MINUTES OF TOWN BOARD MEETING HELD ON NOVEMBER 15, 2021

A work session meeting of the Town Board of the Town of Lewisboro, Westchester County, New York, was held on November 8, 2021, at 7:30 p.m. via Zoom only.

PRESENT:

Supervisor	Peter Parsons
Council Members	Tony Gonçalves, Richard Sklarin, Daniel Welsh
Town Clerk	Janet Donohue
Absent	Jane Crimmins

Also attending was the Attorney for the Town Gregory Folchetti, Facilities Maintenance Manager Joel Smith, Maintenance Assistant Shawn Johannessen and Confidential Secretary/Benefits Coordinator Mary Hafter.

Approximately 85 residents/observers participated via Zoom.

Supervisor Parsons called the meeting to order at 7:35 p.m.

PLEDGE OF ALLEGIANCE

The Supervisor led the Pledge of Allegiance to the flag.

Presentations of summaries of engineering studies results on treatment options of three different lakes were as follows:

LAKE KITCHAWAN

Ken Kohlbrenner of Woodward & Curran made a presentation regarding the Lake Kitchawan summary of engineering study results on treatment options (see attached).

LAKE TRUESDALE

Mike Manning and Chrissie Swann of Ramboll and John Watson of Insite Engineering made a presentation regarding the Lake Truesdale summary of engineering study results on treatment options (see attached).

LAKE WACCABUC

Don Fletcher, David Hanny and Rachel Schnabel of Barton & Loguidice made a presentation regarding the Lake Waccabuc summary of engineering study results on treatment options (see attached).

A question-and-answer segment was held after each presentation.

MEETING -Date Set

An upcoming meeting of the Town Board will include a meeting on Monday, November 22, 2021, at 7:30 p.m. at the Lewisboro Library, 15 Main Street, South Salem, New York.

ADJOURNMENT

On motion by Supervisor Parsons, seconded by Mr. Sklarin, the Board voted 4-0 to adjourn at 10:35 p.m.

Janet L. Donohue
Town Clerk

EXECUTIVE SUMMARY

Lake Kitchawan is a 90-acre lake located in the Towns of Lewisboro and Pound Ridge. The lake falls within the Croton Watershed which provides drinking water the New York City. The Croton Watershed is the southernmost watershed that provides over 9 million NYCDEP customers in New York City with their drinking water. Lake Kitchawan is a Class B waterbody under the New York Codes, Rules, and Regulations (6 NYCRR Part 864.6), which means that it is best intended for contact recreation (i.e., swimming and bathing), non-contact recreation (i.e., boating and fishing), aesthetics, and aquatic life. The area surrounding Lake Kitchawan has transitioned from summer cottages to a year-round residential community causing impacts to the water quality of the lake.

The Town of Lewisboro has retained Woodard & Curran, an engineering firm based in Rye Brook, NY, to complete a water quality study on Lake Kitchawan. Woodard & Curran is working to identify existing water quality impacts and environmental concerns that are impacting the water quality of Lake Kitchawan and develop alternatives to address the issues. As part of this wastewater study, previous studies and sampling data were evaluated along with Westchester County records of septic failures. Additionally, six rounds of sampling took place to evaluate current levels of water quality parameters indicative of septic system impacts on the lake. The sampling that took place as part of this study occurred from May 2021 to August 2021. The results of this sampling ultimately showed that high levels of bacteria and nutrients were present throughout the various sample locations, but with exceptionally high concentrations at the two outfalls on Lake Kitchawan Drive and Shore Trail. The fecal coliform and E. coli levels at these outfalls exceed health hazard levels established by NYSDOH. The nutrient levels indicate eutrophic conditions in Lake Kitchawan. These are two common indicators of wastewater system failures, therefore action should be taken to mitigate these issues.

There are multiple alternatives which could remediate the impacts local septic systems are having on Lake Kitchawan. The No Action alternative would continue the use the existing onsite septic systems, so there would be no cost to the Town of Lewisboro, but the current bacteria and nutrient loading would remain and the water quality would continue to degrade. The Repair and Replacement Alternative would replace the conventional septic systems with an advanced treatment system at 187 properties located east of the lake which are thought to have the most significant impact on Lake Kitchawan. It is important to focus on these properties since they have small parcel sizes and steep slopes directed toward the lake. This alternative includes the removal of the existing septic tank and installation of a new onsite advanced treatment system which will utilize the existing leaching fields. The estimated capital cost for this alternative is $3,900,000. The Centralized Treatment Alternative would install low-pressure sewers throughout the project area to connect 474 developed parcels within the project area to a newly constructed treatment plant at an estimated capital cost of $50,800,000. The Decentralized Treatment Alternative would break the project area into clusters which would be treated separately on vacant parcels. The entire project area can be split into clusters, but it is expected that the lake water quality may improve with a lower cost by only applying the decentralized treatment to a critical area of 187 parcels. The critical area can be split into three clusters and each cluster would have a low-pressure sewer system conveying flow to the corresponding treatment location. The estimated capital cost for the Decentralized Treatment Alternative treating the critical area is $11,600,000.

All alternatives excluding the No Action Alternative would ultimately reduce nutrient and bacterial loading to the soil, and therefore reduce loading to the surface water and groundwater. If the Town of Lewisboro takes no action, the continued use of high-density septic systems will further degrade the quality of water in Lake Kitchawan and the lake will remain impaired thus limiting its beneficial use as a Class B waterbody. There will also be continued water quality impacts to the Croton Reservoir which impacts over 9 million NYCDEP customers since Lake Kitchawan is part of the Croton Watershed.

Based on the analysis, the Repair and Replacement Alternative is recommended because it addresses the degradation of local surface water quality in a cost-effective manner by leveraging existing infrastructure. This alternative proposes to install the individual onsite advanced treatment system at 187 parcels surrounding the lake which have been identified as having the most significant impact to the water quality based on their close proximity, small parcel size, and steep slope. The Repair and Replacement Alternative will reduce nutrients and coliforms in the lake at a lower cost than the remaining proposed alternatives. The capital cost associated with this project is $3,900,000. This project would include the formation of the Lake Kitchawan Septic District. Once the District is formed, detailed design would be completed. Bidding and construction would follow the completion of the design phase..

Lake Kitchawan Wastewater Study

November 15, 2021

COMMITMENT & INTEGRITY DRIVE RESULTS

enda

- Background & Existing Conditions
- Sampling Results
- Alternatives Evaluated
- Recommended Alternative
- Next Steps

ckground/Existing Conditions

- acre lake
- ss B waterbody
- ated within the Croton Watershed
- vious Studies:
  - 2008 CSLAP Report
  - 2009 Town-Wide Comprehensive Lake Management Plan
  - 2008 Lake Kitchawan Watershed Management Plan

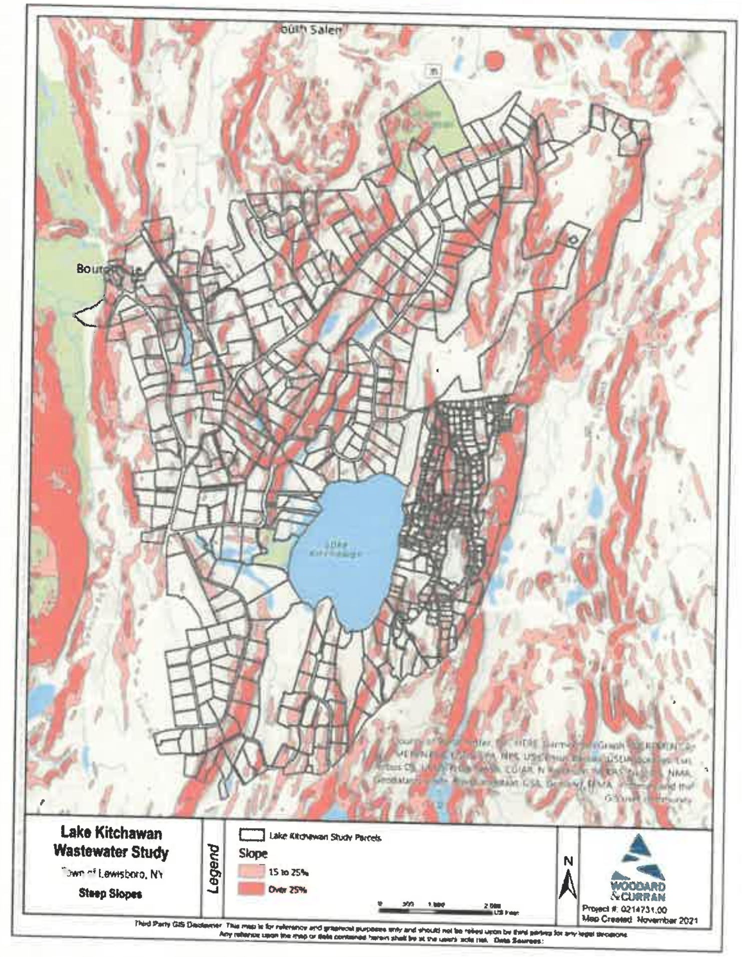
Lake Kitchawan

isting Conditions

Area:

ɔunt: 633
474 developed (75%)

ɛentage of steep slopes



Project Area Steep Slopes

isting Conditions

Area:

ɔunt: 633
474 developed (75%)

:entage of steep slopes

Project Area Steep Slopes

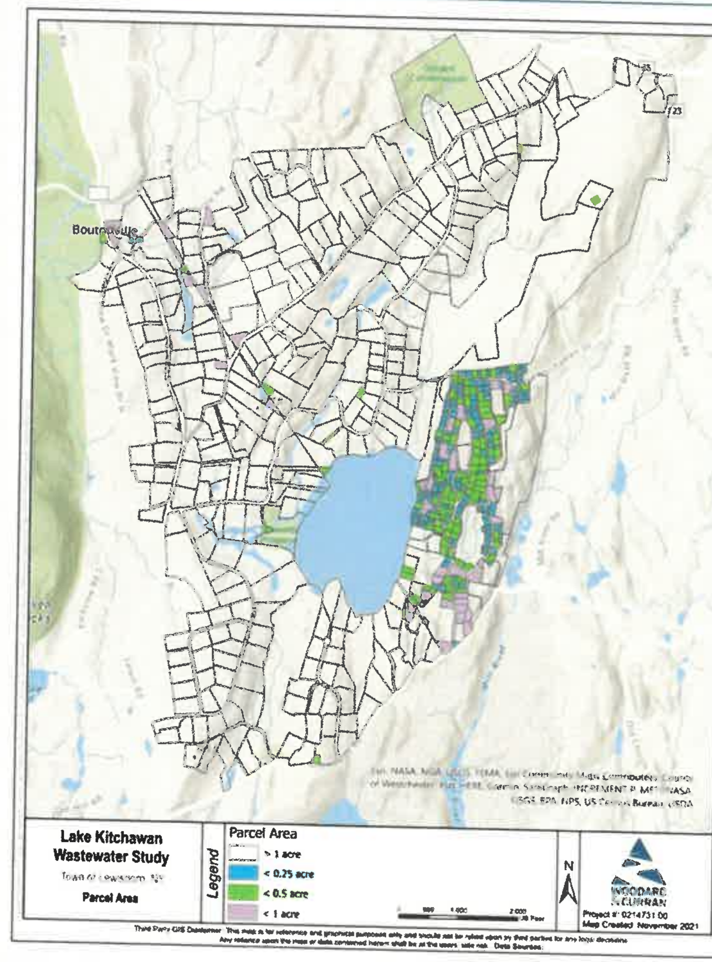
isting Conditions

Area:

ɔunt: 633
474 developed (75%)

Developed Parcel Size: 1.94 acres

C Average Developed Parcel Size: 0.34 acres



Small Property Sizes

isting Conditions

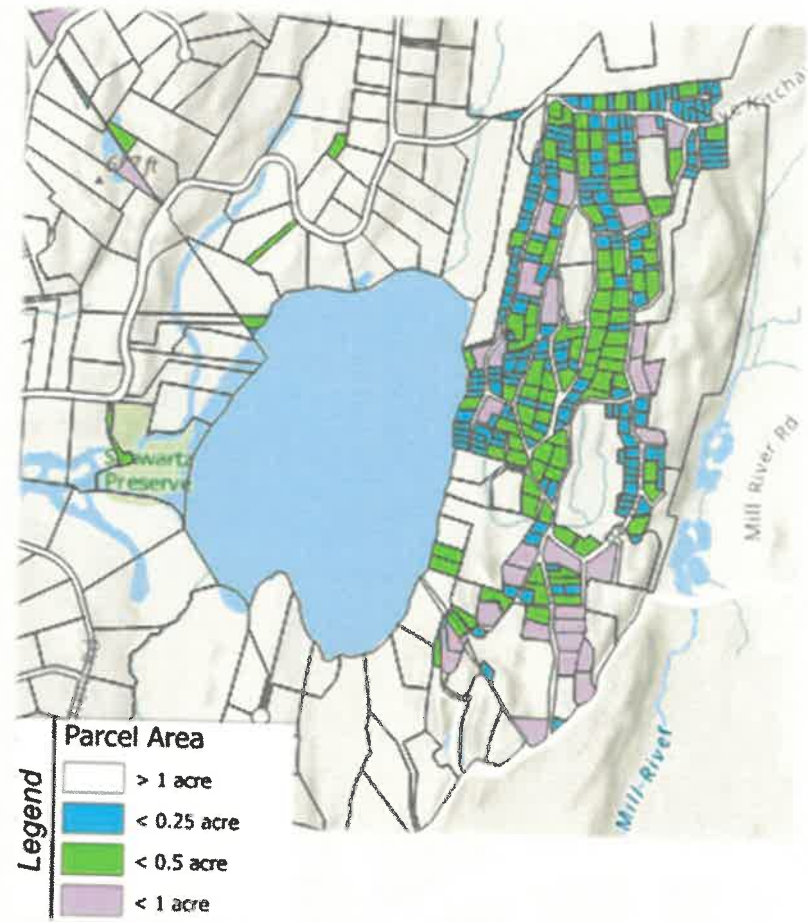
Area:

ɔunt: 633

474 developed (75%)

Developed Parcel Size: 1.94 acres

C Average Developed Parcel Size: 0.34 acres



Small Property Sizes

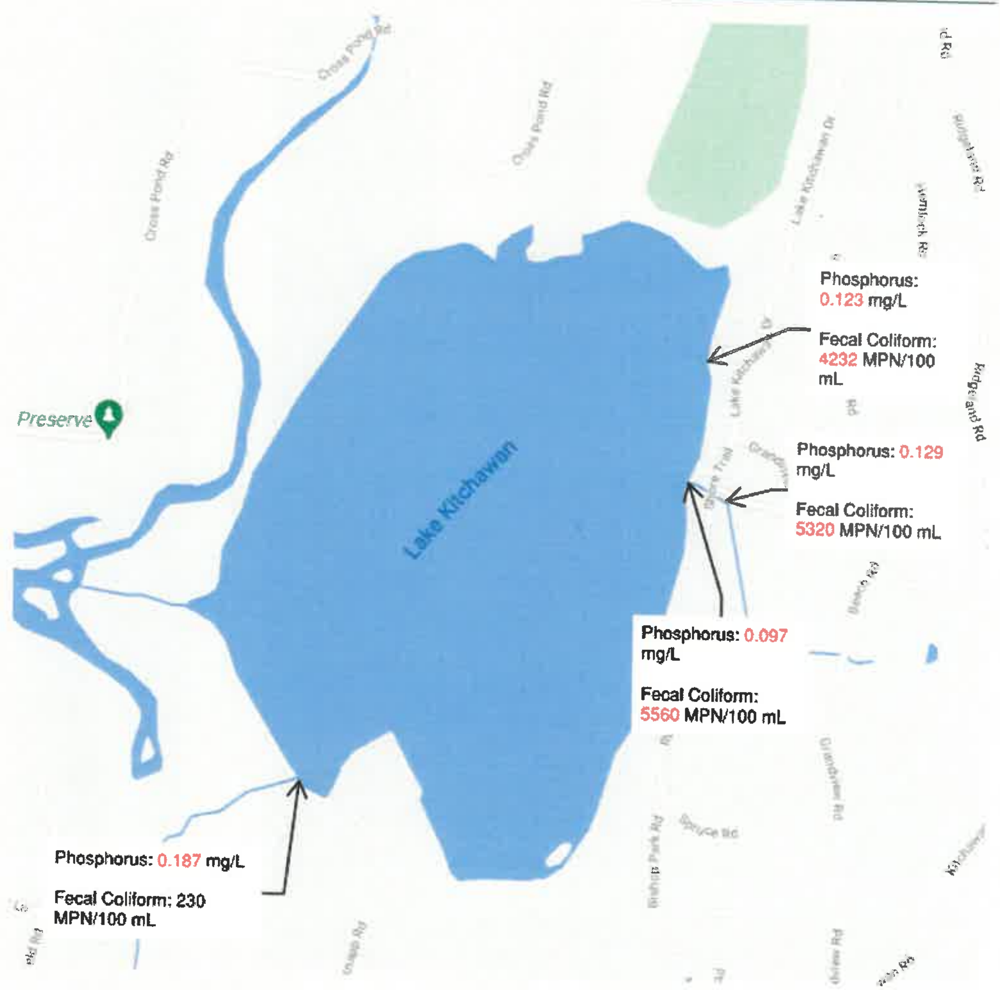
mpling Results

ch Basins:

- All 3 exceeded had elevated fecal coliform and E. coli levels

e Samples:

	Phosphorus (mg/L)	Fecal Coliform (MPN/100 mL)
vel:	Eutrophic conditions when > 0.020 mg/L	Health hazard by NYSDOH above 1,000 col/100 mL
Average	0.123	4,232
Max	0.260	16,000
Average	0.097	5,560
Max	0.240	16,000
Average	0.129	5,320
Max	0.280	9,200
Average	0.187	230
Max	0.290	230



2021 Average Concentrations

:ernatives Evaluated

Action

pair and Replacement

Advanced onsite systems (187 parcels)

ntralized Treatment

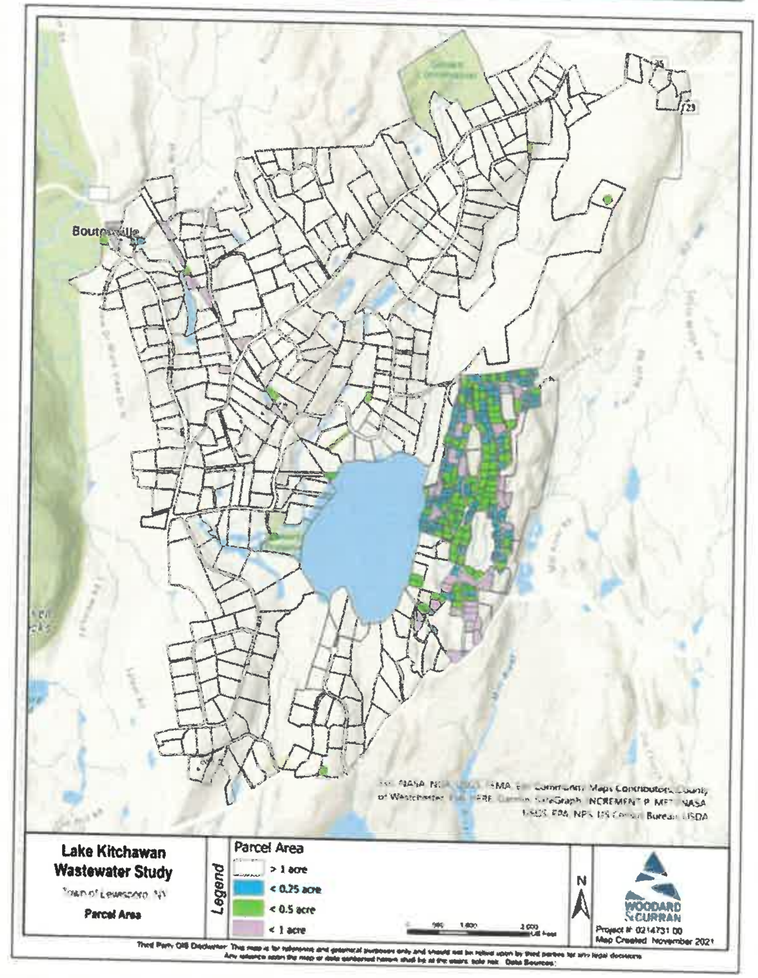
Collection system and local treatment plant

centralized Treatment – Entire Area

6 clusters across the entire service area

centralized Treatment – Critical Area

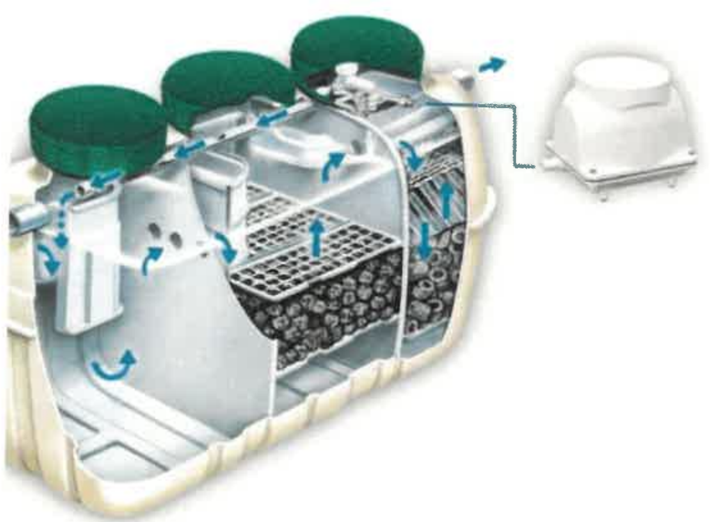
4 clusters targeted on critical area

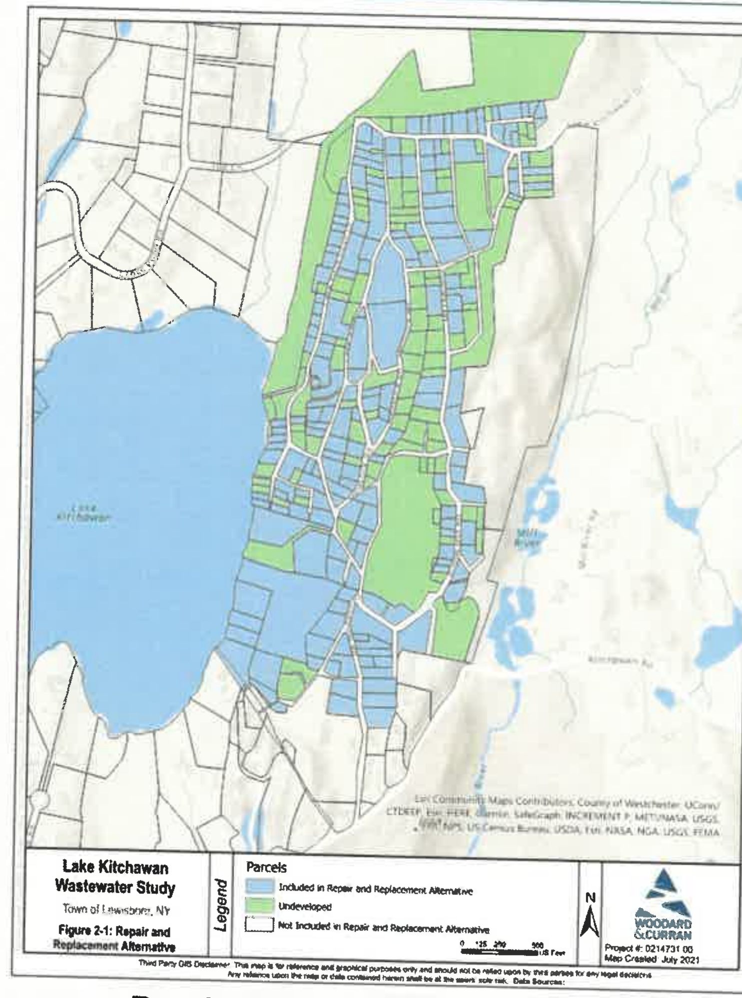


commended Alternative

Repair and Replacement

- FujiClean Model CE5/CRX
- 187 Properties
- Estimated Cost: $3.9M





Repair and Replacement Alternative

xt Steps

Finalize report, incorporating review comments from NYCDEP

Evaluate grant and financing opportunities

Apply for state grants and loans to assist in advancing mplementation of the recommended project alternative

Questions?

Executive Summary

Project Background and History

Ramboll Americas Engineering Solutions, Inc. (Ramboll) was retained by the Town of Lewisboro and teamed with Insite Engineering, Surveying and Landscape Architecture, P.C. to prepare an engineering report evaluating the impacts on Truesdale Lake water quality resulting from Onsite Wastewater Treatment Systems (OWTSs), otherwise known as Onsite Septic Disposal Systems (OSDSs) or septic tanks that are contributing high levels of nutrients to the Lake. As part of the report, a variety of desktop evaluation tools supplemented with field visits were utilized to estimate wastewater flows and confirm existing conditions surrounding the Lake. The report provides an extensive review of alternatives evaluated to improve the water quality of the Lake by mitigating the nutrient loading and outlines available wastewater management alternatives that would improve the water quality. The report will follow New York State Environmental Facilities Corporation (NYSEFC), New York City Department of Environmental Protection (NYSDEP), and New England Interstate Water Pollution Control Commission (NEIWPCC) guidance for municipal wastewater infrastructure projects.

Truesdale Lake (referenced herein as 'the Lake') is a small, 83-acre man-made lake created in 1927 by the construction of an 18-foot-tall dam, capturing the flow from a variety of sources including Pumping Station Swamp on the New York / Connecticut border, the northeastern side of the Lake. Along with small creeks and water courses, precipitation (precipitation that is not readily absorbed by the ground and runs overland as runoff) accounts for a significant portion of flow into the Lake, estimated to be 1.6 billion gallons a year. The Lake is approximately 25-feet wide at the mouth of the lake and has a maximum depth of 14-feet. The Lake discharges via a 200-foot dam with an 18-foot spillway located at the northern end of the Lake, under Indian Lane. Located in the Town of Lewisboro, with the Lake's watershed spanning more than 2,000 acres, reaching upstream into western Connecticut. The Lake drains into the Waccabuc River within the New York City Croton watershed – a major source of drinking water for New York City. Historic studies of Lake water quality identified an increasing eutrophication trend within the Lake over the last decade. Eutrophication is where the presence of nutrients within the lake provide a food source for the micro flora and fauna in the water causing bacterial and algal growth, decreased dissolved oxygen and an overall decrease in water quality. Lake nutrient levels have reached a threshold resulting in the Lake being listed on the NYSDEC Section 303(d) list of impaired water bodies. Phosphorus is the primary nutrient of concern with additional impacts caused by nitrogen.

The main sources of phosphorus and nitrogen include septic tank runoff, fertilizers, and wildlife. Recent studies have reported as much as 65% of phosphorous found in the Lake comes from septic systems. When phosphorus enters the OWTS as raw septage, the primary form of treatment is solids containing phosphorus settling to the bottom on the tank and being pumped out and treated at a wastewater treatment facility every few years. When the septic effluent (water separated from the settled solids) containing soluble phosphorus reaches the absorption field, some phosphorus is utilized by soil microbes and taken up by plants. Excess phosphorus is then available to flow via subsurface water or surface breakouts into the local watershed. Studies have reported that phosphorus influence on waterbodies decrease with distance from the absorption fields with the distance of 250 feet from the waters edge generally accepted as the zone with the most influence.

The approximate population of the study area, according to the 2019 US Consensus, provides 419 single-family homes with 1,300 inhabitants using OWTSs in the study area for the Lake. The density of OWTSs and housing dramatically increases with proximity to the Lake, with 274 developed parcels within 800 feet of the lake shore. These parcels are smaller in size than those parcels further from the shore posing an increasing challenge for the absorption fields to adequately treat septic effluent efficiently. Small parcel sizes combined with poor soil conditions in the Town result in many of the septic absorption fields being inadequate. These substandard soil conditions include steep slopes, and shallow rock and water tables that result in absorption field breakouts and subsurface flows that provide avenues for septic induced nutrients to reach the Lake, especially if the septic systems have not been properly pumped out and maintained following installation.

As the surrounding OWTSs are the main contributor to nutrient loading, resulting bacterial and algal growth, impairing water quality of the Lake (eutrophication), this study was commissioned. The objective was to identify and evaluate wastewater collection and treatment management alternatives, specifically public sanitary sewers and treatment, that can be implemented on a cost-effective basis to reduce nutrient levels in Truesdale Lake and return the Lake to a more natural and recreational state. Identified alternatives considered cost, environmental impacts, energy efficiency, and political acceptability.

Report Summary

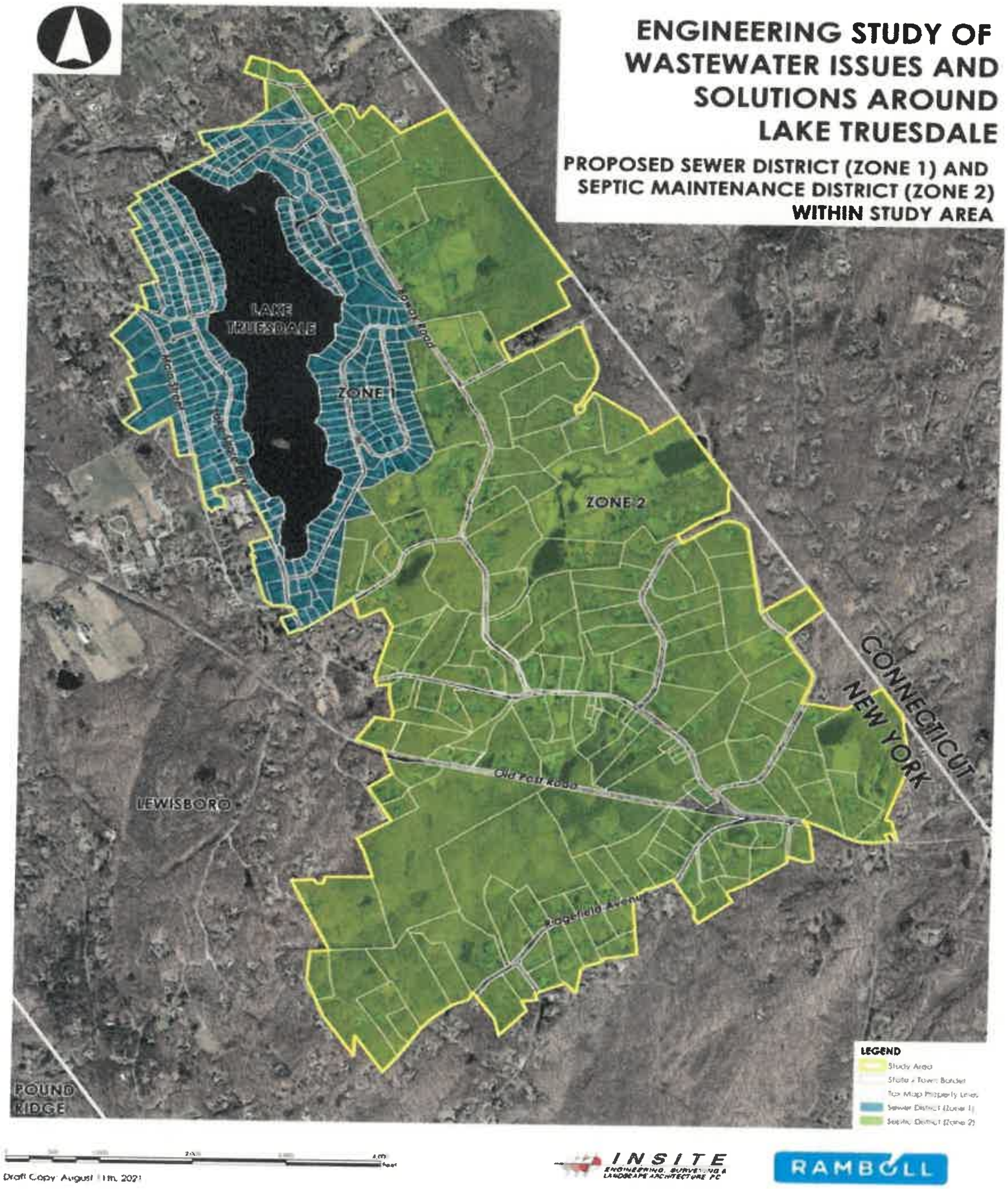
Ramboll partnered with Insite Engineering, Surveying & Landscape Architecture, P.C. to develop a Geographic Information System (GIS) for the study area identified by New York City Department of Environmental Protection (NYCDEP). This model provided a visual representation of the flow paths, soil types, slopes, wetlands, water bodies, and wastewater generated within the Truesdale Lake study area.

Given the size and span of the Truesdale Lake study area, the study area was broken into two (2) major zones of influence, Zone 1 and Zone 2. The designated zones are shown in the figure below. Zone 1 includes the area immediately surrounding the Lake and consists of approximately 2/3 of the OSDSs within the study area, most of which are on small lots and within 800 feet of the lakeshore. Zone 2 includes the remaining 1/3 of the OSDSs which are located on larger parcels, further from the Lake, where residences are more dispersed. Using publicly available data obtained from the Town of Lewisboro, NYCDEP and Westchester County, the developed GIS database, regional knowledge, and frequent site visits, cost-effective approaches for identifying solutions to improve the water quality of the Lake and implementation scenarios were evaluated.

Truesdale Lake Study Area Parcels	513
Developed Parcels	419
Undeveloped Parcels	94
Zone 1 Developed Parcels	274
Zone 2 Developed parcels	145
Total Bedrooms	1,370
Average flow per bedroom	130 gpd
Estimated flow in study area	178,100 gpd

The alternatives evaluated are described in detail in the next section.

Figure 1: Proposed Sewer and Septic Districts



Evaluated Water Quality Improvement Alternatives

Several wastewater management alternatives were evaluated for implementation within the study area ranging from continued on-site treatment to construction of a new centralized collection and treatment system. Alternatives considered are briefly described below and may include one or more of the systems proposed for this study in a combined fashion.

Potential alternatives included:

- ***Upgrade residential onsite septic systems to provide advanced treatment*** – advanced residential on-site treatment systems utilize both aerobic and anaerobic processes for enhanced nutrient removal. The proposed modification to provide enhanced treatment consists of adding an aeration process after anaerobic treatment in the septic tank. This step requires the addition of a low-pressure air system installed either within the septic tank, or in a separate tank. Existing septic systems can be modified; however, sometimes the most cost effective and efficient route is system replacement. Inspection of the absorption field and modifications, if required, are included in this approach.
- ***Cluster collection/treatment system*** – cluster/decentralized collection systems treat wastewater from several homes (aka. cluster) and are typically designed to treat 1,000 to as much as 20,000 gallons per day. Most systems consist of one or more larger septic tanks followed by an appropriately sized absorption field. Under this alternative, flow currently treated by individual septic systems would be diverted to a common septic system sized to treat all several connected homes. Discharge from each new cluster system would be conveyed by gravity or pumped to a subsurface discharge point located at a distance of 250 feet or more from the Lake or other watercourse. Each cluster system would be located on an undeveloped parcel greater than 4-acre with suitable soil conditions and located more than 250-feet away from the Lake.
- ***Collection and offsite Treatment*** – as an option to on-site or localized (cluster) treatment systems, formation of a sewer district and construction of a collection system with treatment at an existing or new wastewater treatment plant (WWTP) is also a consideration.
  - ***Collection System (gravity sewer and/or low-pressure sewer)*** – a public collection sewer serves each customer within the system (district) and conveys the sewage to a centralized location for treatment. For this service area, gravity and low-pressure systems were considered for implementation. Gravity sewers require a series of downhill sloping pipes, access manholes at directional or grade changes and require substantial area for installation. If gravity flow is not possible, lift or pump stations are required to convey wastewater over hills. Low-pressure sewers provide the same collection function and utilize packaged grinder pump stations at each or combined residences and small diameter pipe. Low-pressure systems are advantageous in areas with undulating terrain, rocky soil conditions, and/or areas where homes are lower than adjacent roadways and high bedrock or groundwater tables, which would make a conventional gravity sewer system cost prohibitive.

  Potential alternatives for treatment include:

  - ***Treatment at an existing local WWTP (Wastewater Treatment Plant)*** – treatment at an existing facility provides the largest cost savings if the facility has capacity and is in close proximity to the service area, as the cost is primarily operation and maintenance and the construction of a public conveyance system. While the most favorable option, there were no facilities near the Town with treatment capacity or the ability to accept sewage flows from the Lake Truesdale study area.

- ***Construction or expansion of an existing WWTP*** – If available treatment capacity is not locally available, construction of a new WWTP may prove to be viable. The new facility would need to comply with all local and State regulations and discharge into an existing watercourse that meets certain criteria. Construction of a new facility would require substantial capital cost and the Town would be responsible for long-term operation of the facility.

Recommendations

Zone 1

Zone 1 consists of the residences located from 0-feet to 800-feet of the lake shore (refer to figure above) where nutrient loading into the Lake is most significant.

After in-depth research into the alternative options mentioned above and following conversations with the Town of Lewisboro and the NYCDEP, it was determined that a low-pressure sewer collection system and the expansion of the WWTP at the Lewisboro Elementary School was the best course of action for improving the water quality of the Lake for Zone 1. A low-pressure sewer was chosen over a gravity sewer for reasons that included topography challenges (gravity flow uphill requires pumping stations which significantly add cost), operational ease and cost. The low-pressure system will have grinder pumps at each residence, some residences close in proximity can share, with connections to a small diameter pipeline that will carry wastewater to a centralized unit, the Lewisboro Elementary School facility, for treatment. The existing facility will be upgraded to efficiently treat the entire projected flow, which is estimated to be 140,000 gpd (gallons per day). Effluent will be discharged into the Waccabuc River.

The recommended expanded facility would have proven technology and redundancy to provide consistent and high level of nutrient reduction, specifically for phosphorus removal. For simplicity's sake, pre-engineering packaged processes can be installed easily within a small footprint and tailored to match the existing architecture of the school buildings. While there are some drawbacks to package plants, a custom designed and constructed facility may be suitable when financial and regulatory factors are considered.

The proposed expanded WWTP would be constructed adjacent to the existing facility and entirely enclosed within a building designed to match the existing WWTP building to create a consolidated campus look.

Zone 2

Zone 2 consists of the residences located further than 800-feet from the lake shore (refer to Figure 1). As Zone 2 is further from the Lake with septic systems located on larger, flatter parcels of land, the opportunity for nutrient uptake by the absorption fields and adjacent soil is increased, and the cost for pipeline construction outweigh the benefits of sewer collection, the recommendation for Zone 2 is to implement a septic remediation program. It is recommended that these septic systems be upgraded to a system with improved nutrient removal to minimize the amount of nutrients in the effluent water that enter the absorption fields.

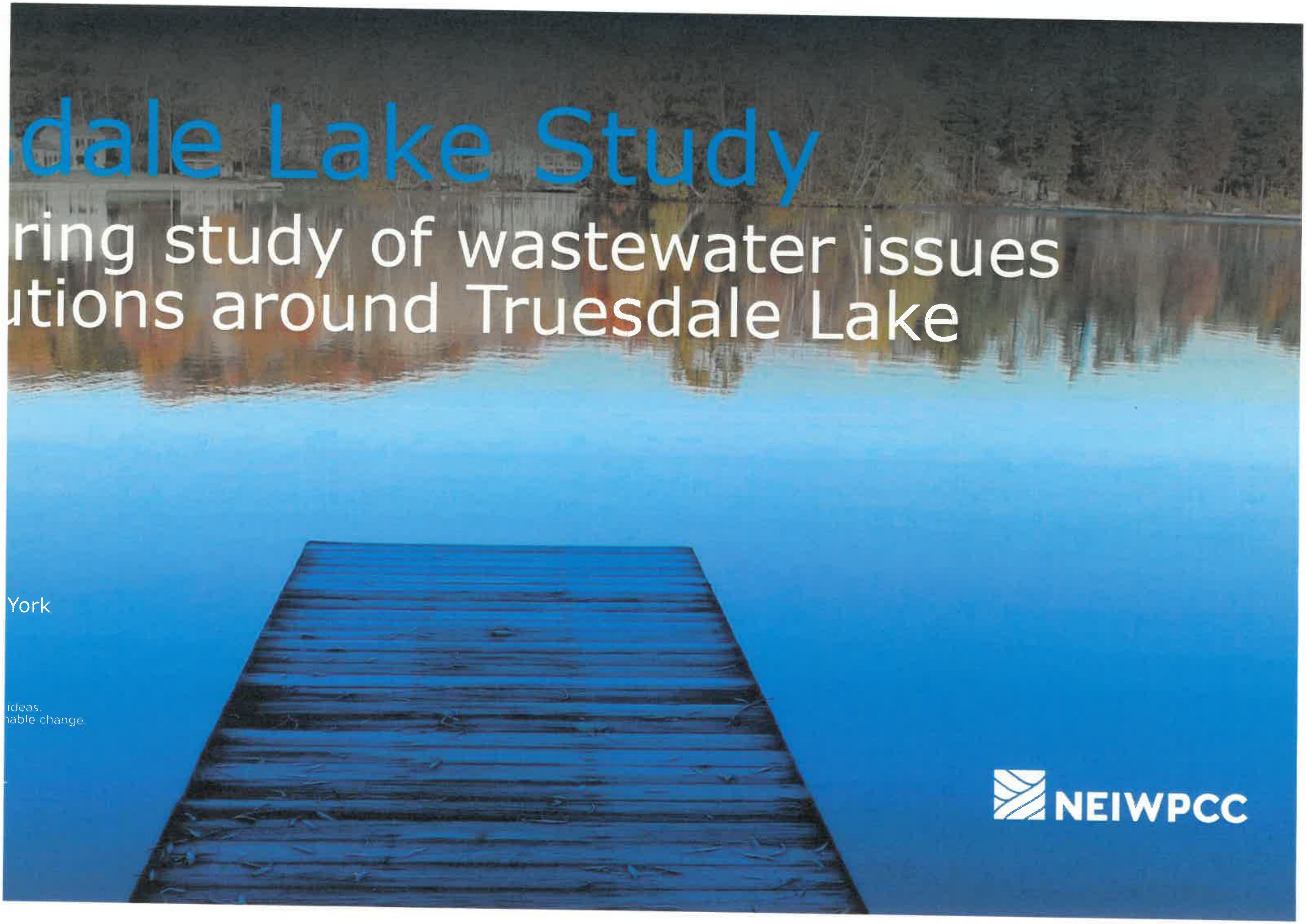
Each septic system would be assessed by a septic contractor by opening the uncovering portions of the absorption system for inspection and systems not in disrepair/failure (no surface discharge or standing water in trenches/ no excessive bio mat/sludge build up in gravel) would be upgraded with the installation of an Enhanced treatment Unit (ETU). Systems in failure would be replaced with an ETU and new absorption field.

This alternative includes utilizing improved technology for OWTS nutrient removal for the replacement of existing, dated OWTSs. For this alternative to be most effective, all existing septic tanks that do not meet current treatment codes should be replaced with new, upgraded equipment properly designed to support phosphorus treatment.

Recommendation Summary

By implementing the recommended alternatives described above, the phosphorus loading to Truesdale Lake attributed to OWTSs discharge (human waste contribution) is estimated to decrease from 6,400 lb./year to 1,100 lb./year resulting in approximately 80% loading reduction. This is based off the targeted WWTP effluent discharge limit of 0.5 mg/L for Zone 1 and the implementation of upgraded OWTSs for Zone 2. Note that this does not include nonpoint source loading, which does not originate from OWTSs and accounts for approximately 35% of the Lake's phosphorus loading.

Truesdale Lake is one of several lakes in the area undergoing a similar evaluation to explore best practices to mitigate nutrient loadings to the local watersheds with a larger goal of providing additional protection for the New York City East of Hudson drinking water system.


dale Lake Study
ring study of wastewater issues
tions around Truesdale Lake
York
ideas.
hable change.
NEIWPCC

1. **Introduction**
   - Meet the team (Ramboll and Insite)
   - Objectives
2. **Existing conditions evaluation**
   - Environmental settings
     - Nutrient loading
     - Onsite septic disposal systems
   - Nutrient (phosphorus) loading
   - Water quality improvement alternatives
3. **Questions**

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Michael Manning

Project Officer,
Ramboll

Chrissie Swann

Project Manager,
Ramboll

Amit Itkin

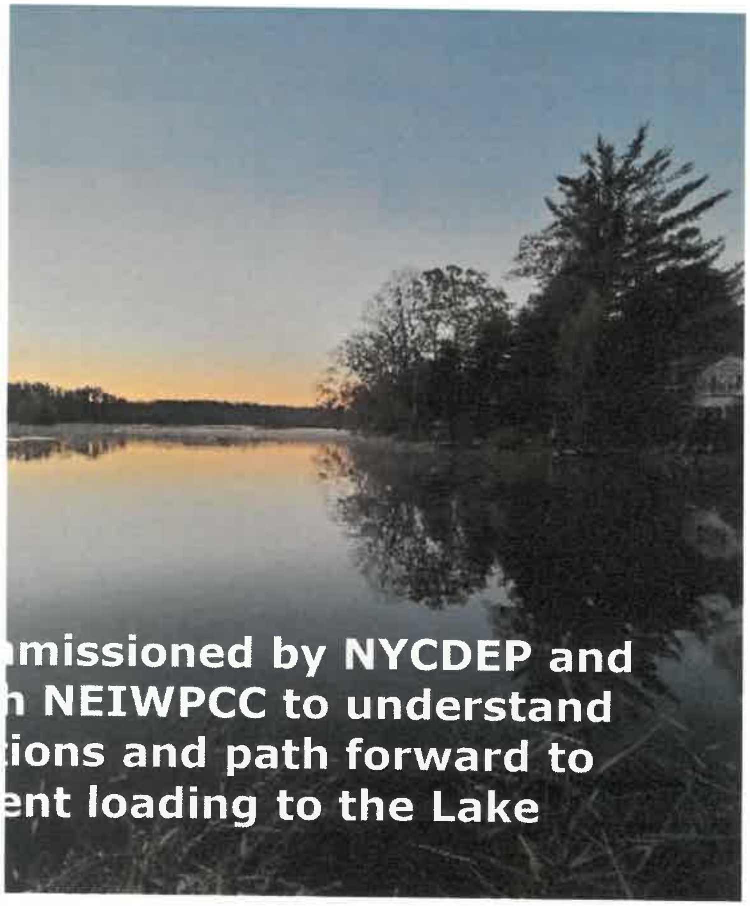
Engineer,
Ramboll

John Watson

Project Officer,
Insite

Eric Schlobohm

Project Manager,
Insite



Project Drivers:

Truesdale Lake water quality has been ***deteriorating,*** and the Lake is listed on the NYSDEC listing of impaired water bodies – ***reduced aesthetic and recreational qualities***

Protection of water quality within NYCDEP Croton Watershed

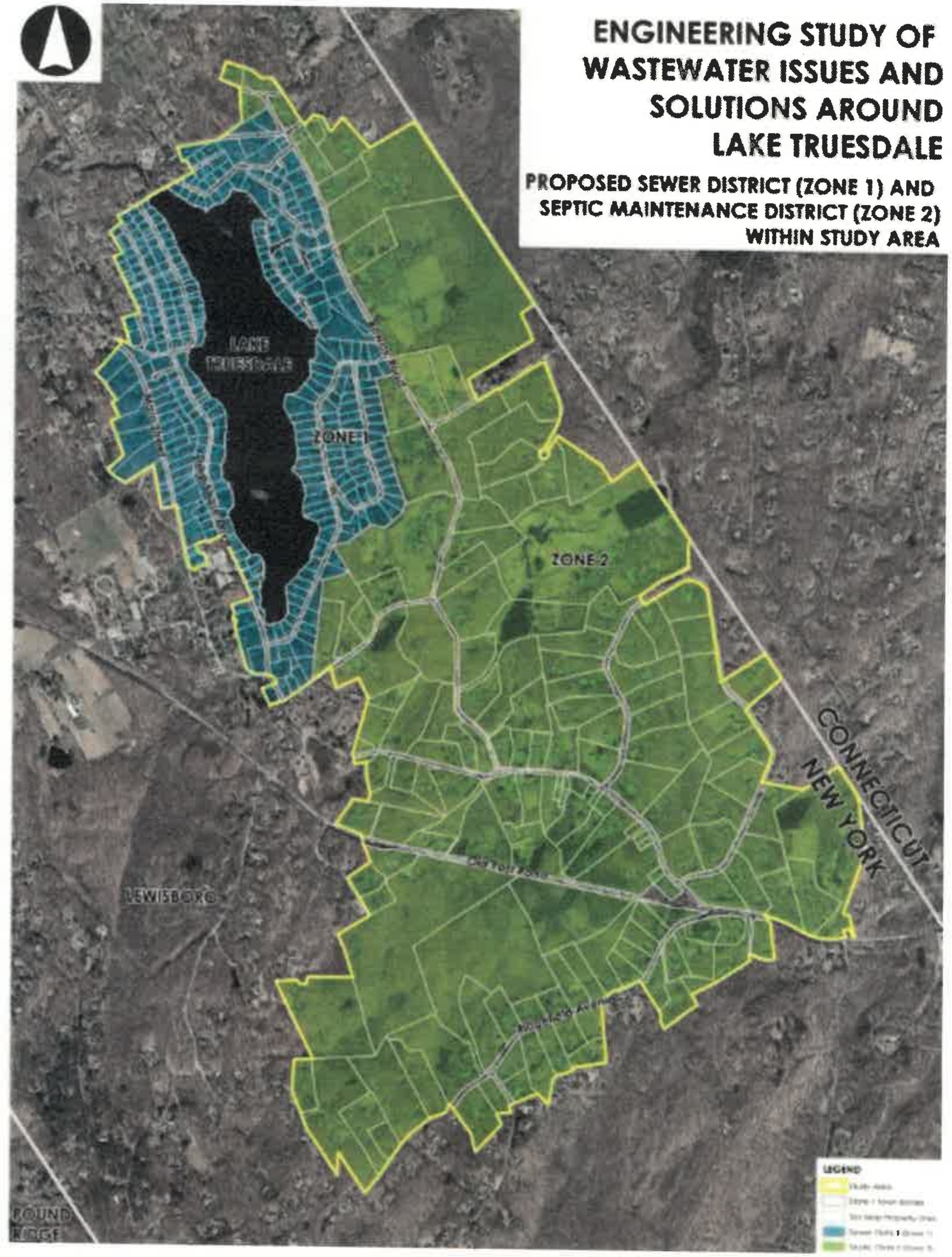
Incomplete data of existing conditions

Development of infrastructure scenarios for management of residential wastewaters

Lake Facts

- 83-acre, manmade lake in 1927, bordering Connecticut
- Dam on north end controls water elevation
- Up to 14-feet deep
- Eastern edge of NYCDEP Croton Watershed

ea nics	Study area zones
rcels:	**Zone 1:** Parcels less than 1 acre within 800-feet (+/-) of Lake shore (blue) 274 residences
n: Census)	**Zone 2:** Larger parcels (green) 145 residences



ng	• Soluble reactive phosphorus, nitrate + nitrite N and TKN levels have increased over the past decade • Phosphorus is greatest concern • Lake does not meet recommended level for many recreational uses
sphorus ns	• Algal blooms • Low water visibility • Ecosystem impacts
of ding	• Urban stormwater runoff • ***Septic loading*** • Fertilizers • Wildlife

isting Conditions aluation

:a Data Collection

ıd review

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ɔm count,
ɳd age

ws

Operational

- Documented septic tank clean outs
- Documented septic system repairs

Result:
Extent of known/suspected underperforming onsite disposal systems (OSDS)

Environmental

- Site conditions

Result
Summary of site conditions that are favorable or unfavorable for onsite treatment

em
ntal

ka OSDS) are
en properly
ntained, and

Factors that influence OSDS performance and impact the nearby watershed:

- Depth to groundwater (5-foot separation from absorption field)
- Soil type
- Depth to bedrock (5-foot separation from absorption field)
- Proximity to lakes, water courses, and wetlands
- Slope (<15%)
- Separation distance from adjoining drinking water wells

Depth to Water Table

- One of several critical design considerations
- Adequate vertical separation between absorption fields and groundwater is essential for optimal performance
- WCDOH requirements: 5 feet
- Typical septic system depth: 2.5 feet

ry

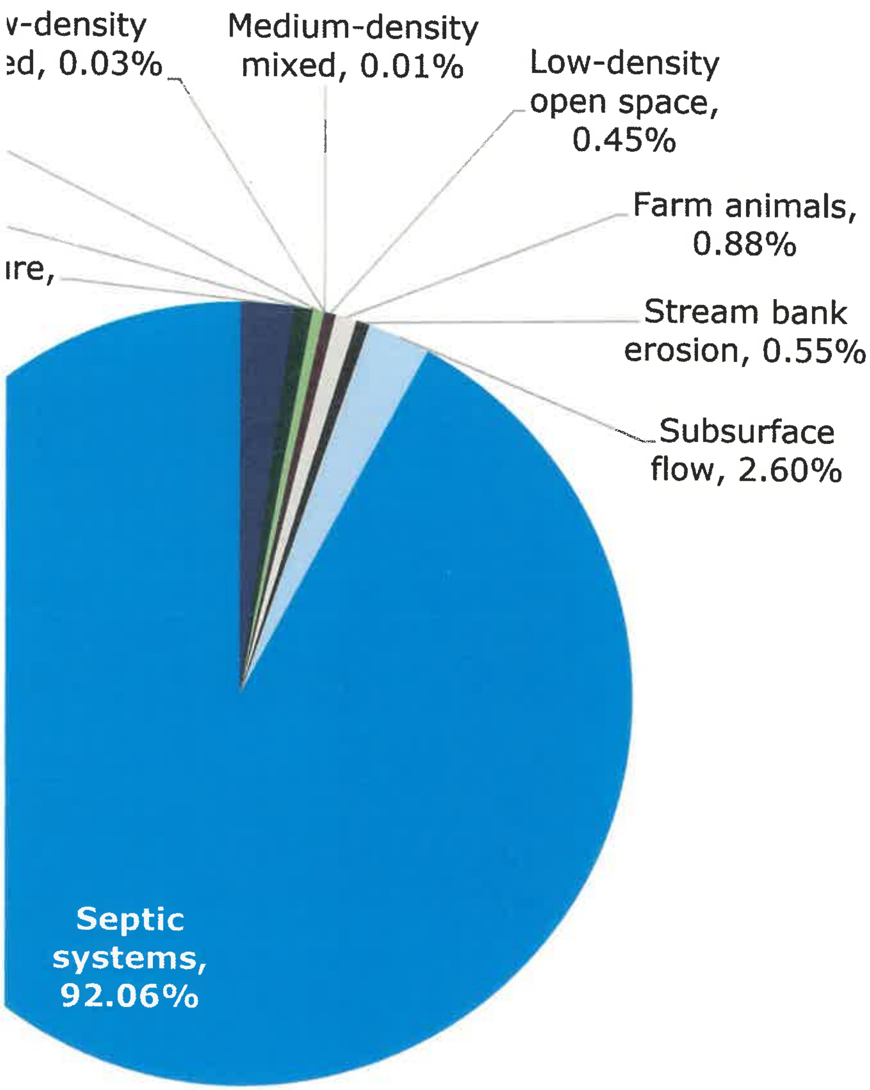
conditions are
ts to the Lake
enues:

Septic systems were installed in poor soils without adequate water table clearance, or shallow depth to bedrock, or on parcels too small or too sloped to support proper treatment

Septic systems are antiquated and need service and/or replacement

Septic systems have not been inspected, pumped or maintained

Most failures are subsurface and impossible to identify



Phosphorus Loading Sources*

*Note that several scenarios of septic failures were modeled for this analysis, the data presented in this pie chart is from the worst-case scenario:

A. 2 septic failures per Zone
Underestimation of loading at 100 lb/year

B. All systems within 200-feet of a water course or well, or those systems located in a shallow water table (presented worst-case)
Overestimation of loading at 1,200 lb/year

C. EPA Cited 15% failure
Median estimation of loading at 403 lb/year

D. Zero failures
Unrealistic, shows wildlife contributes 90lb/year loading to the lake

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- Residential Onsite Sewage Disposal Systems
- Enhanced Treatment Units (ETUs)
- Gravity Collection System
- Low-pressure Sewer Collection System with Grinder Pump
- Vacuum Sewer Collection System
- Effluent Sewer Collection
- Septic Tank Effluent Pump (STEP)
- Septic Tank Effluent Gravity (STEG)
- Cluster Collection/Treatment System
- Treatment at Existing Local WWTP

- All of the above listed wastewater management alternatives were evaluated in depth for the Town of Lewisboro. The most feasible and cost-effective alternatives are described on the following slide.

ity Improvement Alternatives

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02

Treatment at regional WWTP

- Low pressure sewers and conveyance to a local wastewater facility
- Few potential options within a reasonable distance (10 miles)

03

Construction or expansion of an existing WWTP

- Low pressure sewers and conveyance to a local wastewater facility
- Closest facility is the Lewisboro Elementary School WWTP (8,000 GPD)
- Expansion of existing MBR process to 140,000 GPD avg.
- New discharge point at Waccabuc River as existing discharge may not support additional flow

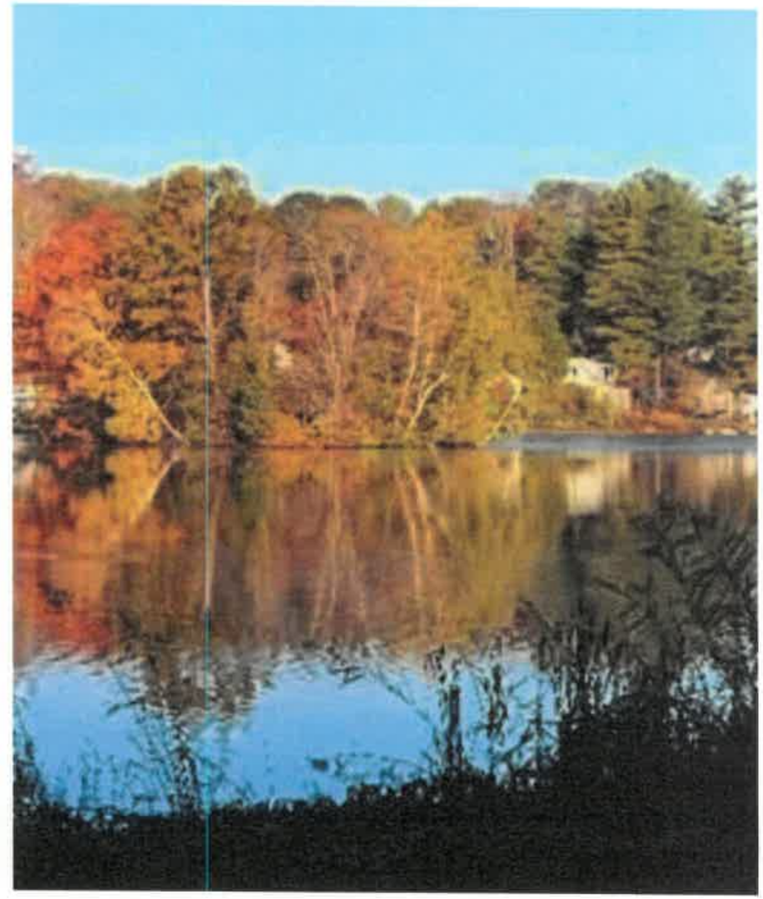
Proposed alternatives will result in a potential 87%* reduction of phosphorus loading to the Lake

**Based off worst-case scenario evaluations*

ded Alternatives for Further Review

- Low pressure sewers with treatment at the expanded Lewisboro-Katonah Elementary School WWTP
- New effluent outfall at the Waccabuc River
- Serves 274 parcels

- Continued onsite treatment with addition of enhanced treatment units (nutrient removal) and inspection and repair of existing systems
- Lot sizes and location will support long term commitment to onsite systems (145 systems)
- Includes development of septic maintenance district and a septic maintenance program: evaluate systems, system repairs and remediations, long-term maintenance program



n Phosphorus Loading to the Lake

efit to Lake	Zone 1 loading (lb/yr)	Zone 2 loading (lb/yr)	Total Lake loading (lb/yr)
ng	1,000	100	1,100
	20	80	100
ading rce)	**1020**	**180**	**1200**
WTP effluent loading*	220	N/A	N/A
effluent loading	N/A	40	N/A
n of TP	800	60	
Lake	**20**	**120**	**140**

rges to Waccabuc River, removing septic loading in Zone 1 to the Lake

Existing modeled loading

Potential resulting modeled loading

estions?

k you!

ideas
able change.

INSITE
ENGINEERING, SURVEYING &
LANDSCAPE ARCHITECTURE, P.C.

This document contains excerpts from, and summaries of the Lake Waccabuc Engineering Study Draft Report, dated August 13, 2021. The information provided in this document may change in response to comments received by the Town of Lewisboro, the New York City Department of Environmental Protection, and the New England Interstate Water Pollution Control Commission.

6.0 EVALUATION OF TREATMENT OPTIONS

The following treatment options were evaluated to determine feasible alternatives:

- Option 1 – Repair/Replace Individual Septic Systems
- Option 2 – Construction of a Community Septic System
- Option 3 – Connection to an Existing Wastewater Treatment Plant
- Option 4 – Construction of a New Wastewater Treatment Plant

6.1 Prioritization of Areas to be Served

The most concentrated location of parcels determined to have the highest priority in Figure 6-1 are located in the Eastern Region. Similarly, the region with the greatest cost-value of implementing a sewer versus the amount of estimated phosphorus removed is also the Eastern Region. A summary of this cost-benefit analysis is provided in Table 6-1.

Table 6-1: Cost-Benefit Analysis by Region

Study Area Region	Capital Cost of Sewer System*	Estimated Phosphorus Removed (lbs/day)	Sewer Cost/ Phosphorus Removed
Northwest	$3,100,000	42.6	$73,000
Eastern	$6,900,000	266.6	$26,000
Mid	$5,300,000	70.4	$75,000
Southern	$2,200,000	12.3	$180,000

*Cost does not include stream crossings.

7.0 ALTERNATIVES ANALYSIS

The following alternatives were evaluated as possible wastewater management solutions:

- Alternative 1A – Replacement of Septic Systems within the Study Area
- Alternative 1B – Replacement of Septic Systems and Installation of Phosphorous Treatment Systems
- Alternative 2A – Community Septic System for the South Shore Waccabuc Association
- Alternative 2B – Community Septic System for the South Shore Waccabuc Association with Replacement of Individual Septic Systems for Remaining Properties in the Study Area
- Alternative 3 – Connection to the Heritage Hills WWTP for the Entire Study Area
- Alternative 4A – Wastewater Treatment Plant at South Shore to Treat the Eastern Region
- Alternative 4B – Wastewater Treatment Plant at Lewisboro Elementary to Treat the Study Area

8.0 POTENTIAL WATER QUALITY IMPACTS OF ALTERNATIVES

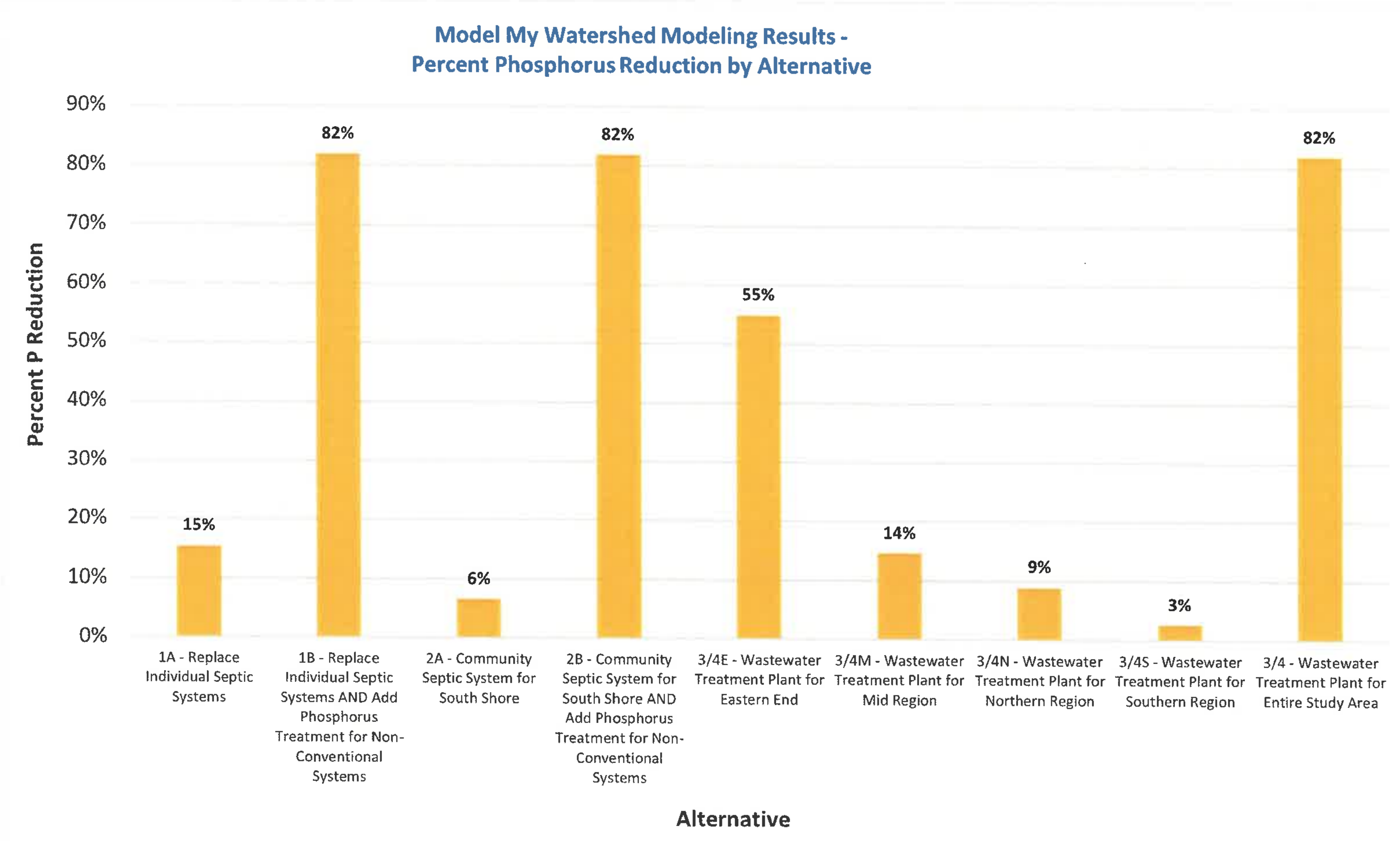


Figure 8-1: Model My Watershed Modeling Results – Percent Phosphorus Reduction by Alternative

8.0 ESTIMATED COST OF ALTERNATIVES

Table 8-X: Summary of Estimated Probably Cost

	Total Estimated Project Capital Cost
Alternative No. 1A	$5,100,000
Alternative No. 1B	$7,700,000
Alternative No. 2A	$1,400,000
Alternative No. 2B	$9,000,000
Alternative No. 3	$43,200,000
Alternative No. 4A	$18,800,000
Alternative No. 4B	$34,500,000

11.0 SUMMARY AND COMPARISON OF ALTERNATIVES

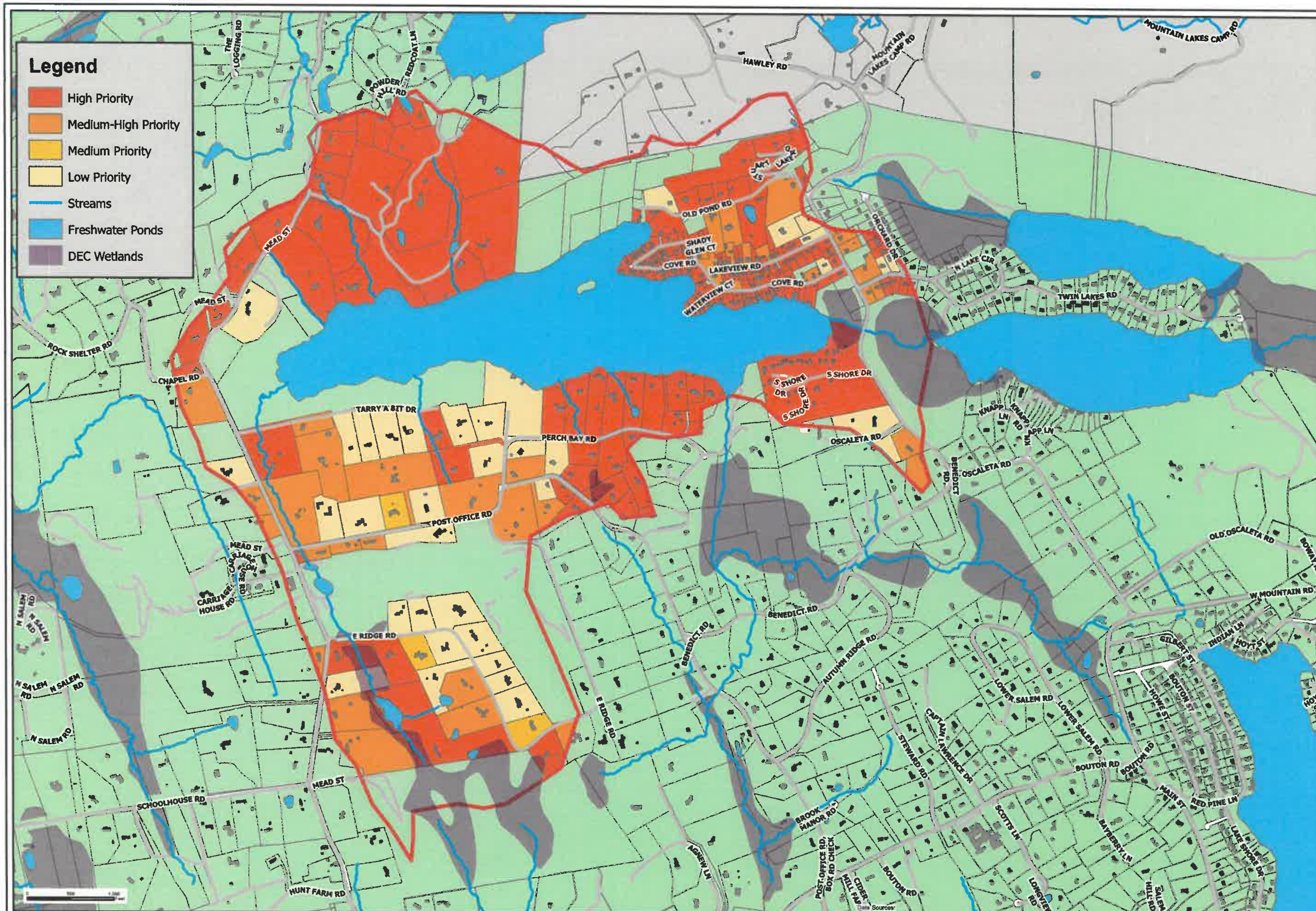
11.2 Life-Cycle Cost Analysis

Table 11-1: Life Cycle Costs of Alternatives

	Present Day Annual Capital Cost[1]	Annual O&M	Annual Short-Lived Assets	Total
Alternative No. 1A	$290,000	$22,000	-	$320,000
Alternative No. 1B	$430,000	$22,000	$58,000	$510,000
Alternative No. 2A	$80,000	$3,000	$4,400	$90,000
Alternative No. 2B	$500,000	$23,000	$61,000	$590,000
Alternative No. 3	$2,380,000	$33,000	$51,000	$2,470,000
Alternative No. 4A	$1,040,000	$249,000	$52,000	$1,350,000
Alternative No. 4B	$1,900,000	$224,000	$59,000	$2,190,000

1. Assumes a 30-year loan with 3.6% interest, Including Collection system.

The costs summarized in Table 11-1 show that Alternative 1A, replacement of the failing and failed septic systems within the study area, is the most cost effective of the alternatives evaluated for the Lake Waccabuc study. However, Alternative 1A is not the most effective alternative to resolve the contamination issues experienced at Lake Waccabuc due to the individual onsite septic systems surrounding the lake. Therefore, Alternative 4A is recommended as the most cost effective solution that provides the greatest benefit.



Town of Lewisboro

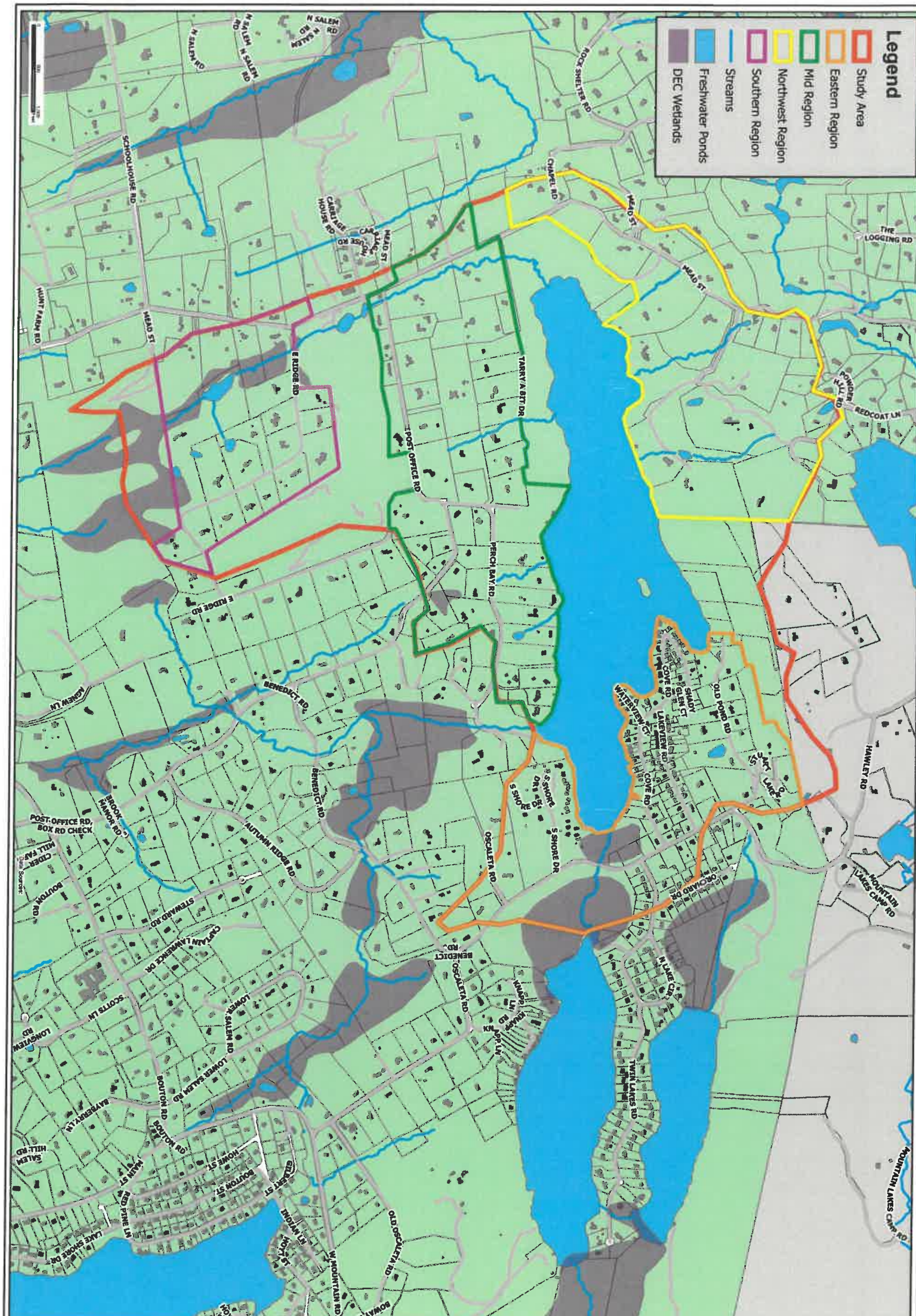
Wastewater Management Solution Prioritization

New York

Westchester County

Barton & Loguidice

Date	August 6, 2021
Scale	1" = 1,000'
Figure Number	6-1
Project Number	2390.001.001



Town of Lewisboro

Study Area Regions

New York

Westchester County

Barton & Loguidice

Date: August 5, 2021

Scale: 1" = 1,000'

Figure Number: 6-2

Project Number: 2390.001.001

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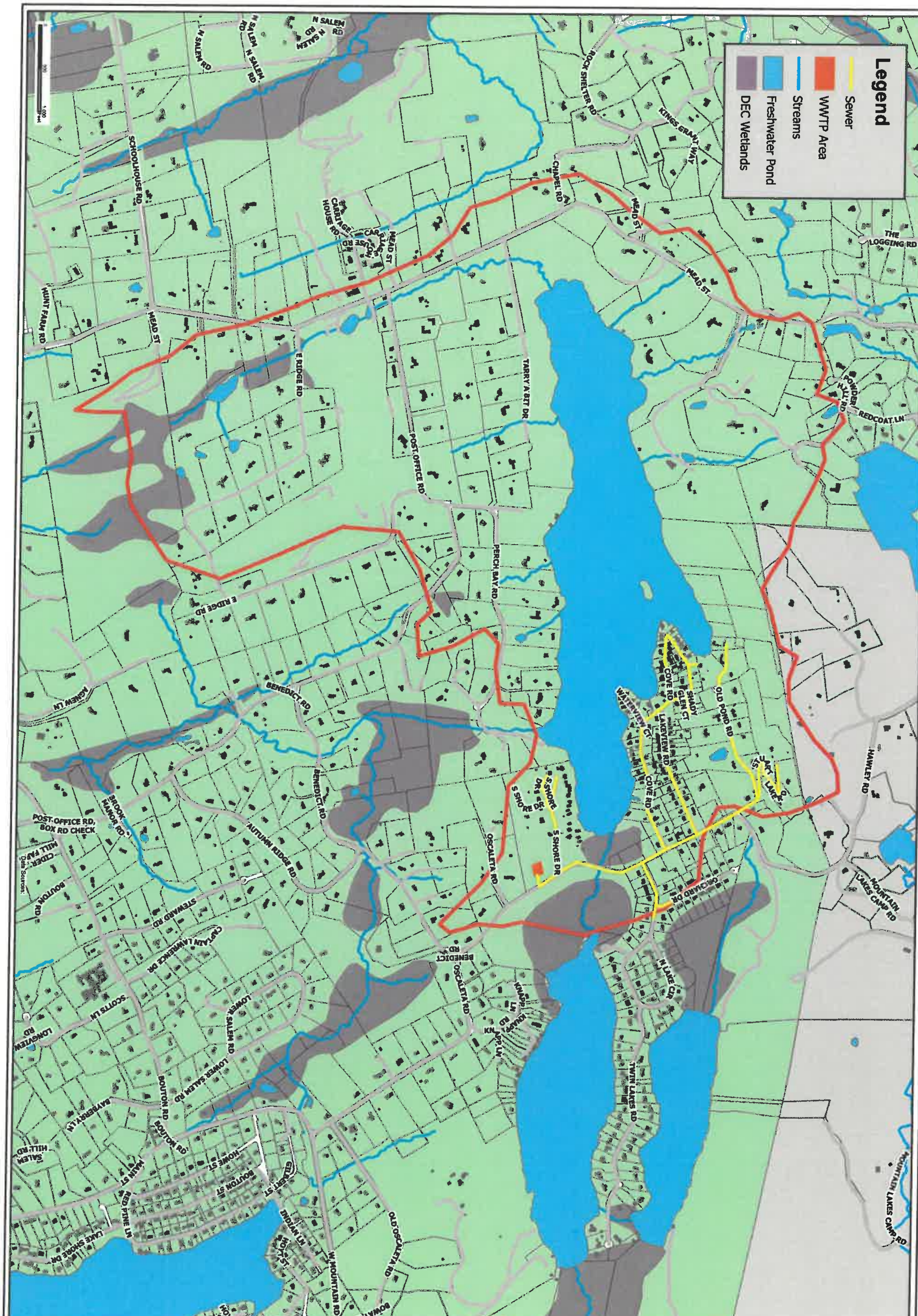

Project Number 2390.001.001	**Figure Number** —	**Scale** 1" = 1,000'
Date August 10, 2021	Barton & Loguidice	

Town of Lewisboro

Alternative 4A
WWTP at South Shore

New York — Westchester County

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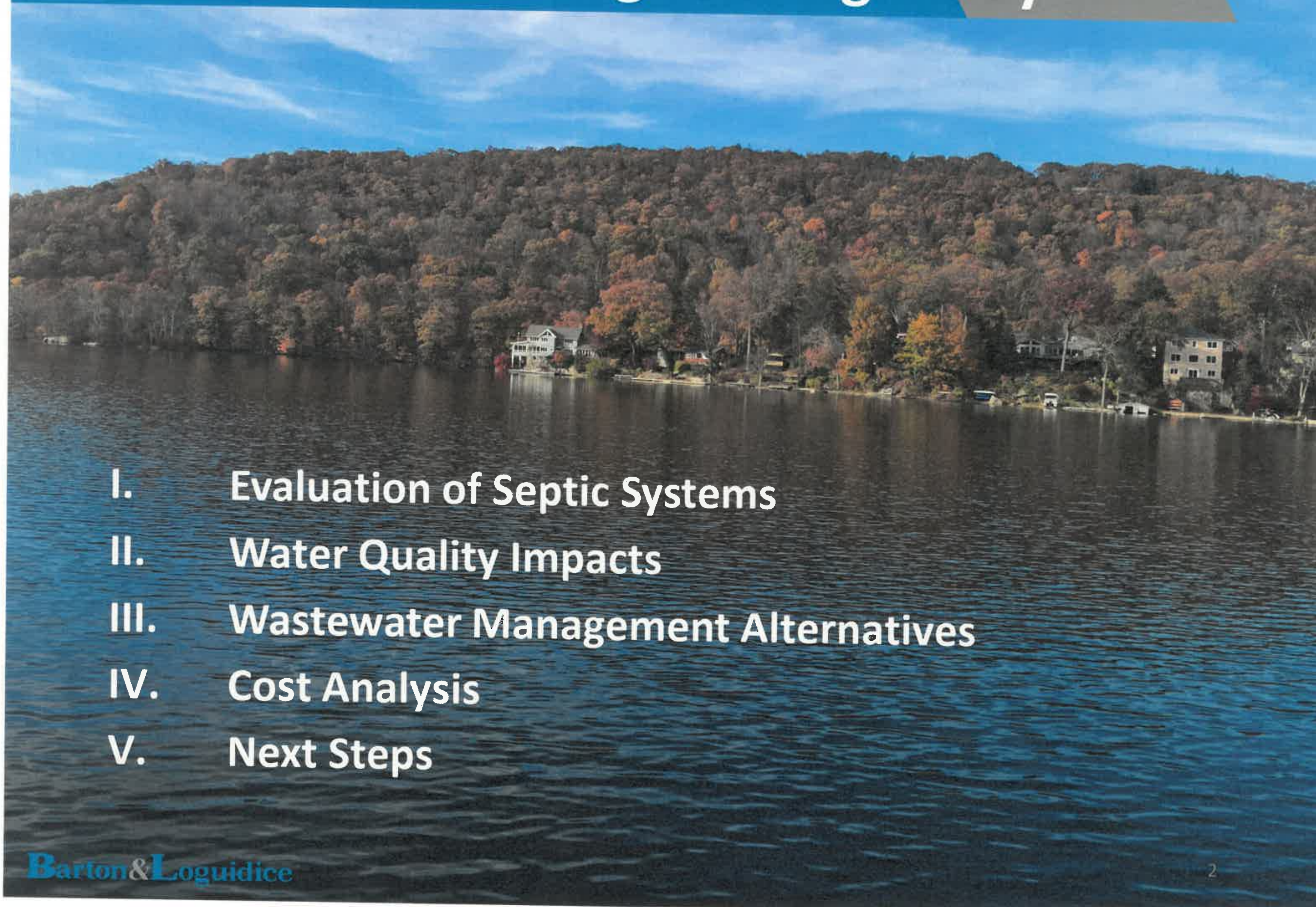
Barton & Loguidice

Lake Waccabuc

Engineering Study

November 15, 2021

Lake Waccabuc Engineering Study



I. Evaluation of Septic Systems
II. Water Quality Impacts
III. Wastewater Management Alternatives
IV. Cost Analysis
V. Next Steps

Barton&Loguidice

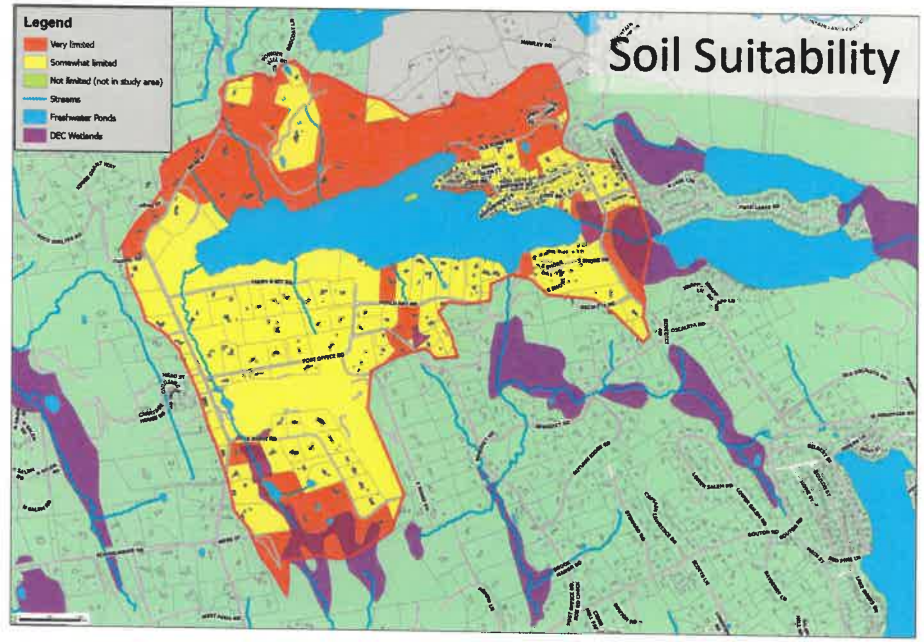
Evaluation of Septic Systems

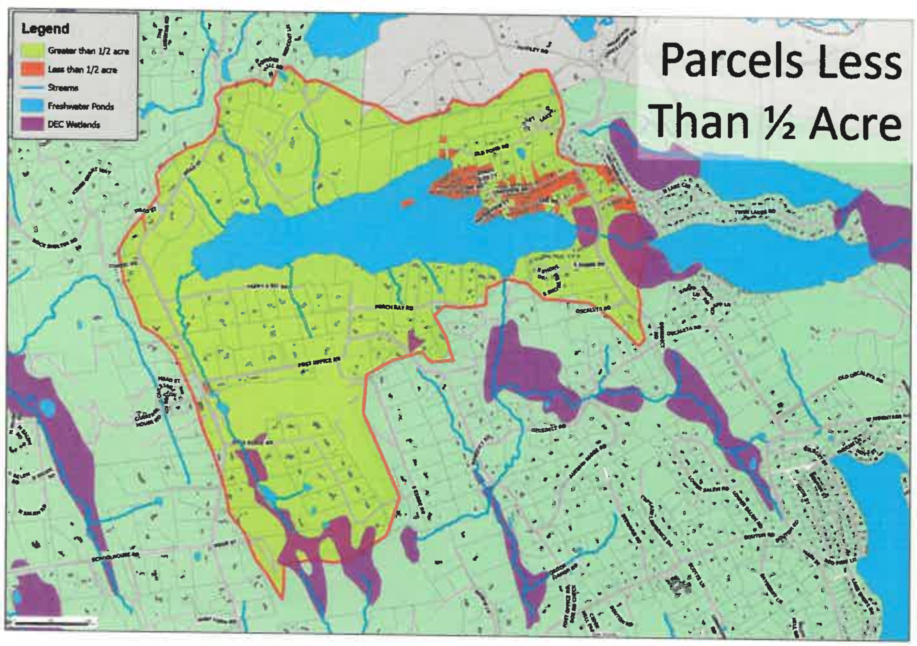
Lake Waccabuc Study Area

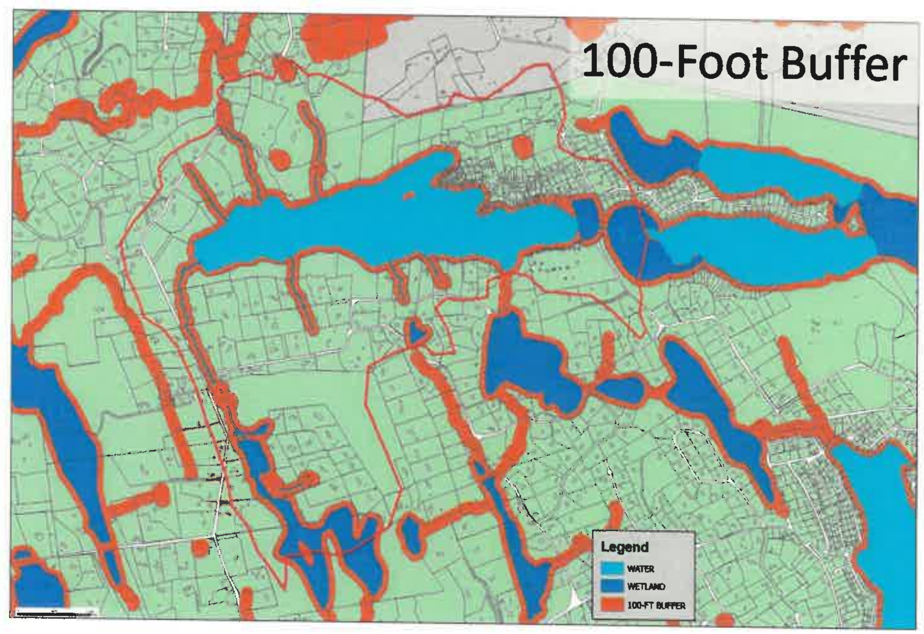
- The study area is made up of the Lake Waccabuc watershed, excluding Lake Rippowam and Lake Oscaleta
- 285 homes in the study area
- Estimated population of 770 people

Environmental Constraints

- Infiltration rate of soils
- Depth to seasonal high groundwater table
- Depth to bedrock
- Steepness of slopes
- Proximity to surface water
- Parcel size







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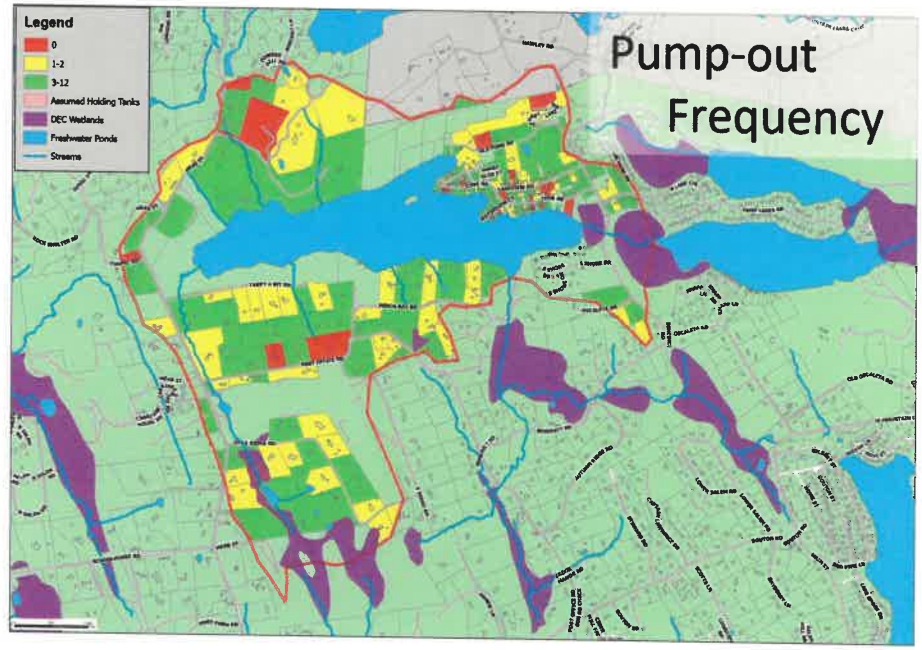
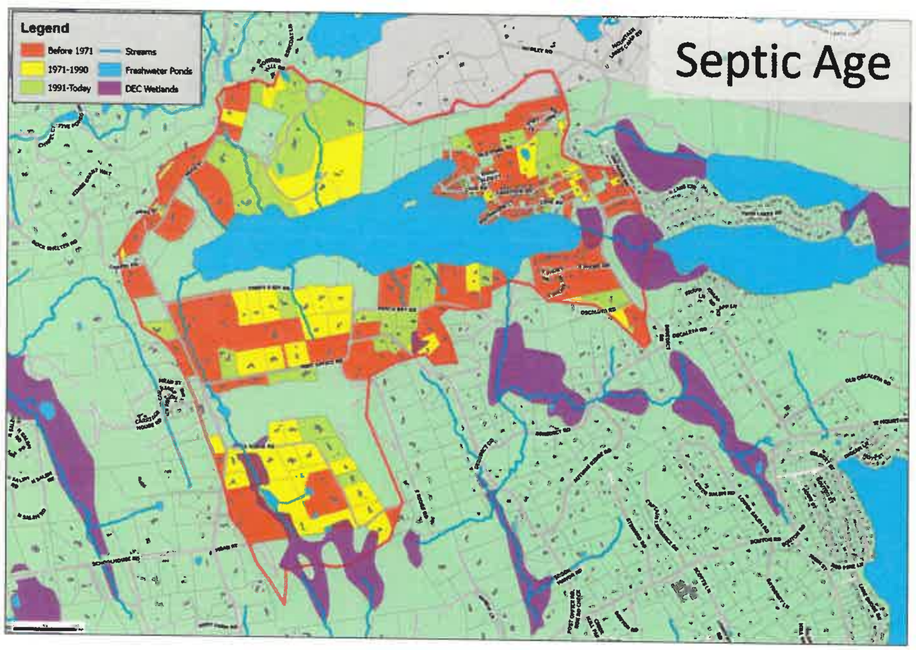
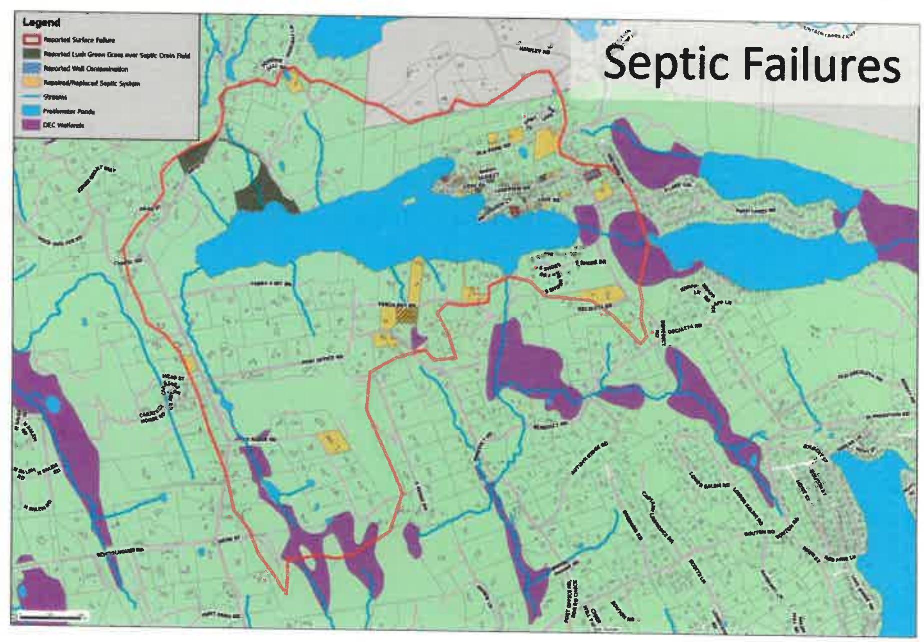
Site Septic Age and Maintenance

- Septic pump-outs required at least once every 5 years
- Average of 2 septic failures reported per year in study area
- Average septic system lifespan is 15 to 40 years (EPA)







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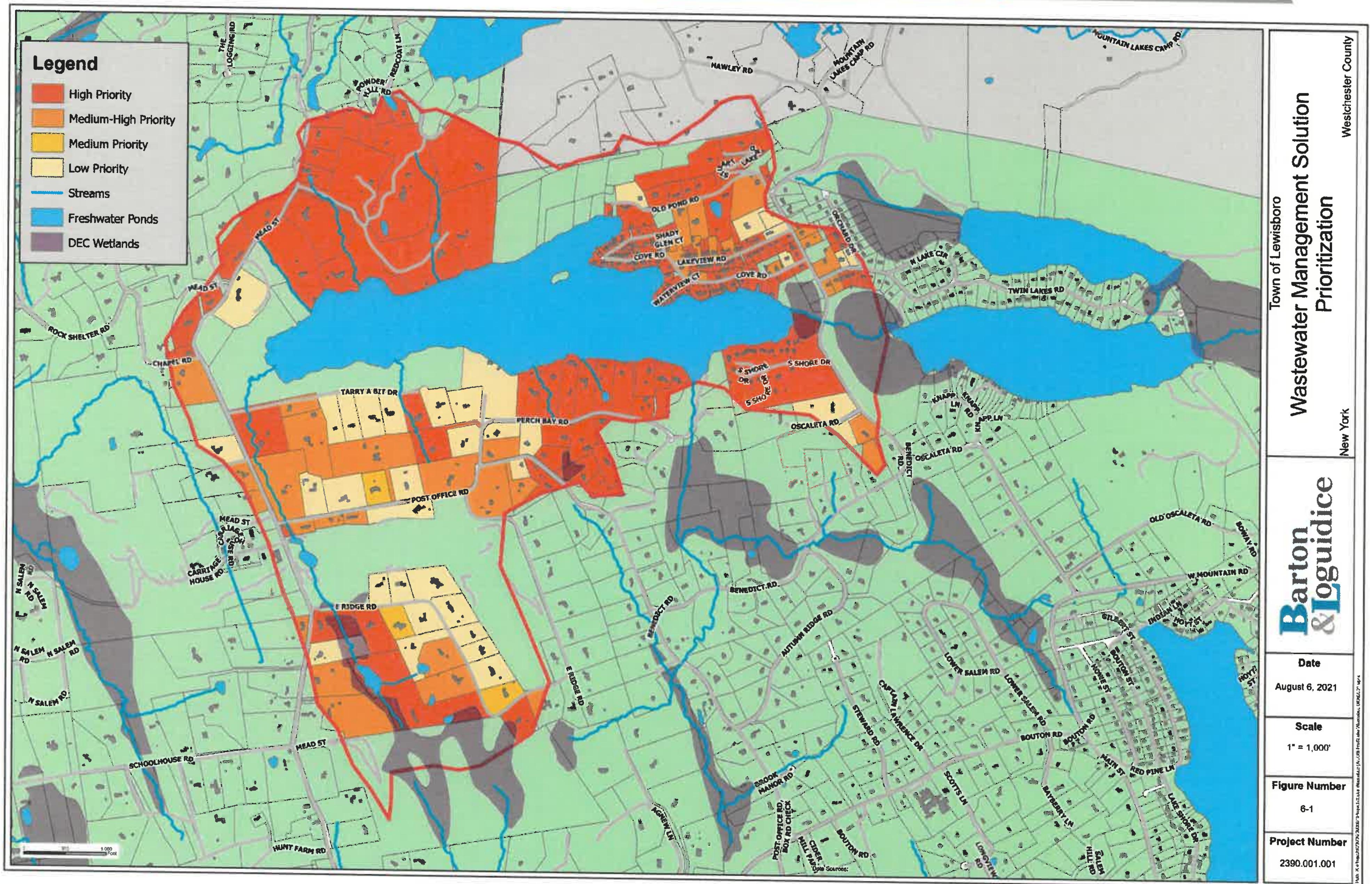
Prioritization of Sites



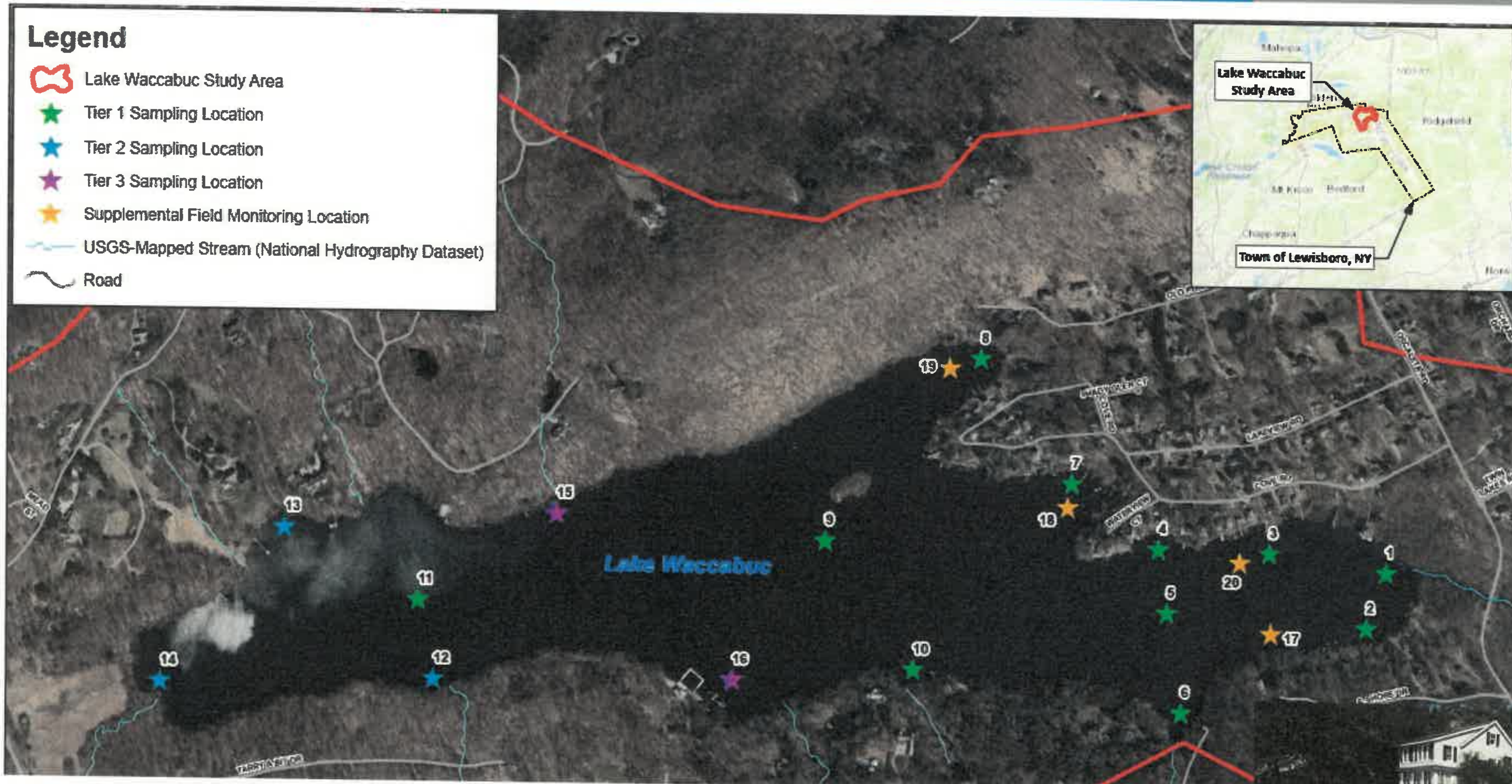
Water Quality Impacts

Effects of High Nutrient Concentrations

Effects of high nutrient concentrations in Lake Waccabuc include:

- Depletion of dissolved oxygen concentrations
  - Can result in fish kills
- Frequent harmful algal blooms (HABs)
  - HABs produce algal toxins harmful to human health and aquatic life
- Impairment of drinking water supply
- Vulnerability for invasive species
  - Increased growth of lake weed
- Limits on recreational opportunities

Field Sampling & Monitoring - Locations

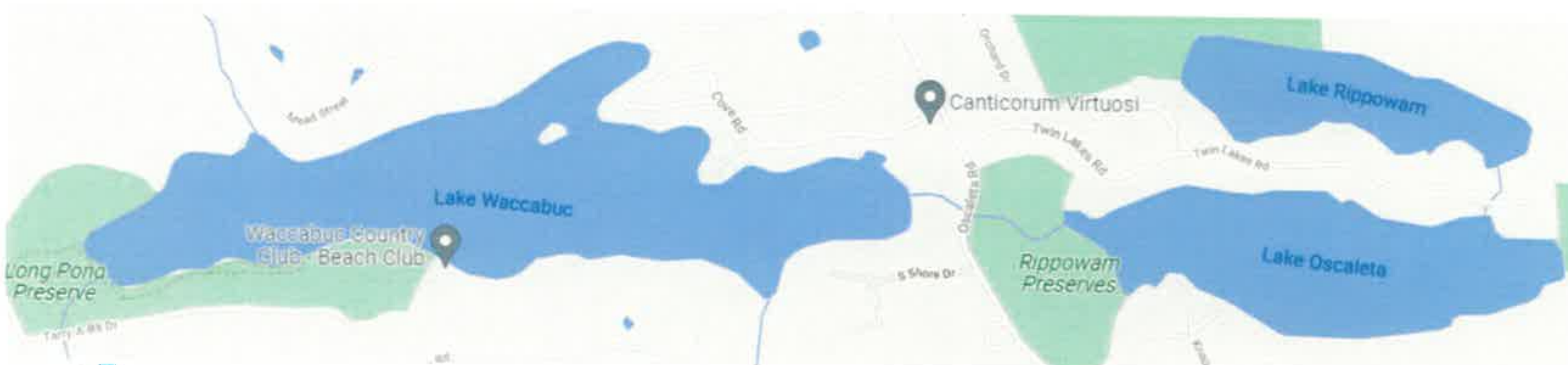


July 2021 field monitoring/sampling

Barton&Loguidice

Water Quality Monitoring Results

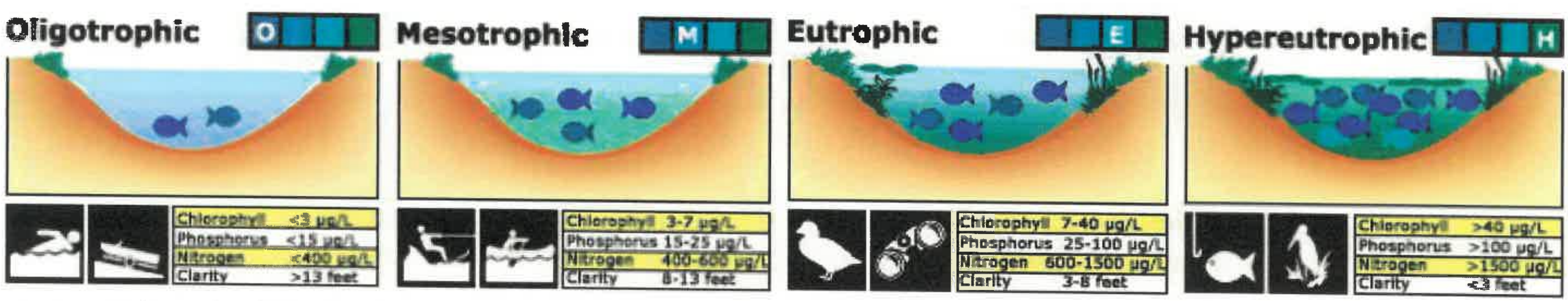
- Data was consistent with the Citizen Statewide Lake Assessment Program (CSLAP) results
- **Phosphorus** is the primary pollutant of concern
- CSLAP - significant increase in phosphorus levels since 1986
- 2020 CSLAP - peak phosphorus concentration of 0.053 mg/L
  - Over 2.5x greater than the NYS recommended limit (0.020 mg/L)
- July 2021 Phosphorus concentrations ranged from 0.025-0.043
- In general, highest phosphorus concentrations were observed at the Lake Waccabuc inlet.



Nutrient Concentrations & Trophic States

- Lake Waccabuc is approaching a **Eutrophic** state
- Cyanobacteria or "blue-green algae" present lake-wide
- Green non-toxic algae also present

Classification	Definition	Water Quality
Oligotrophic	Low level of biological productivity	Good
Mesotrophic	Moderate level of biological productivity	Fair
Eutrophic	High level of biological productivity	Poor
Hypereutrophic	Highest level of biological productivity	Very Poor



Source: University of Florida, Water Institute

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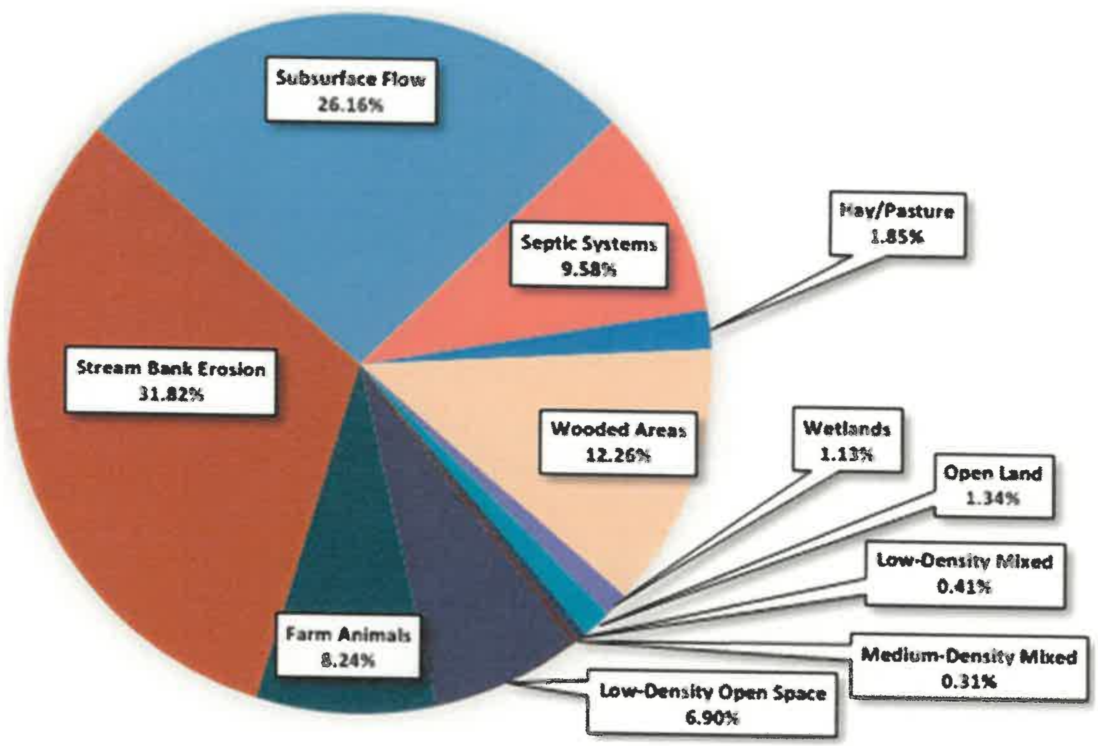
Pollutant Load Modeling

- The Study Area is estimated to contribute between 9 to 1,074 lbs./year of phosphorus to the Lake from failing septic systems.
- The range is due to the number of failing septic systems incorporated into the model.

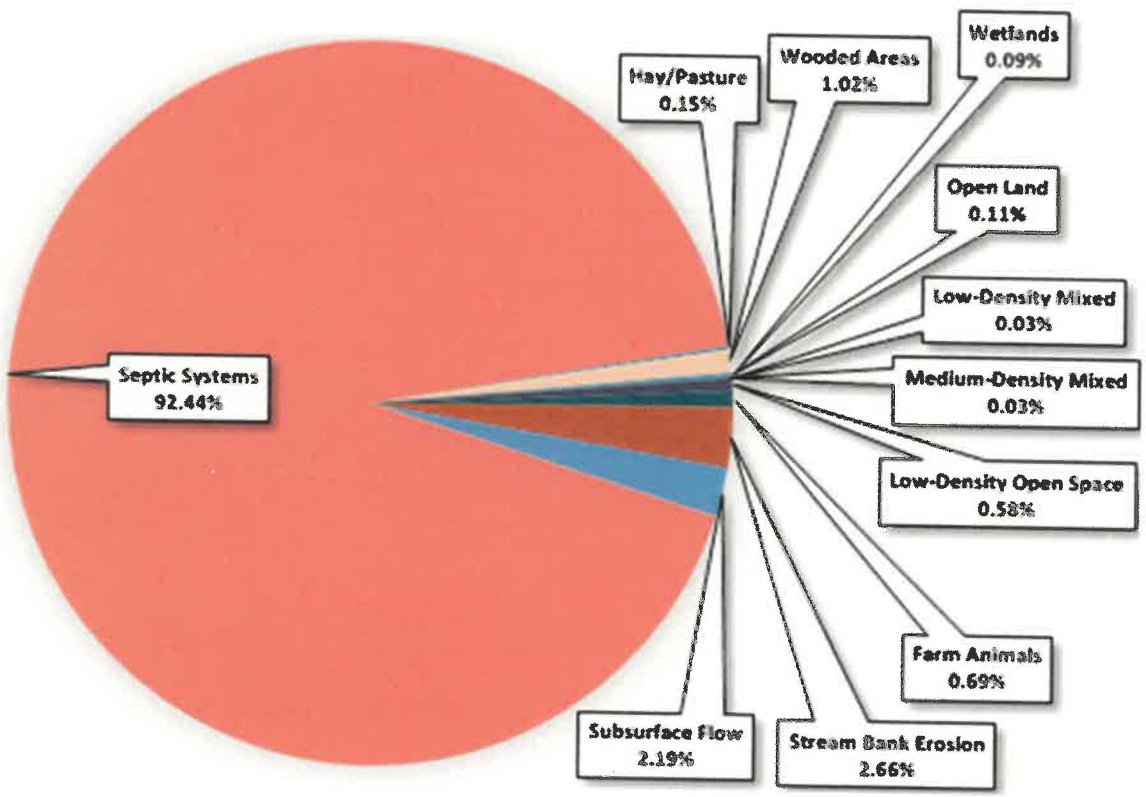
Minimum Phosphorus Septic Contribution

(Based on 2 failing septic systems/year)



Pollutant Load Modeling

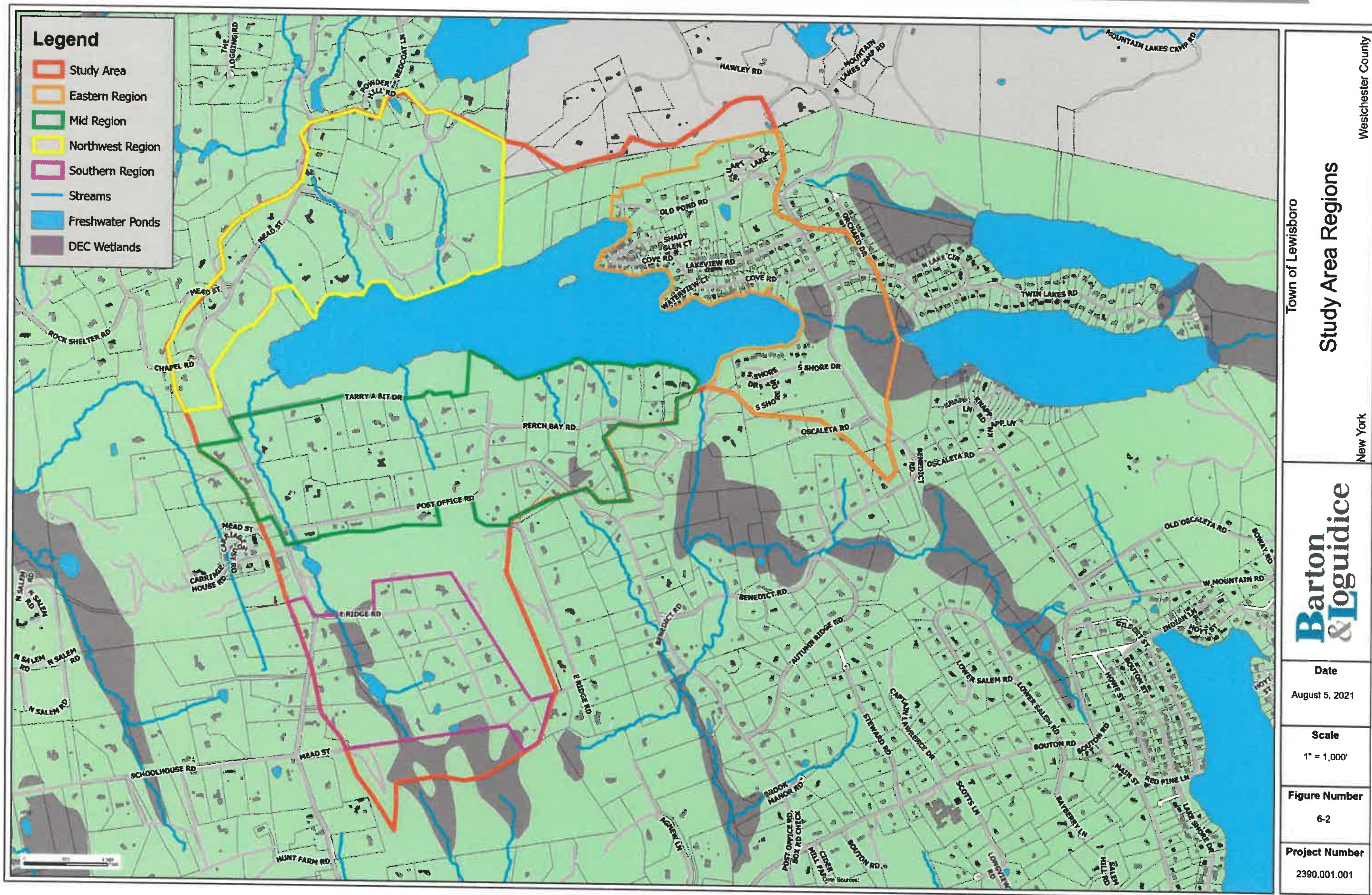
Maximum Phosphorus Septic Contribution



Maximum Scenario assumed 213 Failing Septic Discharges/year, including systems that were:

1) 50 years or older;
2) 30-49 years old without records of regular pump-outs;
3) Within 100-feet of a waterbody;
4) On slopes > 15%;
5) Cesspools and seepage pits;
6) Bedrock < 4 ft.
7) On properties < 0.5-acre

Study Area Regions



Cost-Benefit to Sewer Each Region

Study Area Region	Capital Cost of Sanitary Sewer System	Maximum Percent Phosphorus Reduction	Sewer Cost Per % Phosphorus Removed
Eastern	**$6,900,000**	**62%**	**$111,000**
Northwest	$3,100,000	10%	$310,000
Mid	$5,300,000	16%	$331,000
Southern	$2,200,000	4%	$550,000

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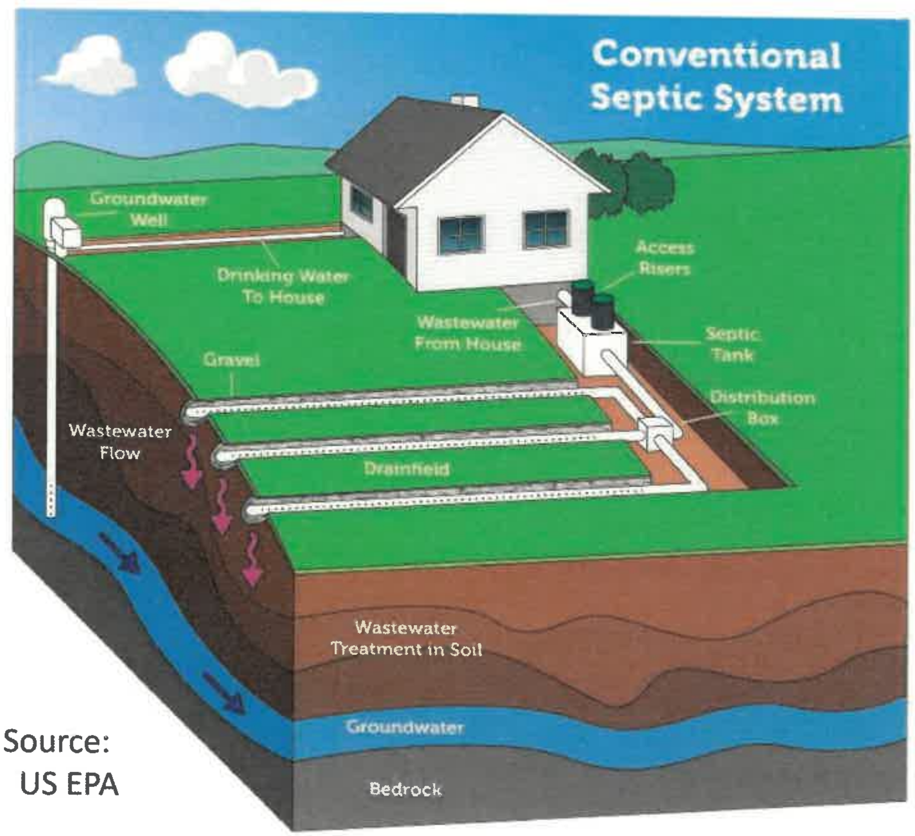
Wastewater Management Alternatives

Wastewater Management Alternatives

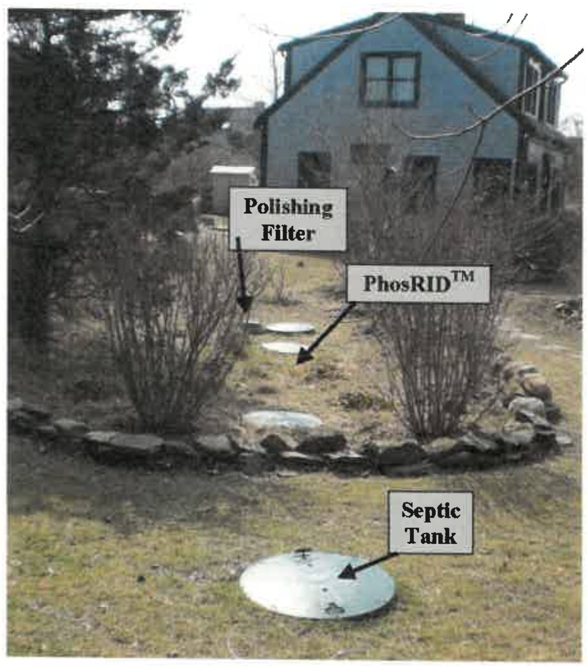
1. Upgrades/Replacements of Individual Septic Systems
2. Connection to Community / Cluster Septic Systems
3. Sewer to an Existing Wastewater Treatment Plant (WWTP)
4. Sewer to a New Wastewater Treatment Plant

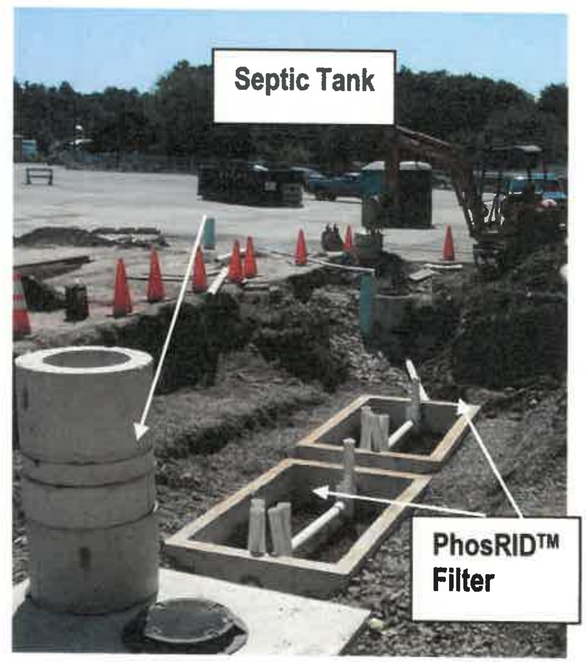


Source:
US EPA

Upgrades/Replacements of Septic Systems

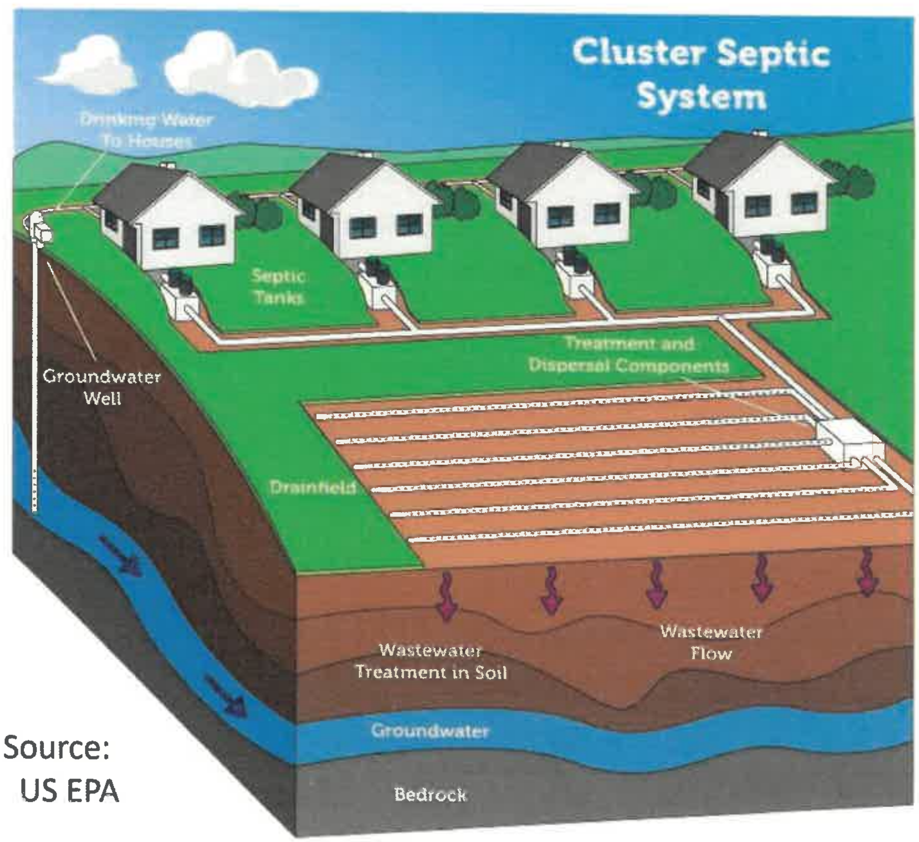
- Replacing old septic systems may reduce nutrient pollution to Lake Waccabuc, **IF** there are no environmental constraints
- For sites with environmental constraints, we recommend the implementation of a phosphorus treatment system





Wastewater Management Alternatives

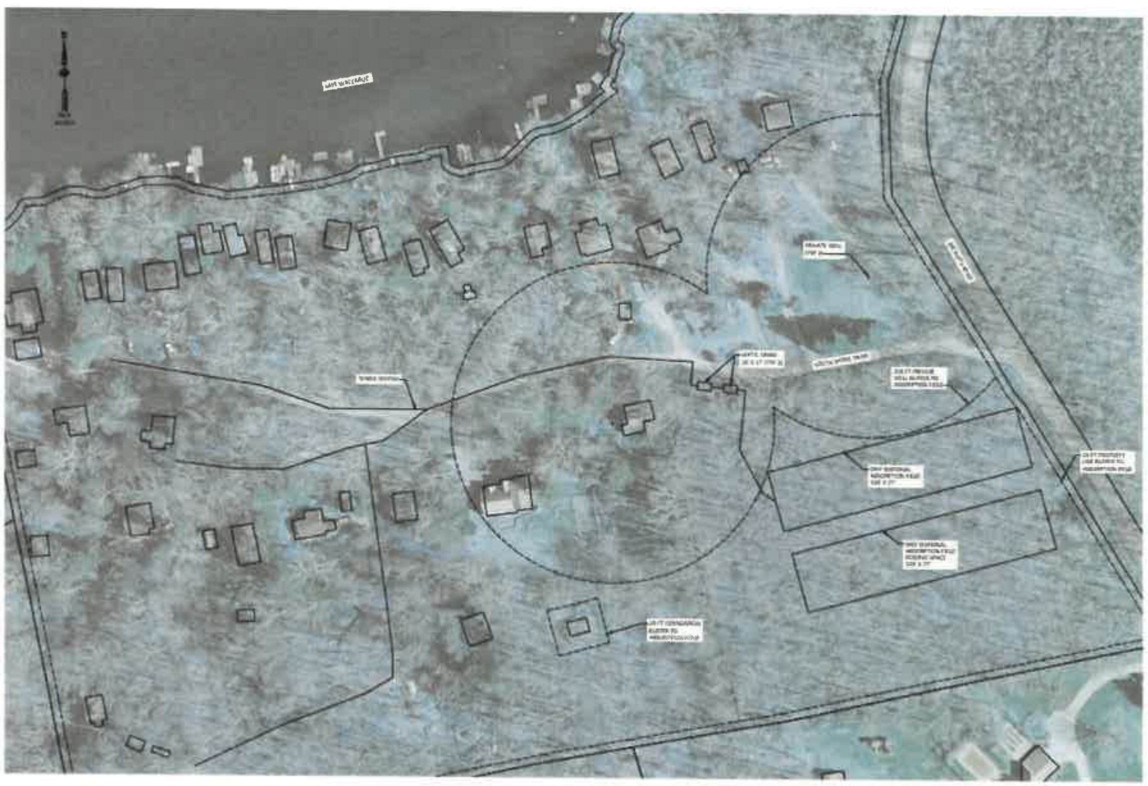
1. Upgrades/Replacements of Individual Septic Systems
2. Connection to Community / Cluster Septic Systems
3. Sewer to an Existing Wastewater Treatment Plant (WWTP)
4. Sewer to a New Wastewater Treatment Plant



Source: US EPA

Connection to Community Septic Systems

- Limited land available to build a community septic system
- The land requirement is estimated at ~8 acres to support the entire study area
- South Shore Waccabuc Association can support its residents



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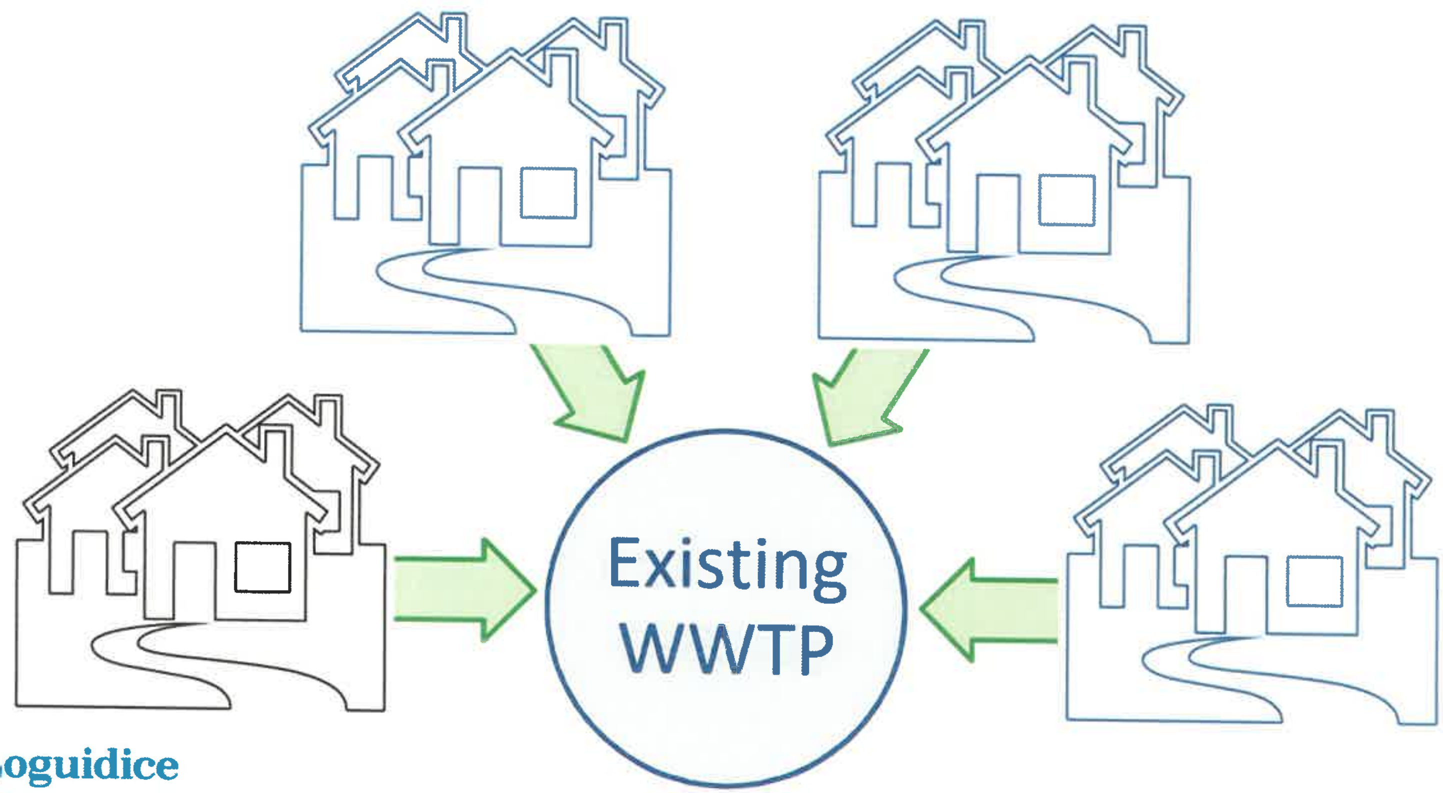
Wastewater Management Alternatives

1. Upgrades/Replacements of Individual Septic Systems
2. Connection to Community / Cluster Septic Systems
3. **Sewer to an Existing Wastewater Treatment Plant (WWTP)**
4. Sewer to a New Wastewater Treatment Plant



Sewer Extension to an Existing WWTP

- Ridgefield, Connecticut has the nearest municipal WWTP
  - They recently upgraded their plant and are already at capacity
  - They do not have the space to further increase their capacity
- Evaluated other nearby municipal WWTPs within a 10-miles radius
  - Considered sending sewer to Heritage Hills WWTP

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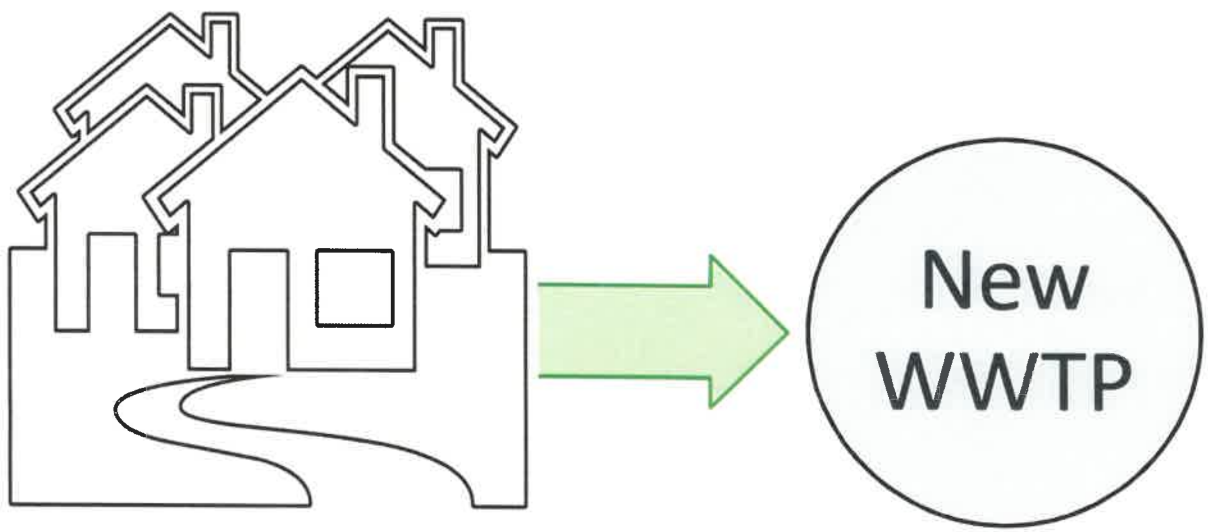
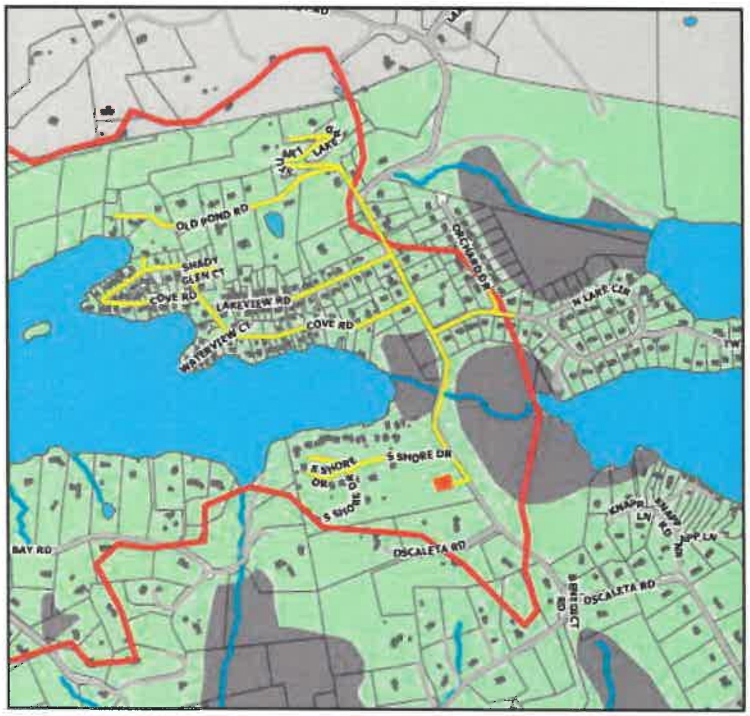
Wastewater Management Alternatives

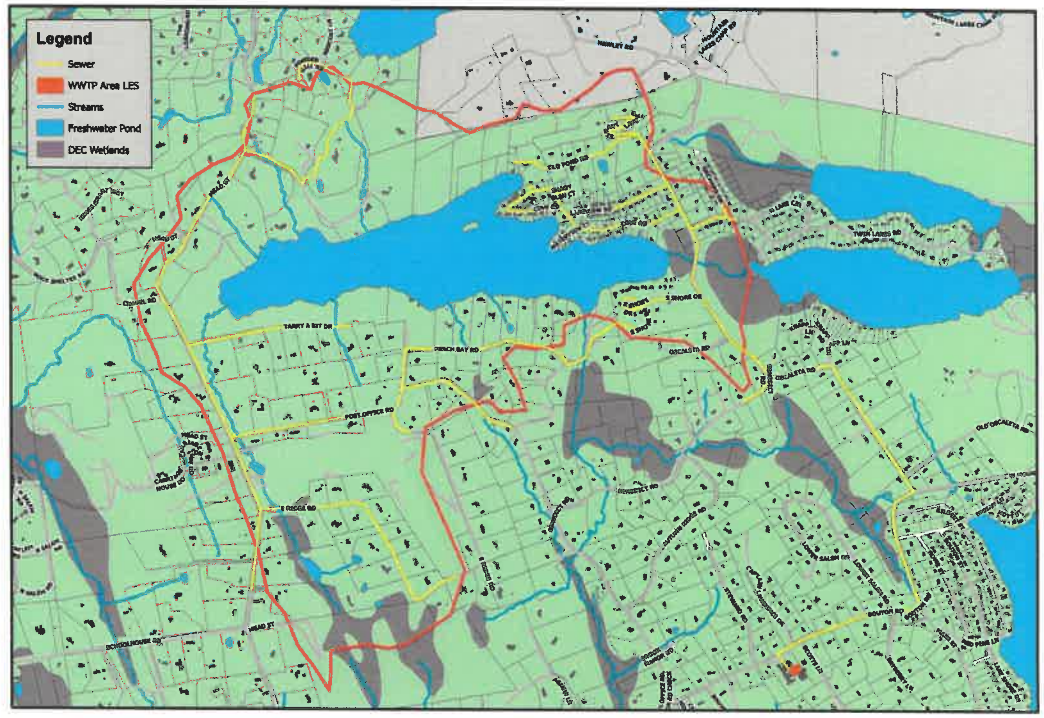
1. Upgrades/Replacements of Individual Septic Systems
2. Connection to Community / Cluster Septic Systems
3. Sewer to an Existing Wastewater Treatment Plant
4. Sewer to a New Wastewater Treatment Plant



Sewer to a New WWTP

- There is limited land available to build a WWTP
  - It would take ~ 0.5 acres to treat the entire study area
- 2 sites were chosen for evaluation:
  - South Shore Drive – Treat Eastern Region
  - Lewisboro Elementary School – Treat the Entire Study Area





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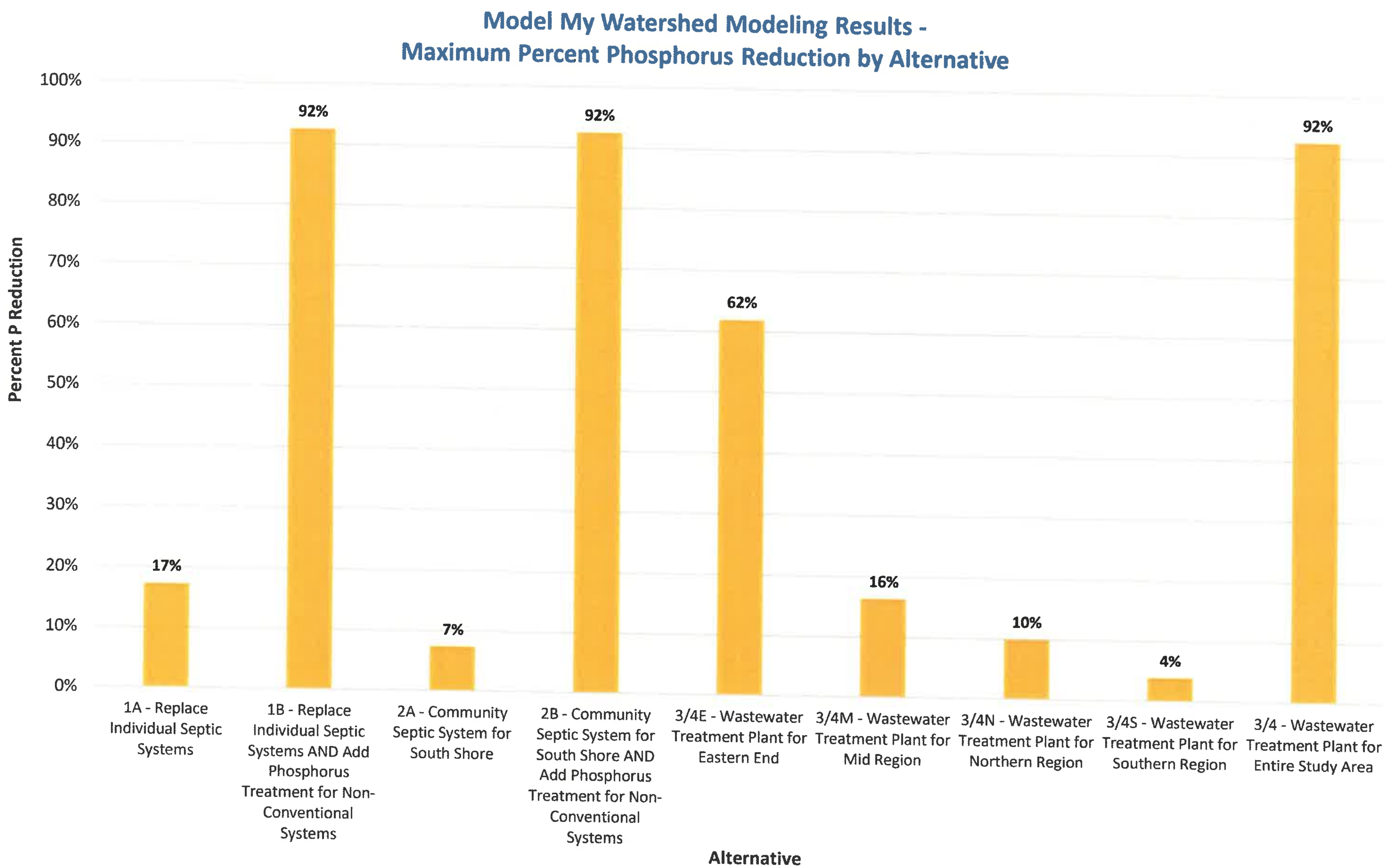
Modeling Alternatives – Phosphorus



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Cost Analysis

Capital Cost

Alternative	Area to be Treated	Capital Cost
Alternative 1A – Replacement of Septic Systems	Entire Study Area	$5,100,000
Alternative 1B – Replacement of Septic Systems with Phosphorous Treatment	Entire Study Area	$7,700,000
Alternative 2A – Community Septic System	Only South Shore	$1,400,000
Alternative 2B – Community Septic System for South Shore & Replacement of Septic Systems w/ Phosphorous Treatment for Remaining Study Area	Entire Study Area	$9,000,000
Alternative 3 – Connection to Heritage Hills WWTP	Entire Study Area	$43,200,000
Alternative 4A – SBR WTP at South Shore	Only East Region	$16,600,000
Alternative 4B – SBR WTP at Lewisboro School	Entire Study Area	$34,100,000

Life Cycle Cost Analysis

Alternative	Area to be Treated	Annual Cost
Alternative 1A – Replacement of Septic Systems	Entire Study Area	$320,000
Alternative 1B – Replacement of Septic Systems with Phosphorous Treatment	Entire Study Area	$510,000
Alternative 2A – Community Septic System	Only South Shore	$90,000
Alternative 2B – Community Septic System for South Shore & Replacement of Septic Systems w/ Phosphorous Treatment for Remaining Study Area	Entire Study Area	$590,000
Alternative 3 – Connection to Heritage Hills WWTP	Entire Study Area	$2,470,000*
Alternative 4A – SBR WTP at South Shore	Only East Region	$1,190,000
Alternative 4B – SBR WTP at Lewisboro School	Entire Study Area	$2,190,000

**Does not include cost of user fee.*

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Cost-Benefit Analysis by Alternative

Alternative	Area to be Treated	Percent Phosphorous Reduction from Septic Systems	Total Annual Cost
Alternative 1A	Entire Study Area	19%	$320,000
Alternative 1B	Entire Study Area	100%	$510,000
Alternative 2A	Only South Shore	8%	$90,000
Alternative 2B	Entire Study Area	100%	$590,000
Alternative 3	Entire Study Area	100%	$2,470,000*
Alternative 4A	Only East Region	67%	$1,190,000
Alternative 4B	Entire Study Area	100%	$2,190,000

**Does not include cost of user fee.*

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Cost-Benefit Analysis by Alternative

Alternative	Area to be Treated	Percent Phosphorous Reduction from Septic Systems	Total Annual Cost
Alternative 1A	Entire Study Area	19%	$320,000
Alternative 1B	Entire Study Area	100%	$510,000
Alternative 2A	Only South Shore	8%	$90,000
Alternative 2B	Entire Study Area	100%	$590,000
Alternative 3	Entire Study Area	100%	$2,470,000*
Alternative 4A	**Only East Region**	**67%**	**$1,190,000**
Alternative 4B	Entire Study Area	100%	$2,190,000

**Does not include cost of user fee.*

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Next Steps

Project Schedule

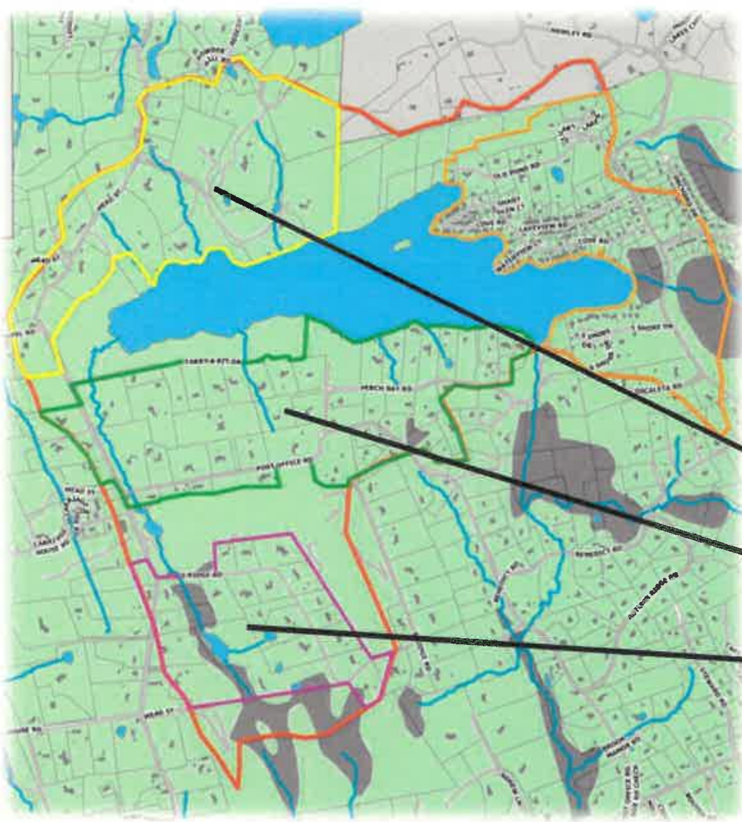
Project Schedule Milestone Item	Schedule Date
Submit Final Engineering Report	December 2021
Complete SEQR & Environmental Review	Spring /Summer 2022
District Formation	Summer 2022
Bond Resolution	Summer 2022
Funding Applications	Summer 2022
Establish Agreement with SSWA	Summer/Fall 2022
Preliminary Design Phase	Fall 2022/Spring 2023

Annual User Fee

- Estimated annual cost to cover Operations & Maintenance (O&M) and Short-Lived Assets (SLA) is **$263,000**
- Proposed average annual user fee to cover O&M and SLA is **$1,600**
- Funding is needed for project capital cost, estimated at **$16,600,000**
- The Engineering Report prepared through this study will be used to apply for grant funding

Cost to Include Remaining Study Area

- Estimated cost to replace/repair septic systems and install phosphorus treatment units for the remaining properties in the study area is **$2,700,000**



- Estimated cost to extend the sewer collection system to the other regions as future phases:

Study Area Region	Capital Cost of Sanitary Sewer Extension
Northwest	$3,100,000
Mid	$5,300,000
Southern	$2,200,000
Total	**$10,600,000**

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Funding Opportunities

Program Name	Sponsoring Agency(ies)	Funding Type
Water Infrastructure Improvement Act (WIIA)	New York State Environmental Facilities Corporation (NYSEFC)	Grant for the lesser of 25% net eligible project cost or $5M for projects less than $5M
Small Cities Community Development Block Grant Program (CDBG)	Housing and Community Renewal (HCR)	Grants to $1,000,000 for public health projects; grants from $100,000 to $750,000 for projects creating jobs
Government Efficiency-Planning/Implementation	Department of State	Grant with local match
Water Quality Improvement Grant Program	New York State Department of Conservation (NYSDEC)	Up to $10M grant/max 40% of construction costs, local match of 25% for municipal systems to serve multiple properties with inadequate on-site septic systems Up to $3M grant for decentralized municipal wastewater treatment facilities for failing on-site treatment systems
Economic Development Waterfront Revitalization	Empire State Development; Appalachian Regional Commission	Grant program with local match
Climate Smart Communities Grant Program	NYSDEC	Grants up to $2M with 50% local match

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Lakes Oscaleta & Rippowam

- It is recommended that a study of Lake Oscaleta and Lake Rippowam be completed
- It is apparent that these lakes play a role in phosphorus contributions to Lake Waccabuc
- If the sewer district were expanded to include homes from these two lakes communities, it could decrease the annual user fee

Barton&Loguidice

https://LakeWaccabucStudy.com

The experience to
listen
The power to
solve℠

BartonandLoguidice.com