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

2022

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. The Water Quality Advisory Committee will rank and score projects based on the Scoring Criteria contained in the application materials. 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 individual or multiple projects.

WATER QUALITY IMPROVEMENT PROJECT MEANS:

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 and vessel pumpout stations 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: Peconic Land Trust
Project Title: Evaluating Groundwater Seepage and Nutrient Input into Poxabogue Pond
Project Manager Name: Bruce Horwith

Name	Bruce Horwith
Title	Natural Resource Consultant
Organization	Peconic Land Trust
Address	296 Hampton Rd; Southampton, NY 11968
Phone	631-283-3195
Email	mswain@peconiclandtrust.org

Property owner (if different from Project manager organization):

Name	Southampton Board of Trustees
Affiliation	
Organization	
Address	116 Hampton Road
Phone	631-287-5717
Email	towntrustees@southamptontownny.gov

Project Address: Poxabogue Pond SCTM #(S) 908-001-1-6

Type of Project (Check all that apply):
☐ Reduction ☑ Remediation ☐ Restoration

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

The Peconic Land Trust (PLT) in consultation with Cornell Cooperative Extension of Suffolk County (CCE) propose to use a remediation siting strategy to target shoreline areas and perform site characterization along Poxabogue Pond in preparation for installation of a nitrogen remediation approach such as a native vegetation buffer or permeable reactive barrier (PRB) depending on site suitability. Phase 1, to be funded by private donations secured through the PLT, includes mapping high nitrogen loading zones by measuring porewater nitrogen concentration and groundwater seepage rates in groundwater discharge zones. Data from Phase 1 will inform and help focus the site characterization for remediation in Phase 2. Phase 2 includes characterizing soil, groundwater nitrogen concentrations, and other hydrogeological conditions inland from high nitrogen loading zones identified in Phase 1. The information acquired through this project will provide critical site-specific hydrogeological data to support the design and installation of a nitrogen remediation approach where it will impart the greatest water quality improvement. We currently seek 1) matching funds to complete Phase 2 of this multi-phase project and 2) the Town's commitment to support this effort which will provide leverage to continue to fund the project in the long term.

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

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

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

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

- ☐ 303(d) Impaired
- ☐ Peconic Estuary Program - PEP map
- ☑ High
- ☐ Medium
- ☐ Outside High and Medium priority areas*

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

Poxabogue Pond is in a high priority area and is in the same subwatershed, thus it is hydraulically connected to Sagaponack Pond, which is in a high priority area and is a 303(d)impaired waterbody. Please see section 2. Priority Area (pages 1-2) within the attached narrative.

3. PROJECT DESCRIPTION

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

Please see section 3a. Existing Conditions (pages 2-3) within the attached narrative.

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.

Please see section 3b. How the Proposed Solution Addresses Nitrogen Remediation (pages 3-5) within the attached narrative.

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

Please see section 3c. Technology Efficacy in Similar Settings (page 6) within the attached narrative.

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).

Please see section 3d. How the Project Supports Goals/Policies (page 7) within the attached narrative.

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.

The nutrient of concern is nitrogen. Preliminary results revealed surface water TKN concentrations of 1.7 and 2.1 mg N/L but these. Blooms of blue-green algae, likely induced by elevated nitrogen concentrations, are a known problem in the pond. The current proposal for Phase 1 and 2 will provide additional data on the existing conditions and inform the nitrogen reduction target. The goal is to design and install a remediation approach such as a vegetative buffer or PRB or a combination of approaches to intercept and treat nutrient rich water where the highest groundwater nitrogen loads are entering the pond.

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

Porewater and groundwater samples will be analyzed by an ELAP certified laboratory for the nitrogen series (nitrate, nitrite, ammonium, TKN) and select samples will be analyzed for phosphorous. Additional sampling may include organic carbon, metal analysis, and hydrogen sulfide. At the conclusion of each Phase, we will provide a report to the Town summarizing the results. After remediation installation occurs we plan to monitor the nitrogen removal performance quarterly and will provide the Town with results in a remediation performance report. In addition to reports provided to the Town, findings will be communicated publicly through various forms of media including presentations and content available on the the PLT and CCE webpages.

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

Woodchip-based PRBs have been shown to be effective in removing nitrogen from groundwater for 15+ years without maintanence(Robertson et al. 2008). Please see section 3b. How the Proposed Solution Addresses Nitrogen Remediation (pg. 3).

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.

Please see section 5. Cost Factors (pages 8-9) within the attached narrative. The current budget is appropriate and reasonable as it is based on updated quotes for salaries, equipment rental fees, analytical and contractor costs as well as travel/mileage reimbursements. CCE was a leader in the site characterization and installation of the Hampton Bays bulkhead PRB in addition to the site characterization efforts for Sagaponack Pond, as well as other Southampton and East Hampton PRBs which are currently in the design phase. They are experienced in properly budgeting for the work.

5b. Describe any matching funds to be provided.

The PLT has already secured approximately $40,000 and is prepared to contract Cornell Cooperative Extension to perform Phase 1 of the multi-phase project. The PLT will solicit additional funding to support 50% of the total budget for the project. The Town's 50% contribution would be used to fund Phase 2 which is the site characterization that directly informs remediation design. Furthermore, the Town's commitment to support this effort will provide leverage for the PLT to continue to raise the additional funds necessary to fund future phases. The PLT is prepared to reach out to the community for private donations, support from partner organizations, and apply for grants from state, county and local municipalities, if necessary.

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.

The PLT does not have funds available to fully fund this project. The use of CPF funding to help us complete this project makes the effort a public-private-government partnership. If funds awarded are lower than the level requested, we will work with our donor community, or if necessary we will strategize with Cornell Cooperative Extension to adapt the project to the level of funding available.

6. MANAGEMENT, EXPERIENCE, ABILITY

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

The PLT has been involved in numerous restoration projects, including on Georgica Pond, the Forge River in Mastic Beach, and Widow's Hole Preserve in Greenport. Cornell Cooperative Extension and its associated contractors led the implementation of a PRB in Hampton Bays to reduce nitrogen input to Shinnecock Bay and is currently involved with PRBs funded through the NYSDEC WQIP which are in the site characterization and design phases. See attached CV's for Horwith, Paulsen, and Graffam.

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

The Southampton Trustees, keepers of the Poxabogue Pond bottom, are in favor of the project have provided a letter of support.

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

No permits are needed for the current proposed Phase 1 and Phase 2 work to be completed with the requested CPF funding. The information gained in this project will help determine the feasibility and scope of nitrogen remediation necessary at Poxabogue Pond. At the conclusion of the Phase 2 site characterization we will have more information about permits that may be required for the installation of remediation.

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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.

The current request does not have a budget for remediation maintenance and monitoring. However after installation of the nitrogen remediation technology, performance monitoring will be performed quarterly. Monitoring will include sampling upgradient, within, and downgradient of the remediation for NO3-, NO2-, NH4+, and TKN to determine nitrogen removal and to calculate pounds of nitrogen removed per year. We anticipate that monitoring funds will be secured through private donation and will be used as a match during a subsequent CPF funding cycle. Traditional PRBs are passive nitrogen removal systems which require no maintanence but some PRB designs involve carbon injection and may require maintanence.

8. DURATION OF PROJECT

8a. Provide a projected project timeline. Note: The Committee will only make recommendations for shovel-ready projects that can commence this fiscal year.

Please see section 8. Anticipated Project Timeline (page 10) within the attached narrative.

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

This is a multi-phase project and the current proposal requests funds to accomplish Phase 1 and Phase 2 to inform the PRB design. Upon completion of the Phase 2 site characterization work, the PLT would likely apply to next year's funding cycle to secure CPF funds to complete the design and installation of the nitrogen remediation. The site characterization will determine the ideal location(s), size, and scope of the nitrogen remediation. At this time, it is premature to develop a budget for the design and installation as we think it is a wise approach to let the site characterization guide the remediation strategy. For additional information please see section 5. Cost Factors (pages 8-9) within the attached narrative.

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

- [x] Photos of existing conditions
- [x] Location Map
- [x] State Environmental Quality Review Act (SEQRA) Long or Short Environmental Assessment Form (EAF) https://www.dec.ny.gov/permits/6191.html
- [x] 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)
- [x] Project budget (see attached template)
- [x] Ownership commitment is provided via letter of intent (LOI) for non-municipal owners or municipal resolution for municipal owners
- [ ] Public agencies must complete SEQRA on the project and submit determination of significance and associated documentation.

10. 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

Is the applicant a municipality group? ☐ Yes ☑ No
If yes, please enter the request date or anticipated request date of RFP (Request for Proposals) _____.

PLANNING/ENGINEERING/DESIGN	Town CPF Request	Matching Funds Committed	Matching Funds Pending	Estimated Total Project Costs
Task 1-	$-	$-	$-	$- 0.00
Task 2-	$-	$-	$-	$- 0.00
Task 3-	$-	$-	$-	$- 0.00
Task 4-	$-	$-	$-	$- 0.00
Task 5-	$-	$-	$-	$- 0.00
Task 6-	$-	$-	$-	$- 0.00
	$-	$-	$-	$- 0.00
Planning/Engineering/Design Cost Total	$- 0.00	$- 0.00	$- 0.00	$- 0.00

Contractual Services				
	$-	$-	$-	$- 0.00
	$-	$-	$-	$- 0.00
	$-	$-	$-	$- 0.00
	$-	$-	$-	$- 0.00
	$-	$-	$-	$- 0.00
CCE salary (includes unemployment and worker's comp)	$- 13,145.00	$- 13,144.00	$-	$- 26,289.00
Contractor CLEAR	$- 13,039.00	$- 13,040.00	$-	$- 26,079.00
Contractual Services Cost Total	$- 26,184.00	$- 26,184.00	$- 0.00	$- 52,368.00

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
Supplies, Geoprobe and equipment rental fees	$-3,062.00	$3,063.00	$-	$-6,125.00
analytical costs	$-4,625.00	$4,625.00	$-	$-9,250.00
	$-	$-	$-	$-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	$-7,687.00	$7,688.00	$-0.00	$-15,375.00

Additional Cost				
travel	$-989.00	$-989.00	$-	$-1,978.00
14.56% indirect administrative cost for CCE	$-5,076.00	$-5,075.00	$-	$-10,151.00
	$-	$-	$-	$-0.00
	$-	$-	$-	$-0.00
	$-	$-	$-	$-0.00
	$-	$-	$-	$-0.00
	$-	$-	$-	$-0.00
Additional Cost Total	$-6,065.00	$-6,064.00	$-0.00	$-12,129.00

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

Total Project Cost	$-79,872.00
Applicant matching funds committed	$-39,936.00
Applicant matching funds pending approval (e.g. grant request submitted pending determination)	$-0.00
Total CPF Funds Requested	$-39,936.00

Source of matching funds	Amount
Peconic Land Trust	$ 39,936.00

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COMMUNITY PRESERVATION FUND (CPF)
WATER QUALITY IMPROVEMENT PROGRAM

APPLICANT'S INFORMATION

Owner: Peconic Land Trust
Contact First and Last Name: Bruce Horwith
Contact Address: 16 Salt Marsh Path; East Hampton, NY 11937
Contact Phone: 631-599-0040
Contact Email: bruce.horwith@gmail.com

CONTRACT RECIPIANT INFORMATION

Name/Organization: Peconic Land Trust
Contact Person/Officer: John v.H Halsey/President
Contact Address: 296 Hampton Rd; Southampton, NY 11968
Contact Phone: 631-283-3195
Contact Email: mswain@peconiclandtrust.org

PROJECT INFORMATION

Project Title: Reducing Groundwater Nitrogen Input into Poxabogue Pond
Project Location: Poxabogue Pond
Project Description (1-3 sentences):

The Peconic Land Trust (PLT) in consultation with Cornell Cooperative Extension of Suffolk County (CCE) propose to use a remediation siting strategy to target shoreline areas and perform site characterization along Poxabogue Pond in preparation for installation of a nitrogen remediation approach such as a native vegetation buffer or permeable reactive barrier (PRB).

ANTICIPATED PROJECT TIMELINE

Begin: Summer 2022
Complete: Phase 1 and 2 complete by Summer 2023
Notes:

The anticipated timelines are provided to show that the PLT, CCE, and associated contractors are highly motivated to begin the project upon securing funds. Timelines are contingent upon contract approvals and fund dispersal, and thus need to be flexible.

ATTESTATION

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

Check all boxes & sign.

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

☑ We understand that progress reports will need to be generated as specified in our Water Quality Improvement Contract AND a final report showing qualitative and/or quantitative data will be generated upon project completion. .

Signature: John v.H. Halsey Date 4/15/2022

Reducing Groundwater Nitrogen Input into Poxabogue Pond

2. Priority Area

Poxabogue Pond, owned by Southampton Town, is a coastal plain pond within the Long Island Greenbelt region which is considered a high priority area according to the Water Quality Improvement Project Plan (WQIPP). Poxabogue Pond and Sagaponack Pond are within the same subwatershed, thus are hydraulically connected. Sagaponack Pond is within a high priority area and is considered a NYS 303d impaired waterbody for fecal coliform pollution. Collectively Suffolk County, Southampton Town, Southampton Board of Trustees, The Nature Conservancy, the Friends of Long Pond Greenbelt, the Peconic Land Trust (PLT), and community members have played a role in preserving and managing Poxabogue Pond and nearby land. Safeguarding the natural habitat, preserving the aesthetic value, and maintaining the agricultural heritage of the area is of primary importance to the residents and local organizations such as the PLT.

The Long Island Greenbelt is a New York State Significant Coastal Fish and Wildlife Habitat which is home to globally rare species. The pond is situated between Poxabogue Pond Park owned by Suffolk County and Sagg Swamp which is managed by the Nature Conservancy. Additionally, some of the land surrounding the pond is residential or Town-owned property, some of which is part of the purchase of development rights (PDR) program. Over time, land use surrounding the pond has shifted from agricultural towards a combination of residential, agricultural, and preserved woodlands and freshwater wetlands.

A wetland buffer of varying thickness surrounds the pond and supports the shoreline habitat. However, native shoreline vegetation, such as cattails, have been replaced by the invasive species *Phragmites australis*. Although the Long Island Greenbelt still contains a vibrant habitat including some rare flora and fauna, environmental stressors are a major issue. Land use change and population increase in the region has culminated in increased environmental stressors such as fecal coliform bacteria, herbicides, excessive nutrients, and harmful algae blooms. According to the Suffolk County Subwatershed Wastewater Plan (SCSWP) (pg. 2-186), 52% of nitrogen inputs to Sagaponack Pond and Poxabogue Pond subwatershed are septic derived and 48% of nitrogen inputs are collectively from fertilizer, atmospheric deposition, and pet waste. The pond is fed below by groundwater and above by precipitation, thus seasonal variability in groundwater table height and rainfall determines

the water level in the pond and the nutrient inputs from both stormwater runoff and groundwater seepage.

3a. Existing Conditions

In 2021 the PLT contracted Cornell Cooperative Extension of Suffolk County (CCE) to implement a remediation siting strategy at Sagaponack Pond with a focus on the Smith Corner Preserve shoreline and in areas downgradient from where the PLT holds easements. This effort led to a remediation project funded through the Community Preservation Fund (CPF) for the site characterization, and future design and installation of a nitrogen remediation approach such as a permeable reactive barrier (PRB) to intercept and treat contaminated groundwater before it seeps into Sagaponack Pond. In fact, five shoreline areas were identified as high nitrogen loading zones and potential remediation sites, and site characterization at the Smith Corner Preserve is currently underway. The siting strategy revealed that groundwater seepage rates were highest in the northern half and on the western shoreline of Sagaponack Pond. In addition, seepage rates on the southern shoreline were very low or negative indicating groundwater recharge. It is hypothesized that a similar groundwater flow pattern holds true for Poxabogue Pond. However, quantifying seepage rates directly and measuring water table elevation over multiple seasons will provide data to test the hypothesis.

Harmful algae blooms have been detected in Poxabogue in prior years and recently two surface water grab samples collected from different sides of the pond in March 2022 had 1.7 and 2.1 mg N/L as TKN. Exactly where groundwater nitrogen loading to the pond is highest is still an open question. To the best of our knowledge, this project would provide the first direct measurements of groundwater derived nutrient loads to Poxabogue Pond. The current project builds upon model outputs and regional waterbody prioritization from the SCSWP by providing the locally collected data necessary to take actionable steps towards protection and remediation. Moreover, there is interest in understanding groundwater discharge and nitrogen loading specifically in the southeastern region of Poxabogue Pond where the Town of Southampton owns land adjacent to the pond and this project will provide data to inform land use practices there. Overall, it is critical to “ground-truth” modeled data, evaluate seasonal water table fluctuation, and monitor groundwater seepage rates and nutrient loading under water table elevation extremes to effectively, and economically, apply management and remediation

measures intended to control nutrient sources. Poxabogue Pond and Sagaponack Pond are within the same subwaterhed, thus are hydraulically connected, and funding this project is another step towards improving water quality in the region.

3b. How the Proposed Solution Addresses Nitrogen Remediation

The PLT in collaboration with CCE are seeking funds to implement the proven remediation siting strategy which includes creating a groundwater seepage and nitrogen loading map and performing site characterization at Poxabogue Pond to inform remediation design, such as a native vegetation buffer, a PRB, or a combination of approaches if needed. PRBs have been used extensively in the midwest United States and Canada to treat agricultural and septic derived nitrate plumes (Robertson et al. 2000, Schipper et al. 2010, Christianson et al. 2020) and have recently been installed near impaired waterbodies in Suffolk County and on Cape Cod as an approach to mitigate surface water nitrogen pollution (Graffam et al. 2020, Hiller et al. 2015). PRBs support a natural microbial community for nitrate removal through a series of reactions called denitrification. After installation they are subsurface and require no aboveground structures, they are completely passive with no moving parts, and continue to provide passive nitrogen removal with no maintenance for decades. In fact, one of the longest PRB studies available found that after 15 years 80% of carbon remained, so less than 1.5% of carbon was used per year (Robertson et al. 2008). Assuming half of the total carbon was available to microbes, the life of the PRB would exceed 30 years without maintenance.

Most importantly, PRBs can treat all nitrates regardless of the source, and have the potential to provide rapid relief from excess nitrogen. This type of treatment is ideal for Poxabogue because nitrogen loading to the pond is a combination of septic, fertilizer, and atmospheric deposition, and PRBs can treat nitrate from all these sources while improvements to fertilization practices and septic upgrades are implemented over time. After PRB installation, nitrogen reduction measures will involve sampling upgradient (pre-treatment), within the barrier, and downgradient (post-treatment) of the barrier to determine nitrogen removal as percent N removed and the pounds of nitrogen removed per year. Calculating the pounds of nitrogen removed requires knowledge of the volume of water treated per day which will be determined during the site characterization and PRB design process.

Specifically, the remediation siting strategy involves multiple phases. Phase 1 Step 1 includes deploying a patented porewater evaluation instrument to locate and map groundwater discharge zones using conductivity and temperature contrast between the porewater at 1 foot into the pond bottom and surface water 1 foot above the bottom. This will be accomplished by establishing transects starting nearshore and moving offshore (Fig. 1). The porewater evaluation instrument also facilitates sample collection. Samples will be collected at each station and analyzed by an ELAP certified laboratory for the nitrogen series (nitrate, nitrite, ammonium, TKN) and select samples will be analyzed for phosphorous. At each station, coordinates will be recorded using a Wide Area Augmentation System (WAS) locked GPS, an instrument capable of sub-meter accuracy. Porewater field parameters will include temperature, conductivity, total dissolved solids (TDS), pH, oxidation reduction potential (ORP), and dissolved oxygen. Additionally. a qualitative description of the sediment bottom type will be recorded at each

Figure 1: Map of Poxabogue Pond with porewater survey transects shown by the red dotted lines and anticipated shoreline stations for porewater and groundwater seepage measurements shown by light blue triangles.

station and a field log will be maintained. Sediment bottom type is an important indicator of groundwater seepage zones.

In Phase 1 Step 2, stations which have the highest porewater nitrogen concentration, and which show the greatest potential for elevated groundwater seepage rates will be selected for further measurements with groundwater seepage equipment (Paulsen et al. 2001). The groundwater seepage meter will be deployed within the pond bottom for extended periods to determine groundwater seepage rates. By combining seepage rate and porewater nitrogen concentration, a nutrient load to the surface water is calculated. The deliverable for Phase 1 will be a map of nitrogen loading around Poxabogue. Shoreline areas will be ranked according to nitrogen loading which will help target the best location for remediation placement, will ensure that funds are directed towards projects which will have the largest positive impact on pond water quality and this allows for an efficient use of CPF money.

The area(s) with the highest nitrogen loading will be selected for Phase 2 site characterization to determine site suitability and provide critical data for remediation design. Phase 2 will include mobilizing and operating a Geoprobe to install several nearshore shallow profile wells and collect soil borings. Soil borings will be analyzed for grain size analysis and hydraulic conductivity tests will be performed. A survey of well elevations will be performed to determine the hydraulic gradient, groundwater flow direction, and groundwater velocity. Groundwater samples will be collected at 5 to 10 ft intervals below the water table and field parameters will include temperature, conductivity, total dissolved solids (TDS), pH, oxidation reduction potential (ORP), and dissolved oxygen. Samples will be collected and analyzed by an ELAP certified laboratory for the nitrogen series (nitrate, nitrite, ammonium, TKN) and select samples will be analyzed for phosphorous. During site characterization work, environmental disturbances will be minimized whenever possible. This project is highly feasible given that there is access to road right of ways and or private and public property access for machinery along much of the shoreline surrounding the pond.

The deliverables for Phase 2 include a site characterization report which outlines targeted site(s) for remediation, the anticipated pounds of nitrogen removed, site-specific data for remediation design, and recommendations on the nitrogen remediation approach. Although nitrogen is the primary pollutant and nutrient of concern, phosphorous samples will be collected at select stations. Phosphorous is known to play a role in algae bloom formation in freshwater

bodies. While PRBs do not treat phosphorous, native vegetated buffers can help with phosphorous removal, thus we feel it is important to know some information about both nitrogen and phosphorous to impart the greatest water quality benefit with the strategic placement of remediation. Additionally, outreach to stakeholders and community members will occur. The goal is to help the community understand the importance of groundwater and surface water quality and provide education on the science and efficacy of the remediation approach.

The integrated remediation siting strategy that CCE implements allows for a comprehensive understanding of the hydrogeologic conditions and the groundwater, porewater, and surface water interactions. The siting strategy also supports a holistic approach to nitrogen remediation because each waterbody is unique and there is not a one-size-fits-all solution. For instance, onsite wastewater improvements are critically important, and the siting strategy can identify areas where septic upgrades are most useful. However, according to the SCSWP septic upgrades alone will not be enough to meet nitrogen load reduction targets in the subwatershed, thus alternative approaches such as PRBs and bio-extraction with a native vegetation buffer can help meet targets.

PROJECT PHASE SUMMARY:

Phase 1: Prioritize and inform the location(s) and design of the nitrogen remediation. Funded through private donations secured by the PLT.

1. Use porewater evaluation equipment to map porewater nitrogen concentrations.
2. Use groundwater seepage equipment to map seepage rates, calculate nitrogen loading to the pond surface water, and rank shoreline areas according to nitrogen loading.

Phase 2: Remediation site characterization. Funded through CPF.

1. Bases on the results of Phase 1, install shoreline groundwater wells at targeted locations and collect hydrogeological data to inform the remediation design.
2. Determine the site suitability for nitrogen remediation technology such as PRBs or native vegetation buffer.
3. Communicate the results in the form of a site characterization report and provide educational outreach to stakeholders and the community.

Phase 3 and Phase 4: *Remediation design and installation (future work not funded with this proposal)*

1. *Design and install the nitrogen remediation based on the results of the site characterization using a cost-effective and appropriate design*

2. *Document the design and installation process and provide a report to the Town*
3. *Monitor the performance of the remediation approach*
4. *Communicate performance results and provide educational outreach to the community*

3c. Technology Efficacy in Similar Settings

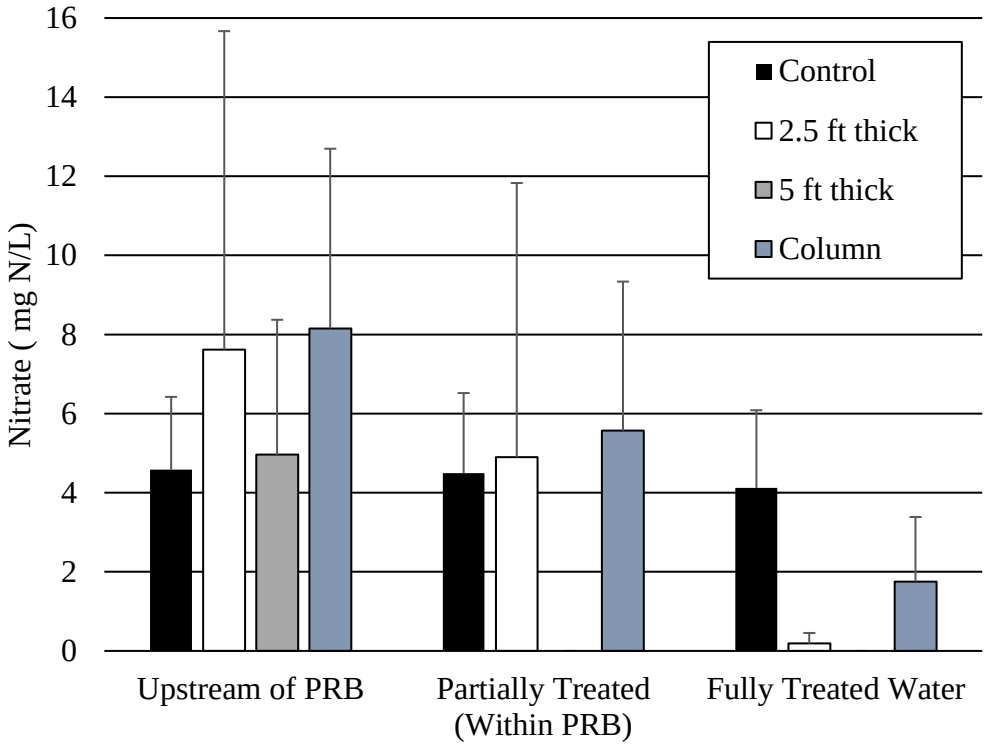

Figure 2: Bulkhead PRB performance data from April 2021. Partially treated and fully treated water is collected from the center and downgradient of the PRB, respectively.

In 2020, a 100 ft. long PRB was installed during scheduled bulkhead replacement to prevent nitrate contaminated groundwater from entering Shinnecock Bay. The installation was funded by the Town of Southampton CPF at the Hampton Hills Association property and consisted of 12 test cells with 4 different design configurations (5 ft thick, 2.5 ft thick, column array, and control test cells without woodchips). Nitrate concentrations upstream of the PRB varied between 0.6 and 18.9 mg N/L in April 2021 with an average of 6.3 mg N/L, and between 1.2 and 33.7 mg N/L in September 2021 with an average of 5.3 mg N/L. In April 2021, percent nitrate removal was 100%, 99%, 84%, and 13% in the 5 ft, 2.5 ft, column array, and control test cells, respectively. In September 2021, percent removal was 94%, 100%, 100%, and -5% in the 5

ft, 2.5 ft, column array, and control test cells, respectively. Control areas do not contain woodchip media and are filled with native sand which does not provide the conditions for nitrate removal to occur. In Figure 1 there is little to no change in groundwater nitrate concentration collected from upgradient, within, and downgradient of control test cells. On the other hand, the PRB test cells provide the conditions for nitrate removal as shown in Figure 1 where nitrate concentrations decreases as water passes through the woodchip media for all PRB design configurations.

3d. How the Project Supports Goals/Policies

This project is anticipated to provide valuable information for the Town and other stakeholders which can be added to the existing collection of data and will complement other ongoing modeling and water quality monitoring efforts in the region. Information and insights gained from this project will be distributed publicly through various forms of media including reports, presentations, and content available on the PLT and CCE webpages. Overall, **this project is aligned with regional water quality goals** because it would reduce the nitrogen load entering Poxabogue Pond and reduce the effects of eutrophication. Providing relief from elevated surface water nitrogen concentrations reduces algae growth and decreases biological oxygen demand. In addition, this project is consistent with goals which seek to enhance natural areas for recreation. The project seeks to help avoid loss of economic, environmental, and aesthetic value by increasing water clarity and providing a healthier habitat for fish and other aquatic life. Specifically, this project is consistent with the following goals and policies important to New York State and the Town of Southampton:

a) Long Island Nitrogen Action Plan Scope (ny.gov)
   - Goal #1: Assess nitrogen pollution in Long Island waters (pg. 7)
   - Goal #2: Identify sources of nitrogen to impaired and non-impaired water bodies (pg. 7)
   - Goal #3: Develop an implementation plan to achieve reductions including action plans which contain near term actions that will reduce nitrogen pollution to groundwater and surface waters (pg. 7)

b) Town of Southampton
   - WQIPP Vision Goals for Natural Resources Goal #2: Improve the quality of surface and bay waters by reducing nutrient loading, toxins and sedimentation (pg. 6)
   - Coastal Resources and Water Protection Plan

- Policy 5.1 Reduce nutrients to levels necessary to support a healthy ecosystem; one that allows for harvestable, sustainable fish and shellfish populations, healthy submerged aquatic vegetation, and traditional human uses in the Town's waters (pg. 71).
    - a. Reduce the input of nutrients from all sources including human waste, pet waste, storm water, and fertilizers.
    - b. Employ effective means to reduce nutrients such as permeable reactive barriers etc.

5. Cost Factors

Direct Costs	Cost
Salary (includes U/I and W/C)	$26,289
Equipment and supplies	$15,375
Travel	$1,978
Contractor costs (CLEAR)	$26,079
Indirect Administrative Costs	
14.56% Cornell Cooperative Extension	$10,151
CPF Request	**$39,936**
Matching Funds (Peconic Land Trust)	**$39,936**
Total Budget (Phase 1 & 2)	**$79,872**

The current request of $79,872 is for the completion of Phases 1 and 2 of the remediation siting strategy. The work is to be performed by CCE and its associated contractors including CLEAR. The PLT has already secured privately funded donations to support the project, indicating it is a high priority for residents. PLT is prepared to financially support half of the project cost and proposes that the Town CPF matches their contribution which will allow the project to be fully funded. **Since the PLT has already secured approximately $40,000 from private donors, they are prepared to enter into an agreement with CCE to fund the work associated with Phase 1.** The Town's matching contribution would be used to fund Phase 2 which is the site characterization that directly informs remediation design. The Town's commitment to support this effort will provide leverage for the PLT to continue to raise the additional funds necessary to fund future phases. This is truly a unique opportunity for private-public-governmental partnership which will maximize the use of both public and private funds to benefit the community and improve Poxabogue Pond water quality.

The current budget is appropriate and reasonable as it is based on updated quotes for salaries, equipment rental fees, analytical and contractor costs as well as travel/mileage reimbursements. CCE was a leader in the site characterization and installation of the Hampton Bays bulkhead PRB in addition to the site characterization effort for Southampton and East Hampton PRBs which are currently in the design phase. They are experienced in properly budgeting for the work.

Upon completion of Phase 1 and 2, the PLT would likely apply to next year's funding cycle to secure CPF funds to complete the design and installation of the nitrogen remediation. The purpose of this approach is to exercise an appropriate use of funds given the current understanding of the site conditions. Developing a budget for the design and installation is premature since the site characterization will determine the location and size of the remediation strategy.

While there are substantial upfront costs due to site characterization, design, and installation of PRBs, the treatment requires no maintenance or energy input after installation which makes them cost-efficient over their lifespan. According to multiple sources, the cost effectiveness of PRBs is similar to other nitrogen removing technologies (Schipper et al. 2010, SCSWP pg. 2-117, Fig. 2-54). Funds for performance monitoring will be secured through private donations and will be used as a match in a subsequent proposal. After installation of the nitrogen remediation technology, maintenance and monitoring will be performed quarterly and will include sampling upgradient, within, and downgradient of the treatment area to determine nitrogen removal as percent N removed and pounds of nitrogen removed per year. Surface water conditions downgradient of the treatment area will also be monitored quarterly. Performance results will be provided to the Town in a report.

8a. Anticipated Project Timeline

The anticipated timelines are provided to show that the PLT, CCE, and associated contractors are highly motivated to begin the project upon securing funds. Timelines are contingent upon contract approvals and fund dispersal, and thus need to be flexible.

Funding Request	Description	Summer 2022	Fall 2022	Winter 2022	Spring 2023	Summer 2023
Current 2022	Planning and management	x				
	Implement Phase 1 of remediation siting strategy	x	x			
	Implement Phase 2 of remediation siting strategy			x	x	
	Data analysis and final report preparation				x	x
	Outreach and recommendations			x	x	x

Funding Request	Description	Fall 2023	Winter 2023	Spring 2024+
Anticipated 2023	Remediation Design	x		
	Remediation Installation		x	
	Performance Monitoring			x

References:

- Christianson, L. E., Cooke, R. A., Hay, C. H., Helmers, M. J., Feyereisen, G. W., Ranaivoson, A. Z., ... & Robinson, R. J. (2020). Effectiveness of Denitrifying bioreactors on Water Pollutant Reduction from Agricultural Areas. *Transactions of the ASABE*, 0.
- Graffam, M., Paulsen, R., and Volkenborn, N. "Hydro-biogeochemical processes and nitrogen removal potential of a tidally influenced permeable reactive barrier behind a perforated marine bulkhead." *Ecological Engineering* 155 (2020): 105933.
- Hiller, K. A., Foreman, K. H., Weisman, D., and Bowen, J. L. (2015). "Permeable Reactive Barriers Designed To Mitigate Eutrophication Alter Bacterial Community Composition and Aquifer Redox Conditions." *Appl. Environ. Microbiol.*, 81(20), 7114-7124, doi:10.1128/AEM.01986-15
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- Robertson, W. D., Blowes, D. W., Ptacek, C. J., and Cherry, J. A. (2000). Long-term performance of in situ reactive barriers for nitrate remediation. *Groundwater*, 38(5), 689-695.
- Robertson, W. D., and Cherry, J. A. (1995). "In situ denitrification of septic-system nitrate using reactive porous media barriers: field trials." *Groundwater*, 33, 99-111, doi:10.1111/j.1745-6584.1995.tb00266.x
- Robertson, W. D., Vogan, J. L., and Lombardo, P. S. (2008). "Nitrate Removal Rates in a 15-Year-Old Permeable Reactive Barrier Treating Septic System Nitrate." *Ground Wat. Monitor. Remed.*, 28(3), 65-72, doi:10.1111/j.1745-6592.2008.00205.x
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Photos of Existing Conditions at Poxabogue Pond March 2022

Photos of Existing Conditions at Poxabogue Pond March 2022

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BIO-SKETCH

I am a conservation biologist holding a Ph.D. from the University of Michigan, with over 35 years experience in national and international natural resource management. Since 2010, I have focused on land use planning and management, with an emphasis on pond restoration, phragmites control, buffer planting near wetlands, dune ecology, and wildlife habitat restoration. In addition to offering scientific expertise and project management services, typically I provide assistance in navigating the highly regulated environment that exists on the East End of Long Island.

Recent and ongoing projects include:

- Coordinator, Sagg Pond Restoration. Employed by the Peconic Land Trust to coordinate this partnership with the Town of Southampton, the Southampton Town Trustees, Stony Brook University, Cornell Cooperative Extension and private homeowners.
- Georgica Pond restoration, East Hampton. Since about 2010, I have worked with homeowners, The Peconic Land Trust, the Friends of Georgica Pond Foundation, the Town of East Hampton Trustees, and the Village of East Hampton to advise on wetland restoration and pond management issues, including obtaining permits to control phragmites on more than two dozen properties; coordinating a project to excavate a bottleneck on Trustee-owned land in order to improve water circulation; collaborating with Stony Brook University on actions needed to reduce the excess nutrient levels in the pond, including Permeable Reactive Barriers, algae harvesting and mesocosms to investigate the ability of different wetland plant species to filter pollutants and excess nutrients.
- Bay Inlet Pond restoration (within Lions Head in East Hampton). Ongoing project, involving the Lions Head Beach Association and several homeowners, to control phragmites and establish native buffers.
- Great Pond and Fresh Pond restoration, North Haven. I obtained the permits to control phragmites on several properties; and I am assisting the homeowners to evaluate the impacts of recent dredging and to develop the guidelines for future dredging.
- Wickapogue Pond restoration (Southampton). Starting in 2012, I worked with about a dozen homeowners and the Peconic Land Trust to control phragmites, water lilies and algal blooms.
- Phragmites control and shoreline restoration on properties on Sagg Pond, Mecox Bay, Sag Harbor Cove, Long Pond (Southampton), Hook Pond and Hog Creek (East Hampton).
- Grassland restoration (Montauk)

- Dune restoration project in Napeague (East Hampton)
- Landscaping to promote native plant species and enhance wildlife in several private residences on the East End.

Prior to going into private practice as a natural resource consultant, I served as Director of Preserves for the Nature Conservancy on Long Island from 1999 to 2010, where I was responsible for overseeing the stewardship of hundreds of acres of lands and worked with local governments to review and strengthen the regulations governing activities in sensitive habitats, including wetlands and coastal dunes.

My previous professional experience includes: work with the World Resources Institute on tropical deforestation initiatives; work with the U. S. Congress Office of Technology Assessment on environmentally appropriate agricultural development in Africa; short-term consultancies for USAID throughout Africa; and seven years working and living in the West Indies directing a regional program to conserve the biodiversity of the Eastern Caribbean.

I also have owned Wild Bird Crossing in Bridgehampton Commons since 1998, a retail store that specializes in products for backyard bird feeding and nature appreciation.

Molly Graffam, PhD
423 Griffing Ave., Riverhead, NY 11901
meg372@cornell.edu

Education:
Ph.D., Stony Brook University, Marine Science (2014 – 2020)
STRIDE Advanced Graduate Certificate (2019 – 2020)
B.S., Fairfield University, Biochemistry (2009 – 2013)

Employment:
Cornell Cooperative Extension Water Resource Geochemical Specialist (Aug. 2018 – present)
- Conducting applied research on water quality and PRB projects in Suffolk County
- Facilitating outreach/education and information transfer to the local Towns and community members

Professional Experience:
Cornell Cooperative Extension Groundwater Program Assistant (Aug. 2018 – Jan. 2021)
- Helped secure CPF grant for bulkhead PRB integration
- Collected and analyzed site characterization data to inform groundwater velocity and PRB thickness
- Determined bulkhead perforations, i.e. hole size and spatial pattern

New York State Center for Clean Water Technology Research Assistant (Jan. 2016 – Dec. 2020)
- Designed and conducted field and laboratory experiments to address research questions pertaining to groundwater and wastewater nitrogen remediation and pollution swapping potential
- Presented complex research findings to scientists, stakeholders, and the public
- Prepared DEC quarterly reports with insightful data interpretation

Stony Brook University Volkenborn Lab (June 2015 – Jan. 2016)
- Investigated animal-sediment interactions of infaunal intertidal marine organisms
- Used planar optode imaging for spatial/temporal O_2 analysis of marine sediment
- Deployed pressure sensors to monitor pressure dynamics associated with animal burrowing

Fairfield University Harper-Leatherman Lab (Jan. 2011 – May 2013)
- Used analytical techniques and instruments such as Low-Pressure Liquid Chromatography, UV-Vis spectrophotometer, potentiostat & Fourier Transform Infrared Spectrometer to study gold nanoparticle and Cytochrome *c* electrochemical interactions

Publications:

Graffam, M., Polerecky, L., & Volkenborn, N. "Hydro-biogeochemical function of soil based onsite wastewater treatment systems: Insights from high-resolution O_2 imaging." *Journal of Sustainable Water in the Built Environment* 6.2 (2020): 04020005.

Graffam, M., Paulsen, R., & Volkenborn, N. "Hydro-biogeochemical processes and nitrogen removal potential of a tidally influenced permeable reactive barrier behind a perforated marine bulkhead." *Ecological Engineering* 155 (2020): 105933.

Gobler, C. J., Waugh, S., Asato, C., Clyde, P. M., Nyer, S. C., **Graffam, M**., ... & Walker, H. W. (2021). Removing 80%–90% of nitrogen and organic contaminants with three distinct passive, lignocellulose-based on-site septic systems receiving municipal and residential wastewater. *Ecological Engineering*, *161*, 106157.

Harper-Leatherman, A. S., Wallace, J. M., Long, J. W., Rhodes, C. P., **Graffam, M.**, Abunar, B. H., & Rolison, D. R. (2021). Redox Cycling within Nanoparticle-Nucleated Protein Superstructures: Electron Transfer between Nanoparticulate Gold, Molecular Reductant, and Cytochrome c. *The Journal of Physical Chemistry B*.

Presentations:

As presenter
2020. **Graffam, M.** and Volkenborn, N. "Bulkhead permeable reactive barriers for groundwater nitrate remediation." NYS Center for Clean Water Technology Seminar Series
2020. **Graffam, M.** and Volkenborn, N. "High-resolution O_2 imaging as a tool to study hydro-biogeochemical processes in soil-based nitrogen-removing systems." NYWEA Spring Conference
2018. Roberts, S., **Graffam, M.**, "Permeable Reactive Barriers and Constructed Wetlands to Remediate Contaminated Waters". Long Island Clean Water Partnership's "Water We Going To Do?"
2018. **Graffam, M.**, Volkenborn, N., in collaboration with Cornell Cooperative Extension, "Permeable Reactive Barriers" An update on the status of PRB research presented to funders and the public at the annual CCWT Symposium

As co-author
2018. Langlois, K., Collier, J., Volkenborn, N., **Graffam, M.**, Characterization of the microbial community driving on-site wastewater treatment in nitrogen removing biofilters (NRBs). American Chemical Society

Posters:
"CWs and PRBs: Solutions for Removing Nitrogen from Long Island Household Wastewater and Groundwater." presented at State of the Bays seminar, May 2018.
"NRBs and PRBs: Solutions for Removing Nitrogen from Long Island Household Wastewater and Groundwater." presented at Earthstock Environmental Student Research Exhibition, April 2018 and State of the Bays seminar, April 2017.
"Moving Anoxic Porewater: The Dark Side of Bioirrigation." Poster presented at 5th Nereis Park Conference, August 2017, 45th Benthic Ecology Meeting, March 2016, and at the SoMAS

Ron Paulsen P.G.- Hydrogeologist
Coastline Evaluation Corp/CLEAR
8 Bay View Drive, Hampton Bays, NY,11946

EDUCATION:

- 1995 State University of New York at Stony Brook M.S. (Hydrogeology)
- 1979 Adelphi University B.S. (Biology/Chemistry)
- 1976 Suffolk Community College A.S. (Marine Technology)

POSITIONS AND RESPONSIBILITES

Mr. Paulsen has a Master of Science degree from Stony Brook University in New York and is a New York State licensed professional geologist. He has worked for the last 25 years on numerous groundwater investigations, conducted marine environmental research and developed educational programs at the Cornell Cooperative Extension of Suffolk and the Office of Water Resources in Suffolk County. Currently Mr Paulsen is working with Cornell as an associate under contract with his company CLEAR. He has been the project manager for numerous ground and surface water investigations at numerous state and federal superfund sites. His major responsibilities involve the supervision of groundwater investigative teams comprised of well drilling, percussion drilling, and geophysical units. Mr. Paulsen's primary applied research interest is the study of ground/surface water interactions and the development of equipment and techniques used to locate, define and quantify groundwater-venting areas offshore. He has participated with the US Navy's environmental services program at SPAWAR Systems Center, San Diego SSC SD) in the study of submarine groundwater discharge at Navy harbors throughout the US including San Diego Bay, Pearl Harbor, Puget Sound and the Anacostia River. This cooperative effort included the development of new measurement and sampling techniques and methodologies. As a visiting scientist at Stony Brook University he has published several papers on submarine groundwater discharge and the development and application of ultrasonic groundwater seepage meters. More recent experience has included a 36-month investigation of seepage into the Columbia River at the US Dept. of Energy Hanford, Washington site. Long Island projects include investigation of the hyporheic zone in several embayments in Suffolk County. These projects include groundwater discharge mapping into the Peconic and Great South Bay embayment systems. Most recent work includes a nitrogen fate and transport of groundwater into the Forge River and evaluations of groundwater seepage into Acobonnac Harbor, Sag Pond, Georgica Pond and Pussy Pond on the east end of Long Island. The work also includes pilot testing of near shore permeable reactive barriers to mitigate excessive nitrogen entering these embayments.

MOST RECENT RELATED PROJECTS

Paulsen R,J., M Graffam, P Murray, 2022. Data Report-Locating Groundwater Derived Nitrogen Discharging into Hog Creek, East Hampton, NY

Graffam M,E., R Paulsen, P Murray, 2021. Long Term PRB Monitoring and *Phragmites australis* Salt Treatment in Pussy's Pond - Amendment 6 Final Report

Graffam M,E., R Paulsen, 2021. Identifying and Remediating Groundwater Derived Nitrogen from Accabonac Harbor/Pussy's Pond: Task 1 Report

Paulsen R,J., C.Pickerell, P Murray. 2016. Data Report Locating and Quantifying Groundwater Derived Nitrogen Seeping into Upper Southwest Reach of Accobonac Harbor, Town of East Hampton, NY

Paulsen R,J., C.Pickerell, 2016. Data Report Locating and Quantifying Groundwater Derived Nitrogen Seeping into Pussy Pond, East Hampton, NY

Paulsen R,J., C.Pickerell, 2016. Phase 2 Progress Report on Evaluation of Sediment PRB to Mitigate Nitrogen Seeping into the Surface Waters of Pussys Pond
Town of East Hampton, NY

RELEVANT PUBLICATIONS AND REPORTS:

Chadwick D.B., J.G. Groves, L. He, C.F. Smith, R.J. Paulsen, and B. Harre. 2002a. New Techniques for Evaluating Water and Contaminant Exchange at the Groundwater-Surface Water Interface. Proceedings of Oceans 2002, Biloxi, Mississippi.

Chadwick, D.B., S.E. Apitz, V. Kirtay, J. Germano, J. Maa, C. Smith, R. Paulsen, M. Montgomery, W. Ziebis, and J. Gieskes. 2002b. SERDP CU1209: Pathway Ranking for In-place Sediment Management (PRISM), SERDP Annual Report, December 2002.

Chadwick, D.B., J. Groves, C. Smith, and R. Paulsen. 2003b. Hardware description and sampling protocols for the Trident Probe and UltraSeep system: Technologies to evaluate contaminant transfer between groundwater and surface water. Technical Report #1902, SSC San Diego, United States Navy.

Chadwick, D.B., Groves, J., Smith, C., Paulsen, R., and B Harre. New Tools for Monitoring Coastal Contaminant Migration. Sea Technology 17-22, June 2003.

Paulsen, R.J., C. F. Smith, D. O'Rourke and T. Wong 2001 Development and Evaluation of an Ultrasonic Groundwater Seepage Meter, Ground Water Nov-Dec 2001, 904-911 2001.

Paulsen, R.J., Smith, C.F. and T.F. Wong 1998. Defining freshwater outcrops in West Neck Bay, Shelter Island, New York using direct contact resistivity measurements and transient underflow measurements. Long Island Geology Conference, SUNY-Stony Brook.

Paulsen, R.J., Smith, C.F., and Wong, T-f, 1997, Defining Freshwater Outcrops in West Neck Bay, Shelter Island New York Using Direct Contact Resistivity Measurements and Transient Underflow Measurements, Geology of Long Island and Metropolitan New York Program with Abstracts, April 19,1997, 88-97.

Paulsen, R.J., O'Rourke, D., Smith, C.F. and T-f Wong Tidal Load and Salt Water Influences on Submarine Ground Water Discharge 2004 Vol. 42 No.7.

Paulsen, R.J., Smith, C.F. and T-f Wong. 1997. Development and evaluation of an ultrasonic groundwater seepage meter, in Geology of Long Island and Metropolitan New York, 88-97.

Paulsen, R., C. Smith, and D. O'Rourke (2004b), Peconic Estuary: A preliminary analysis of the relationship between submarine groundwater discharge (DGD) and submerged aquatic vegetation in the Peconic Estuary. U.S. Environemntal Protection Agency, Washington, D.C. (http://cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryID=85726)

Paulsen, R. J., C.F. Smith, J. Wanlass, and N. H. Stark (2008), *Forge River Groundwater Flow Rate and Nutrient Contaminant Load Site Investigation Draft Report.* 67 pp. Submitted by Suffolk County Department of Health Services, Office of Ecology.

Paulsen, R. J., C.F. Smith, J. Wanlass, and N. H. Stark (2009), *Great Peconic Bay Groundwater Flow Rate and Pesticide Contaminant Load Site Investigation Draft Report.* 74 pp. Submitted by Suffolk County Department of Health Services, Office of Ecology.

Paulsen, R. J., C.F. Smith, J. Wanlass, and N. H. Stark (2009), *Cold Spring Pond Groundwater Flow Rate and Nutrient Contaminant Load Site Investigation Draft Report.* 60 pp. Submitted by Suffolk County Department of Health Services, Office of Ecology.

Paulsen, R. J., C.F. Smith, J. Wanlass, and N. H. Stark (2009), *Jessup Neck Groundwater Flow Rate and Nutrient Contaminant Load Site Investigation Draft Report.* 41 pp. Submitted by Suffolk County Department of Health Services, Office of Ecology.

Paulsen, R.J., J.Duran (2013), *Forge River Nitrogen Evaluation Repot.* 78pp. Submitted by Cornell Cooperative Extension of Suffolk County

Smith, C.F., Paulsen, R.J., and D. O'Rourke 2000 Deployment of the Ultrasonic Groundwater Seepage Meter at the Florida State University Marine Laboratory. Report to the International Oceanographic Committee 28pgs.

Smith, C.F., R.J. Paulsen and D. O'Rourke 2001 Demonstration of an Ultrasonic Seepage Meter by Quantifying Specific Discharge Across the Sediment-Water Interface along the AnacostiaRiver, Washington D.C. 2001 Report to the United States Navy and Computer Sciences Defense Group 25pgs.

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:

Reducing Groundwater Nitrogen Input into Poxabogue Pond

Project Location (describe, and attach a location map):

Poxabogue Pond

Brief Description of Proposed Action:

The Peconic Land Trust (PLT) in consultation with Cornell Cooperative Extension of Suffolk County (CCE) propose to use a remediation siting strategy to target shoreline areas and perform site characterization along Poxabogue Pond in preparation for installation of a nitrogen remediation approach such as a native vegetation buffer or permeable reactive barrier (PRB) depending on site suitability. Phase 1, to be funded by private donations secured through the PLT, includes mapping high nitrogen loading zones by measuring porewater nitrogen concentration and groundwater seepage rates in groundwater discharge zones. Data from Phase 1 will inform and help focus the site characterization for remediation in Phase 2. Phase 2 includes characterizing soil, groundwater nitrogen concentrations, and other hydrogeological conditions inland from high nitrogen loading zones identified in Phase 1. The information acquired through this project will provide critical site-specific hydrogeological data to support the design and installation of a nitrogen remediation approach where it will impart the greatest water quality improvement.

Name of Applicant or Sponsor:	Telephone: 631-283-3195
Peconic Land Trust	E-Mail:

Address:

296 Hampton Rd

City/PO:	State:	Zip Code:
Southampton	NY	11778

	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: Southampton Town Trustees	☐	☑

3. a. Total acreage of the site of the proposed action? 40 acres
   b. Total acreage to be physically disturbed? <0.5 acres
   c. Total acreage (project site and any contiguous properties) owned or controlled by the applicant or project sponsor? 40 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

	NO	YES	N/A
5. Is the proposed action,			
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?	☐	☑

	NO	YES
7. Is the site of the proposed action located in, or does it adjoin, a state listed Critical Environmental Area?		
If Yes, identify: Name:Long Pond, Reason:Benefit to human health & protect drinking water, Agency:Suffolk County, Date:2-10-88	☐	☑

	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?	☐	☐

	NO	YES
9. Does the proposed action meet or exceed the state energy code requirements?		
If the proposed action will exceed requirements, describe design features and technologies: Not applicable	☐	☐

	NO	YES
10. Will the proposed action connect to an existing public/private water supply?		
If No, describe method for providing potable water: Not applicable	☑	☐

	NO	YES
11. Will the proposed action connect to existing wastewater utilities?		
If No, describe method for providing wastewater treatment: Not applicable	☑	☐

	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?	☑	☐
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: The project involves installing approximately ten 1-inch and four 2-inch diameter wells to collect water samples and may lead to the installation of a shoreline Permeable Reactive Barrier or other N-reducing approach such as a native vegetation buffer.		

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? Tiger Salamander, Hessel's ...	☐	☑
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:_____ _____	☑	☐
~~1~~9. 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

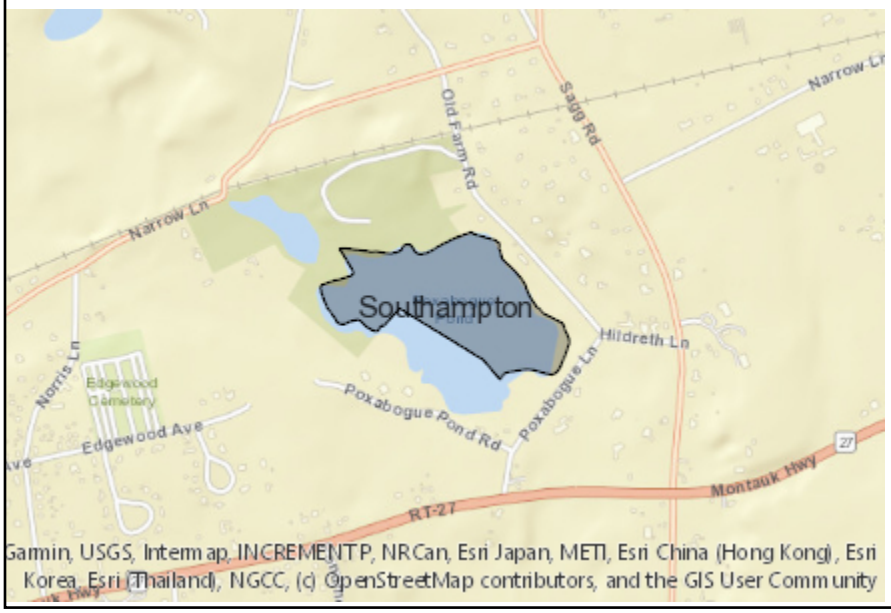
Applicant/sponsor/name: John v.H. Halsey, President Date: 4/15/2022

Signature: _____ Title: President

PRINT FORM

EAF Mapper Summary Report

Thursday, April 14, 2022 6:48 PM



Disclaimer: The EAF Mapper is a screening tool intended to assist project sponsors and reviewing agencies in preparing an environmental assessment form (EAF). Not all questions asked in the EAF are answered by the EAF Mapper. Additional information on any EAF question can be obtained by consulting the EAF Workbooks. Although the EAF Mapper provides the most up-to-date digital data available to DEC, you may also need to contact local or other data sources in order to obtain data not provided by the Mapper. Digital data is not a substitute for agency determinations.

Part 1 / Question 7 [Critical Environmental Area]	Yes
Part 1 / Question 7 [Critical Environmental Area - Identify]	Name:Long Pond, Reason:Benefit to human health & protect drinking water, Agency:Suffolk County, Date:2-10-88
Part 1 / Question 12a [National or State Register of Historic Places or State Eligible Sites]	No
Part 1 / Question 12b [Archeological Sites]	Yes
Part 1 / Question 13a [Wetlands or Other Regulated Waterbodies]	Yes - Digital mapping information on local and federal wetlands and waterbodies is known to be incomplete. Refer to EAF Workbook.
Part 1 / Question 15 [Threatened or Endangered Animal]	Yes
Part 1 / Question 15 [Threatened or Endangered Animal - Name]	Tiger Salamander, Hessel's Hairstreak
Part 1 / Question 16 [100 Year Flood Plain]	Yes
Part 1 / Question 20 [Remediation Site]	No

BOARD OF TRUSTEES

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TOWN OF SOUTHAMPTON

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ANN WELKER

WILLIAM PARASH

116 HAMPTON ROAD
SOUTHAMPTON, NEW YORK 11968
PHONE: 631 287-5717 FAX: 631 287-5723

April 07, 2022
Town of Southampton
Water Quality Advisory Committee
Community Preservation Fund Program
24 W. Montauk Highway
Hampton Bays, NY 11946

Dear Water Quality Advisory Committee and Southampton Town Board,

As the keepers of the bay bottom and stewards of water quality, the Southampton Town Board of Trustees are writing to express their approval of the project titled "Reducing Groundwater Nitrogen Input into Poxabogue Pond". This project is an effort led by the Peconic Land Trust (PLT) in consultation with Cornell Cooperative Extension of Suffolk County (CCE) to improve the water quality of Poxabogue Pond. Like many waterbodies on Long Island, Poxabogue Pond has experienced stress from human activities such as septic, fertilizer and atmospheric derived nitrogen inputs. The pond experiences harmful algae blooms which have been linked to elevated nitrogen concentrations. By reducing groundwater nitrogen inputs, this project will directly benefit the ecological health of Poxabogue Pond.

In 2021 the PLT in consultation with CCE surveyed the water quality and groundwater nitrogen inputs into Sagaponack Pond on and near the Smith Corner Preserve as well as areas down gradient from where PLT holds easements. This effort led to a Community Preservation Funded remediation project for the site characterization, and future design and installation of a nitrogen remediation approach such as a permeable reactive barrier (PRB) to intercept and treat contaminated groundwater before it seeps into Sagaponack Pond. Poxabogue Pond and Sagaponack Pond are hydraulically connected and within the same sub watershed. Thus, another step towards improving water quality in the region is to use this proven strategy to investigate and implement groundwater nitrogen remediation at Poxabogue Pond as well. The PLT has already secured a significant amount of privately funded donations to support the project, indicating it is a high priority for residents. Additionally, this project is anticipated to provide valuable data for the Town which can complement existing projects and be added to the existing repository of water quality information.

For these reasons, the Trustees believe this project is in alignment with the Town of Southampton's water quality and environmental protection goals and we support this project moving forward.

Sincerely,

Scott M. Horowitz President
President

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Reducing Groundwater Nitrogen Input into Poxabogue Pond

The Peconic Land Trust (PLT) in consultation with Cornell Cooperative Extension of Suffolk County (CCE) propose to locate and target shoreline areas for remediation and perform site characterization of property along Poxabogue Pond in preparation for installation of a nitrogen remediation approach such as a native vegetation buffer or permeable reactive barrier (PRB) if the site is deemed suitable for this approach. They currently seek funds for Phases 1 and 2 of a multi-phase project. Phase 1 includes identifying groundwater discharge zones with high nitrogen loading by measuring pore water nitrogen concentration, groundwater seepage rates, and surface water conditions within the pond. Phase 2 includes characterization of soil, groundwater nitrogen concentrations, and hydrogeological conditions inland from high nitrogen loading zones identified in Phase 1. The information acquired during Phase 1 and 2 will provide the critical site-specific hydrogeological data to support and guide the design and installation of a nitrogen remediation approach. By locating and ranking the shoreline according to nutrient loading, this project will help ensure that future funds are directed towards projects which will have the largest positive impact on Poxabogue Pond water quality.

Land use directly surrounding Poxabogue Pond includes Suffolk County property such as the Poxabogue County Park, Town-owned property, some of which is part of the purchase of development rights (PDR) program, as well as residential property. In addition to determining the appropriate location, type, and informing a shoreline remediation design, this project will provide hydrogeological data around the southeastern shoreline of the pond that can help stakeholders determine the course of action for future land use in the area. Furthermore, data collected as part of this project will inform areas where inland septic upgrades could improve groundwater and surface water quality.

In 2021 the PLT in consultation with CCE surveyed the water quality and groundwater nitrogen inputs into Sagaponack Pond on and near the Smith Corner Preserve as well as areas down gradient from where PLT holds easements. This effort led to a Community Preservation Funded (CPF) remediation project for the site characterization, and future design and installation of a nitrogen remediation approach such as a permeable reactive barrier (PRB) to intercept and treat contaminated groundwater before it seeps into Sagaponack Pond. Poxabogue Pond and Sagaponack Pond are hydraulically connected and within the same sub watershed. Thus, another step towards improving water quality in the region is to use this proven strategy to investigate and implement groundwater nitrogen remediation at Poxabogue Pond as well.

PLT has already secured privately funded donations to support the project, indicating it is a high priority for residents. They are prepared to financially support half of the total project cost and propose that the Town CPF matches their contribution which will allow the project to be fully funded. Information and data generated during this project will be communicated to the Town

and public and distributed through community outreach as well as on the PLT and CCE websites.

Please feel free to visit the webpage www.PeconicLandTrust.org/SaggPond for additional information about this on-going project and view recordings from the latest presentations.

Evaluating Pollutant Load

This project is aimed at siting a groundwater nitrogen remediation at Poxabogue Pond. Currently the data available to input into the EPA Spreadsheet Tool for Evaluating Pollutant Load is limited but upon completion of the project, more data will be available to better characterize the nitrogen loading. Quantifying nitrogen loading for the entire subwatershed was not feasible for this proposal. Instead, we determined land use according to Suffolk County GIS Viewer and estimated nutrient load for the ~700 acres surrounding the pond (Fig. A). Soil type was classified as soil hydrologic group A based on the USDA soil classification map (Fig. B). The nutrient loading estimate presented here is very conservative given the entire subwatershed was not included. The following nutrient load calculation was generated with the inputs and assumptions identified below:

- Bridgehampton Weather Station
- 15.163 acres designated for cropland determined from Suffolk County GIS Viewer properties with land use code 120
- Number of agricultural animals are zero
- Septic inputs are 48 determined from Suffolk County GIS Viewer assuming 1 septic tank for each property with land use code 201 and 281
- Soil hydraulic group A – highest infiltration
- Default values for cropland runoff

N Load (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sediment Load (no BMP)
lb/year	lb/year	lb/year	t/year
203.2	70.4	472.4	43.1

Figure A: Red line shows the approximate area for which land use was identified and nutrient load was calculated according to Suffolk County GIS Viewer land use codes.

Figure B: Web-based soil survey surrounding Poxabogue Pond found at Web Soil Survey (usda.gov). Soil in the area is dominantly Bridgehampton silt loam which consists of very deep, well drained and moderately well drained soils.

Long Island Analytical Laboratories, Inc.

110 Colin Drive

Tel: 631 472-3400
Fax: 631 472-8505

Date	Estimate #
4/15/2022	1415

Name / Address	Ship To
Cornell Cooperative Extension of Suffolk Ron Paulsen 423 Griffing Ave Suite 100 Riverhead, NY 11901	

P.O. No.	Terms	Customer Phone	Customer Fax	Salesman
	Net 30	631 727-7850		JA

Description	Qty	Rate	Total
SAMPLING UNIT COST:			
Grain Size Analysis: $125.00 per sample	0	125.00	0.00
Permeability: $95.00 per sample	0	95.00	0.00
Phosphorus: $45.00 per sample	0	45.00	0.00
Nitrogen Series: $55.00 per sample	0	55.00	0.00
TOC: $65.00 per sample	0	65.00	0.00
Notes: Results take approximately 5 - 7 business days.			

Total $0.00

Signature _____