VILLAGE OF SAG HARBOR

Kathleen Mulcahy, Mayor
James L. Larocca, Trustee
Aidan Corish, Trustee
Beth M. Kamper, Clerk-Administrator

PO Box 660
55 Main Street
Sag Harbor, NY 11963-0015
Tel: 631-725-0222 Fax: 631-725-0316

Thomas C. Gardella, Deputy Mayor
Bob Plumb, Trustee
Denise R. Schoen, Village Attorney
Timothy E. Bullock, Treasurer

May 14, 2021

Lisa Kombrink, Esq.
Town of Southampton
Community Preservation Department
24 W. Montauk Highway
Hampton Bays, NY 11946

Re: Community Preservation Fund
Water Quality Improvement Project Plan Fund (WQIPP)

Re: CPF Proposal – Sewershed K Engineering Design

Dear Ms. Kombrink,

On behalf of the Village of Sag Harbor, I am pleased to submit the enclosed grant application for CPF Water Quality Improvement Program funds to complete detailed design and prepare construction documents for expansion of the Village sewer system.

The proposed project represents the first step toward implementing recommendations contained in the Village Sewer Master Plan, which was funded in part by a CPF award last year. The analyses conducted for the Plan identified two high-priority sewersheds that will be targeted for connection to the Village Wastewater Treatment Facility. This proposal focuses on one of the two areas, referred to as Sewershed K, which is situated entirely within the Town of Southampton boundary.

To facilitate your review of the application, I have attached a list of key talking points.

Please let us know if you have any questions or if additional information would be helpful. Trustee Aidan Corish is the primary point of contact at acorish@sagharborny.gov or 631-725-0222. I can be reached at the same number or via email at kmulcahy@sagharborny.gov.

Sincerely yours,

Kathleen Mulcahy
Mayor

SAG HARBOR VILLAGE
SEWERSHED K ENGINEERING DESIGN
OVERVIEW

WATER QUALITY CHALLENGES:

- **Wastewater from on-site septic systems is the primary source of nitrogen in Sag Harbor and Sag Harbor Cove.** In reports released in February 2020 and March 2021, Stony Brook University School of Marine and Atmospheric Sciences identified nitrogen as the nutrient promoting algal growth and, in turn, rust tides, low water clarity, and low oxygen. The 2021 report found that septic tanks and cesspools were the strongest source of N for the Harbor. Reduction of nitrogen inputs from these sources will benefit water quality in these impaired water bodies.

- **Less than 10% of the parcels within the Village are connected to the STP.** Most homes in the Village are not connected to the sewer system, which in general serves only the Village commercial district clustered around Main Street. There are a significant number of homes that cannot utilize I/A systems due to shallow groundwater conditions, including homes in Sewershed K.

- **The Village is bounded on three sides by water.** Almost all of the homes in the Village use older septic systems, many consisting only of cesspools in areas of high ground water levels, high density, and are located close to water bodies where the nitrogen travel time to surface water is less than 2 years. Various studies report that the levels of nitrogen discharge from these systems is in the range of 65 - 85 mg/L of nitrogen. The Village STP is currently permitted for nitrogen discharge of up to 10 mg/L, but on average performs at a level of under 7 mg/L and as low as 2 mg/L. These are levels much lower than those provided by the new onsite I/A systems which sometimes struggle to meet their 19 mg/L requirement. Thus, expansion of the number of homes receiving sewer service is considered to be the preferred option in terms of the greatest amount of nitrogen reduction.

SEWER MASTER PLAN FINDINGS AND RECOMMENDATIONS:

- **The Village's Wastewater Treatment Facility (WWTF) is operating with an excess capacity of approximately 92,500 gallons per day**. The main goal of the Sewer Master Plan, which is now 70% complete, is to identify the best and most efficient use of the excess STP capacity to remove parcels from onsite systems in order to maximize nitrogen removal.

- **A total of 16 potential new sewersheds** were identified based on physical boundaries, groundwater travel time, receiving waterbodies, topography, soil characteristics and other considerations. These were then scored based on a weighted system to identify impact on Village water bodies.

- **Based on estimated water quality benefits, two sewersheds have emerged as clear priorities for sewering – these are designated as Sewersheds K (located in Southampton Town) and L (located almost entirely in East Hampton Town).** Factors considered in the scoring process were: groundwater flows to receiving waterbodies, estimated amount of nitrogen in wastewater, density of nitrogen in wastewater (per acre), depth to groundwater, percent of non-vacant parcels in 0-2 year groundwater contributing area, and number of buildings within or near very poorly drained soils.

- **Sewershed K** generates effluent at a rate of approximately 12,346 gallons per day. It is the highest priority sewershed of all 16 sewersheds identified in the Village. See attached maps.

- **A Map and Plan for Sewershed K** will be completed as part of the Sewer Master Plan this year.

- **A qualified consultant has provided technical support for the proposed scope of work, timeline and budget.** Cameron Engineering was retained by the Village to prepare the Sewer Master Plan as well as the Map and Plan. The proposed project to prepare Contract Documents (plans and specifications) will position the Village to move to the construction phase as early as next year.

- **The Village is positioned to begin the project in a timely manner.** With a well-defined work scope in place, the Village aims to kick off this project upon completion of the Map & Plan this fall.

- **The goal of this project is to improve water quality, not promote or facilitate growth.** The Village as a whole is considered to be "built out" and the business district is already served by the WWTF. Village Law requires new construction and substantial reconstruction projects to use the new I/A low nitrogen systems. Thus, any areas of the Village where there could be new construction would be considered low priority areas for sewering.

- **The Sewer Master Plan Progress Report (September 2020) and Update 1 (February 22, 2021)** are provided with the application attachments.

TOWN OF SOUTHAMPTON

Department of Community Preservation
24 W Montauk Hwy, Hampton Bays, NY 11946
Ph: 631-287-5720 Fx: 631-728-1920
www.southamptontownny.gov/WQIPP

COMMUNITY PRESERVATION FUND (CPF)
WATER QUALITY IMPROVEMENT PROGRAM
CHECKLIST/APPLICATION INSTRUCTIONS

The CPF Water Quality Improvement Project Plan (WQIPP) Fund follows the objectives in the adopted Water Quality Improvement Project Plan (see http://www.southamptontownny.gov/WQIPP)

To apply for funding, an application must be COMPLETED and submitted along with detailed narratives and supporting information as described below. Parcel acquisitions will be considered on an ongoing basis, independent of this application process.

Note: Electronic application submission required and 4 - full printed sets of application, site plan and narrative. Upload application at www.southamptontownny.gov/WQIPPSUBMISSION
A Public Hearing and Town Board Resolution will be required for all projects pursuant to Chapter 140 of the Town Code.

WATER QUALITY IMPROVEMENT PROJECT MEANS:

[1] DEFINITIONS:

1. **Wastewater Treatment Improvement Project** means the planning, design, construction, acquisition, enlargement, extension, or alteration of a wastewater treatment facility, including alternative systems to a sewage treatment plant or traditional septic system, to treat, neutralize, stabilize, eliminate or partially eliminate sewage or reduce pollutants in treatment facility effluent, including permanent or pilot demonstration wastewater treatment projects, or equipment or furnishings thereof. Stormwater collecting systems shall also be included within the definition of a wastewater improvement project.

2. **Nonpoint Source Abatement and Control Program Projects** developed pursuant to section eleven-b of the soil and water conservation districts law, title 14 of article 17 of the environmental conservation law, section 1455b of the federal coastal zone management act, or article forty-two of the executive law;

3. **Aquatic Habitat Restoration Project** means the planning, design, construction, management, maintenance, reconstruction, revitalization, or rejuvenation activities intended to improve waters of the state of ecological significance or any part thereof, including, but not limited to ponds, bogs, wetlands, bays, sounds, streams, rivers, or lakes and shorelines thereof, to support a spawning, nursery, wintering, migratory, nesting, breeding, feeding, or foraging environment for fish and wildlife and other biota.

4. **Pollution Prevention Project** means the planning, design, construction, improvement, maintenance or acquisition of facilities, production processes, equipment or buildings owned or operated by municipalities for the reduction, avoidance, or elimination of the use of toxic or hazardous substances or the generation of such substances or pollutants so as to reduce risks to public health or the environment, including changes in production processes or raw materials; such projects shall not include incineration, transfer from one medium of release or discharge to another medium, off-site or out-of-production recycling, end-of-pipe treatment or pollution control.

5. **The Operation of the Peconic Bay National Estuary Program,** as designated by the United States Environmental Protection Agency. Such projects shall have as their purpose the improvement of existing water quality to meet existing specific water quality standards. Projects which have as a purpose to permit or accommodate new growth shall not be included within this definition

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COMMUNITY PRESERVATION FUND (CPF)
WATER QUALITY IMPROVEMENT PROGRAM
PROPOSAL SUMMARY

Project Applicant: Village of Sag Harbor
Project Title: Sewershed K Engineering Design
Project Manager Name: Aidan Corish, Trustee

Name	Aidan Corish
Title	Village Trustee
Organization	Village of Sag Harbor
Address	55 Main Street, Sag Harbor, NY 11963
Phone	631-725-0222
Email	acorish@sagharborny.gov

Property owner (if different from Project manager organization):

Name	same
Affiliation	
Organization	
Address	
Phone	
Email	

Project Address: Sag Harbor Sewerage system SCTM #(S) N/A Sewerage system encompasses municipal boundary

Type of Project (Check all that apply):

☑ Reduction ☐ Remediation ☐ Restoration

Project Summary: (Provide a brief narrative description of proposed WQIPP project)

As a step towards mitigating existing water quality issues in area surface waters, the Village of Sag Harbor plans to construct a sewer system expansion to collect and convey approximately 12,346 gallons per day (GPD) of sanitary wastewater generated within Sewershed K to the existing Village of Sag Harbor Wastewater Treatment Facility (WWTF). This sewershed is comprised of approximately 44 parcels that currently utilize onsite wastewater treatment systems (OWTS) in an area identified as the highest priority for sewering in the Village Sewer Master Plan Progress Report (September 2020) and Update 1 (February 22, 2021). Treated effluent discharged from the WWTF has nitrogen concentrations that are better than any approved onsite septic system. Therefore, the Village's WWTF will prevent nitrogen-rich onsite wastewater point sources from continuing to discharge to the ground, thereby contributing to the improvement of water quality in the Peconic Estuary.

CPF funds will support the cost of retaining a qualified engineering firm to complete an engineering report, secure regulatory approvals, and prepare contract documents (plans and specifications) suitable for bidding. The project will advance the Village to a state of readiness for construction.

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If additional information is needed to describe the project; a project narrative can accompany the application. Please limit the narrative to approximately 3 pages of project description, provide a summary of water quality benefits/objectives of approximately 2 pages and provide a cost estimate of approximately 2 to 4 pages with supporting estimates. Any additional materials should be focused specifically on the proposed project with references to other studies that are pertinent

1. PROJECT TYPE (check all that apply)

Must meet at least one of the definitions of "Water Quality Improvement Project" per State Law Chapter 551 cited above. Check all that apply.

- [x] Wastewater Treatment Improvement Project
- [ ] Non-point source abatement and control
- [ ] Aquatic habitat restoration
- [ ] Pollution prevention
- [ ] Operation of Peconic Bay National Estuary Program (Grant Match)

Note: Monitoring costs are only potentially eligible for CPF funding within Aquatic habitat restoration projects.

2. PRIORITY AREA(S) (check all that apply)

Priority areas are defined in the Water Quality Improvement Project Plan (WQIPP).

- [x] 303(d) Impaired
- [x] High
- [ ] Medium
- [ ] Outside High and Medium priority areas*

*If Outside High and Medium priority areas, explain how the project is relevant to WQIPP goals.

The portion of the Sag Harbor Sewerage System that lies to the west of Division Street is within the Town of Southampton. Affected waterbodies include: Sag Harbor Bay, Sag Harbor Cove, Upper Sag Harbor Cove, Morris Cove, Ligonee Creek, and Paynes Creek.

3. PROJECT DESCRIPTION

3a. Existing conditions of applicable groundwater/sub-watershed/waterbody and most recent and relevant data available (provide sources).

See Attachment 1.

3b. How the proposed solution addresses the issue in the context of Reduction, Remediation and/or Restoration as per the CPF Water Quality Project Plan. Note all remediation and restoration projects must assure that reduction measures are also addressed.

See Attachment 1.

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3c. Describe the proposed technology and its demonstrated efficacy in similar settings. May include published data.

See Attachment 1.

3d. How the project supports Town of Southampton, Suffolk County, NYSDEC, Long Island Nitrogen Action Plan (LINAP) or other adopted goals/policies (provide references with pages numbers).

See Attachment 1.

3e. Review the following statements and indicate whether they are applicable to your project. For all "Yes" responses, please indicate how your project addresses the requirements indicated.

YES	N/A	
☐	☑	**If stormwater system or drainage is proposed:** The project must indicate compliance with the New York State Stormwater Design Manual (2015 and as updated).
☐	☑	**If project is related to farmland:** Describe any Agricultural Stewardship Plan or other long term strategy for Nitrogen abatement.
☐	☑	**If the project is for habitat restoration:** The narrative must address how underlying causes are being ameliorated and expected outcomes for local species populations or other ecological considerations are given.
☑	☐	**If project is a Sewage Treatment Plant (STP) or cluster treatment system:** Fund allocation request is based on cost for reduction of pre-existing conditions and not for purpose of accommodating new density (describe pre-existing density and associated flow (gallons per day) and total projected nitrogen reduction in narrative). Include detailed information on how many homes the system would treat as well as potential for formation of Sewer District, if required by Suffolk County Health Department or Town Law.
☐	☑	**If the project is requesting grant match:** Include information related to funding program source and purpose of application and any relevant items on this checklist. Note: A Town Board resolution will be required in order to encumber matching funds for grant applications.

4. WATER QUALITY BENEFIT

4a. Identify Nitrogen, Pathogen or Pollutant of Concern (POC) including Existing Condition and Target Reduction.

See Attachment 1.

4b. Describe plans for collecting and reporting on water quality over time.

See Attachment 1.

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4c. Indicate useful life of proposed technology (must meet or exceed five years).

See Attachment 1.

5. COST FACTORS

5a. Explain how you have confirmed that the proposed budget is reasonable, appropriate and necessary. If available, provide third party estimates or other documentation of how costs were determined.

See Attachment 1.

5b. Describe any matching funds to be provided.

See Attachment 1.

5c. Explain: i. Why project cannot proceed and intended benefits cannot be achieved without external funding.
ii. if funds are awarded at a lower level than requested, or if there are cost overruns, explain how the project will proceed.

See Attachment 1.

6. MANAGEMENT, EXPERIENCE, ABILITY

6a. Describe applicant's experience in completing similar projects.

See Attachment 1.

6b. Describe community support or opposition to project. If there is opposition, explain how this is to be addressed.

See Attachment 1.

6c. Describe any permits needed and time frame/status of approvals. If permits are approved, indicate same.

See Attachment 1.

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7. MAINTENANCE, MONITORING, EVALUATION

Estimate ongoing maintenance costs and explain how these will be supported. Explain stewardship and monitoring activities planned for ensuring sustainability of the project.

See Attachment 1.

8. DURATION OF PROJECT

8a. Provide a projected project timeline.

See Attachment 1.

8b. If project is multi-year or phased, provide a breakdown of budget and milestones for each year and phase.

See Attachment 1.

9. ATTESTATION

Allocation of CPF funds will not be for the purpose of accommodating new growth, as this is prohibited by State law.

☑ Check box to certify that funds will not be directed for projects for the purpose of accommodating new growth.

Signature: [signature] Date 5/04/21

10. REQUIRED ATTACHMENTS Confirm that the following required documents are attached to this application:

- ☑ Photos of existing conditions
- ☑ Location Map
- ☑ State Environmental Quality Review Act (SEQRA) Long or Short Environmental Assessment Form (EAF) https://www.dec.ny.gov/permits/6191.html
- ☑ Completed EPA Spreadsheet Tool for Evaluating Pollutant Load (STEPL) https://www.epa.gov/nps/spreadsheet-tool-estimating-pollutant-loads-stepl or similar standardized methodology (describe)
- ☑ Project budget (see attached template)
- ☑ Ownership commitment is provided via letter of intent (LOI) for non-municipal owners or municipal resolution for municipal owners

11. OTHER ATTACHMENTS

List other attachments provided, including cost estimates, bids, plans, documentation of matching funds, and other as appropriate to demonstrate project readiness, quality, feasibility, and cost effectiveness

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BUDGET PROPOSAL

PLANNING/ENGINEERING/DESIGN	Town CPF Request	Matching Funds Committed	Matching Funds Pending	Estimated Total Project Costs
Task 1- Force Main in ROW	$- 235,000.00	$-	$-	$- 235,000.00
Task 2- Design Site Plan for Property Hookup	$- 242,000.00	$-	$-	$- 242,000.00
Task 3- [see narrative, p. 18-19 for detailed breakdown]	$-	$-	$-	$- 0.00
Task 4-	$-	$-	$-	$- 0.00
Task 5-	$-	$-	$-	$- 0.00
Task 6-	$-	$-	$-	$- 0.00
	$-	$-	$-	$- 0.00
Planning/Engineering/Design Cost Total	$- 477,000.00	$- 0.00	$- 0.00	$- 477,000.00

Contractual Services				
	$-	$-	$-	$- 0.00
	$-	$-	$-	$- 0.00
	$-	$-	$-	$- 0.00
	$-	$-	$-	$- 0.00
	$-	$-	$-	$- 0.00
	$-	$-	$-	$- 0.00
	$-	$-	$-	$- 0.00
Contractual Services Cost Total	$- 0.00	$- 0.00	$- 0.00	$- 0.00

Construction & Site Improvements				
	$-	$-	$-	$- 0.00
	$-	$-	$-	$- 0.00
	$-	$-	$-	$- 0.00
	$-	$-	$-	$- 0.00
	$-	$-	$-	$- 0.00
	$-	$-	$-	$- 0.00
	$-	$-	$-	$- 0.00
Construction & Site Improvements Cost Total	$- 0.00	$- 0.00	$- 0.00	$- 0.00

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Equipment/Materials/Supplies	Town CPF Request	Matching Funds Committed	Matching Funds Pending	Estimated Total Project Costs
	$-	$-	$-	$-0.00
	$-	$-	$-	$-0.00
	$-	$-	$-	$-0.00
	$-	$-	$-	$-0.00
	$-	$-	$-	$-0.00
	$-	$-	$-	$-0.00
	$-	$-	$-	$-0.00
				$ 0.00
				$ 0.00
				$ 0.00
				$ 0.00
				$ 0.00
				$ 0.00
				$ 0.00
				$ 0.00
Equipment/Materials/Supplies Total	$-0.00	$0.00	$-0.00	$-0.00

Additional Cost				
	$-	$-	$-	$-0.00
	$-	$-	$-	$-0.00
	$-	$-	$-	$-0.00
	$-	$-	$-	$-0.00
	$-	$-	$-	$-0.00
	$-	$-	$-	$-0.00
	$-	$-	$-	$-0.00
Additional Cost Total	$-0.00	$-0.00	$-0.00	$-0.00

Planning/Engineering/Design Cost Total (from page 7)	$- 477,000.00	$- 0.00	$- 0.00	$- 477,000.00

Total Project Cost	$-477,000.00
Applicant matching funds committed	$-0.00
Applicant matching funds pending approval (e.g. grant request submitted pending determination)	$-0.00
Total CPF Funds Requested	$-477,000.00

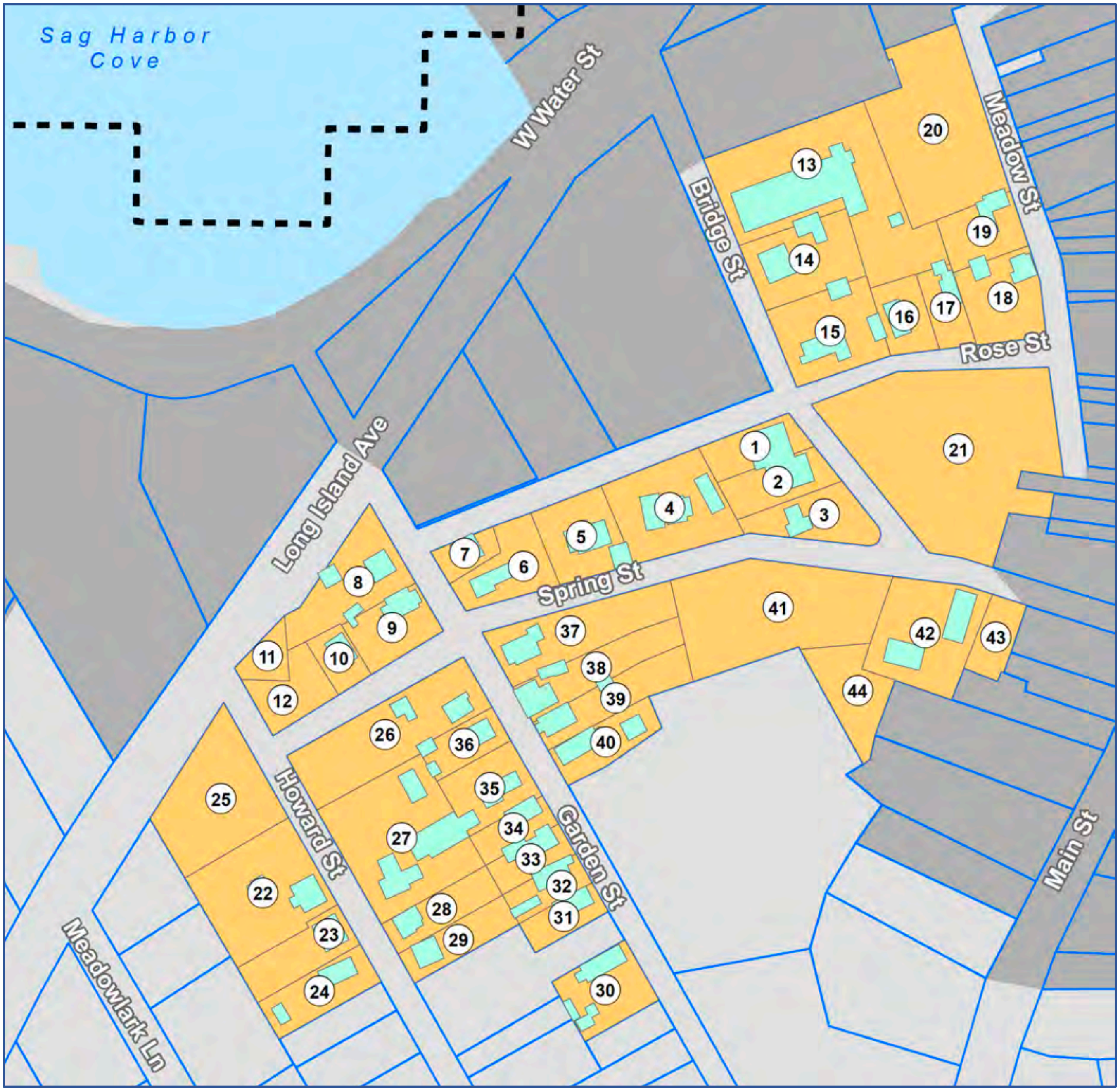
Please see application narrative for description of matching funds.

Source of matching funds	Amount

TOWN OF SOUTHAMPTON COMMUNITY PRESERVATION FUND
VILLAGE OF SAG HARBOR

SEWERSHED K – ENGINEERING DESIGN

ATTACHMENTS



Detail, Sag Harbor Sewershed Boundary K parcel map, Cameron Engineering, 2021

INDEX

Sewershed K Engineering Design
Attachment 1 – Supplemental Narratives

PROPOSAL SUMMARY

As a step towards mitigating existing water quality issues in area surface waters, the Village of Sag Harbor plans to construct a sewer system expansion to collect and convey approximately 12,346 gallons per day (GPD) of sanitary wastewater generated within "Sewershed K" in the Sag Harbor Sewer Master Plan to the existing Village of Sag Harbor Wastewater Treatment Facility (WWTF). This sewershed is comprised of approximately 44 parcels that currently utilize onsite wastewater treatment systems (OWTS) in an area identified as high priority for sewering in the Village Sewer Master Plan Progress Report (September 2020) and Update 1 (February 22, 2021). Treated effluent discharged from the WWTF has nitrogen concentrations consistently shown via lab testing to be better than any approved onsite septic system. Therefore, the Village's WWTF will prevent nitrogen-rich onsite wastewater point sources from continuing to discharge to the ground, thereby contributing to the improvement of water quality in the Peconic Estuary.

CPF funds will support the cost of retaining a qualified engineering firm to complete an engineering report, secure regulatory approvals, provide design services, and prepare contract documents (plans and specifications) suitable for bidding. It is estimated that the proposed work will advance the Village to a state of readiness for construction as early as mid-2022.

A prioritized ranking of 16 sewersheds in the Village, which primarily reflects the environmental impact of a particular sewershed on the overall quality of the Village's coastal waters, has determined that Sewershed K is the highest priority area for sewering in the entire Village. The ranking model is provided with Update 1 to the Sewer Master Plan and is provided in the application attachments.

The design flow will support existing development and is not intended to accommodate new growth.

ITEM 3. PROJECT DESCRIPTION

3a. EXISTING CONDITIONS

Water quality

In February 2020, Dr. Christopher Gobler of the Stony Brook University School of Marine and Atmospheric Sciences (SOMAS) released the findings of a comprehensive, two-year study of Sag Harbor's coastal waters in a report titled, *Assessment of Water Quality in Marine Waters Surrounding Sag Harbor Village, 2018-2019.*[1] The study's objectives were:

1. To assess water quality across Sag Harbor and Sag Harbor Cove,
2. To identify causes of water quality impairment, and
3. To identify managerial actions that could be taken to improve water quality.

Assessment of water quality occurred over annual cycles in 2018 and 2019, during which a series of parameters central to the functioning of Sag Harbor were carefully monitored. Following the completion of analytic processes, Dr. Gobler identified significant concerns around nitrogen loading by onsite septic systems and the related impacts on surface water quality.

The findings are summarized as follows:

- **Multiple water quality impairments were observed; Nitrogen, low oxygen, reduced water clarity, algal blooms, rust tides, and pathogenic bacteria were all detected at levels exceeding state and federal guidance values.**
  - Hypoxia (dissolved oxygen < 3 mg L-1) and anoxia (<0.5 mg L-1) were observed both years in Upper Sag Harbor Cove, and, to a lesser extent, within Sag Harbor Cove and the inner harbor.
  - Water clarity at most stations was < 2 meters during summer and sometimes < 1 meter within Upper Sag Harbor Cove.
  - Levels of algae (chlorophyll *a*) were always above the EPA ideal value of 5 µg L-1 and at times exceeded the maximal guidance value of 20 µg L-1 in Upper Sag Harbor Cove and Otter Pond. While levels of harmful algal blooms caused by *Alexandrium* and *Dinophysis* never rose to a level of concern either year, high levels of the ichthyotoxic rust tide algae, *Cochlodinium*, were detected both years in Upper Sag Harbor Cove and in the inner harbor in 2019.
  - The Peconic Estuary has a target total N level of 0.4 mg L-1 and this level was occasionally exceeded in Otter Pond, the inner harbor, and at Haven's Beach.
  - Experiments performed during both summers demonstrated that nitrogen was clearly the element limiting the growth of algae in Sag Harbor Cove and Upper Sag Harbor Cove.
  - Levels of fecal coliform bacteria exceeded guidance values for shellfishing on occasion in Otter Pond, the Inner Harbor, and at Haven's Beach, with the latter location being open to shellfishing. Human waste was the primary source of fecal bacteria to the Inner

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[1]Available at: https://www.sagharborpartnership.org/uploads/1/0/4/2/104256339/sag_harbor_2019_draft_final_report.pdf

Harbor, but further study is needed to affirm the source of fecal contamination in the inner harbor (e.g. vessel discharges or onsite septic systems).

- The report indicates that the Village's Wastewater Treatment Facility is functioning at a high level of efficiency and in particular the ultraviolet disinfection system. In Dr. Gobler's opinion the facility's effluent is not the source of the active fecal contamination identified in his water quality sampling program.

- **Nitrogen was the nutrient promoting algal growth and, in turn, rust tides, low water clarity, and low oxygen.**
  - Given the ability of N to increase phytoplankton biomass, the exceedance of guidance values for total N, algae, and water clarity, and the occurrences of harmful rust tides that are promoted by excessive N, reductions in N loading across the region are warranted.

- **Wastewater from on-site septic systems was the primary source of nitrogen in Sag Harbor and Sag Harbor Cove (See Figure 1).**
  - Nitrogen loading analyses indicated that septic tanks and cesspools were the strongest source of N for both the Cove, the Inner Harbor and the Harbor, representing 70% and 90% of the total load.

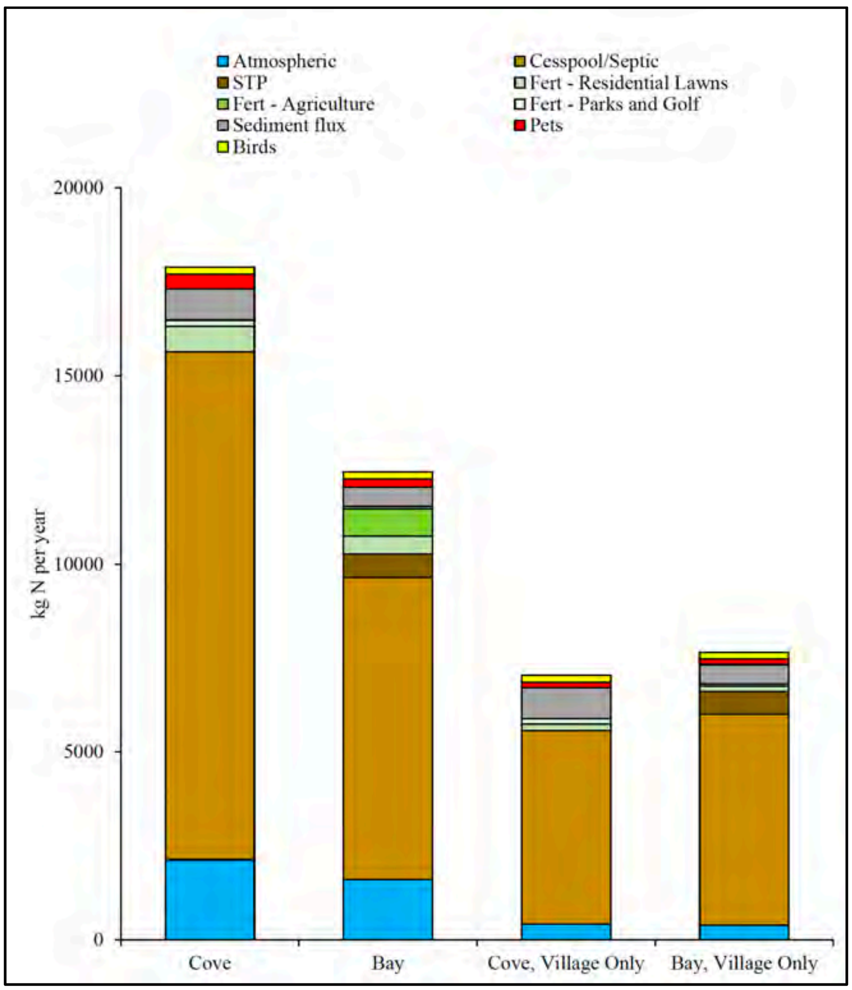

Figure 1. Estimated nitrogen loads (kg N per year) to Sag Harbor, NY during 2019. Source: Gobler, 2020

- **Upgrading septic systems and/or connecting homes to the sewage treatment plant will reduce the incidence of rust tide, algal blooms, and hypoxia while improving water clarity.**
    - The report noted that nitrogen discharge from the Village's existing wastewater treatment facility (<5 Mg/L) is better than any approved onsite septic system, including the newer I&A treatment systems.

A photograph of existing conditions is shown in **Figure 2**.

In March 2021, Dr. Gobler issued an updated report entitled, "Refined Assessment of Water Quality in Marine Waters Surrounding Sag Harbor Village, 2020." The report is provided with the application attachments. The findings further reinforce the importance of reducing N loading in our downtown:

> "Given the connection between excessive N and water quality impairments, reductions in N loading across Sag Harbor are warranted. Nitrogen loading analyses indicated that septic tanks and cesspools were the strongest source of N for the Harbor, representing 90% of the total load. Given this, upgrading these systems and/or connecting homes to the sewage treatment plant would be the effective mitigation approaches." (Page 15)

The Village of Sag Harbor *Water Quality Improvement Project Plan* (WQIPP) was completed for the Village by the firm Nelson, Pope & Voorhis (NPV) in August 2016.[2] The report indicates that:

- Stormwater and other pollutants associated with onsite septic systems have increased as the Village and neighboring areas have developed and matured (see attached map titled Priority Waterbodies List).
- The NYSDEC has imposed MS4 pathogens TMDL load reductions, which calls for a 50% reduction in pathogens from municipal storm sewer system discharges to Sag Harbor (MS4 Pathogens TMDL Retrofit Area).[3]
- Due to historic settlement patterns, many Village lots do not conform with current lot size and overall density requirements recognized today as being necessary for groundwater and surface water protection. With many small developed lots in proximity to TMDL waterbodies and in high groundwater areas (see attached Depth to Water Table map), it is likely that on-site sanitary treatment systems are contributing to local water quality impairments (See attached Lot Size Map).
- The Village of Sag Harbor's lowest topographic elevations occur along its extensive shorelines and northeastern boundary, where shallow depth to groundwater is also evident. Greater than 50% of the Village lies within the 0-2 year groundwater contributing area to local surface waterbodies.
- The Village is prone to flooding during severe rain events and it sustained extensive long-term damage as the result of Superstorm Sandy in 2012 (See FEMA Map and SLOSH maps). The WWTF is located within a flood zone.

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[2] Available at: http://sagharborny.gov/DocumentCenter/View/136/2016-Water-Quality-Improvement-Plan-PDF?bidId=

[3] Retrofit Program Plan Guidance Document For Pathogen Impaired Watershed MS4s on Long Island (2013). NYSDEC. Available at: https://www.dec.ny.gov/docs/water_pdf/rppgdpiwms4li.pdf

Fig. 2. Sag Harbor (foreground) and Sag Harbor Cove (top). Source: SOMAS

The WQIPP presented a variety of conceptual water quality improvement projects designed to address NYSDEC MS4 TMDL regulatory requirements and to reduce, remediate and restore the health of shared Town and Village water resources in the Sag Harbor watershed. Two recommendations were presented for wastewater treatment with the intention that the concepts will be refined as ongoing evaluation of the means to achieve optimal water quality improvement progresses. These concepts are:

- **On-site Sanitary Wastewater Treatment Upgrades**: provide support to property owners in priority areas of the Village for septic system and cesspool upgrades and potential Innovative & Alternative system installations.
    - Highest priority areas for sewering include developed, unsewered parcels within Groundwater Management Zone IV (See attached High Priority Parcels map).
- **Potential Expansion of Sag Harbor Wastewater Treatment Sewer Service Areas**: conduct feasibility study to determine to advisability of extending the area served by the Village wastewater treatment facility, which is operating below capacity.
    - The Sewer Master Plan was initiated in 2020 and addresses the feasibility study recommendation and provides the basis for the proposed project.
    - The Sewer Master Plan is now 70% completed. To date, it has identified the most critical sewersheds within the Village that should be considered for connection to the Village's existing sewer service area collection system. A Map and Plan for Sewershed K is being developed as part of the Master Plan.

Sag Harbor Village Wastewater Treatment Facility

The Village has a somewhat unique designation of properties that is different from other municipalities for its sewerage system. All properties inside the Village of Sag Harbor municipal boundary are within its sewer district, which encompasses the entire Village. The district is defined in Village code as its "sewerage system."[4] Only those properties that are within the sewer "service area," have the ability and are required to connect to the Wastewater Treatment Facility (WWTF). See **Figure 3**. Presently, less than 10% of the parcels within the Village are connected. The remaining parcels in the sewer district are considered to be in the "non-service areas," which are serviced by private on-site wastewater treatment systems.

The Village of Sag Harbor's WWTF has a design capacity of 0.25 million gallons per day (MGD). While the peak monthly average is well below this volume, the WWTP can see a daily peak flow approaching 150,000 gpd in the busy summer months of June through September. Accounting for a 10,000 gallon buffer, this leaves approximately 100,000 gpd of excess capacity.

Lab tests performed by Long Island Analytical Laboratories, Inc. indicate that the WWTF performs at a high level of efficiency. Tests performed in February 2020 determined that the nitrogen measurement was 1.96 Mg/L. Further, the fecal coliform count was less than 1.0 MPN/100 ml (1.0 the smallest measurement).[5] The most recent filing of the March 2021 Discharge Monitoring Report (DMR) to the New York State Department of Environmental Conservation (DEC) shows the last 12 month (March 2020-March 2021) rolling average for Total Nitrogen at 2 pounds per month total discharge loading at a 7mg/l average concentration. By contrast, the WWTF permitted effluent is 10 Mg/L, our local groundwater is 4-4.5 Mg/L, and I/A systems are permitted at 19.00 Mg/L.

Other studies

Additional studies documenting surface water quality, planning, sewer capacity and sewer options provide data that will inform and support future water quality efforts in the Village. These are:

- Local Waterfront Revitalization Program. Adopted 1986 and amended 2006. Currently undergoing update with draft anticipated to be submitted to NYS Department of State in the fall of 2020.
- "Planning Strategies for the Village of Sag Harbor", Interscience Research Associates Environmental Planning & Development Consulting, 2008.
- "Sewer Capacity Study, Sag Harbor," Cameron Engineering, May 2014. This was part of a larger Suffolk County study for extension of existing sewer districts within the County.
- "Engineering Report, Village of Sag Harbor Wastewater Treatment Plant, Plant Capacity for Future Expansion of Sewer District", Dietrich Engineering, P.C., June 2018.
- "Triennial Review of Coliform Data, Shelter Island Sound-South, Shellfish Land Number 18S, Towns of Southampton, East Hampton and Shelter Island, 2013-2017", NYSDEC, Shellfish Growing Classification Unit, June 2018.
- "Suffolk County Subwatersheds Wastewater Management Plan", Camp, Dresser & McKee, February 2020.

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[4] Village Code §220-1.2 defines the wastewater collection and treatment system as a "sewerage system."
[5] Long Island Analytical Laboratories, Inc. February 25, 2020. Available upon request.

- Other documents and reports of the DEC and Peconic Estuary Program (PEP) pertaining to water quality testing and classification of impaired water bodies.

    - Sag Harbor and Sag Harbor Cove is listed as an Impaired waterbody in the NYSDEC Priority Waterbody List.[6] The waterbody is impaired for shellfishing, and stressed for public bathing and recreation. Known pollutants are pathogens, algal/plant growth, and nutrients (nitrogen). The PWL listing was last revised 1/4/2016, and lists urban/storm runoff as a known source of pollutants, and onsite septic systems as a suspected source. Dr. Gobler's 2020 report, issued in March 2021, has since confirmed the role of onsite systems as the major contributors of nitrogen to surface waters.
    - Sag Harbor and Sag Harbor Cove was among the waterbodies covered by the Peconic Estuary Pathogen TMDL to address shellfishing impairments that was established in 2007.
    - Sag Harbor and Sag Harbor Cove is included within the PEP study area. The PEP 2020 Comprehensive Conservation and Management Plan[7] identifies high levels of nutrients, particularly nitrogen from non-point sources such as residential septic systems, as a contributing factor to observed water quality problems in the estuary.
    - Dr. Gobler's most recent report entitled "Refined Assessment of Water Quality in Marine Waters Surrounding Sag Harbor Village", March 2021 made significant statements regarding Nitrogen loading:
        - The Suffolk County Watershed Management Plan recommends a 62-81% reduction of nitrogen loading to the marine waters of the Village.
        - Recommends connecting unsewered parcels to be connected to the Village's wastewater treatment facility.
        - Effluent from onsite wastewater treatment systems is responsible for more than 70% of the nitrogen loading to marine waters.

[6] Available at https://www.dec.ny.gov/docs/water_pdf/wiatllissisgb.pdf
[7] Available at https://www.peconicestuary.org/ccmp2020/

Sag Harbor Sewer Service Area Detail

Figure 3. Sag Harbor Sewer Service Area and Village Boundary

Existing wastewater treatment facility

The Village of Sag Harbor with a population of approximately 2,274 (2016 census), operates and maintains a sewerage system comprised of sewage collection piping, manholes, and a tertiary wastewater treatment facility (WWTF). The boundaries of the sewerage system encompass the entire legal boundaries of the Village (2.32 square miles). The sewerage system includes all of the properties within the Village whether they are served by sewers or have private On-Site Wastewater Treatment System (OWTS). Presently only a portion (downtown commercial area) of the Village is sewered. There are a total of seven (7) Sewer Service Areas (SSAs) where sewage collection and treatment infrastructure is located. The SSAs are located predominantly in the downtown commercial and business area with limited residential parcels. A map of the Sewerage System (Village boundaries) and Sewer Service Areas is provided in the application attachments.

The Village's WWTF is operated under the provisions and effluent limitations of a New York State Department of Environmental Conservation (NYSDEC) State Pollution Discharge Elimination System (SPDES) permit (NY0028908). The WWTF discharges through an outfall located at the bulkhead of the WWTF site. The WWTF has a design capacity of 250,000 gallons per day (GPD). While the peak monthly average is well below this volume, the WWTF can see a daily peak flow approaching 150,000 gpd in the busy summer months of June through September. This leaves approximately 90,000-100,000 gpd of excess capacity. The plant utilizes a sequential batch reactor, which processes the influent using an ultra-violet light system to kill the bacteria prior to outflow. **Figure 4** depicts the collection system. **Figure 5** provides an aerial view of the plant.

Figure 4. Existing Sag Harbor Sewer Service Area Collection System

Figure 5. Sag Harbor Wastewater Treatment Plant

In July 2020, the Village initiated development of a Sewer Master Plan to provide the data, information, rationale, cost and recommendations of where and how to best to either expand the existing sewer Service Areas or create a new Sewer Service Area(s). As noted in this narrative and in the application attachments, the Master Plan Progress Report and Update 1 recommended Sewershed K as the highest priority for sewering in the Village. These are provided with the application attachments.

2020 Sewer Master Plan

The Village, with support of its engineering consultant Cameron Engineering, initiated development of the Sewer Master Plan in July 2020 and it is currently at 70% completion. The goal of the plan is to provide guidance to the Village on the management of wastewater generated by residents and its downtown commercial district. To support this work, the Village received a grant of $72,400 from the Town of East Hampton CPF, representing 50% of the plan's total cost. A grant award from the Town of Southampton CPF, also for $72,400, has been approved and will support completion of the Master Plan Final Report this year.

When the Master Plan initiative kicked off in July 2020, the Southampton CPF award had not yet been approved. Due to funding constraints, it was necessary to complete the plan over two phases. The Village started by identifying elements of the plan that were most important and would provide a basis for the Village to make important decisions on wastewater management. The focus items were as follows:

- Determine Available Capacity of the existing Sewage Treatment Plant
- Potential Buildout within existing Sewer Service Areas
- Identify Potential Sewershed Boundaries

- Develop a Matrix for Ranking of Potential Sewersheds
- Identify Cost of Nitrogen Reduction

This first phase of work culminated in completion of the Sewer Master Plan Progress Report (September 2020) and Update 1 (February 22, 2021), which are attached to this application. Key takeaways from these deliverables are as follows:

- Available capacity at the WWTF is estimated at 92,500 GPD (Progress Report, p. 3-1).
- A total of 16 potential new sewersheds were identified based on physical boundaries, groundwater travel time, receiving waterbodies, topography, soil characteristics and other considerations (Progress Report, p. 4-2 identifies 14; Update 1 refines the boundaries and adds two additional sewersheds).
- The sewersheds were prioritized based on a weighted scoring system to identify impact on Village water bodies. Factors include groundwater flows to receiving waterbodies, amount of residential nitrogen, density of residential nitrogen, depth to groundwater, percent of non-vacant parcels, and number of buildings within or near very poorly drained soils. Sewersheds with a higher score indicate a higher priority for upgrade.
- Two sewersheds have been identified as highest priority for sewering, taking into account proximity to existing sewer infrastructure, nitrogen reduction benefits, available WWTF capacity, cost, and related factors.
    - <u>Sewershed L</u> - estimated 9,800 GPD. Highest ranked sewershed within the East Hampton Town boundary; a small portion of the sewershed extends west of Division Street due to the historical development of the sewerage area that excluded residential parcels (Update 1 and Sewershed L Collection System Proposed Boundary Map).
    - <u>Sewershed K</u> – estimated 12,346 GPD, located entirely within the Town of Southampton (Update 1)

The second phase of work, funded by a 2020 Southampton CPF award, is now underway and will encompass the Master Plan Final Report inclusive of a Map and Plan for sewersheds L and K. Please see the attached scope of work which is part of the contract for the 2020 Southampton CPF award.

3b. How the project addresses the issue in the context of reduction as per the CPF WQIPP

<u>Environmental significance</u>

The 2020 and 2021 Gobler studies concluded that wastewater from on-site septic systems is the primary source of nitrogen in Sag Harbor and Sag Harbor Cove. The report also determined that upgrading septic systems and/or connecting homes to the WWTF will reduce nitrogen inputs to these waterbodies, thereby improving water quality (specifically, reducing the incidence of rust tide, algal blooms, and hypoxia while improving water clarity).

The proposed project represents a first step forward toward implementing recommendations of the Sewer Master Plan, and will build upon Dr. Gobler's recommendations as well as those contained in the 2016 Water Quality Improvement Project Plan. The proposed engineering report and plans and specifications will position the Village to proceed with securing financing and proceed to bidding. When sewering is complete, an estimated 44 parcels will be connected to the WWTF and pollutant load reductions will be realized. Nitrogen loading to area surface waters will be reduced by an estimated 1,541 lbs. annually. This loading is based on current land uses.

Planning efforts to date

As of February 22, 2021, the Village has completed portions of the Sewer Master Plan that are necessary to provide the rationale for proceeding with detailed engineering design for Sewershed K. Please see the following reports and maps which are provided with the application attachments:

- Sewer Master Plan Progress Report, September 2020
- Sewer Master Plan Update 1, February 22, 2021
- Sewershed K Collection System Proposed Boundary Map
- Sewershed K Groundwater Contributing Areas Map
- Sewershed K Topographic Map
- Sewershed K Parcel Map

A Map and Plan for Sewershed K will be completed in accordance with the timeline shown in item 7a. The specific sub-tasks for the Map and Plan are as follows:

a) Identify specific boundaries and parcels to receive sewers,
b) Prepare GIS maps and exhibits showing boundaries of sewer extension areas,
c) Identify specific methods of sewering,
d) Prepare cost estimates for new sewers, including engineering design costs for Plans and Specifications,
e) Identify Village share of costs and parcel owner's share of costs,
f) Assist Village in conducting public information sessions,
g) Confer/assist with Village Attorney on extension of Sewer Service Areas
h) Complete a Long Form Environmental Assessment Form
i) Communicate with New York State Department of Environmental Conservation and Suffolk County Department of Health Services

The proposed scope of work for engineering design will commence upon completion of the Map and Plan.

Proposed solution

The Village will retain a qualified consultant to prepare an engineering report, support legal regulatory approvals, and prepare plans and specifications required for construction bidding. Tasks are as follows:

Engineering Report: Prepared in accordance with Ten State Standards, provides basis of design of the new sewers, identifies projected flow from the sewershed, locates the sewers, size of the sewers, slope of the sewers, type of piping, connections, service connection locations, construction techniques and cost estimate. Submitted to regulatory agencies for review.

Design Drawings (Public ROW): Detailed drawings prepared by engineers and designers showing the alignment, depth and location of new sewer piping both in Plan view and Profile view in accordance with Ten State Standards requirements for piping depth, size and slope. Field work will be conducted to determine location of house service connections. Information provided by utility markout and surveyor will allow design engineer to show utility crossings and potential utility conflicts requiring relocations. Road restoration design to be included.

Design Drawings (Parcels): LPS systems necessitate some homeowner investment in site plan preparation and installation of equipment on the homeowner's property. In order to lower potential barriers to homeowners connecting to the system, the Village is considering taking a lead role in site plan development for each property. Should funding be made available for design of individual parcel LPS systems (locating, piping to and from unit, existing utilities and electrical routing and requirements) the design drawings will include an individual site plan for each of the parcels showing existing conditions and proposed installation. Site plans will be suitable for submission to permitting agencies and for construction documents. This is further discussed in the cost section of this proposal.

Specifications/Contract: Specifications will be prepared including a "Front End" that provides contract language for the construction work. Included are sections on Bid Bond, Performance Bond, Insurances, Payment, Labor Rates and the General Conditions as to how the construction work is to be undertaken and administered by the Contractor. "Technical Specifications" will be prepared that will detail the materials to be used, installation requirements, sheeting, shoring dewatering, testing procedures, manufacturer approvals, safety plans, approval and acceptance procedures and project closeout.

Survey and Utility Markout: A qualified and experienced surveyor will engage an approved markout firm to identify utilities using information provided by the utility owners. Utilities to include gas, water, electric, cable and telephone. Following utility markout a surveyor will proceed to conduct a topographic survey (NAVD 88) for curb to curb within the areas to be sewered. Survey to pick up street features, including curbing, drainage structures, existing sewers (connection points), utility markouts, water boxes, etc. Survey files to be in latest version of AutoCad and will be used for design of the sewer plan and profiles.

Soil Borings: A requisite amount of soil borings will be performed and a geotechnical report will be prepared to provide subsurface information to the design engineer. Information will determine if any subsurface conditions exist that may require special foundations for sewer pipe support. Borings will be drilled to a minimum of 20 feet and will note groundwater elevation if encountered. Information will be used to determine if sheeting and dewatering of trench will be required.

Cost Estimating: Upon completion of the 90% level of the Contract Documents (Plans & Specifications), a qualified and experienced firm specializing in construction cost estimating will be engaged to develop a detailed cost estimate for the sewer work.

Permitting: The design drawings for the sewer extension in Sewershed "K" will be submitted to both the New York State Department of Environmental Conservation and the Suffolk County Department of Health Services. Comments from the agencies will be incorporated into the design documents. Additional permits such as disposal of dewatering flow will be identified.

Administration: Cameron Engineering will work with Village officials, Sewer Committee members, and the Village Attorney in shepherding the sewer extension through the design and permitting process.

Meetings will be conducted on a regularly scheduled basis, communications including emails, texts and written progress reports will be prepared throughout the project. Assistance on grant reporting will be provided.

The scope of work will position the Village to immediately proceed to bidding for the sewer expansion.

3c. Narrative describes proposed technology in sufficient detail and includes information on its demonstrated efficacy in similar setting (may include published data).

The proposed project is a planning effort, not a specific technology. The Map and Plan, which the Village will complete prior to initiating this project, will specify the method of sewering and technologies to be utilized. As has been the case in development of Sewer Master Plan, nitrogen reduction will be a primary consideration.

3d. Narrative indicates how the project supports Town of Southampton, Suffolk County, NYSDEC Long Island Nitrogen Action Plan (LINAP) or other adopted goals/policies (provide references with pages numbers, etc.)

Town of Southampton Water Quality Improvement Project Plan (2016): The plan indicates that:

- The highest concentration of nitrogen from septic systems to the Peconic Estuary originates primarily from Sag Harbor, Riverhead and Montauk (p. 29).
- The primary source of pollution to the Town's waters originates from onsite cesspool and septic systems, and that the bulk of the Town's attention at the onset of the CPF funding program will be focused on reducing those loads (p.20).
- All Village coastline that lies within the Town of Southampton is situated in a high priority area, as shown on the attached map. The high priority area includes substantial portions of the areas that are targeted for sewer service expansion.

Suffolk County Comprehensive Water Resources Management Plan[8]: The plan identifies Sag Harbor Cove and Connected Creeks as Wastewater Management Area 10 (page 6-10) and determines that the area is a wastewater management Priority Rank 2 area with an overall ideal water quality goal of 81 percent. Page 6-19 states that residential neighborhoods surrounding Sag Harbor Cove "scored in favor of sewering due to their proximity to the existing WWTF and the ecological rank of Priority Rank 1. In addition, Sag Harbor Cove is identified as potentially requiring nitrogen load reductions above the reduction that could be achieved through the use of I/A OWTS alone to meet water quality goals. The proposed project is directly supportive of these findings by advancing efforts to connect the targeted neighborhoods to the WWTF.

Long Island Nitrogen Action Plan (LINAP)[9]: Goal 4.a.a is to develop "action plans which contain near term actions that will reduce nitrogen pollution to groundwater and surface waters." The proposed project is directly supportive of this goal as it will lead to implementation of wastewater system improvements that will reduce nitrogen pollution to groundwater and surface waters (page 7).

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[8] Available at: https://suffolkcountyny.gov/Portals/0/formsdocs/planning/CEQ/2020/RevisedComplete%20SWP2-21-20.pdf
[9] Available at: https://www.dec.ny.gov/docs/water_pdf/linapscope.pdf

Peconic Estuary Program (PEP) Comprehensive Conservation and Management Plan[10]: Within the Clean Water Goal, Objective E calls for decreasing negative impacts from legacy, current and future nutrient inputs. The proposed project is directly supportive of this goal as it will enable the Village to connect properties in a high priority area to the WWTF, thereby reducing nitrogen and other pollutants entering the estuary. The sewershed is identified as a high priority based on proximity to WWTF, proximity to surface water, groundwater depths/travel times, and nitrogen removal potential.

Sag Harbor Village Water Quality Improvement Plan (WQIPP)[2]: As previously noted, the proposed project is supported by the following WQIPP recommendation:

- Potential Expansion of Sag Harbor Wastewater Treatment Facility District: conduct feasibility study to determine to advisability of extending the area served by the Village wastewater treatment facility, which is operating below capacity. (Page 6.)

2020 Sag Harbor Village Sewer Master Plan: The project implements a recommendation of the Sag Harbor Sewer Master Plan to utilize available capacity of the WWTF to extend the sewerage system to the parcels located in Sewershed K (Attached Update 1, February 22, 2021, p. 1 and Exhibits 2,3,4).

4. WATER QUALITY BENEFIT

4a. Identify Nitrogen, Pathogen or Pollutant of Concern (POC) including Existing Condition and Target Reduction.

As indicated in Update 1 (February 22, 2021), sewering of Subwatershed K is expected to reduce the flow of nutrients and pollutants to area surface waters. Estimated nitrogen reduction is 1,541 lbs. per year.

It is acknowledged for the purpose of this funding request that the WWTF is located in the Town of East Hampton, but that Sewershed K, along with the majority of parcels in the sewer service area, is located in the Town of Southampton. The project addresses water quality goals held in common by both Towns.

4b. Describe plans for collecting and reporting on water quality over time.

The water quality monitoring activities initiated by SOMAS in 2018 will continue to be supported by the Village in 2021 and moving forward.

4c. Indicate useful life of proposed technology (must meet or exceed five years).

A sewer system will meet or exceed the five-year threshold required by CPF. The proposed low pressure pumping system force main is expected to have a minimum of a 30-year service life. Fittings, valves and other ancillary equipment associated with the force main would be expected to have a 10-15 year service life.

Should the Village elect (subject to construction grant funding) to provide the residential LPS pumping units, it would be expected that some components of the units such as the fiberglass housing and piping

[10] Available at: https://www.peconicestuary.org/ccmp2020/

would have a greater than 20-year service life. Pumping units would be expected to have a 10-15 year service life with routine maintenance being performed in accordance with manufacture's recommendations by qualified service technicians.

SECTION 5. COST FACTORS

5a. Explain how you have confirmed that the proposed budget is reasonable, appropriate, and necessary. If available, please provide any and all estimates or documentation of how costs were determined.

The proposal budget was developed by Cameron Engineering as part of its scope of work for the Village of Sag Harbor Sewer Master Plan. As demonstrated in the attached statement of qualifications, Cameron has extensive experience in the planning, design and engineering of sewer systems in Suffolk County, and knowledge of current market conditions. Accordingly, the firm provided a detailed rationale for the itemized budget as discussed below.

How costs were determined: The Village of Sag Harbor has commenced the development of Sewer Master Plan with the assistance of grants from both the Town of Southampton and the Town of East Hampton. The Master Plan is approximately 70% completed and has identified and analyzed some of the key components that will allow the Village to advance towards providing new sewers in the Village. The Master Plan will identify specific areas to be sewered, the boundaries, specific parcels, methods of sewering and the associated costs. Presently there are several critical sewersheds that have been identified that if sewered would result in an immediate improvement to Village's waterways. The two highest ranked (most critical) sewersheds are in proximity to the existing sewer service areas, one being located in the Town of East Hampton ("Sewershed L") and the other in the Town of Southampton ("Sewershed K"). In order to advance the sewering initiative and achieve goals for improving water quality in the near term, the Master Plan scope of work includes preparation of a Map and Plan for both of these sewersheds.

When the draft Master Plan is completed, submitted and available to the public, the Village will be in a position to conduct informational meetings with Village residents and stakeholders. These stakeholder meetings are expected to result in the confirmation of the specific boundaries of the sewer extension. Following this, the next step, which is the subject of the proposal being submitted to Southampton CPF, will be the preparation of an engineering report and upon its approval by regulatory agencies, the development of Contract Documents (plans and specifications) necessary to procure a qualified and experienced General Contractor.

The construction cost for the proposed sewer extension in Sewershed "K" is not confirmed at this time as the specific boundaries have not been finalized. The Map & Plan will result in the delineation of the sewer extension boundaries. However, preliminarily the sewershed is expected to have a minimum of 4,200 linear feet of sewers located within the Village's Right of Way (ROW) but could be increased if the Village incorporates sewer piping on individual parcels (see note below). This estimated footage includes the footage for the house to sewer service connections. This would account for approximately 20% to the overall piping footage. For planning purposes, the overall footage would be between a minimum of 4,200 linear feet and a maximum of 5,000 linear feet. Using a construction cost factor of $200 per linear foot, the construction cost would be in the range of $0.84-$1.0M. This estimate does not include the “soft costs” associated with the design, specialty services, permitting, construction management and inspection services.

In order to address feasibility of sewering from the perspective of individual homeowners, the Village is considering taking responsibility for performing the design of the LPS pumping unit for each parcel located in Sewershed K. This would involve the creation of individual site plans for each parcel showing the existing conditions and utility locations and the proposed new installation of the LPS units and associated gravity piping to the unit and discharge piping to the new force main connection to the Village’s new system. Site plans would be suitable for submittal to the SCDHS for approval. The cost of this task is included in the project budget as an optional item for the purpose of CPF evaluation. The Village would welcome the opportunity to discuss this potential use of CPF funds.

Budget Proposal: For engineering design related services for the design of “Sewershed K” located in the Town of Southampton:

TASK 1- Design Force Main in ROW	**FEES**
Engineering Report	$30,000
Design Drawings	$60,000
Specifications (Contract)	$60,000
Survey and Utility Markout	$50,000 (M/WBE subcontractor)**
Borings/Geotech Report	$17,000 (M/WBE subcontractor)**
Cost Estimating	$8,000 (M/WBE subcontractor)**
Project Administration	$10,000
Total	**$235,000**

** Survey, Soil Borings and Cost Estimating services are estimates. These services are directly connected to the overall scope of the project. Cost proposals will be solicited for the tasks once the sewer extension boundaries are confirmed by the Map & Plan. M/WBE subcontractors will be targeted to align with New York State (NYS) contract requirements, in the event that a portion of this project is funded from NYS sources.

TASK 2 - Design LPS Site Plans for Property Hookups	**FEES**
Engineered Site Plan - 44 parcels @ $5,500	$242,000

Task 2 is funding is for the Design Site Plan for each parcel based on the estimated engineering cost as noted below. With an LPS system requiring pumps at each parcel hookup location, this a necessary and significant portion of the overall cost.

TOTAL BUDGET

Total Task 1 – Design Force Main in ROW	$235,000
Total Task 2 – Design LPS Site Plans for Property Hookups	$242,000
Total Tasks 1 and 2	**$477,000**

5b. Describe any matching funds to be provided

The Village is seeking funds from the Southampton Town CPF Water Quality program to support the proposed scope of work. Village contributions to the project which are not reflected in the grant budget include:

- In-kind staff and consultant resources for project management, administration and grant writing; and
- Estimated $7,500 to continue water quality monitoring to be performed by SOMAS in 2021

Additional leveraged support includes studies that informed development of the Sewer Master Plan. These include:

- 2018 study of several sewer service expansion options, prepared by Dietrich Engineering ($10,455) and funded by the Village.
- A two-year water quality and testing study performed by Dr. Christopher Gobler of SOMAS. The full cost of the study was approximately $70,000, with the majority of funds provided by community fundraising efforts led by the Sag Harbor Partnership, and $12,500 provided by the Village.
- Town of East Hampton CPF 2020 award for $72,400 to fund 50% of the cost for preparing the Sewer Master Plan, as well as the Map and Plan for sewersheds L and K.

5c. Explain why the project cannot proceed and intended benefits cannot be achieved without external funding. Please describe how the project will proceed if funds awarded are lower than requested or if there are cost overruns.

The Village has advanced its efforts to the extent that financial resources allow and cannot proceed with additional engineering services without external funding support. As noted above, the Village provided partial funding for the SOMAS study and self-funded the previous WWTF capacity studies. It also plans to support additional water quality monitoring in 2021.

If funds are awarded at a lower level than requested, the Village will continue to seek other sources of funding to make up the shortfall, though this may affect the project timeline and delay the intended water quality improvement outcomes. Suffolk County Water Quality grants and NYS Consolidated Funding Application programs generally follow an extended timeline due to annual funding cycles and lengthy contracting procedures.

The Village is well positioned to avoid cost overruns. Its engineering consultant has researched project costs based on professional knowledge of tasks required and current market conditions. We have proposed the most complete, reasonable cost estimate possible at this point in time. The consultant procurement process will require bidders to provide itemized cost proposals, and cost will be a consideration in scoring. The resultant consultant contract will outline clear deliverables and performance expectations, with payments tied to completion of deliverables.

With regard to future construction, the Village is actively investigating strategies for a diversity of funding streams.

6. MANAGEMENT, EXPERIENCE, ABILITY

6a. Describe applicant's experience in completing similar projects

In addition to the Sewer Master Plan Progress Report (September 2020) and Update 1 (February 22, 2021), the Village has completed a number of planning studies, including but not limited to:

- Local Waterfront Revitalization Program. Adopted 1986 and amended 2006. Currently undergoing update.
- "Planning Strategies for the Village of Sag Harbor." Interscience Research Associates Environmental Planning & Development Consulting, 2008.
- Water Quality Improvement Project Plan. Nelson Pope & Voorhis, 2016.
- "Engineering Report, Village of Sag Harbor Wastewater Treatment Plant, Plant Capacity for Future Expansion of Sewer District." Dietrich Engineering, P.C., June 2018.

The Village will oversee delivery of the funded scope of work under the direction of Trustee Aidan Corish. Since his tenure as Trustee began in 2017, his accomplishments have included helping to implement the first ever continuous water quality testing initiative in association with SOMAS; initiating the project to expand the WWTF service areas to reduce the amount of nitrogen entering the waterways; and working continuously to secure grants for infrastructure projects. His oversight will occur in coordination with Village Clerk/Treasurer Beth Kamper, who will be responsible for financial administration; and Superintendent of Public Works Dee Yardley who is responsible for managing the Village WWTF. Trustee Corish will ensure public engagement via meetings of the Village Trustees.

Qualifications of the Cameron Engineering team are attached. Cameron has been retained to prepare the Sewer Master Plan, including the Map & Plan for Sewersheds L and K, and to provide support for shaping the scope of work, timeline and budget for this grant request.

6b. Describe community support or opposition to project. If there is opposition, explain how this is to be addressed.

The Sag Harbor Partnership, a nonprofit organization dedicated to the preservation and enhancement of the quality of life in Sag Harbor, NY, was created to support environmental, education, historic preservation, economic and social programs that benefit the greater Sag Harbor community. The Partnership, working with the Village's Harbor Committee and community stakeholders, raised funds from the community and awarded a grant to the SUNY School of Marine and Atmospheric Sciences at Stony Brook to complete the 2020 study authored by Dr. Gobler. Materials from their website and social media are attached.

News coverage includes the following articles:

- "Sag Harbor Launches Water Quality Initiative." *East End Beacon,* June 1, 2018
- "Sag Harbor Begins to Weigh Expanding Sewer Plant Service Area." *Sag Harbor Express*, February 6, 2019
- "Study Suggests Boaters May Be Releasing Septic Waste in Sag Harbor." *Sag Harbor Express*, February 12, 2020

- "Sag Harbor Will Seek Funding for Sewer Engineering Study." *Sag Harbor Express*, March 10, 2021

Public Meetings of the Sag Harbor Village Trustees have occurred in connection with adoption of the following resolutions:

- Resolution #15, October 2019, authorizing advertisement of Request For Proposals to obtain professional services for development of Sewer Master Plan
- Resolution #5, January 2020, Awarding RFP to Cameron Engineering for Development of Sewer Master Plan
- Resolution #7, January 2020, appointing members to Sewer Committee
- Resolution #5, March 2021, approving submission of a proposal to Town of East Hampton CPF for funding of plans and specifications for Sewershed L (located within Town of East Hampton)
- Resolution #19, May 11, 2021, approving this submission

Village officials have engaged community members in discussions about sewering with responses being generally positive. Community outreach and education efforts will be ongoing in order to ensure the public remains engaged and informed.

6c. Describe any permits needed and timeframe/status of approvals.

No permits are required for development of plans and specifications, however regulatory approvals required for construction will be addressed during the design process.

7. MAINTENANCE/MONITORING/EVALUATION

a. Please describe the proposed plan for on-going maintenance and evaluation including who will be responsible for the maintenance and monitoring. Please include how it will be funded.

The water quality monitoring activities initiated by SOMAS in 2018 will continue to be supported by the Village in 2021 and beyond.

The Map and Plan, as well as the engineering report will detail operations and maintenance requirements for the sewer system on Village ROW; these will be the responsibility of the Village.

8. DURATION OF THE PROJECT

a. Provide a projected project timeline

In order to realize near-term environmental benefits, the Village has established an aggressive timeline for implementing the Sewer Master Plan recommendation to connect Sewershed K to the WWTF. The 2020 award from the Southampton Town CPF is supporting completion of the Sewer Master Plan which includes the Map & Plan for Sewershed K. The grant contract has been executed and work is underway.

The timeline for the proposed project will proceed following completion of the Sewer Master Plan, as noted below, and assumes that the Village and Town CPF will execute a contract for the project by September 30, 2021.

- Complete Sewer Master Plan with Map and Plan for Sewershed K – September 30, 2021
- Execute contract with selected engineering consultant to provide engineering services for Sewershed K, and issue Notice to Proceed (NTP) – October 31, 2021

The selected consultant will begin work upon issuance of NTP, and is expected to complete all deliverables within an estimated period of 7 months as follows:

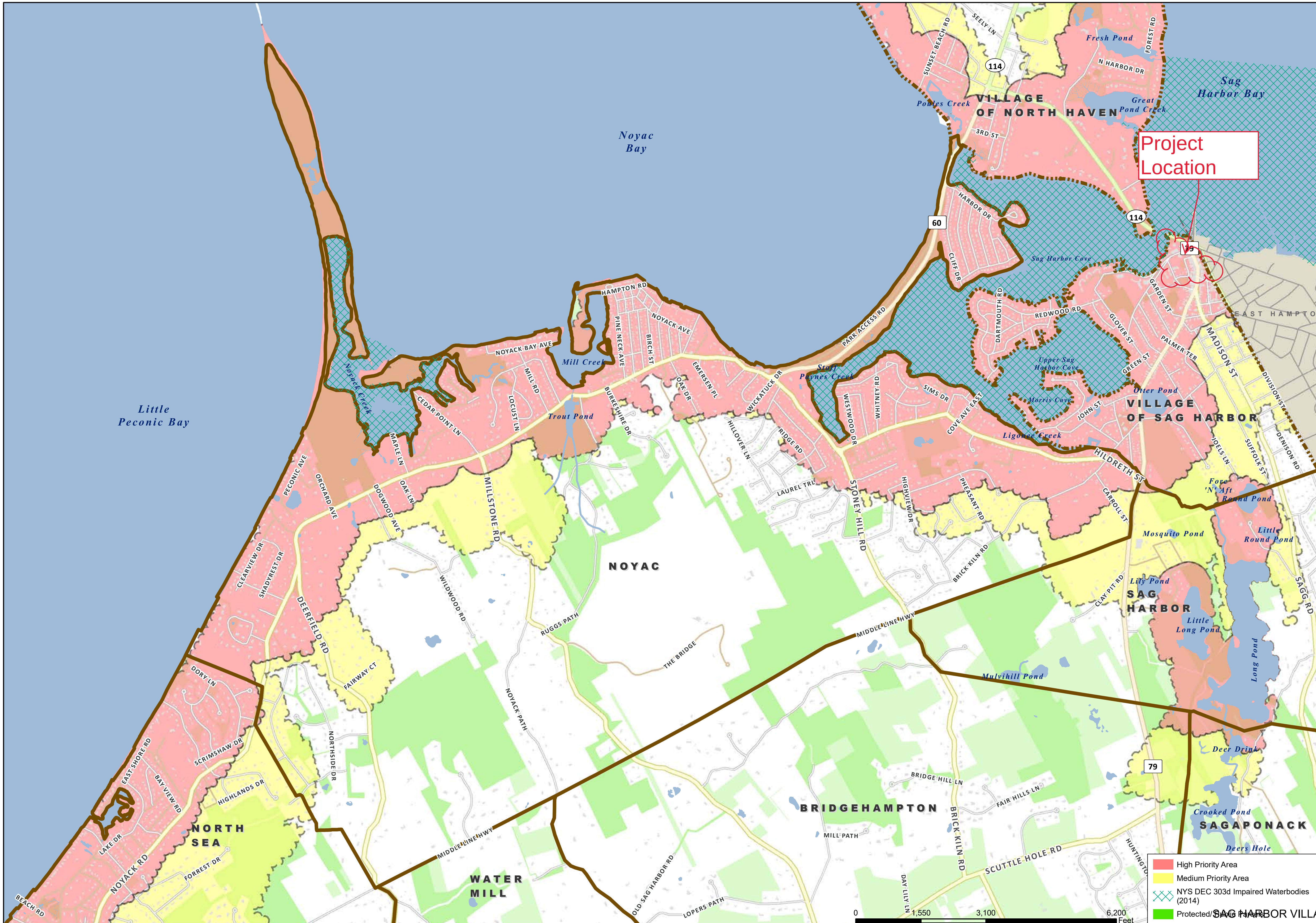
1. Prepare FOIL requests from utility owners within the identified sewer extension area. Duration of 5 days from NTP.
2. Conduct parcel surveys for determination of location for house service connection. Complete within 30 days of the NTP.
3. Prepare individual site plans for all 44 parcels showing existing and proposed LPS installation. Duration of 60 days from NTP.
4. Survey and soil borings are expected to commence 45 days from NTP and will take 1-2 weeks to complete. Data for design should be available from the subcontractors approximately 30 days after their respective field work is completed.
5. Specifications for sewer design to commence within 4 weeks of the NTP.
6. Detailed design must await the receipt of the survey and soil borings data. Start date would be approximately 60 days after the NTP.
7. Detailed design to be a 90% level within 150 days of the NTP. Submittal to regulatory agencies at this time of the Contract Documents (Plans & Specifications).
8. Detailed cost estimate of the 90% Contract Documents will be prepared while documents are out to regulatory agencies for review.
9. Contract Documents – detailed drawings and written specification (suitable for bidding) to be completed within 180-210 days of the NTP depending on regulatory review time frame.

b. If project is multi-year or phased, provide a breakdown of budget and milestones. N/A

10. SUSTAINABILITY

The WWTF is located in the 500-year flood zone (Zone AE). The sewerage system includes flood hazard areas as shown on the attached FEMA flood zone and Sea, Lake and Overland Surge from Hurricanes (SLOSH) maps.

The Village is a stakeholder in the 2020 Suffolk County Multi-Jurisdictional Hazard Mitigation Plan. This plan addresses flood mitigation needs and will preserve Village eligibility for future FEMA funding opportunities for capital projects needed to mitigate the flood hazards at the WWTF. Planning and engineering services related to the proposed project have and will continue to incorporate flood mitigation as well as shallow groundwater issues. New sewer lines to be installed in Sewershed K will use plastic piping with O-rings at the joints, so that any rise in groundwater level will not negatively impact the system. Likewise, manhole inserts will prevent surface flood waters from entering manholes at the street level. Due to high groundwater conditions present in Sewershed "K", use of Low Pressure Pumping Units (LPS) are likely to be favored over conventional gravity piping that would be very costly to install.

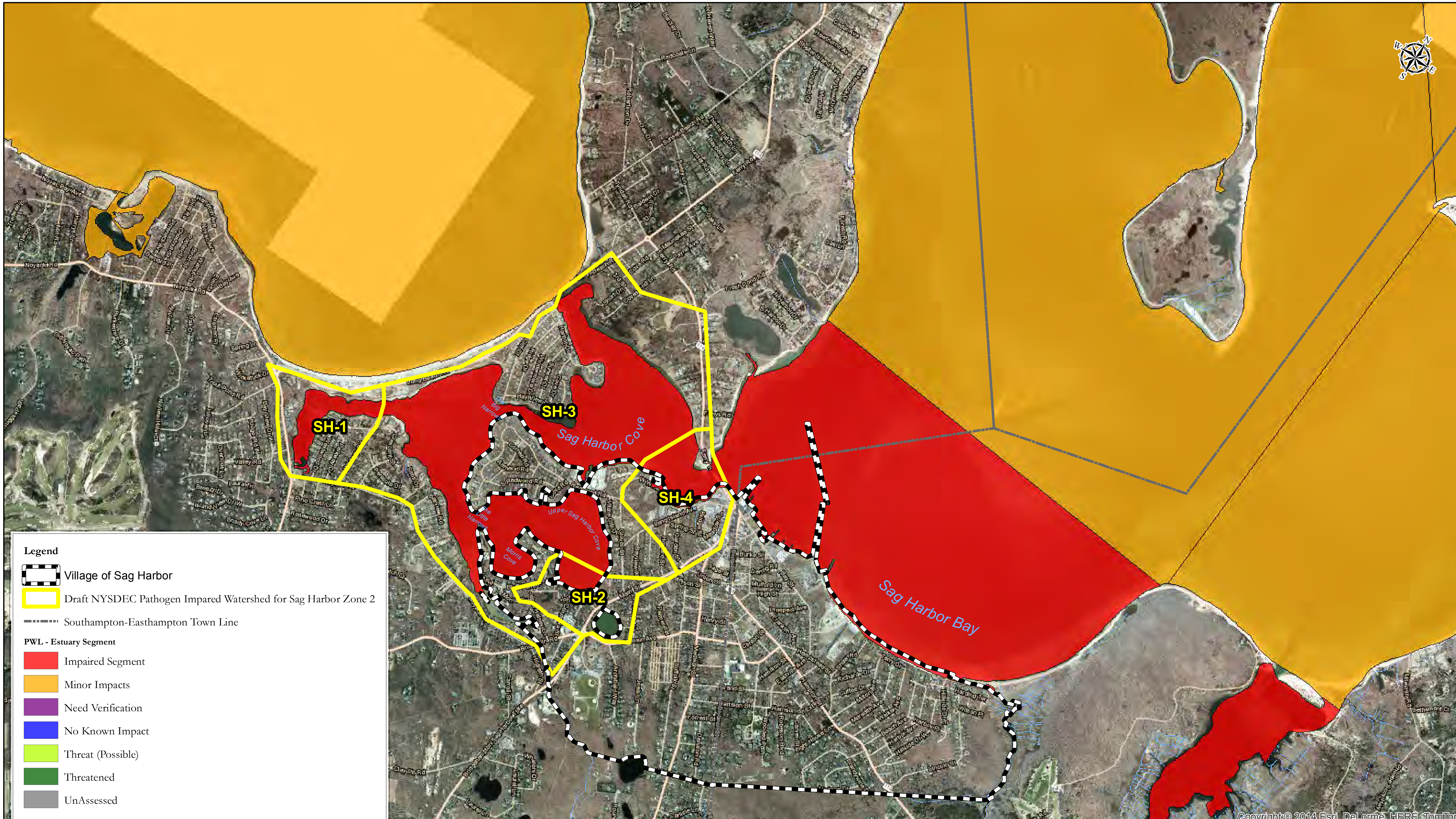


Town of Southampton CPF Water Quality Improvement Project Plan

NOYAC

Suffolk County Real Property Tax Service
COPYRIGHT 2016, COUNTY OF SUFFOLK, N.Y.
Real Property Taxmap parcel linework used with permission of
Suffolk County Real Property Tax Service Agency (R.P.T.S.A.)

Prepared By: The Town of Southampton Dept of Geographic Information Systems Date: 7/5/2016 - MAP ID: 2514



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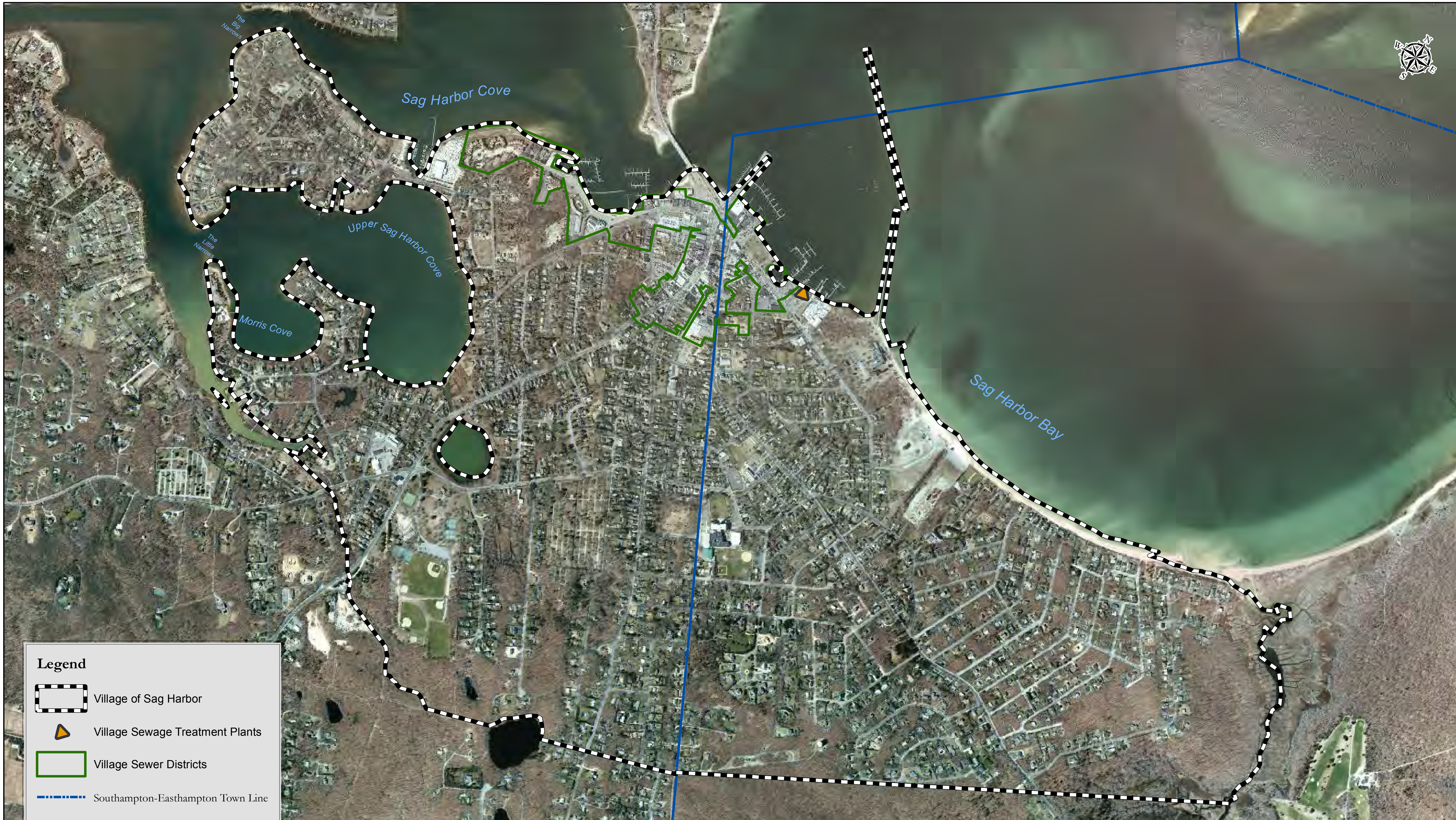
PRIORITY WATERBODY LIST

Source: NYSGIS Orthoimagery Program, 2013; NYSDEC; Pathogen Impared Waterbodies for Sag Harbor, May 2016
Scale: 1 inch = 2,000 feet

Village of Sag Harbor



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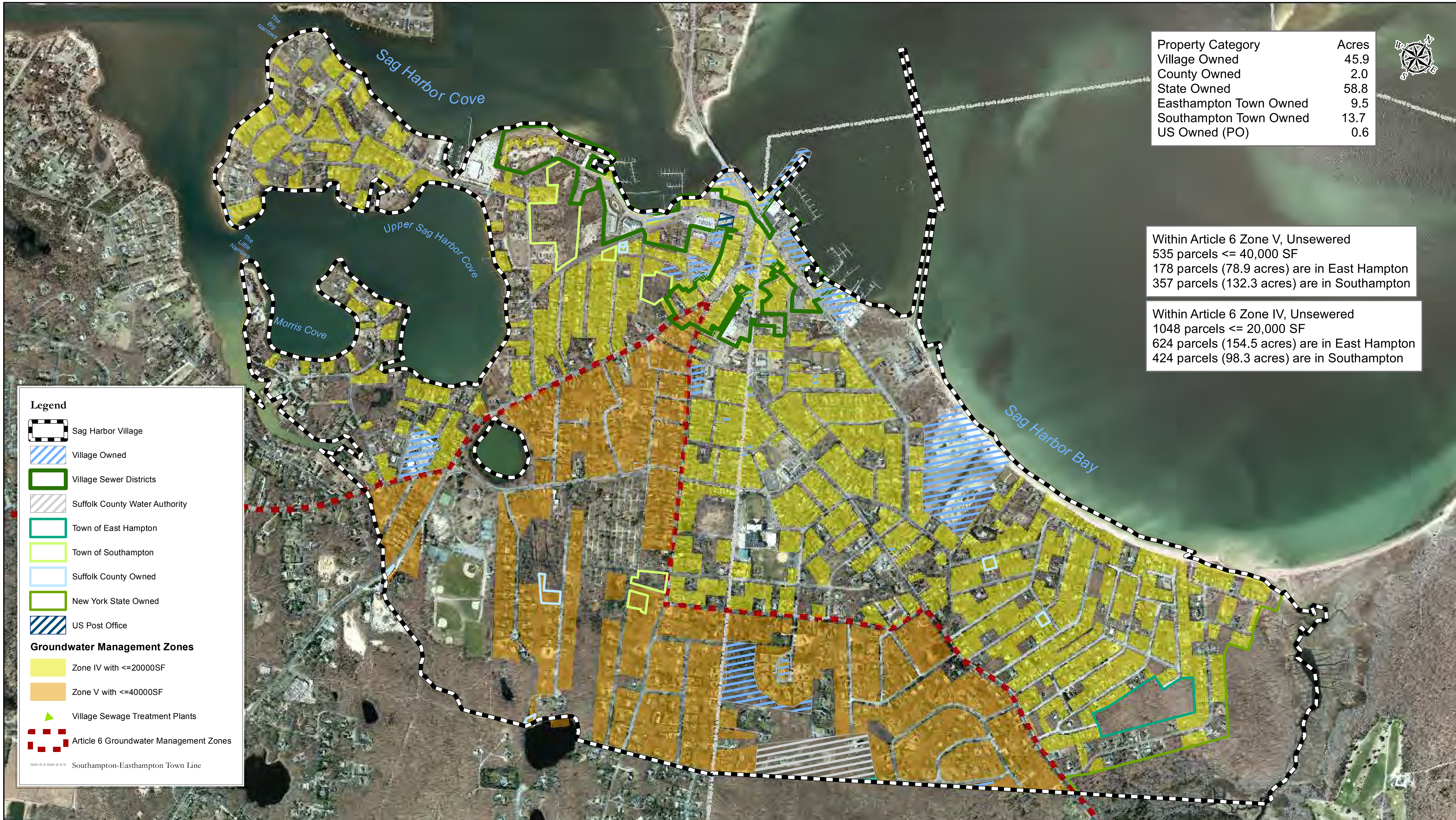
SEWERED AREAS

Source: NYSGIS Orthoimagery Program, 2013; SCDHS
Scale: 1 inch = 1,000 feet

Village of Sag Harbor



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LOT SIZE MAP

Source: NYSGIS Orthoimagery Program, 2013; Village of Sag Harbor; SCDHS - Article 6 Sanitary Code
Scale: 1 inch = 1,000 feet

Village of Sag Harbor

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DEPTH TO WATER TABLE

Source: NYSGIS Orthoimagery Program, 2013; Water Table from USGS SIM 3270, 2010 data
Scale: 1 inch = 1,000 feet

Village of Sag Harbor

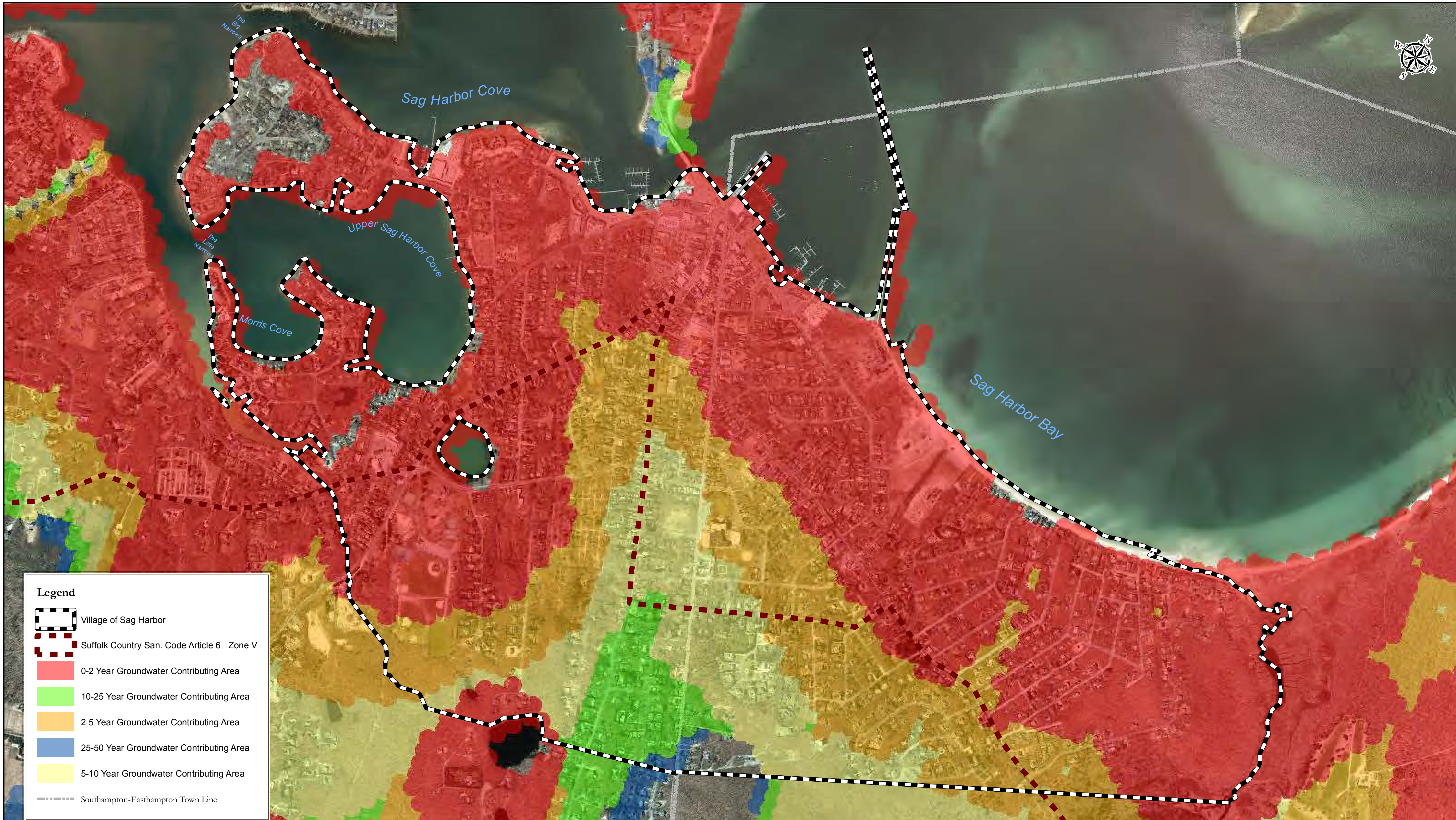

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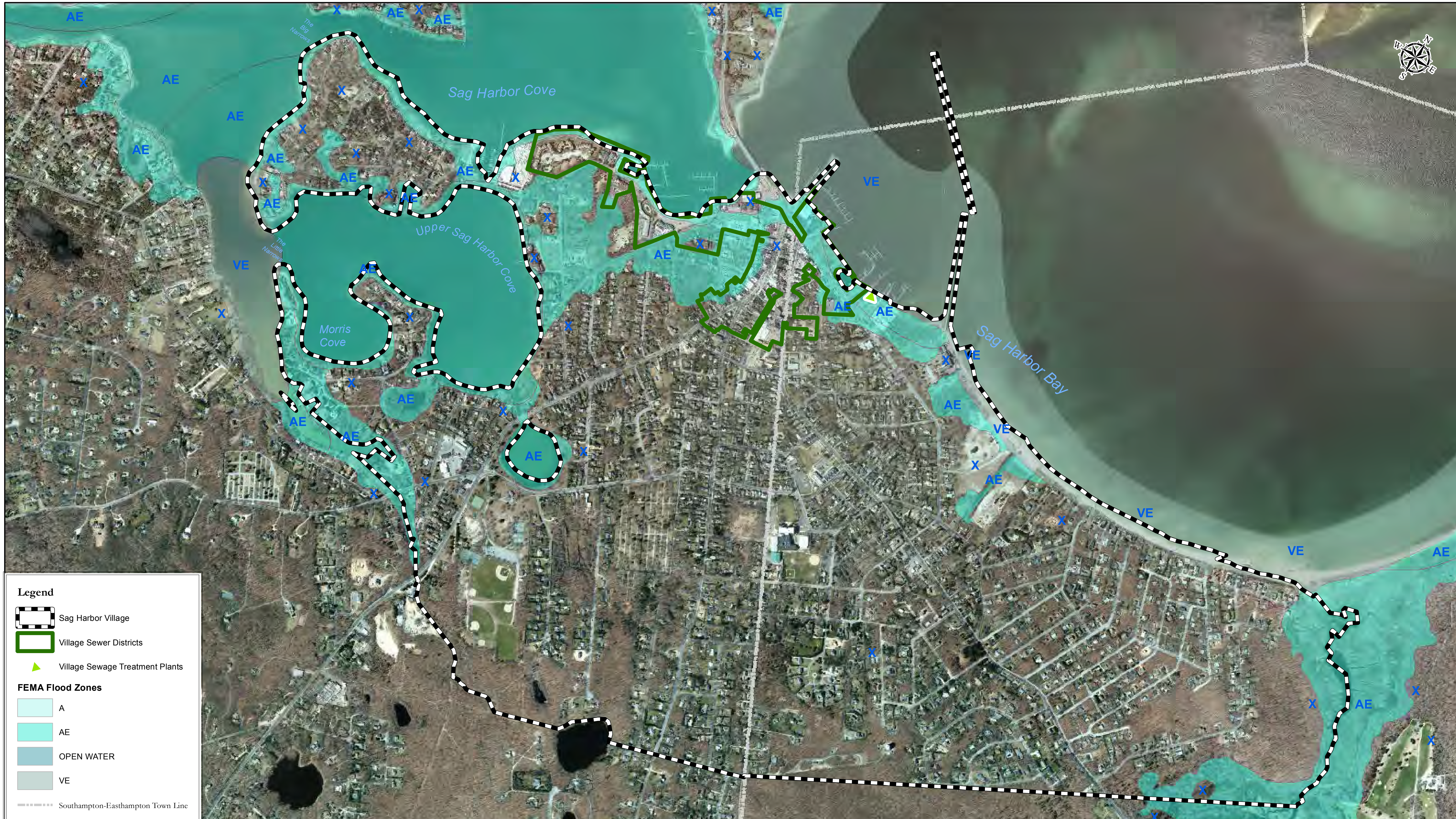
FIGURE 14
GROUNDWATER CONTRIBUTING AREA

Source: NYSGIS Orthoimagery Program, 2013; SCDHS
Scale: 1 inch = 1,000 feet

Village of Sag Harbor



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FEMA FLOOD ZONES

Source: NYSGIS Orthoimagery Program, 2013; Village of Sag Harbor; FEMA flood zones, 2013
Scale: 1 inch = 1,000 feet

Village of Sag Harbor

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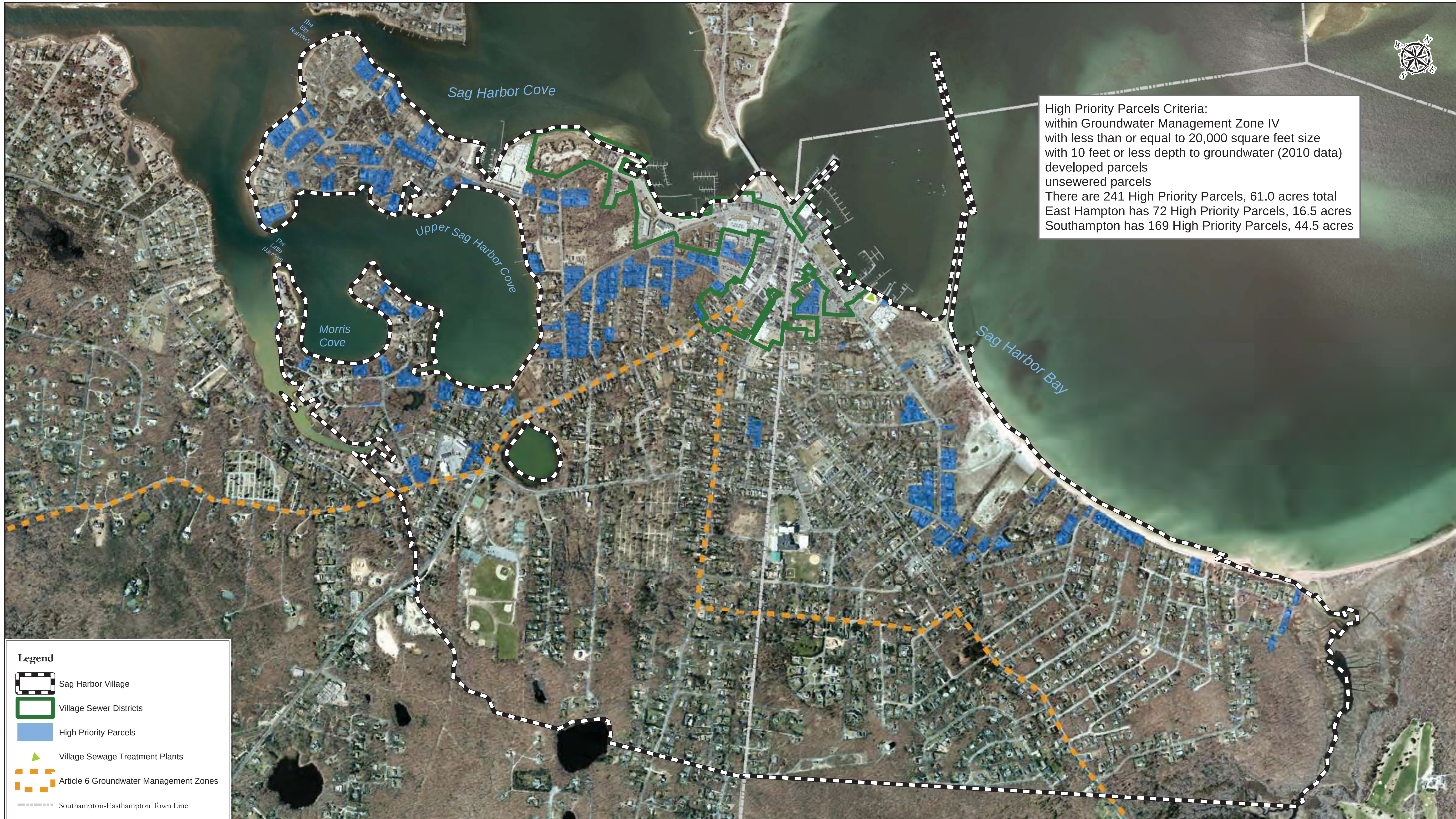
SEA, LAKE AND OVERLAND SURGE FROM HURRICANES (SLOSH) MAP

Source: NYSGIS Orthoimagery Program, 2013; NYSEMO; FEMA (SLOSH)
Scale: 1 inch = 1,000 feet

Village of Sag Harbor



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HIGH PRIORITY PARCELS

Source: NYSGIS Orthoimagery Program, 2013; Village of Sag Harbor; USGS 2010 SIM 3270; SCDHS - Article 6 Sanitary Code
Scale: 1 inch = 1,000 feet

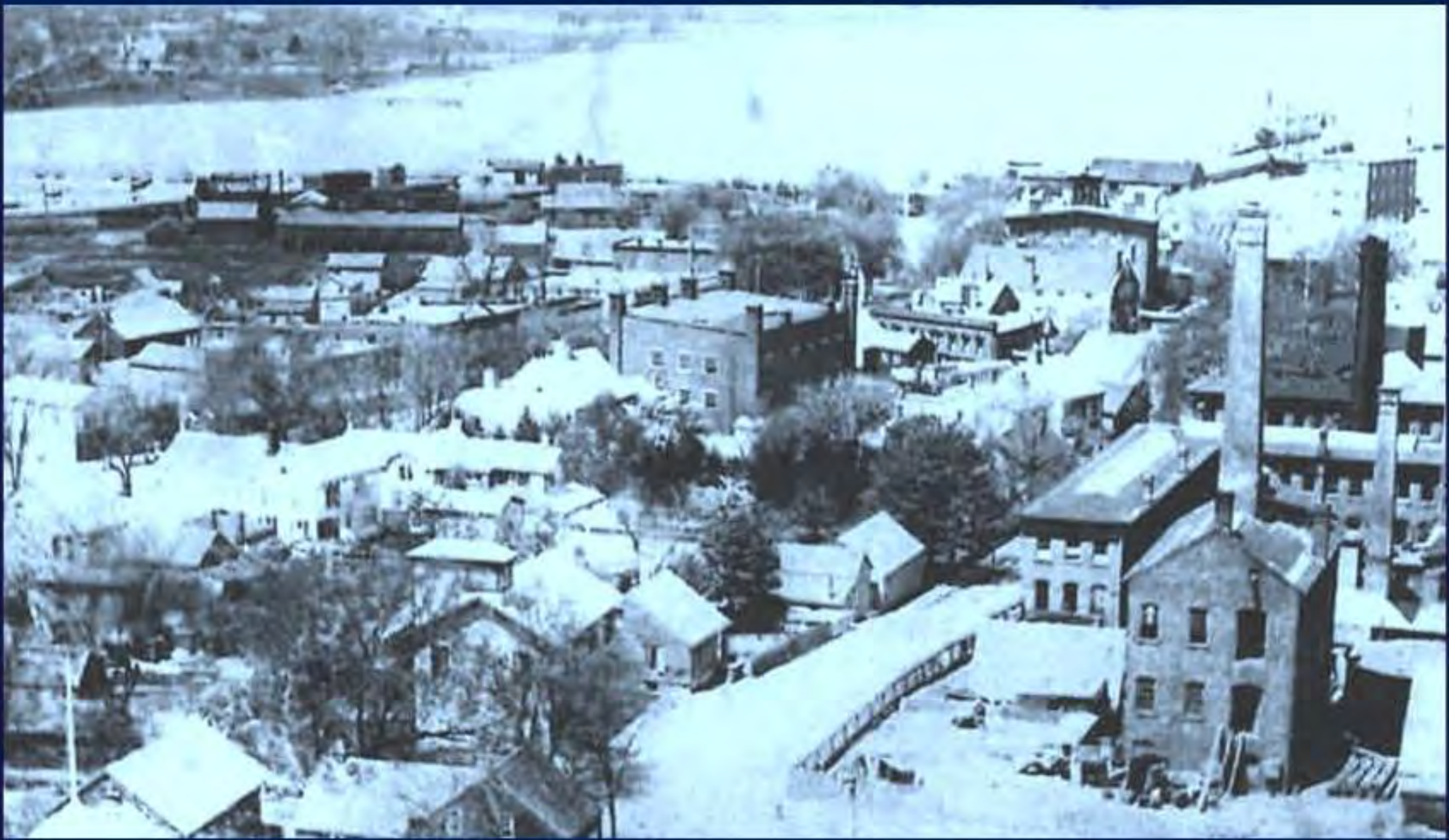
Village of Sag Harbor

PROGRESS REPORT

Sewer Master Plan

Prepared for:

Village of Sag Harbor



Prepared by:

CAMERON ENGINEERING

September 2020

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APPENDICES

(Appendices are found at the end of the document)

1. Overview

The Village of Sag Harbor has initiated the development of its Sewer Master Plan (the "Plan"). The Plan is to provide guidance to the Village on the management of wastewater generated by its residents and its downtown commercial district. Presently approximately 13% of the parcels within the Village is sewered, with the balance of the parcels using on-site wastewater treatment systems (OWTS). The Village's boundaries lie in both the Town of Southampton and the Town of East Hampton. There are 1,219 parcels representing approximately 55% within the Town of Southampton and 919 parcels representing approximately 45% within the Town of East Hampton. The Village recognizes that the health of the Village's vibrancy and economy is tied directly to the quality of the local surface waters including the inland embayments and the harbor area. The Plan will be important in identifying management measures to protect these waterbodies.

Village has received a grant of $72,400 from the Town of East Hampton towards the Plan's total cost of $145,800. The Village is pursuing additional funding to cover the cost of the Plan. The Village and Cameron Engineering & Associates, LLP (Cameron Engineering) have determined to move forward with developing the Plan using the currently available funding. To maximize the funding in place, the overall scope of work to be covered in the Plan was modified to address the most important and critical items as determined by the Sewer Committee and Cameron Engineering.

2. Goals and Objectives

The Sewer Committee and Cameron Engineering held a virtual kickoff meeting on July 24, 2020 to review the scope of the Plan as detailed in Cameron Engineering's proposal accepted by the Village. For the kickoff meeting, Cameron Engineering prepared a "Checklist of Scope Items" that identified a total of forty-four (44) items to be addressed in the Plan. Due to the available funding constraints, it was necessary to identify those elements of the Plan that were deemed the most important and would provide a basis for the Village to make important decisions on wastewater management. The balance of the scope items would be undertaken once the remainder of the grant funding is secured.

The most critical items as identified in the Kickoff Meeting are:

- Determine Available Capacity of Sewage Treatment Plant
- Potential Buildout within existing Sewer Service Areas
- Identify Potential Sewersheds Boundaries
- Develop a Matrix for Ranking of Potential Sewersheds
- Identify Cost of Nitrogen Reduction

While the excess capacity of treatment capacity at the Village's STP is a key factor, the capacity is not sufficient to contemplate sewering of the entire Village. The Plan will address alternatives to connecting parcels to the STP, including both communal wastewater treatment systems and individual I/A treatment systems.

The following sections provide details on the progress made to date on the above items.

3. Available Capacity at Sewage Treatment Plant (STP)

3.1. Available Capacity

The Village's Sewage Treatment Plant (STP) has a stated design capacity of 250,000 gallons per day (gpd). Per NYSDEC requirements, a Facility Plan would be required once the flow at the STP reaches 95% of design capacity that would be equal to an average daily flow 237,500 gpd. Peak days for flow in prior high summer seasons have been in the range of 140,000 to 150,000 gpd. Due to this year's pandemic, peak flows are lower than prior years. For the purposes of this progress report we have allocated an available capacity of 92,500 gpd before a Facility Plan would be required. As discussed on the kickoff meeting, using the Suffolk County Department of Health Services factor of 300 gpd for a Single-Family Equivalent (SFE), this available or excess capacity is equivalent to approximately 308 single family homes.

The discussion of the STP capacity presumes that the operability of a wastewater treatment plant may become more challenging once the flow level increases and approaches the design capacity. Presently at the reduced flow levels, the STP often has two and at times three tanks offline during the off-season low flow period. This provides operations staff with flexibility to divert flow to an empty tank to allow for a scheduled repair to piping, valves, or aeration headers as well as the flexibility to take a tank offline for unscheduled maintenance or emergency events. This operational flexibility is significantly reduced once peak flows increase and more of the process tanks are on line 100% of the time.

3.2. Build-Out and Service Areas

The Village has seven (7) Sewer Service Areas that service the downtown commercial areas of the Village. It is necessary to determine if there is potential of additional infill or buildout of existing parcels within the service areas. This exercise was performed in 2014 as part of the sewer expansion studies funded by the Suffolk County Department of Public Works. At that time, approximately 24,000 – 59,000 gpd of additional sewage was projected to be potentially generated from infill and buildout within the Sewer Service Area in accordance with zoning and codes in place at that time.

Cameron Engineering revisited the existing Sewer Service Areas in August to determine if there were any changes from the existing conditions observed in 2014.

3.2.1. Existing Service Area

The Village has a somewhat unique designation of properties that is different from other municipalities for its sewerage system. All properties inside the Village of Sag Harbor are within its “sewerage system”. Only those properties that are within the sewer “service area,” have the ability and are required to connect to the wastewater treatment plant (WWTP). Presently, only 295 Village parcels out of 2,210 are connected. The remaining parcels in the sewerage system are considered to be in the “non-service areas,” which are serviced by private on-site wastewater treatment systems. The Village does not have a ‘sewer district.’

3.2.2. Field Survey

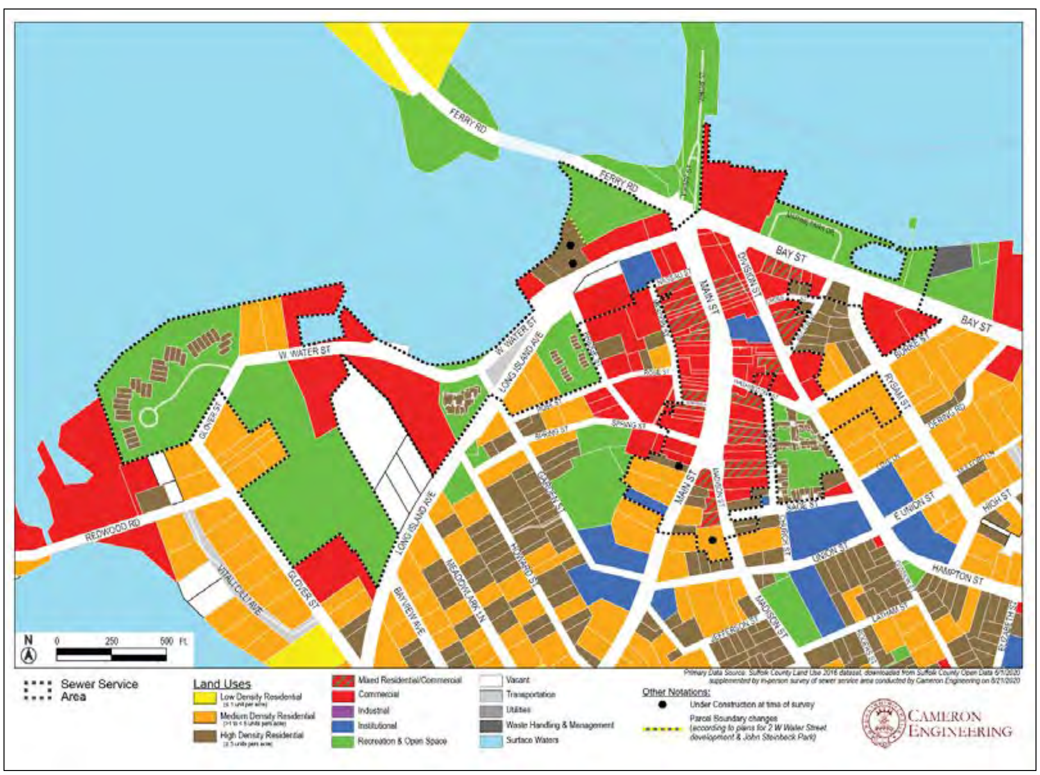
On August 21, 2020, Cameron Engineering completed a comprehensive field survey of the Village’s existing sewer service area. The objective of the field survey was to confirm existing land uses at each parcel within the sewer survey area and update GIS data and the corresponding land use map accordingly. Typically, there is only one land use applied to each parcel. However, with certain parcels, there are multiple uses. An example of this is Downtown Row Type Use.

3.2.3. Existing Land Use and Zoning

<u>Land Use</u>

The surveyed sewer service area contains a total of 295 parcels[1], based on the Suffolk County Land Use dataset[2]. This dataset includes overlapping tax parcels in multi-floor condominium buildings at five residential sites (144 parcels in total) and one commercial site (5 parcels). The land use of each parcel was verified or updated based upon observable conditions.

Figure 3-1. Land Uses within Sewer Service Area



[1] Note: One building containing Residential condo parcels at 2 W Water St (15 parcels in total) has been demolished and is currently under construction and being replaced by 3 condo units (likely 4 parcels).
[2] Parcel dataset downloaded from https://gis3.suffolkcountyny.gov/gisviewer/

Within the sewer service area, residential use accounts for 59% of the total parcels (19% of the total parcel land area). This includes Low-, Medium- and High-Density residential uses, but not mixed-use buildings where apartments are located above ground floor commercial uses. 10.2% of the parcels (6.9% of parcel land area) in the sewer service area contain "Mixed Residential/Commercial" buildings (ground floor commercial; upper floor residential). Mixed Residential/Commercial uses are located primarily along Main Street.

Table 3-1. Land Uses within the Sewer Service Area

Land Use	Parcel Count	Percent	Acreage	Percent
Residential (Low-, Med.- & High-Density)	174	59.0%	11.09	19.1%
Mixed Residential/Commercial	30	10.2%	4.02	6.9%
Commercial	70	23.7%	19.13	32.9%
Institutional	3	1.0%	1.30	2.2%
Recreation & Open Space	14	4.7%	21.99	37.8%
Vacant	1	0.3%	0.27	0.5%
Transportation	3	1.0%	0.34	0.6%
Total	**295**	*100%*	**58.13**	*100%*

Commercial Use, *including* the mixed-use category[3] accounts for approximately 34% of the total parcels (approximately 40% of parcel land area). Commercial Use without the mixed-use category accounts for 23.7% of the total parcels (nearly 33% of parcel land area). Recreation and Open Space (which includes private residential condo grounds)[4] comprised approximately for 4.7% of total parcels, or approximately 38% of parcel land area. One percent of parcels in the survey area are classified Institutional (2.2% of the parcel land area). This category includes public facilities such as the Sag Harbor Municipal Building, Police Station, and the Post Office.

[3] The Suffolk County Land Use dataset considers these mixed-use buildings "Commercial Use", following the general rule of assigning the most intense use to a parcel where multiple uses are found.

[4] According to the Dataset, provided by the Suffolk County Department of Economic Development & Planning, Division of Planning & Environment: "Dedicated common areas in a residential condominium development are classified as Recreation and Open Space, because these areas mostly serve as passive or active recreation and open space and are not available for development"

Zoning

The majority of the land area within the Village is zoned R20 Residential, which allows for single-family detached housing (as-of-right) and two-family conversions (by special permit). Within the sewer service area, 25% of the parcels are zoned R20, accounting for 25% of the parcel land area.

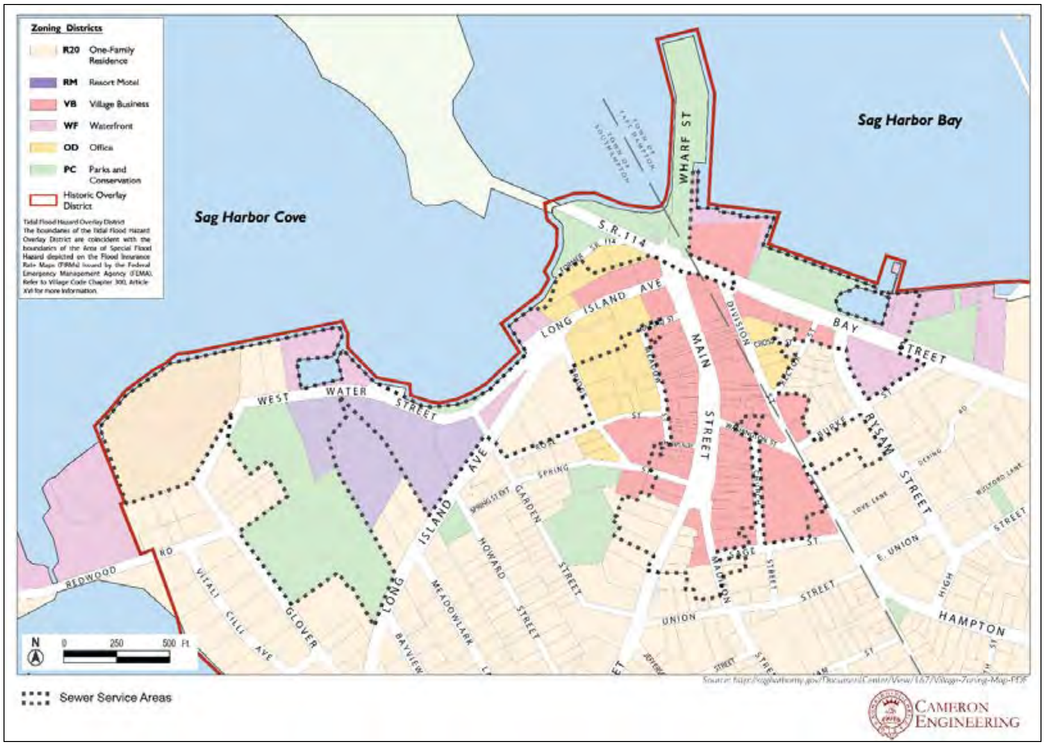
Village Business (VB), which is a commercial district for retail uses and restaurants as well as public facilities, comprises approximately 52% of the total parcels, 26% of the parcel land area. Parcels zoned Office District (OD) allow for banks and professional offices and account for nearly 9% of parcels (7.3% of the parcel land area) in the sewer service area. The Resort Motel (RM) district provides for transient travelers and accounts for 6% of the parcels (9.2 % of parcel land area) within the sewer service area.

The Waterfront District (WF) was created to preserve public access to the shoreline, and accounts for 12.9% of the land area within the sewer service area. The Parks and Conservation (PC) district is reserved for recreational areas, beach areas, open spaces, nature preserves and historic sites, and accounts for 20% of the land within the sewer service area.

Table 3-2. Zoning within the Sewer Service Area

Zoning District	Parcel Count	Percent	Acreage	Percent
Residence (R20)	81	27.5%	14.80	25.5%
Resort Motel (RM)	18	6.1%	5.42	9.3%
Village Business (VB)	155	52.5%	14.98	25.8%
Waterfront (WF)	12	4.1%	7.02	12.1%
Office District (OD)	26	8.8%	4.26	7.3%
Parks & Conservation (PC)	3	1.0%	11.64	20.0%
Total	**295**	*100%*	**58.13**	*100%*

Figure 3-2. Zoning within the Sewer Service Area



3.2.4. Methodology and Preliminary Findings

To better understand potential for growth and development within the Village, Cameron Engineering initiated a detailed buildout analysis for all parcels/uses within the sewer service areas. This analysis is a critical step in determining both existing water and sewer flows and in planning for potential future growth scenarios within the Village. As discussed above, a GIS parcel database, including relevant land use and zoning information, will be used as the foundation for the buildout analysis. When complete, this buildout analysis will incorporate water/sewer flows (both estimated and actual flows from SCWA and the Village), current land use and building data and zoning parameters – to assess potential for growth (i.e., addition of residential units) or change in use (i.e., dry use to wet use conversion, such as a new restaurant opening). Using this methodology, the database can be easily updated to account for property changes – or used to model various growth scenarios.

To date, Cameron Engineering has compiled Suffolk County Water Authority (SCWA) water use records for these parcels for 2017, 2018 and 2019 (using a mix of monthly and quarterly billing data aggregated into annual totals). Records are linked through street addresses, Suffolk County Tax Map ID numbers (provided in SCWA's requested format), object connection numbers/meter numbers and Lat/Long coordinates. A field survey was performed to verify and refine these records. This is an important step as many of the Village's mixed-use properties and multi-tenant commercial properties do not appear within Suffolk County GIS parcel records. Cameron has requested sewer billing data from the Village to supplement SCWA records and provide a clearer picture of each property's water use and sewer use. This is also helpful in identify types of water "loss" (i.e., water not entering the sewer system due to marina use, irrigation, swimming pools etc.). This parcel database and buildout analysis will continue to be refined as development of the Master Plan continues.

In terms of preliminary findings, water use over the past three years appears significantly higher than Cameron's previous analysis of the Village STP and sewer service areas (2010-2014). As confirmed by the August 2020 field survey, there are minimal vacancies throughout the Village with a high level of activity in the downtown and waterfront area. This pattern of growth and activity will be explored in-depth within the Master Plan Report, including the identification of new developments and uses, identification of significant water/sewer users and identification of areas with the highest potential for future growth. As water and sewer use continues to increase in the Village, this database and buildout analysis will play an increasingly important role in identifying potential future capacity issues.

We are noting that water usage is up significantly but have to compare to STP flow records to determine the relationship of water usage to sewage generation.

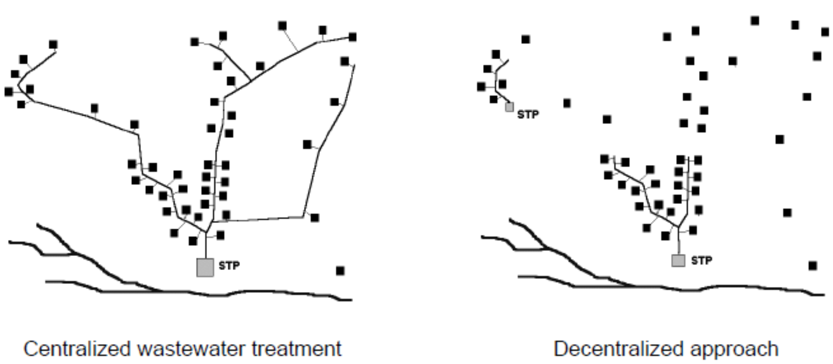
4. Potential Sewersheds

As the available capacity at the STP is limited to approximately 92,500 gpd, it is necessary to determine what areas of the Village have the greatest need for improved wastewater treatment. This initial capacity must take into account the potential buildout flow within existing sewered areas as noted in prior section. This value has not been determined at this time pending a more detailed analysis of water records and sewage flow at the STP.

The Plan is focused on maximizing environmental benefits, and the greatest need is where the most nitrogen is being generated and which of the Village's waterways it is ultimately flowing to. To this end, it is necessary to establish sewershed boundaries within the Village that will be evaluated for increased wastewater treatment. This increased treatment may include:

- Centralized: Connecting to the existing Sag Harbor STP
- Decentralized: Clustered wastewater treatment systems (2 or more systems)
- Innovative and Alternative (I/A) On-site Wastewater Treatment Systems

Figure 4-1. Centralized wastewater vs. decentralized wastewater treatment systems



Source (US EPA, 2003)

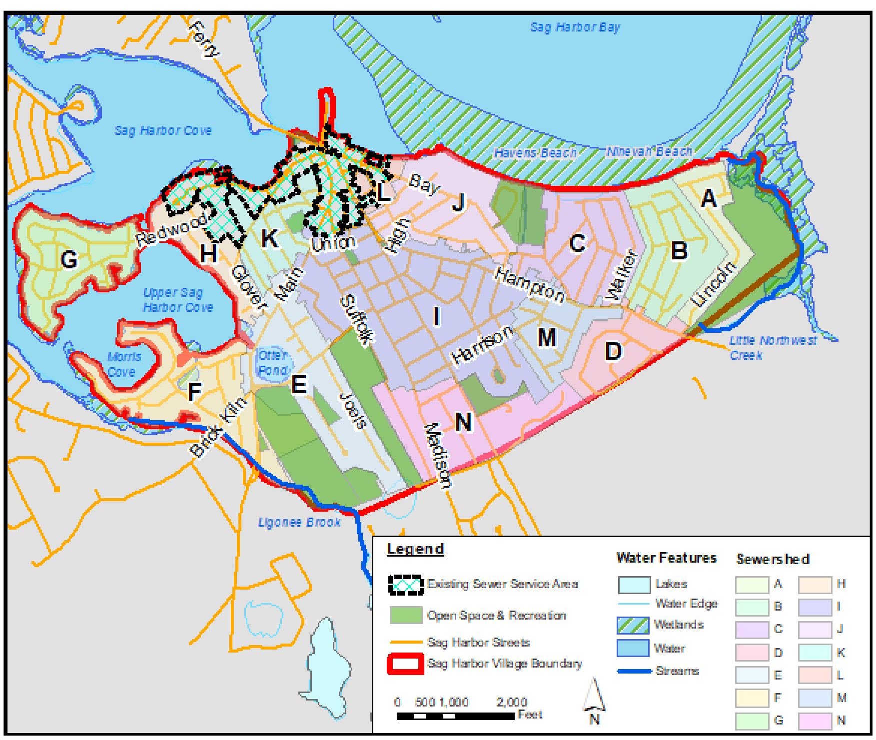
The US Environmental Protection Agency (US EPA) Office of Water has published numerous guidance manuals for onsite wastewater treatment systems (OWTS) and clustered (decentralized) wastewater treatment systems. For at least 20 years, the US EPA has promoted the value of decentralized wastewater treatment systems, particularly for rural and suburban communities. Cluster or decentralized systems are defined as those that serve two or more dwellings or buildings, but less than an entire community (Figure 4-1).

Because both the Centralized and Decentralized approach requires joining wastewater systems from multiple properties, the potential sewershed boundaries encompass streets, using typical engineering design. Also taken into consideration to identify the potential sewershed boundaries were the following factors:

- Physical boundaries
- Groundwater travel time and receiving waterbodies
- Depth to groundwater
- Topography (elevation)
- Soil characteristics

Using these criteria, Cameron Engineering has identified a total of fourteen (14) potential sewersheds within the Village's boundaries. Figure 4-2 displays the potential sewershed boundaries used in this analysis. The following sections describe the criteria used.

Figure 4-2. Village of Sag Harbor Potential Sewershed Boundary



Designating the boundaries of the potential sewersheds takes into consideration property lines, streets, groundwater flow, and contributing water bodies. In certain circumstances, soil type and elevation were elements used to decipher boundaries of the sewersheds. These characteristics grouped parcels together to help determine which areas of the Village would have the largest beneficial impact on the environment should an alternative to the current septic systems be upgraded.

4.1. Physical Characteristics

Physical characteristics such as property lines and streets, guided the sewershed boundaries as they play an important role in both centralized and decentralized sewering. Streets provide locations for utilities as they are typically not privately owned and guarantee access for construction and maintenance vehicles and personnel.

4.2. Groundwater Flow and Water Bodies

Although located on the southern portion of Long Island, the groundwater flow trends are similar to those on the north shore of Long Island. This is due to the Village's location on the north shore of the

of the South Fork. Since there are high topographic elevations in the middle of the Fork, groundwater flow is split along this ridge. The Sag Harbor area groundwater flows north to Sag Harbor Cove and Sag Harbor Bay, which are part of the Peconic Estuary (Figure 4-3). Travel time is under two years for the majority of the Village. Areas in the central part of the Village have an increased travel time, with a very small portion in the 25-50 year travel time range. Consequently, upgrading existing OWTS within the Village would have a more rapid effect as compared to interior Long Island where groundwater travel times could be greater than 50 years. There would be a positive effect on the quality of the groundwater discharging to the Inner waterbodies, Sag Harbor Cove, Bay and by extension the water quality in the receiving waters of the Peconic Estuary.

The Village of Sag Harbor has a long shoreline along Sag Harbor Cove and Sag Harbor Bay as well as numerous water bodies within the Village (Figure 4-4). Although portions of the waterfront are bulkheaded, sections of natural shoreline and tidal wetlands remain. Sag Harbor Cove and Upper Sag Harbor Cove are semi-enclosed bays surrounded by residential land uses, many of which are in low-lying areas. Since they are semi-enclosed, the flushing rate is much less than Sag Harbor Bay. Therefore, groundwater flowing to the waterbodies with the lower flushing are more impacted by OWTS discharge as compared to the Bay. Within the Village, groundwater flow is generally divided along the Town of East Hampton and Town of Southampton boundary, also coinciding with Division Street. Generally, parcels in East Hampton flow to Sag Harbor Bay, while parcels in Southampton flow towards Sag Harbor Cove.

Figure 4-3. Sag Harbor-Groundwater Contributing Areas

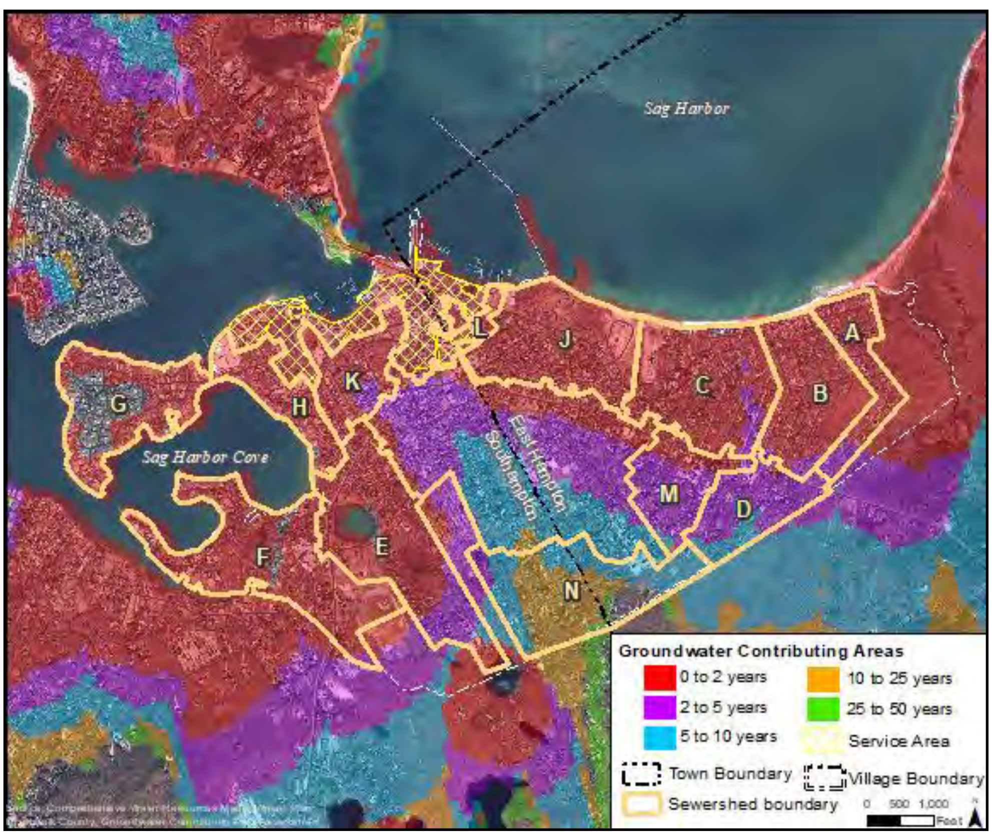
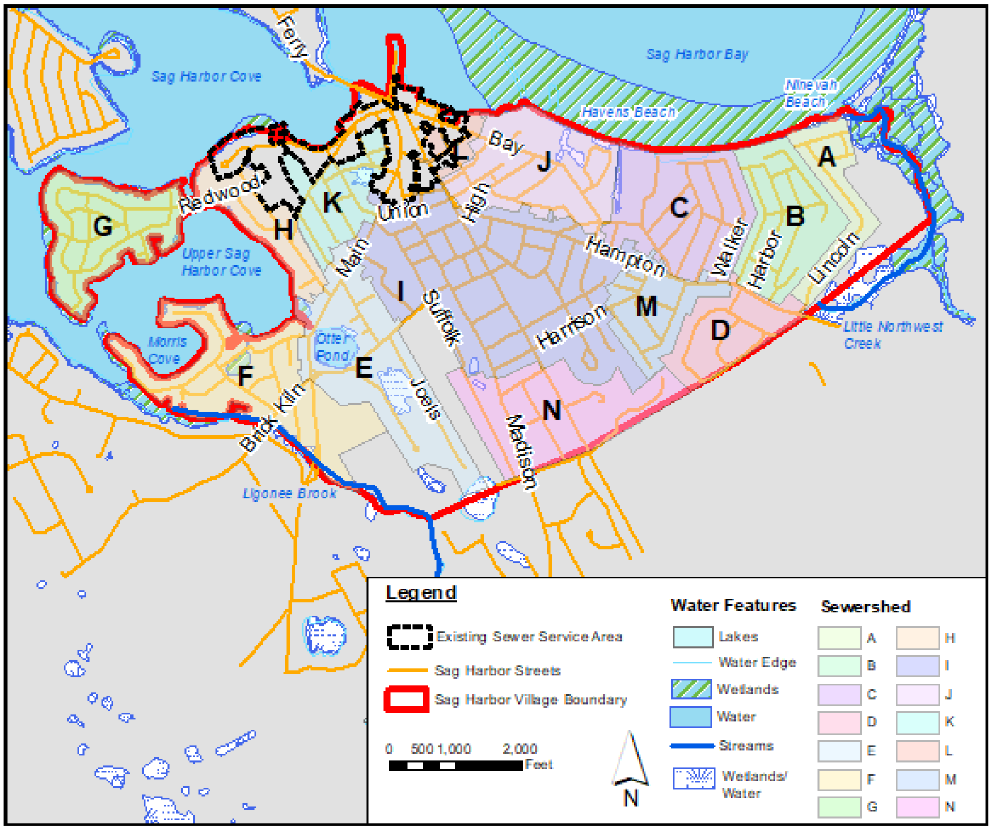


Figure 4-4. Sag Harbor -Area Water Bodies

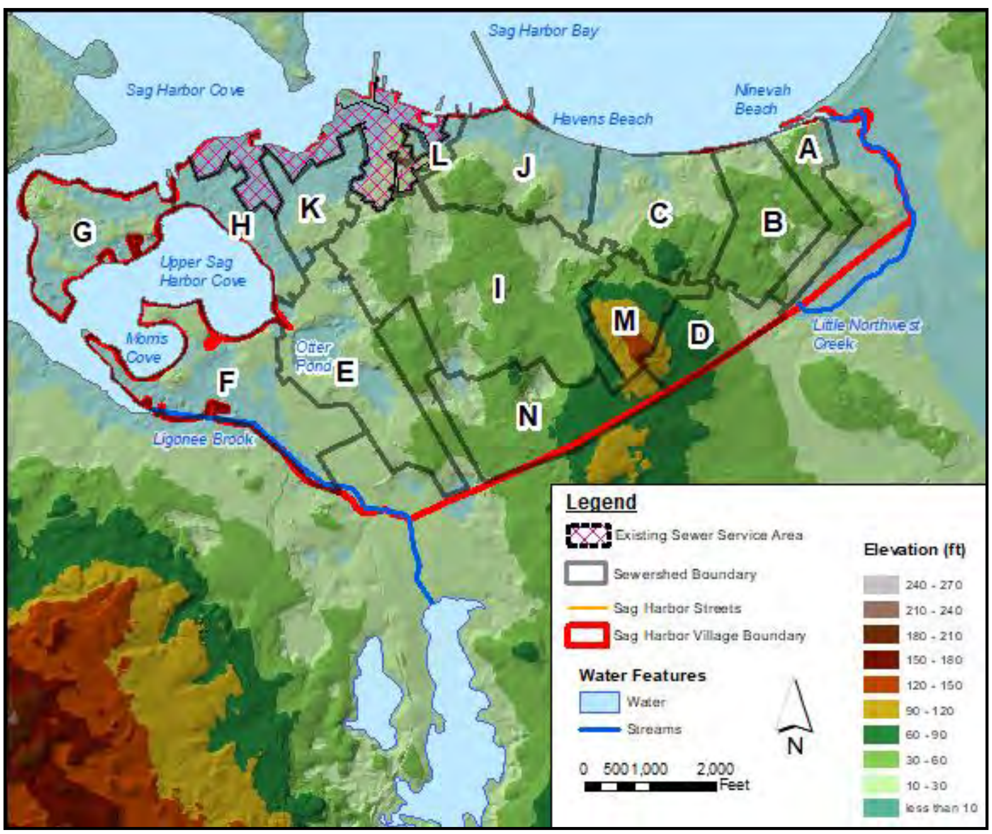


4.3. Topography and Depth to Groundwater

Much of the Village of Sag Harbor (Figure 4-5) is at low elevations (0-60 feet). Elevations below 10 feet are typically problematic for onsite wastewater treatment systems (OWTS). The County requires a minimum of two feet between the bottom of the OWTS (typically the leaching pool) and groundwater. Typical installation of OWTS places them at least 8-10 feet below grade. Many of the OWTS are located in areas of 0-10-foot elevation may therefore not meet County requirements. The County requires this separation between groundwater and OWTS to facilitate a degree of mechanical and biological treatment of the effluent by the soil and the bacteria that reside there.

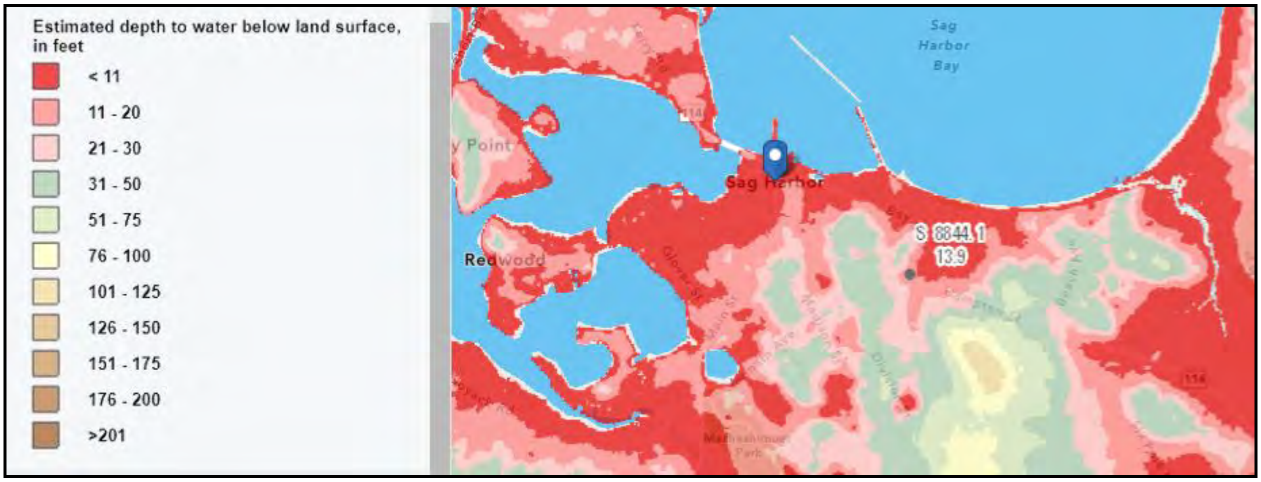
Groundwater can be relatively high near the coast particularly in areas with elevations under 10 feet. The U.S. Geologic Survey (USGS) has created an interactive map indicating the depth to groundwater below surface for Long Island[5]. A snapshot of this map is shown in Figure 4-6. This map appears consistent when comparing to the topography elevations (less than 10 ft) in Figure 4-7. Those OWTS that do not meet these County requirements may be contributing higher nitrogen loads to groundwater than systems located at higher elevations. Additionally, there is the potential to introduce coliform bacteria into the groundwater if there is minimal or no separation from the bottom of leaching pool or cesspool to the groundwater interface. Overflows of failed OWTS can lead to coliforms being introduced into stormwater systems as well during rain events.

Figure 4-5. Sag Harbor - Area Elevations



[5] USGS Long Island Depth to Water Viewer https://ny.water.usgs.gov/maps/li-dtw/

Figure 4-6. Sag Harbor - Area Depth to Groundwater (Source: USGS https://ny.water.usgs.gov/maps/li-dtw/)

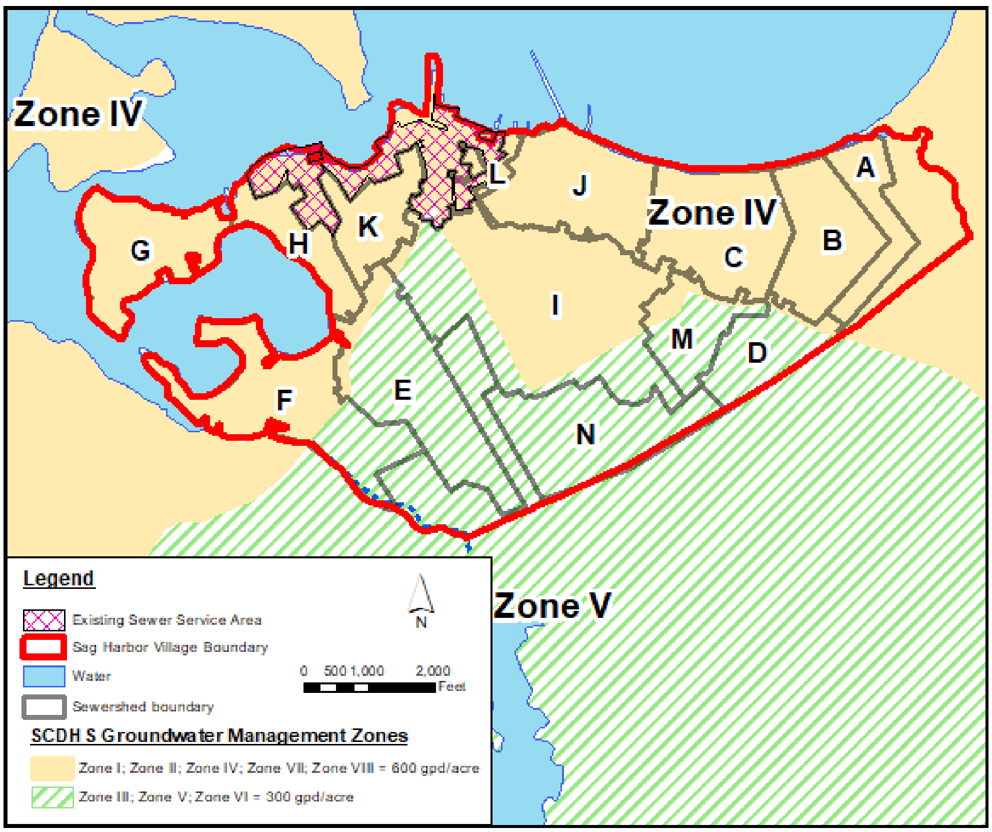


Failing onsite systems can contribute excess nitrogen and pathogens to surface waters and can be a human health concern. As failing or failed systems may have the most deleterious impact on water quality and even human health, they should be prioritized for getting upgraded treatment as compared to their upgradient neighbors.

According to the US EPA, "onsite wastewater systems (septic tanks, cesspools) that are poorly installed, improperly located, or are in close proximity to waterbodies are potential sources of human pathogens to surface water and groundwater (US EPA, 2001). Researchers demonstrated higher levels of indicator bacteria in coastal waters with increasing urban density, during dry and wet conditions (Duda & Cromartie, 1982). The authors found that OWTS densities exceeding one system per seven acres resulted in bacterial levels sufficient to cause shellfish closures. Suffolk County OWTS densities are not as conservative as this study. Within the Village of Sag Harbor, SCDHS has two designated Groundwater Management Zones. Zone IV has an allowable density of 600 gpd/acre, which is equivalent to 2 Single Family Residences (SFE) per acre. Zone V has an allowable density of 300 gpd/acre, which is equivalent to 1 SFE per acre.

These rates apply to properties that are not connected to the existing sewer service areas. Pathogens from OWTS can reach surface waters via stormwater runoff from failing OWTS or via groundwater from the leaching pool effluent that is introduced into the groundwater due to insufficient separation from bottom of leaching pool soil. OWTS located in areas with high groundwater elevation could be a source of coliform introduction into the Village's local waterways

Figure 4-7. Sag Harbor Area – Groundwater Management Zones



An estimation of the quantity of pathogens contributed by OWTS to surface water via groundwater movement depends upon on a number of factors including soil type, depth to the water table, temperature, season, and the survival rate of pathogens. Effluent from OWTS must first travel through the soil medium before reaching the water table. In 1988, researchers studied the effect of loading rate and water table depth on the absorption of OWTS contaminants (Cogger, Hajjar, Moe, & Sobsey, 1988). They found that depth to water table was the primary factor in removal of contaminants while the loading rate was a secondary factor. A 1974 paper (Bouwer, Lance, & Riggs, 1974) suggested that majority of fecal coliforms were removed in the two feet of soil between the bottom soil elevation of the OWTS and the water table.

4.4. Soils

The soil types within the Village of Sag Harbor that are indicators of a high-water table include:

- Type Bd: Berryland
- Type Mu: Muck
- Type Tm: Tidal Marsh

These types are classified as 'Very Poorly Drained'. These areas are also indicative of precluding the option to replace existing or failed OWTS with I/A systems. These soil characteristics are not favorable for additional reduction of both nitrogen and coliform bacteria.

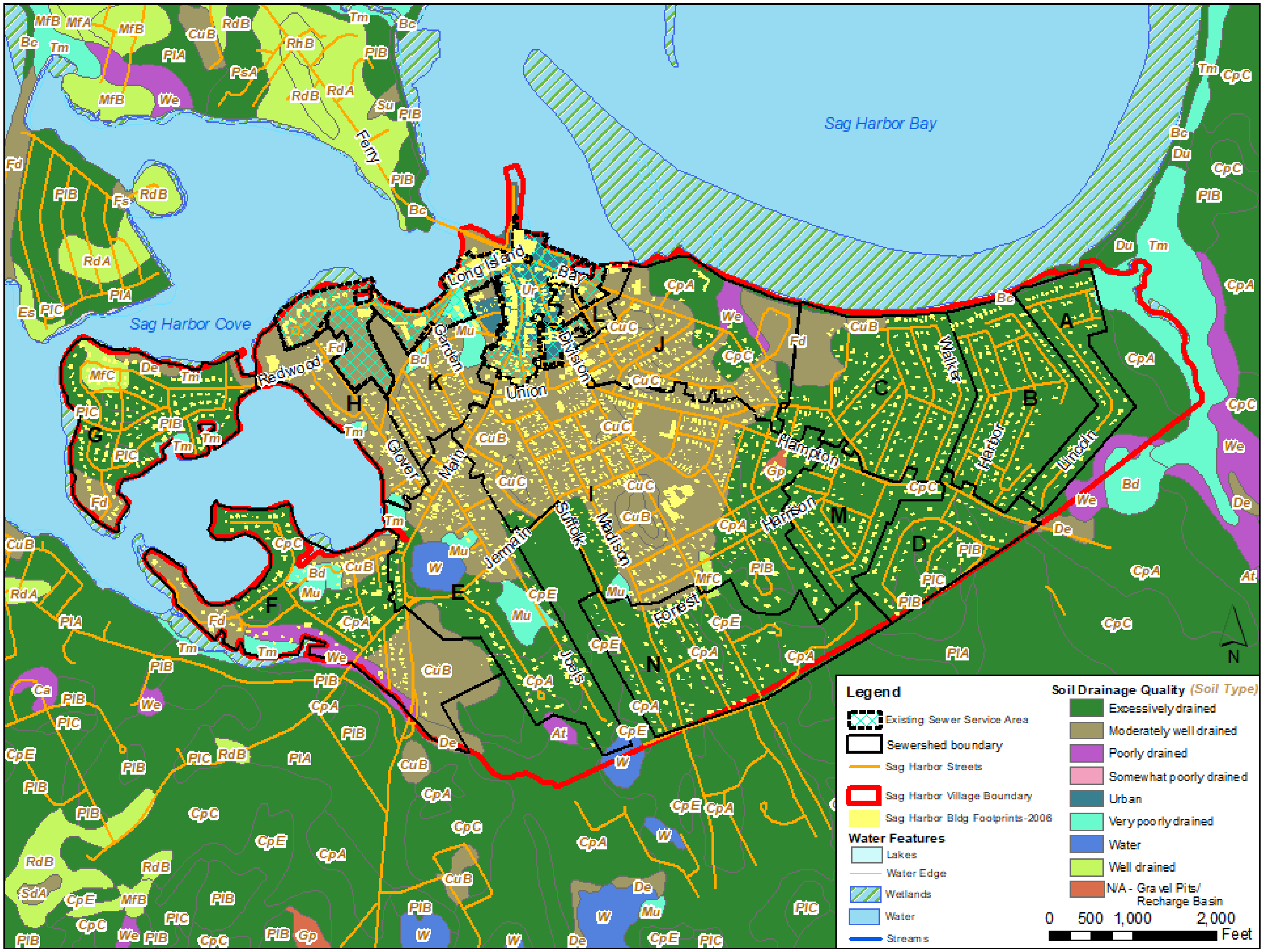
In the 2006 study (Karathanasis, Mueller, Boone, & Thompson, 2006) quantified the removal efficiencies for various soil types in their study area. They found that, through two feet of soil beneath the bottom elevation of the OWTS, pathogen removal efficiencies varied from approximately 64 percent to almost complete removal, depending upon the soil type. They determined, however, that fecal coliform removal was generally poor in all soil groups in their study, through coarse-textured soils (e.g., those with high sand content, like those present here on Long Island) performed worse than fine-textured (i.e., clayey) soils. In addition, they concluded that increasing soil depth might be ineffective for treatment of OWTS effluents, particularly in coarse-textured soils. High groundwater elevations and permeable sandy substrates are both located in the Village of Sag Harbor.

The soil types within the Village of Sag Harbor that are indicators of excessively drained soils include:

- Type Bc: Beaches
- Type CpA: Carver
- Type PlB: Plymouth

Well -draining soils are often favored for placement of leaching pools yet provide minimal treatment of the effluent from the OWTS.

Figure 4-8. Sag Harbor Area – Soils



5. Interim Findings

5.1. Existing Service Area – Findings Pending Analysis of Water Usage and Wastewater Records.

5.2. Sewershed Prioritizing

A matrix was developed to prioritize the potential sewersheds for future wastewater treatment upgrades. It is important to note that the scoring of the potential sewersheds reflects primarily the environmental impact of a particular sewershed on the overall quality of the Village's coastal waters. Below is a list of the categories of each characteristic used for scoring and the scales used to attach a value. Each category or factor will be given a value of 1, 2, or 3 and is weighted for its potential impact on the Village's water bodies. A low score would relate to a lesser impact than a higher score that would have a greater adverse impact.

❖ OWTS Effluent (Groundwater) Direction→weighted 20%
Prioritizes the waterbodies with the least flushing
- Inland Waterbody (Pond/Stream etc.) →3
- Inner Estuary (Sag Harbor Cove) →2
- Outer Estuary (Sag Harbor Bay) →1

❖ Amount of Residential Nitrogen (lbs/day)→weighted 25%
Prioritizes larger subwatersheds with less physical boundaries
- Greater than 26 lbs/day →3
- Between 13 and 26 lbs/day →2
- Below 13 lbs/day →1

- ❖ Density of Residential Nitrogen in Pounds per Day (lbs/day/acre)→weighted 20%

  Prioritizes the potential sewersheds that have densities exceeding SCDHS Groundwater Management standards (0.163 lbs/acre = 1 SFE)

  - Greater than 0.326 lbs/acre →3
  - Between 0.163 and 0.326 lbs/acre →2
  - Below 0.163 lbs/acre →1

- ❖ Depth to Groundwater (G/W): Arithmetic Average of High and Low (ft)→weighted 15%

  Prioritizes high groundwater subwatersheds

  - Less than 10 ft →3
  - Between 10 and 30 ft →2
  - Greater than 30 ft →1

- ❖ Percent of Non-Vacant Parcels in 0-2 years G/W Contributing Area→weighted 15%

  Prioritizes the potential subwatersheds with the higher percentage of parcels in this area

  - Greater than 67% →3
  - Between 33% and 67% →2
  - Less than 33% →1

- ❖ Number. of Buildings (2006) in or within 10ft of Very Poorly Drained Soils→weighted 5%

  Very Poorly Drained Soils include types such as Muck, Berryland and Tidal Marsh. Based on age of OWTS, if installed prior to 1980, alternative soil may not have been installed around OWTS, as is required in current installations.

Prioritizing those potential sewersheds with buildings on or within 10 ft of these soil types.

- Greater than 5 bldgs →3
- 1,2,3 or 4 bldgs →2
- Zero bldgs →1

5.3. Matrix Results

The following Figures are the results of the matrix based on the catergories described in the prior section. Sewersheds with the higher score, indicate a higher priortiy for upgrading OWTS within the respective sewershed boundary. Individual Scoresheets for the potential sewersheds are located in Appendix A.

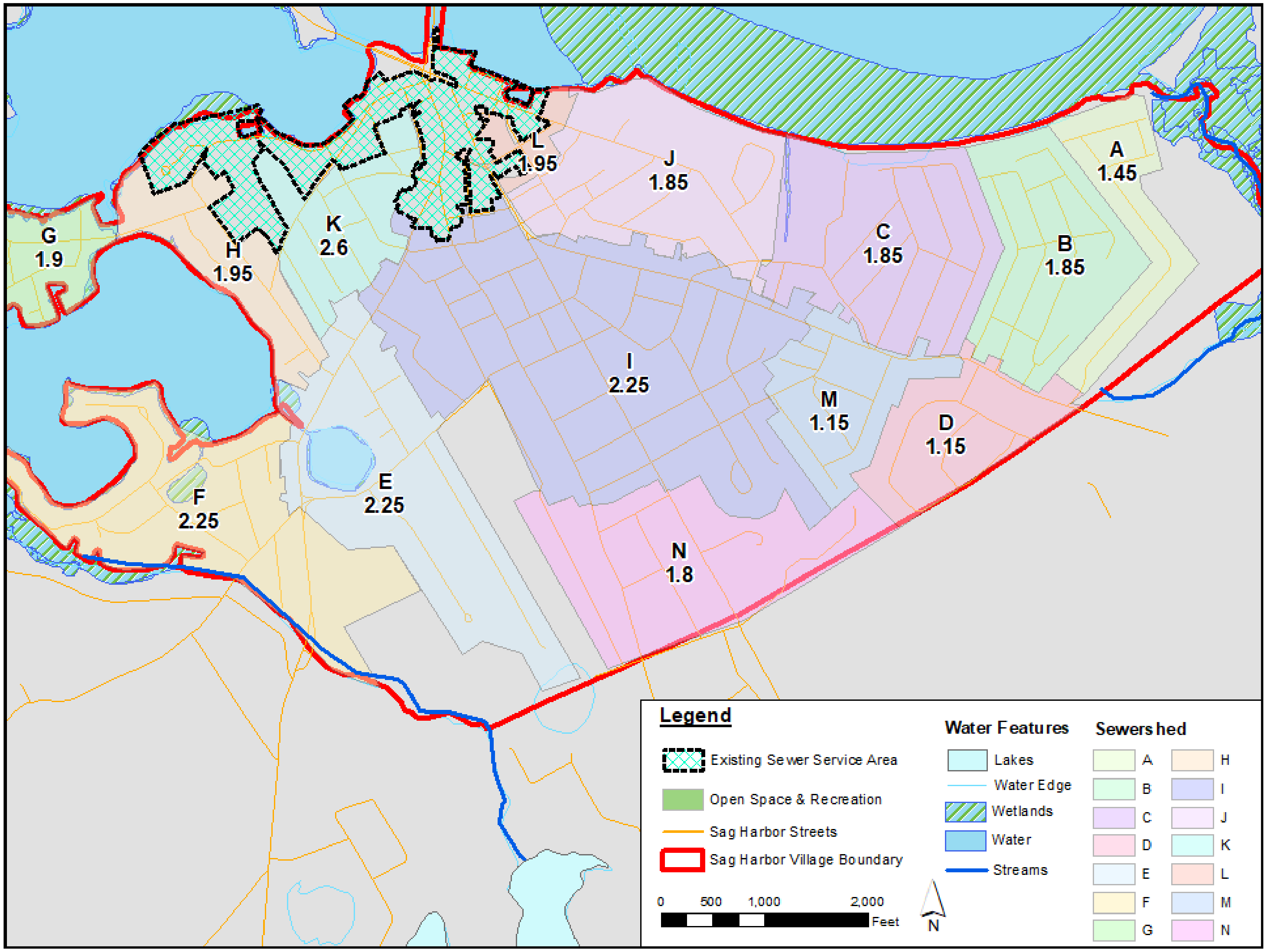
Figure 5-1. Sag Harbor Sewershed Matrix (sorted by Area Name)

	Sewershed Characteristics	Effluent (G/W) Direction		Amount of Nitrogen: Residential (lbs/day)		Density of Nitrogen (lbs/day/acre)		High Groundwater: Arith. Avg Depth to GW (ft)		Percent of Non-Vacant Parcels in 0-2 yr G/W Contributing Area		No. of Bldgs (2006) in or within 10 ft of Very Poor Drained Soils		Totals:
	Weighting	*(unweighted)*	**20%**	*(unweighted)*	**25%**	*(unweighted)*	**20%**	*(unweighted)*	**15%**	*(unweighted)*	**15%**	*(unweighted)*	**5%**	**100%**
Sewershed Area	A	*1*	**0.2**	*1*	**0.25**	*2*	**0.4**	1	**0.15**	3	**0.45**	2	**0.1**	**1.45**
	B	*1*	**0.2**	*2*	**0.5**	*2*	**0.4**	2	**0.3**	3	**0.45**	1	**0.05**	**1.85**
	C	*1*	**0.2**	*2*	**0.5**	*2*	**0.4**	2	**0.3**	3	**0.45**	1	**0.05**	**1.85**
	D	*1*	**0.2**	*1*	**0.25**	*2*	**0.4**	1	**0.15**	1	**0.15**	1	**0.05**	**1.15**
	E	*3*	**0.6**	*2*	**0.5**	*2*	**0.4**	2	**0.3**	3	**0.45**	2	**0.1**	**2.25**
	F	*3*	**0.6**	*2*	**0.5**	*2*	**0.4**	2	**0.3**	3	**0.45**	3	**0.15**	**2.25**
	G	*2*	**0.4**	*2*	**0.5**	*2*	**0.4**	2	**0.3**	2	**0.3**	2	**0.1**	**1.9**
	H	*2*	**0.4**	*1*	**0.25**	*2*	**0.4**	3	**0.45**	3	**0.45**	2	**0.1**	**1.95**
	I	*3*	**0.6**	*3*	**0.75**	*3*	**0.6**	1	**0.15**	1	**0.15**	2	**0.1**	**2.25**
	J	*1*	**0.2**	*2*	**0.5**	*2*	**0.4**	2	**0.3**	3	**0.45**	1	**0.05**	**1.85**
	K	*3*	**0.6**	*2*	**0.5**	*3*	**0.6**	3	**0.45**	3	**0.45**	3	**0.15**	**2.6**
	L	*1*	**0.2**	*1*	**0.25**	*3*	**0.6**	3	**0.45**	3	**0.45**	1	**0.05**	**1.95**
	M	*1*	**0.2**	*1*	**0.25**	*2*	**0.4**	1	**0.15**	1	**0.15**	1	**0.05**	**1.15**
	N	*3*	**0.6**	*2*	**0.5**	*2*	**0.4**	1	**0.15**	1	**0.15**	1	**0.05**	**1.8**
Scales	**3**	Inland		**26**	- +	**0.326**	- +	**0**	- 10	**67%**	- +	**5**	- +	
	2	Inner		**13**	- 26	**0.163**	- 0.326	**10**	- 30	**33%**	- 67%	**0**	- 5	
	1	Outer		**0**	- 13	**0**	- 0.163	**30**	- +	**0%**	- 33%		- 0	

Figure 5-2. Sag Harbor Sewershed Matrix (sorted by sewershed scores)

	Sewershed Characteristics	Effluent (G/W) Direction		Amount of Nitrogen: Residential (lbs/day)		Density of Nitrogen (lbs/day/acre)		High Groundwater: Arith. Avg Depth to GW (ft)		Percent of Non-Vacant Parcels in 0-2 yr G/W Contributing Area		No. of Bldgs (2006) in or within 10 ft of Very Poor Drained Soils		Totals:
	Weighting	*(unweighted)*	20%	*(unweighted)*	25%	*(unweighted)*	20%	*(unweighted)*	15%	*(unweighted)*	15%	*(unweighted)*	5%	100%
Sewershed Area	K	*3*	**0.6**	*2*	**0.5**	*3*	**0.6**	3	**0.45**	3	**0.45**	3	**0.15**	**2.6**
	E	*3*	**0.6**	*2*	**0.5**	*2*	**0.4**	2	**0.3**	3	**0.45**	2	**0.1**	**2.25**
	F	*3*	**0.6**	*2*	**0.5**	*2*	**0.4**	2	**0.3**	3	**0.45**	3	**0.15**	**2.25**
	I	*3*	**0.6**	*3*	**0.75**	*3*	**0.6**	1	**0.15**	1	**0.15**	2	**0.1**	**2.25**
	H	*2*	**0.4**	*1*	**0.25**	*2*	**0.4**	3	**0.45**	3	**0.45**	2	**0.1**	**1.95**
	L	*1*	**0.2**	*1*	**0.25**	*3*	**0.6**	3	**0.45**	3	**0.45**	1	**0.05**	**1.95**
	G	*2*	**0.4**	*2*	**0.5**	*2*	**0.4**	2	**0.3**	2	**0.3**	2	**0.1**	**1.9**
	B	*1*	**0.2**	*2*	**0.5**	*2*	**0.4**	2	**0.3**	3	**0.45**	1	**0.05**	**1.85**
	C	*1*	**0.2**	*2*	**0.5**	*2*	**0.4**	2	**0.3**	3	**0.45**	1	**0.05**	**1.85**
	J	*1*	**0.2**	*2*	**0.5**	*2*	**0.4**	2	**0.3**	3	**0.45**	1	**0.05**	**1.85**
	N	*3*	**0.6**	*2*	**0.5**	*2*	**0.4**	1	**0.15**	1	**0.15**	1	**0.05**	**1.8**
	A	*1*	**0.2**	*1*	**0.25**	*2*	**0.4**	1	**0.15**	3	**0.45**	2	**0.1**	**1.45**
	D	*1*	**0.2**	*1*	**0.25**	*2*	**0.4**	1	**0.15**	1	**0.15**	1	**0.05**	**1.15**
	M	*1*	**0.2**	*1*	**0.25**	*2*	**0.4**	1	**0.15**	1	**0.15**	1	**0.05**	**1.15**
Scales	**3**	Inland		**26**	- +	**0.326**	- +	**0**	- 10	**67%**	- +	**5**	- +	
	2	Inner		**13**	- 26	**0.163**	- 0.326	**10**	- 30	**33%**	- 67%	**0**	- 5	
	1	Outer		**0**	- 13	**0**	- 0.163	**30**	- +	**0%**	- 33%		- 0	

Figure 5-3. Sag Harbor Sewershed Map with Matrix Scores



6. Next Steps

1. Review delineation (boundaries) of potential sewersheds with Sewer Committee.
2. Review the matrix factors and scoring methodology of potential sewersheds with Sewer Committee.
3. Determine the best course of action for improving wastewater management in the sewersheds that had scores showing the highest priority.
    a. Complete water usage to sewage flow relationship for connected parcels within the sewer service areas
    b. Discussion of options for connecting highly ranked sewersheds to STP
        i. With gravity pipes (central pump station if needed)
        ii. With low-pressure sewers
        iii. Other
    c. Discuss options for decentralized treatment areas
        i. Treat wastewater with Village approved I/A system(s)
        ii. Treat/transfer wastewater with other treatment technologies (ie. STEP)
        iii. Other alternatives
    d. Inventory existing OWTS – determine if cesspools or septic tanks (post 1972)
4. Cost Options
    a. Determine amount of nitrogen that can be removed in each sewershed by the various treatment options
    b. Determine an economy of scale for each option
    c. Develop a comparable unit cost→"cost per pound of nitrogen removed"
    d. Advise on cost options that are Village wide (i.e. annual costs that may include a OWTS at the required frequency).

APPENDIX A

Sewershed Checklist

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	A				
Total Acreage	34.6				
Receiving Water	~~Otter Pond~~	~~Morris Cove~~	~~Upper Sag Harbor~~	~~Ligonee Brook~~	
	~~Sag Harbor Cove~~	Sag Harbor Bay	~~Havens Beach~~	Ninevah Beach	
Town located in	East Hampton	~~Southampton~~			
Zoning Classifications	R20				
No. Single Family Residences	58				
No. of Multi-Family	0				
No. of Commercial Properties	0				
No. Buildable Vacant Residential Properties	4				
Estimated Residential Sewage[1]	17,400	Gallons Per Day			
Estimated Residential Nitrogen[2]	9.454	Pounds per Day			
Estimated Residential Nitrogen per Acre	0.273	Pounds per Day per Acre			
Distance to Nearest SSA	5,700	Linear Feet			
Min Depth to Groundwater	4	Feet			
Min Depth to Groundwater	58	Feet			
Arithmetic Average	31	Feet			
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)	
Travel Time to Surface Water	0-2	Years	53	19.73	
	2-5	Years			
	~~5-10~~	Years			
	~~10-25~~	Years			
	~~25-50~~	Years			
	total non-vacant etc... parcels		58		

Notes: 1 - use SCDHS factor of 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	**B**				
Total Acreage	**62.3**				
Receiving Water	~~Otter Pond~~	~~Morris Cove~~	~~Upper Sag Harbor~~	~~Ligonee Brook~~	
	~~Sag Harbor Cove~~	**Sag Harbor Bay**	**Havens Beach**	~~Ninevah Beach~~	
Town located in	**East Hampton**	~~Southampton~~			
Zoning Classifications	**R20**				
No. Single Family Residences	**114**				
No. of Multi-Family	**0**				
No. of Commercial Properties	**0**				
No. Buildable Vacant Residential Properties	**1**				
Estimated Residential Sewage[1]	**34,200**	Gallons Per Day			
Estimated Residential Nitrogen[2]	**18.582**	Pounds per Day			
Estimated Residential Nitrogen per Acre	**0.298**	Pounds per Day per Acre			
Distance to Nearest SSA	**5,000**	Linear Feet			
Min Depth to Groundwater	**5**	Feet			
Min Depth to Groundwater	**51**	Feet			
Arithmetic Average	**28**	Feet			
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)	
Travel Time to Surface Water	**0-2**	Years	107	32.16	
	2-5	Years			
	~~**5-10**~~	Years			
	~~**10-25**~~	Years			
	~~**25-50**~~	Years			
	total non-vacant etc... parcels		114		

Notes:
1 - use SCDHS factor of 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	**C**			
Total Acreage	**82.4**			
Receiving Water	~~Otter Pond~~	~~Morris Cove~~	~~Upper Sag Harbor~~	~~Ligonee Brook~~
	~~Sag Harbor Cove~~	**Sag Harbor Bay**	**Havens Beach**	~~Ninevah Beach~~
Town located in	**East Hampton**	~~Southampton~~		

Zoning Classifications	**R20**			
No. Single Family Residences	**150**			
No. of Multi-Family	**0**			
No. of Commercial Properties	**1**			
No. Buildable Vacant Residential Properties	**3**			
Estimated Residential Sewage[1]	**45,000**	Gallons Per Day		
Estimated Residential Nitrogen[2]	**24.45**	Pounds per Day		
Estimated Residential Nitrogen per Acre	**0.297**	Pounds per Day per Acre		
Distance to Nearest SSA	**3,000**	Linear Feet		
Min Depth to Groundwater	**2**	Feet		
Min Depth to Groundwater	**57**	Feet		
Arithmetic Average	**29.5**	Feet		
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	**0-2**	Years	139	47.94
	2-5	Years		
	~~**5-10**~~	Years		
	~~**10-25**~~	Years		
	~~**25-50**~~	Years		
	total non-vacant etc... parcels		152	

Notes:
1 - use SCDHS factor of 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	**D**				
Total Acreage	**42.1**				
Receiving Water	~~Otter Pond~~	~~Morris Cove~~		~~Upper Sag Harbor~~	~~Ligonee Brook~~
	~~Sag Harbor Cove~~	**Sag Harbor Bay**		**Havens Beach**	~~Ninevah Beach~~
Town located in	**East Hampton**	~~Southampton~~			
Zoning Classifications		**R20**			
No. Single Family Residences		**61**			
No. of Multi-Family		**0**			
No. of Commercial Properties		**0**			
No. Buildable Vacant Residential Properties		**1**			
Estimated Residential Sewage[1]		**18,300**	Gallons Per Day		
Estimated Residential Nitrogen[2]		**9.943**	Pounds per Day		
Estimated Residential Nitrogen per Acre		**0.236**	Pounds per Day per Acre		
Distance to Nearest SSA		**4,800**	Linear Feet		
Min Depth to Groundwater		**4**	Feet		
Min Depth to Groundwater		**101**	Feet		
Arithmetic Average		**52.5**	Feet		
				No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water		~~**0-2**~~	Years	1	0.136
		2-5	Years		
		5-10	Years		
		~~**10-25**~~	Years		
		~~**25-50**~~	Years		
		total non-vacant etc... parcels		61	

Notes:
1 - use SCDHS factor of 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	E				
Total Acreage	96.4				
Receiving Water	Otter Pond	Morris Cove		Upper Sag Harbor	~~Ligonee Brook~~
	Sag Harbor Cove	~~Sag Harbor Bay~~		~~Havens Beach~~	~~Ninevah Beach~~
Town located in	~~East Hampton~~	Southampton			
Zoning Classifications	R20				
No. Single Family Residences	110				
No. of Multi-Family	9				
No. of Commercial Properties	3				
No. Buildable Vacant Residential Properties	1				
Estimated Residential Sewage[1]	38,400	Gallons Per Day			
Estimated Residential Nitrogen[2]	20.864	Pounds per Day			
Estimated Residential Nitrogen per Acre	0.216	Pounds per Day per Acre			
Distance to Nearest SSA	1,040	Linear Feet			
Min Depth to Groundwater	2	Feet			
Min Depth to Groundwater	34	Feet			
Arithmetic Average	18	Feet			
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)	
Travel Time to Surface Water	0-2	Years	105	45.15	
	2-5	Years			
	5-10	Years			
	~~10-25~~	Years			
	~~25-50~~	Years			
	total non-vacant etc... parcels		127		

Notes:
1 - use SCDHS factor of 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	**F**			
Total Acreage	**100.3**			
Receiving Water	~~Otter Pond~~	**Morris Cove**	**Upper Sag Harbor**	**Ligonee Brook**
	Sag Harbor Cove	~~Sag Harbor Bay~~	~~Havens Beach~~	~~Ninevah Beach~~
Town located in	~~East Hampton~~	**Southampton**		

Zoning Classifications	**R20**	
No. Single Family Residences	**110**	
No. of Multi-Family	**9**	
No. of Commercial Properties	**1**	
No. Buildable Vacant Residential Properties	**4**	
Estimated Residential Sewage[1]	**38,400**	Gallons Per Day
Estimated Residential Nitrogen[2]	**20.864**	Pounds per Day
Estimated Residential Nitrogen per Acre	**0.208**	Pounds per Day per Acre
Distance to Nearest SSA	**2,440**	Linear Feet
Min Depth to Groundwater	**2**	Feet
Min Depth to Groundwater	**27**	Feet
Arithmetic Average	**14.5**	Feet

			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	**0-2**	Years	118	71.26
	2-5	Years		
	~~**5-10**~~	Years		
	~~**10-25**~~	Years		
	~~**25-50**~~	Years		
	total non-vacant etc... parcels		122	

Notes:
1 - use SCDHS factor of 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	**G**			
Total Acreage	**66**			
Receiving Water	~~Otter Pond~~	**Morris Cove**	**Upper Sag Harbor**	~~Ligonee Brook~~
	Sag Harbor Cove	~~Sag Harbor Bay~~	~~Havens Beach~~	~~Ninevah Beach~~
Town located in	~~East Hampton~~	**Southampton**		
Zoning Classifications	**R20, WF**			
No. Single Family Residences	**121**			
No. of Multi-Family	**2**			
No. of Commercial Properties	**1**			
No. Buildable Vacant Residential Properties	**2**			
Estimated Residential Sewage[1]	**37,500**	Gallons Per Day		
Estimated Residential Nitrogen[2]	**20.375**	Pounds per Day		
Estimated Residential Nitrogen per Acre	**0.309**	Pounds per Day per Acre		
Distance to Nearest SSA	**1,325**	Linear Feet		
Min Depth to Groundwater	**4**	Feet		
Min Depth to Groundwater	**35**	Feet		
Arithmetic Average	**19.5**	Feet		
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	**0-2**	Years	78	35.52
	~~**2-5**~~	Years		
	~~**5-10**~~	Years		
	~~**10-25**~~	Years		
	~~**25-50**~~	Years		
	total non-vacant etc... parcels		124	

Notes:
1 - use SCDHS factor of 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	H			
Total Acreage	34.3			
Receiving Water	~~Otter Pond~~	Morris Cove	Upper Sag Harbor	~~Ligonee Brook~~
	Sag Harbor Cove	~~Sag Harbor Bay~~	~~Havens Beach~~	~~Ninevah Beach~~
Town located in	~~East Hampton~~	Southampton		

Zoning Classifications	R20, WF			
No. Single Family Residences	46			
No. of Multi-Family	6			
No. of Commercial Properties	2			
No. Buildable Vacant Residential Properties	1			
Estimated Residential Sewage[1]	17,400	Gallons Per Day		
Estimated Residential Nitrogen[2]	9.454	Pounds per Day		
Estimated Residential Nitrogen per Acre	0.276	Pounds per Day per Acre		
Distance to Nearest SSA	Borders	Linear Feet		
Min Depth to Groundwater	5	Feet		
Min Depth to Groundwater	11	Feet		
Arithmetic Average	8	Feet		
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	0-2	Years	52	24.95
	~~2-5~~	Years		
	~~5-10~~	Years		
	~~10-25~~	Years		
	~~25-50~~	Years		
	total non-vacant etc... parcels		52	

Notes: 1 - use SCDHS factor of 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	I				
Total Acreage	193.9				
Receiving Water	Otter Pond	Morris Cove	Upper Sag Harbor	Ligonee Brook	
	Sag Harbor Cove	Sag Harbor Bay	Havens Beach	Ninevah Beach	
Town located in	East Hampton	Southampton			
Zoning Classifications	R20				
No. Single Family Residences	406				
No. of Multi-Family	36				
No. of Commercial Properties	13				
No. Buildable Vacant Residential Properties	15				
Estimated Residential Sewage[1]	143,400	Gallons Per Day			
Estimated Residential Nitrogen[2]	77.914	Pounds per Day			
Estimated Residential Nitrogen per Acre	0.402	Pounds per Day per Acre			
Distance to Nearest SSA	Borders	Linear Feet			
Min Depth to Groundwater	5	Feet			
Min Depth to Groundwater	56	Feet			
Arithmetic Average	30.5	Feet			
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)	
Travel Time to Surface Water	0-2	Years	106	29.85	
	2-5	Years			
	5-10	Years			
	10-25	Years			
	25-50	Years			
	total non-vacant etc... parcels		466		

Notes:
1 - use SCDHS factor of 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	**J**				
Total Acreage	**76.8**				
Receiving Water	~~Otter Pond~~	~~Morris Cove~~	~~Upper Sag Harbor~~	~~Ligonee Brook~~	
	~~Sag Harbor Cove~~	**Sag Harbor Bay**	**Havens Beach**	~~Ninevah Beach~~	
Town located in	**East Hampton**	~~Southampton~~			
Zoning Classifications	**R20, WF**				
No. Single Family Residences	**114**				
No. of Multi-Family	**1**				
No. of Commercial Properties	**2**				
No. Buildable Vacant Residential Properties	**1**				
Estimated Residential Sewage[1]	**34,800**	Gallons Per Day			
Estimated Residential Nitrogen[2]	**18.908**	Pounds per Day			
Estimated Residential Nitrogen per Acre	**0.246**	Pounds per Day per Acre			
Distance to Nearest SSA	**230**	Linear Feet			
Min Depth to Groundwater	**0**	Feet			
Min Depth to Groundwater	**44**	Feet			
Arithmetic Average	**22**	Feet			
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)	
Travel Time to Surface Water	**0-2**	Years	123	56.583	
	~~2-5~~	Years			
	~~5-10~~	Years			
	~~10-25~~	Years			
	~~25-50~~	Years			
	total non-vacant etc… parcels		123		

Notes:
1 - use SCDHS factor of 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	**K**				
Total Acreage	**38.4**				
Receiving Water	**Otter Pond**	**Morris Cove**	**Upper Sag Harbor**	~~Ligonee Brook~~	
	Sag Harbor Cove	~~Sag Harbor Bay~~	~~Havens Beach~~	~~Ninevah Beach~~	
Town located in	~~East Hampton~~	**Southampton**			
Zoning Classifications	**R20, RM, VB, OD**				
No. Single Family Residences	**84**				
No. of Multi-Family	**7**				
No. of Commercial Properties	**8**				
No. Buildable Vacant Residential Properties	**3**				
Estimated Residential Sewage[1]	**29,400**	Gallons Per Day			
Estimated Residential Nitrogen[2]	**15.974**	Pounds per Day			
Estimated Residential Nitrogen per Acre	**0.416**	Pounds per Day per Acre			
Distance to Nearest SSA	**borders**	Linear Feet			
Min Depth to Groundwater	**0**	Feet			
Min Depth to Groundwater	**20**	Feet			
Arithmetic Average	**10**	Feet			
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)	
Travel Time to Surface Water	**0-2**	Years	92	21.93	
	2-5	Years			
	~~5-10~~	Years			
	~~10-25~~	Years			
	~~25-50~~	Years			
	total non-vacant etc... parcels		103		

Notes:
1 - use SCDHS factor of 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	L			
Total Acreage	8.7			
Receiving Water	~~Otter Pond~~	~~Morris Cove~~	~~Upper Sag Harbor~~	~~Ligonee Brook~~
	~~Sag Harbor Cove~~	**Sag Harbor Bay**	~~Havens Beach~~	~~Ninevah Beach~~
Town located in	**East Hampton**	**Southampton**		

Zoning Classifications	**R20, VB, OD**			
No. Single Family Residences	**23**			
No. of Multi-Family	**0**			
No. of Commercial Properties	**3**			
No. Buildable Vacant Residential Properties	**0**			
Estimated Residential Sewage[1]	**6,900**	Gallons Per Day		
Estimated Residential Nitrogen[2]	**3.749**	Pounds per Day		
Estimated Residential Nitrogen per Acre	**0.431**	Pounds per Day per Acre		
Distance to Nearest SSA	**borders**	Linear Feet		
Min Depth to Groundwater	**4**	Feet		
Min Depth to Groundwater	**14**	Feet		
Arithmetic Average	**9**	Feet		
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	**0-2**	Years	25	5.55
	~~2-5~~	Years		
	~~5-10~~	Years		
	~~10-25~~	Years		
	~~25-50~~	Years		
	total non-vacant etc... parcels		25	

Notes:
1 - use SCDHS factor of 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	**M**			
Total Acreage	**40.5**			
Receiving Water	~~Otter Pond~~	~~Morris Cove~~	~~Upper Sag Harbor~~	~~Ligonee Brook~~
	~~Sag Harbor Cove~~	**Sag Harbor Bay**	**Havens Beach**	~~Ninevah Beach~~
Town located in	**East Hampton**	~~Southampton~~		
Zoning Classifications	**R20**			

No. Single Family Residences	**78**			
No. of Multi-Family	**0**			
No. of Commercial Properties	**0**			
No. Buildable Vacant Residential Properties	**2**			
Estimated Residential Sewage[1]	**23,400**	Gallons Per Day		
Estimated Residential Nitrogen[2]	**12.714**	Pounds per Day		
Estimated Residential Nitrogen per Acre	**0.314**	Pounds per Day per Acre		
Distance to Nearest SSA	**borders**	Linear Feet		
Min Depth to Groundwater	**28**	Feet		
Min Depth to Groundwater	**123**	Feet		
Arithmetic Average	**75.5**	Feet		
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	**0-2**	Years	19	8.92
	2-5	Years		
	5-10	Years		
	10-25	Years		
	~~25-50~~	Years		
	total non-vacant etc… parcels		78	

Notes:
1 - use SCDHS factor of 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	N			
Total Acreage	83.16			
Receiving Water	Otter Pond	Morris Cove	Upper Sag Harbor	Ligonee Brook
	Sag Harbor Cove	Sag Harbor Bay	Havens Beach	Ninevah Beach
Town located in	East Hampton	Southampton		
Zoning Classifications	R20			

No. Single Family Residences	93			
No. of Multi-Family	1			
No. of Commercial Properties	0			
No. Buildable Vacant Residential Properties	5			
Estimated Residential Sewage[1]	28,500	Gallons Per Day		
Estimated Residential Nitrogen[2]	15.485	Pounds per Day		
Estimated Residential Nitrogen per Acre	0.186	Pounds per Day per Acre		
Distance to Nearest SSA	3,000	Linear Feet		
Min Depth to Groundwater	6	Feet		
Min Depth to Groundwater	80	Feet		
Arithmetic Average	43	Feet		
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	~~0-2~~	Years		
	2-5	Years		
	5-10	Years		
	10-25	Years		
	25-50	Years		
	total non-vacant etc... parcels		94	

Notes:
1 - use SCDHS factor of 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day

Village of Sag Harbor
Update No.1
Master Plan & Grant Application
for the Town of East Hampton
Date: February 22, 2021

Overview:

Since issuance of Interim Report of the Sewer Master Plan, there have been several revisions resulting from discussions with the Sewer Committee. Specific steps completed to date include:

1. Adjustments in sewershed boundaries resulting in two (2) new sewersheds, “O” and “P”. See attached Exhibit 1.
2. Refinement of sewershed scoresheets based on groundwater elevation and direction of flow.
3. Development of unit cost template for both gravity sewers and low-pressure sewers (LPS).
4. Rescoring of sewersheds with revised scoresheets. This has resulted in some changes in rankings however sewersheds “K” & “L” remain at top of most critical sewersheds, revised sewershed “I” has moved up into the top 3 critical sewersheds. See Exhibit 2 attached.
5. Using the cost template (Item 3) we developed preliminary costs for sewering of sewersheds K, L and I. See Exhibit 3 attached.
6. Due to high construction cost for Sewershed “I”, the Village could consider phasing of sewer service area extensions and focus on the sewering of “K” and “L”.
7. With respect to capital costs for LPS system, the cost for the purchase and installation of individual residential/commercial LPS pump station has not been included. It is estimated that a single-family unit would cost approximately $15,000 to purchase and install. Commercial units may cost more depending on the size of the unit (flow capacity).
8. Proper abandonment of the existing OWTS is also not included in the capital cost estimates for sewering of the three (3) sewersheds. It is estimated that to properly clean and fill existing cesspool could on the order of $5,000.
9. Progress Report 2 will touch on a number of items originally planned including:

    a. Treatment plant upgrades
    b. Relocation of outfall to north side of breakwater
    c. Relocation of treatment plant
    d. Sewering of areas not to be connected to STP

At this point, the Master Plan is at a sufficient point to shift from conducting more detailed planning activities to the initiation of the steps towards the sewering of the three (3) most critical sewersheds. These steps could include:

- Complete and issue draft Master Plan
- Prepare detailed boundaries of the sewersheds
- Perform walk through of proposed areas to be sewered with Village DPW/Sewer Committee
- Prepare long form Environmental Assessment Form (EAF)
- Conduct meetings with Sewer Committee and Village Board
- Hold public information meeting(s)
- Initiate development of the Map & Plan
- Consult with Village Attorney on extension of the existing sewer service areas to accommodate the new sewersheds
- Notify both NYSDEC and SCDHS of proposed expansions of sewer service areas

Concurrent with these activities, the Village should submit a grant application for the detailed design of the sewer service areas expansion.

Grant Application:

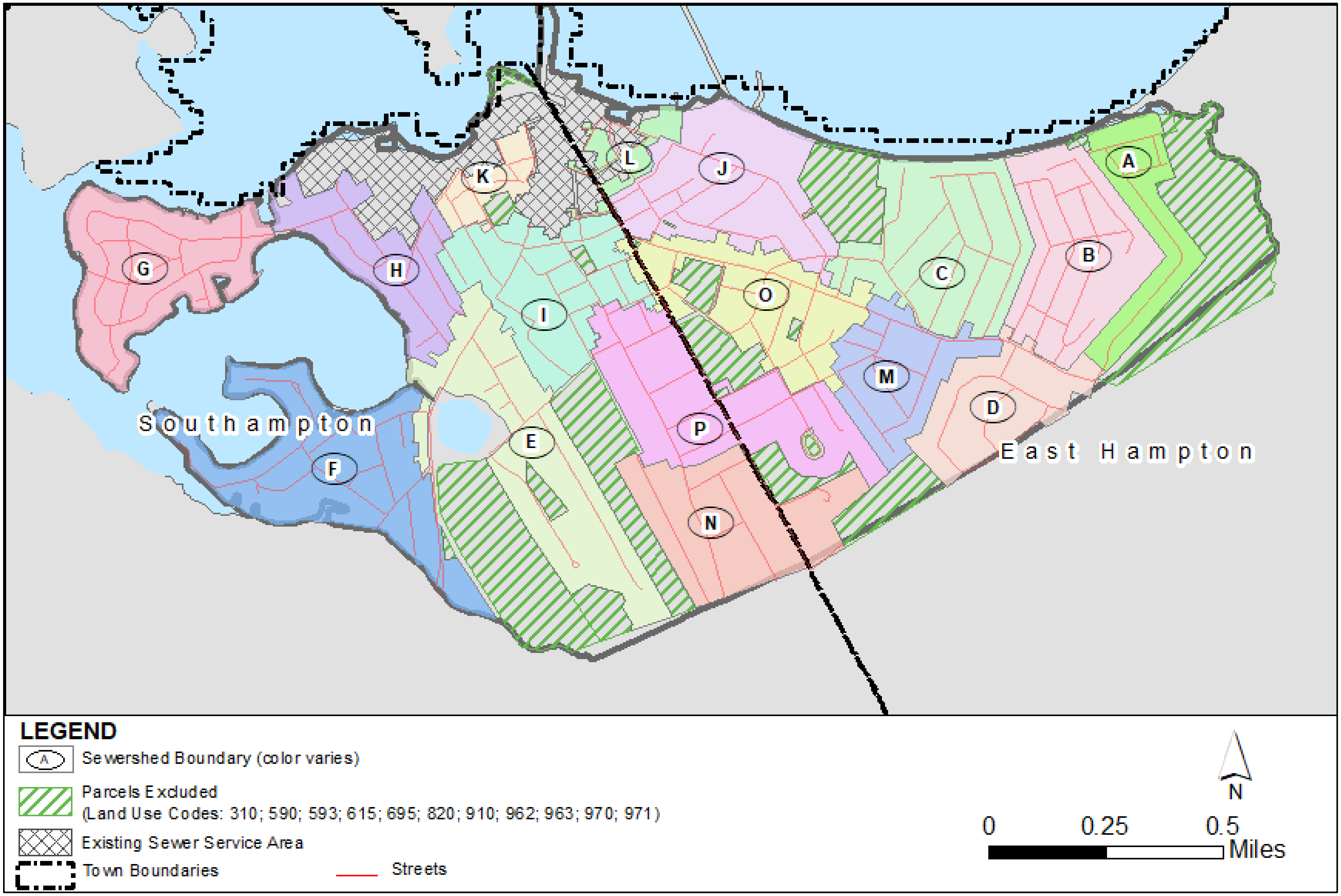
The grant application should be for the development of the detailed design documents (Contract Documents) for the selected sewersheds. Activities to be included in the grant application are:

1. Conduct soil borings (3-5) within proposed sewersheds
2. Conduct detailed topographic survey of the sewersheds
3. Prepare engineering report
4. Prepare detailed plans & specifications
5. Submit to regulatory agencies and respond to technical comments

The costs of these activities will be dependent on the extent of the sewering. One option is to only conduct design on only K and L sewersheds, other option is to get engineering completed on the 3 sewersheds ("I") so that the work is done and could be bid at a later date. Strategy is to position the Village for future construction grants.

K:\C2850-2899\CE2871-003 Sag Harbor Master Plan\Progress Report No.2\Comm 2021\LetterHead -Memo Feb 22 2021.docx

EXHIBIT 1

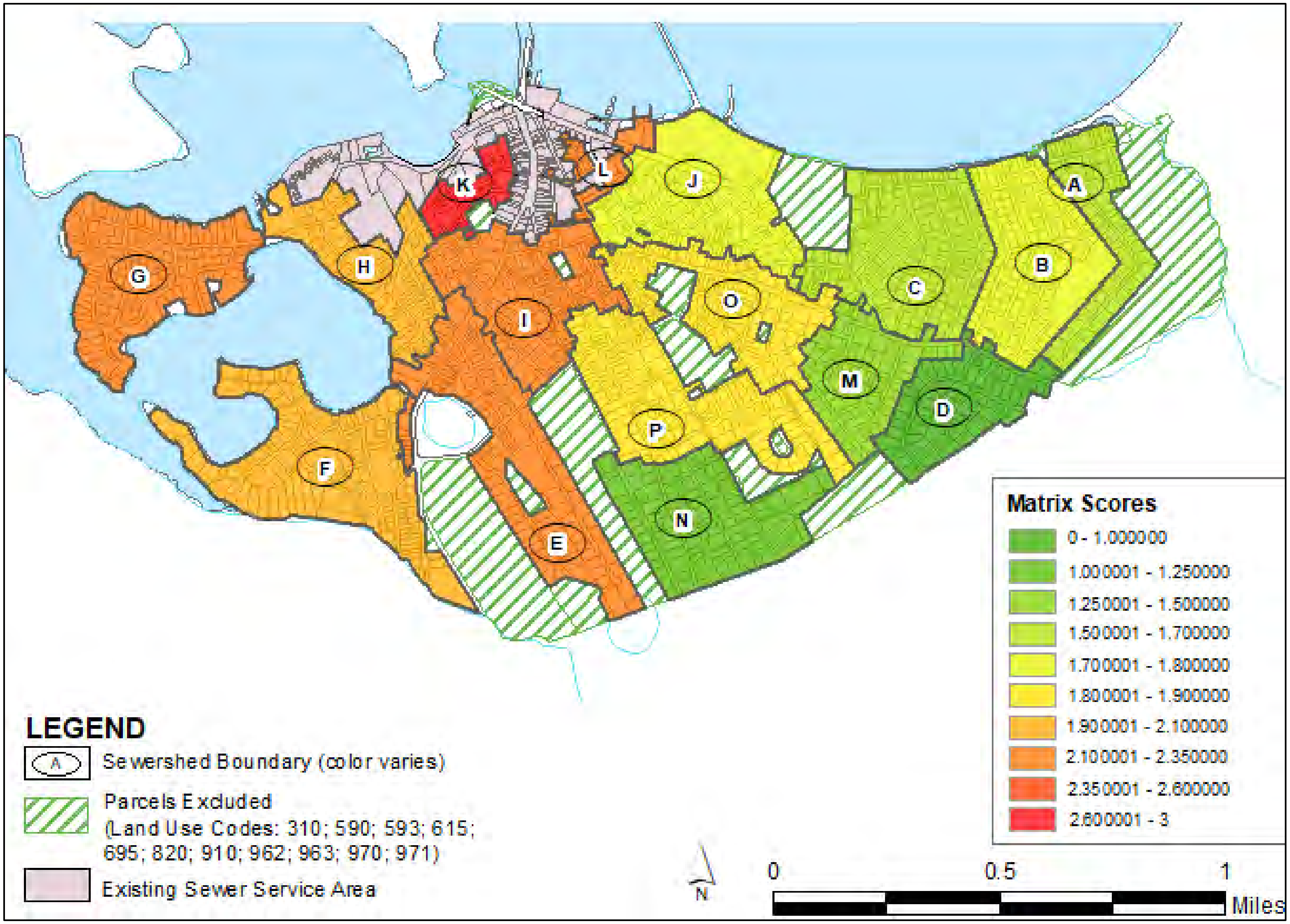


G
H
K
L
J
A
B
C
O
I
M
D
P
E
F
N
Southampton
East Hampton
LEGEND
Sewershed Boundary (color varies)
Parcels Excluded
(Land Use Codes: 310; 590; 593; 615; 695; 820; 910; 962; 963; 970; 971)
Existing Sewer Service Area
Town Boundaries
Streets
N
0
0.25
0.5
Miles

EXHIBIT 2

	Sewershed Characteristics	OWTS Effluent (G/W) Direction		Density of Nitrogen (lbs/day/acre)		High Groundwater: Arith. Avg Depth to GW (ft)		Percent of Non-Vacant Parcel Area in 0-2 yr G/W Contributing Area		No. of Bldgs (2006) in or within 10 ft of Very Poor Drained Soils		Totals:
	Weighting	*(unweighted)*	25%	*(unweighted)*	40%	*(unweighted)*	15%	*(unweighted)*	10%	*(unweighted)*	10%	100%
Sewershed Area	A	*1*	**0.25**	*2*	**0.8**	1	**0.15**	3	**0.3**	2	**0.2**	**1.7**
	B	*1*	**0.25**	*2*	**0.8**	2	**0.3**	3	**0.3**	1	**0.1**	**1.75**
	C	*1*	**0.25**	*2*	**0.8**	1	**0.15**	3	**0.3**	1	**0.1**	**1.6**
	D	*1*	**0.25**	*1*	**0.4**	1	**0.15**	1	**0.1**	1	**0.1**	**1**
	E	*3*	**0.75**	*2*	**0.8**	2	**0.3**	3	**0.3**	2	**0.2**	**2.35**
	F	*3*	**0.75**	*1*	**0.4**	2	**0.3**	3	**0.3**	3	**0.3**	**2.05**
	G	*3*	**0.75**	*2*	**0.8**	2	**0.3**	2	**0.2**	2	**0.2**	**2.25**
	H	*3*	**0.75**	*1*	**0.4**	3	**0.45**	3	**0.3**	2	**0.2**	**2.1**
	I	*2*	**0.5**	*3*	**1.2**	2	**0.3**	2	**0.2**	1	**0.1**	**2.3**
	J	*1*	**0.25**	*2*	**0.8**	2	**0.3**	3	**0.3**	1	**0.1**	**1.75**
	K	*3*	**0.75**	*3*	**1.2**	3	**0.45**	3	**0.3**	3	**0.3**	**3**
	L	*1*	**0.25**	*3*	**1.2**	3	**0.45**	3	**0.3**	1	**0.1**	**2.3**
	M	*1*	**0.25**	*2*	**0.8**	1	**0.15**	1	**0.1**	1	**0.1**	**1.4**
	N	*2*	**0.5**	*1*	**0.4**	1	**0.15**	1	**0.1**	1	**0.1**	**1.25**
	O	*1*	**0.25**	*3*	**1.2**	1	**0.15**	2	**0.2**	1	**0.1**	**1.9**
	P	*2*	**0.5**	*2*	**0.8**	2	**0.3**	1	**0.1**	2	**0.2**	**1.9**
Scales	**3**	Inner		**0.6**	- +	**0**	- 10	**67%**	- +	**9**	- +	
	2	Inner & Outer		**0.3**	- 0.6	**10**	- 30	**33%**	- 67%	**0**	- 9	
	1	Outer		**0**	- 0.3	**30**	- +	**0%**	- 33%		- 0	

EXHIBIT 3



K
L
J
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C
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M
D
P
F
N
E
Matrix Scores
0 - 1.000000
1.000001 - 1.250000
1.250001 - 1.500000
1.500001 - 1.700000
1.700001 - 1.800000
1.800001 - 1.900000
1.900001 - 2.100000
2.100001 - 2.350000
2.350001 - 2.600000
2.600001 - 3
LEGEND
Sewershed Boundary (color varies)
Parcels Excluded
(Land Use Codes: 310; 590; 593; 615; 695; 820; 910; 962; 963; 970; 971)
Existing Sewer Service Area
N
0
0.5
1
Miles

EXHIBIT 4

Budget Year (June 1 - May 31)	2017-2018	2018-2019	2019-2020	at 0.125 MGD
Annual WWTP Budget (O&M)	$ 682,852	$ 661,785	$ 660,522	$ 900,000
Estimated Annual Flow (MGY)	27.33	28.07	23.02	45.63
Est. Average Daily Flow (MGD)	0.075	0.077	0.063	0.125
Est. Inf TN lbs per year (based on 45 mg/L)	10,257	10,535	8,639	17,125
Est. Eff TN lbs per year (based on monthly averages)	1,618	1,724	823	3,159
Est. TN lbs removed per year	8,639	8,811	7,816	13,966
Est. Cost per lb TN removed (O&M)	***$ 79.04***	***$ 75.11***	***$ 84.51***	***$ 64.44***

	SubwaterShed ID	I	K	L
Gravity Collection Pipe	Gravity Pipe Length (ft)	7,800		2,886
	HC pipe length (20'/parcel)	2,700		660
	Total Pipe=	10,500		3,546
	Est. Cost of Gravity Pipe ($597/ft)	$ 6,268,500		$ 2,116,962
	Annual Debt Service (20 yr@ 4%APY)	$ 461,247		$ 155,770
	# Parcels Served by Grav	135		33
	Flow Served by Grav (gpd)	52,098		9,812
	Estimated lbs N per day	20		4
	Estimated lbs N removed by WWTP per day	17.8		3.4
	Estimated lbs N removed annually	6,502		1,225
	Annual Debt Service Cost per lb N	$ 71		$ 127
	Annual O&M Cost per lb N removed	$ 64		$ 64
	Annual Cost per lb N removed	$ 135		$ 191
LPS Collection Pipe*	LPS Length (ft)	3,771	2,954	
	HC pipe length (20'/parcel)	960	880	
	Total Pipe=	4,731	3,834	
	Est. Cost per LPS Pipe ($72/ft)	$ 340,632	$ 276,012	
	Annual Debt Service (20 yr@ 4%APY)	$ 25,064	$ 20,309	
	# Parcels Served by LPS	48	44	
	Flow Served by LPS (gpd)	16,120	12,346	
	Estimated lbs N per day	6	5	
	Estimated lbs N removed by WWTP per day	5.5	4.2	
	Estimated lbs N removed annually	2,012	1,541	
	Annual Debt Service Cost per lb N	$ 12	$ 13	
	Annual O&M Cost per lb N removed	$ 64	$ 64	
	Annual Cost per lb N removed	$ 76	$ 77	

*Requires individual pump stations to pump to LPS pipe and individual O&M costs to be incurred by parcel owner as compared to gravity sewer.

Village of Sag Harbor

Town of Southampton CPF Round 3 award $72,400

Sewer Master Plan

Scope of work

March 3, 2021

Overview:

The Village of Sag Harbor has embarked on the development of a Sewer Master Plan that will assist the Village in determining its future wastewater treatment needs. Proper planning of managing wastewater within the Village's boundaries will provide the protection of its surface waters by reducing contaminant loading to the waterways while continuing to support a vibrant economy based on tourism and water related activities.

The Village conducted a procurement process to select Cameron Engineering & Associates, LLP of Woodbury to develop the Sewer Master Plan (Plan). The total cost of the Plan is $145,800. The Village applied for and obtained a grant of $72,400 from the Town of East Hampton. This grant allowed for the Village to initiate the development of the Plan. An Interim Report (copy attached to this grant application) has been completed using the funds from the Town of East Hampton grant. Recognizing that the grant from the Town of East Hampton was insufficient to complete the entire Plan, the Village Sewer Committee and Cameron Engineering conducted a Kick-off Meeting and identified and selected several critical items to be evaluated. The intent was to work with the available funding and to advance as far as possible on the following key items:

1. Determine Available Capacity of Sewage Treatment Plant
2. Potential Buildout within existing Sewer Service Areas
3. Identify Potential Sewersheds Boundaries
4. Develop a Matrix for Ranking of Potential Sewersheds
5. Identify Cost of Nitrogen Reduction

The work conducted and detailed in the Interim Report was able to satisfactorily accomplish Items No.1 through No.4. The Interim Report made significant progress on identifying and evaluating the key components and foundation of the Master Plan. The Interim Report concluded with a list of proposed “Next Step Items”. These included:

1. Review delineation (boundaries) of potential sewersheds with Sewer Committee.
2. Review the matrix factors and scoring methodology of potential sewersheds with Sewer Committee.
3. Determine the best course of action for improving wastewater management in the sewersheds that had scores showing the highest priority.
    a. Complete water usage to sewage flow relationship for connected parcels within the sewer service areas
    b. Discussion of options for connecting highly ranked sewersheds to STP
        i. With gravity pipes (central pump station if needed)
        ii. With low-pressure sewers
        iii. Other
    c. Discuss options for decentralized treatment areas
        i. Treat wastewater with Village approved I/A system(s)
        ii. Treat/transfer wastewater with other treatment technologies (ie. STEP)
        iii. Other alternatives
    d. Inventory existing OWTS – determine if cesspools or septic tanks (post 1972)
4. Cost Options
    a. Determine amount of nitrogen that can be removed in each sewershed by the various treatment options
    b. Determine an economy of scale for each option
    c. Develop a comparable unit cost→”cost per pound of nitrogen removed”

d. Advise on cost options that are Village wide (i.e. annual costs that may include a OWTS at the required frequency).

A meeting with the Sewer Committee to discuss the findings of Interim Report and the proposed action items was productive and provided insight as to how best to proceed upon receipt of the grant from the Town of Southampton.

Refinement of Project Goals:

During discussions with the Sewer Committee it became clear that due to the progress made and detailed in the Interim Report, as well as cost efficiencies realized, that an opportunity to refine the Master Plan's original scope should be considered. The refinement of the scope of work will be appropriate and beneficial to the overall goal of the Village implementing measures to protect its waterways in a timely manner. Toward that end a deliverable has been added to define and commence detailed analysis of measures to sewer the most critical sewersheds within the Village. This effort will advance the Village to a state of readiness for sewering.

Deliverable 1 – Master Plan Completion

With the goal of advancing the Master Plan to identify specific locations for sewering based on the scientific analysis established in the Interim Report, the following scope items were identified for completion of the Master Plan:

1. Review sewershed boundaries for adjustment in size and application of enhanced factors.
    a. New factors to include change of overall nitrogen in a sewershed to amount of nitrogen per acre, density proving to be more important than total pounds.
    b. Refinement of effluent from OWTS to specific waterbodies using LIDAR and groundwater elevations.
2. Rescoring and ranking of sewersheds.
3. Evaluation of sewering methods; gravity, low-pressure, Septage Tank Effluent Pumping (STEP) and vacuum collection.

4. Evaluating improvements at the wastewater treatment facility for climate change and process upgrades.
5. Evaluating relocation of the existing plant outfall to outside breakwater.
6. Considerations for the relocation of the existing treatment plant.
7. Preparing cost analyses for nitrogen removal at the WWTP.
8. Identifying methods for sewering of top ranked sewersheds.
9. Preparing preliminary cost estimates for sewering of top ranked sewersheds.
10. Prepare Findings and Recommendations section of Master Plan.
11. Issue draft and final Sewer Master Plan

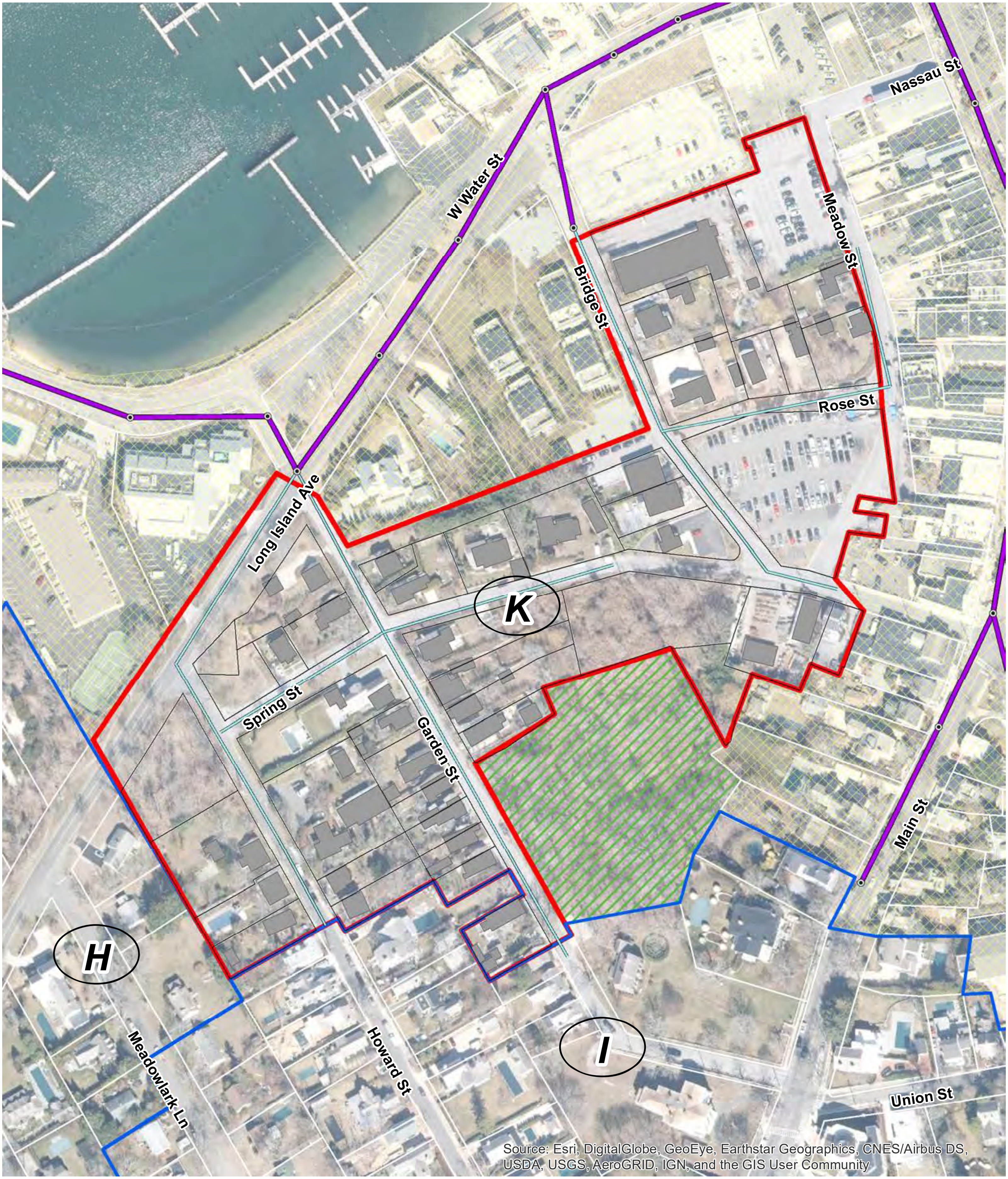
Deliverable 2 – Map and Plan for priority sewersheds:

Cameron Engineering working with the Village's Sewer Committee will undertake the following tasks:

1. Meet with Sewer Committee to review Findings & Recommendations as stated in the draft Master Plan.
2. Proceed to develop a Map & Plan for the sewering of Sewersheds "K" and "L". Specific sub-tasks;
    a. Identify specific boundaries and parcels to receive sewers,
    b. Prepare GIS maps and exhibits showing boundaries of sewer extension areas,
    c. Identify specific methods of sewering,
    d. Prepare cost estimates for new sewers, including both construction and engineering design costs for Plans and Specifications,
    e. Identify Village share of costs and parcel owners' share of costs,
    f. Assist Village in conducting public information sessions,
    g. Confer/assist with Village Attorney on extension of Sewer Service Areas
    h. Complete a Long Form Environmental Assessment Form
    i. Communicate with New York State Department of Environmental Conservation and Suffolk County Department of Health Services

3. Assist Village in pursuing grant opportunities

It is believed that the Map & Plan will be a significant step towards advancing the acceptance of the Master Plan and setting the groundwork for the detailed design and preparation of Contract Documents. Having construction documents ready and approved by the appropriate regulatory agencies will enhance the Village's position for securing grants and funding issued by local, state and federal agencies.



LEGEND

A Proposed Sewershed Boundary*

K Proposed Sewershed Boundary 'K' *

Sewershed 'K' - Bldg Footprints (2006 data)

Existing Sewer Service Area

Parcels Excluded

Ex. Gravity Sewer

Ex. Gravity MH

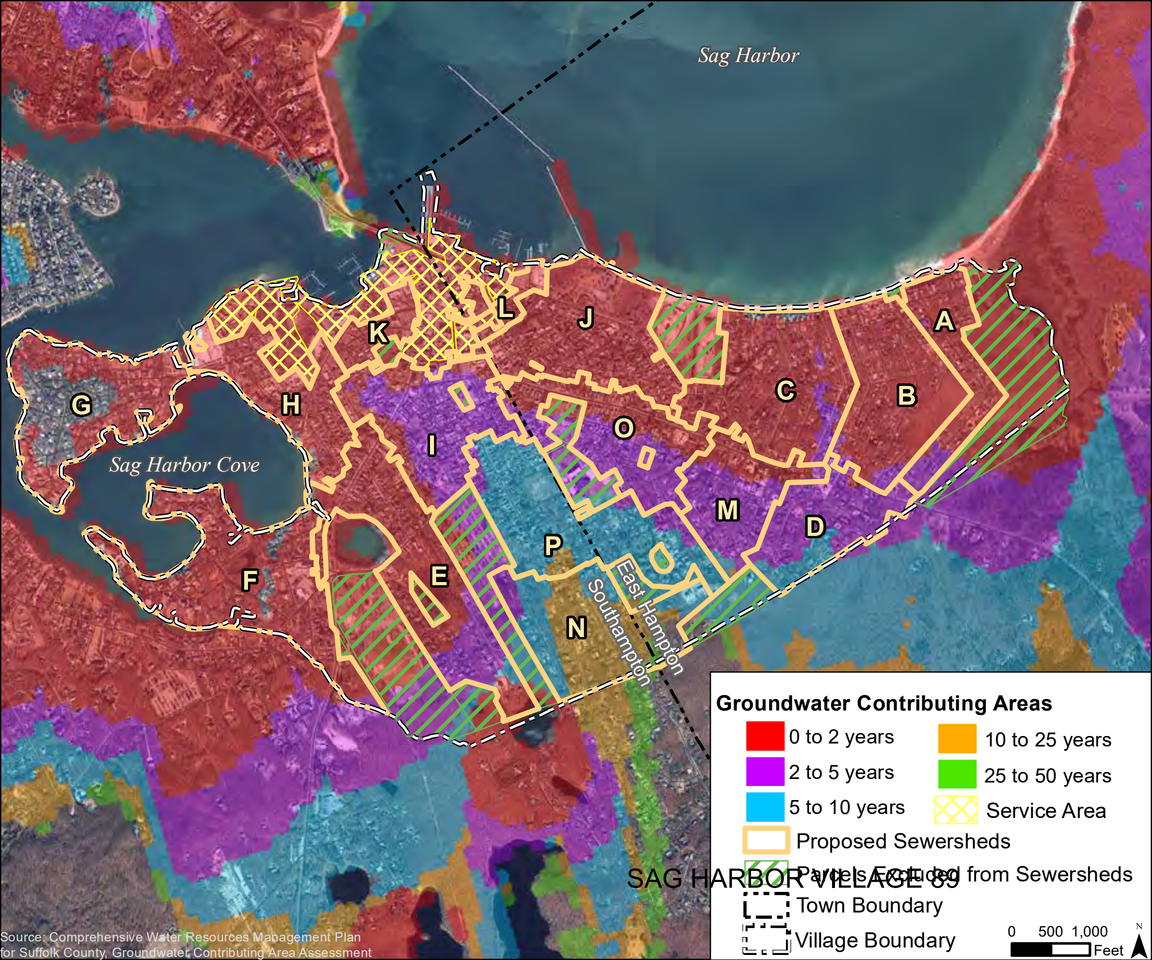
Prop. Low Pressure Sewer in 'K'

N

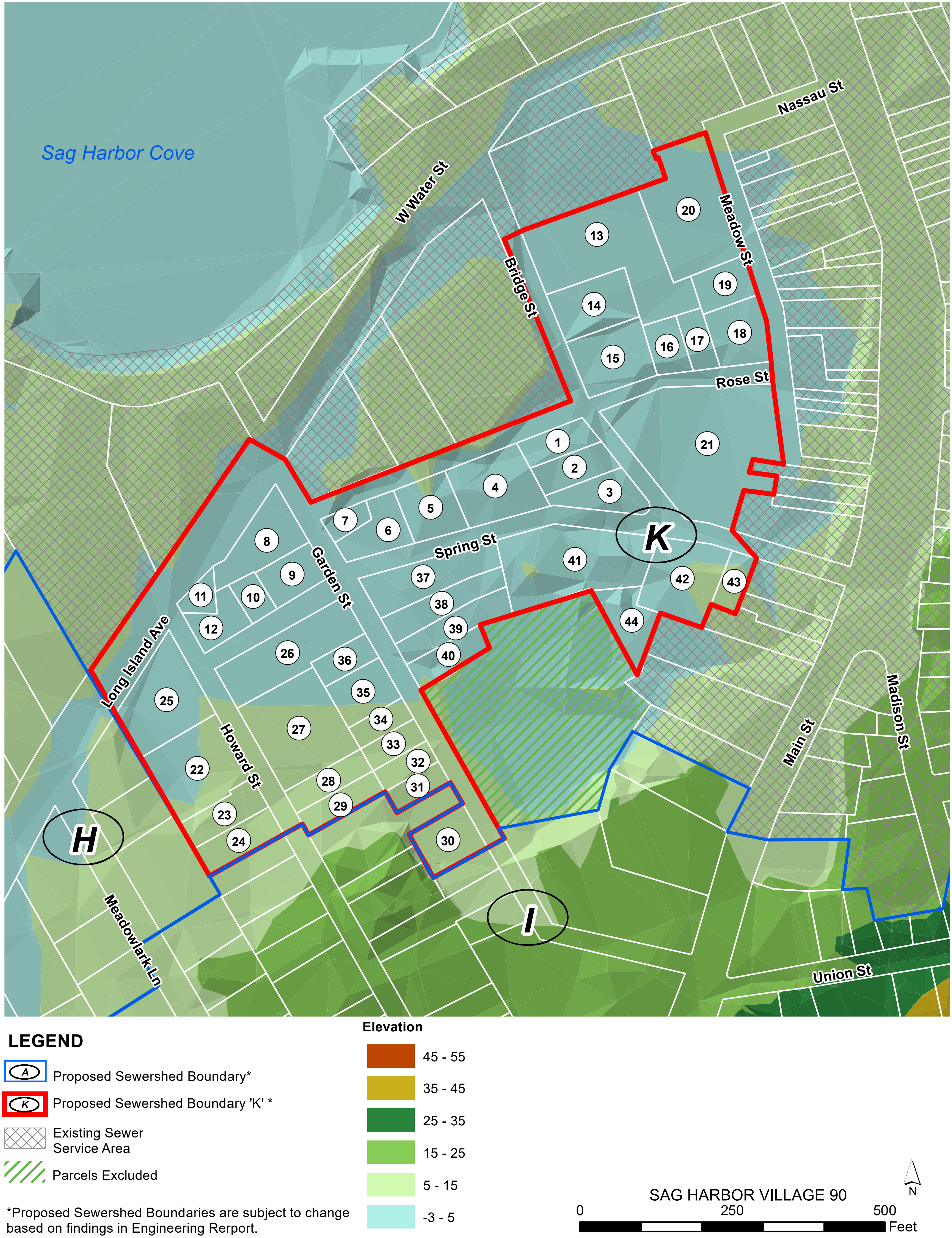
SAG HARBOR VILLAGE 88

0 250 500 Feet

*Proposed Sewershed Boundaries are subject to change based on findings in Engineering Rerport.



SAG HARBOR VILLAGE 89


Sag Harbor Cove
W Water St
Bridge St
Nassau St
Meadow St
Rose St
Spring St
Garden St
Long Island Ave
Howard St
Meadowlark Ln
Main St
Madison St
Union St
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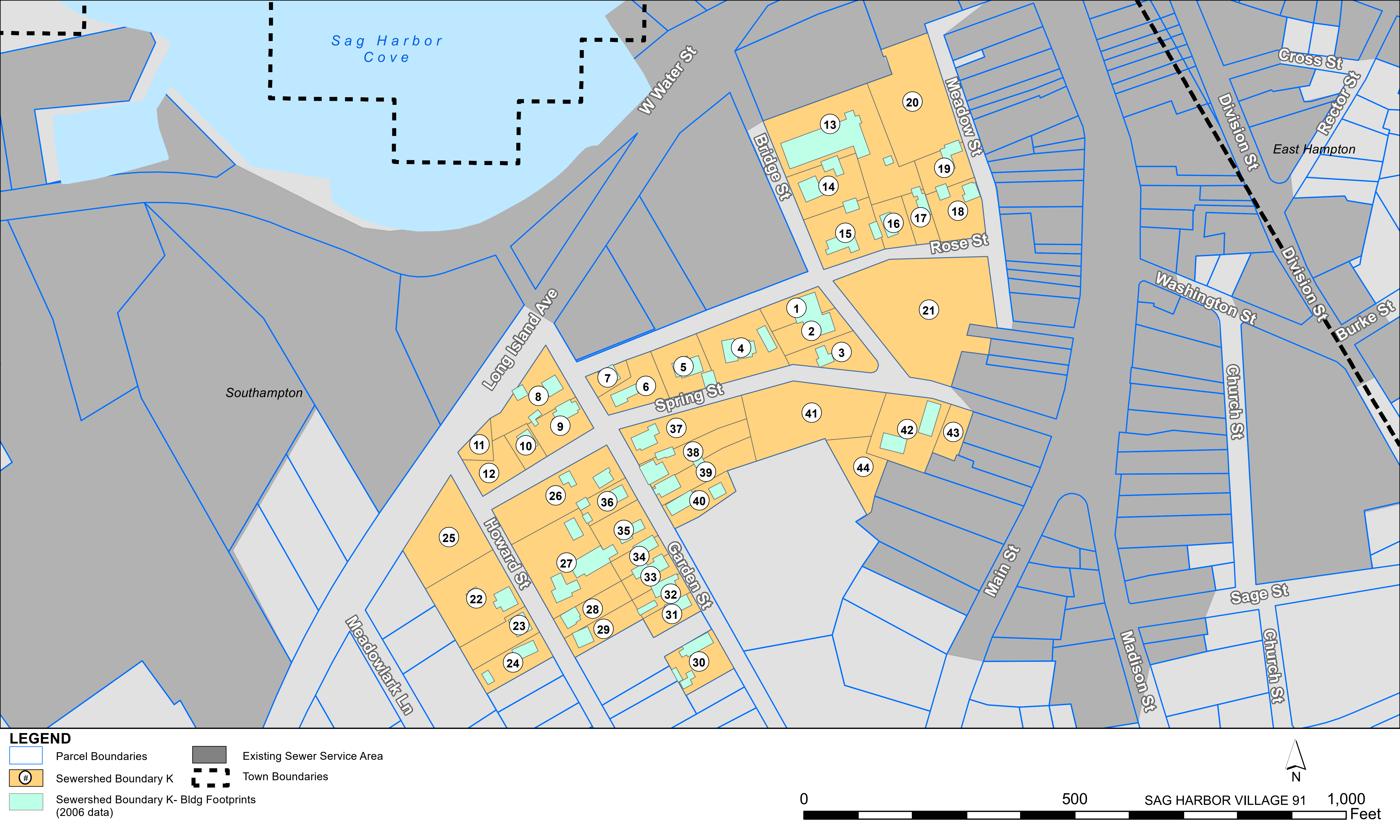
LEGEND
A Proposed Sewershed Boundary*
K Proposed Sewershed Boundary 'K' *
Existing Sewer Service Area
Parcels Excluded
*Proposed Sewershed Boundaries are subject to change based on findings in Engineering Rerport.
Elevation
45 - 55
35 - 45
25 - 35
15 - 25
5 - 15
-3 - 5
N
SAG HARBOR VILLAGE 90
0
250
500
Feet



SAG HARBOR VILLAGE 91

East End Beacon
news for the twin forks.

Announcements Environment

Sag Harbor Launches Water Quality Initiative

June 4, 2018 Beth Young 0 Comments

Sunset from the Sag Harbor bridge.

Sag Harbor's economy and quality of life is dependent on the health of its harbors and bays, and the village is seeing disturbing changes in its waterways.

The Sag Harbor Water Quality Initiative, a public/private partnership anchored by the Village of Sag Harbor and the Sag Harbor Yacht Club, has launched this spring, in an attempt to counter these changes.

The Initiative has received a proposal from Stony Brook University School of Marine and Atmospheric Sciences to professionally and comprehensively evaluate local waters, placing five monitoring stations throughout Sag Harbor to test for harmful algae, pathogenic bacteria and nutrient overload.

The monitoring stations will also track temperature, salinity, dissolved oxygen, pH and chlorophyll A.

The goal, according to the Initiative, is to measure current impacts of harmful algae and the environment the waters are providing for future harmful algae and bacterial growth.

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This Morning's Bulletin — 3.9.20
Updates: Coronavirus Hits the East End
Editorial: Better Lives for Women
On Women's Vital Role in Migration

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atmospheric deposition, birds and surface runoff.

In order to get grants for remediation, the program will provide data that demonstrates whether there is a measurable problem. To date that has not been done in a systematic, inclusive and consistent manner.

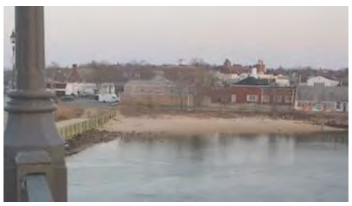
Unfortunately, Community Preservation Funds are not available for testing.

The Initiative is halfway to raising $52,358 for the project, and is looking fro community support. You can contribute online using this form.

View Pledge Form

Share this:

Related



Sag Harbor Unveils Plans for Waterfront Park Named for John Steinbeck

March 9, 2016
In "Community"

Understanding the Drinking Water Beneath Our Feet

June 12, 2017
In "Environment"

This Morning's Bulletin — 6.4.18

June 4, 2018
In "Morning Bulletin"

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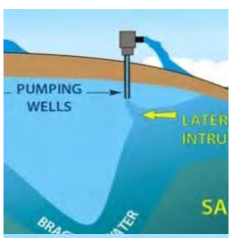
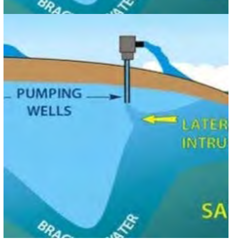


Water Authority Launches Series of Water Quality Talks

The Suffolk County Water Authority will host the first meeting of a planned ten-year public…



SCWA to Host Sag Harbor Water Forum

The Suffolk County Water Authority will hold the third installment of its public education initiative…

Sag Harbor Budget Vote

The Sag Harbor School district is putting up a $36.9 million budget May 20, up…

← This Morning's Bulletin — 6.1.18

Fishing in Tune with Nature & People →

Sag Harbor Begins to Weigh Expanding Sewer Plant Service Area

By **Peter Boody (https://sagharborexpress.com/author/peterboody/)** - February 6, 2019

(https://sagharborexpress.com/wp-content/uploads/2019/02/IMG_8635-2.jpg)

Public Works Superintendent Dee Yardley holds a sample of treated waste water for testing in the sewage plant's lab. Peter Boody photo

Sag Harbor's 44-year-old but twice expanded and upgraded sewage treatment plant on Bay Street is the best technology available for removing nitrogen from septic waste water before it enters the bay system, says Village Trustee Aidan Corish.

But the plant's network of sewage pipes has only about 75 connections serving perhaps 100 properties clustered around the business district, about 6 percent of all village properties. They are located in seven service areas along four main sewer lines totaling about one mile in length, from the Villas condominiums on West Water Street, on the west; Main Street south to just shy of the John Jermain Library; the Watchcase condos on Division Street and Il Cappucino restaurant on Madison Street.

The sewage plant, licensed to process up to 250,000 gallons effluent, could handle almost double the load it currently treats. At a time when nitrogen is continuously leaching from old private septic systems and polluting the Peconic Bay system, some residents and officials have long wondered if the village should get serious about expanding the plant's service area.

A new committee held its first meeting last month in Village Hall to begin exploring that possibility, according to Mr. Corish, who said it will continue to meet monthly, inviting experts to help it explore engineering, regulatory, cost and potential grant issues in order to begin developing an expansion plan that could be presented to the Village Board of Trustees.

Mr. Corish, who is the Village Board's liaison to the sewage treatment plant, said the group "has the mayor's blessing and the full support of the board."

The committee includes former trustee and now chair of the Zoning Board of Appeals, Robby Stein, who was the Village Board's former liaison to the plant; Public Works Superintendent Dee Yardley, a state-licensed operator who manages the plant; Trustee Thomas Gardella, who is a plumber; and John Parker, a member of the village's Harbor Committee known for his familiarity with Sag Harbor's waterfront and its environmental health.

The committee will meet again on Wednesday, February 13 to hear from marine scientist Chris Clapp of the Nature Conservancy, who worked closely with the Village of Westhampton Beach as a member of its Conservation Advisory Board to develop the plans for a new public sewage system in that waterfront village.

"This is a long-term proposition, not something that's going to happen this week or next," Mr. Corish said.

At the first meeting, which was held on January 9, the group determined its "guiding principles," Mr. Corish said, including agreeing that the committee needed expert advice and that the focus initially should be on extending sewer lines to Sag Harbor's waterfront communities, the low-lying Redwood area on the west and the "SANS" neighborhood, containing the private communities of Sag Harbor Hills, Azurest and Ninevah, on the east.

Mr. Corish's committee has begun meeting at a time when the Village Board is weighing the adoption of a proposed law, like those in effect in the towns of East Hampton and Southampton, to require all new residential construction to install an "I/A," or "innovative/alternative" septic system that actively reduces nitrogen before leaching waste water into the ground. The village law also may require an I/A system to be installed whenever an older septic system had failed or needs major repairs or replacement.

Grants are available from state, county and town sources to cover some if not all of the $20,000 to $30,000 cost of installation. The systems require electrical power and regular monitoring and maintenance, which has prompted a few critics to predict that many of the new systems won't be effective in the long run.

The idea of expanding the sewer plant service area has gained traction because of the impending I/A requirement. The option of connecting to the village system would save the expense of an I/A system; it also would consistently remove 95 percent of all nitrogen from their waste water, according to Mr. Yardley, the plant operator. "Denitrification is the whole point of this place," he commented.

"It's the gold standard of what we can do in this village," Mr. Corish said. "It's gone a long way to allowing our Main Street to be prosperous."

Connecting to a new sewer line would be required of all adjacent properties by Village Code, with the cost to be paid by the user. There also is an annual service fee, depending on how many sewage units, as specified in the village code, each property requires; and a water usage fee.

Gravity forces effluent through the village's network of pipes to a pump and powerful grinder 30 feet below ground level just outside the treatment plant that can pulverize a two-by-four. The effluent is then pumped up to the plant, a concrete and brick structure that is elevated about 10 feet above ground level because of the high water table in the area.

The plant structure contains five open-air 50,000-gallon-capacity rectangular tanks, at least one of which is usually kept empty, to aerate effluent; allow bacteria to denitrify it; and separate out the solids, which are collected with a scavenger waste truck monthly in winter and every two weeks in summer and taken to the county's Bergen Point scavenger waste facility in West Babylon.

The remaining water, which looks totally clear, is decanted, sent through a channeling system where it is treated by bacteria-killing ultraviolet light, regularly monitored and tested and finally released into the bay through an outfall at the village's dinghy dock.

Mr. Yardley said the plant has improved water quality in the harbor area, enough so that seals have returned to the vicinity of the plant in the winter.

"As the water goes, so goes the village," said Mr. Corish.

In the early 1970s. the U.S. EPA, after the enactment of the Clean Water Act on the federal level and the Tidal Wetlands Act on the state level, pressured the village to stop allowing raw effluent from the central business district to flow down a pipe on Main Street to a holding tank at Long Wharf, from which it flowed into the bay untreated at every high tide. Local residents today can remember swimming off the wharf and having to check to be sure they were not about to jump into something odious.

Comments

(https://sagharborexpress.com/author/peterboody/)

Peter Boody (https://sagharborexpress.com/author/peterboody/)

Peter Boody is news editor of The Sag Harbor Express. Previously he was the editor of the Southampton Press for many years and also edited several other papers, including the Shelter Island Reporter and the East Hampton Press, of which he was founding editor. He was a regular correspondent for the New York Times Long Island section and wrote the novel "Thomas Jefferson, Rachel & Me."

Study Suggests Boaters May Be Releasing Septic Waste in Sag Harbor

By **Peter Boody (https://sagharborexpress.com/author/peterboody/)** - February 12, 2020

(https://sagharborexpress.com/wp-content/uploads/2020/02/Gobler.jpeg)

Dr. Christopher Gobler speaking before the Harbor Committee on Feb. 6. Peter Boody photo

A two-year study of water quality in Sag Harbor found that it is good overall but that nitrogen loading, mostly from conventional cesspools and septic tanks leaching untreated waste into groundwater, is promoting algae growth including a rust tide in the summer.

The study also found that fecal bacteria — some of it from human waste, possibly including boaters illegally releasing effluent — is an issue in some locations.

While waste from dogs and small mammals was present at most of the six sites around Sag Harbor where water was tested, there's a "very strong human signal" in the DNA of fecal bacteria found in the inner harbor and Sag Harbor Cove, Dr. Christopher Gobler reported on February 6, when he presented highlights of his study to the Harbor Committee and a packed audience in the Municipal Building.

Private donors paid most of the $80,000 tab for the study, including the Sag Harbor Partnership and the Sag Harbor Yacht Club and Yacht Yard. Sag Harbor Village and the East Hampton and Southampton Town Trustees also contributed. Mary Ann Eddy, the chair of the Harbor Committee, which regulates activities on the water and within 100 feet of it, helped coordinate the project.

Dr. Gobler, a professor at the SUNY School of Marine and Atmospheric Sciences in Stony Brook, and his researchers set up sensors and took regular samples at six sites around Sag Harbor's waters from April to October in 2018 and 2019. They tested for multiple indicators of water quality, such as nitrogen and oxygen content.

In addition to his presentation last week, he has prepared a 90-page report on the project titled "Assessment of Water Quality in Marine Waters Surrounding Sag Harbor Village, 2018-2019."

In his presentation, Dr. Gobler said that septic systems and cesspools could not be the source of fecal bacteria in local waters because the bacteria "can't travel in groundwater," unless the septic systems are actually submerged. In that case, they could be directly passing fecal bacteria into ground and surface waters.

The municipal sewage treatment plant has as high level of waste treatment, including ultraviolet light to kill bacteria and is the best option for the treatment of human waste, Dr. Gobler noted. But it has been cited by the state DEC following breakdowns in the past for "violations in fecal coliform" in its effluent, so it could be a contributing source for the bacteria found in the inner harbor and Upper Sag Harbor Cove, Dr. Gobler said.

Sag Harbor Cove contained the next-highest level of human fecal bacteria, Dr. Gobler reported, even though it is well removed from the treatment plant. It has nearby marina activity, he noted, adding that he has seen the same rise in human waste bacteria when sampling water closer to marinas in Three Mile Harbor in East Hampton.

"Some finer scale sampling could resolve the relative importance of each," Dr. Gobler said, referring to boat traffic and the sewage treatment plant. With samples from more locations, he added, his researchers could correlate high bacteria counts to nearby vessel concentrations.

"I cannot say from my study it is the boats," Dr. Gobler said when asked by audience member Steve Williams, president of the Azurest Property Owners Association, if "boats are discharging in our harbor."

"It could be the boats; there are some signs it is the boats," Dr. Gobler said. "But there is the sewage treatment plant … and there have been occasions when it has had high levels" of fecal bacteria in its effluent.

"There's only a small human signal" in the waters off Havens Beach, the village's public swimming facility, Dr. Gobler said, but he called the presence of fecal coliform there from other sources, including dogs and small mammals, the most problematic of all six sites tested around Sag Harbor water because people swim and shellfish there.

Nitrogen loading exceeded the Peconic Estuary Program's recommended maximum in the inner harbor inside the breakwater, and in Otter Pond on two occasions, Dr. Gobler reported. Water clarity declined in the summer months and chlorophyll levels, "a proxy for total algae," peaked. Oxygen levels fell to low levels in Sag Harbor Cove and Otter Pond.

One alga, rust tide or cochlodinium, which kills fish, reached high levels in Sag Harbor Cove and the Upper Cove and in the harbor itself in 2019, but "they weren't what I'd call Biblical levels," Dr. Gobler said.

Summing up Dr. Gobler's report in response to an emailed request for comment, Ms. Eddy wrote that "going forward …. further study is needed at the Inner Harbor including the STP [sewage treatment plant] to determine the source(s) of human pathogens."

She wrote that the public and local officials should "accept that we have a nitrogen problem" coming from on-site septic systems and she wondered if properties close to shorelines should be required to install innovative/alternative septic systems that actively reduce nitrogen levels, unlike conventional systems.

She said a meeting with Mayor Kathleen Mulcahy — who attended the presentation and said she wanted to see the study project continued — would take place this week "to discuss the report and steps going forward this week."

Dr. Gobler called the study "very complex … the most complex I've ever had," and thanked Ms. Eddy and the project sponsors. "It took a village to pull off this study," he said.

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	Thomas C. Gardella, Deputy Mayor
SECONDER:	Aidan Corish, Trustee
AYES:	Mulcahy, Gardella, Plumb, Corish, Larocca

12. Resolution No. 7 - October 2019

Resolution No. 7- October 2019 Authorizing Mayor Mulcahy to enter into agreement to designate the East Hampton Town Trustees as Escrowee to administer each municipality's funds allocated to the Sag Harbor Water Quality Initiative

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	Aidan Corish, Trustee
SECONDER:	Thomas C. Gardella, Deputy Mayor
AYES:	Mulcahy, Gardella, Plumb, Corish, Larocca

13. Resolution No. 8 - October 2019

Resolution No. 8 - October 2019 Year End Budget Transfers

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	Thomas C. Gardella, Deputy Mayor
SECONDER:	Bob Plumb, Trustee
AYES:	Mulcahy, Gardella, Plumb, Corish, Larocca

14. Resolution No. 9 - October 2019

Resolution No. 9 - October 2019 Sag Harbor Community Housing Trust, Inc. - Transfer of Funds

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	Thomas C. Gardella, Deputy Mayor
SECONDER:	Bob Plumb, Trustee
AYES:	Mulcahy, Gardella, Plumb, Corish, Larocca

15. Resolution No. 10 - October 2019

Resolution No. 10 - October 2019 Authorization to advertise a Request for Proposals (RFP) to obtain professional services for an evaluation of existing sewage facility infrastructure within the Village and to develop a master plan on extending sewers to critical areas in need within the Village

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	Aidan Corish, Trustee
SECONDER:	Thomas C. Gardella, Deputy Mayor
AYES:	Mulcahy, Gardella, Plumb, Corish, Larocca

16. Resolution No. 11 - October 2019

Resolution No. 11 - October 2019 Authorization to advertise a Request for Proposals (RFP) to obtain professional engineering services for stormwater abatement technical design and planning pursuant to an award from the Town of Southampton CPF Water Quality Technical Advisory Commitee

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	Thomas C. Gardella, Deputy Mayor

Executive Session

At 4:45 PM with a motion offered by Trustee Larocca and seconded by Trustee Corish the Board entered into Executive Session to discuss possible litigation.

AYES: Thomas C. Gardella, Bob Plumb, Aidan Corish, James L Larocca

RECUSED: Kathleen Mulcahy

At 5:32 PM with a motion offered by Trustee Larocca and seconded by Trustee Corish, the executive session ended. All in favor motion so carried.

AYES: Thomas C. Gardella, Bob Plumb, Aidan Corish, James L Larocca

RECUSED: Kathleen Mulcahy

Flag Salute

6:00 PM Meeting called to order on January 14, 2020 at Municipal Building, 55 Main Street, Sag Harbor, NY.

Attendee Name	Title	Status	Arrived
Kathleen Mulcahy	Mayor	Present	
Thomas C. Gardella	Deputy Mayor	Present	
Bob Plumb	Trustee	Present	
Aidan Corish	Trustee	Present	
James L Larocca	Trustee	Present	

I. Introduction

1. Schedule Public Hearing
   Resolution No. 1 - January 2020 Schedule Public Hearing on February 11, 2020 to consider whether to affirm or suspend curb cut permit for the property located at 200 Madison Street

RESULT:	**ADOPTED [4 TO 0]**
MOVER:	James L Larocca, Trustee
SECONDER:	Aidan Corish, Trustee
AYES:	Thomas C. Gardella, Bob Plumb, Aidan Corish, James L Larocca
RECUSED:	Kathleen Mulcahy

II. Public Hearing

III. Local Laws

1. **Local Law (ID # 8263) LL # _ of 2020**

2. **Local Law (ID # 8264) LL # _ of 2020**

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	James L Larocca, Trustee
SECONDER:	Aidan Corish, Trustee
AYES:	Mulcahy, Gardella, Plumb, Corish, Larocca

6. Village Election

Approval to set date and time for annual Village Election on June 16, 2020 between the hours of 12 noon - 9:00 PM at Fire Headquarters on Brickiln Road declaring vacancies and to advertise all notices for Village Election

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	Aidan Corish, Trustee
SECONDER:	Thomas C. Gardella, Deputy Mayor
AYES:	Mulcahy, Gardella, Plumb, Corish, Larocca

7. 2020/2021 Real Property Tax Exemption Income Limits

Approval of 2020/2021 real property tax exemption income limits for senior citizens and disabled persons

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	Thomas C. Gardella, Deputy Mayor
SECONDER:	Bob Plumb, Trustee
AYES:	Mulcahy, Gardella, Plumb, Corish, Larocca

8. Resolution No. 3 - January 2020

Resolution No. 3- January 2020 Approval of 2019 Service Listing for Sag Harbor Volunteer Ambulance Service Award Program

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	Thomas C. Gardella, Deputy Mayor
SECONDER:	James L Larocca, Trustee
AYES:	Mulcahy, Gardella, Plumb, Corish, Larocca

9. Resolution No. 4 - January 2020

Resolution No. 4 - January 2020 Appointing Blue Square Consulting Swimming Pool and Waterfeature Design Consultant to the Harbor Committee - Volunteer Basis

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	Kathleen Mulcahy, Mayor
SECONDER:	Aidan Corish, Trustee
AYES:	Mulcahy, Gardella, Plumb, Corish, Larocca

10. Resolution No. 5 - January 2020

Resolution No. 5- January 2020 Award RFP to Cameron Engineering for Development of Sewer Master Plan

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	Aidan Corish, Trustee
SECONDER:	Thomas C. Gardella, Deputy Mayor
AYES:	Mulcahy, Gardella, Plumb, Corish, Larocca

11. Shelter Island Shuttle Co. LLC

Capt. John D. Eicher requests authorization to perform six passenger pick-ups and drop-offs from the transient dock on Long Wharf for the 2020 Season

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	James L Larocca, Trustee
SECONDER:	Bob Plumb, Trustee
AYES:	Mulcahy, Gardella, Plumb, Corish, Larocca

12. Resolution No. 6 - January 2020

Resolution No. 6 - January 2020 Approve the 2019 Fire Department Listing LOSAP Point Awards

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	Thomas C. Gardella, Deputy Mayor
SECONDER:	James L Larocca, Trustee
AYES:	Mulcahy, Gardella, Plumb, Corish, Larocca

13. Lelanta 2020

Howard Costa and Kell Kramer request permission to operate a commercial charter from mooring D-01A for the 2020 boating season

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	James L Larocca, Trustee
SECONDER:	Bob Plumb, Trustee
AYES:	Mulcahy, Gardella, Plumb, Corish, Larocca

14. Resolution No. 7 - January 2020

Resolution No. 7 - January 2020 Appoint Members to Sewer Committee

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	Aidan Corish, Trustee
SECONDER:	Thomas C. Gardella, Deputy Mayor
AYES:	Mulcahy, Gardella, Plumb, Corish, Larocca

15. Resolution No. 8 - January 2020

Resolution No. 8 - January 2020 Authorization to award the contract for the Havens Beach Improvements Project to the lowest bidder South Fork Asphalt

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	Thomas C. Gardella, Deputy Mayor
SECONDER:	James L Larocca, Trustee
AYES:	Mulcahy, Gardella, Plumb, Corish, Larocca

16. Resolution No. 9 - January 2020

Resolution No. 9 - January 2020 Correcting Scrivenors Error in Grant of Award for Stormwater Abatement, Technical Design and Planning and Authorization for Mayor to sign the contract

APPOINT MEMBERS TO SEWER COMMITTEE

WHEREAS, the Village Board would like to formalize the creation of a "Sewer Committee" to make recommendations to the Village Board regarding the development of a sewer master plan that would evaluate whether to expand existing sewer service areas or create new sewer service areas within the Village based on environmental, economic, and other criteria; and

WHEREAS, the Village Board would like to appoint members to serve on the Sewer Committee on a yearly basis with appointments to run with the calendar and subject to automatic yearly renewal unless the Village Board makes modifications; now, therefore, be it

RESOLVED, that the following individuals shall serve as members of the Sewer Committee for the calendar year 2020 in the following capacities:

Aidan Corish, Chairman
John Parker, Member
Tom Gardella, Member
Jeff Peters, Member

Village of Sag Harbor
New York

Action Item
8292

Resolution No. 7 - January 2020

Information

Department:	Village Office	**Sponsors:**	
Category:	Approval		

Meeting History

Jan 14, 2020 6:00 PM — **Mayor and Board of Trustees** — **Regular Meeting**

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	Aidan Corish, Trustee
SECONDER:	Thomas C. Gardella, Deputy Mayor
AYES:	Kathleen Mulcahy, Thomas C. Gardella, Bob Plumb, Aidan Corish, James L Larocca

VILLAGE OF SAG HARBOR

Kathleen Mulcahy, Mayor
James L. Larocca, Trustee
Aidan Corish, Trustee
Beth M. Kamper, Clerk-Administrator

PO Box 660
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Sag Harbor, NY 11963-0015
Tel: 631-725-0222 Fax: 631-725-0316

Thomas C. Gardella, Deputy Mayor
Bob Plumb, Trustee
Denise R. Schoen, Village Attorney
Timothy E. Bullock, Treasurer

RESOLUTION No. 6 – MAY 2021

Authorize the Mayor to Execute Any and All Documents Pertaining to the Town of Southampton Community Preservation Fund Water Quality Improvement Program

RESOLVED, that the Village of Sag Harbor hereby authorizes the Mayor or her designee to execute any and all documents pertaining to the 2021 Town of Southampton Community Preservation Fund Water Quality Improvement Program application to support estimated project costs associated with engineering design and related services for sewering as recommended in the Sewer Master Plan.

Motion Made By: Trustee Corish
Motion Seconded By: Trustee Plumb

Beth M. Kamper, Clerk-Administrator

May 11, 2021

Community Support

SAG HARBOR PARTNERSHIP

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WHAT IS THE SAG HARBOR PARTNERSHIP?

Sag Harbor Partnership is a 501(c)3 designated not-for-profit organization dedicated to the preservation and enhancement of the quality of life in Sag Harbor, NY.

The activities and programs of our organization include education, historic preservation of the built environment, preservation of the natural environment and related social and economic concerns, such as affordable housing and support for locally-owned small businesses.

With funds raised through our fundraising activities, we will offer grants to support projects and other organizations engaged in work that further our stated purposes, including professional assistance.

SAG HARBOR WATER QUALITY INITIATIVE REPORT

Dr. Christopher Gobler a professor at the SUNY School of Marine and Atmospheric Sciences at Stony Brook, reported on the results of his work assessing the water quality in marine waters surrounding Sag Harbor Village from 2018-2019 on February 6, 2020. "A two-year study of water quality in Sag Harbor found that is good overall but that nitrogen loading, mostly from conventional cesspools and septic tanks leaching untreated wast into groundwater, is promoting algae growth including a rust tide in the summer. The study also found fecal bacteria - some of it from human waste, possibly including boaters illegally releasing effluent - is an issue in some locations." Read more HERE in the Sag Harbor Express.

The Sag Harbor Partnership supports this important work through a Grant to Stoney Brook University School of Marine and Atmospheric Sciences. Many thanks to Mary Ann Eddy, chair of the Harbor Committee for her work coordinating the study. Dr. Gobler's report is available by clicking the button below.

Sag Harbor Water Quality Assessment

Sag Harbor Partnership
February 17 at 10:43 AM ·

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REFINED ASSESSMENT OF WATER QUALITY IN MARINE WATERS SURROUNDING SAG HARBOR VILLAGE, 2020

Christopher J. Gobler

March 2021

Stony Brook University
School of Marine and Atmospheric Sciences

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EXECUTIVE SUMMARY

Sag Harbor is a village of historic significance and a popular regional destination. During the past decade, there has been increasing concern regarding water quality on eastern Long Island and a study from 2018 – 2019 revealed a series of water quality impairments within Sag Harbor including harmful algal blooms, hypoxia, and fecal bacterial contamination. Here, a follow-up study was designed to affirm water quality observations made from 2018 to 2019 and to gain a refined understanding of bacterial contamination within Sag Harbor surface water. Water quality observations were largely consistent with prior monitoring with primarily good water quality conditions but also some dissolved oxygen measurements falling below the NYSDEC chronic standard of 4.8 mg L^{-1} and some measurements of algae (i.e. chlorophyll *a*) exceeding federal guidelines put forth by NOAA and EPA. The later condition was associated with a dense rust tide that occurred during July and August with cell densities frequently exceeding the threshold of harm to marine life of 300 cells mL^{-1}. The occurrence of the rust tide and other water quality impairments affirmed the need to reduce watershed nitrogen (N) loads to improve water quality.

Bacteriological measurements affirmed prior observations but also provided evidence to support new conclusions. Enhanced spatial sampling identified the Havens Sump and Little Northwest Creek as strong sources of potentially pathogenic bacteria to surface waters with fecal bacterial being levels more than an order of magnitude above state standards and microbial source tracking (MST) indicating these bacteria were largely derived from dogs and small mammals. While the Haven Sump did not impair water quality at a site 500 feet from shore, it is likely contaminating Havens Beach when draining to surface waters. Likewise, elevated *Enterococcus* levels outside of Little Northwest Creek suggests this drainage could be a recreational hazard. Fecal bacterial levels were elevated within breakwater of Sag Harbor with MST analyses indicating the bacteria were derived from a combination of sources including dog and small mammals delivered via road runoff and human fecal bacteria from boats. Effluent from the sewage treatment plant contained, high levels of human-derived bacterial DNA, but low levels of fecal indicator bacteria. Given the breakwater area is closed to shellfishing, preventing swimming in this region seems warranted.

This study has provided a refined indication of where future efforts should focus with regard to both remediation and monitoring. Efforts to reduce N loads to surface waters are warranted and given the performance and capacity of the sewage treatment plant, a combination of extending sewer lines and upgrading onsite septic systems to low N systems seems warranted. The Havens Sump is a strong source of fecal bacterial contamination to surface waters that does not contaminate waters 500 feet offshore but may contaminate neighboring beaches; this requires affirmation in parallel with an effort to mitigate the outflow of this sump. The dynamics of contamination of surface waters by Little Northwest Creek is unknown but could influence the extend to which bathing or shellfishing may be impaired in receiving waters. Continued monitoring of Sag Harbor surface waters is critical to assess the extent to which ongoing mitigation efforts are realized as improved water quality.

1. WATER QUALITY

1.1. Background

During 2018 and 2019, the Gobler Laboratory performed a comprehensive study of Sag Harbor surface waters that was designed to 1. Assess water quality across Sag Harbor and Sag Harbor Cove, 2. To identify causes of water quality impairment, and 3. To identify managerial actions that could be taken to improve water quality. A series of impairments (measurements below state or federal guidance values) during each summer were observed. Hypoxia (dissolved oxygen < 3 mg L^{-1}) and anoxia (<0.5 mg L^{-1}) were observed both years in Upper Sag Harbor Cove, and, to a lesser extent, within Sag Harbor Cove and the inner harbor. Water clarity at most stations was < 2 meters during summer and sometimes < 1 meter within Upper Sag Harbor Cove. Levels of algae (chlorophyll *a*) were always above the EPA ideal value of 5 µg L^{-1} and at times exceeded the maximal guidance value of 20 µg L^{-1} in Upper Sag Harbor Cove and Otter Pond. While levels of harmful algal blooms caused by *Alexandrium* and *Dinophysis* never rose to a level of concern either year, high levels of the ichthyotoxic rust tide algae, *Cochlodinium*, were detected both years in Upper Sag Harbor Cove and in the inner harbor in 2019. The Peconic Estuary has a target total N level of 0.4 mg L^{-1} and this level was occasionally exceeded in Otter Pond, the inner harbor, and at Haven's Beach. Experiments performed during both summers demonstrated that nitrogen was clearly the element limiting the growth of algae in Sag Harbor Cove and Upper Sag Harbor Cove. Levels of fecal coliform bacteria exceeded guidance values for shellfishing on occasion in Otter Pond, the inner harbor, and at Haven's Beach, with the later location being open to shellfishing. Microbial source tracking revealed the sources of fecal bacteria differed by time and location and primarily included dogs, small mammals, humans, and birds. The human signal was strongest within the inner harbor, while dogs, small mammals, and birds were strongest for Otter Pond and Haven's Beach. Sediment surveys revealed the presence of thick and organic rich muds in Upper Sag Harbor Cove as well as isolated regions in the Cove and inner harbor. Nitrogen loading analyses indicated that septic tanks and cesspools were the strongest source of N for both the Cove and the Harbor, representing 70 and 90% of the total load, respectively. Given the ability of N to increase phytoplankton biomass, the exceedance of guidance values for total N, algae, and water clarity, and the occurrences of harmful rust tides that are promoted by excessive N, reductions in N loading across the region are warranted. Given the that overwhelming majority of N entering this region emanates from onsite septic systems, upgrading these systems and/or connecting homes to the sewage treatment plant would be the most effective approaches. While a more fine-scale study of pathogenic bacteria may be needed to optimize remedial approaches, minimizing or rerouting surface discharge of water from the Haven's Beach sump or Otter Pond may be effective management approaches.

Given these findings and given that there are presently efforts to mitigate nitrogen loading due to septic systems, a 2020 study was undertaken to affirm some trends from the 2018-2019 report but also to gain a refined understanding of fecal bacterial contamination and microbial source tracking, with a new array of sites focusing on the area within the breakwater (*see below*), and potential influence from the sewage treatment plant. Water quality parameters were monitored through the summer and fall of 2020 in the waters surrounding Sag Harbor. Regions covered in this study include Havens Beach, within the breakwater, Sag Harbor Cove, and Little Northwest Creek. Measurements were taken for temperature, salinity, and dissolved oxygen; discrete samples were collected to measure phytoplankton biomass, harmful algae, and bacterial contamination (*see Chapter 2: Microbial Source Tracking*).

1.2. Methods

1.2.1. Field sampling

A new array of sites was selected for 2020 which included two sites at Havens Beach (Sump and Buoy), four in the breakwater (Outfall, Breakwater Yacht Club, Sag Harbor Yacht Club, and Mooring Field), one within the upper cove (Ship Ashore), and two in Little Northwest (Creek and Outlet) (Fig. 1.1). Discrete sampling was performed twice a month from May 15th through October 14th, for all sites with the exception of Little Northwest sites which were added September 22nd. Physical parameters of temperature, salinity, and dissolved oxygen were measured using a YSI handheld meter at surface (and depth where applicable). Continuous data for dissolved oxygen was recorded at the Ship Ashore site by a HOBO sonde that recorded at 15 minute intervals. Water samples were collected by use of 1 L bottles, which were washed with 10% HCl, liberally rinsed with deionized water prior to use. Once the water was collected on-site, the sampling bottle was transferred and kept in a dark, cool container (~5°C) until laboratory analyses could be performed within <6 hours of collection.

1.2.2. Quantification of chlorophyll a

Upon the return of water samples to the laboratory at Stony Brook Southampton, 200 mL of water from each site, in triplicate, were passed through a glass fiber filter (size GFF = pore size = 0.7 μm) within a filter tower. A vacuum pump was used to drain the water through the filter tower, which was thoroughly rinsed with 0.2 μm filtered seawater. Upon complete filtration, filters were removed, placed in scintillation vials, and frozen at -20°C until analysis could take place. For analysis, 4 mL of 90% acetone was added to each scintillation vial and placed back in the freezer for 24 h. After 24 h, 1.5 mL of sample was extracted and placed in a 1.8 mL glass scintillation vial. Vials were placed into a Trilogy fluorometer for final analysis.

1.2.3. Quantification of harmful algal bloom species

Upon receiving water samples collected from field sites, a whole water sample was preserved in acidic Lugol's solution. Cell densities of *Cochlodinium*, *Alexandrium*, and *Dinophysis* were enumerated using a 1 mL Sedgewick-Rafter slide under a compound microscope and were quantified as cells mL^{-1}.

1.2.4. Water quality standards

For water quality parameters, there are various standards for marine waterbodies in New York. According to the New York State Department of Environmental Conservation (NYSDEC), levels of fecal coliform bacteria should not exceed 49 colony forming units (CFU) per 100 mL and should be, on average, below 14 CFU per 100 mL for shellfishing. According to the NYSDOH, levels of Enterococcus should not exceed 104 CFU per 100 mL for recreational swimming. According to the NYSDEC, dissolved oxygen concentrations are considered not conducive for aquatic life below 4.8 mg L^{-1} and should never fall below 3.0 mg L^{-1}. The NYSDEC and the National Oceanic and Atmospheric Administration (NOAA) state that secchi disk depth, a proxy for water clarity, should be above 2.0 m. According to NOAA, the maximum concentration for chlorophyll *a* should be 20 µg L^{-1}. For harmful algal blooms, such as *Cochlodinium*, standards for what is considered a bloom varies by species. For *Cochlodinium*, the alga does not pose a threat to human health but has been shown to cause mortality in finfish and shellfish at densities at or exceeding 300 cells mL^{-1}, which is what would be considered a bloom for the alga (Tang and Gobler, 2009).

1.3. Results

1.3.1. Discrete monitoring

Surface temperatures were 14 ± 1°C on May 15th, rose through June and July to a maximal peak of 27 ± 1°C on July 24th, and declined thereafter to 16 ± 1°C on October 14th (Fig. 1.2a). Bottom temperatures where applicable (marina sites) were roughly 0.5°C cooler than surface, and followed surface temperature. Surface temperatures in the cove at Ship Ashore were 1 - 2°C higher than other sites from May through July, but were similar from August on. Average summer (June 20 – Sept 22) surface temperatures were 24 ± 1°C (Fig. 1.2b), in keeping with observations from 2018 (25 ± 1°C) and 2019 (25 ± 1°C).

Surface salinity values started at 28 ± 1 PSU on May 15th and rose gradually over the summer to around 32 ± 1 PSU on September 22nd (Fig. 1.3a). Average surface salinity values across sites was 30 ± 1 PSU (Fig 1.3b). Bottom salinities where applicable (marina sites) were around 1 - 2 PSU higher (avg. 32 ± 1 PSU) and tracked with surface salinities. The lowest salinities and greatest fluctuations occurred at the STP Outfall, and LNW Creek. Surface salinity at these sites fluctuated with tidal cycle and freshwater inputs from the STP and creek, respectively, though bottom salinity at the Outfall was stable and followed nearby waters. The sampling locations in 2020 represented, on average, higher salinity waters compared to those sampled in 2018 (28 ± 1 PSU) or 2019 (25 ± 1 PSU).

Dissolved oxygen levels started at 9 mg L^{-1} on May 15th and decreased into June (Fig. 1.4a). Average summertime (June 20 – Sept 22) dissolved oxygen was 6 ± 1 mg L^{-1}. (Fig. 1.4b).

Bottom dissolved oxygen measurements were on average 0.3 mg L^{-1} lower than surface values. The only discrete measurement that was below the NYSDEC standard of 4.8 mg L^{-1} was taken from LNW Creek on October 1st (3.4 mg L^{-1}; Fig. 1.4a). This measurement was taken at dawn during a low spring-tide, and represents an extreme of freshwater influence and biological respiration. Sampling generally occurred during daylight hours, and although other sites did not fall below the 4.8 mg L^{-1} standard, many minimum measurements were near that threshold (Fig. 1.4b) and may fall below during the night when photosynthesis is suspended and respiration is at a maximum. This was observed in the continuous dataset from Ship Ashore in the cove, where nighttime dissolved oxygen concentrations fell below 4.8 mg L^{-1} several times during the summer, and even fell below the hypoxia threshold of 3 mg L^{-1} once on July 20th (Fig. 1.4c). Compared to previous years, average dissolved oxygen was slightly lower in 2020 (6 ± 1 mg L^{-1}) than 2018 (7 ± 1 mg L^{-1}) or 2019 (7 ± 1 mg L^{-1}).

Secchi depth measurements were limited to marina sites (Ship Ashore, Breakwater YC, Sag Harbor YC, and Outfall, dependent on tide). Secchi depths within the breakwater were generally good at 2.1 ± 0.1 m, near or above the 2 m NOAA standard. Clarity was somewhat worse in the cove, with an average secchi depth of 1.6 ± 0.1 m.

Algal biomasses as measured by chlorophyll *a* concentrations were 2.5 ± 0.1 µg L^{-1} in May (Fig. 1.5a). Values increased across sites to a small peak mid-June at 8.8 ± 0.6 µg L^{-1}. Concentrations rose again in July to a peak bloom period between July and August. Chlorophyll remained below the 20 µg L^{-1} NOAA standard for eutrophic waters at most sites, with the exception of the Outfall and Sag Harbor YC within the breakwater. Concentrations at the Outfall peaked on July 24th at 29.4 µg L^{-1}, and Sag Harbor YC saw a bloom on August 20th with a concentration of 21.5 µg L^{-1} (Fig. 1.5a), increases linked to the rust tide (*see below*). The average chlorophyll *a* concentration for the sampling season was 7.2 ± 0.6 µg L^{-1}, and 8.9 ± 0.9 µg L^{-1} for the summer months alone (Fig. 1.5b). These values are comparable to previous years when average summer chlorophyll *a* values were 9.0 ± 1.0 µg L^{-1} (2018), and 8.1 ± 0.7 µg L^{-1} (2019). Average concentration was highest in the cove at Ship Ashore (10.7 ± 1.9 µg L^{-1}), followed by the area within the breakwater (avg. 9.7 ± 0.4 µg L^{-1}; 10.6 ± 3.6 µg L^{-1} at the Outfall). Sampling of Little Northwest was added after the peak bloom season, and observed values were low (≤5 µg L^{-1}).

1.3.2. Harmful algal blooms

Cochlodinium was not detected at any site from June through July 9th (Fig. 1.6a). *Cochlodinium* quickly bloomed in the weeks following, and was observed at maximum concentrations across all sites on July 24th, coinciding with the peaks observed in algal biomass. Blooms were in excess of 300 cells mL^{-1} in the cove (Ship Ashore, 900 ± 40 cells mL^{-1}), within the breakwater (Outfall, 1770 ± 40 cells mL^{-1}; Breakwater YC, 620 ± 10 cells mL^{-1}), and Havens Beach (Buoy, 740 ± 20 cells mL^{-1}); concentrations dangerous to fish and wildlife. *Cochlodinium* decreased in density and persisted in the tens to hundreds range (<300 cells mL^{-1}) through until September 22nd. Mean summer *Cochlodinium* density was 130 ± 50 cells mL^{-1} (Fig. 1.6b), similar to values observed in 2018 and 2019 (avg. 110 ± 70 cells mL^{-1}, max. 1560 cells mL^{-1}).

Cochlodinium was the only HAB that bloomed during the 2018-2019 study and was the sole focus here. Two samples were collected in May 2020 to examine the prevalence of spring HABs, *Dinophysis* and *Alexandrium*. As was the case in 2018 and 2019, both of these HABs was present only at low densities, < 100 cells mL^{-1}. COVID restrictions prevented more intense sampling for HABs during the spring of 2020.

2. MICROBIAL SOURCE TRACKING

2.1. Background

Pathogenic bacteria that commonly co-occur with indicator bacteria are a hazard to humans recreating within affected waters by infecting the alimentary canal, ears, eyes, nasal cavity, skin or upper respiratory tract, which can be exposed through immersion or the splashing of water (Thompson et al., 2005). Fecal coliform bacteria and *Enterococcus* are the recommended indicators for human pathogens in marine waters (Thompson et al., 2005). The presence of high levels of fecal coliform bacteria and/or *Enterococcus* may trigger action by a municipal agency to remediate such conditions. One key obstacle to generating a successful remediation plan for high levels of indicator bacteria such as fecal coliform bacteria and/or *Enterococcus* is that the source of the potentially pathogenic bacteria is often unknown. That is, pathogenic, fecal bacteria co-present with fecal coliform bacteria and/or *Enterococcus* may be derived from any animal, including humans and remedial plans for mitigating bacteria from human wastewater will differ radically from plans focused on the mitigation of animal feces. Moreover, mitigation of feces-derived bacteria from birds that live on the waterbody would differ radically from plans to minimize dog or deer feces that might emanate from road run-off. Recently, advances in molecular techniques have facilitated the identification and quantification of the ultimate source of bacterial contamination derived from feces (Harwood et al., 2014). For this project, microbial source tracking has been implemented to identify the source of fecal contamination in Sag Harbor. Using cutting-edge approaches and a newly acquired digital polymerase chain reaction machine, the genes associated with fecal bacteria originating from humans, dogs and small mammals, deer, and birds have been quantified across multiple locations and dates, building upon data acquired in 2019. This definitive and quantitative information will now allow concrete and successful plans to be developed to greatly reduce fecal bacterial contamination of Sag Harbor.

2.2. Methods

2.2.1. Sample collection

Samples from each site (Fig. 1.1) were collected in sterile 2 L containers and kept cold (<5°C) until analysis could be performed. The filtration units used to concentrate the water samples were sterilized with 70% ethanol and liberally rinsed with deionized water. Triplicate whole water samples were collected for DNA analysis in which samples were well-mixed to ensure even distribution of biomass prior to filtering 25 – 100 mL onto a 0.2 µm Millipore polycarbonate filter, dependent on water turbidity. Fecal coliform and Enterococci bacteria were quantified using Colilert-18 and Enterolert / Quanti-tray kits, respectively, and were incubated at 44.5°C (fecal coliforms) and 41°C (Enterococci).

2.2.2. DNA Extraction

Total cellular genomic DNA was extracted using the Qiagen DNeasy PowerWater Kit per the manufacturer's instructions. Briefly, the polycarbonate filters were transferred to a 5 mL bead beating tube and treated with a lysis buffer, including a detergent to chemically lyse all cells and remove non-DNA organic and inorganic material, for chemical and mechanical lysis. The supernatant was then treated with an inhibitor removal solution to remove remaining proteins and other inhibitors. The total genomic DNA was subsequently captured on a silica column via centrifugation (13.00 g; Polycarbonate filters using a high-concentration salt solution, washed with ethanol to remove residual salts and contaminants, followed by elution of high-quality DNA with 75 µL nuclease free water. The eluted samples were analyzed on a Qubit Fluorometer (Invitrogen, Carlsbad, CA, USA) and Nanodrop Spectrophotometer (Thermo Scientific, Waltham, MA, USA) to ensure nucleic acid recovery and quality. The purified DNA samples were stored at -80°C until digital polymerase chain reaction (dPCR) analysis.

2.2.3. Digital PCR

Digital PCR analysis was conducted using the chip-based Applied Biosystems™ QuantStudio™ 3D Digital PCR System (Applied Biosystems, Foster City, CA, USA) to quantitatively identify sources of fecal contamination originating from human, avian (gulls, geese, chickens, and ducks), ruminant (deer) and dog (small mammals) fecal-associated bacterial phyla. Specifically, one general and four host-specific qPCR assays targeting conserved genetic regions in the 16S rRNA region were adapted for use with digital PCR; the Enterococcus marker used as a total fecal indicator (EPA. Washington 2012, Cao, Raith et al. 2016), the HF183 (Haugland, Varma et al. 2010, Layton, Cao et al. 2013, Green, Haugland et al. 2014, Harwood, Staley et al. 2014), BacR (Reischer, Kasper et al. 2006, Mieszkin, Yala et al. 2010, Boehm, Van De Werfhorst et al. 2013) and BacCan-UCD (Kildare, Leutenegger et al. 2007, Boehm, Van De Werfhorst et al. 2013) markers used to identify human-, ruminant- and canine- fecal-associated Bacteroidales, and the GFD marker used to identify avian fecal-associated Heliobacter (Green et al. 2012; Ahmed et al. 2016). These four host-specific assays were chosen as they have been previously shown to have the greatest sensitivity and specificity of assays developed for each host to date and have been validated with both fecal and environmental water samples (reviewed in Boehm et al. 2013).

Samples were amplified using a Taqman-based assay and the exact primer and probe sequences from the qPCR assays found in Kildare et al. (2007), Leutenegger et al. (2007), Mieszkin et al. (2010), Yala et al. (2010), Green et al. (2012), Dick et al. (2012), Layton et al. (2013), and Cao et al. (2013) with the exception of the GFD probe which was created during this study using Primer Quest software and modifications to fluorescent dyes attached to the HF183 and BacR probes to allow for assay duplexing (Table 2.1).

Each assay was validated and optimized using the dPCR system prior to sample analysis using synthetic double-stranded DNA fragments of the target genes as standards (gBlocks, Integrated DNA Technologies). Specifically, the target sequences specified in the original qPCR studies for the HF183 (Green, Haugland et al. 2014), GFD (Ahmed, Harwood et al. 2016) assays were used while target sequences for the BacR, BacCan-UD and enterococcus assays were constructed in house as they were not specified in the original studies (Table 3.1). Lyophilized gBlocks were resuspended in 25 µL of IDTE buffer + 100 ng/µL polyA carrier (Roche, Catalog no.10108626001) used to increase the recovery of the synthetic standards (Miyaoka, Berman et al. 2016), quantified using a Qubit, and serially diluted to prepare standards with final concentrations of 800 copies μL^{-1}. Optimization trials testing gradients of annealing temperature, primer-probe concentrations and numbers of cycles were conducted to identify optimal thermocycling conditions for each assay. Additionally, to confirm the ability to multiplex the Entero/HF183 and BacR/BacCan-UD assays these assays were run in simplex and multiplex to identify any assay inhibition or cross reactivity.

Digital PCR amplifications were performed in 14.5 µL reaction mixtures consisting of 7.25 µL of Quanti Studio 3D digital PCR Master mix v2 (2x stock solution), 0.725 µL Taq Man assay primer and probe mix (20x stock solution, see Table 3.1 for final concentrations), 1.525 µL nuclease free water and 5 ul sample DNA. All samples were originally run using maximum 5 µL of extracted DNA to try to achieve an on-chip concentration in the optimal range of 200-2000 c/µL; if target concentrations exceeded this concentration samples were rerun using 2.5 µL DNA/ 2.5 µL NFW. The dPCR reactions were loaded onto QuantStudio™ 3D Digital PCR Chip V2 chips containing 20,000 well partitionings with the QuantStudio™ 3D Digital PCR Chip loader (Applied Biosystems, Foster City, CA, USA), sealed with immersion fluid and the chip lid per the manufacturer's instructions. All chip preparation was performed in less than one hour per manufacturer's recommendations to prevent against degradation. Loaded chips were then amplified using a ProFlex™ 2x Flat PCR System thermocycler (Applied Biosystems, Foster City, CA, USA) using thermocycling conditions adapted from previously published qPCR assays (Table 3.1). Amplified chips were brought to room temperature to prevent condensation before imaging on the QuantStudio™ 3D Digital PCR instrument (Applied Biosystems, Foster City, CA, USA). All samples were run in duplicate, along with a negative (nuclease free water) and positive (dBlock standards, 800 copies μL^{-1} concentration) control.

2.2.4. Sample analysis

Imaging data derived from the QuantStudio™ 3D Digital PCR instrument was analyzed using the Applied Biosystems QuantStudio® 3D AnalysisSuite™ cloud software. This software provided quality control steps on a per chip basis determining wells suitable for further analysis. In this study the default quality threshold of 0.5 was used for all chips. Chips were also manually inspected for equal distribution of positive wells across the chips and chip damage, such as large bubbles or evaporation, resulting in loss of readable wells in which chips were omitted and the sample rerun. Software derived fluorescence (call) thresholds delineating the unamplified wells (negative calls) and amplified wells (positive calls) were manually reviewed for each chip and adjusted to a common threshold per assay based on the ranges of the positive control and negative control clusters. Additionally, spread of reads along the secondary assay (non-target dye) was manually reviewed in which wells identified as positive located largely outside the range of the positive control clusters on the secondary axis were identified as no amplification to reduce false positives. The negative and positive well count was then converted to absolute quantification (copies μL^{-1}) by the software using Poisson statistics, and corrected for dilution/concentration factors during sample collection (filtration), DNA extraction, and PCR reaction preparation. Sample concentrations have been reported in copies per 100 mL per host marker.

2.3. Results and Discussion

Fecal coliform bacteria were <2 CFU 100 mL^{-1} beginning on May 15th (Fig. 2.2a). Measurements in May for the Havens Beach Sump were taken from the bay where the outflow emptied, and values were low. From June onward, values were measured from the outflow rivulet itself and values were high in excess of the NYSDEC shellfishing standard for individual dates of 49 CFU 100 mL^{-1}, and frequently >1000 CFU 100 mL^{-1} (Fig. 2.2a). The summertime average for the Sump was 920 ± 390 CFU 100 mL^{-1} (Fig. 2.2b). Fecal coliform concentrations remained below the standard for all other sites through June. The NYSDEC shellfishing standard was also surpassed at the STP Outfall, Sag Harbor YC, LNW Creek, and LNW Outlet. Fecal coliforms at the Outfall reached 65 CFU 100 mL^{-1} on August 6th, and 62 CFU 100 mL^{-1} (Fig. 2.2a). Concentrations were generally in the 10 – 20 CFU 100 mL^{-1} range, with the mean summertime concentration at the Outfall being 25 ± 8 CFU 100 mL^{-1} (Fig 2.2b). This value is also over the NYSDEC standard for mean fecal coliform concentrations of 14 CFU 100 mL^{-1}. Values at the Sag Harbor YC spiked earlier and more intensely with a concentration of 370 CFU 100 mL^{-1} on July 9th, and 140 CFU 100 mL^{-1} October 14th (Fig. 2.2a). There was a greater fluctuation in values at the Sag Harbor YC compared to the Outfall, ranging from 4 – 40 CFU 100 mL^{-1}, with an average summertime concentration of 70 ± 51 CFU 100 mL^{-1} (Fig 2.2b). LNW Creek sampling started on September 22nd, and fecal coliform concentrations were excessively high (>520 CFU 100 mL^{-1}) for all three dates sampled. The greatest concentration measured was 2830 CFU 100 mL^{-1}, measured on October 1st, which was taken during a spring low-tide and represents a maximum influence of freshwater from the creek (Fig 2.2a). Likewise, the LNW Outlet where the creek meets the bay experienced a peak of 70 CFU 100 mL^{-1} on the same date. The average concentration of fecal coliforms in LNW Creek was 1700 ± 670 CFU 100 mL^{-1}, and 30 ± 20 CFU 100 mL^{-1} at the LNW Outlet, both in excess of the 14 CFU 100 mL^{-1} NYSDEC mean standard for shellfishing (Fig 2.2b). The region within the breakwater, including the Outfall, is classified as Uncertified by the NYSDEC, and Little Northwest Creek is classified as Seasonally Uncertified from May 1st through November 30th, which includes all dates sampled.

The concentration of *Enterococcus* bacteria followed similar trends to fecal coliform bacteria. The NYSDOH standard for bathing beaches is <104 CFU 100 mL^{-1}. Sites generally stayed below this limit, increasing from May to peak concentrations in August and September, and decreased slowly thereafter (Fig. 2.3a). The 104 CFU 100 mL^{-1} standard was exceeded at Havens Sump, the STP Outfall, and LNW Creek & Outlet. The Sump, as it was for fecal coliforms, was consistently high in Enterococci bacteria, with an average of 390 ± 110 CFU 100 mL^{-1} (Fig. 2.3b). Enterococci concentration surpassed the limit once on August 20th, with a value of 115 CFU 100 mL^{-1} (Fig. 2.3a), and the mean concentration was lower at 42 ± 15 CFU 100 mL^{-1} (Fig. 2.3b). Enterococcus at Little Northwest followed the trends described above with fecal coliforms. From the start of sampling, values were in excess of 320 CFU 100 mL^{-1} in LNW Creek, with a peak concentration on October 1st with 2400 CFU 100 mL^{-1}, which coincided with a peak at the LNW Outlet of 104 CFU 100 mL^{-1} (Fig. 2.3a). The mean Enterococcus concentration observed in LNW Creek was 1090 ± 660 CFU 100 mL^{-1}, and 48 ± 28 CFU 100 mL^{-1} at the LNW Outlet (Fig. 2.3.b).

The abundances of *Enterococcus* measured by genetic copies determined through dPCR generally paralleled the results of the IDEXX method above, with some distinct differences (Fig. 2.4). Firstly, there was a large spike in genomic copies on October 14th at the Havens Buoy that was not reflected in cellular counts (Figs. 2.4, 2.3a). Secondly, and most notably, genomic concentrations were very high in the STP effluent (Fig. 2.4) with peaks on May 15th and September 3rd which were not reflected in IDEXX-derived colony counts (Fig. 2.3a). Average abundances also reflect these trends and exceptions (Fig. 2.5b) with Havens Sump having the most *Enterococcus* (56,000 ± 35,000 genomic copies 100 mL^{-1}), followed by Havens Buoy (29,000 ± 28,000 genomic copies 100 mL^{-1}), and the STP Effluent (11,000 ± 7,000 genomic copies 100 mL^{-1}). This is in contrast to the very low *Enterococcus* concentration of 2.0 ± 0.9 CFU 100 mL^{-1} enumerated through well-tray analysis (Fig. 2.3b)

Microbial source tracking in 2020 revealed a mixture of human and animal-derived bacterial influence that varied between sites, regions, and dates. The human fecal bacterial gene copy densities were extremely high in the STP effluent with the highest peak of more than 40,000 gene copies mL^{-1} in May and multiple dates to > 1,000 gene copies mL^{-1} (Fig 2.5a). The second highest peak in human-derived fecal bacteria was in the STP outfall with levels there being nearly an order of magnitude lower than the STP effluent but peaking several similar dates (e.g. May 15th and 28th (Fig 2.5a). A similar source-to-outflow pattern was seen at the Havens Sump and Sump outfall site with the exception that the bacterial population in the Sump was dominated by the dog-small mammal with in the sump peaks during summer and fall exceeding 1,500 gene copies mL^{-1} and levels in the outfall exceeding 100 gene copies mL^{-1} (Fig 2.5a). Finally, this same source-to-outflow pattern was observed at Little Northwest Creek which had high levels of bird and small mammal bacteria and levels about half as high in the outflow of the Creek (Fig 2.5a). On average, the STP effluent had the highest levels of human and total bacterial gene copies) while the Haven's Sump had the highest levels of small mammal bacteria and the second highest level of total bacterial gene copies (Fig 2.6b).

Across all sites sampled in 2020 the strongest source of fecal bacteria was from dog / small mammal-derived (43 ± 7%), followed by human-derived (25 ± 8%), bird-derived (21 ± 4%), and ruminant-derived (11 ± 2%). This is the same hierarchical order observed in microbial source tracking done in 2019. Havens Sump bacteria was on average 82 ± 7% dog / small mammal-, 7 ± 2% bird-, 6 ± 3% ruminant, and 5 ± 4% human-derived (Fig 2.6a). The nearby Havens Buoy was also dog / small mammal-dominant with 53 ± 12% from that source, but also had the strongest ruminant signal (23 ± 9%) of any site, and greater signals from human and bird sources (9 ± 4% and 15 ± 13%, respectively). Effluent from the sewage treatment plant was primarily human-derived (81 ± 7%), with a lesser dog / small mammal (10 ± 4%) and ruminant signal (7 ± 3%). Effluent flows from the STP into the waters within the breakwater. The signal at the Outfall receives a strong human signal from the effluent (44 ± 11%), but also has increasing dog / small mammal (27 ± 9%), bird (17 ± 12%), and ruminant signal (13 ± 6%) as it mixes with surrounding waters. Moving further from the Outfall, similar trends are seen at both the Breakwater and Sag Harbor Yacht Clubs. Dog / small mammal became dominant at 45 ± 7% (Breakwater YC) and 43 ± 10% (Sag Harbor YC), and human-derived lessened to 32 ± 10% and 30 ± 9% (Fig. 2.6a). There was also a stronger bird-derived signal (24 ± 16%) at the Sag Harbor YC. Further from the Outfall is the West Mooring Field, which had the most mixed assemblage of bacteria with 28 ± 12% human-, 28 ± 9% bird-, 23 ± 10% ruminant-, and 18 ± 8% dog / small-mammal-derived. In Sag Harbor Cove at Ship Ashore, had even less of a human signal with 41 ± 12% dog / small-mammal-, 34 ± 15% bird-, 15 ± 5% ruminant-, and 10 ± 6% human-derived bacteria. The region of Little Northwest Creek had the second highest average dog / small mammal signal compared to Havens Beach, and the greatest average bird-derived bacteria signal. Bacteria at LNW Creek were 51% dog / small mammal, and 44% bird-derived with other sources <4%. At the LNW Outlet, dog / small mammal-derived made up 56%, bird-derived 34%, and human-derived 9% (Fig 2.6).

There were some findings during 2020 with regard to potentially pathogenic bacteria that were concerning, while others were less problematic. While Havens Sump consistently harbored very high levels of indicator bacteria, well over regulatory limits, the site 500 feet offshore never exceeded regulatory limits. Still, the samples collected at Havens Beach in 2019 exceeded regulatory limits for swimming and shellfishing on multiple occasions, and while clean water 500 feet from shore demonstrates that the halo effect of the sump is small, most of Havens Beach is less than 500 feet from the sump outflow. Also, dPCR approaches indicated high levels of potentially pathogenic bacteria, even at the Havens Buoy site, suggesting bacteria are transported that far, but may be inactive. Given this region is open the shellfishing and that the Havens Sump discharges into a public bathing beach, the collective findings of this study indicate east-west halo of the Sump must be understood and that the outfall of Haven's Sump must be mitigated to protect public health.

The situation for Little Northwest Creek is similar to Havens Sump / Beach. Levels of indicator bacteria were extremely high the Creek, consistently above regulatory limits for shellfishing and bathing, and the discharge zone of the creek also exceeded these limits on one of three sampling occasions. While this region is closed to shellfishing from May 30th to November 1st, it is possible individuals may swim in this region during summer which could be a public health risk.

A final bacterial issue to consider is within the breakwater zone. Sites in this zone were consistently over the shellfishing standard, but shellfishing is not allowed in this region. One sample was over the swimming standard, but it would seem swimming may be rare in this zone and the mooring field site was never over the shellfishing or swimming standard.

Upon first inspection, the preponderance of bacterial data might provide a mixed answer with regard to the source of bacterial to the region inside the breakwater. Fecal coliform bacteria levels and *Enterococcus* levels of the sewage treatment plant (STP) effluent were all low and lower than the levels at the outfall or any of the yacht clubs, indicating the STP was not a source of bacteria to this region. By contrast, the microbial source tracking data indicated high levels of human-derived bacteria in the STP effluent, much higher than the levels found in the surface waters of the breakwater, suggesting the STP might be a source of bacteria. This seeming contradiction is resolved by considering the methods used to generate the data. Microbial source tracking quantified DNA from bacteria, not actual live bacteria, whereas the assays for fecal coliform bacteria and *Enterococcus* are growth assays with concentrations of bacteria quantified based on the growth of the bacteria within the water. As such, the STP effluent had very high levels of human-derived bacteria DNA, but those bacteria were not viable and could not grow in the assays, likely due to the UV disinfection within the STP that damages the microbes, resulting in dead cells with DNA intact that would be harmless to humans. This finding is consistent with other studies that have measured bacteria using DNA probes and growth assays (Kauser et al., 2019; Acharya et al 2020). Therefore, while the human-derived bacteria accounted for 30 – 40% of the total bacteria within the breakwater region, the percentage of viable bacteria was likely lower. Also, importantly, the contribution of bacteria from other animals was often higher than the human bacteria for surface waters indicating that street and stormwater run-off is also contributing to the high bacterial loads within the breakwater, a conclusion consistent with the topography of the region, as the entire Village slopes down from the south, east, and west to converge on the Harbor.

Given that areas with the greatest tidal flushing (Mooring, Ship Ashore) had the lowest concentrations of bacteria, particularly compared to areas within the breakwater, it would seem that tidal flushing also influences bacterial levels.

The 2020 study reinforces several findings of the 2019 microbial source tracking project, and the impact of both human- and animal-derived fecal bacterial. Results from 2019 likewise had found dog / small mammal-derived bacteria to be the greatest influence at most sites, making up 20 – 90% of gene copies. Dog / small mammal-, deer-, and bird-derived bacteria can be washed into systems through surface runoff, and the strong animal-derived signals from sites, especially the Havens Sump and LNW Creek sites, shows that influence. In 2019, the presence of a dog park at Havens Beach was thought to contribute to the heightened signal observed as the dog / small mammal assay detects other small mammals common to the region in addition to dogs (i.e. cats, mice, raccoons, rabbits), whose waste may be directly washed into the drainage area served by the sump. The measurement of exceedingly high bacterial levels within the sump suggests this is a strong source of bacteria to the region. The viability of these bacteria, however, is unknown. It is possible some of these freshwater bacteria perish upon discharge to marine waters, a hypothesis consistent with the high *Enterococcus* DNA levels at the buoy but lower levels of *Enterococcus* detected during growth assays. This hypothesis, however, needs to be affirmed, particularly for Havens Beach where high levels of fecal bacteria were detected in 2019.

Fluctuations in precipitation, runoff, and bird movement and migration may contribute to observed shifts in relative contribution of animal- versus human-derived bacteria over time (Fig. 2.6b). The largest fluctuations appear in bacterial contributions from birds. Large peaks occurred at the Havens Buoy from an average around 2% spiking to 65%, the Outfall (5% to 74%), Sag Harbor YC (8% to 100%), and Mooring (20% to 67%). Bird-derived bacteria is contributed in part through runoff, but also directly through the movement and activity of birds on the coast. Influxes of migratory birds may also contribute to increases in fecal load, but there does not appear to be a consistent seasonal trend in the data presented here.

Microbial source tracking has been a molecular technique used to identify bacteria in aquatic water bodies for more than two decades and has become more advanced and refined through the years, particularly with the advent of digital PCR (Huggett et al., 2015) which was used in this study. Still, one of the on-going challenges of microbial source tracking is designing primer sets that maximize specificity and minimize cross-reactivity. All primer sets used in the current study have proved to be highly specific, generating 100% positive results when bacteria from a source in question was present (Bohem et al., 2013). Moreover, of multiple dog-specific primer sets available, the primer set used in this study (BacCan-UCD) has been shown to be the most precise and specific (Bohem et al., 2013). In multiple studies it was shown to always detect the presence of dog-derived bacteria (100% specificity; Schriewer et al., 2013). Moreover, as a quality control measure, our dog primers were tested against plasmids containing sequences from deer, humans, and birds and displayed no cross-reactivity. Still, these primers have also been shown to have minor cross-reaction with fecal bacteria derived from other animals including cats, cattle, pigs, humans, and gulls. Since the human- and bird-specific primers used in this study were designed to detect the latter two groups and since those primers are generally 100% specific (Bohem et al., 2013), the dog signal may be indicative of other mammals including cats, raccoons, opossum, and possibly rodents, which may be numerically one of the largest groups of animals within the watershed.

3. MANAGEMENT OPTIONS

Management of pathogens in surface waters of Sag Harbor Village is warranted. Levels of fecal coliform bacteria exceeded guidance values for shellfishing at the Havens Beach outlet in 2019 and the Little Northwest Creek outlet, with the former location being open to shellfishing and a bathing beach locale and the later open to swimming but seasonally closed to shellfishing. Only one sample within the inner harbor, however, exceeded NYS Department of Health swimming standard. Microbial source tracking revealed the sources of fecal bacteria differed by time and location and primarily included dogs, small mammals, humans, and birds. The human signal was strongest within the inner harbor, while dogs, small mammals, and birds were the primary sources for Little Northwest Creek and Havens Beach.

Potential remediation options for pathogens differ by site. For example, the Havens Sump site had elevated levels of pathogens originating from birds, dogs, and small mammals. While the buoy site 500 feet from the beach had low fecal bacteria levels, the bathing beaches are likely exposed to high levels during storms. In 2019, Haven's Beach had consistently high levels of *Enterococcus*. Moreover, studies by the Gobler Lab a decade ago also identified high levels of fecal bacteria in this region. Given the location of the sump adjacent to these waters, the creation of an expanded buffer system to intercept and divert run-off from these sites into surface water would reduce the delivery of pathogens.

Fecal contamination within the inner harbor presents a situation that is more straightforward in some respects, but more complex in others. As outlined above, the sewage treatment plant is not a source of viable bacteria for this region and while boats are likely a source of bacteria, they are likely less important than street run-off. Since this region is closed to shellfishing and since regions further away like the Ship-a-shore site or the Mooring Field site never exceeded the swimming standard, a simple mitigation approach for within the breakwater might be to ensure there is no swimming there.

As was the case in 2020, there continues to be multiple lines of evidence indicating that excessive nitrogen (N) loading is impairing surface water quality across Sag Harbor. Dissolved oxygen levels fell below the NYSDEC chronic standard, chlorophyll levels were occasionally above federal standards, and high levels of the ichthyotoxic rust tide algae, *Cochlodinium*, occurred during summer. This alga has been shown to be promoted by excessive N loading (Gobler et al., 2012). All of these findings were despite the focus on the more open and well-flushed waters of Sag Harbor rather than Sag Harbor Cove which showed a higher level of impairment in 2020.

Given the connection between excessive N and water quality impairments, reductions in N loading across Sag Harbor are warranted. Nitrogen loading analyses indicated that septic tanks and cesspools were the strongest source of N for the Harbor, representing 90% of the total load. Given this, upgrading these systems and/or connecting homes to the sewage treatment plant would be the effective mitigation approaches.

In 2016, Suffolk County adopted Article 19 of the sanitary code which permitted the use of innovative and alternative septic systems. Such systems must reduce total nitrogen levels in septic effluent to less than 19 mg L^{-1} and, to date, five such commercially available systems have been approved for use. Additional systems are in the piloting stage of approval, making the array of choices even larger in the future. For example, the NYS Center for Clean Water Technology at Stony Brook University is piloting Nitrogen Removing Biofilters as onsite septic systems which have been achieving septic effluent of < 10 mg L^{-1} as well as >90% removal of drugs, pharmaceuticals, personal care products, and other organic contaminants. Presently, Suffolk County, the Town of East Hampton Town and the Town of Southampton all have grants available to homeowners to install any of the Article 19-approved low nitrogen septic systems. The cost of a 'simple' installation of the low nitrogen systems is presently ~$25,000. The sum total of grants available is often in excess of the cost of the full installation of the systems meaning that, in many cases, they can be installed for free. In some cases, however, installation can become more expensive if, for example, major infrastructure or landscaping must be moved or replaced during the installation process.

Beyond upgrading septic systems, there are likely opportunities to connect parts of Sag Harbor Village to the existing sewage treatment plant. The plant is currently discharging very low levels of N to surface waters, on average < 5 mg L^{-1}, which is better than any approved onsite septic system. For regions near the sewage treatment plant, it may be cost effective to hook up homes and facilities to the existing plant. This must be fully investigated, however, as for some parts of Long Island such costs can exceed $50,000 per home and the installation of sewage lines can be disruptive to neighborhoods. Still, once connected, the installation would create a maintenance-free solution for homeowners although the connection to the sewage treatment plant will represent an additional utility fee. For onsite systems, Suffolk County requires homeowners to purchase operation and maintenance contracts with certified companies who will inspect systems one-to-two times per year to assure systems are functioning properly.

Recently, Suffolk County completed its Subwatersheds study and declared that Sag Harbor Cove should strive for a 62% to 81% N reduction to achieve water quality improvements, levels that could be achieved by upgrading septic systems. In contrast, the same study declared Sag Harbor was not a high priority for water quality improvement due to an absence of HABs and hypoxia during Suffolk County monitoring during the past decade. These findings are generally consistent with those of this study which also found water quality impairment was more significant in Sag Harbor Cove and Upper Sag Harbor Cove compared to Sag Harbor. Our utilization of more high frequency monitoring compared to Suffolk County allowed for the detection of transient harmful algal blooms and hypoxia in Sag Harbor. Collectively, both studies prioritize N reductions in Sag Harbor Cove over Sag Harbor.

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5. FIGURES AND TABLES

Site	Latitude	Longitude
1. Havens Sump	41.000474°N	72.283182°W
2. Havens Buoy	41.002059°N	72.282721°W
3. Outfall	41.001977°N	72.291304°W
4. Breakwater YC	41.002530°N	72.290804°W
5. Sag Harbor YC	41.003112°N	72.292333°W
6. Mooring	41.006711°N	72.297180°W
7. Ship Ashore	41.000189°N	72.307287°W
8. LNW Creek	41.001648°N	72.270472°W
9. LNW Outlet	41.001095°N	72.274478°W

Figure 1.1. List of discrete sampling sites for Sag Harbor, NY, 2020.

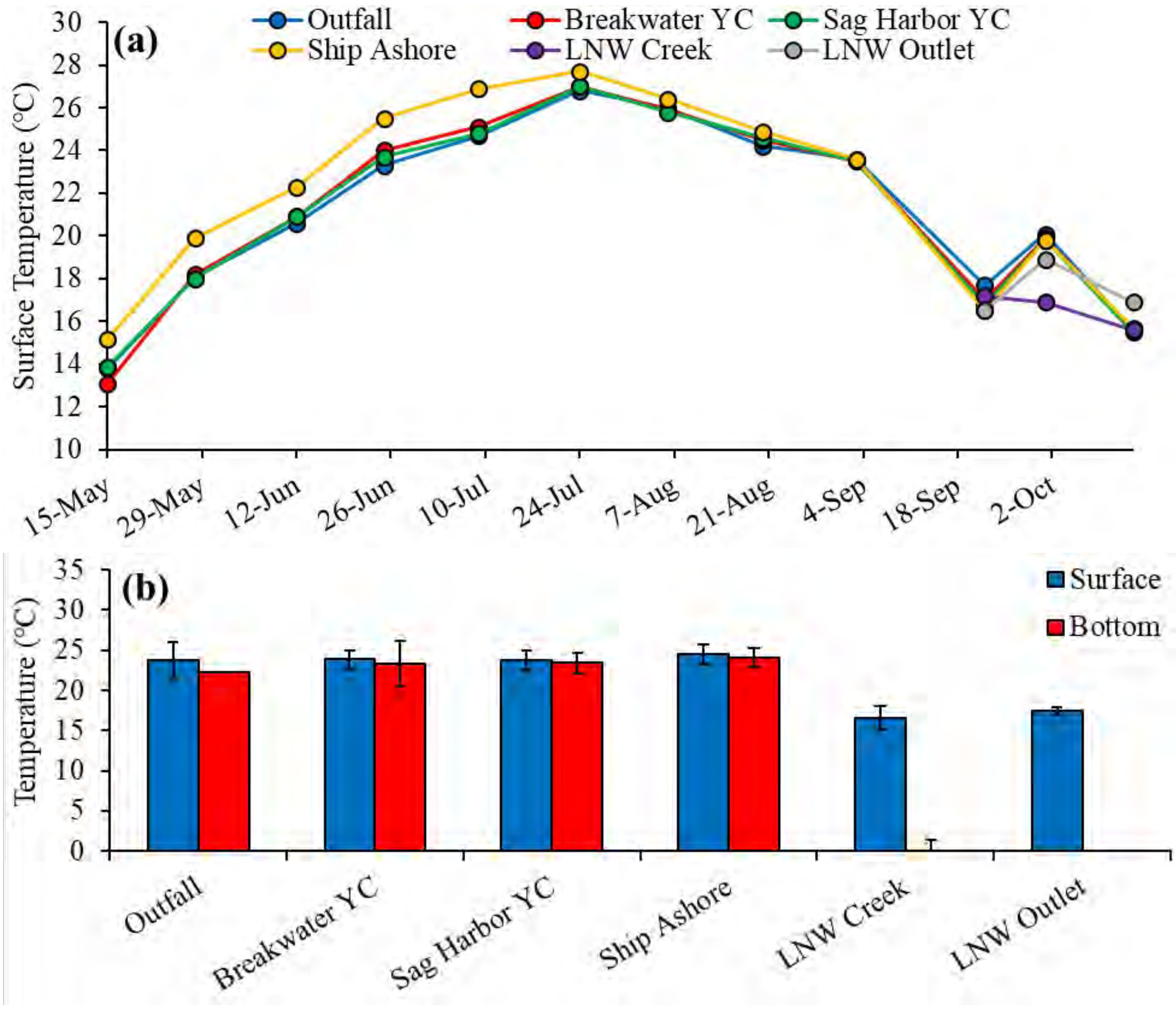


Figure 1.2. Time-series of 2020 surface temperatures (a), and mean summer surface and bottom temperatures (b).

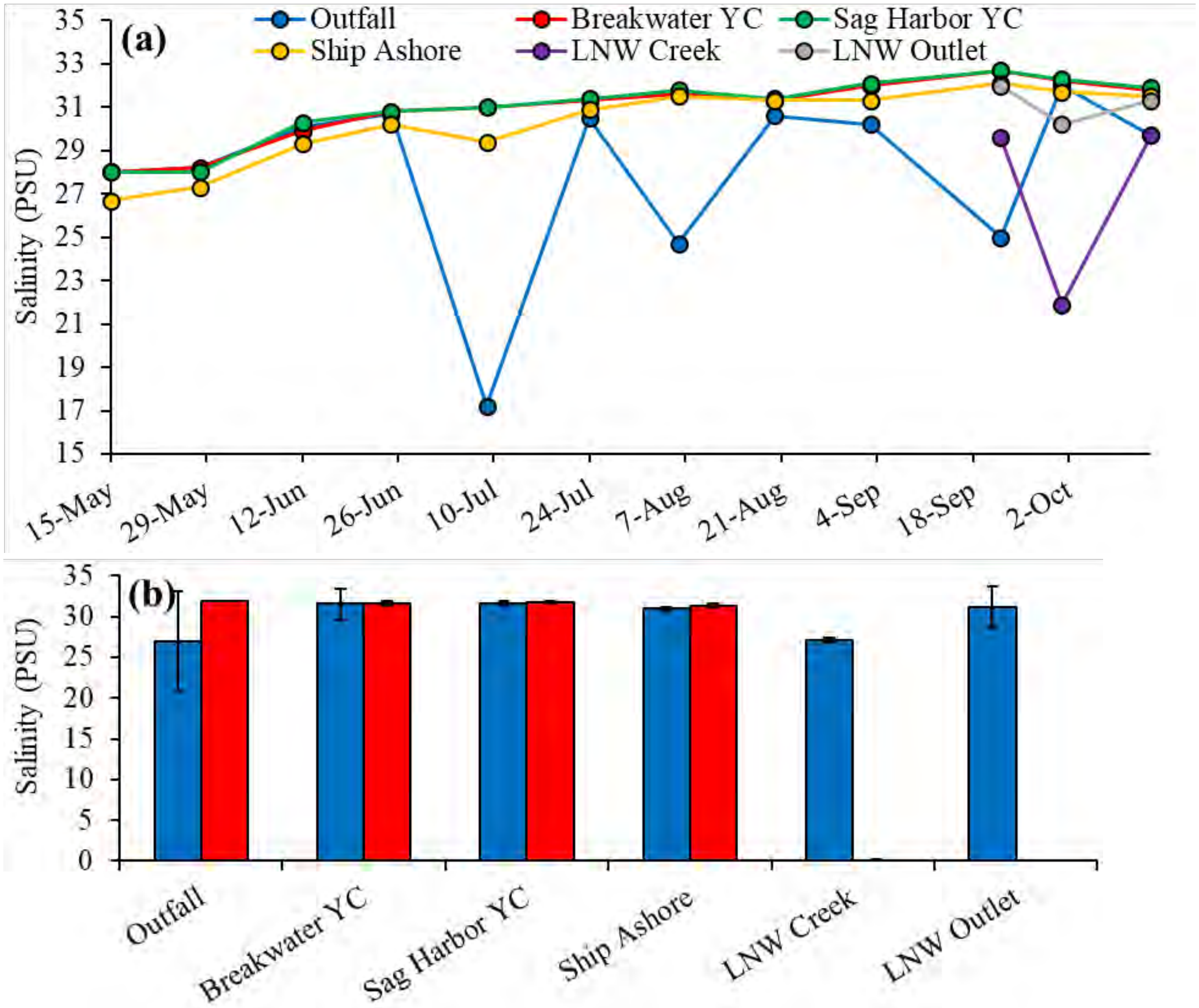


Figure 1.3. Time-series of 2020 surface salinities (a), and mean summer surface and bottom salinity (b).

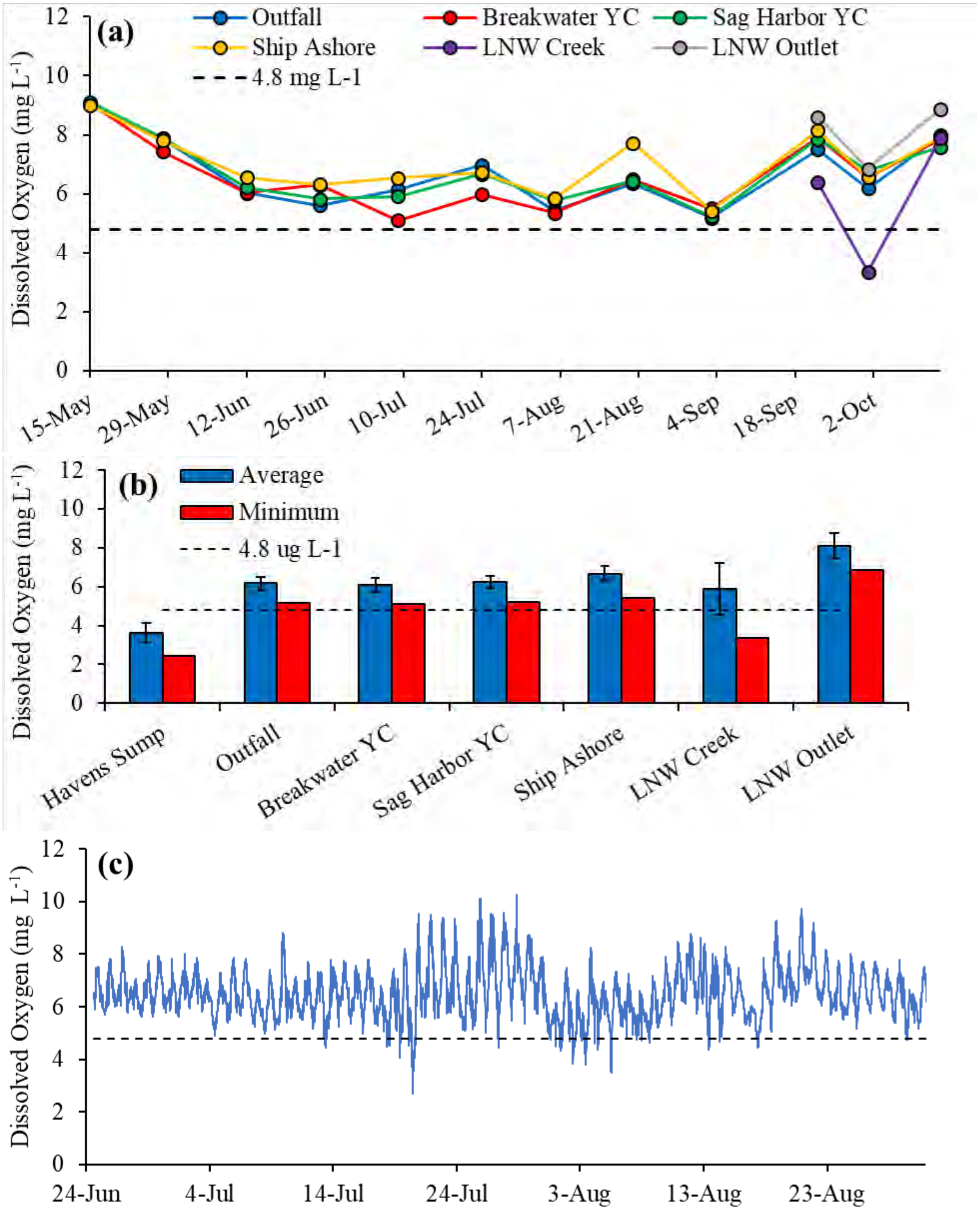


Figure 1.4. Time-series of 2020 discreet dissolved oxygen measurements (a), mean and minimum summer dissolved oxygen measurements (b), and continuous dissolved oxygen data from Ship Ashore marina site (c). Dashed line shows guidance level of 4.8 mg L^{-1}.

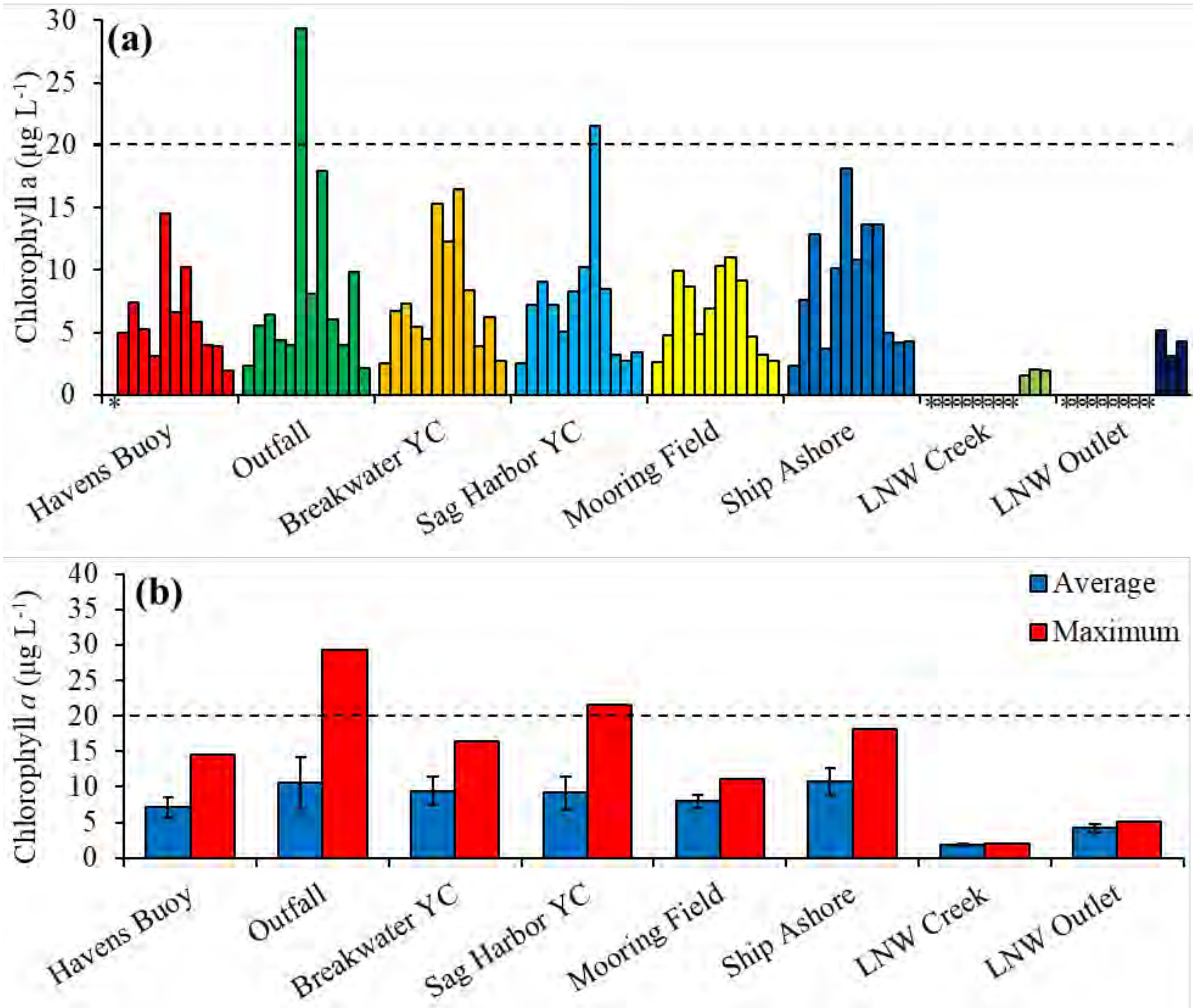


Figure 1.5. Time-series of 2020 Chlorophyll *a* measurements (a), and mean and maximum summer Chlorophyll *a* (b). Dashed line shows maximum guidance level of 20 µg L^{-1}. Sampling dates in A were 5/1, 5/12, 5/27, 6/10, 6/24, 7/8, 7/20, 8/5, 8/19, 9/2, 9/21, 10/15.

Date	Station	Alexandrium	Dinophysis
5/15/2020	SAG Sump	84	0
5/15/2020	SAG Sump Offshore	N/A	
5/15/2020	SAG STP		
5/15/2020	SAG Outfall	0	0
5/15/2020	SAG Outfall E	0	0
5/15/2020	SAG Outfall W	0	0
5/15/2020	SAG Mooring	0	0
5/15/2020	Ship Ashore (SAG3)	0	0
5/28/2020	SAG Sump	N/A	
5/28/2020	SAG Sump Offshore	N/A	
5/28/2020	SAG STP		
5/28/2020	SAG Outfall	N/A	
5/28/2020	SAG Outfall E	0	14
5/28/2020	SAG Outfall W	N/A	
5/28/2020	SAG Mooring	0	0
5/28/2020	Ship Ashore (SAG3)	0	0

Table 1.1. Densities of *Alexandrium* and *Dinophysis* during May 2020.

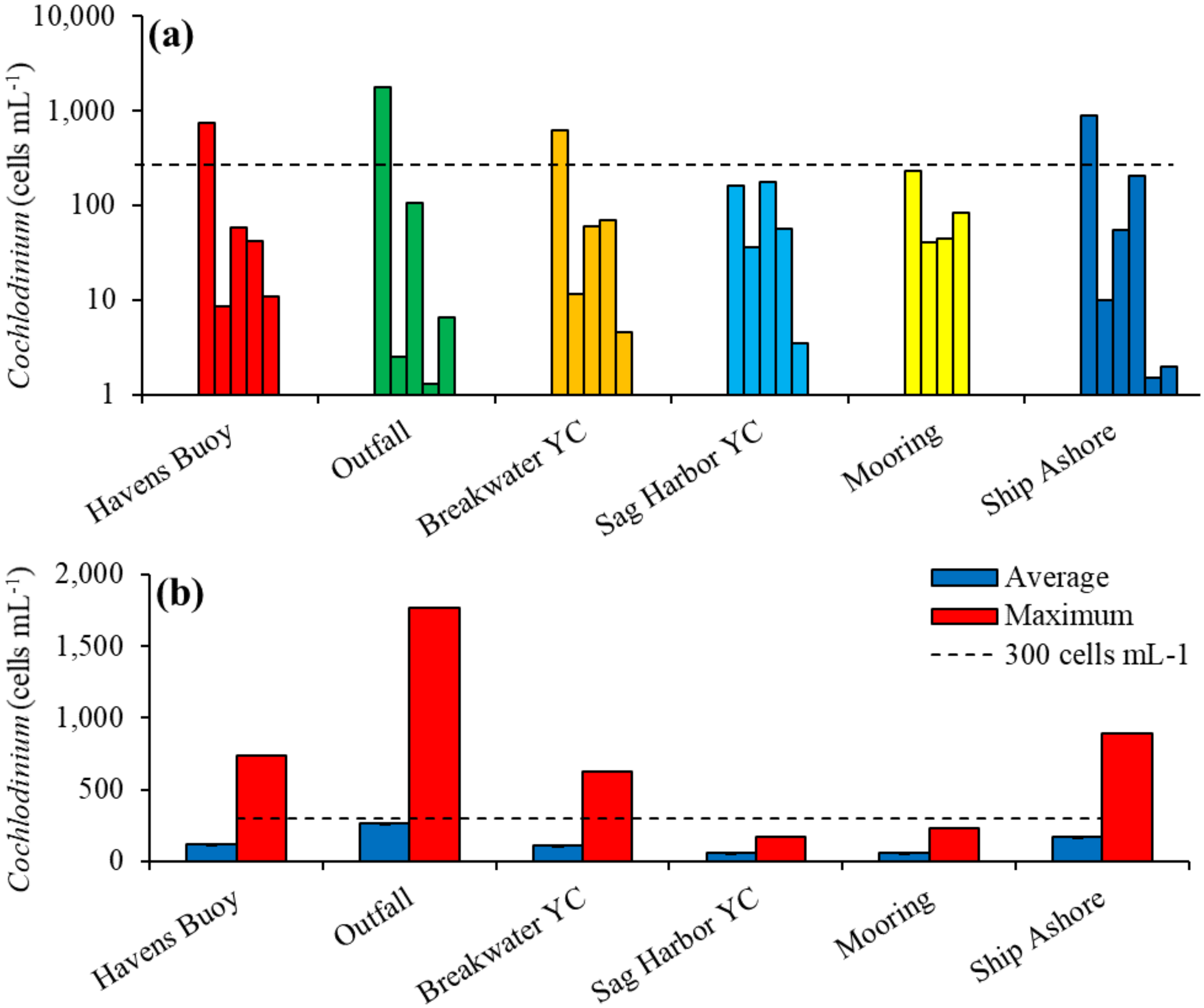


Figure 1.6. Time-series of 2020 *Cochlodinium* cell counts (a), and mean and maximum summer cell counts (b). Dashed line shows ichthyotoxic guidance level of 300 cells mL^{-1}. Sampling dates in A were 7/24, 8/5, 8/19, 9/2, 9/21, 10/15.

Table 2.1. Primers (F: Forward, R: Reverse), probes (P), and PCR conditions for each microbial source tracking assay.

Assay	Target	Primers and Probes		Final concentration	Reference	PCR Conditions	Assay type
Entero/ HF183	General (Enterococcus)	F	EnteroF1A 5-GAGAAATTCCAAACGAACTTG-3	900 nM	Cao et al. 2016, EPA method 1611, 2012	95°C for 10 min, 45 cycles of 94°C for 30 s/ 60°C for 1 min, 98°C for 10 min, 10°C hold	multiplex
		R	EnteroR1 5-CAGTGCTCTACCTCCATCATT-3	900 nM			
		P	GPL813TQ [FAM]-TGGTTCTCTCCGAAATAGCTTTAGGGCTA-[QSY]	250 nM			
	Human (Bacteriodetes)	F	HF183-1 5-ATCATGAGTTCACATGTCCG-3	900 nM	Haugland et al. 2010, Layton et al. 2013		
		R	BthertR1 5-CGTAGGAGTTTGGACCGTGT-3	900 nM			
		P	BthetP1 [VIC]-CTGAGAGGAAGGTCCCCCACATTGGA-[QSY]	250 nM			
BacCan/ BacR	Dog / small mammal (Bacteriodetes)	F	BacCan-545f1 5-GGAGCGCAGACGGGTTTT-3	900 nM	Kildare et al. 2007, Boehmn et al. 2013	50°C for 2 min, 95°C for 10 min, 45 cycles of 95°C for 15 s/ 58°C for 1 min, 10°C hold	multiplex
		R	BacUni-690r1b 5-CAATCGGAGTTCTTCGTGATATCTA-3	900 nM			
		R	BacUni-690r2 5-AATCGGAGTTCCTCGTGATATCTA-3	900 nM			
		P	BacUni-656p [FAM]-TGGTGTAGCGGTGAAA-[TAMRA-MGB]	250 nM			
	Deer (Bacteriodetes)	F	BacB2-590F 5-ACAGCCCGCGATTGATACTGGTAA-3	900 nM	Meiszkin et al. 2010, Boehmn et al. 2013		
		R	Bac708Rm 5-CAATCGGAGTTCTTCGTGAT-3	900 nM			
		P	BacB2-626P [VIC]-ATGAGGTGGATGGAATTCGTGGTGT-[QSY]	250 nM			
GFD	Bird (Heliobacter)	F	GFDF 5-TCGGCTGAGCACTCTAGGG-3	900 nM	Green et al. 2012, Ahmed et al. 2016, This Study	95°C for 10 min, 45 cycles of 95°C for 15 s/ 57°C for 30 s, 98°C for 10 min, 10°C hold	singleplex
		R	GFDR 5-GCGTCTCTTTGTACATCCCA-3	900 nM			
		P	GFD [FAM]-AAGGAGGAGGAAGGTGAGGACGA-[QSY]	250 nM			

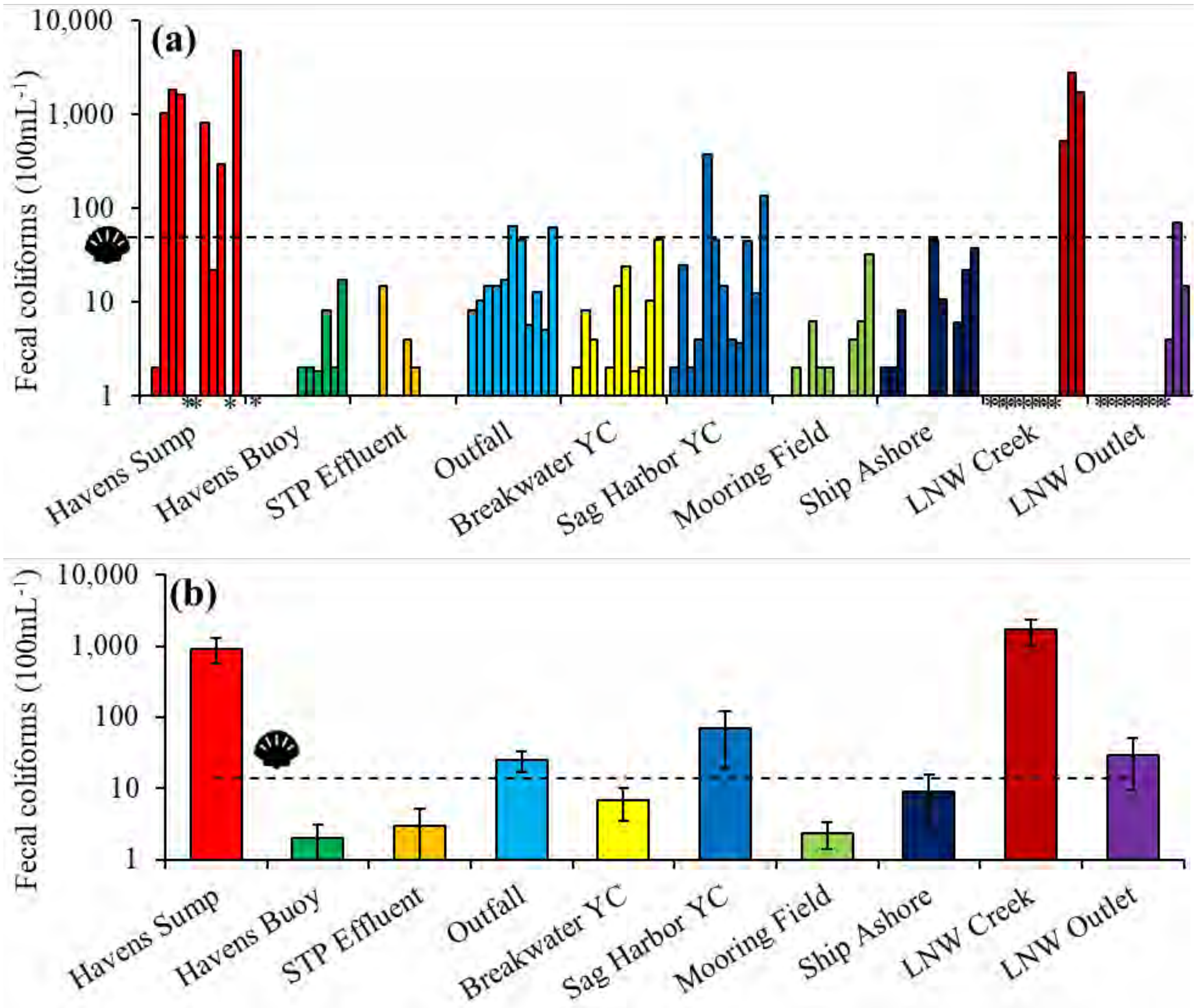


Figure 2.2. Time-series of fecal coliform bacteria concentrations from all sites (a), and summertime mean concentrations (b). Dashed lines show individual date limit of 49 CFU 100 mL^{-1} (a), and average concentration limit of 14 CFU 100 mL^{-1} (b) for shellfishing. Asterisks indicate dates not sampled. Sampling dates in A were 5/1, 5/12, 5/27, 6/10, 6/24, 7/8, 7/20, 8/5, 8/19, 9/2, 9/21, 10/15.

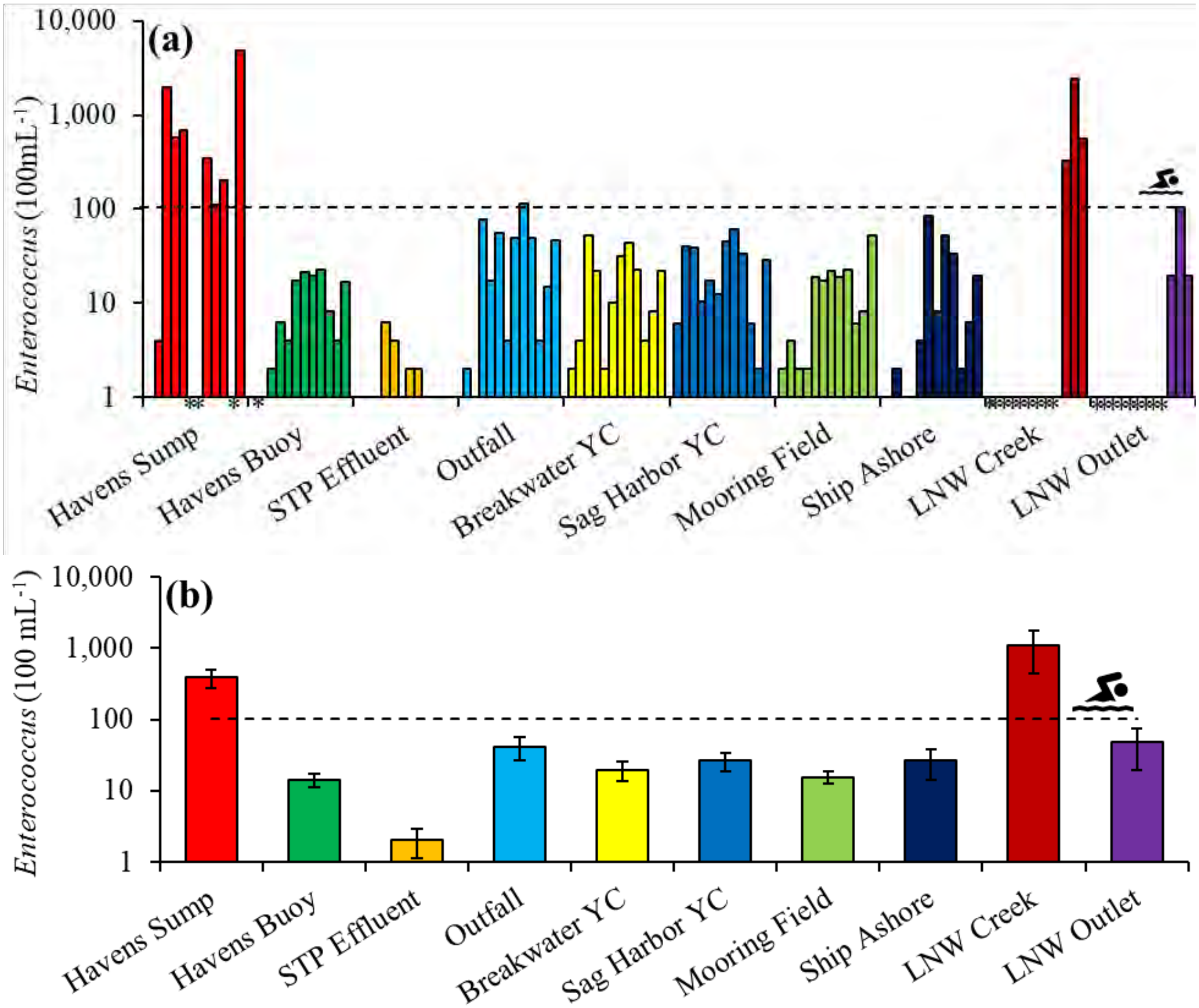


Figure 2.3. Time-series of *Enterococcus* bacteria concentrations from all sites (a), and summertime mean concentrations (b). Dashed lines show bathing safety limit of 104 CFU 100 mL^{-1}. Sampling dates in A were 5/1, 5/12, 5/27, 6/10, 6/24, 7/8, 7/20, 8/5, 8/19, 9/2, 9/21, 10/15.

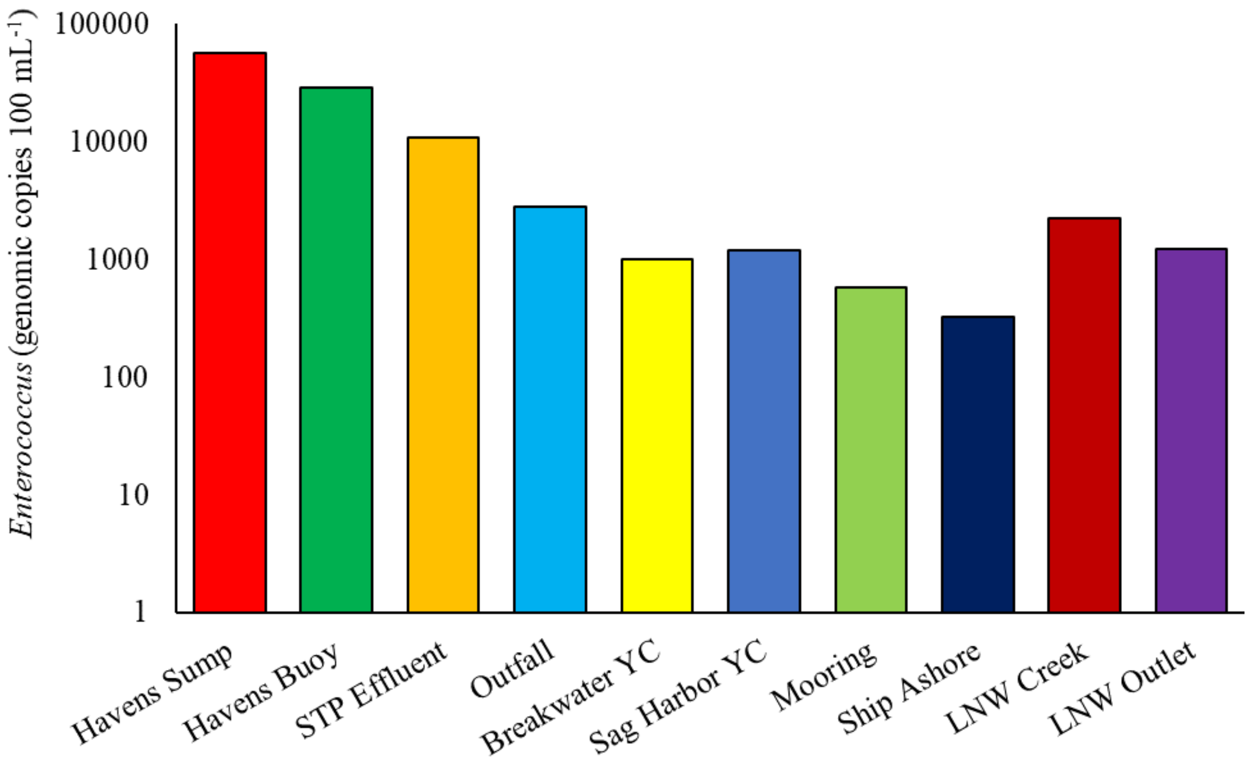


Figure 2.4. *Enterococcus* bacteria concentration enumerated through dPCR genomic copies.

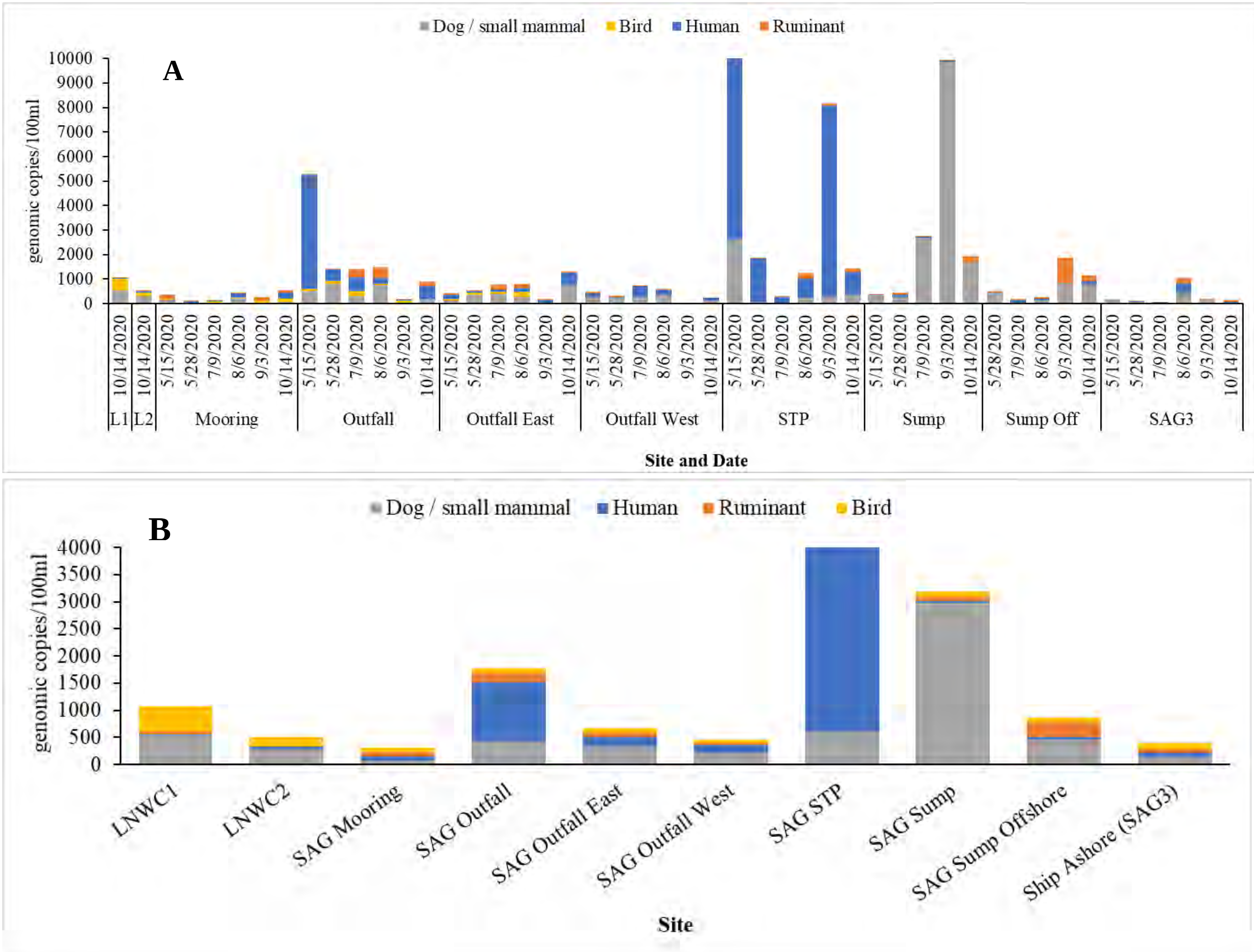


Figure 2.5. Gene copies of each bacteria type at each location: A. As a time series and B. As an average for the sampling season

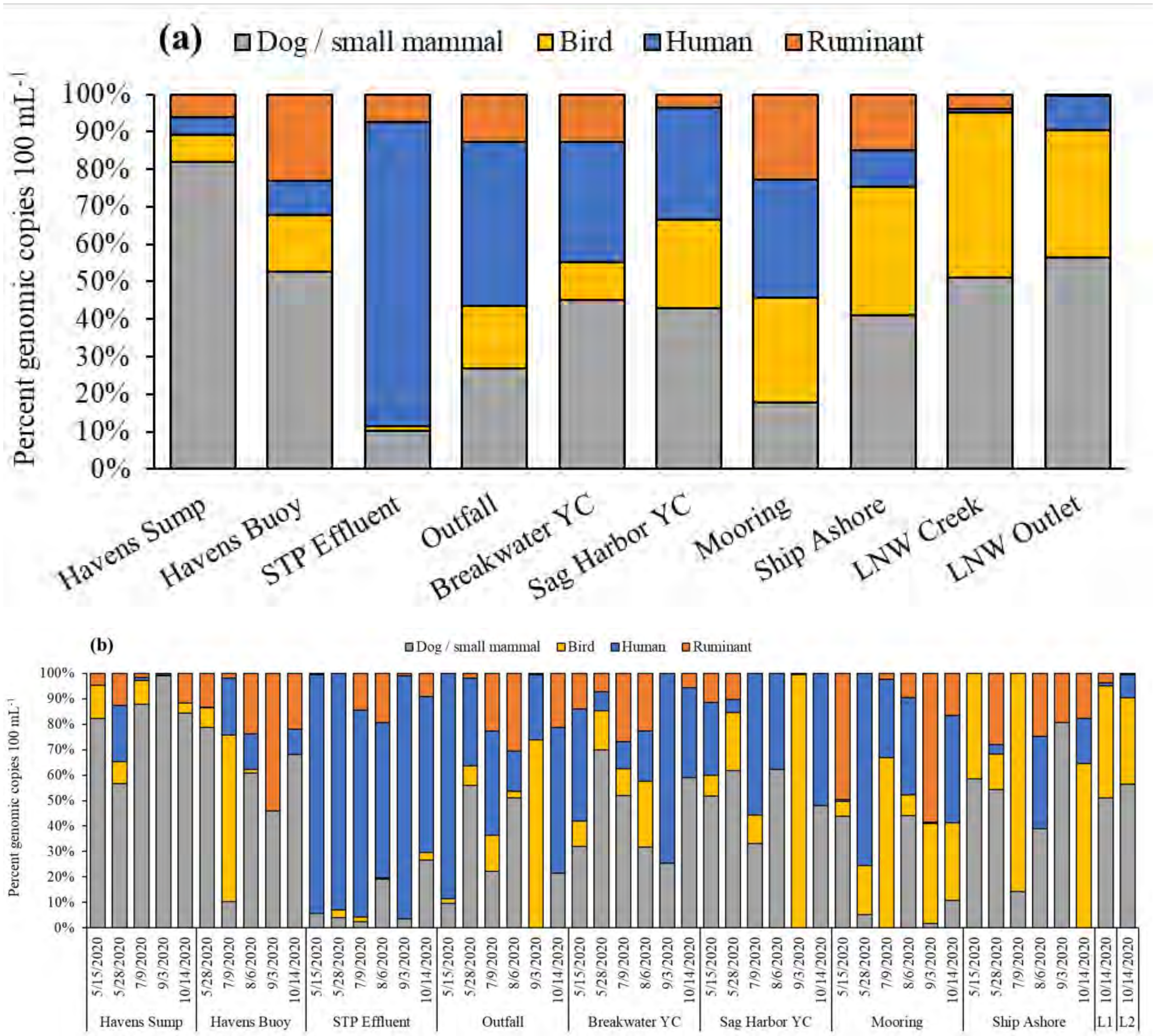


Figure 2.6. Average relative abundance of fecal derived bacteria emanating from human, birds, deer, dogs / small mammals for sites across Sag Harbor in 2020 (a). Time-series of relative abundance of fecal derived bacteria for each date analyzed (b).

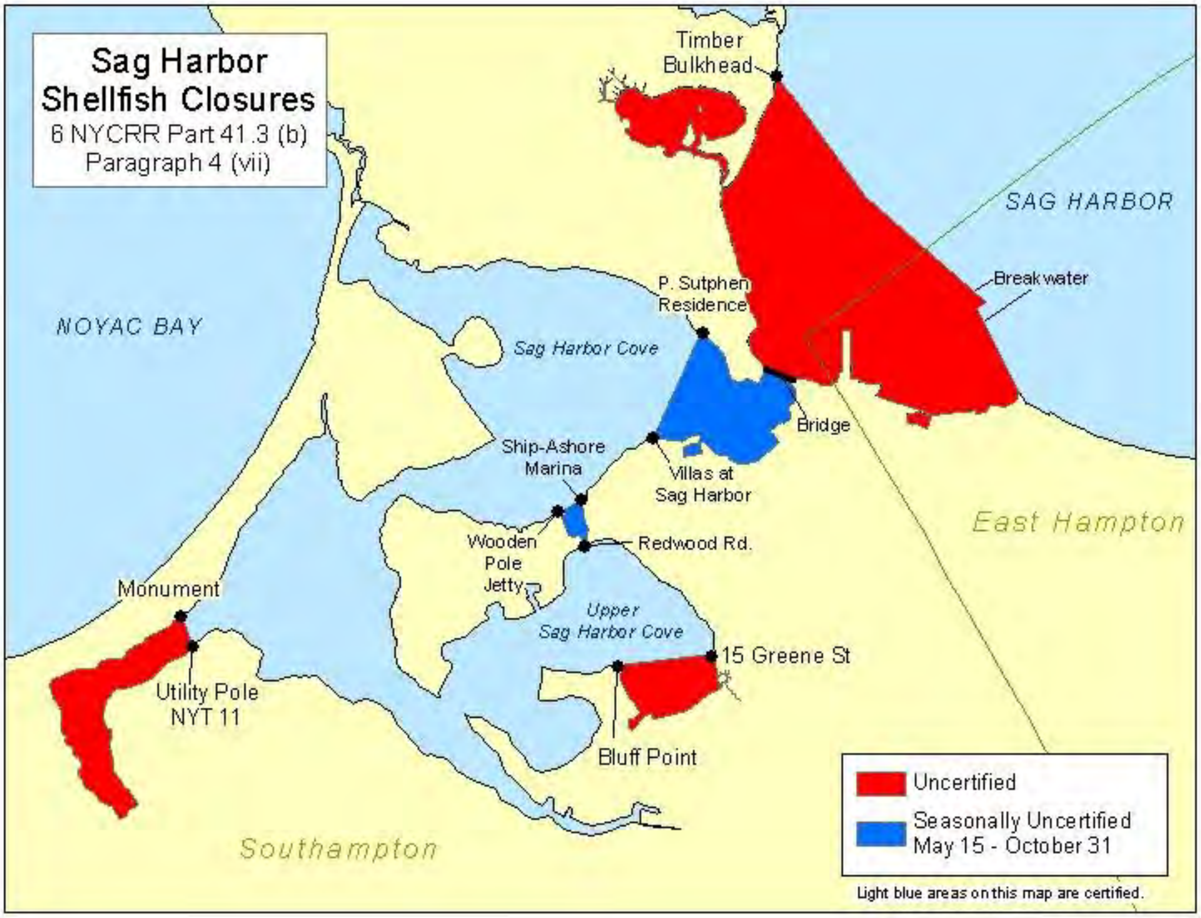


Figure 2.7. NYSDEC shellfish bed closures in Sag Harbor.

Short Environmental Assessment Form
Part 1 - Project Information

Instructions for Completing

Part 1 – Project Information. The applicant or project sponsor is responsible for the completion of Part 1. Responses become part of the application for approval or funding, are subject to public review, and may be subject to further verification. Complete Part 1 based on information currently available. If additional research or investigation would be needed to fully respond to any item, please answer as thoroughly as possible based on current information.

Complete all items in Part 1. You may also provide any additional information which you believe will be needed by or useful to the lead agency; attach additional pages as necessary to supplement any item.

Part 1 – Project and Sponsor Information

Name of Action or Project:
Village of Sag Harbor Sewer Master Plan - Town of East Hampton Community Preservation Fund (CPF) Water Quality Improvements Program

Project Location (describe, and attach a location map):
Village of Sag Harbor, Suffolk County, New York

Brief Description of Proposed Action:
Village to be preparing engineering design and contract documents (Plans & Specifications) for the extension of existing sewage collection system into adjacent non-sewered areas of Village currently being served by onsite wastewater treatment systems (OWTS). Extension of sewers will allow parcel owners to connect to the new sewers and properly abandon their existing OWTS. The Village's Sewage Treatment Plant (STP) currently has approximately 92,500 gallons per day of excess treatment capacity. Sewage flow from the targeted sewershed ("K") is currently estimated at 12,346 gallons per day.

Name of Applicant or Sponsor: Village of Sag Harbor	Telephone: (631) 725-0222 E-Mail: clerk@sagharborny.gov	
Address: 55 Main Street		
City/PO: Sag Harbor	State: NY	Zip Code: 11963

	NO	YES
1. Does the proposed action only involve the legislative adoption of a plan, local law, ordinance, administrative rule, or regulation? If Yes, attach a narrative description of the intent of the proposed action and the environmental resources that may be affected in the municipality and proceed to Part 2. If no, continue to question 2.	☑	☐
2. Does the proposed action require a permit, approval or funding from any other government Agency? If Yes, list agency(s) name and permit or approval:	☐	☑

3. a. Total acreage of the site of the proposed action? TBD acres
b. Total acreage to be physically disturbed? TBD acres
c. Total acreage (project site and any contiguous properties) owned or controlled by the applicant or project sponsor? TBD acres

4. Check all land uses that occur on, are adjoining or near the proposed action:

5. ☑ Urban ☐ Rural (non-agriculture) ☐ Industrial ☐ Commercial ☐ Residential (suburban)
☐ Forest ☐ Agriculture ☐ Aquatic ☐ Other(Specify):
☐ Parkland

5. Is the proposed action,	NO	YES	N/A
a. A permitted use under the zoning regulations?	☐	☑	☐
b. Consistent with the adopted comprehensive plan?	☐	☑	☐

	NO	YES
6. Is the proposed action consistent with the predominant character of the existing built or natural landscape?	☐	☑

7. Is the site of the proposed action located in, or does it adjoin, a state listed Critical Environmental Area?	NO	YES
If Yes, identify: Special Groundwater Protection Area (South Fork) CEA; Long Pond CEA; Peconic Bay and Environs CEA	☐	☑

	NO	YES
8. a. Will the proposed action result in a substantial increase in traffic above present levels?	☑	☐
b. Are public transportation services available at or near the site of the proposed action?	☐	☑
c. Are any pedestrian accommodations or bicycle routes available on or near the site of the proposed action?	☐	☑

9. Does the proposed action meet or exceed the state energy code requirements?	NO	YES
If the proposed action will exceed requirements, describe design features and technologies: N/A	☐	☐

10. Will the proposed action connect to an existing public/private water supply?	NO	YES
If No, describe method for providing potable water:	☐	☑

11. Will the proposed action connect to existing wastewater utilities?	NO	YES
If No, describe method for providing wastewater treatment:	☐	☑

	NO	YES
12. a. Does the project site contain, or is it substantially contiguous to, a building, archaeological site, or district which is listed on the National or State Register of Historic Places, or that has been determined by the Commissioner of the NYS Office of Parks, Recreation and Historic Preservation to be eligible for listing on the State Register of Historic Places? Sag Harbor Village Historic District; Sag Harbor Hills, Azurest, & Ninevah Subdivisions	☐	☑
b. Is the project site, or any portion of it, located in or adjacent to an area designated as sensitive for archaeological sites on the NY State Historic Preservation Office (SHPO) archaeological site inventory?	☐	☑

	NO	YES
13. a. Does any portion of the site of the proposed action, or lands adjoining the proposed action, contain wetlands or other waterbodies regulated by a federal, state or local agency?	☐	☑
b. Would the proposed action physically alter, or encroach into, any existing wetland or waterbody?	☑	☐
If Yes, identify the wetland or waterbody and extent of alterations in square feet or acres:		

14. Identify the typical habitat types that occur on, or are likely to be found on the project site. Check all that apply:

☐ Shoreline ☐ Forest ☐ Agricultural/grasslands ☐ Early mid-successional

☐ Wetland ☑ Urban ☑ Suburban

	NO	YES
15. Does the site of the proposed action contain any species of animal, or associated habitats, listed by the State or Federal government as threatened or endangered?	☐	☑
16. Is the project site located in the 100-year flood plan?	☐	☑
17. Will the proposed action create storm water discharge, either from point or non-point sources? If Yes,	☑	☐
a. Will storm water discharges flow to adjacent properties?	☐	☐
b. Will storm water discharges be directed to established conveyance systems (runoff and storm drains)? If Yes, briefly describe:	☐	☐
18. Does the proposed action include construction or other activities that would result in the impoundment of water or other liquids (e.g., retention pond, waste lagoon, dam)? If Yes, explain the purpose and size of the impoundment:	☑	☐
19. Has the site of the proposed action or an adjoining property been the location of an active or closed solid waste management facility? If Yes, describe:	☑	☐
20. Has the site of the proposed action or an adjoining property been the subject of remediation (ongoing or completed) for hazardous waste? If Yes, describe:	☑	☐

I CERTIFY THAT THE INFORMATION PROVIDED ABOVE IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE

Applicant/sponsor/name: Kathleen Mulcahy Date: 5/14/21

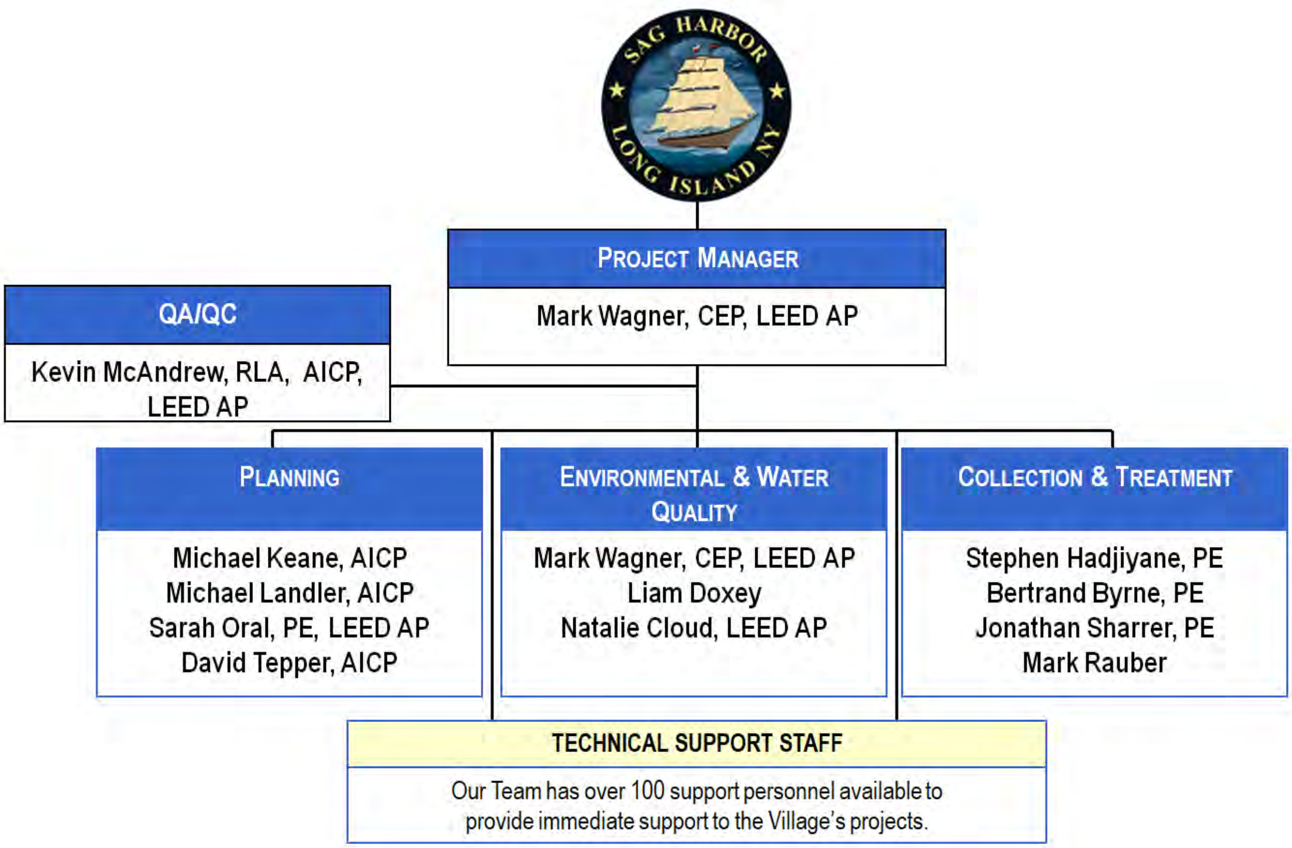
Signature: [signature] Title: Mayor

PRINT FORM

Staffing

Professional Management and Staff
Cameron Engineering is comprised of highly qualified planners, engineers, environmental scientists and landscape architects. This Village of Sag Harbor project will be properly staffed to take into account the strengths of the Firm and maximum utilization of its resources.

Organization Chart



Key Personnel

Mark Wagner, CEP, AICP, LEED AP - As Principal and Manager of Water and Wastewater Engineering, Mr. Wagner is extensively involved in the management and coordination of all projects involving wastewater collection, conveyance, treatment, operations and maintenance of municipal treatment facilities and solid waste treatment and management. Areas of responsibility include project planning, design, construction administration, providing operator training and technical assistance, processing systems troubleshooting, facility start-ups, regulatory interfacing, cost analysis and project permitting. Mr. Wagner has been with the firm since 1985. He has an excellent relationship with the local (SCDHS) and State (NYSDEC) regulatory agencies. Mr. Wagner is also a Grade 4A Certified Wastwater Treatment Plant Operator. Projects of note conducted under Mr. Wagner's direction include the Consolidation of the Villages of Lawrence and Cedarhurst Wastewater Infrastructure, Bergen Point Sewage Treatment Plant 120 MGD Ultraviolet Disinfection, Village of Greenport Water Pollution Control Plant BNR/UV Upgrade, City of Glen Cove BNR/UV Upgrade, City of Long Beach Total Residual Chlorine, Greater Atlantic Beach Water Reclamation TRC and Ammonia Reduction Project, and management and supervision of the Cedar Creek WPCP.

Mr. Wagner has been involved in the start up of processing systems, troubleshooting, and providing technical assistance to both municipal and private operators. He is a Certified Grade 4A Wastewater Treatment Plant Operator (Certificate No. 7146). He has been a Course Instructor for NYSDEC approved certification courses for over 35 years and has been involved first hand with the training of over 830 wastewater treatment operators. Mr. Wagner will serve as both the Program Manager and Project Manager.

Stephen Hadjiyane, P.E., BCEE – Mr. Hadjiyane has over 30 years of experience in the design and construction of wastewater treatment, pumping stations, and collection systems. His experience includes dry and wet pit submersible pumps, vertical shaft pumps, and ejector pumps. His broad experience in process design, mechanical pump systems, hydraulics, screening equipment's, and electrical/instrumentation is perfect for this assignment. His experience includes several Rockland County Sewer District No. 1 pump station improvements and chemical bulk storage facilities. His wastewater treatment plant and pump station experience includes upgrades to numerous projects for New York City Department of Environmental Protection, Nassau and Suffolk Counties, and Town of Greenwich, CT.

Michael Keane, AICP - As a Manager of our Land Use and Environmental Planning Group, Mr. Keane provides expertise in matters that concern both the natural and built environments. As an Urban Planner with 13 years of private and public sector experience, he has the proven expertise in managing complex land use and environmental planning projects across a broad spectrum of geographies. In land use projects, he addresses social, economic, and environmental issues in a manner that respects community needs, protects the environment, and satisfies fiscal realities.

Resumes follow this page.

CAMERON ENGINEERING

Mark Wagner, C.E.P., LEED AP

Partner, Water & Wastewater Engineering

Education:
Bachelor of Science
Oceanography
Florida Institute of Technology

Licenses/Registrations:
Licensed Operator Grade 4A
New York State Wastewater Treatment

Certifications:
LEED Accredited Professional

Certified Environmental Professional (ABCEP)

Affiliations:
Energeia Partnership – 2017 Molloy College
New York Water Environment Association

- Partner, Energeia Partnership
- NYWEA Board of Directors
- Chairman, Long Island Chapter: 2003
- Board of Directors, Long Island Chapter: 1997 – 2004
- Former Chair, NYWEA Plant Operations and Maintenance Committee

Awards:

- NYWEA John Chester Brigham Award 2017
- NYWEA, Bob Carballeira Distinguished Service Award, 2014
- NYWEA, Milton T. Hill Award, 2005
- NYWEA, David Flaumenbaum Safety & Training Award, 2002
- NYWEA, Outstanding Operator, 1991
- NYWEA, Chapter Achievement Award, 1990

Years with this Firm: 34

Years with other Firms: 7

As Partner in charge of Water and Wastewater Engineering, Mr. Wagner is extensively involved in the management and coordination of all projects involving wastewater collection, conveyance, treatment, operations and maintenance of municipal treatment facilities and solid waste treatment and management. Areas of responsibility include project planning, design, providing operator training and technical assistance, systems troubleshooting, facility start-ups, regulatory interfacing, cost analysis and project permitting. Mr. Wagner has been the Project Manager for several sewer and storm water planning studies including the Village of Sag Harbor, Village of Southampton, Center Moriches, Smithtown/King's Park, Villages of Lawrence and Cedarhurst Consolidation and Rocky Point Downtown Study, the Five Towns Drainage Study and the SCDPW I/I Study.

Mr. Wagner is currently serving as the Partner-in-Charge on our Village of Sag Harbor's On-Call Engineering Services Agreement. He oversees the execution of current task orders including the wastewater management master plan, the Village's sewage treatment plan, the sewer rehabilitation system, and UV system engineering.

Mr. Wagner has a thorough understanding of regulatory issues relating to sewage collection and treatment including SPDES permits, Total Maximum Discharge Limitations (TMDLs), effluent limitations, Ten State Standards for design of systems as well as the SEQRA environmental review process.

Treatment plant upgrades performed under his direction include the Village of Greenport BNR, City of Glen Cove BNR, Greater Atlantic Beach Water Reclamation District Upgrade and Ammonia Reduction with Total Residual Chlorine reduction. Bergen Point Ultraviolet Light, City of Long Beach post Sandy improvements and Total Residual Chlorine reduction.

He has been involved in numerous facility start-ups throughout New York, New England and California. He is a Certified Grade 4A Wastewater Treatment Plant Operator (since 1978). He has been a Course Instructor for NYSDEC approved certification courses for over 36 years and has been involved first hand with the training of over 830 wastewater treatment operators. Mr. Wagner has participated in the Operators Challenge on both the State and National Levels.

As an Accredited Professional in Leadership in Energy and Environmental Design, Mr. Wagner has fostered green and sustainable design and operation features where appropriate. He has been highly successful in assisting clients in obtaining NYS Clean Air/Clean Water Bond Acts, American Reinvestment and Recovery Act (ARRA) as well as water quality improvement grants.

Mr. Wagner also leads the company's efforts in providing stormwater management services including development of planning documents, detailed design, permitting and construction management services.

Mr. Wagner has significant experience in solid waste management. He has been involved in permitting of off-island municipal solid waste transfer, disposal and yard waste composting projects. He coordinated the design and permitting of one of the largest outdoor biosolids and paper mill waste composting projects in NY State. Additionally, he has been involved in municipal solid waste characterization studies, permitting (6 NYCRR Part 360) of mixed waste processing facilities, transfer stations and yard waste composting operations.

CAMERON ENGINEERING

Kevin M. McAndrew, RLA, AICP, LEED AP

Partner, Civil Engineering, Site Development & Landscape Architecture & Planning

Education:
Bachelor of Landscape Architecture
SUNY College of Environmental Science and Forestry in association with Syracuse University

Mr. McAndrew has served as an adjunct professor at Polytechnic University where he lectured on land planning, zoning, and site engineering matters.

Licenses/Registrations:
Registered Landscape Architect:
New York
Florida

Certifications:
LEED Accredited Professional

American Institute of Certified Planners

Affiliations:
Tesla Science Center Advisory Committee: Committee Member

American Planning Association - Member

American Society of Landscape Architects

Long Island Builders Institute (LIBI)

Long Island Real Estate Group (LIREG)

New York State Council of Landscape Architects – Past Board Member

Design Professionals Coalition of Long Island President: 1997

Nassau Land Trust – Past Board Member

Years with this Firm: 19

Years with other Firms: 17

Kevin M. McAndrew, RLA, LEED AP – As Partner of Civil Engineering, Site Development and Landscape Architecture& Planning, Mr. McAndrew leads the firms design efforts associated with our land development projects and planning initiatives including downtown re-development projects for planning projects, Transit Oriented District (TOD) and Mixed-use projects, streetscapes, open space/park/plaza designs and planning initiatives. Mr. McAndrew is a registered landscape architect, certified planner and LEED AP professional with over 34-years of experience in master planning, site planning, zoning expertise, environmental assessment including visual resource assessment and green infrastructure design. Mr. McAndrew co-managed the City of Cortland DRI Strategic Investment Plan. Mr. McAndrew has been responsible for our site design efforts associated with transformative hamlet center and downtown re-development projects including Wyandanch Village, Town of Babylon Copiague Commons, Town of Babylon Greentek Living, Village of Amityville (current TOD project) One Third Avenue, Village of Mineola Village Green, Village of Mineola (current Mixed-use and TOD project) Mill Creek Residential, Village of Hempstead Mill Creek Residential, Village of West Hempstead Mr. McAndrew has also managed our municipal streetscape projects, parks/open space projects, institutional and higher education campus planning/site design and all residential sectors including low-density single family subdivisions, townhouse/condominium developments and rental communities.

Mr. McAndrew has participated in a lead role in each of the featured relevant experience for this proposal:

- Town of Hempstead – TOD Study for Inwood and North Lawrence
- Village of Port Jefferson - Comprehensive Plan/SEQRA Services
- Village of Southampton – Zoning Study
- Medford Vision Update – 112 Corridor Zoning
- Town of Hempstead – Franklin Square Revitalization Study
- Town of Cordlandt – Gyrodyne Medical Oriented District (MOD)/Zoning
- Amityville Transit Oriented Development (TOD)/SEQRA
- City of Cortland – Downtown Revitalization Initiative – Round 2
- City of Long Beach – Comprehensive Plan/SEQRA Services
- Town of Hempstead – Golf Course Moratorium
- Stasi Westbury
- Wyandanch Village – Mixed Use/Transit Oriented Development
- Copiague Commons
- One Third Avenue Apartments – Mineola
- Village Green – Mineola
- Village of Roslyn – SEQRA Services
- Baldwin Grand Avenue

Michael R. Keane, AICP

Manager, Land Use and Environmental Planning

Education:
Master of Urban Planning
Hunter College
City University of New York, 2009

Bachelor of Arts
History
University of Massachusetts - Amherst, 1998

Certifications:
Member
American Institute of Certified Planners (AICP)

Affiliations:
Member
American Planning Association
Urban Land Institute

Speaking Engagements:
New York University
Adjunct Professor of Urban Planning
2012 to Present

APA 2018 National Planning Conference, New Orleans – "The Art of Private Practice Planning"

Years with this Firm: 1

Years with other Firms: 12

As a Manager of our Land Use and Environmental Planning Group, Mr. Keane provides expertise in matters that concern both the natural and built environments. As an Urban Planner with 13 years of private and public sector experience, he has the proven expertise in managing complex land use and environmental planning projects across a broad spectrum of geographies. In land use projects, he addresses social, economic, and environmental issues in a manner that respects community needs, protects the environment, and satisfies fiscal realities.

Mr. Keane's area of expertise includes City and State Environmental Quality Review (CEQR/SEQR), National Environmental Policy Act (NEPA), zoning and land use planning, and site and master plan development. He has a unique understanding of the land use process and the ins and outs of the environmental analysis. He has represented clients before governmental authorities responsible for approving major land use actions undergoing environmental review.

Mr. Keane is a recent addition to Cameron Engineering and brings a wealth of experience and knowledge. His previous work includes serving as the environmental planning lead responsible for overseeing the preparation and review of environmental planning documents for projects undergoing environmental review for the Grand Central Terminal Train Shed Rehabilitation Project, MTA Metro---North Railroad (NEPA), and the Empire Corridor Syracuse Congestion Relief Project, New York State Department of Transportation (NEPA; SEQR).

Serving as a Senior Environmental Planner and Senior Project Manager, Mr. Keane collaborated on dozens of environmental planning projects, including area-wide and site-specific land use actions subject to CEQR and the New York City Uniform Land Use Review Procedure (ULURP) process. Mr. Keane has directed the preparation of environmental assessment and impact statements that resulted in project approval, and advised clients on a wide range of land use, zoning, and regulatory matters to support the use and development of land in New York City. Notable project experience includes Bay Street Corridor Rezoning (CEQR EIS). 69-02 Queens Blvd. Mixed Use Development (CEQR EAS; ULURP), Avenues: The World School (CEQR EAS), 45 Broad Street Development (CEQR EAS; ULURP), and 1125 Whitlock Mixed---Use Development (CEQR EAS; ULURP).

In his earlier career, Mr. Keane collaborated on major planning initiatives throughout the Northeast and internationally, including municipal-wide and regional comprehensive plans, zoning code amendments, and visual impact analyses. This included the Capital City of Hanoi – 2030 Master Plan, City of Stamford Master Plan, Rockland County Master Plan, City of Mount Vernon Master Plan, Nassau County Master Plan, Village of Port Chester Master Plan, and Town of Mamaroneck Inclusionary Housing Zoning Text Amendment and SEQR EIS.

Mr. Keane's experience includes time spent as an Urban Planner with the Office of Manhattan Borough President, Scott Stringer in 2008. In this role he collaborated on the preparation of the Borough President's West Harlem Special District Proposal, several recommendations of which were incorporated into the Department of City Planning's zoning text amendment for the 90-block area in West Harlem. City Council approved the rezoning in November 2012.

CAMERON ENGINEERING

Michael E. Landler, AICP

Planning Director

Education:
Master of Planning
University of Virginia

Bachelor of Arts – Urban Planning
University of Illinois at Urbana-Champaign

Affiliations:
American Institute of Certified Planners, Member

American Planning Association, Member

Years with this Firm: 1

Years with other Firms: 20

Mr. Landler has over 20 years of extensive planning experience working for both municipalities and private consulting firms. Mr. Landler has a Master of Planning Degree from the University of Virginia, with an emphasis on land use and housing, in addition to a Bachelor of Arts Degree in Urban Planning from the University of Illinois at Urbana-Champaign. His planning career has spread from Nevada, California, to New York, providing exceptional planning expertise with specific municipal experience in Westchester County, including the Towns of New Castle and Pound Ridge, and the Village of Pleasantville. Provided services included the review and compilation of project oversight reports, and the drafting of new local laws, resolutions, ordinances and amendments. Past experience has also included performing research and composing Environmental Impact Statements. He was responsible for all SEQRA-related documentation required by the municipalities that he served as a planning consultant. The comprised the completion of all letters and documentation for both Type I and Type II designated projects, including the establishment of a lead agency, the completion of a determination of significance, as well as the drafting of negative declarations.

Current projects include:

- **Carlls Path, Deer Park - Proposed Multi-Family Residential Development** – Cameron Engineering is providing Civil Engineering services for the approximately 24 acre site, located on Carlls Path, in Deer Park which is currently utilized for storage/warehousing purposes. The project sponsor is seeking an application to the Town of Babylon to re-zone the property and construct over 400 residential rental units and an assisted living facility.
- **Gyrodyne – Town of Cortlandt Medical Office District** – The Town of Cortlandt has established a Medical Office District (MOD) to support the creation of a mixed-use commercial center in the area surrounding the New York Presbyterian Hospital facility. Cameron Engineering is assisting Gyrodyne with the development of a sustainable mixed-use campus plan with medical office space and residential units. Cameron is responsible for the preparation of a DEIS for the project.
- **Town of Hempstead - Transit Oriented Development (TOD) Study** - The Town of Hempstead is evaluating an amendment to its Building Zone Ordinance to enable the creation of a Transit Oriented (TO) Zoning District in the vicinity of the Inwood and Lawrence Long Island Railroad (LIRR) stations. Cameron Engineering is providing Planning Services for an initial zoning analysis, build-out analysis and market analysis study to be prepared to assist the Town in determining the various zoning approaches and zoning elements that should be included in any future TOD ordinance in the vicinity of the studied locations.
- **Town of Hempstead – Franklin Square Revitalization Study -** The Town of Hempstead is evaluating an amendment to its Building Zone Ordinance to facilitate real estate investment and revitalization efforts in the hamlet of Franklin Square. Cameron Engineering is providing Planning Services for an initial zoning analysis, build-out analysis and market analysis study to be prepared to assist the Town in determining the various zoning approaches and zoning elements that should be included in any future ordinance in the vicinity of the studied location.
- **Long Island Transfer Development Rights Project Development** – Cameron Engineering is preparing a regional GEIS for a model TDR program that can be used voluntarily by municipalities on Long Island that protects land by redirecting development from sending areas to receiving areas that can accommodate safe growth and development.

CAMERON ENGINEERING

Sarah Oral, P.E., LEED AP BD+C

Project Manager

Education:

- B.S. Civil Engineering, Tulane University
  Recipient of Distinguished Honor Scholarship
- Accident Reconstruction Training, The Traffic Institute of Northwestern University

Licenses/Registrations:

Professional Engineer: NY

LEED Accredited Professional with a specialty in Building Design and Construction - U.S. Green Building Council Certification

Affiliations:

- American Society of Civil Engineers
- Institute of Transportation Engineers
- New York Statewide Accident Reconstruction Society
- U.S. Green Building Council, Long Island Chapter Sustainable Transportation Committee, Current Member
- Vision Long Island, Current Board Member
- Village of Roslyn Board of Trustees. Current Trustee
- Village of Roslyn Planning Board, Former Member (2012-2013)
- Roslyn Gardens Board of Directors, Former Director (2010-2013)

Years with this Firm: 4

Years with other Firms: 12

Ms. Oral has 16 years of experience in land development with a focus on civil engineering and traffic engineering. She has been responsible for traffic, transportation, drainage and sanitary system analysis and design, computer aided traffic flow modeling, the preparation and review of traffic impact studies, parking studies, traffic calming studies and signal warrant studies including data collection and engineering analysis. Ms. Oral has created site plans including the design of parking layouts, and has designed various roadway improvements, road diets, Complete Streets design elements, Smart Growth concept integration, bicycle and pedestrian facilities, and maintenance and protection of traffic plans. She has performed access management and design, as well as Transit Oriented Development (TOD) design and analysis. Sarah has expanded her planning expertise in the fields of climate change mitigation and adaptation. She is currently serving as Long Island coordinator for the Clean Energy Communities program for the New York State Energy Research and Development Authority (NYSERDA).

Ms. Oral also provides forensics engineering evaluation of roadway safety, traffic flow, and pavement marking and signage design, and accident reconstruction analysis via vehicle dynamics, mechanics, and road characteristics. Ms. Oral also has experience with field inspection of on-site and off-site drainage and paving, field surveying and data reduction. She possesses a working knowledge of federal, state, and local specifications, standards, and procedures, and all work complies with the Federal MUTCD, NYS Supplement, ADA, & AASHTO standards.

Ms. Oral has been qualified as a traffic engineering expert for multiple Towns and Villages throughout Nassau and Suffolk Counties. She has also been qualified as a roadway design expert by the New York State Court of Claims.

- **ESD Downtown Revitalization Initiative – Round Two - City of Cortland** – Performed background research, site visits, Committee and public engagement meetings; conducted stakeholder interviews; prepared components of the Downtown Cortland Strategic Investment Plan: Downtown Profile and Assessment; Public Engagement Plan; Project Profiles; Logging public response to aspects of the Strategic Investment Plan; Assistance with Project Prioritization; and weekly Project Management with State DRI coordinators.
- **Climate Smart Communities, Long Island** – Long Island Coordinator for Climate Smart Communities. Recruits Long Island municipalities into the program, creating educational handouts and information packets, facilitating several educational workshops and seminars, securing regional experts for presentations, and the establishment of a project website. She also established the Long Island CRS Users Group to support and educate communities about FEMA's National Flood Insurance Program Community Rating System, and distributes highlights and follow up to those involved in the Users Group, including State agencies, within 2-3 days of all meetings.
- **Cortlandt Manor Medical Oriented District (MOD)** – Order of magnitude traffic mitigation for the proposed MOD overlay zone, review proposed MOD zoning requirements and similar local zoning codes for successfully executed regulations.
- **Copiague Commons, Copiague** – Performed an area-wide analysis of traffic impacts to congested intersections, signal mitigation to improve Level of Service, integration of Transit Oriented Development concepts to take advantage of the site's close proximity to the LIRR, and traffic calming and streetscape improvements to support improved conditions for pedestrian and bicycle traffic.
- **Peconic Care, Calverton** - Performed transportation engineering tasks including an analysis of a potential railroad crossing and the subsequent gates and signalization that would be required. Other tasks included analyzing traffic impacts to the local roadway network and potential mitigation measures to offset any negative impacts.
- **Town of Babylon, Alternatives Analysis for the Route 110 Corridor –** Provided engineering services to determine the preferred trunk line alignment along a 5-mile section of Route 110 for Bus Rapid Transit (BRT). Plans included conceptual alignment and typical sections, with stations and connections to local feeder routes.

David Tepper, AICP

Planning / GIS

Education:
Master of Planning
University of Southern California

Bachelor of Arts
Sociology
University of Southern California

Certifications:
AICP
American Institute of Certified Planners
American Planning Association

Years with this Firm: 7

Mr. Tepper has extensive experience as an Urban and Environmental Planner and serves as the technical lead on SEQRA projects for the firm. Mr. Tepper's SEQRA experience includes preparation of SEQRA documents, environmental analyses and environmental impact statements for a variety of projects, including planning initiatives, development applications and public infrastructure projects. He also serves as lead on the firm's Geographic Information Systems (GIS) projects - providing oversight for the integration of GIS with the firm's ongoing projects. He offers valuable experience in the development of spatial databases for municipal and county governments and regional planning entities including cadastral, transportation, environmental and demographic data. He has utilized GIS extensively in numerous planning initiatives, including: comprehensive/master plan updates, growth management plans, community vision plans, alternatives analyses, buildout analyses and infrastructure needs assessments.

- **Village of Amityville Transit Oriented (TO) Code and DGEIS** – Helped develop the new transit oriented zoning district for the Village of Amityville, including language for zoning amendments/ordinance. Also prepared the Draft GEIS for the TO District, including detailed analyses on land use and zoning, community character, community services, taxes and economic impacts, noise, air quality, and alternatives analyses.
- **Cortland Downtown Revitalization Initiative (DRI)** – Performed project analyses, background research and conducted stakeholder interviews to guide the Cortland DRI planning process. Prepared components of the Downtown Cortland Strategic Investment Plan to describe the City's needs, history, and revitalization potential. Helped to craft and execute a fully-developed Public Engagement Plan and participated in all public meetings in Cortland.
- **Nassau County Infill Redevelopment Feasibility Study** – Created GIS maps, existing conditions reports and performed related analyses for 21 different LIRR stations in Nassau County to assess the overall development infill potential for each station area. Based on these existing conditions reports and several rounds of public input, Nassau County ultimately selected three station areas that showed the most potential for infill development.
- **City of Long Beach Comprehensive Plan Update –** Prepared the majority of the City's Comprehensive Plan update and associated SEQRA-required environmental analyses. Work included detailed land use and economic development recommendations considering downtown revitalization (zoning changes, streetscape enhancements and market analyses), multi-modal traffic enhancements, Complete Streets initiatives, parking management strategies, stormwater management improvements, and various coastal resiliency measures tailored to Long Beach. In addition, detailed development scenarios were prepared and analyzed for key areas including the Central Business District and Civic Core, the Oceanfront and the Bayfront along the north shore of the City. This project involved major public outreach efforts, including open public meetings, targeted focus group sessions, key stakeholder consortiums and an array of online/print/phone campaigns to expand and enhance public participation. **Southampton Sewer Study –** Prepared a Full Environmental Assessment Form (FEAF) and Expanded Environmental Assessment, including a detailed buildout analysis to assess impacts of sewers on downtown growth and development. The preparation of the FEAF and Expanded Assessment incorporated review of prior studies, reports, and memoranda related to potential sewering and development of the Village, review of the Draft GEIS prepared by Suffolk County for non-sewered study areas and the preparation of a Negative Declaration for the Village.
- **New York Rising - Community Reconstruction (NYRCR) Plans** – Provided various GIS mapping services/analyses, drafted conceptual/final NYRCR plans, and participated in numerous committee meetings and public engagement events for all of the Suffolk County NYRCR communities affected by Superstorm Sandy.

CAMERON ENGINEERING

Liam Doxey

Civil Engineer

Education:
Bachelor of Science
Civil Engineering
Stony Brook University, Stony Brook NY

Certifications:

- OSHA 10 Hour Construction Safety & Health
- LIRR Roadway Worker Protection
- Soil Density Testing
- Concrete Field Testing

Years with this Firm: 1

Mr. Doxey has a Bachelor's Degree in Civil Engineering from Stony Brook University. While attaining his degree, Mr. Doxey gained experience in seawall replacement, developing a feasibility study and also worked on water treatment plant design, solar module design, land surveying, conducted materials testing (i.e.; steel, concrete, asphalt) as well as geotechnical testing analyzing properties of soils, including permeability, consolidation, and compression tests, using the ASTM manuals. He is currently working on many of the firm's civil engineering projects for various municipal clients.

- **Sag Harbor On-Call Engineering Service Agreement** – Cameron Engineering was awarded a two-year agreement to provide engineering services to all Sag Harbor village-owned property. Mr. Sharrer is currently involved with providing services to the Village of Sag Harbor for its wastewater treatment plant, review of sewer connection applications and data review.
- **Village of Island Park, Flood Protection for the Major Infrastructure Phase II –** Cameron Engineering is developing a plan to improve the Village resiliency. The project is funded by and conceived by the Federal Emergency Management Agency's Hazard Mitigation Grant Program, administered through the New York Stated Division of Homeland Security. Hydraulic and tidal surge modelling are being conducted to optimize storm drainage and coastal barrier design. Tidal gates, barriers and sea walls are being evaluated and a Benefit Cost Analysis (BCA). Improvements under the evaluation include tidal gates, barriers and sea walls, outfall tide flex valves, drainage system improvement, stormwater pumping/ diversion, beach stabilization/replenishment, temporary/potable cofferdams. Project features include stormwater/tidal surge modelling, tidal gates/barriers and sea walls, FEMA, NYSDEC and ACOE permitting, beach stabilization/ replenishment.
- **City of Long Beach, City of Long Beach Disaster Management Response and Recovery Services Contract** - Cameron Engineering was tasked with the preparation of a Hazard Mitigation Proposal (HMP) to accompany the City Hall Project Worksheet (PW) for the hardening of City Hall. The purpose of the HMP is to identify the infrastructure improvements necessary to harden both City Hall and the City's firehouse which is at elevation 8 to protect City Hall to the Base Flood Elevation (BFE) 12.6 plus one (1) foot. Hardening to this elevation will protect the lower floor of City Hall including the mechanical and electrical systems that provide utilities to the City Hall. Similarly, protection of the adjacent fire house to the Base Flood Elevation (BFE) 12.6 plus one (1) foot will prevent flood waters from entering the building and damaging equipment and building systems.
- **City of Long Beach, Water Purification Plant, Hazard Mitigation** - The City owns and operates a Water Purification Plant (WPP) located on Park Place. The WPP sustained damage during Superstorm Sandy. Damage from surge waters entering the WPP occurred to the process equipment, pumps, motors, sensors, actuators and automated control systems. The damage occurred in the generator room, chlorine storage and distribution room, maintenance room, alum storage and distribution room, pump room, general storage tank, booster pump station and at Well Houses # 9, #11, #13, #15, #16, # 17, and #18. Cameron Engineering is providing engineering services to the City for the required improvements to its Water Purification Plant.

Previous Experience:

Nassau County Department of Public Works, Westbury, NY
Department of Civil Engineering
As an Intern, Mr. Doxey prepared resurfacing plans and traffic marking specifications, for various county-owned roadways, in AutoCAD and Civil3D. He also accompanied professional engineers on site investigations to obtain design measurements and assess damage to pavement, curbs, storm drains, traffic loops, etc. His duties included creating cost estimates and providing Field Inspector services

CAMERON ENGINEERING

Natalie Cloud, LEED AP

Environmental Engineer

Education:
Bachelor of Science
Environmental Engineering
State University of New York at Buffalo

Certifications:
LEED Accredited Professional - U.S. Green Building Council Certification

Affiliations:
New York Water Environment Association

Years with this Firm: 13

Years with other Firms: 5

Ms. Cloud currently assists in the design of the Firm's projects within the areas of new water and wastewater systems and design. Her duties include project engineering analysis and calculations, conceptual design, preparation of plans and specifications, and report writing. Her experience includes water distribution system design and modeling. Ms. Cloud conducts shop drawing reviews and attends meetings on behalf of clients as part of the construction phase services.

Ms. Cloud's experience includes:

- **Sag Harbor On-Call Engineering Service Agreement** – Cameron Engineering was awarded a two-year agreement to provide engineering services to all Sag Harbor village-owned property. Ms. Cloud is currently involved with providing services to the Village of Sag Harbor for its wastewater treatment plant, review of sewer connection applications and data review.
- **Suffolk County Sewer District Capacity Study, Suffolk County, NY:** Manage-Analysis five existing sewered areas: Sag Harbor, Port Jefferson, Patchogue, Riverhead and Calverton. The Study included existing and projected wastewater generation rates on a per parcel basis. A collection system analysis was performed and recommendations for infrastructure upgrades were provided. The Study provided aid to Suffolk County in determining the availability of existing treatment capacities.
- **Rocky Point Sewering Feasibility Study, Rocky Point, NY:** Managed study and contributed research/conceptual design layouts of traditional and alternative sewering within the study area. Included economic feasibility and impact. GIS data compilation, database development and spatial analysis to aid alternative scenarios development and feasibility analysis.
- **Smithtown and Kings Park Feasibility Study, Smithtown, NY:** Build-out Analysis of two downtown business districts with wastewater generation rates. GPS field surveys were performed to determine existing and proposed conditions. Preliminary sewering design layouts were completed which Included vacuum-assisted sewers and the expansion of the existing wastewater treatment plant. GIS was a key component in analyzing the two separate study areas with combined design layouts and recommendations.
- **Forge River Watershed Plan, Mastic-Shirley area, NY:** Compiling watershed inventory and characterization, environmental/spatial analyses, and the development of management strategies through GPS and GIS data.
- **Malverne Stormwater System mapping, Malverne, NY:** GIS modeling of the entire stormwater system of Malverne, including natural features of the system. Assembling a GIS model of the stormwater system via integration of historic plans and diagrams and field-collected inventory data.
- **City of Long Beach Wastewater Treatment Plant Sandfilter Repairs** – In the wake of Superstorm Sandy, Cameron Engineering is assessing in the rehabilitation and construction repairs to the City of Long Beach's Wastewater Treatment Plant's sandfilter building in order to reduce total suspended solids within the treatment process.
- **Greater Atlantic Beach Water Reclamation District - Atlantic Beach, NY**-Preparation of Phase II Facility Improvements Plans and Specifications which address improvements at the facility based on NYSDEC modifications to the plant's permit. Includes the addition of a Dechlorination Facility, sodium bisulfite chemical feed system and a lift station to provide for series flow to the Trickling Filter process in order to reduce ammonia nitrogen concentrations. Provided field supervision during construction.
- **Belgrave Water Pollution Control District** - The project included the upgrade of the District's secondary treatment plant to achieve the NYSDEC requirements for nitrogen reduction by 2014 and Total Residual Chlorine (TRC) limitations.

CAMERON ENGINEERING

Stephen Hadjiyane, P.E., BCEE

Senior Associate, Technical Advisor

Education:

Education:

Master of Science
Environmental Engineering
Manhattan College, Bronx, NY

Bachelor of Science
Chemical Engineering
SUNY Buffalo, Buffalo, NY

Associate of Applied Science
SUNY Farmingdale
Farmingdale, NY

Licenses/Registrations:

Professional Engineer:
NY, CT, MA

Certifications:

Board Certified Environmental Engineer (BCEE)

Affiliations:

Past Chair/Member, New York Water Environmental Association Long Island Chapter, 1990 - Current

Member, Long Island Water Conference, 2000 - Current

Awards:

Chapter Achievement Award, New York Water Environmental Association, Long Island Chapter - 2014

Environmental Engineer Award, New York Water Environmental Association - 2016

Years with this Firm: 1

Years with other Firms: 33

Mr. Hadjiyane is a Professional Engineer in New York, Connecticut and Massachusetts and a Board-Certified Environmental Engineer (BCEE) with 30 years of experience. He works with the Water/Wastewater group in designing and managing projects while providing QA/QC oversight for the delivery of high quality work products.

Throughout his 30-year career, Mr. Hadjiyane has played a key role managing and directing strategic wastewater infrastructure projects to protect and enhance New York's water resources. He has been a trusted advisor for Nassau and Suffolk Counties, Rockland County, Westchester County, and for the New York City Department of Environmental Protection.

Responsibilities include providing a technical advisory role on complex projects, performing quality assurance/quality control, and directing and supervising engineering projects for the firm. Specializing in designs for wastewater and water treatment facilities, and stormwater pumping stations, background includes the design of activated sludge, extended aeration, and nitrogen removal treatment systems. Experienced in the design of sludge thickening, solids dewatering, and odor control systems. Also experienced in the design of vertical and horizontal centrifuge pumps, as well as extended shaft and pumps operating on variable frequency drives. Pumping system design experience includes vertical turbine, submersible, progressive cavity, rotary lobe, plunger, and wet- and dry-pit pumping systems. Experience leading thickener system upgrades includes progressive cavity and torque flow pumping systems needed for thickener underflow, transfer, and mixing systems.

His project experience includes:

- **Sag Harbor On-Call Engineering Service Agreement** – Senior Engineer assisting with operational assistance at the Village's sewage treatment plant including evaluating odor controls and UV Disinfection system upgrades, sewer rehabilitation and lining repairs and review of sewer connection applications..
- **SCDPW, Brentwood Sewer Feasibility Study –** Project Manger developing a feasibility report to review the current and future infrastructure to improve the economic, housing opportunities and environmental aspects of the downtown Brentwood area. The purpose of the feasibility study is to evalaute sewer optoins and provide a strategy for commercial development for revitalization efforts.
- **Great Neck Water Pollution Control District, Manhasset Sanitary Sewer Feasibility Study** – Project Manager performing a sewer feasibility studies The first study focuses on the downtown Manhasset commercial area located on Plandome Road. The second study area is the residential area west of Plandome Road from Colonial Parkway to the north and Shore Road to the south. Evaluating sewer options that include gravity/pump stations, and low pressure sewers. Developed construction cost estimated and benefit cost analysis.
- **Village of Hempstead, Sewage Collection Systems –** Senior Engineer performing hydraulic analysis on sewer system to determine if new sewer availability request for connecting to the Village's sewer system can be approved. Developed sewer flow projections for future planning and development.
- **Bay Park Sewage Treatment Plant Improvements, Nassau County, NY, Nassau County Department of Public Works.** Project Director responsible for providing design engineering and construction services for the rehabilitation of the Bay Park sewage treatment plant grit removal facility. Prepared technical design report evaluating grit removal technologies to replace the existing detritus with vortex-style units. Report included a flow assessment of the incoming plant flows, design basis for vortex-style grit removal units, design basis for grit handling equipment, proposed grit removal facility preliminary layout and hydraulic profile, and estimated construction costs. Prepared contract bid documents for improvements to the existing facility including new vortex grit removal systems, grit pumps, grit classifiers and cyclones, new isolation slide gates, new sodium hydroxide and hypochlorite storage and feed systems, new odor control system, hazardous gas monitoring system, new process monitoring control system, and new heating, ventilation, and air-conditioning (HVAC), fire alarm, and electrical systems. Also prepared detailed maintenance of plant operation procedures to maintain operation of the plant during construction.

CAMERON ENGINEERING

Bertrand A. Byrne, P.E.

Civil Engineer, Water Distribution Systems

Education:
Doctor of Philosophy
Water Resources
Rutgers University, NJ (In progress)

Masters of Science
Water and Wastewater Treatment
Rutgers University, NJ, 2014

Bachelor of Science/Civil Engineering
Howard Engineering, DC, 2001

Licenses/Registrations:
Professional Engineer: New York / Florida

Certifications:
Associate Project Management Certification

Affiliations:
Tau Beta Pi
WEF
NSPE
AWWA

Awards:
ASCE (National Capital Section) Student Award (2000)

Years with this Firm: 8

Years with other Firms: 23

Mr. Byrne is experienced in hydraulic and hydrologic modeling, water supply and distribution systems. Experience also included leakage investigation and performance analysis, project management and construction management. Competent in many areas of engineering consultancy: including civil/environmental engineering, master-planning, project management and construction management.

Mr. Byrne's experience includes:

- **Suffolk County Sewer District Capacity Study, Suffolk County, NY:** Manage- Analysis five existing sewered areas: Sag Harbor, Port Jefferson, Patchogue, Riverhead and Calverton. The Study included existing and projected wastewater generation rates on a per parcel basis. A collection system analysis was performed and recommendations for infrastructure upgrades were provided. The Study provided aid to Suffolk County in determining the availability of existing treatment capacities.
- **Village of Hempstead, Sewage Collection Systems –** Mr. Byrne is performing hydraulic analysis on sewer system to determine if new sewer availability request for connecting to the Village's sewer system can be approved. Mr. Byrne also assisted in developing sewer flow projections for future planning and development.
- **Suffolk County DPW - Infiltration and Inflow (I/I) Study** - Prompted by concerns over aging infrastructure and the identification of extraneous flows during storm events, the SCDPW contracted Cameron Engineering to conduct an infiltration and inflow study in portions of its Southwest Sewer District. With the aid of a GIS, Cameron Engineering inventoried and analyzed the physical condition of the sanitary sewer collection infrastructure in two study areas, the Brightwaters and West Islip collection areas.
- **Village of Hempstead, Sewer Evaluation** – The project involved the development of a hydraulic model that will be used to simulate existing and future demand conditions and identify system deficiencies under these conditions. The project included the development of a GIS database of the Village's sewer collection system from record drawing and field surveys that was used to build the model. Upon completion the hydraulic model was handed over to the Village to be used on an ongoing basis to assist in the evaluation of future transmission and distribution improvements.
- **Tohopekaliga Water Authority (Florida) Master Plan –** This project involved the development of hydraulic models of water distribution systems and wastewater collection systems to populate a capital improvement plan with future water and sewer improvements needed to address future population growth in Kissimmee Florida. The model required extensive digitization of record drawings and the assignment of relevant attribute data to digitized infrastructure and the incorporation of existing GIS data from other sources.
- **Seminole County (Florida) Master Plan –** This project involved the development of hydraulic models of water distribution systems and wastewater collection systems to populate a capital improvement plan with future water and sewer improvements needed to address future population growth in Seminole County, Florida. The model required extensive digitization of record drawings and the assignment of relevant attribute data to digitized infrastructure and the incorporation of existing GIS data from other sources.
- **Nassau County DPW Five Towns Study, Nassau County, NY –** Superstorm Sandy impacted the Five Towns area of Nassau County with coastal storm surge related flooding. H/H modeling was used to assess existing storm drainage system deficiencies under various rainfall and tailwater conditions and to develop and test flood mitigation alternatives for stormwater runoff, coastal storm surge and stormwater runoff in combination coastal storm surge related flooding.

CAMERON ENGINEERING

Jonathan J. Sharrer, P.E.

Engineer

Education:
Bachelor of Science
Environmental Engineering
SUNY College of Environmental Science and Forestry

Licenses/Registrations:
Professional Engineer:
New York

Affiliations:
New York Water Environment Association

Years with this Firm: *13*

Years with other Firms: 6

Mr. Sharrer is involved with the design of the Firm's projects within the areas of wastewater treatment plants, upgrading of existing treatment facilities and force main/gravity wastewater collection system designs. His duties include project engineering analysis, calculations, conceptual design, preparation of plans and specifications, drafting and report writing. His experience also includes investigating the feasibility of Horizontal Directional Drilling (HDD) for force main routing. Mr. Sharrer conducts shop drawing review and attends meetings on the behalf of clients as part of construction phase services.

Mr. Sharrer also provides construction management and observation services for sewage treatment plant upgrades, water main installation and sanitary sewer/force main projects. As a Field Representative, Mr. Sharrer ensures that contract requirements are met, such as verification of quantities and proper operation of installed equipment. He also conducts final inspections.

Mr. Sharrer's project experience includes the following projects:

- **Sag Harbor On-Call Engineering Service Agreement** – Cameron Engineering was awarded a two-year agreement to provide engineering services to all Sag Harbor village-owned property. Mr. Sharrer is currently involved with providing services to the Village of Sag Harbor for its wastewater treatment plant, review of sewer connection applications and data review.
- **Nassau County Consolidation of Sanitary Sewers in Villages of Lawrence and Cedarhurst, Nassau County, NY** - Preparation of Plans and Specifications for gravity collection, pump station and force main for the consolidation plan of Cedarhurst and Lawrence. Cameron Engineering conducted extensive surveys using GIS and ground truthing to map out several routing locations for the proposed force mains. Project included pipe jacking design for crossing wetlands adjacent to the Inwood Pump Station.
- **Nassau County DPW Barnes Avenue Sanitary Sewer Overflow Design, NY** – In the wake of Superstorm Sandy, The County directed Cameron Engineering to prepare a detailed Technical Design Report followed by the development of Contract Documents (Plans & Specifications) for a new 12 MGD flow diversion pump station and 3 mile 30" diameter force main to transfer sewage from the Village of Hempstead to North Merrick.
- **Club at Melville – Design of Pump Station and Force Main, Melville, NY -** Managed the design of an on-site sanitary sewer pumping station and force main system to collect and convey wastewater flow from a senior housing complex located on Deshon Drive in Melville. Provided hydraulic calculations to determine wet well/force main sizing and pump capacities, as well as design of pump station control building and components including standby generator, level control system, flow meter and provisions for a future odor control system. Performed construction management services, including periodic oversight of construction activities and field coordination between Contractors, Developer and on-site Construction Manager.
- **Suffolk County DPW Kime Avenue, West Islip, NY** - Cameron Engineering provided design engineering, permitting and construction oversight and administration services for the rehabilitation of an existing 48-inch diameter reinforced concrete sanitary sewer interceptor located beneath the Southern State Parkway and between Kime Avenue and Babylon Avenue in West Islip, New York.
- **Long Beach WPCP and Roosevelt Boulevard Pump Station Superstorm Sandy Emergency Repairs – Long Beach, NY –** Preparation of Plans and Specifications for the repair/replacement of plant process equipment, including but not limited to, pumps, valves, flow meter and clarifier drive units as a result of damages sustained from Superstorm Sandy. Provided construction administration services and periodic field supervision/oversight, which includes shop drawing submittal review, construction progress meetings and review of payment requisitions.

CAMERON ENGINEERING

Mark P. Rauber

Engineering Director

Education:
Mechanical Engineering Northeastern University

OSHA 1910.120 Hazardous Waste Operations and Emergency Response

OSHA 1910.146 Permit Required Confined Space

Certifications:
Engineer-in-Training (EIT)

Affiliations:
American Society of Mechanical Engineers

New York Water Environment Association

Years with this Firm: 16

Years with other Firms: 16

Mr. Rauber has provided full service construction related services, including review of shop drawing, review/response to RFI's, comprehensive regulatory reporting, review and approval of payment requisitions and change order requests and has provided periodic site visits for project compliance, punchlist, startup and project certification of completion.

As lead Project Engineer, Mr. Rauber has provided comprehensive construction related services for several of the Firm's wastewater treatment facility improvement projects including, but not necessarily limited to, Nassau County Consolidation of Sanitary Sewer Services - Villages of Lawrence and Cedarhurst, Greater Atlantic Beach Water Reclamation District Phase II Facility Improvements, Phase I Facility Improvements at the Village's of Lawrence and Cedarhurst WPCP's and Phase II BNR Facility Improvement Project at the Village of Greenport WPCP. Mr. Rauber has also been instrumental for the design, construction oversight, startup, testing and operation of the Bergen Point WWTP, City of Glen Cove WPCP and Village of Greenport WPCP Ultraviolet (UV) Light Disinfection Systems.

Mr. Rauber's is also primarily responsible for design of the Firm's projects in the areas of wastewater collection, conveyance (i.e., pumping stations) and treatment with the upgrade of several existing and design of several new facilities. He has prepared Engineering Reports/Studies, developed hydraulic profiles/analyses, analyzed unit processes for compliance with regulatory and accepted design standards. He is also responsible for the development of contract plans and specifications, vendor analysis and probable construction cost estimates.

Mr. Rauber has also served as Project Engineer for several Sanitary Sewer Evaluation Studies (SSES) conducted for the Nassau and Suffolk County. His efforts have included flow studies, sewer condition evaluations, CCTV inspections, sewer lining, report preparation and recommendations. Based on his recommendations, Mr. Rauber has developed contract plans and specifications and provided construction oversight of the necessary improvements.

Project Experience includes:

- **Suffolk County Sewer District Capacity Study, Suffolk County, NY:** Manages analysis five existing sewered areas: Sag Harbor, Port Jefferson, Patchogue, Riverhead and Calverton. The Study included existing and projected wastewater generation rates on a per parcel basis. A collection system analysis was performed and recommendations for infrastructure upgrades were provided. The Study provided aid to Suffolk County in determining the availability of existing treatment capacities.
- **Nassau County DPW Consolidation of Villages of Lawrence and Cedarhurst Sewer Infrastructure, Lawrence/Cedarhurst, NY -** Based on recommendations provided by Cameron Engineering to an earlier Consolidation Master Plan, County moved forward with the closure of two aged treatment plants into the County's regional facilities. Cameron Engineering conducted extensive surveys using GIS and ground truthing to map out several routing locations for the proposed force mains.
- **Belgrave Water Pollution Control District, Great Neck, NY** - The project includes the upgrade of the District's secondary treatment plant to achieve the NYSDEC requirements for nitrogen reduction by 2014 and Total Residual Chlorine (TRC) limitations. Cameron Engineering completed an analysis of the District's existing outfall pipe which included both an overland and submarine component.
- **Nassau County DPW Barnes Avenue Sanitary Sewer Overflow Design, NY** – In the wake of Superstorm Sandy, The County directed Cameron Engineering to prepare a detailed Technical Design Report followed by the development of Contract Documents (Plans & Specifications) for a new 12 MGD flow diversion pump station and 3 mile 30" diameter force main to transfer sewage from the Village of Hempstead to North Merrick.