904-4-1-72	245 North Sea Rd	0.04	484	One Story Small Structure	Non-profit Organization (Museum)	650	N/A	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	36	Library, firehouse, precinct, museum, art gallery w/o meeting rooms	0	36
904-4-1-73	249 North Sea Rd	0.07	681	Cultural Facilities - Museums, art galleries, etc.	Vacant Land	N/A	0	N/A	0	Non Medical Office	2	690
904-4-1-79.8	295 North Sea Rd	2	463	Bank Complex with Office Building	Bank	4300	0	Non Medical Office	258	Non Medical Office	1	1,146
					Law Office	2400	0	Non Medical Office	144	Non Medical Office	1	
					Construction Company Office	2400	0	Non Medical Office	144	Non Medical Office	0	
904-4-1-75	307 North Sea Rd	0.8	426	Fast Food Franchises	Fast Food Restaurant	3300	0	Restaurant	3,300	Restaurant	0	3,300
904-4-1-76.2	321 North Sea Rd	1.3	433	Auto Body, Tire Shops, Other Related Auto Sales	Tire Shop	20300	0	Car Maintenance Garage	800	Car Maintenance Garage	0	800
904-4-1-77	14 Count Rd 39	0.3	432	Service and Gas Stations	Gas Station	400	0	Convenience Store/Market	20	Convenience Store/Market	0	20
904-7-4-1.1	30 Pine St	6.98	612		Elementary School - Assuming 517 students and 53 teachers as per https://www.usnews.com/education/k12/new-york/southampton-elementary-school-204454	49120	0	Day School	4,275	Day School	0	4,275
904-7-4-1.2	116 Hampton Rd	2.48	652	Government Office Building	Town Building	22000	0	Non Medical Office	1,320	Non Medical Office	0	1,320
904-14-3-10	23 Culver St	0.22	210	One Family Year Round Residence	Office Building (flow included in	1300	0	Non Medical Office	78	Non Medical Office	0	378
					Single Family Home		N/A	N/A	300			
904-6-1-18		0.01	692	Roads, Streets, Highways and Parkways, Express or Otherwise (if listed) Including Adjoining Land	N/A	N/A	0				0	0
904-6-1-17		0.15	546	Other Indoor Sports	Hometown Taxi	Flow Included with 25 Hill St	0				0	0
904-6-1-24		0.01	N/A		N/A	N/A	0				0	0
904-6-1-19.1		0.02	692	Roads, Streets, Highways and Parkways, Express or Otherwise (if listed) Including Adjoining Land	N/A	N/A	0				0	0
904-15-1-1		0.07	N/A			N/A	0				0	0
904-15-1-19.1		0.13	692	Roads, Streets, Highways and Parkways, Express or Otherwise (if listed) Including Adjoining Land		N/A	0				0	0
904-15-1-35		0.03	692	Roads, Streets, Highways and Parkways, Express or Otherwise (if listed) Including Adjoining Land	Board Room attached to village hall	1100	0	Non Medical Office	66	Non Medical Office	0	66
904-15-1-31		0.04	N/A			N/A	0				0	0
904-15-1-34		0.03	653	Parking Lots		N/A	0				0	0
904-6-5-41		0.07	692	Roads, Streets, Highways and Parkways, Express or Otherwise (if listed) Including Adjoining Land		N/A	0				0	0
904-6-2-49.1		0.07	438	Parking Lot		N/A	0				0	0
904-6-5-6		0.08	N/A			N/A	0				0	0
904-6-2-20		0.02	692	Roads, Streets, Highways and Parkways, Express or Otherwise (if listed) Including Adjoining Land		N/A	0				0	0

South Hampton Tax Map Format D-S-B-L	Address	Acreage	Property Type Code	Property Classification	Existing Structure Use	Building/Unit SQ	Existing Apartment in Building	SCDHS Structure Use	Estimated Existing GPD	Projected Commercial Use	Projected Residential Stories (300 GPD per Story)	Projected Flow GPD
904-6-4-31		0.06	N/A			N/A	0				0	0
904-6-4-4			438	Parking Lot		N/A	0				0	0
904-6-2-1	165 Main St	1.87	695	Cemeteries		N/A	0				0	0
904-6-2-3	159 Main St	0.81	210	One Family Year Round Residence	Single Family Home		N/A	N/A	300		0	300

General Assumptions

1. Projected building sqft on vacant land for non-medical office buildings is assumed to be one half the total parcel sqft.

2. Projected building sqft on vacant land for restaurants are assumed to be the average restaurant sqft in the project area - 2800 sqft.

3. Assume 3.5 people per residential home.

4. Assume 3 people per apartment unit.

5. Southampton Vision Board additional residential story assumed to have a flow of 300 gallons per day with 3.5 people.

APPENDIX C – LOW-PRESSURE SEWER DESIGN

Environment One Corporation

Pressure Sewer Preliminary Cost and Design Analysis For Southampton, NY

Prepared For:
D&B Engineers and Architects
330 Crossways Park Drive
Woodbury NY 11797 USA
Tel: 516-364-9890
Fax:
Prepared By: M. Crowley
April 11, 2022

Southampton, NY

Prepared by : M. Crowley **On:** April 11, 2022

Notes :
Analysis based upon drawings and data provided. Station recommendations are preliminary.

GPD values impact retention times only, not line sizing or hydraulics. GP laterals to be 1.25".

Analysis valid only with pipe type listed.

General recommendations for valve placement are: clean out valves at intervals of approximately 1,000 ft and at branch ends and junctions; isolation valves at branch junctions; and air release valves at changes in grade of 20 to 25 ft or more and/or at intervals of 2,000 to 2,500 ft. Lateral kits comprised of a ball and check valve are required to be installed between the pump discharge and street main on all installations. Laterals should be located as close to the public right of way as possible.

Quantities of grinder pumps, pipe, and valves are indicated on the cost page. The model of grinder pump(s) indicated is based upon the initial information provided to us but may not be the most appropriate for the specific location or requirements of the project. Costs of these items and their installation are best obtained from sources in your region. We recommend you contact your local distributor of Environment One products for additional recommendations.

Valve quantities approximate.

Station recommendations are preliminary and based upon flows provided by the engineer. Quantities approximate.

<<<<< E N D O F N O T E S >>>>>

April 11, 2022

Budgetary Low Pressure Sewer System Costs

Southampton, NY

	Quantity	Description	Unit Cost	Installation	Sub Total
Valves	6	Air/Vacuum Release Valve	$0.00	0.00	$0.00
	31	Clean Out	$0.00	0.00	$0.00
					$0.00
Pumps	123	DH071-93	$0.00	0.00	$0.00
	31	DH151-93	$0.00	0.00	$0.00
	33	DH152-93	$0.00	0.00	$0.00
	10	WH472-92	$0.00	0.00	$0.00
	10	WH484-92	$0.00	0.00	$0.00
	2	W-Series Quadplex	$0.00	0.00	$0.00
	209	Lateral Kits (Includes Ball\Check Valve Assembly)	$0.00	0.00	$0.00
	209	Lateral (Boundary) Installation	$0.00	0.00	$0.00
	209	Pump/Panel Installation	$0.00	0.00	$0.00
	209	LF of 1.25" Lateral Pipe	$0.00	0.00	$0.00
					$0.00
Piping	6,869	2.00" Pipe	$0.00	0.00	$0.00
	7,041	3.00" Pipe	$0.00	0.00	$0.00
	2,393	4.00" Pipe	$0.00	0.00	$0.00
					$0.00

Number of Connections	**221**		
Total Per Connection	**$0.00**	**Total (w/o other)** >>>>>>>>>>>>>	**$0.00**
Grand Total Per Connection	**$0.00**	**Grand Total (including other)** >>>>>>>>>>>>>	**$0.00**

Note: The System Costs above are based on piping sized for, and Grinder Pumps manufactured by Environment One Corporation.

PRELIMINARY PRESSURE SEWER - PIPE SIZING AND BRANCH ANALYSIS

Prepared By:
M. Crowley

Southampton, NY

April 11, 2022

Zone Number	Connects to Zone	Number of Pumps in Zone	Accum Pumps in Zone	Gals/day per Pump	Max Flow Per Pump (gpm)	Max Sim Ops	Max Flow (GPM)	Pipe Size (inches)	Max Velocity (FPS)	Length of Main this Zone	Friction Loss Factor (ft/100 ft)	Friction Loss This Zone	Accum Fric Loss (feet)	Max Main Elevation	Minimum Pump Elevation	Static Head (feet)	Total Dynamic Head (ft)
This spreadsheet was calculated using pipe diameters for: SDR11HDPE											Friction loss calculations were based on a Constant for inside roughness "C" of: 150						
1.00	3.00	2	2	316	11.00	2	22.00	2.00	2.38	135.00	1.19	1.61	15.26	23.00	8.00	15.00	30.26
2.00	3.00	7	7	698	11.00	3	33.00	2.00	3.57	655.00	2.52	16.50	30.15	23.00	10.00	13.00	43.15
3.00	10.00	0	9	0	11.00	3	33.00	2.00	3.57	189.00	2.52	4.76	13.65	23.00	9.00	14.00	27.65
4.00	5.00	9	9	2672	11.00	3	33.00	2.00	3.57	497.00	2.52	12.52	23.33	23.00	21.00	2.00	25.33
5.00	10.00	5	14	1568	11.00	4	44.00	3.00	2.19	295.00	0.65	1.92	10.81	23.00	10.00	13.00	23.81
6.00	9.00	9	9	443	11.00	3	33.00	2.00	3.57	348.00	2.52	8.77	21.35	23.00	11.00	12.00	33.35
7.00	8.00	9	9	268	11.00	3	33.00	2.00	3.57	226.00	2.52	5.69	23.69	23.00	20.00	3.00	26.69
8.00	9.00	10	19	1182	11.00	5	55.00	3.00	2.74	552.00	0.98	5.42	18.00	23.00	11.00	12.00	30.00
9.00	10.00	4	32	858	11.00	6	66.00	3.00	3.29	268.00	1.38	3.69	12.58	23.00	10.00	13.00	25.58
10.00	37.00	10	65	1257	11.00	7	77.00	4.00	2.32	795.00	0.54	4.29	8.89	23.00	10.00	13.00	21.89
11.00	12.00	9	9	839	11.00	3	33.00	2.00	3.57	773.00	2.52	19.48	33.45	29.00	29.00	0.00	33.45
12.00	25.00	7	16	598	11.00	4	44.00	3.00	2.19	337.00	0.65	2.19	13.97	26.00	26.00	0.00	13.97
13.00	15.00	2	2	333	11.00	2	22.00	2.00	2.38	101.00	1.19	1.20	25.33	30.00	27.00	3.00	28.33
14.00	15.00	3	3	429	11.00	2	22.00	2.00	2.38	216.00	1.19	2.57	26.70	30.00	27.00	3.00	29.70
15.00	16.00	4	9	213	11.00	3	33.00	2.00	3.57	258.00	2.52	6.50	24.13	30.00	27.00	3.00	27.13
16.00	17.00	9	18	816	11.00	4	44.00	3.00	2.19	207.00	0.65	1.35	17.63	30.00	29.00	1.00	18.63
17.00	22.00	11	29	633	11.00	5	55.00	3.00	2.74	324.00	0.98	3.18	16.28	28.00	27.00	1.00	17.28
18.00	19.00	9	9	838	11.00	3	33.00	2.00	3.57	208.00	2.52	5.24	21.55	31.00	30.00	1.00	22.55
19.00	21.00	4	13	143	11.00	4	44.00	3.00	2.19	303.00	0.65	1.97	16.31	30.00	30.00	0.00	16.31
20.00	21.00	5	5	651	11.00	3	33.00	2.00	3.57	302.00	2.52	7.61	21.95	29.00	29.00	0.00	21.95
21.00	22.00	0	18	0	11.00	4	44.00	3.00	2.19	191.00	0.65	1.24	14.34	27.00	27.00	0.00	14.34
22.00	25.00	6	53	923	11.00	7	77.00	4.00	2.32	245.00	0.54	1.32	13.10	27.00	27.00	0.00	13.10
23.00	24.00	9	9	1285	11.00	3	33.00	2.00	3.57	844.00	2.52	21.26	36.63	29.00	19.00	10.00	46.63
24.00	25.00	7	16	1296	11.00	4	44.00	3.00	2.19	552.00	0.65	3.59	15.37	29.00	25.00	4.00	19.37
25.00	28.00	9	94	1594	11.00	8	88.00	4.00	2.65	531.00	0.69	3.67	11.78	23.00	19.00	4.00	15.78
26.00	27.00	6	6	503	11.00	3	33.00	2.00	3.57	352.00	2.52	8.87	19.71	24.00	24.00	0.00	19.71
27.00	28.00	4	10	347	11.00	4	44.00	3.00	2.19	420.00	0.65	2.73	10.84	23.00	19.00	4.00	14.84
28.00	37.00	4	108	1149	11.00	8	88.00	4.00	2.65	508.00	0.69	3.51	8.11	23.00	14.00	9.00	17.11
29.00	30.00	9	9	663	11.00	3	33.00	2.00	3.57	712.00	2.52	17.94	66.72	31.00	31.00	0.00	66.72
30.00	32.00	9	18	640	11.00	4	44.00	3.00	2.19	726.00	0.65	4.72	48.78	24.00	24.00	0.00	48.78
31.00	32.00	2	2	610	11.00	2	22.00	2.00	2.38	273.00	1.19	3.25	47.31	25.00	25.00	0.00	47.31
32.00	34.00	12	32	357	11.00	6	66.00	3.00	3.29	1,324.00	1.38	18.23	44.06	23.00	19.00	4.00	48.06
33.00	34.00	2	2	138	11.00	2	22.00	2.00	2.38	271.00	1.19	3.22	29.05	23.00	20.00	3.00	32.05
34.00	36.00	5	39	1083	11.00	6	66.00	3.00	3.29	879.00	1.38	12.10	25.83	23.00	15.00	8.00	33.83
35.00	36.00	5	5	200	11.00	3	33.00	2.00	3.57	509.00	2.52	12.82	26.55	23.00	15.00	8.00	34.55

Note: This analysis is valid only with the use of progressive cavity type grinder pumps as manufactured by Environment One.

PRELIMINARY PRESSURE SEWER - PIPE SIZING AND BRANCH ANALYSIS

Prepared By:
M. Crowley

Southampton, NY

April 11, 2022

Zone Number	Connects to Zone	Number of Pumps in Zone	Accum Pumps in Zone	Gals/day per Pump	Max Flow Per Pump (gpm)	Max Sim Ops	Max Flow (GPM)	Pipe Size (inches)	Max Velocity (FPS)	Length of Main this Zone	Friction Loss Factor (ft/100 ft)	Friction Loss This Zone	Accum Fric Loss (feet)	Max Main Elevation	Minimum Pump Elevation	Static Head (feet)	Total Dynamic Head (ft)
This spreadsheet was calculated using pipe diameters for: SDR11HDPE											Friction loss calculations were based on a Constant for inside roughness "C" of: 150						
36.00	37.00	4	48	1770	11.00	6	66.00	3.00	3.29	663.00	1.38	9.13	13.73	23.00	12.00	11.00	24.73
37.00	37.00	0	221	0	11.00	12	132.00	4.00	3.98	314.00	1.46	4.60	4.60	23.00	23.00	0.00	4.60

Note: This analysis is valid only with the use of progressive cavity type grinder pumps as manufactured by Environment One.

PRELIMINARY PRESSURE SEWER - ACCUMULATED RETENTION TIME(HR)

Prepared By:
M. Crowley

Southampton, NY

April 11, 2022

Zone Number	Connects to Zone	Accumulated Total of Pumps this Zone	Pipe Size (inches)	Gallons per 100 lineal feet	Length of Zone	Capacity of Zone	Average Daily Flow	Average Fluid Changes per Day	Average Retention Time (Hr)	Accumulated Retention Time (Hr)
This spreadsheet was calculated using pipe diameters for: SDR11HDPE								Gals per Day per Dwelling		200
1.00	3.00	2	2.00	15.40	135.00	20.79	632	30.39	0.79	1.09
2.00	3.00	7	2.00	15.40	655.00	100.89	4,886	48.43	0.50	0.79
3.00	10.00	9	2.00	15.40	189.00	29.11	5,518	189.55	0.13	0.30
4.00	5.00	9	2.00	15.40	497.00	76.55	24,048	314.14	0.08	0.32
5.00	10.00	14	3.00	33.47	295.00	98.73	31,888	322.99	0.07	0.24
6.00	9.00	9	2.00	15.40	348.00	53.60	3,987	74.38	0.32	0.59
7.00	8.00	9	2.00	15.40	226.00	34.81	2,412	69.29	0.35	0.93
8.00	9.00	19	3.00	33.47	552.00	184.73	14,232	77.04	0.31	0.58
9.00	10.00	32	3.00	33.47	268.00	89.69	21,651	241.40	0.10	0.27
10.00	37.00	65	4.00	55.31	795.00	439.74	71,627	162.89	0.15	0.17
11.00	12.00	9	2.00	15.40	773.00	119.06	7,551	63.42	0.38	0.79
12.00	25.00	16	3.00	33.47	337.00	112.78	11,737	104.07	0.23	0.41
13.00	15.00	2	2.00	15.40	101.00	15.56	666	42.81	0.56	1.50
14.00	15.00	3	2.00	15.40	216.00	33.27	1,287	38.68	0.62	1.56
15.00	16.00	9	2.00	15.40	258.00	39.74	2,805	70.58	0.34	0.94
16.00	17.00	18	3.00	33.47	207.00	69.28	10,149	146.50	0.16	0.60
17.00	22.00	29	3.00	33.47	324.00	108.43	17,112	157.81	0.15	0.43
18.00	19.00	9	2.00	15.40	208.00	32.04	7,542	235.41	0.10	0.82
19.00	21.00	13	3.00	33.47	303.00	101.40	8,114	80.02	0.30	0.71
20.00	21.00	5	2.00	15.40	302.00	46.52	3,255	69.98	0.34	0.76
21.00	22.00	18	3.00	33.47	191.00	63.92	11,369	177.86	0.13	0.41
22.00	25.00	53	4.00	55.31	245.00	135.52	34,019	251.03	0.10	0.28
23.00	24.00	9	2.00	15.40	844.00	130.00	11,565	88.96	0.27	0.67
24.00	25.00	16	3.00	33.47	552.00	184.73	20,637	111.71	0.21	0.40
25.00	28.00	94	4.00	55.31	531.00	293.71	80,739	274.89	0.09	0.18
26.00	27.00	6	2.00	15.40	352.00	54.22	3,018	55.66	0.43	1.29
27.00	28.00	10	3.00	33.47	420.00	140.56	4,406	31.35	0.77	0.86
28.00	37.00	108	4.00	55.31	508.00	280.99	89,741	319.37	0.08	0.10
29.00	30.00	9	2.00	15.40	712.00	109.67	5,967	54.41	0.44	2.06
30.00	32.00	18	3.00	33.47	726.00	242.97	11,727	48.27	0.50	1.62
31.00	32.00	2	2.00	15.40	273.00	42.05	1,220	29.01	0.83	1.95
32.00	34.00	32	3.00	33.47	1,324.00	443.10	17,231	38.89	0.62	1.12
33.00	34.00	2	2.00	15.40	271.00	41.74	276	6.61	3.63	4.13
34.00	36.00	39	3.00	33.47	879.00	294.17	22,922	77.92	0.31	0.50
35.00	36.00	5	2.00	15.40	509.00	78.40	1,000	12.76	1.88	2.08

Note: This analysis is valid only with the use of progressive cavity type grinder pumps as manufactured by Environment One

PRELIMINARY PRESSURE SEWER - ACCUMULATED RETENTION TIME(HR)

Prepared By:
M. Crowley

Southampton, NY

April 11, 2022

Zone Number	Connects to Zone	Accumulated Total of Pumps this Zone	Pipe Size (inches)	Gallons per 100 lineal feet	Length of Zone	Capacity of Zone	Average Daily Flow	Average Fluid Changes per Day	Average Retention Time (Hr)	Accumulated Retention Time (Hr)
This spreadsheet was calculated using pipe diameters for: SDR11HDPE								Gals per Day per Dwelling		200
36.00	37.00	48	3.00	33.47	663.00	221.88	31,002	139.72	0.17	0.19
37.00	37.00	221	4.00	55.31	314.00	173.68	192,370	1,107.59	0.02	0.02

Note: This analysis is valid only with the use of progressive cavity type grinder pumps as manufactured by Environment One

APPENDIX D – GRAVITY SYSTEM DESIGN CALCULATIONS

Pipe (in)	Pump Station Elevation	Slope	Cover (ft)	Manhole Drop (ft)	Pipe
8	20	0.004	4 min from TOP to Grade	0.17	PVC
10	20	0.0028	4 min from TOP to Grade	0.17	PVC

Section	Upstream	Downstream	Upstream Rim* (Assumed)	Downstream Rim* (Assumed)	Upstream Invert	Downstream Invert	Pipe Diameter (ft)	Pipe Diameter (in)	Pipe Cover (ft) Grade to TOP @ Upstream	Pipe Cover (ft) Grade to TOP @ Downstream	Pipe Length (ft)	Slope (ft/ft)	Slope (%)
1	MH 1	MH 2	38	33	29.73	28.34	0.67	8	7.60	4.00	348	0.004	0.4
2	MH 2	MH 3	33	31	27.93	26.33	0.67	8	4.40	4.00	400	0.004	0.4
3	MH 3	MH 4	31	25	21.93	20.33	0.67	8	8.40	4.00	400	0.004	0.4
4	MH 4	MH 5	25	23	19.93	18.33	0.67	8	4.40	4.00	400	0.004	0.4
5	MH 5	MH 6	23	22	18.16	17.23	0.67	8	4.17	4.11	234	0.004	0.4
6	MH 6	MH 7	22	21	17.06	15.46	0.67	8	4.27	4.87	400	0.004	0.4
7	MH 7	MH 8	21	19	15.29	13.69	0.67	8	5.04	4.64	400	0.004	0.4
8	MH 8	MH 9	19	16	12.37	11.33	0.67	8	5.96	4.00	259	0.004	0.4
9	MH 9	MH 10	16	16	11.17	9.57	0.67	8	4.17	5.77	400	0.004	0.4
10	MH 10	MH 11	16	14	9.40	7.80	0.67	8	5.93	5.53	400	0.004	0.4
11	MH 11	MH 12	14	12	7.63	6.33	0.67	8	5.70	5.00	326	0.004	0.4
12	MH 12	MH 13	12	12	6.16	4.80	0.67	8	5.17	6.54	342	0.004	0.4
13	MH 56	MH 55	25	22	17.81	17.34	0.67	8	6.52	4.00	118	0.004	0.4
14	MH 55	MH 11	22	14	10.93	9.33	0.67	8	10.40	4.00	400	0.004	0.4
15	MH 17	MH 16	28	26	22.44	21.34	0.67	8	4.89	4.00	276	0.004	0.4
16	MH 16	MH 15	26	24	20.52	19.33	0.67	8	4.81	4.00	297	0.004	0.4
17	MH 15	MH 14	24	23	19.03	18.33	0.67	8	4.30	4.00	175	0.004	0.4
18	MH 27	MH 26	25	23	18.81	18.33	0.67	8	5.52	4.00	119	0.004	0.4
19	MH 26	Mh 25	23	11	7.93	6.33	0.67	8	14.40	4.00	400	0.004	0.4
20	MH 25	MH 23	11	11	6.16	5.21	0.67	8	4.17	5.12	238	0.004	0.4
21	MH 24	MH 23	17	11	7.71	6.33	0.67	8	8.62	4.00	344	0.004	0.4
22	MH 23	MH 20	11	10	5.04	3.95	0.67	8	5.29	5.38	273	0.004	0.4
23	MH 31	MH 30	28	24	20.25	19.33	0.67	8	7.08	4.00	229	0.004	0.4
24	MH 30	MH 21	24	10	5.93	4.33	0.67	8	17.40	5.00	400	0.004	0.4
25	MH 29	MH 28	26	21	17.90	16.34	0.67	8	7.43	4.00	391	0.004	0.4
26	MH 28	MH 20	21	10	6.93	5.33	0.67	8	13.40	4.00	400	0.004	0.4
27	MH 33	MH 32	12	12	7.33	6.33	0.67	8	4.00	5.00	250	0.004	0.4
28	MH 32	MH 18	12	11	6.16	5.26	0.67	8	5.17	5.07	225	0.004	0.4

Section	Upstream	Downstream	Upstream Rim* (Assumed)	Downstream Rim* (Assumed)	Upstream Invert	Downstream Invert	Pipe Diameter (ft)	Pipe Diameter (in)	Pipe Cover (ft) Grade to TOP @ Upstream	Pipe Cover (ft) Grade to TOP @ Downstream	Pipe Length (ft)	Slope (ft/ft)	Slope (%)
29	MH 22	MH 21	8	10	3.33	2.79	0.67	8	4.00	6.54	134	0.004	0.4
30	MH 21	MH 20	10	10	2.63	1.87	0.67	8	6.71	7.47	190	0.004	0.4
31	MH 20	MH 19	10	10	1.70	1.36	0.67	8	7.63	7.98	86	0.004	0.4
32	MH 19	MH 18	10	11	1.19	-0.17	0.67	8	8.14	10.51	341	0.004	0.4
33	MH 18	MH 13	11	12	-0.34	-1.82	0.67	8	10.67	13.15	370	0.004	0.4
34	MH 50	MH 40	28	27	23.20	22.33	0.67	8	4.13	4.00	217	0.004	0.4
35	MH 41	MH 40	27	27	22.33	21.94	0.67	8	4.00	4.39	97	0.004	0.4
36	MH 40	MH 39	27	29	21.78	20.19	0.67	8	4.56	8.15	397	0.004	0.4
37	MH 39	MH 38	29	27	20.02	18.42	0.67	8	8.31	7.91	400	0.004	0.4
38	MH 49	MH 48	29	30	24.33	24.09	0.67	8	4.00	5.25	61	0.004	0.4
39	MH 48	MH 45	30	30	23.92	22.34	0.67	8	5.41	6.99	395	0.004	0.4
40	MH 47	MH 46	30	31	25.33	24.88	0.67	8	4.00	5.45	112	0.004	0.4
41	MH 46	MH 45	31	30	24.72	23.12	0.67	8	5.62	6.22	400	0.004	0.4
42	MH 45	MH 38	30	27	22.17	21.41	0.67	8	7.16	4.92	191	0.004	0.4
43	MH 38	MH 37	27	26	18.25	17.28	0.67	8	8.08	8.05	243	0.004	0.4
44	MH 44	MH 43	33	31	27.93	26.33	0.67	8	4.40	4.00	400	0.004	0.4
45	MH 43	MH 42	31	29	25.93	24.33	0.67	8	4.40	4.00	400	0.004	0.4
46	MH 42	MH 37	29	26	22.93	21.33	0.67	8	5.40	4.00	400	0.004	0.4
47	MH 54	MH 53	19	21	14.33	13.53	0.67	8	4.00	6.80	199	0.004	0.4
48	MH 53	MH 52	21	26	13.37	11.77	0.67	8	6.97	13.57	400	0.004	0.4
49	MH 52	MH 51	26	29	11.60	10.01	0.67	8	13.73	18.32	398	0.004	0.4
50	MH 51	MH 37	29	26	9.84	8.24	0.67	8	18.49	17.09	400	0.004	0.4
51	MH 37	MH 36	26	24	8.08	7.54	0.67	8	17.26	15.80	135	0.004	0.4
52	MH 36	MH 35	24	19	7.37	5.77	0.67	8	15.96	12.56	400	0.004	0.4
53	MH 59	MH 58	27	24	20.86	19.33	0.67	8	5.47	4.00	382	0.004	0.4
54	MH 58	MH 57	24	22	17.91	17.33	0.67	8	5.42	4.00	145	0.004	0.4
55	MH 60	MH 57	15	22	10.33	9.07	0.67	8	4.00	12.26	315	0.004	0.4
56	MH 57	MH 35	22	19	8.90	7.92	0.67	8	12.43	10.41	246	0.004	0.4
57	MH 35	MH 34	19	17	5.60	5.16	0.67	8	12.73	11.17	110	0.004	0.4
58	MH 34	MH 13	17	12	5.00	3.40	0.67	8	11.34	7.94	400	0.004	0.4
59	MH 13	MH 14	12	23	-1.99	-3.23	0.67	8	13.32	25.56	311	0.004	0.4
60	MH 14	PS	23	20	-3.40	-3.67	0.83	10	25.56	22.83	96	0.0028	0.28

	Rim Elevation	Manhole Depth	North	South	East	West
MH-1	38	8.27		29.73		
MH-2	33	5.07	28.34	27.93		
MH-3	31	9.07	26.33	21.93		
MH-4	25	5.07	20.33	19.93		
MH-5	23	4.84	18.33	18.16		
MH-6	22	4.94	17.23	17.06		
MH-7	21	5.71	15.46	15.29		
MH-8	19	6.63	13.69	12.37		
MH-9	16	4.83	11.33	11.17		
MH-10	16	6.60	9.57	9.40		
MH-11	14	6.37	7.80	7.63	9.33	
MH-12	12	5.84	6.33	6.16		
MH-13	12	13.99	4.80	-1.82	3.40	-1.99
MH-14	23	26.40		-3.40	-3.23	18.33
MH-15	24	4.97	19.33		19.03	
MH-16	26	5.48	21.34	20.52		
MH-17	28	5.56		22.44		
MH-18	11	11.34	-0.34	-0.17	5.26	
MH-19	10	8.81	1.19	1.36		
MH-20	10	8.30	1.70	1.87	3.95	5.33
MH-21	10	7.37	2.63	2.79		4.33
MH-22	8	4.67	3.33			
MH-23	11	5.96		5.21	6.33	5.04
MH-24	17	9.29				7.71
MH-25	11	4.84	6.16		6.33	
MH-26	23	15.07			18.33	7.93
MH-27	25	6.19				18.81
MH-28	21	14.07			6.93	16.34
MH-29	26	8.10			17.90	
MH-30	24	18.07			5.93	19.33
MH-31	28	7.75				20.25
MH-32	12	5.84		6.33		6.16
MH-33	12	4.67	7.33			
MH-34	17				5.16	5.00
MH-35	19	13.40		7.92	5.77	5.60
MH-36	24	16.63			7.54	7.37
MH-37	26	17.92	8.24	17.28	21.33	8.08
MH-38	27	8.75	18.25	18.42	21.41	
MH-39	29	8.98	20.02	20.19		
MH-40	27	5.22	21.78	21.94	22.33	
MH-41	27	4.67	22.33			
MH-42	29	6.07			24.33	22.93
MH-43	31	5.07			26.33	25.93
MH-44	33	5.07				27.93

	Rim Elevation	Manhole Depth	North	South	East	West
MH-45	30	7.83		22.34	23.12	22.17
MH-46	31	6.28			24.88	24.72
MH-47	30	4.67				25.33
MH-48	30	6.08	23.92	24.09		
MH-49	29	4.67	24.33			
MH-50	28	4.80				23.20
MH-51	29	19.16	10.01	9.84		
MH-52	26	14.40	11.77	11.60		
MH-53	21	7.63	13.53	13.37		
MH-54	19	4.67		14.33		
MH-55	22	11.07			17.34	10.93
MH-56	25	7.19				17.81
MH-57	22	13.10	8.90	17.33		9.07
MH-58	24	6.09	17.91	19.33		
MH-59	27	6.14	20.86			
MH-60	15	4.67			10.33	

Assumptions

1. Manholes on gravity sewers shall be located no more than 400 ft part
2. Drop between inlet invert and outlet invert pipe will have a .1 ft minimum. 2 inches is used in this design
3. Manholes are used at every junction and at the beginning of a lateral or a main
4. Minimum main size of 8-inch has a minimum slope of 0.4%. 10-inch pipe has a minimum slope of 0.28%

APPENDIX E – SEQUENCING BATCH REACTOR TECHNOLOGY

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Process Design Report

SOUTHAMPTON LONG ISLAND STP NY

Design# 165880
Option: Updated Preliminary Design

AquaSBR®

Sequencing Batch Reactor

October 13, 2021
Designed By: Nicholas Fortsas

6306 N. Alpine Rd Loves Park, IL 61111
(815) 654-2501 www.aqua-aerobic.com

Upstream Recommendations

- Neutralization is required ahead of the biological system if the pH is expected to fall outside of 6.5-8.5 for significant durations.

- Coarse screening and grit removal is recommended (by others) ahead of the biological system.

- Elevated concentration of hydrogen sulfide can be detrimental to both civil and mechanical structures. If anaerobic conditions exist in the collection system, steps should be taken to eliminate hydrogen sulfide prior to the treatment system.

Flow Considerations

- The maximum flow, as shown on the design, has been assumed as a hydraulic maximum and does not represent an additional organic load.

Biological Process

- The decanter performance is based upon a free-air discharge following the valve and immediately adjacent to the basin. Actual decanter performance depends upon the complete installation including specific liquid and piping elevations and any associated field piping losses to the final point of discharge. Modification of the high water level, low water level, centerline of discharge, and / or cycle structure may be required to achieve discharge of full batch volume based on actual site installation specifics.

Aeration

- The aeration system has been designed to provide 1.25 lbs. O2/lb. BOD5 applied and 4.6 lbs. O2/lb. TKN applied at the design average loading conditions, while maintaining a residual DO concentration of 2.00 mg/l.

- A common standby blower will be shared among the biological reactors and digester.

- Depending on the actual yard piping from the blowers to the diffuser system and the heat losses associated with the yard piping, additional provisions for cooling of the air (i.e. incorporating heat exchangers) and/or modification of in-basin piping and/or diffuser sleeve material may be required. Aqua-Aerobic Systems, Inc. may need to modify the following equipment offering to ensure compatibility of all in-basin components with actual air temperatures.

Digester

- A supernatant return device is recommended in the digester.

- The digester aeration system has been designed based on 2.0 lbs O2/lb VSS removed.

- The air supply for the digester system is based on each basin receiving 100% of the total sludge produced per day.

Process/Site

- The following parameters have been assumed, as displayed on the design (engineer to verify): Elevation, in basin temperatures, ambient temperatures.

- The anticipated effluent nitrogen requirement is predicated upon an influent waste temperature of 10 °C or greater. While lower temperatures may be acceptable for a short-term duration, nitrification and (if required) denitrification below 10 °C can be unpredictable, requiring special operator attention.

- Sufficient alkalinity is required for nitrification, as approximately 7.1 mg alkalinity (as CaCO3) is required for every mg of NH3-N nitrified. If the raw water alkalinity cannot support this consumption, while maintaining a residual concentration of 50 mg/l, supplemental alkalinity shall be provided (by others).

- The average and maximum design flow and loading conditions, shown within the report, are based on maximum month average and maximum day conditions, respectively.

Post-Secondary Treatment

-The following processes follow the Biological process:
- Effluent flow equalization.
- Tertiary Filtration.

Filtration

- The cloth media filter recommendation and anticipated effluent quality are based upon influent water quality conditions as shown under "Design Parameters" of this Process Design Report.

- The filter influent should be free of algae and other solids that are not filterable through a nominal 10 micron pore size media. Provisions to treat algae and condition the solids to be filterable are the responsibility of others.

- The cloth media filter has been designed to handle the maximum design flow while maintaining one unit out of service.

Equipment

- Changes in basin geometry may require alterations in the equipment recommendation.

- The basins are not included and shall be provided by others.

- Influent is assumed to enter the reactor above the water level, away from the decanter, and to avoid splashing or direct discharge in the immediate vicinity of other equipment. If the influent enters the basin below the water level, adequate hydraulic capacity shall be made in the headworks to prevent backflow from one reactor to the other during transition of influent.

- Based on the process requirements and selected equipment, the reactor wall height should be at least 23 ft in the biological system.

- Scope of supply includes freight, installation supervision and start-up services.

- Equipment selection is based upon the use of Aqua-Aerobic Systems' standard materials of construction and electrical components, suitable for non-classified electrical environments.

- Equipment selection is based upon the use of materials of construction and electrical components suitable for an electrically classified environment.

- The basin dimensions reported on the design have been assumed based upon the required volumes and assumed basin geometry. Actual basin geometry may be circular, square or rectangular with construction materials including concrete or steel.

- The control panel does not include motor starters or VFDs, which should be provided in a separate MCC (by others).

- Provisions should be made, by others, for overflows in each of the recommended basins.

- Aqua-Aerobic Systems, Inc. is familiar with various “Buy American” Acts (i.e. AIS, ARRA, Federal FAR 52.225, EXIM Bank, USAid, PA Steel Products Act, etc.). As the project develops Aqua-Aerobic Systems can work with you to ensure full compliance of our goods with various Buy American provisions if they are applicable/required for the project. When applicable, please provide us with the specifics of the project’s “Buy American” provisions.

- If the cloth media filter will be offline for extended periods of time, protection from sunlight is required.

AquaSBR - Sequencing Batch Reactor - Design Summary

DESIGN INFLUENT CONDITIONS

Avg. Design Flow = 0.225 MGD = 852 m3/day

Max Design Flow = 0.26 MGD = 984 m3/day

DESIGN PARAMETERS

	Influent	mg/l	Effluent (After Filtration) Required	<= mg/l	Anticipated	<= mg/l
Bio/Chem Oxygen Demand:	BOD5	270	BOD5	30	BOD5	30
Total Suspended Solids:	TSS	320	TSSa	30	TSSa	30
Total Kjeldahl Nitrogen:	TKN	70	TKN	--	TKN	--
Total Nitrogen:	--	--	TN	10	TN	10

SITE CONDITIONS

	Maximum		Minimum		Elevation (MSL)
Ambient Air Temperatures:	82 F	27.8 C	23 F	-5.0 C	400 ft
Influent Waste Temperatures:	68 F	20.0 C	50 F	10.0 C	121.9 m

SBR BASIN DESIGN VALUES

No./Basin Geometry: = 2 Rectangular Basin(s)

Freeboard: = 2.0 ft = (0.6 m)

Length of Basin: = 43.0 ft = (13.1 m)

Width of Basin: = 30.0 ft = (9.1 m)

	Water Depth		Basin Vol./Basin		
Min	= 18.3 ft	= (5.6 m)	**Min**	= 0.177 MG	= (668.7 m³)
Avg	= 20.6 ft	= (6.3 m)	**Avg**	= 0.199 MG	= (753.9 m³)
Max	= 21.0 ft	= (6.4 m)	**Max**	= 0.203 MG	= (767.1 m³)

Number of Cycles:	= 5 per Day/Basin (advances cycles beyond MDF)	
Cycle Duration:	= 4.8 Hours/Cycle	
Food/Mass (F/M) ratio:	= 0.038 lbs. BOD5/lb. MLSS-Day	
MLSS Concentration:	= 4500 mg/l @ Min. Water Depth	
Hydraulic Retention Time:	= 1.770 Days @ Avg. Water Depth	
Solids Retention Time:	= 27.0 Days	
Est. Net Sludge Yield:	= 0.859 lbs. WAS/lb. BOD5	
Est. Dry Solids Produced:	= 435.0 lbs. WAS/Day	= (197.3 kg/Day)
Est. Solids Flow Rate:	= 40 GPM (5216 GAL/Day)	= (19.7 m³/Day)
Decant Flow Rate @ MDF:	= 406 GPM (as avg. from high to low water level)	= (25.6 l/sec)
LWL to CenterLine Discharge:	= 1.0 ft	= (0.3 m)
Lbs. O2/lb. BOD5	= 1.25	
Lbs. O2/lb. TKN	= 4.60	
Actual Oxygen Required:	= 1238 lbs./Day	= (561.3 kg/Day)
Air Flowrate/Basin:	= 403 SCFM	= (11.4 Sm3/min)
Max. Discharge Pressure:	= 10.7 PSIG	= (74 KPA)
Daily Max. Month Avg. Estimated Power*:	= 363.0 KW-Hrs/Day	

* Power consumption calculations in this document are based on maximum month conditions. Detailed power vs. loading calculations can be provided if requested.

POST-SBR EQUALIZATION DESIGN PARAMETERS

Avg. Daily Flow (ADF):	= 0.225 MGD	= (852 m³/day)
Max. Daily Flow (MDF):	= 0.26 MGD	= (984 m³/day)
Decant Flow Rate from (Qd):	= 406 gpm	= (1.5 m³M)
Decant Duration (Td):	= 64 min	
Number Decants/Day:	= 10	
Time Between Start of Decants:	= 144 min	

POST-SBR EQUALIZATION VOLUME DETERMINATION

The volume required for equalization/storage shall be provided between the high and the low water levels of the basin(s). This Storage Volume (Vs) has been determined by the following:

Vs = [(Qd -(MDF x 694.4)] x Td = 14,428 gal = (1,928.9 ft³) = (54.6 m³)

The volumes determined in this summary reflect the minimum volumes necessary to achieve the desired results based upon the input provided to Aqua. If other hydraulic conditions exist that are not mentioned in this design summary or associated design notes, additional volume may be warranted.

Based upon liquid level inputs from each SBR reactor prior to decant, the rate of discharge from the Post-SBR Equalization basin shall be pre-determined to establish the proper number of pumps to be operated (or the correct valve position in the case of gravity flow). Level indication in the Post-SBR Equalization basin(s) shall override equipment operation.

POST-SBR EQUALIZATION BASIN DESIGN VALUES

No./Basin Geometry:	= 1 Rectangular Basin(s)				
Length of Basin:	= 13.0 ft	= (4.0 m)			
Width of Basin:	= 18.0 ft	= (5.5 m)			
Min. Water Depth:	= 1.5 ft	= (0.5 m)	**Min. Basin Vol. Basin:**	= 2,625.6 gal	= (9.9 m³)
Max. Water Depth:	= 9.7 ft	= (3.0 m)	**Max. Basin Vol. Basin:**	= 17,054.0 gal	= (64.6 m³)

POST-SBR EQUALIZATION EQUIPMENT CRITERIA

Mixing Energy with Diffusers:	= 15 SCFM/1000 ft³	
SCFM Required to Mix:	= 34 SCFM/basin	= (58 Nm³/hr/basin)
Max. Discharge Pressure:	= 4.8 PSIG	= (33.03 KPA)
Max. Flow Rate Required Basin:	= 181 gpm	= (0.684 m³/min)
Avg. Power Required:	= 29.1 kW-hr/day	

Aerobic Digester - Design Summary

AEROBIC DIGESTER DESIGN PARAMETERS

Sludge Flowrate to the Digester	= 5,218.9 gal/day	= (19.8 m³/day)
Inlet Sludge Concentration	= 1.00%	
Solids Loading to the Digester	= 435.3 lb/day	= (197.5 kg/day)
Inlet Volatile Solids Fraction	= 72.2%	

AEROBIC DIGESTER BASIN DESIGN VALUES

No./Basin Geometry:	= 2 Rectangular Basin(s)				
Length of Basin:	= 14 ft	= (4.3 m)			
Width of Basin:	= 18 ft	= (5.5 m)			
Min. Water Depth:	= 14.7 ft	= (4.5 m)	**Min. Basin Vol. Basin:**	= 27,708.9 gal	= (104.9 m³)
Max. Water Depth:	= 21 ft	= (6.4 m)	**Max. Basin Vol. Basin:**	= 39,584.1 gal	= (149.9 m³)

AEROBIC DIGESTER PROCESS DESIGN PARAMETERS

Solids Retention Time:	= 30.3 days	
Digester Design Temperature:	= 20 C	
Volatile Solids Destruction:	= 41.5%	
Digester Solids Concentration:	= 2%	
Oxygen Supplied for Digestion:	= 2 lbs O2 per lb VSS Destroyed	
Oxygen Distribution Per Basin:	= 100.0%	
Actual Oxygen Required:	= 260.8 lb/day	= (118.3 kg/day)
Volatile Percentage After Digestion:	= 60.3%	
Estimated Dry Solids to be Removed:	= 304.8 lb/day	= (138.3 kg/day)
Volume of Solids to be Removed:	= 1,827.6 gal/day	= (6.92 m³/day)
Estimated Supernatant Volume:	= 11,875.2 gal/basin	= (44.95 m³/basin)
Assumed Supernatant Duration:	= 180 minutes	
Calculated Supernatant Flow:	= 66.0 gpm	= (4.2 l/sec)

1. The Volatile Solids Destruction listed above shall be used for determination of the oxygen demand during summer conditions. It should be noted that the actual VSS destruction will be dependant upon digester inlet condition, temperature, and operating conditions.
2. The Digester Solids Concentration is reflected as an average concentration, assuming the operations include frequent settling and supernating practices.

AEROBIC DIGESTER EQUIPMENT CRITERIA

SCFM Required for O2 Demand:	= 109/basin	= (184 m³/hr/basin)
Mixing Energy with Diffusers (Coarse):	= 30 SCFM/1000ft³ of reactor	
SCFM Required to Mix:	= 159 SCFM/basin	= (270 Nm³/hr/basin)
Max. Discharge Pressure:	= 9.67 PSIG	= (66.70 KPA)
Max. Flow Rate Required Basin:	= 40 gpm	= (0.151 m³/min)
Avg. Power Required:	= 228.16 kW-hr/day	

AquaDISK Tertiary Filtration - Design Summary

DESIGN INFLUENT CONDITIONS

Pre-Filter Treatment:	SBR		
Avg. Design Flow	= 0.23 MGD	= 156.25 gpm	= 851.72 m³/day
Max Design Flow	= 0.26 MGD	= 180.56 gpm	= 984.21 m³/day

AquaDISK FILTER RECOMMENDATION

Qty Of Filter Units Recommended	= 2
Number Of Disks Per Unit	= 4
Total Number Of Disks Recommended	= 8
Total Filter Area Provided	= 86.4 ft² = (8.03 m²)
Filter Model Recommended	= AquaDisk Package: Model ADFSP-11-4E-PC
Filter Media Cloth Type	= OptiFiber PA2-13

AquaDISK FILTER CALCULATIONS

Filter Type:

Vertically Mounted Cloth Media Disks featuring automatically operated vacuum backwash . Tank shall include a hopper-bottom and solids removal manifold system.

Average Flow Conditions:

Average Hydraulic Loading = Avg. Design Flow (gpm) / Recommended Filter Area (ft²)
= 156.3 / 86.4 ft²
= 1.81 gpm/ft² (4.42 m/hr) at Avg. Flow

Maximum Flow Conditions:

Maximum Hydraulic Loading = Max. Design Flow (gpm) / Recommended Filter Area (ft²)
= 180.6 / 86.4 ft²
= 2.09 gpm/ft² (5.11 m/hr) at Max. Flow

Solids Loading:

Solids Loading Rate = (lbs TSS/day at max flow and max TSS loading) / Recommended Filter Area (ft²)
= 32.5 lbs/day / 86.4 ft²
= 0.38 lbs. TSS /day/ft² (1.84 kg. TSS/day/m²)

The above recommendation is based upon the provision to maintain a satisfactory hydraulic surface loading with (1) unit out of service. The resultant hydraulic loading rate at the Maximum Design Flow is: 4.2 gpm / ft² = (10.2 m/hr)

AquaSBR

Influent Valves

2 Influent Valve(s) will be provided as follows:

- 4 inch electrically operated plug valve(s).

Mixers

2 AquaDDM Direct Drive Mixer(s) will be provided as follows:

- 7.5 HP Aqua-Aerobic Systems Endura Series Model SS DDM Mixer(s).
- Motor will be nameplated for class I Division II Group D.

Mixer Mooring

2 Mixer cable mooring system(s) consisting of:

- #12 AWG-four conductor electrical service cable(s).
- Aerial support tie(s).
- Electrical cable strain relief grip(s), 2 eye, wire mesh.
- 304 stainless steel mooring cable(s).
- Maintenance mooring cable loop(s).
- Stainless steel mooring spring(s).

Decanters

2 Decanter assembly(ies) consisting of:

- 6x4 Aqua-Aerobics decanter(s) with fiberglass float, 304 stainless steel weir, galvanized restrained mooring frame, and painted steel power section with #14-10 conductor power cable wired into a NEMA 4X stainless steel junction box with terminal strips for the single phase, 60 hertz actuator and limit switches.
- 6 inch diameter decant hose assembly.
- 4" schedule 40 galvanized steel mooring post.
- 6 inch electrically operated butterfly valve(s) with actuator.

Transfer Pumps/Valves

2 Submersible pump assembly(ies) consisting of the following items:

- 2.4 HP Submersible Pump(s) with painted cast iron pump housing, discharge elbow, and multi-conductor electrical cable.
- 3 inch diameter plug valve(s).
- 3 inch diameter swing check valve.
- Upper guide bar bracket(s).
- Guide bar(s).

Retrievable Fine Bubble Diffusers

4 Retrievable Fine Bubble Diffuser Assembly(ies) consisting of:

- 20 diffuser tubes consisting of two flexible EPDM porous membrane sheaths mounted on a rigid support pipe with 304 stainless steel band clamps.
- 304 stainless steel manifold weldment.
- 304 stainless steel leveling angles.
- 304 stainless steel leveling studs.
- Galvanized vertical support beam.
- Galvanized vertical air column assembly.
- Galvanized upper vertical beam and pulley assembly.
- Galvanized top support bracket.
- 3" EPDM flexible air line with ny-glass quick disconnect end fittings.
- Galvanized threaded flange.

- 3" manual isolation butterfly valve with cast iron body, EPDM seat, aluminum bronze disk and one-piece steel shaft.
- Ny-glass quick disconnect cam lock adapter.
- 304 stainless steel adhesive anchors.
- Brace angles.

1 Diffuser Electric Winch(es) will be provided as follows:

- Portable electric winch.

Positive Displacement Blowers

3 Positive Displacement Blower Package(s), with each package consisting of:

- ROOTS 65 Positive Displacement Blower Package with common base, V-belt drive, enclosed drive guard, pressure gauge, pressure relief valve, and vibration pads.
- Stainless steel anchors.
- 20 HP motor with slide base.
- Inlet filter and inlet silencer.
- Discharge silencer, check valve, manual butterfly isolation valve, and flexible discharge connector.

Air Valves

2 Air Control Valve(s) will be provided as follows:

- 4 inch electrically operated butterfly valve(s) with actuator.

Level Sensor Assemblies

2 Pressure Transducer Assembly(ies) each consisting of:

- Submersible pressure transducer(s).
- Mounting bracket weldment(s).
- Transducer mounting pipe weldment(s).

2 Level Sensor Assembly(ies) will be provided as follows:

- Float switch(es).
- Float switch mounting bracket(s).
- Stainless steel anchors.

Instrumentation

2 Dissolved Oxygen Assembly(ies) consisting of:

- Hach LDO dissolved oxygen probe with replaceable sensor cap and electric cable. Probe includes stainless steel stationary bracket and retrievable pole probe mounting assembly. One (1) probe per basin.
- Hach SC200 controller and display module(s).

AquaSBR: Post-Equalization

Transfer Pumps/Valves

3 Submersible pump assembly(ies) consisting of the following items:

- 2.4 HP Submersible Pump(s) with painted cast iron pump housing, discharge elbow, and multi-conductor electrical cable.
- 3 inch diameter plug valve(s).
- 3 inch diameter swing check valve.
- Guide bar(s).
- Upper guide bar bracket(s).

Fixed Coarse Bubble Diffusers

1 Aqua-Aerobic's Fixed Coarse Bubble Diffuser System(s) consisting of the following components:

- PVC diffuser(s).
- Schedule 40 galvanized steel riser pipe(s).
- Schedule 40 PVC manifold piping.
- Stainless steel anchors.

Positive Displacement Blowers

1 Positive Displacement Blower Package(s), with each package consisting of:

- ROOTS 22 Positive Displacement Blower Package with common base, V-belt drive, enclosed drive guard, pressure gauge, pressure relief valve, and vibration pads.
- Stainless steel anchors.
- 2 HP motor with slide base.
- Inlet filter and inlet silencer.
- Discharge silencer, check valve, manual butterfly isolation valve, and flexible discharge connector.

Level Sensor Assemblies

1 Pressure Transducer Assembly(ies) each consisting of:

- Submersible pressure transducer(s).
- Mounting bracket weldment(s).
- Transducer mounting pipe weldment(s).

1 Level Sensor Assembly(ies) will be provided as follows:

- Float switch(es).
- Float switch mounting bracket(s).
- Stainless steel anchors.

AquaSBR: Aerobic Digester

Transfer Pumps/Valves

2 Submersible pump assembly(ies) consisting of the following items:

- 2.4 HP Submersible Pump(s) with painted cast iron pump housing, discharge elbow, and multi-conductor electrical cable.
- 3 inch diameter plug valve(s).
- 3 inch diameter swing check valve.
- Upper guide bar bracket(s).
- Guide bar(s).

Fixed Coarse Bubble Diffusers

2 Aqua-Aerobic's Fixed Coarse Bubble Diffuser System(s) consisting of the following components:

- PVC diffuser(s).
- Schedule 40 galvanized steel riser pipe(s).
- Schedule 40 PVC manifold piping.
- Stainless steel anchors.

Positive Displacement Blowers

2 Positive Displacement Blower Package(s), with each package consisting of:

- ROOTS 53 Positive Displacement Blower Package with common base, V-belt drive, enclosed drive guard, pressure gauge, pressure relief valve, and vibration pads.
- Stainless steel anchors.
- 15 HP motor with slide base.
- Inlet filter and inlet silencer.
- Discharge silencer, check valve, manual butterfly isolation valve, and flexible discharge connector.

Level Sensor Assemblies

2 Sensor installation(s) consisting of:

- Submersible pressure transducer(s).
- Stainless steel sensor guide rail weldment(s).
- PVC sensor mounting pipe(s).
- Top support(s).

2 Level Sensor Assembly(ies) will be provided as follows:

- Float switch(es).
- Float switch mounting bracket(s).
- Stainless steel anchors.

Controls

Controls wo/Starters

1 Controls Package(s) will be provided as follows:

- NEMA 12 panel enclosure suitable for indoor installation and constructed of painted steel.
- Fuse(s) and fuse block(s).
- Compactlogix Processor.
- Operator interface(s).
- Remote Access Ethernet Modem.

Cloth Media Filters

AquaDisk Tanks/Basins

2 AquaDisk Model # ADFSP-11x4E-PC Package Filter 304 Stainless Steel Tank(s) consisting of:

- 4 Disk 304 SS tank(s).
- 2" ball valve(s).

AquaDisk Centertube Assemblies

2 Centertube(s) consisting of:

- 304 stainless steel centertube weldment(s).
- Centertube driven sprocket(s).
- Dual wheel assembly(ies).
- Rider wheel bracket assembly(ies).
- Centertube bearing kit(s).
- Effluent centertube lip seal.
- Pile cloth media and non-corrosive support frame assemblies.
- 304 Stainless steel frame top plate(s),
- Media sealing gaskets.
- Disk segment 304 stainless steel support rods.

AquaDisk Drive Assemblies

2 Drive System(s) consisting of:

- Gearbox with motor.
- Drive sprocket(s).
- Drive chain(s) with pins.
- Stationary drive bracket weldment(s).
- Adjustable drive bracket weldment(s).
- Chain guard weldment(s).
- Warning label(s).

AquaDisk Backwash/Sludge Assemblies

2 Backwash System(s) consisting of:

- Backwash shoe assemblies.
- Backwash shoe support weldment(s).
- 1 1/2" flexible hose.
- Stainless steel backwash shoe springs.
- Hose clamps.

2 Backwash/Solids Waste Pump(s) consisting of:

- Backwash/waste pump(s).
- 0 to 15 psi pressure gauge(s).

- 0 to 30 inches mercury vacuum gauge(s).
- Throttling gate valve(s).
- 2" bronze 3 way ball valve(s).

AquaDisk Instrumentation

2 Pressure Transmitter(s) consisting of:

- Level transmitter(s).

2 Float Switch(es) consisting of:

- Float switch(es).

2 Vacuum Transmitter(s) consisting of:

- Vacuum transmitter(s).

AquaDisk Valves

2 Solids Waste Valve(s) consisting of:

- 2" full port, three piece, stainless steel body ball valve(s), grooved end connections with single phase electric actuator(s). Valve / actuator combination shall be TCI / RCI (RCI, a division of Rotork).
- 2" flexible hose.
- Victaulic coupler(s).

2 Set(s) of Backwash Valves consisting of:

- 2" full port, three piece, stainless steel body ball valve(s), grooved end connections with single phase electric actuator(s). Valve / actuator combination shall be TCI / RCI (RCI, a division of Rotork).
- 2" flexible hose.
- Victaulic coupler(s).

AquaDisk Controls w/Starters

2 Control Panel(s) consisting of:

- NEMA 4X fiberglass enclosure(s).
- Circuit breaker with handle.
- Transformer(s).
- Fuses and fuse blocks.
- Line filter(s).
- GFI convenience outlet(s).
- Control relay(s).
- Selector switch(es).
- Indicating pilot light(s).
- MicroLogix 1400 PLC(s).
- Ethernet switch(es).
- Operator interface(s).
- Power supply(ies).
- Motor starter(s).
- Terminal blocks.
- UL label(s).

2 Conduit Installation(s) consisting of:

- PVC conduit and fittings.

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

AquaSBR®

Sequencing Batch Reactor

AquaSBR®
Sequencing Batch Reactor

For over 35 years, Aqua-Aerobic Systems has led the industry in sequencing batch reactor technology with performance proven and cost effective treatment systems capable of effectively removing nutrients and reducing phosphorus with the flexibility of process control that adapts to changing demands.

The AquaSBR® sequencing batch reactor provides true batch technology with all phases of treatment accomplished in a single reactor. All components are easily accessible and the advanced decant system ensures optimum quality effluent withdrawal. Treatment can be optimized with the IntelliPro® process monitoring and control system to further reduce operation and maintenance,energy costs and improve performance.

System Features and Advantages

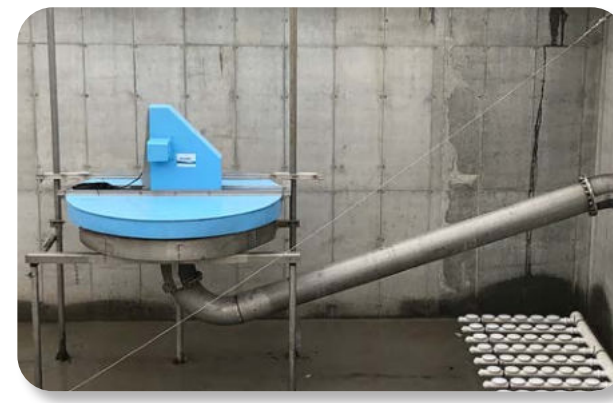
- Independent aeration and mixing with the Aqua MixAir® system provides process advantages and lower energy consumption
- A true-batch system utilizes Mix-Fill, React-Fill, React, Settle and Decant phases within a single reactor
- No secondary clarifiers and return activated sludge (RAS) lines
- All components of the AquaSBR system are retrievable and easily accessible
- Hydraulic fluctuations are easily managed through the flexibility of a time managed process operating strategy
- Enhanced biological nutrient removal:
  - Anaerobic period during Mix-Fill phase to achieve low biological phosphorus requirements
  - Minimize metal salt usage with automated addition after biological luxury uptake to achieve <0.5 mg/l TP
- Ideal for low total nitrogen requirements:
  - Flexibility to modify aeration cycling for TN removal under changing conditions
  - Achieves total nitrogen levels down to 3.0 mg/l
- Low cost of ownership

Aqua MixAir® System

The AquaSBR sequencing batch reactor utilizes the Aqua MixAir® system by providing separate mixing with the AquaDDM® direct-drive mixer and an aeration source such as the Aqua-Jet® surface aerator or Aqua-Aerobic diffused aeration. This system has the capability to cyclically operate the aeration and mixing to promote anoxic/aerobic and anaerobic environments with low energy consumption. In addition, the Aqua MixAir system can achieve and recover alkalinity through denitrification, prevent nitrogen gas disruption in the settle phase, promote biological phosphorus removal, and control certain forms of filamentous bacteria.

Advanced Decanter

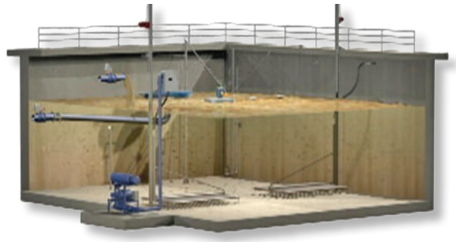
The Aqua-Aerobic floating decanter follows the liquid level, maximizing the distance between the effluent withdrawal and sludge blanket. It is an integral component to the AquaSBR system and provides reliable, dual barrier subsurface withdrawal with low entrance velocities to ensure surface materials will not be drawn into the treated effluent. The decanter is easily accessible from the side of the basin and requires minimal maintenance.



AquaSBR®
Phases of Operation

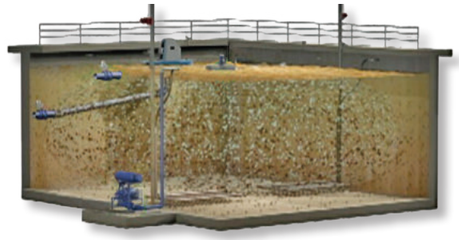
The AquaSBR sequencing batch reactor system features time-managed operation and control of aerobic, anoxic and anaerobic processes within each reactor including equalization and clarification. The AquaSBR system utilizes five basic phases of operation to meet advanced wastewater treatment objectives. The duration of any particular phase may be based upon specific waste characteristics and/or effluent objectives.

1 Mix-Fill



- Influent flow enters the reactor
- Mixing is initiated with the AquaDDM mixer to achieve complete mix of the reactor contents in the absence of aeration
- Anoxic conditions are created which facilitate removal of any residual nitrites/nitrates (NO_x) via the process of denitrification
- In systems requiring phosphorus removal, the Mix-Fill phase is extended to create anaerobic conditions where phosphorus accumulating organisms (PAO) release phosphorus then ready for subsequent luxury uptake during aeration times
- Anoxic conditions assist in the control of some types of filamentous organisms

2 React-Fill

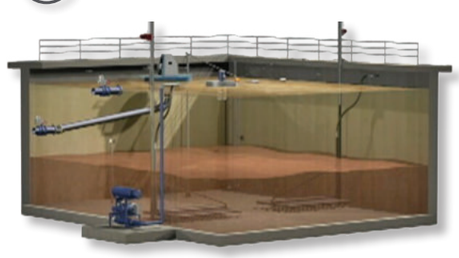


- Influent flow continues under mixed and aerated conditions
- Intermittent aeration may promote aerobic or anoxic conditions
- Biological/chemical oxygen demand (BOD/COD) and ammonia nitrogen (NH_3) are reduced under aerated conditions
- Luxury uptake of phosphorus is produced under aerated conditions
- NO_x is reduced under anoxic conditions
- Separation of aeration and mixing allows the aeration source to be turned down during low flow conditions to conserve energy while the system's flexibility allows nitrification/denitrification to be easily managed

3 React

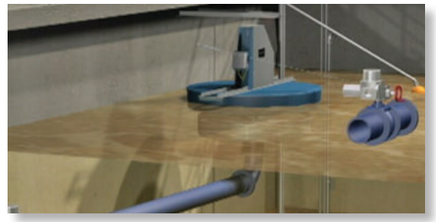
- Influent flow is terminated creating true batch conditions
- Mixing and aeration continue in the absence of influent flow
- Biological/chemical oxygen demand (BOD/COD) and ammonia nitrogen (NH_3) reduction continue under aerated conditions
- Oxygen can be delivered on a "as needed" basis via dissolved oxygen probes while maintaining completely mixed conditions
- Provides final treatment prior to settling to meet targeted effluent objectives

4 Settle



- Influent flow does not enter the reactor
- Mixing and aeration are terminated
- Ideal solids/liquid separation is achieved due to perfectly quiescent conditions
- Adjustable time values allow settling time to match prevailing process conditions

5 Decant/Sludge Waste



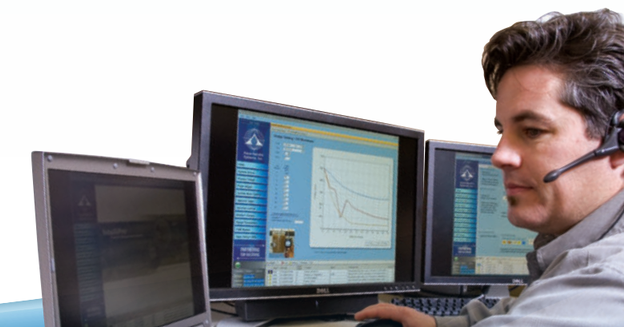
- Influent flow does not enter the reactor
- Mixing and aeration remain off
- Decantable volume is removed by subsurface withdrawal
- Floating decanter follows the liquid level, maximizing distance between the withdrawal point and the sludge blanket
- Small amount of sludge is wasted near the end of each cycle

IntelliPro®
Process Monitoring and Control System

The IntelliPro system is a personal computer (PC) based program that interfaces with the AquaSBR system's programmable logic controller (PLC) via a network connection to assist operators in optimizing the treatment process of the plant and further reducing operating costs.

System Advantages

- Real-time, online monitoring and control
- "Active Control Mode" which automatically receives, interprets and proactively adjusts in-basin instruments and process variables including biological nutrient removal, chemical addition and energy
- Reduces the operator's sampling time
- Real-time and historical graphical trending of process parameters
- BioAlert™ process notification provides corrective action to eliminate operational interruptions and upsets
- Assists in the optimization of enhanced nutrient removal
- Online operation and maintenance support
- Remote troubleshooting provides on-demand troubleshooting assistance



AquaSBR®
Typical Applications

Biological Nutrient Removal

- 1.65 MGD Avg. Daily Flow
- Replaced flow-through activated sludge system for enhanced biological nutrient removal (EBNR) to meet Chesapeake Bay Initiative.

Phosphorus Removal

- 2.7 MGD Avg. Daily Flow
- Dissolved oxygen control optimizes power consumption
- Process control achieves 98% removal of total influent phosphorus

Nitrification

- 0.8 MGD Avg. Daily Flow
- Dual basin system. Utilizes process control via IntelliPro® system.

Reuse

- 2.0 MGD Avg. Daily Flow
- 3-basin system followed by (2) AquaDisk® cloth media filters produces reuse quality water.

Industrial Pretreatment

- .075 MGD Avg. Daily Flow
- Treating high strength dairy waste since 1991.

Retrofit

- 0.88 MGD Avg. Daily Flow
- Dual basin retrofit uses existing oxidation ditch to provide treatment flexibility and power savings

Providing TOTAL Water Management Solutions

Visit our website at www.aqua-aerobic.com to learn more about the AquaSBR® Sequencing Batch Reactor and our complete line of products and services:

Aeration & Mixing

Biological Processes

Filtration

Oxidation & Disinfection

Membranes

Controls & Monitoring Systems

Aftermarket Products and Services

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

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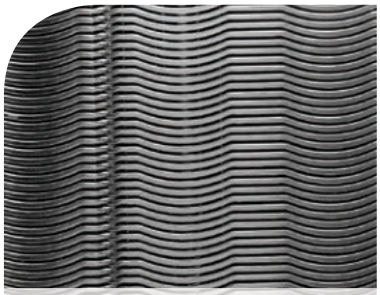
solutions@aqua-aerobic.com

Bulletin #980D 11/20

High-capacity sidehill screen with advanced bi-wave wedgewire design

Hydroscreen static screens used in broke thickening



Hydroscreen bi-wave wedgewire screen

Hycor® Hydroscreen™ Static Screen

Liquid & solid separation

The Hycor® Hydroscreen™ unit is a proven, reliable performer for liquid/solid separation in municipal and industrial applications, particularly for screening fibrous and non-greasy solids. There are no moving parts, motors, or complicated connections. The Hydroscreen is simple and economical to operate.

The Hydroscreen is designed with custom features to meet site requirements for separation, and is compact while providing high throughput. There are headbox options, including deep flat and shallow tapered designs to accommodate solids loading. A swinging baffle across the weir directs the flow for the most efficient screen operation.

The Hydroscreen unit's unique bi-wave wedgewire screen panel with double downward curves increases the Coanda effect by rapidly stripping liquid from the influent as it hits the top of the screen panel. The rapid shearing maximizes solids capture and minimizes screen blinding.

Additional drainage occurs as the solids captured by the screen roll down the curved screen face. At the end of the screen panel is a drip lip that directs the drained liquid away from the solids and returns it to the filtrate chamber.

Ideal for a multitude of liquid/solid separation applications

Food Processsing

- Washwater
- By-product recovery
- Plant effluent
- Flume water

Textiles

- Fibrous solids removal

Chemical Processing

- Organic and inorganic slurries

Municipal

- Primary treatment
- Grit dewatering

Pulp and Paper

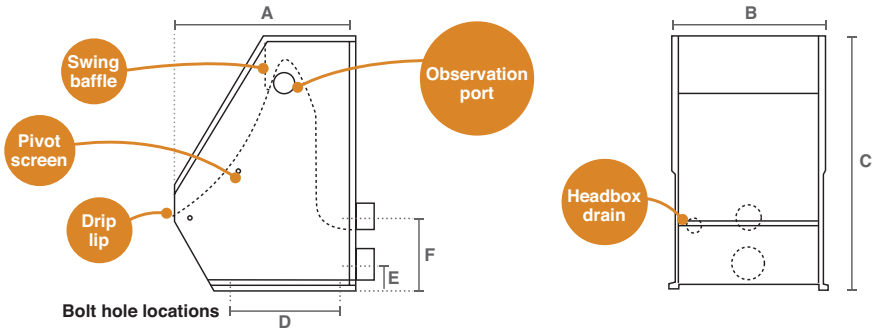
- Whitewater
- Broke thickening
- Mill effluent
- Log flume and debarking
- Screen rejects
- Fiber recovery
- De-ink washing
- Cleaner rejects
- Pulping
- Chip washing

Options

- Doors and covers
- Headboxes
- Discharge chute
- Custom-designed headbox to optimize operating conditions

Standard Features

- Unique bi-wave screen panel
- Drip lip promotes drier solids
- Available in 304 or 316 stainless steel
- Flow distribution baffle maximizes solids capture
- Pivoting screen panel on 48", 72" and 120" wide models facilitates maintenance and clean-up



Model	A Inches	B Inches	C Inches	D Inches	E Inches	F Inches	Inlet Dia.*	Outlet Dia.*	Dry WT. (Lbs.)	Operating Wt. (Lbs)
HS-18	40 7/8	19 1/2	61	27	6	-	Top feed	6	200	520
HS-36	40 7/8	37 1/2	61	27	7	-	Top feed	8	800	3100
HS-48	60	51	84	40 3/4	9 1/16	24 13/16	8	10	800	3100
HS-72	60	75	84	40 3/4	10 1/16	28 1/2	10	12	1200	4910
HS-120	60	124	84	40 3/4	11 11/16	42 1/2	(2)10	16	2000	8575

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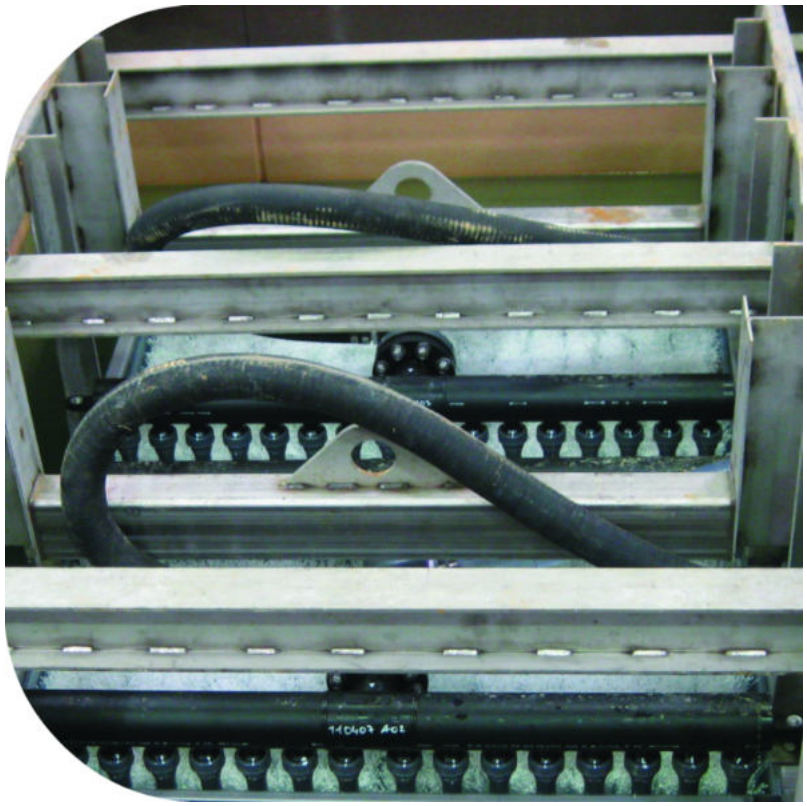
APPENDIX F – MEMBRANE BIOLOGICAL REACTOR TECHNOLOGY

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Process Design Report

SOUTHAMPTON LONG ISLAND STP NY

Design# 166035
Option: Preliminary MBR Design



Aqua-Aerobic® MBR

Membrane Bioreactor System

November 08, 2021
Designed By: Nicholas Fortsas

6306 N. Alpine Rd Loves Park, IL 61111
(815) 654-2501 www.aqua-aerobic.com

Upstream Recommendations

- Neutralization is required ahead of the biological system if the pH is expected to fall outside of 6.5-8.5 for significant durations.

- Coarse screening and grit removal is recommended (by others) ahead of the biological system.

- Elevated concentration of hydrogen sulfide can be detrimental to both civil and mechanical structures. If anaerobic conditions exist in the collection system, steps should be taken to eliminate hydrogen sulfide prior to the treatment system.

- Fine screening (by others) is required upstream of the Aqua-Aerobic MBR system, with an opening of 1-2 mm depending upon the characteristics of the screen. Punched hole or wire mesh up to 2 mm is preferred. Wedge wire screens are not recommended, but may be acceptable provided a maximum 1 mm opening.

- Coarse solids screening and grit removal (by others) is recommended upstream of the fine screens.

- If fine screening bypass provisions are included, the bypass channel shall be designed with a manual (or automatic) screen with similar opening properties (i.e. 1-2 mm). In no event should unscreened wastewater enter the Aqua-Aerobic MBR system.

Flow Considerations

- The maximum flow, as shown on the design, has been assumed as a hydraulic maximum and does not represent an additional organic load.

Aeration

- The aeration system has been designed to provide 1.25 lbs. O2/lb. BOD5 applied and 4.6 lbs. O2/lb. TKN applied at the design average loading conditions, while maintaining a residual DO concentration of 2.00 mg/l.

- A common standby blower will be shared among the biological reactors and digesters.

- Depending on the actual yard piping from the blowers to the diffuser system and the heat losses associated with the yard piping, additional provisions for cooling of the air (i.e. incorporating heat exchangers) and/or modification of in-basin piping and/or diffuser sleeve material may be required. Aqua-Aerobic Systems, Inc. may need to modify the following equipment offering to ensure compatibility of all in-basin components with actual air temperatures.

Digester

- A supernatant return device is recommended in the digester.

- The digester aeration system has been designed based on 2.0 lbs O2/lb VSS removed.

- The air supply for the digester system is based on each basin receiving 100% of the total sludge produced per day.

Process/Site

- The following parameters have been assumed, as displayed on the design (engineer to verify): Elevation, in basin temperatures, ambient temperatures.

- The anticipated effluent nitrogen requirement is predicated upon an influent waste temperature of 10 °C or greater. While lower temperatures may be acceptable for a short-term duration, nitrification and (if required) denitrification below 10 °C can be unpredictable, requiring special operator attention.

- Sufficient alkalinity is required for nitrification, as approximately 7.1 mg alkalinity (as CaCO3) is required for every mg of NH3-N nitrified. If the raw water alkalinity cannot support this consumption, while maintaining a residual concentration of 50 mg/l, supplemental alkalinity shall be provided (by others).

- The ability to meet the anticipated effluent nitrogen concentration is contingent upon the system's ability to hydrolyze the influent organic nitrogen to NH3-N. A certain fraction of the organic nitrogen may be refractory and, therefore, will not be biologically converted.

- The average, maximum and peak design flow and loading conditions, shown within the report, are based on maximum month average, maximum day and peak hour conditions, respectively.

Post-Secondary Treatment

-The following processes follow the Biological process:
- Membranes

Membrane

- The following components are not included in Aqua-Aerobic Systems' scope of supply and shall be provided by others:
  - Chemicals required for process and/or cleaning and their containers.
  - Starters, VFDs and/or motor control centers.
  - Neutralization system.
  - Interconnecting wiring and piping, unless specifically called out within this design.
  - CIP system piping.

- The membranes are sized to process the maximum with all membrane trains online.

- A pH adjustment system is not included. Depending on the particular characteristics of the wastewater (hardness, etc.) a caustic feed system (by others) may be required to optimize membrane performance.

- Influent to the membrane system must not contain any substance that is incompatible with the membrane, epoxy potting, SS/PVC piping, or EPDM gaskets/seals, if applicable. This includes silicones, solvents, free oil, etc.

- Chemical pump sizing is based on an influent alkalinity of 500 mg/l as CaCO3, conductivity of 1000 uS/cm, & hardness of 100 mg/l as CaCO3 and assumes there are no additional contaminants that will affect the pH.

- The membrane tanks (provided by others) must be made of, or coated with, a material capable of handling a pH as low as 2 and as high as 10.5 for up to 24 hours quarterly.

Equipment

- Changes in basin geometry may require alterations in the equipment recommendation.

- The basins are not included and shall be provided by others.

- Based on the process requirements and selected equipment, the reactor wall height should be at least 24 ft in the biological system.

- Scope of supply includes freight, installation supervision and start-up services.

- Equipment selection is based upon the use of Aqua-Aerobic Systems' standard materials of construction and electrical components, suitable for non-classified electrical environments.

- The basin dimensions reported on the design have been assumed based upon the required volumes and assumed basin geometry. Actual basin geometry may be circular, square or rectangular with construction materials including concrete or steel.

- Influent is assumed to enter the bioreactor above the waterline, located appropriately to avoid excessive splashing or direct discharge in the immediate vicinity of other equipment. If the influent is to be located submerged below the waterline, adequate hydraulic capacity should be made in the headworks to prevent backflow from one bioreactor to the other during transition of influent.

- The control panel does not include motor starters or VFDs, which should be provided in a separate MCC (by others).

- Provisions should be made, by others, for overflows in each of the recommended basins.

- Aqua-Aerobic Systems, Inc. is familiar with various "Buy American" Acts (i.e. AIS, ARRA, Federal FAR 52.225, EXIM Bank, USAid, PA Steel Products Act, etc.). As the project develops Aqua-Aerobic Systems can work with you to ensure full compliance of our goods with various Buy American provisions if they are applicable/required for the project. When applicable, please provide us with the specifics of the project's "Buy American" provisions.

- This product is being sold as a domestic project. However, if circumstances arise where this item would be exported, this product is classified as ECCN 2B352 under US export compliance laws/regulations. This product would require an export license from the Department of Commerce Bureau of Industry and Security (BIS) to all countries listed in current CB Column 2 on the BIS country chart, if the goods (or technology, defined as a "deemed export") are exported from the United States. Deemed exports are defined as sending technology/source code to a foreign national, within the United States or outside the United States. See http://www.bis.doc.gov website for details and additional information for compliance with the laws/regulation.

Aqua-Aerobic MBR - Membrane Bioreactor - Design Summary

Southampton Long Island STP NY 116924 AASI Design Number 166035

DESIGN INFLUENT CONDITIONS

Avg. Design Flow	= 0.225 MG/day	=	852	m^3/day
Max. Design Flow	= 0.26 MG/day	=	984	m^3/day
Peak Hydraulic Flow	= 0.323572 MG/day	=	1,225	m^3/day

INFLUENT PARAMETERS

	Influent	mg/l	Effluent Required	≤ mg/l	Effluent Anticipated	≤ mg/l
Bio/Chem Oxygen Demand:	BOD5	270	BOD5	30	BOD5	30
Suspended Solids:	TSS	320	TSS	30	TSS	30
Nitrogen:	TKN	70	Total-N	10	Total-N	10

SITE CONDITIONS

	Maximum		Minimum		Elevation (MSL)
Ambient Air Temperature:	86 F	30 C	32 F	0 C	400 ft
Influent Waste Temperature:	68 F	20 C	50 F	10 C	122 m

STAGED AERATION REACTOR

			Water Depth			Volume/Basin		
No./Basin Geometry:	= 2	Rectangular	Avg. =	21 ft	= 6.4 m	Avg. =	0.073 MG	= 274.7 m3
Freeboard:	= 3 ft	= 0.91 m						
Length of Basin:	= 22 ft	= 6.7 m						
Width of Basin:	= 21 ft	= 6.4 m						

BIOREACTOR PROCESS VARIABLES:

Hydraulic Retention Time:	=	15.5	hours (at average water level, average flow)
MLSS Concentration:	=	8,000	mg/l (at low water level)
Food/Mass (F/M) Ratio:	=	0.052	lbs BOD5 /lb MLSS-day
Solids Retention Time:	=	19.7	days
Est. Net Sludge Yield	=	0.821	lbs WAS/lb. BOD5 applied
Est. WAS Volume:	=	6,236	gallons/day
WAS Pumping Rate:	=	40	GPM
Actual Oxygen Required:	=	1,238	lbs O_2/day
Bioreactor Airflow Required/Basin:	=	343	SCFM/basin
Total Bioreactor Airflow:	=	687	SCFM
Average Discharge Pressure:	=	10.7	psig (10.67 psig max discharge pressure)
Est. Bioprocess Average Power Consumption:	=	403	kWh/day

Aqua-Aerobic MBR - Membrane Bioreactor - Design Summary

Southampton Long Island STP NY 116924 AASI Design Number 166035

MEMBRANE BASIN DESIGN

Number of Parallel Tanks:	= 3 Membrane Tanks		
Freeboard:	= 2 ft	=	0.61 m
Length of Basin:	= 5.8 ft	=	1.8 m
Width of Basin:	= 7 ft	=	2.1 m
Water Depth:	= 9.3 ft	=	2.8 m
Membrane Tank Volume:	= 2824 gal	=	10.7 m3

MEMBRANE PROCESS VARIABLES:

No. Membrane Modules per Tank:	=	1	Membrane Modules/Tank		
Active Membrane Area per Module:	=	7,492	ft2 per module (696 m2)		
Total Membrane Area Provided:	=	22,477	ft2 total (2088 m2)		
Average Membrane Flux Rate (F_{opt}):	=	10	Gallons/day/ft2 (17 liters/m2/hr)		
Maximum Membrane Flux Rate (F_{pk}):	=	14.4	Gallons/day/ft2 (24.4 liters/m2/hr)		
Est. Membrane Tank MLSS Concentration:	=	10,000	mg/l		
Design Peak Sludge Recycle Rate to Bioreactors:	=	4.0	x Average Design Flow	=	0.9 MGD
Avg. Membrane Tank Feed Rate (all trains on-line):	=	760	GPM Total (253 GPM per membrane tank)		
Peak Membrane Tank Feed Rate (all trains on-line):	=	850	GPM Total (283 GPM per membrane tank)		
Average Membrane Air Scour Requirement:	=	121	SCFM (varying distribution to all tanks)		
Peak Membrane Air Scour Requirement:	=	243	SCFM (varying distribution to all tanks)		
Air Scour Blower Discharge Pressure:	=	5.1	psig		
Est. Membrane Average Power Consumption:	=	146	kWh/day		

Aerobic Digester - Design Summary

AEROBIC DIGESTER DESIGN PARAMETERS

Sludge Flowrate to the Digester	= 6,236.0 gal/day	= (23.6 m³/day)
Inlet Sludge Concentration	= 1.00%	
Solids Loading to the Digester	= 520.1 lb/day	= (235.9 kg/day)
Inlet Volatile Solids Fraction	= 72.2%	

AEROBIC DIGESTER BASIN DESIGN VALUES

No./Basin Geometry:	= 2 Rectangular Basin(s)				
Length of Basin:	= 17 ft	= (5.2 m)			
Width of Basin:	= 18 ft	= (5.5 m)			
Min. Water Depth:	= 14.7 ft	= (4.5 m)	**Min. Basin Vol. Basin:**	= 33,646.5 gal	= (127.4 m³)
Max. Water Depth:	= 21 ft	= (6.4 m)	**Max. Basin Vol. Basin:**	= 48,066.4 gal	= (182.0 m³)

AEROBIC DIGESTER PROCESS DESIGN PARAMETERS

Solids Retention Time:	= 30.8 days	
Digester Design Temperature:	= 20 C	
Volatile Solids Destruction:	= 41.5%	
Digester Solids Concentration:	= 2%	
Oxygen Supplied for Digestion:	= 2 lbs O2 per lb VSS Destroyed	
Oxygen Distribution Per Basin:	= 100.0%	
Actual Oxygen Required:	= 311.7 lb/day	= (141.4 kg/day)
Volatile Percentage After Digestion:	= 60.3%	
Estimated Dry Solids to be Removed:	= 364.3 lb/day	= (165.2 kg/day)
Volume of Solids to be Removed:	= 2,183.8 gal/day	= (8.27 m³/day)
Estimated Supernatant Volume:	= 14,419.9 gal/basin	= (54.59 m³/basin)
Assumed Supernatant Duration:	= 180 minutes	
Calculated Supernatant Flow:	= 80.1 gpm	= (5.1 l/sec)

1. The Volatile Solids Destruction listed above shall be used for determination of the oxygen demand during summer conditions. It should be noted that the actual VSS destruction will be dependant upon digester inlet condition, temperature, and operating conditions.
2. The Digester Solids Concentration is reflected as an average concentration, assuming the operations include frequent settling and supernating practices.

AEROBIC DIGESTER EQUIPMENT CRITERIA

SCFM Required for O2 Demand:	= 221/basin	= (376 m³/hr/basin)
Mixing Energy with Diffusers (Coarse):	= 30 SCFM/1000 ft³	
SCFM Required to Mix:	= 193 SCFM/basin	= (328 Nm³/hr/basin)
Max. Discharge Pressure:	= 9.67 PSIG	= (66.70 KPA)
Max. Flow Rate Required Basin:	= 285 gpm	= (1.079 m³/min)
Avg. Power Required:	= 320.14 kW-hr/day	

MBR Reactors

Mixers

2 AquaDDM Direct Drive Mixer(s) will be provided as follows:

- 3 HP Aqua-Aerobic Systems Endura Series Model FSS DDM Mixer(s).

Mixer Mooring

2 Mixer cable mooring system(s) consisting of:

- #12 AWG-four conductor electrical service cable(s).
- Aerial support tie(s).
- Electrical cable strain relief grip(s), 2 eye, wire mesh.
- 304 stainless steel mooring cable(s).
- Maintenance mooring cable loop(s).
- Stainless steel mooring spring(s).

Retrievable Fine Bubble Diffusers

4 Retrievable Fine Bubble Diffuser Assembly(ies) consisting of:

- 15 diffuser tubes consisting of two flexible EPDM porous membrane sheaths mounted on a rigid support pipe with 304 stainless steel band clamps.
- 304 stainless steel manifold weldment.
- 304 stainless steel leveling angles.
- 304 stainless steel leveling studs.
- Galvanized vertical support beam.
- Galvanized vertical air column assembly.
- Galvanized upper vertical beam and pulley assembly.
- Galvanized top support bracket.
- 3" EPDM flexible air line with ny-glass quick disconnect end fittings.
- Galvanized threaded flange.
- 3" manual isolation butterfly valve with cast iron body, EPDM seat, aluminum bronze disk and one-piece steel shaft.
- Ny-glass quick disconnect cam lock adapter.
- 304 stainless steel adhesive anchors.
- Brace angles.

1 Diffuser Electric Winch(es) will be provided as follows:

- Portable electric winch.

Positive Displacement Blowers

3 Positive Displacement Blower Package(s), with each package consisting of:

- ROOTS 76 Positive Displacement Blower Package with common base, V-belt drive, enclosed drive guard, pressure gauge, pressure relief valve, and vibration pads.
- Stainless steel anchors.
- 30 HP motor with slide base.
- Inlet filter and inlet silencer.
- Discharge silencer, check valve, manual butterfly isolation valve, and flexible discharge connector.

Level Sensor Assemblies

2 Sensor installation(s) consisting of:

- Submersible pressure transducer(s).
- Stainless steel sensor guide rail weldment(s).
- PVC sensor mounting pipe(s).
- Top support(s).

2 Level Sensor Assembly(ies) will be provided as follows:

- Float switch(es).

- Float switch mounting bracket(s).
- Stainless steel anchors.

Instrumentation

2 Dissolved Oxygen Assembly(ies) consisting of:

- Thermo Fisher RDO dissolved oxygen probe with electric cable. Probe includes stainless steel stationary bracket and retrievable pole probe mounting assembly.
- Thermo Fisher AV38 controller and display module(s).

Misc/Spare Parts

1 Flow Meter(s) will be provided as follows:

- 4" magnetic flow-meter and converter(s).

AquaSBR: Aerobic Digester

Transfer Pumps/Valves

2 Submersible pump assembly(ies) consisting of the following items:

- 2.7 HP Submersible Pump(s) with painted cast iron pump housing, discharge elbow, and multi-conductor electrical cable.
- 3 inch diameter plug valve(s).
- 3 inch diameter swing check valve.
- Galvanized steel slide rail assembly(ies).

Fixed Coarse Bubble Diffusers

1 Aqua-Aerobic's Fixed Coarse Bubble Diffuser System(s) consisting of the following components:

- PVC diffuser(s).
- Schedule 40 galvanized steel riser pipe(s).
- Schedule 40 PVC manifold piping.
- Stainless steel anchors.

Positive Displacement Blowers

2 Positive Displacement Blower Package(s), with each package consisting of:

- ROOTS 65 Positive Displacement Blower Package with common base, V-belt drive, enclosed drive guard, pressure gauge, pressure relief valve, and vibration pads.
- Stainless steel anchors.
- 20 HP motor with slide base.
- Inlet filter and inlet silencer.
- Discharge silencer, check valve, manual butterfly isolation valve, and flexible discharge connector.

Level Sensor Assemblies

2 Sensor installation(s) consisting of:

- Submersible pressure transducer(s).
- Stainless steel sensor guide rail weldment(s).
- PVC sensor mounting pipe(s).
- Top support(s).

2 Level Sensor Assembly(ies) will be provided as follows:

- Float switch(es).
- Float switch mounting bracket(s).
- Stainless steel anchors.

Controls

Controls wo/Starters

1 Controls Package(s) will be provided as follows:

- NEMA 12 panel enclosure suitable for indoor installation and constructed of painted steel.
- Fuse(s) and fuse block(s).

- Compactlogix Processor.
- Operator interface.
- Remote Access Ethernet Modem.

Membrane

Membranes

3 Membrane Module Assembly(ies) each consisting of:

- Puron / Pulsion LE16 membrane module(s)
- Membrane lifting weldment(s).
- Stainless steel support beam(s).
- Wall mounting bracket(s).
- Permeate and air scour flexible hose(s).
- Stainless steel anchors.

Membrane Accessories

3 Membrane Tank Feed Manifold(s) consisting of:

- Distribution Plate.
- Stainless steel support(s).
- Stainless steel anchors and hardware.
- 304 stainless steel U-bolt(s) and hardware.

3 Pressure Transducer Assembly(ies) each consisting of:

- Submersible pressure transducer(s).
- Mounting bracket weldment(s).
- Transducer mounting pipe weldment(s).

3 Level Sensor Assembly(ies) will be provided as follows:

- Float switch(es).
- Float switch mounting bracket(s).
- Stainless steel anchors.

3 Set(s) of Membrane Air Scour Manifold Components consisting of:

- Air flow meter(s).
- Dip tube(s).
- Air scour manifold pressure transmitter(s).

Permeate Discharge Components

3 Set(s) of Permeate Line Instrumentation and Accessories consisting of:

- 4" magnetic flow-meter and converter(s).
- Rosemount pressure transmitter(s)
- Vent valve(s) assembly(ies).
- Stainless steel vent valve support bracket(s).
- Sampling port ball valve.

1 Permeate Holding Tank(s) consisting of:

- Polyethylene tank(s).
- Pressure transducer(s).
- 3" PVC flange with coupling.
- 1/2" PVC pipe.

3 Set(s) of Membrane Tank Permeate Collection Piping and Accessories consisting of:

- PVC membrane permeate manifold(s).
- PVC permeate discharge pipe(s).
- Permeate pipe support bracket(s).
- 304 stainless steel U-bolt(s) and hardware.
- Stainless steel anchor kit(s).

Transfer Pumps/Valves (Membranes)

1 WAS Pump Installation(s) consisting of:

- 3" manual butterfly valve(s).
- 3" butterfly valve(s) with single phase electric actuator(s). Valve \ actuator combination shall be manufacturer by Del-Tech, Nibco, RCI or equal.

3 Membrane Feed Pump Installation(s) consisting of:

- Centrifugal pump with 3 HP, 3 ph. motor.
- 3" manual butterfly valve(s).

3 Permeate Suction and Effluent Discharge Pump Installation(s) consisting of:

- Positive displacement pump(s) with reducer, coupling, base, and 5HP, TEBC, 3ph. motor.
- 4" manual butterfly valve(s).
- 4" butterfly valve(s) with single phase electric actuator(s). Valve \ actuator combination shall be manufacturer by Del-Tech, Nibco, RCI or equal.

Positive Displacement Blowers

2 Positive Displacement Blower Package(s), with each package consisting of:

- ROOTS 53 Positive Displacement Blower Package with common base, V-belt drive, enclosed drive guard, pressure gauge, pressure relief valve, and vibration pads.
- Stainless steel anchors.
- 5 HP motor with slide base.
- Inlet filter and inlet silencer.
- Discharge silencer, check valve, manual butterfly isolation valve, and flexible discharge connector.

Chemical Feed Systems

1 Chemical Feed System for acid and chlorine, each system consisting of the following:

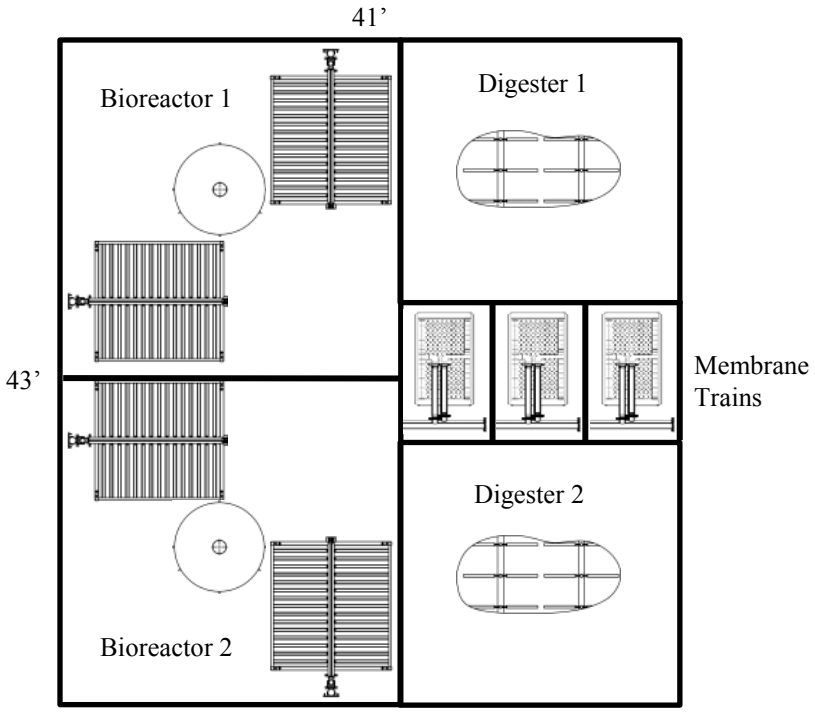
- PVC backing panel(s).
- Calibration columns.
- Chemical feed pumps.
- Pressure relief valves.
- GFI outlet(s).
- Ball valves.
- 316 stainless steel shelf weldments.
- Polypropylene utility trays.

6 Chemical Flow Control Valve(s) consisting of:

- 1/2" Electric PVC ball valve(s).

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Aqua-Aerobic® MBR Concrete General System Layout



NOT FOR CONSTRUCTION
Actual layout will differ.

6306 N. Alpine Rd. Loves Park, IL 61111-7655 p 815.654.2501 f 815.654.2508 www.aqua-aerobic.com

Relevant Experience
Aqua-Aerobic® MBR

Providing Innovative Solutions to Membrane Technology

The Proven MBR Formula

The success of any membrane biological reactor (MBR) relies on three major components:

1. Biological Treatment
2. Membrane Technology
3. Process Control

Aqua-Aerobic Systems, Inc. (AASI) has supplied aeration, mixing and filtration equipment to municipal and industrial sectors for over 40 years. For over two decades, AASI has provided and commissioned over 1,000 biological treatment systems, including the AquaSBR®/AquaExcel®, Aqua MSBR® and AquaPASS® processes. This experience in the design, operation and maintenance of biological treatment systems translates directly to those factors which impact the design, operation and maintenance of the biological treatment system in an MBR application. From the detailed kinetic design to sound equipment sizing criteria and selection, AASI offers the greatest breadth of knowledge and experience of any MBR system supplier.

Also, Aqua's extensive experience in solids/liquid separation dates back 30 years, with technologies including the AquaABF® filters and Cloth Media filters. With respect to membranes, Aqua has focused on Research & Development efforts in this area since 1999. The research has included extensive pilot work with flow-through and batch reactor MBR process systems. AASI is not a membrane manufacturer. Over the course of Aqua's development of the Aqua-Aerobic® MBR, it has developed relationships with companies that focus on this area of expertise.

To support our MBR efforts, Koch Membrane Systems (KMS) PURON™ submerged membrane technology has been selected for integration into the Aqua-Aerobic® MBR System. The PURON™ product is a membrane technology that has enjoyed success in Europe over the last 7+ years. The simple, yet robust design of the PURON™ product complements the Aqua-Aerobic® MBR system design.

Featured Installations

- *Quechan Paradise Casino, CA*
- *Colorado School of Mines, CO*
- *Souder Road, PA*
- *Middle Point Leachate, TN*

AQUA-AEROBIC SYSTEMS, INC.

Featured Aqua-Aerobic® MBR Installations

Quechan Paradise Casino, CA

QAvg : 250,000gal/day, QMax : 250,000gal/day
Operational : January 2009

The Aqua-Aerobic® MBR Membrane Biological Reactor (MBR) is the wastewater treatment system of choice for the Quechan Paradise Casino. This newly constructed gaming facility, located on Native American owned land in Winterhaven, California began its treatment operations in January 2009. Early into the project development, it was decided that the Aqua-Aerobic® MBR system was the optimum solution due to its small footprint, high-quality effluent and low energy consumption. The plant is designed to meet California's strict Title 22 reuse requirements in which effluent is reclaimed to supply drip irrigation for the casino's landscaping and a future onsite golf course.

The Aqua-Aerobic® MBR system was actually started up a month before the casino opened in order to get the biomass to the level needed for treatment of the Grand Opening flows. This unique startup plan saved Quechan from a large expense of hauling seed-sludge. It was expected that the Grand Opening flow would go from < 2% to nearly 100% capacity in one day.

On opening day, the plant processed nearly 100,000 gallons, and the effluent quality was superb. Despite significant fluctuations in daily flows and loads, the plant continues to record exceptional operating data with minimal operator input. The plant's typical operating data is shown below.

	Influent (mg/l)	Effluent (mg/l)
BOD	400	2
TKN	50	3
TN		5
TSS	400	2
TP	12	-

Souder Road, PA

QAvg : 250,000gal/day, QMax : 500,000gal/day
Operational : December 2010

Aqua Aerobic is providing a dual basin bioreactor system and two membrane basins for a small system that will be used to treat the waste from a school and nearby community that is currently being built. The system is sized for average flows at initial conditions as low as 0.025 MGD and is sized to be expanded to 0.25 MGD by simply adding in additional membrane area to the membrane basins at full build-out the system is sized for a peak flow of 1 MGD. The structure will be a two floor building, with pumps and blowers installed in the first floor, with the controls, process and operations room above. The system will operate in a batch mode and adjust the concentration in the bioreactors based on the flow that is coming into the plant. Design data for the project is shown to the left.

	Influent (mg/l)	Effluent (mg/l)
BOD	350	10
TKN	55	3
TN		6
TSS	350	10
TP	10	0.1

Featured Aqua-Aerobic® MBR Installations

Colorado School of Mines, CO

QAvg : 7,600gal/day, QMax : 15,000gal/day
Operational : February 2009

The Advanced Water Technology Center (AQWATEC) at Colorado School of Mines (CSM) partnered with Aqua-Aerobic Systems and CSM's Small Flows Program to explore the viability of new hybrid treatment systems using sequencing batch reactors (SBR) with submerged ultrafiltration membranes. The Aqua-Aerobic® MBR demonstration system is designed for small communities or cluster homes, providing an effluent quality that is suitable for onsite reuse. The main objective of the current study is to assess the performance of the on-site, full-scale, demonstration system, treating domestic wastewater generated by the Mines Park student housing complex (~400 apartments). Primary work focuses on the optimization of the process for biological nutrient removal (BNR), optimization of membrane operation, and recycle rates for constant and diurnal flow patterns. The system is challenged under a variety of weather and operating conditions while considering the potential for beneficial reuse. Typical operating data for the project is shown below.

	Influent (mg/l)	Effluent (mg/l)
BOD	350	2
TKN	70	3
TN		5
TSS	350	<2
TP	12	0.5

Middle Point Leachate, TN

QAvg : 100,000gal/day, QMax : 150,000gal/day
Operational : May 2010

The Middle Point Leachate Facility had a break-point chlorination system. In order to reduce O&M costs, the decision was made to upgrade the system to an activated sludge treatment process. Due to the high strength waste and difficulties with solids separation a treatability study was commissioned. Based on the results of this study, MBR technology was chosen. The Aqua-Aerobic® MBR was eventually utilized based on its operational flexibility and lowest lifecycle costs. The Aqua-Aerobic® MBR system consists of a dual basin flow-through reactors system with two membrane tanks. Each membrane tank will have two 500 m2 modules and have space for a future third module. The system is sized for 0.1 MGD average and 0.15 MGD peak flow, and is designed mainly for nitrification. The design influent ammonia value is 2,765 mg/l. Design data for the project is shown to the right.

	Influent (mg/l)	Effluent (mg/l)
BOD	1800	250
TKN	2765	50
TN		
TSS	500	2
TP		0.1

Aqua-Aerobic® MBR
Membrane Biological Reactor

Providing Innovative Solutions to Membrane Technology

Learn more about the Aqua-Aerobic® MBR System

Aqua-Aerobic Systems, Inc. is proud to offer the water and wastewater treatment industry an innovative solution to membrane technology. If you are currently working on a specific project that requires municipal or industrial wastewater reclamation, or impaired water body TMDL limits, please contact our office and we will be happy to provide you with the information you need to make the Aqua-Aerobic® MBR system an integral part of your next project.

Technical Seminars

Join the thousands of individuals who have attended an Aqua-Aerobic Systems technical seminar in which the Aqua-Aerobic® MBR Membrane Biological Reactor is a featured presentation. If you are interested in attending an upcoming seminar, please contact Sara Miller at 815-639-4417 or smiller@aqua-aerobic.com for a seminar schedule and synopsis.

AQUA-AEROBIC SYSTEMS, INC.

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Bulletin # 650B 10/10

APPENDIX G – CONSTRUCTION COST ESTIMATE

SUBJECT: **GENERAL NOTES & QUALIFICATIONS** | **EST. NO:** 21-0309
PROJECT: NEW SEWER DISTRICT | **EST. BY:** CD
LOCATION: SOUTHAMPTON, NY | **CHKD. BY:**
TYPE EST.: FEASIBILITY | **DATE:** 05-24-22
CLIENT: D&B ENGINEERS & ARCHITECTS | **REV. DATE:** 06-16-22

OPTION 1:	
COLLECTION SYSTEM	$11,501,774
PUMP STATION	$1,889,548
SEWAGE TREATMENT PLANT	$22,023,489
TOTAL OPTION 1 COST	**$35,414,811**
OPTION 2:	
COLLECTION SYSTEM	$10,654,670
PUMP STATION	$1,728,839
SEWAGE TREATMENT PLANT	$23,403,424
TOTAL OPTION 2 COST	**$35,786,933**
ADD ALTERNATE, ASPHALT MILLING AND OVERLAY	$2,854,171

1. All Prices are based on 2021 prevailing wage costs

2. Escalation is based on a mid-point of construction date of November 2024 @ 3.5% per annum compounded.

3. The following items are not included:
   a) Professional/Design fees
   b) Taxes
   c) Hazardous Materials Abatement
   d) Construction Contingency (Owner Reserve)
   e) Land Acquisition Cost
   f) Parcel Connections

4. This estimate is based on conceptual design information as provided by D&B Engineers & architects

5. The estimate was developed in general accordance with guidelines established by the Association for the Advancement of Cost Estimating International (AACEI) and is most accurately described as a Class 4 cost estimate. A detailed description of the estimate class is provided below.

   AACE International CLASS 4 Cost Estimate – Class 4 estimates are generally prepared based on limited information and subsequently have fairly wide accuracy ranges. Typically, engineering is 1% to 15% complete. They are typically used for project screening, determination of feasibility, concept evaluation, and preliminary budget approval. Virtually all Class 4 estimates use stochastic estimating methods such as cost curves, capacity factors, and other parametric and modeling techniques. Expected accuracy ranges are from –15% to –30% on the low side and +20% to 50% on the high side, depending on the technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Ranges could exceed those shown in unusual circumstances. As little as 20 hours or less to perhaps more than 300 hours may be spend preparing the estimate depending on the project and estimating methodology (AACE International Recommended Practices and Standards).

SUBJECT: **COLLECTION SYSTEM, OPTION 1**
PROJECT: NEW SEWER DISTRICT
LOCATION: SOUTHAMPTON, NY
TYPE EST.: FEASIBILITY
CLIENT: D&B ENGINEERS & ARCHITECTS

EST. NO: 21-0309
EST. BY: CD
CHKD. BY:
DATE: 11-10-21
REV. DATE:

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT	TOTAL
	COLLECTION SYSTEM					
	MPT	260	DAY	5,000.00	1,300,000	
	Pavement Cutting & Patching:					
	Sawcut Pavement	51,766	LF	6.00	310,596	
	Demo Asphalt Paving	13,849	SY	13.00	180,037	
	Haul & Dispose of Paving	2,886	LCY	50.00	144,300	
	Temporary Gravel over Trench	13,849	SY	7.00	96,943	
	Asphalt Paving Replacement in Trench, including hauling	13,849	SY	80.00	1,107,920	
	Erosion Control & Temporary Protection	1	ALLOW	100,000.00	100,000	
	Combined Sewer Trenching (4,827 LF):					
	Excavation	4,791	CY	15.00	71,865	
	Pipe Bedding Including Hauling	1,937	LCY	55.00	106,535	
	Backfill With Excavated Materials	3,813	LCY	7.00	26,691	
	Compaction	4,791	CY	8.00	38,328	
	Haul & Dispose of Excess Materials	1,937	LCY	30.00	58,110	
	Gravity Sewer Trenching (12,788 LF):					
	Excavation	11,504	CY	15.00	172,560	
	Pipe Bedding Including Hauling	3,287	LCY	55.00	180,785	
	Backfill With Excavated Materials	10,517	LCY	7.00	73,619	
	Compaction	11,504	CY	8.00	92,032	
	Haul & Dispose of Excess Materials	3,287	LCY	30.00	98,610	
	House Connections Trenching (8,890 LF):					
	Excavation	4,885	CY	15.00	73,275	
	Pipe Bedding Including Hauling	1,685	LCY	55.00	92,675	
	Backfill With Excavated Materials	4,178	LCY	7.00	29,246	
	Compaction	4,885	CY	8.00	39,080	
	Haul & Dispose of Excess Materials	1,685	LCY	30.00	50,550	
	Forcemain Trenching (3,823 LF)					
	Excavation	1,413	CY	15.00	21,195	
	Pipe Bedding Including Hauling	639	LCY	55.00	35,145	
	Backfill With Excavated Materials	1,062	LCY	7.00	7,434	
	Compaction	1,413	CY	8.00	11,304	
	Haul & Dispose of Excess Materials	639	LCY	30.00	19,170	
	Trench Dewatering (Assume 40% of Trenches)	100	DAY	2,000.00	200,000	
	Gravity Piping PVC SDR 35:					
	4"	8,890	LF	10.00	88,900	
	8"	17,519	LF	15.00	262,785	
	10"	96	LF	22.00	2,112	
	4" House Connection Fittings	254	EA	100.00	25,400	

N A S C O
C O N S T R U C T I O N S E R V I C E S I N C.

SUBJECT: **COLLECTION SYSTEM, OPTION 1**
PROJECT: NEW SEWER DISTRICT
LOCATION: SOUTHAMPTON, NY
TYPE EST.: FEASIBILITY
CLIENT: D&B ENGINEERS & ARCHITECTS

EST. NO: 21-0309
EST. BY: CD
CHKD. BY:
DATE: 11-10-21
REV. DATE:

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT	TOTAL
	Manholes including Frame & Cover:					
	6' Deep	24	EA	2,800.00	67,200	
	8' Deep	35	EA	3,600.00	126,000	
	Additional Lengths over 8' Deep	103	VLF	360.00	37,080	
	Forcemain Piping HDPE:					
	6"	8,650	LF	30.00	259,500	
	Air Release/Clean Out Manholes (Allow 1 Per Every 400' of Forcemain)	22	EA	5,000.00	110,000	
				Subtotal	5,716,982	
				General Conditions - 12%	686,038	
				Subtotal	6,403,020	
				Escalation - 10.87%	696,008	
				Subtotal	7,099,028	
				Contractor OH&P - 21%	1,490,796	
				Subtotal	8,589,824	
				Design Contingency - 30%	2,576,947	
				Subtotal	11,166,771	
				Bonds & Insurance - 3%	335,003	
				TOTAL		**$ 11,501,774**

SUBJECT: **PUMP STATION, OPTION 1**
PROJECT: NEW SEWER DISTRICT
LOCATION: SOUTHAMPTON, NY
TYPE EST.: FEASIBILITY
CLIENT: D&B ENGINEERS & ARCHITECTS

EST. NO: 21-0309
EST. BY: CD
CHKD. BY:
DATE: 11-10-21
REV. DATE:

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT	TOTAL
	PUMP STATION					
	Erosion Control & Temporary Protection	1	ALLOW	15,000.00	15,000	
	Parking Lot Pavement Removal & Replacement (Allow 50' x 50')					
	Sawcut Pavement	100	LF	6.00	600	
	Demo Asphalt Paving	278	SY	13.00	3,614	
	Haul & Dispose of Paving	56	LCY	50.00	2,800	
	Asphalt Paving Parking Lot, including hauling	278	SY	60.00	16,680	
	Steel Sheeting	3,160	SF	40.00	126,400	
	Pump Station Earthwork:					
	Excavation	422	CY	10.00	4,220	
	Backfill With Excavated Materials	420	LCY	9.00	3,780	
	Compaction	350	CY	6.00	2,100	
	Haul & Dispose of Excess Materials	87	LCY	30.00	2,610	
	Dewatering	10	DAY	3,000.00	30,000	
	Pre-Fabricated Pump Station Including: (2) Flygt 3171_35hp pumps (1) Duplex control panel with VFD's & bypass starters with Multismart (1) Oldcastle Onelift precast concrete complete pump station including valve vault, piping, valves, etc… Set of accessories Set of level sensors Start up and freight	1	LS	340,000.00	340,000	
	Install Pump Station	1	LS	25,000.00	25,000	
	Above Grade Control Building (20' x 25' x 15' H)	500	GSF	350.00	175,000	
	Electrical Service Connection	1	ALLOW	75,000.00	75,000	
	Emergency Generator, 100 KW including Installation & Circuitry	1	LS	100,000.00	100,000	
	Pump Station I&C Integration	1	ALLOW	6,000.00	6,000	
	Pump Station, Start-up & Testing	1	LS	10,400.00	10,400	

N A S C O
C O N S T R U C T I O N S E R V I C E S I N C.

SUBJECT: **PUMP STATION, OPTION 1**
PROJECT: NEW SEWER DISTRICT
LOCATION: SOUTHAMPTON, NY
TYPE EST.: FEASIBILITY
CLIENT: D&B ENGINEERS & ARCHITECTS

EST. NO: 21-0309
EST. BY: CD
CHKD. BY:
DATE: 11-10-21
REV. DATE:

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT	TOTAL
				Subtotal	939,204	
				General Conditions - 12%	112,704	
				Subtotal	1,051,908	
				Escalation - 10.87%	114,342	
				Subtotal	1,166,251	
				Contractor OH&P - 21%	244,913	
				Subtotal	1,411,164	
				Design Contingency - 30%	423,349	
				Subtotal	1,834,513	
				Bonds & Insurance - 3%	55,035	
				TOTAL		**$ 1,889,548**

SUBJECT: **SEWAGE TREATMENT PLANT, OPTION 1**
PROJECT: NEW SEWER DISTRICT
LOCATION: SOUTHAMPTON, NY
TYPE EST.: FEASIBILITY
CLIENT: D&B ENGINEERS & ARCHITECTS

EST. NO: 21-0309
EST. BY: CD
CHKD. BY:
DATE: 11-10-21
REV. DATE:

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT	TOTAL
	SEWAGE TREATMENT PLANT					
	Site Construction:					
	Erosion Control & Temporary Protection	1	ALLOW	30,000.00	30,000	
	Site Clearing	3	ACRE	17,500.00	52,500	
	Site Improvements, Pavings, Landscaping, Etc.	1	ALLOW	100,000.00	100,000	
	Site Drainage	1	ALLOW	50,000.00	50,000	
	Recharge System					
	Leaching Pools:					
	Leaching Pools Including Excavation & Backfill	320	EA	5,000.00	1,600,000	
	Distribution Structures Including Excavation & Backfill (Allow 40 Each)	40	EA	5,500.00	220,000	
	Distribution Piping Including Trenching	1	ALLOW	500,000.00	500,000	
	Influent Pump Station					
	Steel Sheeting	2,118	SF	35.00	74,130	
	Pump Station Earthwork:					
	Excavation	283	CY	10.00	2,830	
	Backfill With Excavated Materials	281	LCY	9.00	2,529	
	Compaction	235	CY	6.00	1,410	
	Haul & Dispose of Excess Materials	58	LCY	30.00	1,740	
	Dewatering	5	DAY	3,000.00	15,000	
	Pre-Fabricated Influent Pump Station Including: (2) Non-clog submersible pumps (1) Duplex control panel with VFD's & bypass starters with Multismart (1) Oldcastle Onelift precast concrete complete pump station including valve vault, piping, valves, etc… Set of accessories Set of level sensors Start up and freight	1	LS	200,000.00	200,000	
	Install Pump Station	1	LS	20,000.00	20,000	
	Pump Station I&C Integration	1	ALLOW	6,000.00	6,000	
	Pump Station, Start-up & Testing	1	LS	10,400.00	10,400	

SUBJECT: **SEWAGE TREATMENT PLANT, OPTION 1** **EST. NO:** 21-0309
PROJECT: NEW SEWER DISTRICT **EST. BY:** CD
LOCATION: SOUTHAMPTON, NY **CHKD. BY:**
TYPE EST.: FEASIBILITY **DATE:** 11-10-21
CLIENT: D&B ENGINEERS & ARCHITECTS **REV. DATE:**

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT	TOTAL
	UG Tank:					
	Steel Sheeting	9,331	SF	35.00	326,585	
	Earthwork:					
	Excavation	4,630	CY	10.00	46,300	
	Backfill With Excavated Materials	1,188	LCY	9.00	10,692	
	Compaction	990	CY	6.00	5,940	
	Haul & Dispose of Excess Materials	4,368	LCY	30.00	131,040	
	Dewatering	60	DAY	4,000.00	240,000	
	Piles (Allow 8' OC)	90	EA	3,500.00	315,000	
	CIP Concrete					
	Mat Slab (Allow 24" Thk.)	376	CY	700.00	263,200	
	Exterior Walls (Allow 18" Thk)	347	CY	1,500.00	520,500	
	Interior Walls (Allow 12" Thk)	121	CY	1,750.00	211,750	
	Elevated Slab & Beams	4,914	SF	55.00	270,270	
	Above Grade Buildings:					
	Earthwork:					
	Excavation	249	CY	10.00	2,490	
	Backfill With Excavated Materials	48	LCY	9.00	432	
	Compaction	40	CY	6.00	240	
	Haul & Dispose of Excess Materials	201	LCY	30.00	6,030	
	Piles (Allow 8' OC)	52	EA	3,500.00	182,000	
	CIP Concrete					
	Mat Slab (Allow 24" Thk.)	209	CY	700.00	146,300	
	Above Grade Building Including Structure, Building Mechanical & Electrical:					
	100' x 27' x 20' H, Atop Mat Slab	2,700	GSF	325.00	877,500	
	117' x 42' x 16' H, Atop Tanks, Including Odor Control	4,914	GSF	350.00	1,719,900	
	Process Mechanical:					
	Sequence Batch Reactor (SBR)					
	Material Cost	1	LS	562,600.00	562,600	
	Installation Cost	1	LS	84,390.00	84,390	
	Filtration Units					
	Material Cost	1	LS	244,620.00	244,620	
	Installation Cost	1	LS	36,693.00	36,693	
	Static Screen					
	Material Cost	1	LS	26,800.00	26,800	
	Installation Cost	1	LS	5,360.00	5,360	
	Laboratory Equipment	1	ALLOW	25,000.00	25,000	
	Groundwater Monitoring Well	1	ALLOW	10,000.00	10,000	
	Process Piping & Valves (Allow 50% of Equipment Cos	1	ALLOW	497,731.50	497,732	
	Electrical Service Connection, Power Distribution, Control Circuitry	1	ALLOW	750,000.00	750,000	
	Standby Power	1	ALLOW	250,000.00	250,000	

N A S C O
C O N S T R U C T I O N S E R V I C E S I N C.

SUBJECT: **SEWAGE TREATMENT PLANT, OPTION 1**
PROJECT: NEW SEWER DISTRICT
LOCATION: SOUTHAMPTON, NY
TYPE EST.: FEASIBILITY
CLIENT: D&B ENGINEERS & ARCHITECTS

EST. NO: 21-0309
EST. BY: CD
CHKD. BY:
DATE: 11-10-21
REV. DATE:

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT	TOTAL

N A S C O
C O N S T R U C T I O N S E R V I C E S I N C.

SUBJECT: **SEWAGE TREATMENT PLANT, OPTION 1**
PROJECT: NEW SEWER DISTRICT
LOCATION: SOUTHAMPTON, NY
TYPE EST.: FEASIBILITY
CLIENT: D&B ENGINEERS & ARCHITECTS

EST. NO: 21-0309
EST. BY: CD
CHKD. BY:
DATE: 11-10-21
REV. DATE:

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT	TOTAL
	STP Intrumentation (Allow 10% of Process Mechanical & Electrical Cost)	1	ALLOW	249,319.50	249,320	
	STP, Start-up & Testing	1	LS	41,600.00	41,600	
				Subtotal	10,946,823	
				General Conditions - 12%	1,313,619	
				Subtotal	12,260,442	
				Escalation - 10.87%	1,332,710	
				Subtotal	13,593,152	
				Contractor OH&P - 21%	2,854,562	
				Subtotal	16,447,714	
				Design Contingency - 30%	4,934,314	
				Subtotal	21,382,028	
				Bonds & Insurance - 3%	641,461	
				TOTAL		**$ 22,023,489**

SUBJECT: **COLLECTION SYSTEM, OPTION 2**
PROJECT: NEW SEWER DISTRICT
LOCATION: SOUTHAMPTON, NY
TYPE EST.: FEASIBILITY
CLIENT: D&B ENGINEERS & ARCHITECTS

EST. NO: 21-0309
EST. BY: CD
CHKD. BY:
DATE: 05-24-22
REV. DATE:

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT	TOTAL
	COLLECTION SYSTEM					
	MPT	260	DAY	5,000.00	1,300,000	
	Pavement Cutting & Patching:					
	Sawcut Pavement	52,400	LF	6.00	314,400	
	Demo Asphalt Paving	12,755	SY	13.00	165,815	
	Haul & Dispose of Paving	2,657	LCY	50.00	132,850	
	Temporary Gravel over Trench	12,755	SY	7.00	89,285	
	Asphalt Paving Replacement in Trench, including hauling	12,755	SY	80.00	1,020,400	
	Erosion Control & Temporary Protection	1	ALLOW	100,000.00	100,000	
	Combined Sewer Trenching (5,000 LF):					
	Excavation	6,019	CY	15.00	90,278	
	Pipe Bedding Including Hauling	1,157	LCY	55.00	63,657	
	Backfill With Excavated Materials	6,065	LCY	7.00	42,455	
	Compaction	6,019	CY	8.00	48,152	
	Haul & Dispose of Excess Materials	1,157	LCY	30.00	34,710	
	LPS Forcemain Trenching (17,550 LF):					
	Excavation	12,675	CY	15.00	190,125	
	Pipe Bedding Including Hauling	2,438	LCY	55.00	134,063	
	Backfill With Excavated Materials	12,772	LCY	7.00	89,404	
	Compaction	12,675	CY	8.00	101,400	
	Haul & Dispose of Excess Materials	2,438	LCY	30.00	73,140	
	Forcemain Trenching (3,650 LF)					
	Excavation	1,352	CY	15.00	20,280	
	Pipe Bedding Including Hauling	611	LCY	55.00	33,605	
	Backfill With Excavated Materials	1,016	LCY	7.00	7,112	
	Compaction	1,352	CY	8.00	10,816	
	Haul & Dispose of Excess Materials	611	LCY	30.00	18,330	
	Trench Dewatering (Assume 40% of Trenches)	100	DAY	2,000.00	200,000	
	Low Pressure Forcemain Piping HDPE:					
	1-1/4"	6,200	LF	23.00	142,600	
	2"	6,900	LF	25.00	172,500	
	3"	7,050	LF	27.00	190,350	
	4"	2,400	LF	28.00	67,200	
	Lateral connection Kits	210	EA	350.00	73,500	
	Forcemain Piping HDPE:					
	6"	8,650	LF	30.00	259,500	

N A S C O
C O N S T R U C T I O N S E R V I C E S I N C.

SUBJECT: **COLLECTION SYSTEM, OPTION 2**
PROJECT: NEW SEWER DISTRICT
LOCATION: SOUTHAMPTON, NY
TYPE EST.: FEASIBILITY
CLIENT: D&B ENGINEERS & ARCHITECTS

EST. NO: 21-0309
EST. BY: CD
CHKD. BY:
DATE: 05-24-22
REV. DATE:

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT	TOTAL
	Air Release/Clean Out Manholes (Allow 1 Per Every 400' of Forcemain)	22	EA	5,000.00	110,000	
				Subtotal	5,295,927	
				General Conditions - 12%	635,511	
				Subtotal	5,931,438	
				Escalation - 10.87%	644,747	
				Subtotal	6,576,186	
				Contractor OH&P - 21%	1,380,999	
				Subtotal	7,957,185	
				Design Contingency - 30%	2,387,155	
				Subtotal	10,344,340	
				Bonds & Insurance - 3%	310,330	
				TOTAL		**$ 10,654,670**

N A S C O
C O N S T R U C T I O N S E R V I C E S I N C.

SUBJECT: **PUMP STATION, OPTION 2**
PROJECT: NEW SEWER DISTRICT
LOCATION: SOUTHAMPTON, NY
TYPE EST.: FEASIBILITY
CLIENT: D&B ENGINEERS & ARCHITECTS

EST. NO: 21-0309
EST. BY: CD
CHKD. BY:
DATE: 05-24-22
REV. DATE:

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT	TOTAL
	PUMP STATION					
	Erosion Control & Temporary Protection	1	ALLOW	15,000.00	15,000	
	Parking Lot Pavement Removal & Replacement (Allow 50' x 50')					
	Sawcut Pavement	100	LF	6.00	600	
	Demo Asphalt Paving	278	SY	13.00	3,614	
	Haul & Dispose of Paving	56	LCY	50.00	2,800	
	Asphalt Paving Parking Lot, including hauling	278	SY	60.00	16,680	
	Steel Sheeting	2,118	SF	40.00	84,720	
	Pump Station Earthwork:					
	Excavation	283	CY	10.00	2,830	
	Backfill With Excavated Materials	281	LCY	9.00	2,529	
	Compaction	235	CY	6.00	1,410	
	Haul & Dispose of Excess Materials	58	LCY	30.00	1,740	
	Dewatering	8	DAY	3,000.00	24,000	
	Pre-Fabricated Pump Station Including: (2) Flygt 3171_35hp pumps (1) Duplex control panel with VFD's & bypass starters with Multismart (1) Oldcastle Onelift precast concrete complete pump station including valve vault, piping, valves, etc… Set of accessories Set of level sensors Start up and freight	1	LS	312,000.00	312,000	
	Install Pump Station	1	LS	25,000.00	25,000	
	Above Grade Control Building (20' x 25' x 15' H)	500	GSF	350.00	175,000	
	Electrical Service Connection	1	ALLOW	75,000.00	75,000	
	Emergency Generator, 100 KW including Installation & Circuitry	1	LS	100,000.00	100,000	
	Pump Station I&C Integration	1	ALLOW	6,000.00	6,000	
	Pump Station, Start-up & Testing	1	LS	10,400.00	10,400	

N A S C O
C O N S T R U C T I O N S E R V I C E S I N C.

SUBJECT: **PUMP STATION, OPTION 2**
PROJECT: NEW SEWER DISTRICT
LOCATION: SOUTHAMPTON, NY
TYPE EST.: FEASIBILITY
CLIENT: D&B ENGINEERS & ARCHITECTS

EST. NO: 21-0309
EST. BY: CD
CHKD. BY:
DATE: 05-24-22
REV. DATE:

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT	TOTAL
				Subtotal	859,323	
				General Conditions - 12%	103,119	
				Subtotal	962,442	
				Escalation - 10.87%	104,617	
				Subtotal	1,067,059	
				Contractor OH&P - 21%	224,082	
				Subtotal	1,291,142	
				Design Contingency - 30%	387,342	
				Subtotal	1,678,484	
				Bonds & Insurance - 3%	50,355	
				TOTAL		**$ 1,728,839**

SUBJECT: **SEWAGE TREATMENT PLANT, OPTION 2** **EST. NO:** 21-0309
PROJECT: NEW SEWER DISTRICT **EST. BY:** CD
LOCATION: SOUTHAMPTON, NY **CHKD. BY:**
TYPE EST.: FEASIBILITY **DATE:** 05-24-22
CLIENT: D&B ENGINEERS & ARCHITECTS **REV. DATE:**

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT	TOTAL
	SEWAGE TREATMENT PLANT					
	Site Construction:					
	Erosion Control & Temporary Protection	1	ALLOW	30,000.00	30,000	
	Site Clearing	4.5	ACRE	17,500.00	78,750	
	Site Improvements, Pavings, Landscaping, Etc.	1	ALLOW	100,000.00	100,000	
	Site Drainage	1	ALLOW	50,000.00	50,000	
	Recharge System					
	Leaching Pools:					
	Leaching Pools Including Excavation & Backfill	320	EA	5,000.00	1,600,000	
	Distribution Structures Including Excavation & Backfill (Allow 20 Each)	40	EA	5,500.00	220,000	
	Distribution Piping Including Trenching	1	ALLOW	500,000.00	500,000	
	Influent Pump Station					
	Steel Sheeting	2,118	SF	35.00	74,130	
	Pump Station Earthwork:					
	Excavation	283	CY	10.00	2,830	
	Backfill With Excavated Materials	281	LCY	9.00	2,529	
	Compaction	235	CY	6.00	1,410	
	Haul & Dispose of Excess Materials	58	LCY	30.00	1,740	
	Dewatering	5	DAY	3,000.00	15,000	
	Pre-Fabricated Influent Pump Station Including: (2) Non-clog submersible pumps (1) Duplex control panel with VFD's & bypass starters with Multismart (1) Oldcastle Onelift precast concrete complete pump station including valve vault, piping, valves, etc… Set of accessories Set of level sensors Start up and freight	1	LS	200,000.00	200,000	
	Install Pump Station	1	LS	20,000.00	20,000	
	Pump Station I&C Integration	1	ALLOW	6,000.00	6,000	
	Pump Station, Start-up & Testing	1	LS	10,400.00	10,400	

SUBJECT: **SEWAGE TREATMENT PLANT, OPTION 2** **EST. NO:** 21-0309
PROJECT: NEW SEWER DISTRICT **EST. BY:** CD
LOCATION: SOUTHAMPTON, NY **CHKD. BY:**
TYPE EST.: FEASIBILITY **DATE:** 05-24-22
CLIENT: D&B ENGINEERS & ARCHITECTS **REV. DATE:**

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT	TOTAL
	UG Tank:					
	Steel Sheeting	10,816	SF	35.00	378,560	
	Earthwork:					
	Excavation	5,763	CY	10.00	57,630	
	Backfill With Excavated Materials	1,368	LCY	9.00	12,312	
	Compaction	1,140	CY	6.00	6,840	
	Haul & Dispose of Excess Materials	5,548	LCY	30.00	166,440	
	Dewatering	75	DAY	4,000.00	300,000	
	Piles (Allow 8' OC)	80	EA	3,500.00	280,000	
	CIP Concrete					
	Mat Slab (Allow 24" Thk.)	356	CY	700.00	249,200	
	Exterior Walls (Allow 18" Thk)	373	CY	1,500.00	559,500	
	Interior Walls (Allow 12" Thk)	219	CY	1,750.00	383,250	
	Elevated Slab & Beams	4,800	SF	55.00	264,000	
	Above Grade Buildings:					
	Earthwork:					
	Excavation	192	CY	10.00	1,920	
	Backfill With Excavated Materials	70	LCY	9.00	630	
	Compaction	58	CY	6.00	348	
	Haul & Dispose of Excess Materials	161	LCY	30.00	4,830	
	Piles (Allow 8' OC)	32	EA	3,500.00	112,000	
	CIP Concrete					
	Mat Slab (Allow 24" Thk.)	134	CY	700.00	93,800	
	Above Grade Building Including Structure, Building Mechanical & Electrical:					
	30' x 60' x 12' H, Atop Mat Slab	1,800	GSF	300.00	540,000	
	80' x 60' x 16' H, Atop Tanks, Including Odor	4,800	GSF	350.00	1,680,000	
	Process Mechanical:					
	MBR Equipment					
	Material Cost	1	LS	879,580.00	879,580	
	Installation Cost	1	LS	131,937.00	131,937	
	Center Flow Screens					
	Material Cost	2	EA	192,000.00	384,000	
	Installation Cost	2	EA	38,400.00	76,800	
	Laboratory Equipment	1	ALLOW	25,000.00	25,000	
	Groundwater Monitoring Well	1	ALLOW	10,000.00	10,000	
	Process Piping & Valves (Allow 50% of Equipment Cos	1	ALLOW	753,658.50	753,659	
	Electrical Service Connection, Power Distribution, Control Circuitry	1	ALLOW	750,000.00	750,000	
	Standby Power	1	ALLOW	250,000.00	250,000	

N A S C O
C O N S T R U C T I O N S E R V I C E S I N C.

SUBJECT: **SEWAGE TREATMENT PLANT, OPTION 2**
PROJECT: NEW SEWER DISTRICT
LOCATION: SOUTHAMPTON, NY
TYPE EST.: FEASIBILITY
CLIENT: D&B ENGINEERS & ARCHITECTS

EST. NO: 21-0309
EST. BY: CD
CHKD. BY:
DATE: 05-24-22
REV. DATE:

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT	TOTAL
	STP Intrumentation (Allow 10% of Process Mechanical & Electrical Cost)	1	ALLOW	326,097.60	326,098	
	STP, Start-up & Testing	1	LS	41,600.00	41,600	
				Subtotal	11,632,723	
				General Conditions - 12%	1,395,927	
				Subtotal	13,028,650	
				Escalation - 10.87%	1,416,214	
				Subtotal	14,444,864	
				Contractor OH&P - 21%	3,033,421	
				Subtotal	17,478,285	
				Design Contingency - 30%	5,243,486	
				Subtotal	22,721,771	
				Bonds & Insurance - 3%	681,653	
				TOTAL		**$ 23,403,424**

N A S C O
C O N S T R U C T I O N S E R V I C E S I N C.

SUBJECT: **ALTERNATES**
PROJECT: NEW SEWER DISTRICT
LOCATION: SOUTHAMPTON, NY
TYPE EST.: FEASIBILITY
CLIENT: D&B ENGINEERS & ARCHITECTS

EST. NO: 21-0309
EST. BY: CD
CHKD. BY:
DATE: 05-24-22
REV. DATE:

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT	TOTAL
	ADD ALTERNATE, ASPHALT MILLING AND OVERLAY					
	Asphalt Milling & Overlay	88,667	SY	16.00	1,418,672	
				Subtotal	1,418,672	
				General Conditions - 12%	170,241	
				Subtotal	1,588,913	
				Escalation - 10.87%	172,715	
				Subtotal	1,761,627	
				Contractor OH&P - 21%	369,942	
				Subtotal	2,131,569	
				Design Contingency - 30%	639,471	
				Subtotal	2,771,040	
				Bonds & Insurance - 3%	83,131	
				TOTAL		**$ 2,854,171**

VILLAGE OF SOUTHAMPTON SEWER SYSTEM

Life Cycle Cost Analysis

Inflation rate **3.5%** for cost inflation ratio
Discount rate (i) **2%**

PW = F / (1+i)^n

Low Pressure Sewer

Year	2022	2023	2024	2025	2026	2027	2032	2037	2042	2047	2052	2057	2062
Years of Operation (n)	0	1	2	3	4	5	10	15	20	25	30	35	40
Cost Inflation Ratio	1.000	1.035	1.071	1.109	1.148	1.188	1.411	1.675	1.990	2.363	2.807	3.334	3.959
Capital Cost*	$12,204,798												
Equipment Replacement		$5,175	$5,356	$5,544	$5,738	$5,938	$7,053	$8,377	$9,949	$11,816	$14,034	$16,668	$19,796
Maintenance Cost		$9,336	$9,662	$10,001	$10,351	$10,713	$12,724	$15,112	$17,948	$21,316	$25,317	$30,069	$35,713
Electrical Cost (GPU)		$1,242	$1,285	$1,330	$1,377	$1,425	$1,693	$2,010	$2,388	$2,836	$3,368	$4,000	$4,751
Annual Total Cost (F)	$12,204,798	$15,753	$16,304	$16,875	$17,465	$18,077	$21,469	$25,499	$30,285	$35,969	$42,719	$50,737	$60,260
Annual Present Value (PW)	$12,204,798	$15,444	$15,671	$15,901	$16,135	$16,373	$17,612	$18,946	$20,381	$21,924	$23,584	$25,370	$27,291
Net Present Value	$12,204,798	$12,220,242	$12,235,913	$12,251,814	$12,267,949	$12,284,322	$12,369,868	$12,461,891	$12,560,883	$12,667,372	$12,781,923	$12,905,150	$13,037,707

*Capital cost from option 2 collection system + pump station
Operation costs associated with the pump station not included as it is the same for both options

Inflation rate **3.5%**
Interest rate **2%**

Gravity Sewer Option

Year	2021	2022	2023	2024	2025	2026	2031	2036	2041	2046	2051	2056	2061
Years of Operation	0	1	2	3	4	5	10	15	20	25	30	35	40
Cost Inflation Ratio	1.000	1.035	1.071	1.109	1.148	1.188	1.411	1.675	1.990	2.363	2.807	3.334	3.959
Capital Cost**	$13,198,068												
Equipment Replacement		$5,175	$5,356	$5,544	$5,738	$5,938	$7,053	$8,377	$9,949	$11,816	$14,034	$16,668	$19,796
Maintenance Cost		$16,460	$17,036	$17,632	$18,249	$18,888	$22,433	$26,643	$31,644	$37,583	$44,636	$53,014	$62,964
Electrical Cost (Pump Station)		$1,242	$1,285	$1,330	$1,377	$1,425	$1,693	$2,010	$2,388	$2,836	$3,368	$4,000	$4,751
Annual Total Cost	$13,198,068	$22,877	$23,677	$24,506	$25,364	$26,251	$31,178	$37,030	$43,980	$52,235	$62,039	$73,682	$87,512
Annual Present Value	$13,198,068	$22,428	$22,758	$23,093	$23,432	$23,777	$25,577	$27,514	$29,597	$31,839	$34,250	$36,843	$39,633
Net Present Value	$13,198,068	$13,220,496	$13,243,254	$13,266,346	$13,289,779	$13,313,555	$13,437,788	$13,571,428	$13,715,187	$13,869,833	$14,036,189	$14,215,142	$14,407,647

**capital cost from option 1 collection system + pump station
Operation costs associated with the pump station not included as it is the same for both options

VILLAGE OF SOUTHAMPTON SEWER SYSTEM

Life Cycle Cost Analysis

Inflation rate **3.5%** for O&M escalation
Discount rate (Interest) **2%** for discount rate

SBR Technology

Year	2022	2023	2024	2025	2026	2027	2032	2037	2042	2047	2052	2057	2062
Years of Operation	0	1	2	3	4	5	10	15	20	25	30	35	40
Cost Inflation Ratio	1.000	1.035	1.071	1.109	1.148	1.188	1.411	1.675	1.990	2.363	2.807	3.334	3.959
Capital Cost*	$21,705,661												
Equipment Replacement		$64,688	$66,952	$69,295	$71,720	$74,230	$88,162	$104,709	$124,362	$147,703	$175,425	$208,349	$247,454
Maintenance Cost		$7,452	$7,713	$7,983	$8,262	$8,551	$10,156	$12,063	$14,326	$17,015	$20,209	$24,002	$28,507
Electrical Cost (GPU)		$2,981	$3,085	$3,193	$3,305	$3,421	$4,063	$4,825	$5,731	$6,806	$8,084	$9,601	$11,403
Annual Total Cost	$21,705,661	$75,120	$77,750	$80,471	$83,287	$86,202	$102,381	$121,597	$144,419	$171,524	$203,717	$241,952	$287,363
Annual Present Value (PW)	$21,705,661	$73,647	$74,730	$75,829	$76,945	$78,076	$83,988	$90,348	$97,190	$104,549	$112,466	$120,983	$130,144
Net Present Value	$21,705,661	$21,779,308	$21,854,039	$21,929,868	$22,006,813	$22,084,889	$22,492,833	$22,931,669	$23,403,735	$23,911,547	$24,457,814	$25,045,446	$25,677,576

*Capital cost from option 1 STP
Operation associated with the treatment plant not included as they are estimated to be the same (as per manufacturer of both technologies)

Inflation rate **3.5%**
Discount rate (Interest) **2%**

MBR Technology

Year	2022	2023	2024	2025	2026	2027	2032	2037	2042	2047	2052	2057	2062
Years of Operation	0	1	2	3	4	5	10	15	20	25	30	35	40
Cost Inflation Ratio	1.000	1.035	1.071	1.109	1.148	1.188	1.411	1.675	1.990	2.363	2.807	3.334	3.959
Capital Cost**	$23,065,682												
Equipment Replacement		$85,388	$88,376	$91,469	$94,671	$97,984	$116,374	$138,216	$164,158	$194,968	$231,560	$275,021	$326,639
Maintenance Cost		$23,236	$24,049	$24,891	$25,762	$26,664	$31,668	$37,612	$44,671	$53,055	$63,013	$74,839	$88,885
Electrical Cost (Pump Station)		$2,981	$3,085	$3,193	$3,305	$3,421	$4,063	$4,825	$5,731	$6,806	$8,084	$9,601	$11,403
Annual Total Cost	$23,065,682	$111,604	$115,510	$119,553	$123,737	$128,068	$152,105	$180,653	$214,559	$254,829	$302,657	$359,461	$426,927
Annual Present Value	$23,065,682	$109,416	$111,025	$112,658	$114,314	$115,995	$124,779	$134,228	$144,392	$155,326	$167,088	$179,740	$193,351
Net Present Value	$23,065,682	$23,175,098	$23,286,123	$23,398,780	$23,513,094	$23,629,090	$24,235,161	$24,887,126	$25,588,461	$26,342,903	$27,154,476	$28,027,503	$28,966,640

**capital cost from option 2 STP
Operation associated with the treatment plant not included as they are estimated to be the same (as per manufacturer of both technologies)

APPENDIX H – SMARTH GROWTH ASSESSMENT FORM

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

Smart Growth Assessment Form

This form should be completed by an authorized representative of the applicant, preferably the project engineer or other design professional.[1]

Section 1 – General Applicant and Project Information

Applicant: Village of Southampton Project No.:

Project Name: Village of Southampton Sewer System

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

Please provide a brief project summary in plain language including the location of the area the project serves:

The project includes the sewering of approximately 250 parcels and consists of a collection system, a pump station and a wastewater treatment plant. The project is located in the Village of Southampton in Long Island

Section 2 – Screening Questions

A. Prior Approvals

1. Has the project been previously approved for Environmental Facilities Corporation (EFC) financial assistance? ☐ Yes ☑ No
2. If yes to A(1), what is the project number(s) for the prior approval(s)? Project No.:
3. If yes to A(1), is the scope of the previously-approved project substantially the same as the current project? ☐ Yes ☐ No

If your responses to A(1) and A(3) are both yes, please proceed to Section 5, Signature.

B. New or Expanded Infrastructure

1. Does the project involve the construction or reconstruction of new or expanded infrastructure? ☑ Yes ☐ No

Examples of new or expanded infrastructure include, but are not limited to:

(i) The addition of new wastewater collection/new water mains or a new wastewater treatment system/water treatment plant where none existed previously;

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

[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.

(iii) An increase of the permitted water withdrawal or the permitted flow capacity for the water treatment system such that a Department of Environmental Conservation (DEC) water withdrawal permit will need to be obtained or modified, or result in the Department of Health (DOH) approving an increase in the capacity of the water treatment plant.

If your response to B(1) is no, please proceed to Section 5, Signature.

Section 3 –Smart Growth Criteria

Your project must be consistent will all relevant Smart Growth criteria. For each question below please provide a response and explanation.

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

   Explain your response: The collection and wastewater treatment systems are new

2. Is the project located in a (1) municipal center, (2) area adjacent to a municipal center, or (3) area designated as a future municipal center, as such terms are defined herein (please select one response)?

   ☑ Yes, my project is located in a municipal center, which is an area of concentrated and mixed land uses that serves as a center for various activities, including but not limited to: central business districts, main streets, downtown areas, brownfield opportunity areas (see *www.dos.ny.gov* for more information), downtown areas of local waterfront revitalization program areas (see *www.dos.ny.gov* for more information), areas of transit-oriented development, environmental justice areas (see *www.dec.ny.gov/public/899.html* for more information), and hardship areas (projects that primarily serve census tracts or block numbering areas with a poverty rate of at least twenty percent according to the latest census data).

   ☐ Yes, my project is located in an area adjacent to a municipal center which has clearly defined borders, is designated for concentrated development in the future in a municipal or regional comprehensive plan, and exhibits strong land use, transportation, infrastructure, and economic connections to an existing municipal center.

   ☐ Yes, my project is located in an area designated as a future municipal center in a municipal or comprehensive plan and is appropriately zoned in a municipal zoning ordinance

   ☐ No, my project is not located in a (1) municipal center, (2) area adjacent to a municipal center, or (3) area designated as a future municipal center.

   Explain your response and reference any applicable plans:

   The parcels to be sewered are located in the Village's downtown area. This area is included in the Village's revitalization plan, which includes the addition of commercial and mix commercial uses.

3. Is the project located in a developed area or an area designated for concentrated infill development in a municipally-approved comprehensive land use plan, local waterfront revitalization plan, and/or brownfield opportunity area plan?

☑Yes ☐No

Explain your response and reference any applicable plans:

The project is located in the Village's downtown area. The sewer improvements are part of the Village's downtown revitalization plan.

4. Does the project protect, preserve, and enhance the State's resources, including surface and groundwater, agricultural land, forests, air quality, recreation and open space, scenic areas, and significant historic and archaeological resources?

☑Yes ☐No

Explain your response:

The addition of a sewer collection and treatment plant for this area is part of the recommended actions listed in the Harmful Algal Bloom Actiion Plan Lake Agawam, NYSDEC April 2020 that will significantly reduce nitrogen infiltration.

5. Does the project foster mixed land uses and compact development, downtown revitalization, brownfield redevelopment, the enhancement of beauty in public spaces, the diversity and affordability of housing in proximity to places of employment, recreation and commercial development, and the integration of all income and age groups?

☑Yes ☐No

Explain your response:

The revitalization plan for the area includes mixed uses with commercial on the first floor and apartments on the second and third floor with the intent of bringing much needed affordable housing to the area.

6. Does the project provide mobility through transportation choices including improved public transportation and reduced automobile dependency?

☐Yes ☐No ☑N/A

Explain your response:

At this time the project does not include any changes on transportation access.

7. Does the project involve coordination between State and local government, intermunicipal planning, or regional planning?

☑Yes ☐No

Explain your response and reference any applicable plans:

The project will require a SPDES permit for effluent discharge from the NYSDEC and approval by the Suffolk County Department of Health Services

8. Does the project involve community-based planning and collaboration?

   ☑Yes ☐No

   Explain your response and reference any applicable plans:

   The Village designated a Sewer Task Force among its residents to oversee the planning and design of the project. A public meeting was held with residents during the planning effort and coordination will continue through design.

9. Does the project support predictability in building and land use codes?

   ☐Yes ☐No ☐N/A

   Explain your response:

10. Does the project promote sustainability by adopting measures such as green infrastructure techniques, decentralized infrastructure techniques, or energy efficiency measures?

    ☑Yes ☐No

    Explain your response and reference any applicable plans:

    The proposed sewer collection system will use gravity to convey flow, pumping will only be used to convey flow to the wastewater treatment plant. Some of the measures proposed to reduce energy consumption include: using variable frequency drives for pumps and blowers, deeper biological process tanks and fine bubble diffusers to enhanced oxygen transfer and reduce blower needs.

11. Does the project mitigate future physical climate risk due to sea-level rise, storm surges, and/or flooding, based on available data predicting the likelihood of future extreme weather events, including hazard risk analysis data, if applicable?

    ☑Yes ☐No

    Explain your response and reference any applicable plans:

    The new facilities will be located outside the flood zones.

Section 4 – Miscellaneous

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

   If yes, and you have not previously provided the applicable order to EFC/DOH, please submit it with this form.

Section 5 – Signature

By signing 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: Village of Southampton	Phone Number: 6312830247
Name and Title of Signatory: Charlene Kagel-Betts Village Administrator	
Signature:	Date:

APPENDIX I – ENGINEERING REPORT CERTIFCATION

Engineering Report Certification

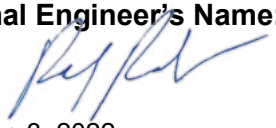
To Be Provided by the Professional Engineer Preparing the Report

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: Sewer System for the Village of South Hampton - Engineering Design Report

Date of Report: May 31, 2022

Professional Engineer's Name: Robert L. Raab, P.E., CCM, BCEE

Signature: 

Date: June 3, 2022