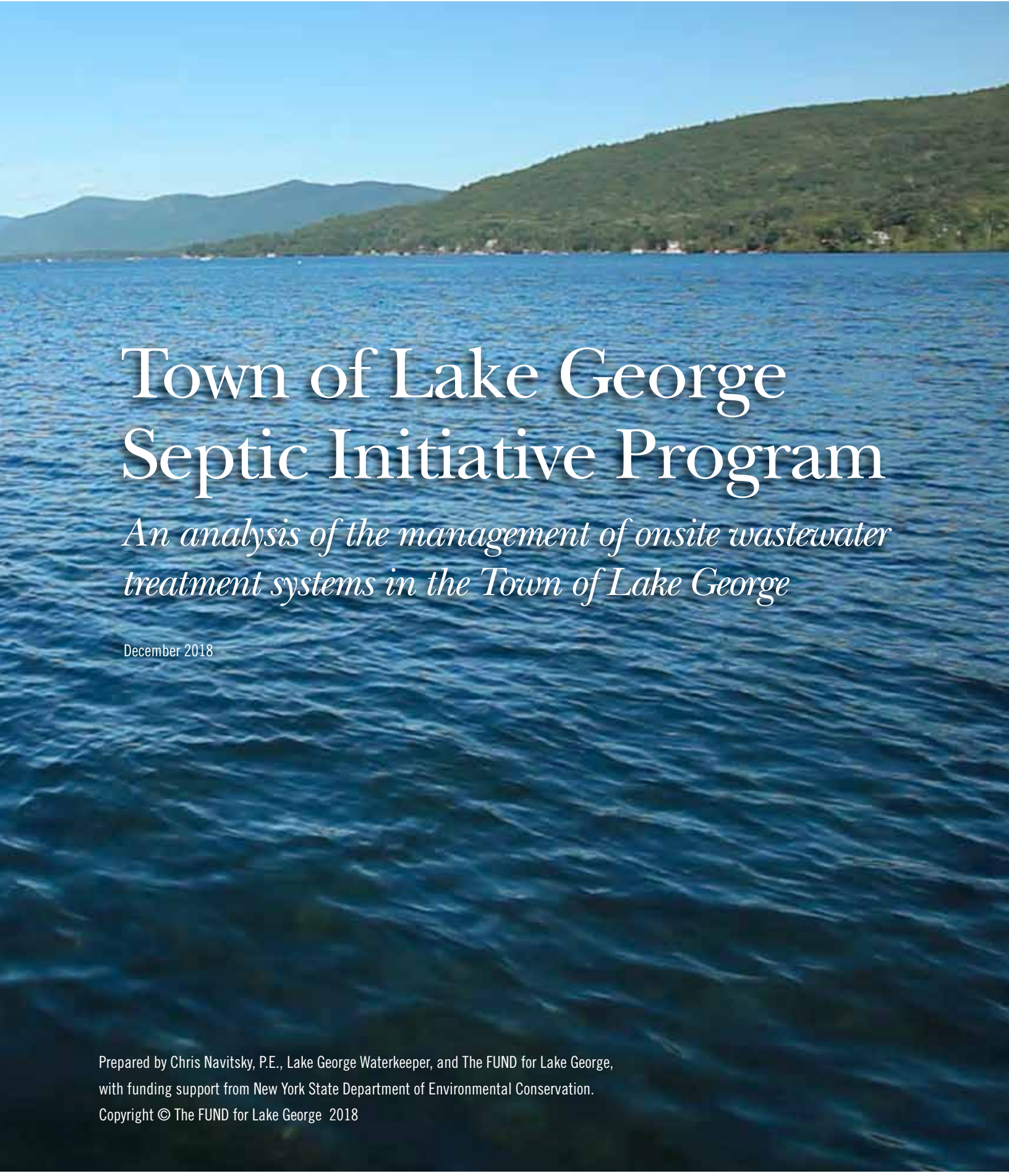

Town of Lake George Septic Initiative Program

An analysis of the management of onsite wastewater treatment systems in the Town of Lake George

December 2018

Prepared by Chris Navitsky, P.E., Lake George Waterkeeper, and The FUND for Lake George,
with funding support from New York State Department of Environmental Conservation.
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Town Lake George

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ABSTRACT

The Town of Lake George Septic Initiative Program is located in the southern basin of Lake George in the Town of Lake George (Warren County), New York. There are an estimated 1,200 onsite wastewater treatment systems within the Town of varying ages and conditions with no existing program to manage their effectiveness or maintenance. Aging treatment systems and outdated technology can have significant impacts on water quality as well as health and economic effects.

To address these potential impacts, the Lake George Town Board introduced the Septic Initiative Program mandating that all existing onsite wastewater treatment systems (OWTS) within the Town are to be catalogued and inspected with the goal that all OWTSs are functioning optimally. The Town started the program by evaluating parcels in Critical Environmental Areas defined as within 500 feet of the Lake George shoreline and 100 feet of streams tributary to Lake George.

Results of the existing system evaluations determined a lack of knowledge of property owners on their systems and when information is known, many systems are undersized, aged, or apply outdated technology. Maintenance is falling well short of what is necessary for systems to function properly and provide adequate treatment. All of this justifies the consideration by the Town of Lake George for an onsite wastewater treatment system management program.

The FUND for Lake George and the Lake George Waterkeeper administered the program and utilized GIS analysis and mapping to create an algorithm to prioritize areas for the management of onsite wastewater treatment systems. Factors were determined, analyzed, and weighted to create three data sets – Site Suitability consisting of surface water setbacks, soil type, depth of soils (to bedrock and groundwater), and slopes, all influencing overall treatment efficiency; Existing System Evaluation consisting of a system's age, components, maintenance, and inspection; and Algae Biomonitoring Indices applying existing protocols and metrics to collected samples as evidence of water quality impacts.

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CHAPTER 1 - EXECUTIVE SUMMARY

1.0 PROJECT LOCATION

The Town of Lake George Septic Initiative Program (SIP) is located in the Town of Lake George, Warren County, New York. The project was planned to establish a program for the management of onsite wastewater treatment systems (OWTS), commonly referred to as septic systems, over approximately 550 parcels within the Project Area.

The Town of Lake George was interested in developing a management program to address aging and outdated OWTS in areas in close proximity of Lake George and tributary streams to the lake. To accomplish this project, the Town successfully applied for and received a Water Quality Improvement Project (WQIP) grant from the New York State Department of Environmental Conservation (NYSDEC) in 2015 to implement the Town of Lake George SIP.

FIGURE 1-1 – *Location map for the Town of Lake George*

1.1 BACKGROUND

Approximately 23 percent of the households in the United States have wastewater treated by individual onsite wastewater treatment systems referred to as septic systems. The majority of these systems occur in rural areas away from centralized urban communities that are serviced by centralized wastewater treatment facilities. The standard septic system consists of three basic components: a septic tank that provides primary

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treatment of settling, an absorption system that disperses effluent to a distribution network, and subsurface soils for secondary treatment and dispersal.

The typical life expectancy of an OWTS is 30-40 years, depending on site conditions, use, wastewater strength, and maintenance. Septic systems, despite being passive, do require maintenance to function properly; maintenance mainly consists of the removal of solids and sludge that has accumulated in the tank.

The Town of Lake George SIP is located along Lake George, a popular tourist and recreational destination, in the southeastern portion of the Adirondack Mountains. A strong seasonal population routinely taxes its signature water quality, classified as Class-AA Special. Approximately 92 percent of the watershed is undisturbed, natural forest lands, 46 percent being "Forever Wild" as part of the Adirondack Forest Preserve. Development in the watershed has primarily been focused along the shoreline with 75 percent concentrated in the more populated and accessible south basin.

Lake George is classified as an oligotrophic lake, or low-nutrient, and low production that has resulted in its exceptional water quality and clarity. However, research conducted in the 1960s and 1970s indicated that nutrient loading had doubled over natural background levels and that Lake George was susceptible to strong biological responses to these increased nutrients, especially loadings of phosphorus and nitrogen from septic systems and sewage treatment plants.

The majority of the watershed is rural without centralized utilities such as wastewater treatment and it is reported that nearly 6,000 parcels utilize OWTSs for wastewater treatment. Despite the high number of systems, there is limited information available on the systems — such as evaluation, inspection or maintenance records— to determine if they are functioning properly. There have been several studies on the status and impacts of OWTS in the Lake George watershed prepared by state agencies and organizations. A common theme in the studies is the importance of soils for effective wastewater treatment and concerns for the type and amount of soil present in the Lake George watershed. The geologic nature of the basin is steep mountains with impenetrable rock. Overburden deposits in the Lake George basin are dominated by glacial tills and sandy kamic deposits. These deposits have very high hydraulic conductivity that allow for high infiltration rates but can be limited on depth, which can impact its ability for adequate wastewater treatment.

The onsite wastewater treatment regulatory landscape can be confusing, with varying state or municipal jurisdiction that depends primarily on the average daily wasteflow produced. Despite the number of agencies, no comprehensive wastewater management program exists, which places the burden on the local municipalities to control review, inspection, and maintenance of onsite wastewater treatment in the Lake George watershed.

The need for evaluating the impact of onsite wastewater treatment systems has been a long-standing concern in the Lake George watershed. An evaluation was part of the 1982 United States Department of Environmental Protection (USEPA) Environmental Impact Statement on Wastewater Treatment Facilities for the Lake George-Upper Hudson Region that concluded there were areas where systems have existing or potential problems. These areas are more prone to failures particularly where the density of buildings and/or small lots limit the land area available for treatment and disposal with minimal soils.

The FUND for Lake George and the Lake George Waterkeeper have monitored water quality to assess the impacts from changes in the watershed around Lake George through various projects. One documented area of concern was the Diamond Point area and Smith Brook, a tributary in Diamond Point, in the Town of Lake George. This is where the concept of the Town of Lake George Septic Initiative originated. These impacts prompted the Lake George Town Board to formalize the program and the Lake George Consolidated Board of Health introduced the Septic

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Initiative Program mandating that all existing onsite wastewater treatment systems within the Town are to be catalogued and inspected with the goal that all OWTSs are functioning optimally. This process started with the mailing of a survey to residents requesting information on a pre-inspection worksheet that commenced the development of an existing system inventory database.

As evident through a recent initiative implemented through the New York State Department of Environmental Conservation (NYSDEC), Harmful Algal Blooms(HABs) have become a major water quality concern and a main contributor of excessive nutrients. Lake George is listed as one of the twelve water bodies of concern by the NYSDEC. In the Lake George HAB Action Plan, management of onsite wastewater treatment systems is one of the priority project actions.

1.2 PROJECT GOALS AND OBJECTIVES

In 2015, the Town of Lake George SIP was awarded a $104,000 grant through the NYSDEC Water Quality Improvement (WQIP) Grant Program. The goals and outcomes for the grant include:

1. Detailed inventory and mapping assessment of all OWTS in the Septic Initiative Program boundaries through an inspection and maintenance program;
2. Final Report that includes an analysis of this inventory, rated systems, and implementation actions;
3. Public workshops and training sessions;
4. Program outreach to adjacent municipalities in the Lake George watershed;
5. Algae sampling and water quality sampling of problem areas found;
6. Partnership with The FUND for Lake George to identify the most crucial properties in need of replacement systems, for which The FUND would provide grant funding to assist private property owners;
7. Installation of risers to grade for all septic system properties;
8. Education of homeowners and contractors; and,
9. Revisions to the Town Consolidated Board of Health Regulation Code.

1.3 SEPTIC INITIATIVE PROGRAM (SIP) DESCRIPTION

The SIP involved all parcels within 500 feet of the shoreline of Lake George, the Critical Environmental Area surrounding Lake George as determined by the Lake George Park Commission, and 100 feet from Class AA-Special streams tributary to Lake George as well as wetlands designated by the Adirondack Park Agency. This totaled 548 parcels, including 137 vacant parcels, and were placed into four phases:

- Phase I, Carriage Hill/Diamond Point to Orcutt Bay;
- Phase II, Cannon Point to Hearthstone Campground;
- Phase III, Hearthstone to English Brook to Sommerville Road; and
- Phase IV, East Brook to Bloody Pond Road to Plum Point.

1.3.1 Septic Initiative Program Inventory Assessment

A total of 397 parcels were part of the inventory assessment that collected data from Town files on age of Single-Family Dwelling/Structure, age of OWTS, system components, record documentation, pumpout/maintenance and inspection/certification as well as from responses to the survey, which had a 34% response rate.

Analysis of the inventory data substantiates the concerns of the Town of Lake George regarding the status of OWTS and justifies the consideration for an onsite wastewater treatment management program. There is a lack of knowledge of

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property owners on their systems and when information on the systems is known, many systems are undersized, aged, or apply outdated technology. Maintenance is falling well short of what is necessary for systems to function properly and provide adequate treatment.

1.3.2 Septic Initiative Program Prioritization Algorithm

Site conditions can significantly affect a system's treatment capability and these limitations include types of soils (sands and coarse materials), depths of soils (shallow depth to bedrock), and slopes, all influencing the overall treatment. Based on the limited resources available to the Town to determine management priorities, The FUND for Lake George developed a Prioritization Algorithm to assist the Town in its management decisions.

This Algorithm is GIS-based and factors databases on the following three items. First, site suitability conditions were determined, analyzed, and weighted to create a data set. Second, the elements of the system inventory were assessed and weighted based on the influence on the level of treatment the existing system can provide to create another data set. Third, algae samples were taken and analyzed to determine potential water quality impacts.

Results of the Site Suitability mapping highlight the greater influence of soils and setbacks to surface waters in the model more than slopes and/or depths of soils. Within the Project Area (500 feet to the Lake George shoreline or 100 feet to tributaries), the differences in the natural breaks (i.e., color changes) are evidence of the influence of soils and/or slopes to impact the score rating of parcels and corresponding potential of the effectiveness of OWTS.

The factors for the existing system inventory (age, components, maintenance, records, and inspections) were weighted based on how much each could affect how the parcel's OWTS is functioning, could indicate a noncompliant system, and/or the system could be close to premature failure.

The Prioritization Algorithm GIS mapping is based on the combined scores from the suitability analysis and existing system inventory rating analysis. Similar to the simulatability analysis, the scoring is color-coded for ease of interpretation. The algae biomonitoring indices were added and the results were categorized based on Palmer Pollution Index and Trophic Index ranges applying the following levels of concern:

1. Palmer > 14 , Trophic 70+;
2. Palmer 11-14, Trophic 70+;
3. Palmer 11-14, Trophic <70;
4. Palmer <11, Trophic 70+; and,
5. Palmer <11, Trophic <70.

Based on the analysis of the maps and GIS layers, the following is a list of Priority Areas for the Town of Lake George to focus management efforts:

1. North Diamond Point;
2. South Diamond Point;
3. Smokey Bear Area;
4. South Green Harbour;
5. Stebbins Brook Area;
6. Sunnyview Area;
7. Westover Cove;
8. Wiawaka Area;
9. Sand Pebble Cove; and,
10. Plum Point.

The above list of Priority Areas is based primarily on the assessment of results from water quality indices of algae biomonitoring and existing system evaluation. The site suitability data helped distinguish areas where system's efficiency may be reduced due to site constraints. Several areas are located at the mouths of tributaries that may indicate influence from upland properties and this should be taken

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into account if future management actions are implemented. There were sites with higher algae biomonitoring indices excluded, based on recent system replacements with the consideration of legacy effects from nutrient accumulation in the soils. This would be justification for continued algae biomonitoring in these locations. In general, areas of red on the map where algae samples were taken indicate impacts of nutrients and should be considered by the Town in future management actions.

1.3.3 Algae Biomonitoring

Wastewater management is an important component for water quality protection and treatment system failure can have health, environmental, and economic effects. Nutrients, especially phosphorus, from leaky septic systems play a major role in causing excessive algae growth in lakes and ponds. Algae are plant-like organisms that live in a variety of environments and are a natural component of water bodies.

Algae are an important component of biological monitoring programs for evaluating water quality. Algal species can vary and be specific to particular water conditions and levels of nutrients containing nitrogen (N) and phosphorus (P) that enter the water body. The N:P ratio generally determines the specific dominant algae and can be based upon sources, which include organic pollution from sewage-related sources such as leaky sewage systems.

Excessive algae growth has been used to identify poorly operating septic systems on Lake George dating back to 1973. A sanitary sewer survey performed by the NYSDEC from 1973 was using excessive algae growth to look at questionable systems in the more heavily developed, non-sewered residential communities in the south basin of Lake George.

Algal Biological Assessments were incorporated in the Lake George Waterkeeper Stream Assessment Project in 2009 to use algae as a biomonitoring indicator for water quality assessments. Algae sampling and assessment based on established protocols and standards are being applied as evidence of water quality impacts with possible connections to inadequately operating onsite wastewater treatment systems. Observations of excessive algae growth in Dunhams Bay in the Town of Queensbury prompted sampling that identified algae species indicating organic pollution through the Palmer Pollution Index. This initiated the Town of Queensbury to form the North Queensbury Wastewater Disposal District No. 1, encouraging septic system upgrades and replacements; after 3 years, the nuisance algae species have been reduced in areas of septic system replacement.

Methods and metrics for algae biomonitoring applied herein are a modified version of the United States Environmental Protection Agency Periphyton Protocols, the New York State Department of Environmental Conservation Periphytic Biomonitoring Protocols, Palmer C.M. Pollution Tolerance Index, Nutrient Requirements under the National Water-Quality Assessment Program data set, and the Lake George Index created under the Lake George Waterkeeper Algae Biomonitoring Program.

Overall, there is a concern regarding excessive levels of nutrients as identified by algae analysis protocols in the littoral (near-shore) zone along the shoreline indicating anthropogenic impacts and sources.

1.4 PRESENTATION OF THE FINAL REPORT

The material in this final report presents, summarizes, and evaluates data collected during the program between 2016-2018 and also provides conclusions and recommendations. The report is organized as follows:

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- CHAPTER 1 is an Executive Summary of the SIP from 2016-2018 and its findings, including conclusions and recommendations based upon the analysis of data.
- CHAPTER 2 presents an introduction to onsite wastewater treatment systems, program description, objectives and goals, project area, and details and methodology for the project.
- CHAPTER 3 presents a background on Lake George, a summary of onsite wastewater treatment systems in the Lake George watershed and the Town of Lake George, geology and soils in the Lake George watershed, and regulatory jurisdiction.
- CHAPTER 4 presents the onsite wastewater treatment system inventory review and assessment.
- CHAPTER 5 presents the GIS based analysis and mapping for Site Suitability and Existing System Inventory Assessment and the creation of the algorithm to prioritize areas for management of onsite wastewater treatment systems.
- CHAPTER 6 presents an Algae Biomonitoring Sampling with protocols and analysis.
- CHAPTER 7 presents historical background information, a brief program summary, data collection and analysis, conclusions, and recommendations.

1.5 DISCUSSION AND CONCLUSION

The following results and conclusions have been developed after careful consideration of the data that were collected for the Town of Lake George Septic Initiative Project (SIP):

- There was a 34 percent response rate for the surveys sent to 397 property owners, which is substantially greater than the 10 percent standard data collection and analysis response rate based on research. The higher response rates for Phase I and II demonstrate the benefit of additional municipal outreach consisting of phone calls and site visits.
- For system age, it can be estimated that just over one-third of the OWTSs are operating under their life expectancy of 30 years and one-third are near or past the life expectancy (30-40 years or greater). There is no information for the remaining one-third of the systems. The need for an inspection and management program is supported by these results and the number of older and unknown systems.
- Nearly one out of five septic tanks (20 percent) are undersized for the required volume, which could result in hydraulic overloads to the treatment disposal area leading to premature system failure. Additionally, over one-third of the septic tanks volumes are unknown indicating a failure of maintenance pumpouts and/or lack of any understanding of the system that can also result in premature system failure.
- There are few metal tanks; however, it should be noted that the septic tank material is not known for many of the properties in the inventory and this number could be higher.
- Over 40 percent of the residential properties are serviced by wastewater treatment systems that appear to be compliant with properly sized septic tanks and absorption fields, based on the assumption of standard percolation rates.
- One in five parcels (20 percent) have no information on their wastewater treatment systems, which indicates that there has been no inspection and/or maintenance, which is the leading cause of failure.

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- One in five systems (20 percent) utilize drywells that have reduced treatment efficiencies and have a greater potential for input of pollutants into groundwater.
- There is not a high percentage of cesspools, but there are significant health and environmental impacts from a single cesspool that provides minimal treatment.
- Over half of the parcels that were surveyed and/or reviewed for the project have no record of maintenance/pumpout and/or have never been pumped out, which is concerning. This will lead to increased system failures from an operational perspective, and reduced efficiency from a treatment perspective.
- When the pumpout percentage per phase is analyzed, Phase I is much higher than any other phase. This could be attributed to more time and contact with the property owners through the survey. This demonstrates that greater municipal involvement and education outreach leads to increased maintenance.
- Inspection analysis shows the benefit of the municipal outreach regarding educating property owners on inspection and maintenance. Phase I has the highest percentage for Tier 3 requiring just pumpouts and demonstrates the success of the additional time the Town had for homeowner outreach and system awareness.
- One-third of the properties are classified as Tier 1, highest inspection concern level with a lack of significant information on the OWTS, design, and maintenance, which are all factors that lead to system failure.
- Applying algae biomonitoring, sites potentially indicating probable organic pollution remained consistent over the two study seasons (2016-2017) at approximately 14 percent. The overall percentage of potential organic pollution sites decreased from 24 percent to 14 percent.
- Impacted sites determined by the Trophic Index indicating excessive nutrients decreased from 65 percent to 46 percent, but the percentage of severely impacted sites increased from 6 percent to 14 percent.
- All sites sampled during both study seasons are impacted based on the Salinity Index indicating the levels of dissolved salt in the water column, an issue that environmental organizations and municipalities have been attempting to address through the Lake George Road Salt Reduction Initiative.
- A majority of sites had one or more forms of cyanobacteria (Blue-green algae) during both study seasons. It should be noted that Blue-green algae do occur naturally, but concerns are raised when it reaches particular percentage of growth.

These results and conclusions provide justification for the development of a Town management program for onsite wastewater treatment systems based on the overall age, amount of unknown information, and lack of routine maintenance.

1.6 RECOMMENDATIONS

The following recommendations have been developed after careful consideration of the survey and site inventory data collected for the Town of Lake George Septic Initiative Program:

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MANAGEMENT

Short-term (Year 0-1)	Mid-term (Year 1-3)	Long-term (Year 3-5)
• Set inspection program as per recommended inspection priority properties focusing on Tier 1 • Develop GIS Database of Inventory Assessment for the Town Planning and Zoning Department	• Review NYSDEC State Pollutant Discharge Elimination System (SPDES) Permits and Inspections and add to inventory database. • Work with NYSDEC to ensure routine inspections of SPDES Permit systems. • Consider the establishment of subwatershed management districts for improved inspection, management, and funding similar to the Town of Queensbury. • Investigate a reduced cost pumpout program secured by the Town for properties within the Project Area. This would require properties to guarantee to schedule a routine pumpout once every 3 years and could be arranged through establishing a management district. • Consider improving treatment methodologies including time dosed dispersal for better effluent distribution reducing soil impacts and reducing dispersal depth to increase biological uptake and treatment.	• Research development of test pilot program for new technologies and practices in the Lake George watershed. Partner with organizations like New England Interstate Water Pollution Control Commission (NEIWPCC), National Sanitary Foundation (NSF), Mass Test Center to identify products and collect performance data for residential onsite treatment systems to become a center for OWTS testing in New York State. • Create an Operation and Maintenance Service through the Planning & Zoning Department, a professional providing service to the public (check operation, perform routine maintenance and repairs, upgrade when necessary, collect system records, troubleshoot).

OUTREACH

Short-term (Year 0-1)	Mid-term (Year 1-3)	Long-term (Year 3-5)
• Provide presentation to Town Planning and Zoning Board, and Consolidated Board of Health • Contact municipal Town Boards and Planning/Zoning Departments in the watershed to schedule presentations.	• Prepare educational brochure for Town residents on the LGSIP, available information, and the findings of the assessment. • Create a page on the Town website dedicated to onsite wastewater treatment systems to provide information on new technologies, maintenance, publications, and links to websites. • Co-host the second Septic Summit with The FUND for Lake George.	

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REGULATION

Short-term (Year 0-1)	Mid-term (Year 1-3)	Long-term (Year 3-5)
Adopt Septic System Inspection Transfer Law.		Require all dwellings to install water conservation fixture devices to reduce burden on absorption systems and have the Town seek sustainability grant funding to accomplish.

MONITORING

Short-term (Year 0-1)	Mid-term (Year 1-3)	Long-term (Year 3-5)
Compare algae biomonitoring results to inspection priority properties.	Develop a monitoring study of onsite wastewater treatment systems with residents to collect data on system efficiency and impacts.	Implement long-term algae biomonitoring program to create database and document improvements to water quality.

FUNDING

Short-term (Year 0-1)	Mid-term (Year 1-3)	Long-term (Year 3-5)
• Work with The FUND for Lake George for grant funding to address identified Priority Areas. • Work with other Warren County municipalities and Warren County Planning Department to have Warren County apply to New York State Environmental Funding Corporation to be placed on NYS Infrastructure Grant Program for funding for septic system replacement. • Apply for funding for system upgrade program listed in the NYSDEC Lake George Harmful Algal Bloom (HAB) Action Plan under Consolidated Funding Application NYSDEC HAB Initiative.	• Investigate partnership with local lending organizations for water quality improvement loans to provide low or no interest loans for onsite treatment system upgrades/ replacements. • Seek financial support from environmental foundation for water quality protection through application of innovative solution(s).	Create a watershed management improvement district for the Project Area that would establish a PILOT (Payment In Lieu of Taxes) Program to allow property owners who replace and/or upgrade their septic systems to take that cost off their property assessment, which could be implemented within an established management district.

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CHAPTER 2 - INTRODUCTION

2.0 INTRODUCTION TO ONSITE WASTEWATER TREATMENT SYSTEMS

An onsite wastewater treatment system (OWTS), commonly referred to as septic system, treats wastewater in areas that are not serviced through a municipal public sewer system containing a central wastewater treatment or collection system. The standard septic system consists of three basic components: a septic tank that provides primary treatment of settling, an absorption system that disperses effluent to a distribution network, and the subsurface soils for secondary treatment and dispersal.

According to the U.S. Census Bureau (1999), approximately 23 percent of the estimated 115 million occupied homes in the United States are served by OWTS, releasing a total of 4 billion gallons of effluent per day. In New York State, just over 20 percent of the housing units are serviced by septic tanks.

2.1.0 History of Onsite Wastewater Treatment Systems

The first septic tank was installed in France around 1860 and was made of concrete with clay piping to transport wastewater from a house to the tank. The tank had an overflow to a pit to disperse the liquid. The septic tank appeared in the United States in 1883 and grew in popularity with discharge to subsurface drains becoming more common in the mid-1900s. As the system numbers grew, so did concerns about functioning properly and being linked to diseases and human health impacts. As these concerns increased, there was a need to regulate and standardize system design and size as well as create installation protocols.

FIGURE 2-1 – *Early Septic Tank*

2.1.1 Onsite Wastewater Treatment System Basic Design and Process

There are three basic components in a septic system treatment process: the septic tank, absorption/dispersal field, and soils. Septic tanks are considered primary treatment and provide separation of solids and liquids and storage of septage for removal. The functions of the septic tank are for primary settling (all settleable solids and 50 percent of suspended solids and Biological Oxygen Demand [BOD]) to protect carryover and to provide minimal level of anaerobic decomposition. The second component is the soil absorption system which distributes the septic tank

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FIGURE 2-2 – *Components and Cross Section of Septic System*

effluent to the third component, the soil, to treat and disperse the wastewater. The functions of the absorption system are to provide secondary treatment (physical [adsorption, filtering], biological [bacteria], chemical [oxidation]) and provide dispersal of wastewater to groundwater.

Septic systems are intended to provide treatment of wastewater to protect human health and impacts to our environment. These systems have life expectancy of 30-40 years depending on site conditions, use, wastewater characteristics, and maintenance. About half of the occupied homes with OWTSs have systems that are more than 30 years old (U.S. Census Bureau 1997) and these outdated and antiquated systems can result in failures. Studies reviewed by the USEPA cite failure rates ranging from 10 to 20 percent (USEPA 2002) and the Commonwealth of Massachusetts determined a failure rate of 20 percent based on their property transfer inspection record. A system has failed when the system, or component of the system, threatens the public health by inadequately treating sewage. Most common failures cause sewage to rise to the surface of the ground (as shown in Figure 2-3), back up into the residence it serves, or discharge to surface waters.

FIGURE 2-3 – *Surfacing sewage indicating failing septic system*

2.1.2 Introduction to Onsite Wastewater Treatment System Management

Many times, these failures can be prevented through a management program with inspections to detect systems that are not achieving treatment standards or required maintenance program to prevent the main factors that cause failure. Inspection

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programs can vary from routine permitting requirements to regulatory agency site visits to evaluation of system components and examination of site conditions for evidence of failures. It is well-documented that the most effective method to long-term effective treatment of a septic system is routine maintenance, primarily consisting of removing accumulated solids from the septic tank as well as an assessment of the tank condition and components.

2.2 SEPTIC INITIATIVE PROGRAM DESCRIPTION, OBJECTIVES, AND GOALS

FIGURE 2-4 – *Septic Tank Maintenance – Tank Pumpout*

The Town of Lake George has recognized the need to address the problem of antiquated and outdated septic systems, which can cause water quality problems as well as impact human health. To address this issue, the Town applied for a New York State Department of Environmental Conservation Water Quality Improvement Program Grant under the Town of Lake George Septic Initiative Program (TLGSIP).

The TLGSIP began in 2013 to inventory and catalog all OWTS on properties within 500 feet of Lake George and 100 feet from streams flowing to the lake. The program consisted of the following:

1. A detailed inventory and mapping assessment of all OWTS in the project area to include a mailed survey and voluntary inspection program;
2. Analysis of inventoried properties to create a rating process and inspection program;
3. Preparation of a Final Report to include recommended actions and implementation plan;
4. Public workshops and contractor training sessions;
5. Outreach to municipalities within Lake George watershed;
6. Sampling and analysis of algae and water quality monitoring;
7. Identification of priority properties for replacement systems in collaboration with The FUND for Lake George, who will provide funding for replacement systems; and,
8. Revision of the Town Consolidated Board of Health Regulation Code.

2.3 PROJECT LOCATION

The project area for the TLGSIP includes all parcels in the Town of Lake George that are within 500 feet of the shoreline of Lake George, which is the Lake George Critical Environmental Area established by the Lake George Park Commission in 1988, as well as all parcels within 100 feet of streams tributary to Lake George. The setback of 500 feet was applied to the shoreline of Lake George because that corresponds with the boundary of Lake George Critical Environmental Area as determined by the Lake George Park Commission in 1988 to protect the water quality and preserve the natural resources of the Lake George Basin that are critically

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important to the economic and environmental vitality of the region. There are 10.5 miles of shoreline on Lake George within the Town and a total of eight streams within the project area, including some of the largest within the Lake George watershed such as English Brook, East Brook, and Smith Brook.

2.4 PROJECT METHODOLOGY

The method of this study was to first divide the project area into four phases to coordinate survey mailings and the review of parcels. Parcels included within the project area were determined through GIS mapping by offsetting the shoreline of Lake George and delineating the streams. The parcels within the project area were included and evaluated to determine where the disturbed areas were located. If the developed/disturbed areas of the parcels were outside the 500-foot area of the Lake George shoreline, they were not included in the project area. All properties within the 100-foot setback of streams were included in the project. A master database was created for the project that would be necessary for the evaluation and analysis including age of the OWTS, components of system, permitting records, design flows, number of bedrooms, and pumpout records. As will be evident later in the report, this information will be utilized for the determination of inspection tiers and system ratings and the development of a GIS-based algorithm to prioritize management areas within the Town.

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CHAPTER 3 - LAKE GEORGE (BASIN & TOWN)

3.0 LAKE GEORGE

Lake George is a long, deep, beautiful, and historic lake in the southeastern portion of the Adirondack Mountains. It is 32 miles long and an average of 1.33 miles wide. It is a popular tourist and recreational destination with a strong seasonal population that has taxed its signature water quality. Lake George is a drinking water source for the Village of Lake George and Ticonderoga as well as numerous individual homeowners around the lake and as such has a water quality rating from the New York State Department of Environmental Conservation (NYSDEC) of Class AA-Special. Approximately 92 percent of the watershed remains undisturbed natural forest lands, 46 percent being "Forever Wild" as part of the Adirondack Forest Preserve.

Development in the watershed has primarily been focused along the shoreline with 75 percent concentrated in the south basin. The major population centers are the Village of Lake George at the southern tip,

FIGURE 3-1 - *Lake George Basin*

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Ticonderoga at the northern end and Bolton Landing on the western shore approximately one third of the way up the lake. The western shore is more accessible and exhibits more development than the eastern shore, which has isolated areas of development.

Lake George is classified as an oligotrophic lake, or low nutrient and low production, which has resulted in its exceptional water quality and clarity. However, research conducted in the 1960s and 1970s indicated that nutrient loading had doubled over natural background levels and that Lake George was susceptible to strong biological responses to these increased nutrients, especially loadings of phosphorus and nitrogen from septic systems and sewage treatment plants. By the end of the 1970s, regulations, as well as actions from research and environmental organizations, led to efforts to reduce nutrient loadings from sewage, wastewater, and stormwater.

Despite these attempts, there has been a slow but steady decline in the water quality of Lake George as documented by numerous studies. Chlorophyll-a has increased by 33 percent by 2009 (46 percent by 2016), indicating greater presence of phytoplankton. (See Figure 3-2) Additionally, chloride levels have more than tripled over the past 37 years, indicating stormwater runoff problems as well as the influence from wastewater treatment. (See Figure 3-3)

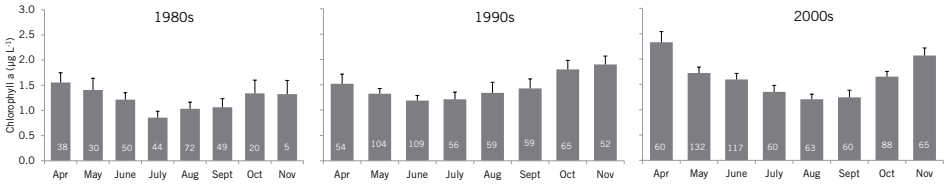

FIGURE 3-2 – *Average Monthly Lakewide Chlorophyll-a Concentrations by Decade*

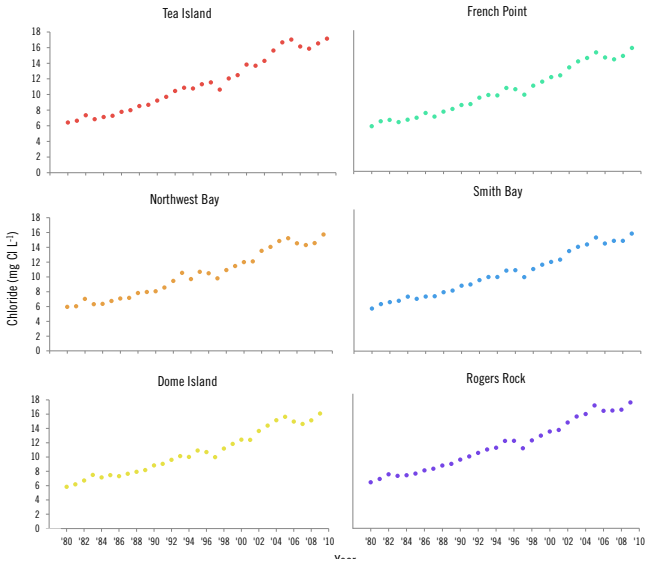

FIGURE 3-3 – *Mean annual chloride concentration (as mg Cl L^{-1}) measured in surface waters at six Lake George monitoring stations, 1980-2009*

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As a result, there continues to be interest in protection of Lake George by New York State, not-for-profit organizations, municipalities, and citizens, much of which is driven by scientific research.

3.1 ONSITE WASTEWATER TREATMENT SYSTEMS IN THE WATERSHED AND TOWN OF LAKE GEORGE

The majority of the watershed is rural without centralized utilities such as wastewater treatment. The only municipal wastewater treatment plants are located in the Village of Lake George, Bolton Landing, Hague, Ticonderoga, and Hulett's Landing. With the limited presence of municipal systems, wastewater treatment is performed by onsite systems, most of those being individual septic systems. It is reported that nearly 6,000 parcels utilize OWTSs for wastewater treatment within the Lake George watershed. (Lake George Association 2017) Despite such a high number of systems, there is limited information available on them—such as evaluation, inspection, or maintenance records—to determine if these systems are functioning properly.

FIGURE 3-4 – *Construction of an onsite wastewater treatment system in Lake George*

With a lack of any form of onsite wastewater treatment system (OWTS) management program and the focus on water quality protection of Lake George, there has been concern surrounding the potential of wastewater plumes from septic systems transporting nutrients, bacteria, and other contaminants. In an attempt to assess these impacts, efforts to determine the state of OWTSs within the watershed and quantify the impact on Lake George have been undertaken.

The most comprehensive study of onsite performance was a 1973 sanitary survey conducted by the NYSDEC. A total of 3,273 systems were inspected with a majority being located near the lake and tributary streams with an objective to determine the condition of systems. It was determined that 20 percent of the systems were suspected of water quality impacts with 2 percent failing and 18 percent of the systems being classified as "questionable" due to unknown systems, limited soils, and fractured bedrock.

New York State's Lake George Park Commission, which has statutory authority for the protection of water quality in the Lake George basin and management authority regarding onsite wastewater treatment systems, also conducted sanitary surveys in 1974, 1979, 1980, and 1981. This consisted of door-to-door surveys and onsite inspection of visible components and it was estimated the failure rate to be 5-15 percent. Again, the uncertainty of the study was recognized due to the subsurface

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conditions, but failures were more prone to be located in shallower soils with rock outcroppings.

Chen (1981), while working for the New York State Department of Health, conducted a study of five onsite wastewater treatment systems along the western shoreline in the Towns of Lake George and Bolton. (See Figure 3-5) He concluded that, in areas where the disposal system was set back from the shoreline and where the groundwater flowed through thick sections of sand and gravel, there was adequate treatment. Chen also concluded that, where there was thin soil cover over bedrock and groundwater was close to the surface, it was probable that the effluent would travel to the lake without adequate treatment.

FIGURE 3-5 – *Location of five onsite wastewater treatment systems in Chen' study (1981)*

Stearns and Wheeler (2001), for the Lake George Park Commission and funded through The FUND for Lake George, undertook a study to evaluate the potential impact of septic systems to Lake George, focusing on phosphorus. The study selected six sites, four of which were part of the final study. Although the study indicated that the phosphorus impact was limited, it concluded the correlation between distance from the septic system to the lake and influence of the system could not be readily determined.

In a recent evaluation of onsite septic systems during the formation of the North Queensbury Wastewater Disposal District No. 1 (Dunhams Bay), a total of 57 parcels/dwellings with septic systems were inventoried from Town of Queensbury records. The evaluation determined that 21 percent of the parcels had adequately designed and documented septic systems, 14 percent had inadequate or marginally documented septic systems, and 65 percent of the septic systems were undocumented or antiquated. (Simms, unpublished 2014)

3.2 GEOLOGY AND SOILS

The ability of an OWTS to function properly is largely dependent upon soils and site conditions, which are utilized to filter and oxidize the effluent to remove pollutants, nutrients, contaminants, and organisms. Soil and site conditions that provide the most effective treatment occur when soil percolation rates are between 5-30 minutes/inch, slopes are less than 15 percent, and when there is a minimum of five feet of usable soils above an impermeable layer.

The general geologic history of Lake George is that a powerful upheaval of pre-Cambian rock and granite was followed by a large glacial event, which created a narrow and steep watershed with mountains and cliffs with impenetrable rock. Overburden deposits in the Lake George basin are dominated by glacial tills and sandy kamic deposits and the grain sizes of the deposits demonstrate the tills are quite sandy with the kamic deposits better washed. The nature of these sands is the higher hydraulic conductivity, which can be 10 to 100 times faster than the tills and are themselves quite high. This results in good soils and infiltration rates for application of absorption disposal systems. However, infiltration capacities are affected by thin soils overlying bedrock that will tend to lower infiltration rates. This supports the previous research conclusion that portions of the Lake George shoreline have inadequate soil cover for proper septic operations and proper treatment of wastewater is prevented prior to entry to the lake by lack of adequate soil cover.

The glacial overburden deposits have low carbonate contents, which is typical for sandier soils. These lower carbonate minerals produce saturated levels of calcium carbonate in the groundwater that can minimize phosphates and limit its mobility.

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3.3 REGULATORY JURISDICTION

The regulation and agency oversight for design of onsite wastewater treatment systems within the Lake George watershed is very complicated. It can involve any one or combination of municipal, county and/or state agencies as well as other agencies with technical guidelines.

The New York State Department of Health (NYSDOH) reviews and approves plans for sewage treatment systems up to 10,000 gallons per day design capacity as well as sewage plans for major subdivisions with five lots or more and lots no larger than five acres.

The NYSDEC reviews and approves plans for sewage disposal facilities with a design capacity of 1,000 gallons per day or more that are not under NYSDOH jurisdiction and when a SPDES (State Pollutant Discharge Elimination System) permit is issued. These permits require the submission of monitoring reports as well as monitoring requirements for effluent limits.

Systems under 1,000 gallons per day are reviewed either by the municipality with jurisdiction, which will have their own sanitary code that may be more restrictive than the NYSDOH Regulations for Individual Residential Wastewater Systems (Appendix 75-A), or the Health Department.

The Adirondack Park Agency (APA) has issued Project Guidelines for Residential Onsite Wastewater Treatment to ensure that residential onsite wastewater treatment systems protect soil, groundwater, and surface water resources and follow the NYSDOH Appendix 75-A regulations.

The Lake George Park Commission (LGPC) has the statutory requirement under Environmental Conservation Law Section 43-0110 to adopt rules and regulations for the discharge of sewage or treated sewage effluent onto the land or into the groundwater of the Lake George Park to ensure optimum protection of ground and surface waters within the Park and such rules and regulations may be more stringent than rules and regulations adopted by other agencies. Since the LGPC has yet to adopt basin-wide OWTS regulations as part of their mandate, this oversight has fallen mostly to the local municipalities.

The Town of Lake George has approved regulations for the elimination of existing pollution and the prevention of new pollution by control over proposed sewage disposal systems, over modification of existing sewage disposal systems, and over the design of adequate drainage systems, which were adopted as Chapter A180 Consolidated Health District Regulations in 1986 and revised in 1994 and 2005. In general, these regulations were more protective of the public health and natural resources of the Town. Part of this Project was for the Town to update the existing Code, which was completed in 2016 as Chapter 115 of the Town Code.

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CHAPTER 4 - OWTS INVENTORY AND ASSESSMENT

4.0 SIP BACKGROUND

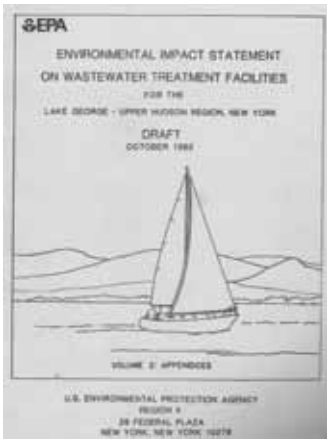

FIGURE 4-1 – *1982 USEPA EIS Cover*

The need for evaluating the impact of onsite wastewater treatment systems has been a long-standing concern in the Lake George basin. An evaluation was part of the 1982 United States Environmental Protection Agency (USEPA) Environmental Impact Statement on Wastewater Treatment Facilities for the Lake George-Upper Hudson Region and concluded there were areas where systems have existing or potential problems that are more prone to failures including north of Lake George Village along Route 9N in the Town of Lake George. (See Figure 4-1) One area cited was Diamond Point, due to density of buildings and/or small lots limiting the land area available for treatment and disposal. Under these circumstances, it is more critical to improve the management and monitoring of onsite wastewater systems to maximize their treatment capabilities.

The FUND for Lake George and the Lake George Waterkeeper have monitored water quality through various projects to assess the impacts from changes in the watershed around Lake George. One documented area of concern was the Diamond Point area and Smith Brook, a tributary in Diamond Point in the Town of Lake George, and this is where the concept of the Town of Lake George Septic Initiative originated. As part of its Stream Assessment Project, the Lake George Waterkeeper performed chemical analysis of Smith Brook in three locations and each sample site had specific conductance values higher than the mean of the entire Lake George watershed. Specific conductance is the measure of electrical conductance of water and is used as an indicator of instream pollution. Biological monitoring also was performed at the same locations, and indicated that the downstream sections of Smith Brook (both above and below Route 9N) were slightly impacted based on the Biological Assessment Profile. Biological assessment involves the collection of macroinvertebrates and algae to determine water quality impacts based on established protocols and indices. Algal Biological Assessments also were performed, which again indicated that the downstream sections of Smith Brook were slightly impacted based on Pollution Tolerance Index. Through the Lake George Waterkeeper Algae Biomonitoring Project, excessive algae growth also was observed in the near shore/littoral area of Lake George in the vicinity of the Town of Lake George Public Beach

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at Diamond Point and south of Smith Brook, as well as in Smith Brook itself. Algae samples were analyzed as per the Palmer Pollution Index established protocols and

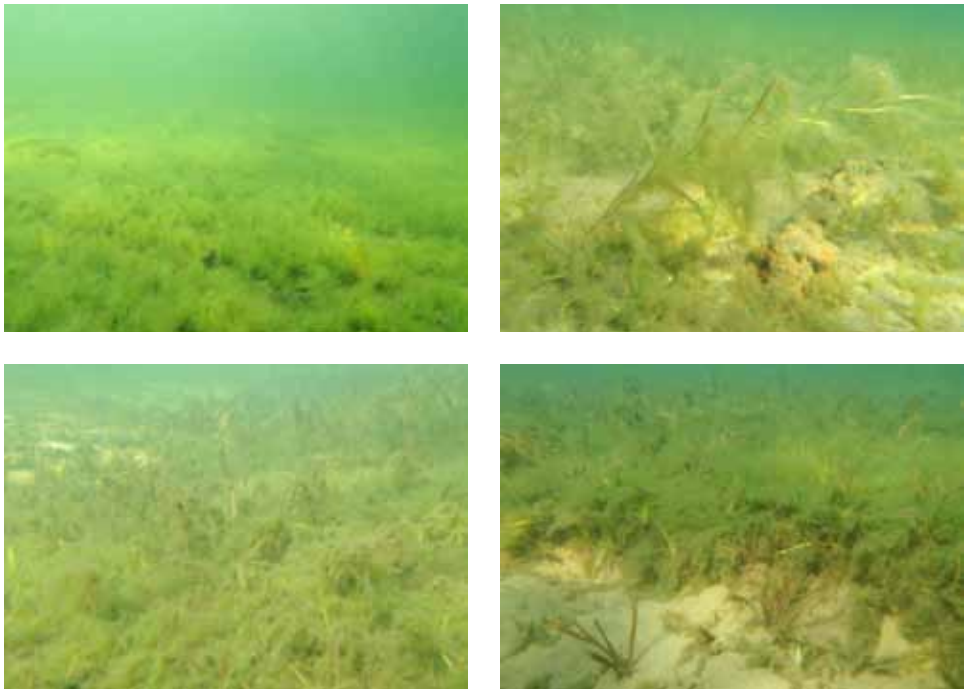

FIGURE 4-2 – *Algae Photos Smith Brook (2008)*

found to be high in species indicating probable organic pollution. (See Figure 4-3)

Subsequently, the Lake George Waterkeeper performed a review of the Town files for permit and information for the septic systems serving approximately 40 properties along Smith Brook and the Lake George shoreline in the area surrounding the water quality concerns. Nearly 50 percent of the files reviewed had no system information or indicated that the systems operated with an inadequate design. Additionally, there was no permit or system information for 25 percent of the properties including seven properties that appeared to utilize cesspools for wastewater treatment. In summary, it can be stated there was a lack of information on the onsite wastewater treatment systems to determine if they were designed properly and there appeared to be substandard systems, both of which could result in inadequate treatment causing water quality impacts.

In 2012, the data on existing system construction and documented algal blooms were presented to Town Supervisor Dennis Dickinson, which catalyzed the concept of the Lake George Septic Initiative Program (SIP) that was developed in the Planning and Zoning Department. The Lake George Consolidated Board of Health (CBOH), formed by the Town and Village of Lake George, is responsible within the Town to implement the Town's septic regulations and the State of New York Sanitary Code.

The CBOH determined the SIP could proceed under their rules governing the design of potential replacement systems, specifically:

> §180-1A SCOPE: *"Minimum requirements are hereby set forth governing the design, construction, installation, operation and maintenance of individual, transient, multiple residence, commercial, land subdivision, townhouse or condominium, etc., drainage, potable water or sewage disposal systems, together with procedures relating thereto, in implementation of the Public Health Law and Sanitary Code of the State of New York. No person shall construct, alter, repair or extend any potable water, drainage or sewage disposal system contrary to the provisions of these regulations."*

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§280-1B SCOPE: *"In the case of an existing wastewater, drainage or water supply system, etc., which exhibits evidence of failure or partial failure, as judged by the Board, the rehabilitation and/or reconstruction of the system shall be in compliance (or a variance sought) with regulations in effect at the time of rehabilitation and/or reconstruction."*

§180-12 INSPECTIONS AND MAINTENANCE: *"Any officer or duly authorized agent of the Board may make such inspections as are necessary to determine satisfactory compliance with these regulations. It shall be the duty of the owner or occupant of the property to giver said official free access to the property at reasonable times for the purpose of making such inspections as are necessary."*

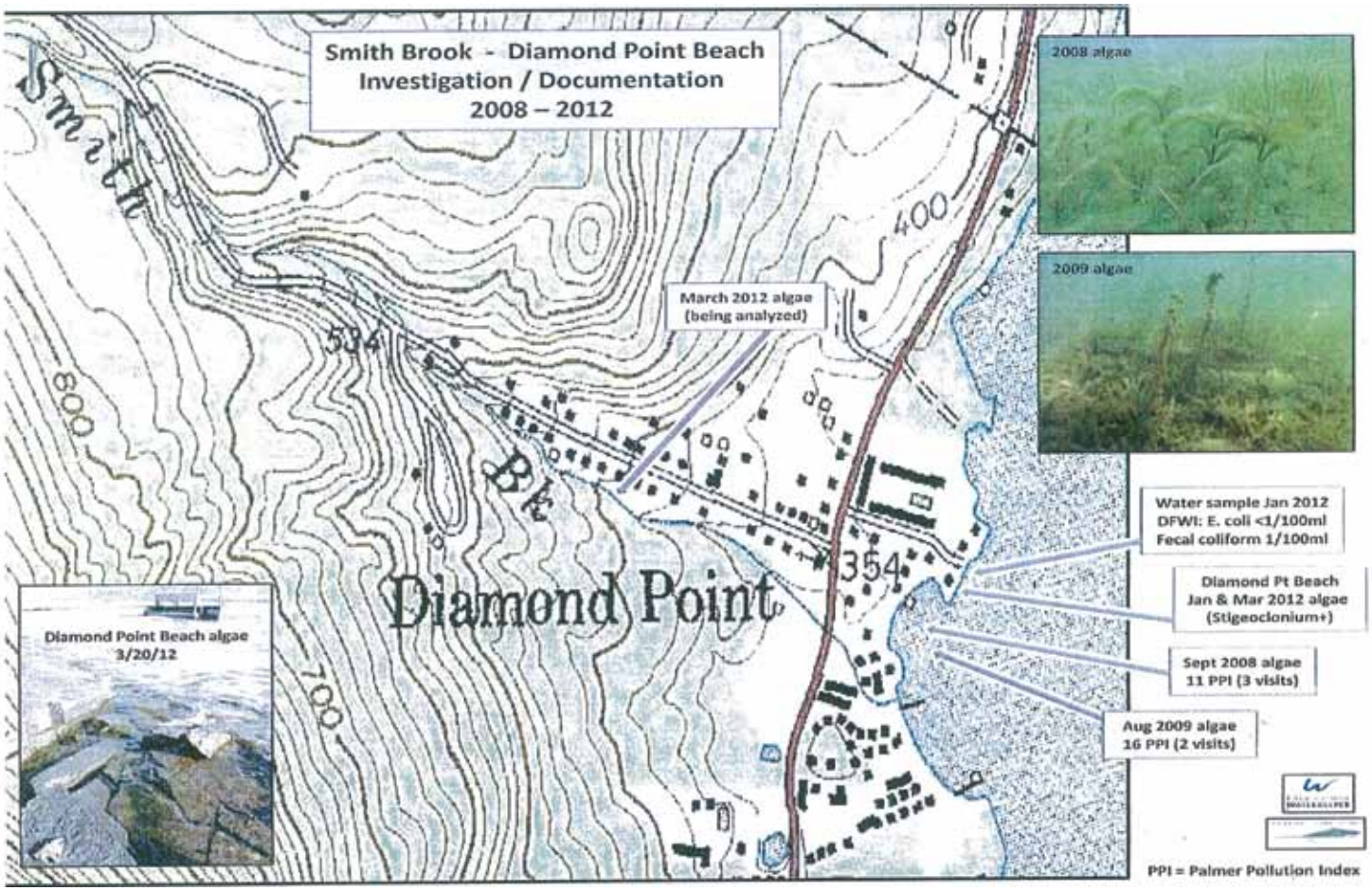

FIGURE 4-3 – *Diamond Point/Smith Brook Investigation Information Sheet (2008-2012)*

In May 2013, the Consolidated Board of Health introduced the Septic Initiative Program, which mandated that all existing onsite wastewater treatment systems within the Town would be catalogued and inspected with the goal that all OWTSs are functioning optimally.

The Town of Lake George Board started to formalize the Septic Initiative by passing a resolution in 2014 designating the Lake George Consolidated Board of Health a Responsible Management Entity (RME). (See Appendix D, Figure D-1)

The initial program objectives for the Septic Initiative Program included:

- Send information letter and pre-inspection worksheet to property owners within the Project Area, which was determined to be properties within 500 feet of Lake

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George, designated as a Critical Environmental Area, and/or within 100 feet of Class-AA-Special streams flowing into Lake George;

- Create a database from the pre-inspection worksheet including onsite wastewater treatment system components, age of system, maintenance, and inspection records;
- Educate homeowners on importance of regular maintenance of their onsite wastewater treatment system;
- Prioritize areas for system management;
- Establish monitoring and maintenance program;
- Identify funding sources including grants, partnerships, and low interest loan programs;
- Propose a Real Estate Property Transfer Law to ensure systems are adequately functioning at time of property transfer and set program to correct non-functioning systems; and
- Outreach to all municipalities within the Lake George watershed to establish a regional, standardized program.

The Septic Initiative Program was estimated initially to involve a total of 400+ parcels. In order to manage the program and effectively attain the objectives, it was decided to phase the project. The first phase would start with the Diamond Point area since the initial program need was assessed there, and then proceed south.

The Septic Initiative was started in 2013 under the Town of Lake George Planning and Zoning Department Director Keith Oborne and Program Administrator Kathy Bozony. In the first year, 67 parcels were initially contacted in the Diamond Point area with the pre-inspection worksheet. In 2014, the workshop survey was expanded to the remainder of the Town and included 277 properties; several training sessions were held for engineers, contractors, and haulers. (See Appendix D, Figures D-2 and D-3)

Funding was sought to facilitate the program and to incorporate database development, mapping, algae sampling, and water quality testing as well as potential grant support for system replacement. This was the basis for Consolidated Funding Grant Applications to New York State Department of State and in 2015, the Town of Lake George SIP was awarded a $104,000 grant through a NYSDEC Water Quality Improvement Program Grant. (See Appendix D, Figure D-4) The goals and outcomes for the grant include:

1. Detailed inventory and mapping assessment of all OWTS in the Septic Initiative Program boundaries through an inspection and maintenance program;
2. Final Report that includes an analysis of this inventory, rated systems, and implementation actions;
3. Public workshops and training sessions;
4. Program outreach to adjacent municipalities in the Lake George watershed;
5. Algae sampling and water quality sampling of problem areas found;
6. Partnership with The FUND for Lake George to identify the most crucial properties in need of replacement systems; The FUND would provide grant funding for private property owners;
7. Installation of risers to grade for all septic system properties;
8. Education of homeowners and contractors; and,
9. Revisions to the Town Consolidated Board of Health Regulation Code.

The project was divided into four phases based on regions of the Town for the management of the project:

- Phase I, Carriage Hill/Diamond Point to Orcutt Bay;

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- Phase II, Cannon Point to Hearthstone Campground;
- Phase III, Hearthstone to English Brook to Somerville Road;
- Phase IV, East Brook to Bloody Pond Road to Plum Point.

4.1 SEPTIC INITIATIVE PROGRAM INVENTORY REVIEW

The basis of the SIP is the development of a detailed database for all the parcels that are within the Program boundary through numerous available methods and means including:

- **Survey –** A pre-inspection worksheet/survey was designed to educate and assist the property owner to document their OWTS. This survey requested information on the design flows, number of bedrooms, septic tank and material, disposal field, age of the system, distance to surface waters, septic tank pumpout information, and a sketch of the system. (See Appendix D, Figure D-3)
- **Phone calls –** Phone calls were used where survey respondents needed assistance and follow-up calls encouraged property owners to complete the survey.
- **Town Files –** The Town Planning and Zoning Department files were used to obtain permit information and any submitted plans. The Town implemented a program in 1991 requesting property owners to complete an "Application for Permit to operate a Wastewater Treatment System" as part of the Lake George Park Commission regulations, which provided information on design flow, tank size, date of last pumpout, absorption field information, separation to surface water, and number of bedrooms.
- **County GIS Clearinghouse –** The Warren County GIS website was used to determine ages of dwellings (and possibly OWTS) and to determine the number of bedrooms on record. This tool could also be used to determine the setback to surface waters and determine whether a parcel was within the Program boundaries.

The database for the evaluation and assessment of OWTS consisted of the following information:

- **Age of Single-Family Dwelling/Structure –** The age of the dwelling could provide information of the age of the OWTS, potential system components, and pumpout requirements.
- **Age of OWTS –** Although the life expectancy of an onsite wastewater treatment system depends on many factors, most important being the maintenance, the average lifetime is 30-40 years.
- **System Components –** Details of the system components include the number of units served, septic tank (size and material) and specific dispersal/treatment field and design (type [absorption field/bed, dimensions and distribution arrangement], drywells [volume, dimensions]).
- **Record Documentation –** Review of the information available for record of the system design and/or installation including engineering design drawings, permit drawings, as-built drawings/sketches and/or owner's sketch, and permit application information. Basically, any information that can detail the location and estimate the condition of the treatment system.
- **Pumpout/Maintenance –** Information provided by the owner regarding the recent pumpout of septic tanks, preferably documented with receipts or pumpout report.
- **Inspection/certification –** Information provided by the owner, design engineer and/or the Town regarding the construction of the systems, evaluation of

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the system during a pumpout and/or determination the system is functioning adequately.

4.2 SEPTIC INITIATIVE PROGRAM INVENTORY PHASES I - IV

The SIP was divided into four phases to allow for survey contact of property owners and to proceed with scheduling of inspections. The Diamond Point area was designated as the first phase since this was where the impacts were first determined through water quality and algae assessment and inventoried existing systems. Subsequent phases then were determined based on shoreline and geography as listed below:

- Phase I, Carriage Hill/Diamond Point to Orcutt Bay;
- Phase II, Cannon Point to Hearthstone Campground;
- Phase III, Hearthstone to English Brook to Somerville Road;
- Phase IV, East Brook to Bloody Pond Road to Plum Point.

FIGURE 4-4 – *Map of Phases I - IV locations in the Town of Lake George*

Parcels within the proposed Project Area were determined through application of geographic information system (GIS), which is designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data, and allows users to create interactive queries, analyze spatial information, edit data in maps, and present results. Protection of surface waters through the management of land use activities and impacts is the main purpose for the initiative and a setback from surface water sources was determined to be 500 feet from Lake George, the Critical Environmental Area surrounding Lake George as determined by the Lake George Park Commission, and 100 feet from Class AA-Special streams tributary to Lake George as well as wetlands designated by the Adirondack Park Agency. The streams

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were determined from a Lake George Consolidated Board of Health Stream Designated Map dated December 4, 2012, and wetland boundaries were taken from GIS information. The phases are described in Appendix A as the following figures: Phase I – Figure A-1, Phase II – Figure A-2, Phase III – Figure A-3, and Phase IV – Figure A-4.

Table 1 provides the parcel information for each Phase:

TABLE 1 - LAKE GEORGE SEPTIC INITIATIVE PARCEL INFORMATION

Phase	Total Parcels	Vacant Parcels	Central System Parcels
I	85	3	-
II	85	11	41
III	245	75	10
IV	133	48	-

Vacant parcels are parcels within the Project Area that were not subject to the property owner survey, system evaluation, or inspection but are included in the study database to be incorporated in the program in the future if the parcel is developed. "Central System Parcels" refers to parcels that are within the Project Area and are connected to a centralized wastewater treatment system that is subject to a SPDES Permit under jurisdiction of the NYSDEC. These parcels may have been included in the property owner survey, system evaluation, or inspection depending on the type of central treatment system, i.e., the property may have a septic tank with the effluent discharged to a centralized system (STEP – Septic Tank Effluent Pump) and maintenance/pumpouts would still be required.

4.3 ASSESSMENT RESULTS

4.3.1 Survey/Pre-Inspection Worksheet

Public implementation of the SIP was initiated with a mailing from the Town of Lake George Planning and Zoning Department that included an introductory letter, educational information on maintenance for a functioning system, and a pre-inspection worksheet. Homeowner education on the need for routine septic tank and component maintenance to produce a functioning septic system is an important aspect of any septic management program. This information included a link to the Cornell Cooperative Extension publication Your Septic System. (See Appendix D, Figure D-5) To ensure that the Town was aware of system components and knowledgeable of individual homeowner's maintenance practices, the pre-inspection worksheet was requested to be filled out. The worksheet was developed to assist the homeowner to document their wastewater treatment system – the system's location, age, size of the septic tank, disposal information, and recent maintenance (i.e. tank pumpouts) documented through septic hauler's invoice/receipt. (See Appendix D, Figure D-3)

These mailings were sent out by the Town of Lake George Planning and Zoning Office to all properties located within the defined Project Area to addresses listed in the Town's tax records for the specific parcel. Mailings were done per phase with follow-up mailings sent after several months to property owners who failed to respond. (See Appendix D, Figure D-2)

Figure 4-5 shows the Town of Lake George performing an inspection after initial mailing.

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FIGURE 4-5 – *Town of Lake George Director of Planning Keith Oborne, Town employees, and Eric Murdock of On Site Systems performing site inspection.*

Table 2 provides a summary of the survey response:

TABLE 2 - LAKE GEORGE SIP SURVEY SUMMARY

Phase	Total Parcels Surveyed	Parcels Responded	Percent Response (%)
I	82	33	40
II	73	33	45
III	159	36	23
IV	83	31	37
Total	397	133	34

A 34 percent overall response rate would appear to be well above the range expected based on a 2016 study from The Center for Public Policy at Texas State University. The study states a response rate for a mail survey to 2000 homes is expected to be 10 percent with a margin of error of 5± percent. Response rates in other municipal resident surveys were slightly higher with the inclusion of phone and electronic contact (Temple University 2016).

Above average response rates could result from:

- Since the survey started with Phases I and II, there was more opportunity for additional mailings to increase the opportunity for response. Additionally, there was more opportunity for contact via phone with property owners;
- All parcels surveyed would have an onsite wastewater treatment system;
- The survey was sent by the Town with the statement that this was a part of a required inspection program; and,
- There is concern for the protection of water quality protection and environmental stewardship by the residents in the Town.

There is the concern that the survey responses would be limited due to the following:

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- Many of the parcels in the Project Area are second homes for owners who have an out of area address and mail may be missed as the owners spend time between residences;
- Property owners fear that a response could result in the need for an expensive replacement of the existing OWTS; and,
- Property owners fear of "over regulation" by requiring an inspection program by the local governing body.

One observation from the survey was that seven residents responded they had no information on their existing system.

4.3.2 Onsite Wastewater Treatment System Assessment (Individual)

Centralized municipal wastewater treatment is limited within the Lake George basin for several reasons – the State Environmental Conservation law allows only limited public wastewater collection and treatment systems and the 1982 Environmental Impact Statement did not recommend expanding municipal collection systems and instead recommended continued reliance on onsite wastewater treatment. Therefore, 65 percent of the residential development totaling approximately 6,000 properties within the watershed is handled by onsite systems with a wide range of variability that can impact their performance including age of the system, treatment components and process, maintenance, and construction. There have been attempts to assess the performance of these systems through four sanitary surveys performed by the Lake George Park Commission in 1974, 1979, 1980, and 1981, that included door-to-door surveys and onsite inspection of visible components. But overall compliance has been limited due to the inability to perform extensive inspections with only the more obvious failures detected though dye testing.

With this variability of conditions present, there is concern from the Town residents about the protection of the exceptional water quality of Lake George and support for a policy to reduce wastewater pollution to the lake. In the Town of Lake George, there are 1,200 properties with onsite treatment systems. Many are located within close proximity to Lake George and tributaries to support more dense development on the most desired parcels. Due to this proximity, there is a higher potential for impacts from aging and antiquated systems that may be approaching their estimated life expectancy. Additionally, the older camps are being replaced with larger dwellings, many with shallow soils with limited depth to bedrock and limited land available for disposal.

It was for these reasons that the Town of Lake George implemented the Septic Initiative Program that included a detailed inventory of the existing systems. Town records were reviewed for all parcels within the previously detailed Project Area to gain additional information that was not provided during the property owner survey. Information was collected on age of dwellings, number of bedrooms, age of septic system, components of the system, permits or record drawings, maintenance records, and records of Town inspections or engineer certifications. This was compiled into a database for review and analysis.

4.3.2.1 ONSITE WASTEWATER TREATMENT SYSTEM AGE

Many factors can impact the expected life expectancy of a standard OWTS including design, soils, loading, maintenance, and site conditions. But most experts place the typical range from 25-40 years until the system soil disposal area is ineffective. This occurs for several reasons. First, most systems are constructed to disperse effluent from the septic tank via gravity, which is the most simple and inexpensive to construct. However, gravity distribution of standard septic tank effluent is the least efficient method as distribution is uneven over the infiltration surface resulting in

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localized overloading creating a biomat (i.e. buildup of sludge layer) that starts to clog the soils. Clogging of the soils can reduce the re-aeration of the soil (flow of oxygen) necessary for biological treatment resulting in anaerobic conditions. (See Figure 4-6) The organisms that thrive under these anaerobic conditions are less efficient at processing the waste material, which promotes the accumulation of waste materials causing further soil clogging and loss of infiltrative capacity. To compound the situation, biological forms that could break down the biomat (worms, insects, plants, etc.) would not be attracted by anaerobic conditions increasing clogging and loss of infiltration leading to system failure.

FIGURE 4-6 – *Photo of the development of a biomat and clogging of the absorption field/soil interface (Photo courtesy of Eljen In-Drain Systems)*

Table 3 shows the results of the inventory review of the age of systems broken into four categories: operating within life expectancy (0-30 years), approaching system life expectancy (30-40 years), exceeding life expectancy (> 40 years) and systems where the ages are unknown, which could be a result of purchasing a residence without inquiring about the system's age or indicating a very old system.

FIGURE 4-7 – *Photo of an old system in the Town of Lake George*

TABLE 3 - LAKE GEORGE SIP SUMMARY OF OWTS AGE

	Age of OWTS			
Phase	**0-30 Years**	**30-40 Years**	**> 40 Years**	**Unknown**
I	33 (40%)	21 (26%)	18 (22%)	10 (12%)
II	21 (28%)	5 (7%)	16 (22%)	32 (43%)
III	68 (43%)	16 (10%)	35 (22%)	40 (25%)
IV	33 (41%)	10 (13%)	13 (16%)	24 (30%)
Total	155 (39%)	52 (12%)	81 (21%)	106 (28%)

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Based on the inventory total information, it can be estimated that just over one-third of the OWTSs are operating within their life expectancy, one-third are near or past the life expectancy and there is no information on system age for just under one-third of the systems. These results and the number of older and unknown systems, support the need for an inspection program.

4.3.2.2 ONSITE WASTEWATER TREATMENT SYSTEM COMPONENTS (TANKS, DISPOSAL)

There are three primary components of a conventional onsite wastewater treatment system – the septic tank, the wastewater absorption system (trench, absorption field, seepage pit), and the soil. There are various treatment options that can impact the level of treatment and all options are well described and detailed in design standards, such as the New York State Department of Health Design Handbook.

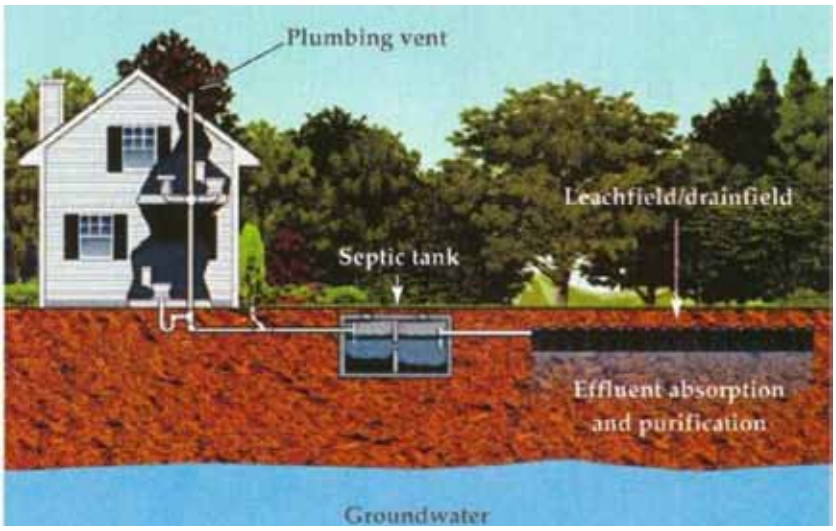

FIGURE 4-8 – *Image of a typical onsite wastewater treatment system showing the three components – septic tank, absorption field, and soils. (Photo courtesy of Massachusetts Alternative Septic System Test Center)*

FIGURE 4-9 – *Photo of newly installed concrete septic tank (Photo provided by Wim McIntyre)*

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The septic tank is the most commonly used wastewater pre-treatment unit for OWTS and creates a condition that will slow the flow of waste to allow solids to settle as well as partially digesting organic solids to form sludge. These processes allow the hydrolyzing of organic molecules for further treatment in the soils. Septic tank volume is based on the design waste-flow determined from the number of bedrooms in a dwelling, which is directly related to the number of full-time residents. The geometry of the tank is important as it affects the residence time in the tank with minimum length-to-width ratios and depth requirements. Design standards require a minimum tank volume of 1,000 gallons. Typically, the tanks are constructed with concrete, which are less susceptible to flotation and collapse, but plastic tanks are common. Coated steel/metal tanks are no longer used because they corrode easily and indicate older systems. There are other components associated with septic tanks to improve their treatment process including compartments, baffles, gas deflectors, and outlet filters. Tanks that are undersized will allow the migration of solids, sludge, and scum from the tank to the absorption system where it will contribute to clogging and eventual system failure.

Table 4 shows results of the inventory review regarding septic tanks servicing residential properties including undersized tanks (tanks with volumes under the required amount per bedroom), unknown (either unknown volume [indicating lack of maintenance pumpout] or no tank [cesspool] or no system information) and metal tanks. It should be noted that the data provided do not include any commercial properties or holding tanks.

TABLE 4 - LAKE GEORGE SIP SUMMARY OF PROBLEM SEPTIC TANKS

Phase	Total Tanks	Undersized Tanks	Unknown	Metal Tanks
I	70	14 (20%)	24 (34%)	2 (3%)
II	70	21 (30%)	27 (39%)	3 (4%)
III	136	15 (11%)	61 (45%)	0 (0%)
IV	71	15 (21%)	14 (20%)	2 (3%)
Total	348	66 (19%)	126 (36%)	7 (2%)

Based on the inventory information, nearly one out of five septic tanks are undersized for the required volume, which could result in hydraulic overloads to the treatment disposal area leading to premature system failure. Additionally, over one-third of the septic tanks volumes are unknown indicating a failure of maintenance pumpouts and/or lack of any understanding of the system, which also can result in

FIGURE 4-10 – *Figure 4-10 – Photo of metal septic tank with evidence of corrosion. (Photo provided by Wim McIntyre)*

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premature system failure. As this is an unknown, this could result in an increase in the number of undersized tanks.

Surprisingly, there is a very low percentage of known metal tanks as it was felt this percentage would be higher due to the number of older systems. However, it should be noted that the septic tank material is not known for many of the properties in the inventory and there could be more metal tanks than noted.

FIGURE 4-11 – *Photo of installation of absorption field trench.*

Subsurface wastewater absorption systems (absorption fields, trenches, seepage pits, etc.) provide both dispersal and treatment of water. The absorption systems are effective and passive treatment systems rely on the soils to treat the effluent through biological, physical (adsorption), and chemical means. The size of the systems should be based upon amount and type of wasteflow, the soil's hydraulic capacity and texture, and the site conditions. Design criteria provides the required loading/applications rates in regulations such as the New York State Department of Health Appendix 75-A. Systems are typically trenches with high length-to-width ratios to increase the contact surface area with the soils to improve treatment. Seepage pits can be effective for wastewater dispersal, but they provide little treatment because they extend deep into the soil profile, where oxygen transfer and treatment are limited, and the separation distance to groundwater is reduced; they are not recommended for onsite wastewater treatment. Cesspools are a form of seepage pits without the benefits of a septic tank for pretreatment for solids removal, resulting in very poor treatment and significant concern for health and environmental impacts.

Table 5 provides results of the inventory review of the subsurface wastewater infiltration systems servicing residential properties looking at compliant systems (systems with adequate tank volume and absorption field sized based on normal percolation rates for the soils present [design percolation rates were typically not available in the records]), drywells (which indicate reduced treatment efficiencies and potential contamination), cesspools (very low treatment levels with high potential of health and environmental impacts), and unknown system.

TABLE 5 - LAKE GEORGE SIP SUMMARY OF OWTS ABSORPTION

Phase	Total Systems	Compliant Systems	Unknown System	Dry Wells	Cesspools
I	70	31 (44%)	4 (6%)	18 (26%)	6 (9%)
II	70	14 (20%)	15 (20%)	18 (26%)	7 (10%)
III	136	61 (45%)	38 (28%)	22 (16%)	6 (4%)
IV	71	37 (52%)	10 (14%)	13 (18%)	2 (3%)
Total	347	143 (41%)	67 (19%)	71 (20%)	21 (6%)

Based on the inventory information, over 40 percent of the residential properties are serviced by wastewater treatment systems that appear to be compliant.

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However, there is a concern that one in five parcels have no information on their wastewater treatment systems, which indicates that there has been no inspection and/or maintenance, which is the leading cause of failure. Additionally, one in five systems utilize drywells that have reduced treatment efficiencies and have a greater potential for input of pollutants into groundwater. Lastly, there is not a high percentage of cesspools, but there are significant health and environmental impacts from a single cesspool. Each of these last three factors is cause for serious consideration of an inspection program.

4.3.2.3 MAINTENANCE

FIGURE 4-12 – *Photo of maintenance/ pumpout of septic tank.*

The typical conventional onsite treatment system is passive and requires little operator involvement. Periodic inspections and pumping are the only operation and maintenance requirements. Pumping is recommended to ensure proper performance and reduce the potential for failure by migration of solids from the septic tank out to the infiltration beds where they will clog the soils. Typically, the tank should be pumped every 3-5 years depending on the size of the tank, number of occupants, and water usage. Septic tank additives are advertised to reduce the amount of sludge accumulating in a tank and reduce the need for pumping. However, these products tend to increase the concentrations of suspended solids in the septic tank effluent that threaten the infiltration dispersal areas and will result in premature failure.

Table 6 provides information on the number of properties in each phase that have never been pumped out and/or the owner has no information on the most recent pumpout; these results include the number of properties that did not provide survey responses.

TABLE 6 - LAKE GEORGE SIP SUMMARY OF MAINTENANCE/PUMPOUTS

Phase	Total Parcels	No Pumpout Known
I	82	23 (28%)
II	74	35 (47%)
III	160	122 (76%)
IV	83	44 (53%)
Total	399	224 (56%)

From the previous results, there is a lack of maintenance records for over half of the parcels that were surveyed and/or reviewed for the project, which is a concern from an operational perspective through the migration of solids leading to increased system failures as well as from a treatment perspective through clogged soils reducing treatment efficiency. When the pumpout percentage per phase is analyzed, Phase I is much lower than any other phase. This could be attributed to more time to contact the property owners through the survey and from individual outreach. This demonstrates greater municipal involvement and education outreach leads to increased maintenance, which will increase the system's life.

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4.3.3 Onsite Wastewater Treatment System Inspection

As seen through the evaluation of the data collected from the surveys and the system inventory review, there is significant variance with the system design, maintenance, and understanding that will impact system performance and increased potential for failure. Typical causes of failure include un-pumped and sludge-filled septic tanks, which result in clogged absorption fields and hydraulic overloading caused by increased occupancy and water use. Many high-use vacation homes served by systems installed under outdated standards can cause water quality impacts and outdated technologies like drywells and cesspools can result in contamination problems.

FIGURE 4-13 – *Photo of inspection and maintenance of effluent filter.*

These problems can be addressed through a management program that incorporates inspection and maintenance of systems. There are concerns from property owners regarding an inspection program, including over-regulation, lack of documented impacts, or that there is not the necessity for the program ("I have never had a problem with my system, so I have never had to pump it out and it is working fine", a typical response received in survey).

But there are also concerns with findings of the data that warrant an improved management system including an inspection program:

- More than 50 percent of systems inventoried are greater than 40 years old or ages are unknown;
- More than 50 percent of the septic tanks' volumes are undersized or unknown;
- More than 50 percent of the properties with residential systems are unaware of the most recent maintenance pumpout;
- 20 percent of the systems are unknown; and,
- 20 percent of the systems utilize drywells for dispersal to the soils.

4.3.3.1 DESCRIPTION AND METHODOLOGY FOR TIERS 1-3

In attempt to prioritize the need for system management, an evaluation system was developed to rank the properties in need of inspection. This ranking was based on four criteria – submission of a survey response (public awareness and involvement), pumpout records (property owner maintenance responsibility), system information (knowledge of system components through property owner and/or Town records), and system inspection records (design professional certification, construction inspection, and/or municipal oversight). These criteria were the basis for a three-tier system to prioritize management and inspection:

- **Tier 1** – High Priority (no information on system, no survey response, no system compliance records)
- **Tier 2** – Mid-Level Priority (minimal system information [sketch or description/application], no system compliance records)
- **Tier 3** – Lower Level Priority – only pumpout required (system information on file, survey received)

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4.3.3.2 RESULTS

Table 7 summarizes the results of applying the inspection tier criteria:

TABLE 7 - LAKE GEORGE SIP SUMMARY OF INSPECTION STATUS

Phase	Tier 1	Tier 2	Tier 3
I	23 (28%)	29 (35%)	30 (37%)
II	30 (41%)	36 (49%)	4 (5%)
III	54 (33%)	106 (65%)	3 (2%)
IV	22 (28%)	53 (68%)	3 (4%)
Total	129 (33%)	224 (57%)	39 (10%)

Assessment of these criteria for inspections show the benefit of the municipal outreach regarding educating property owners on inspection and maintenance. Phase I has the highest percentage for Tier 3 requiring just pumpouts and demonstrates the success of the additional time the Town had for homeowner outreach and subsequent inspections. The criteria again indicate one third of the properties lack significant information on the OWTS, design, and maintenance, which are all factors that lead to system failure.

Again, this evaluation provides justification for the development of a Town management program for onsite wastewater treatment systems.

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CHAPTER 5 - PRIORITIZATION ALGORITHM

5.0 PRIORITIZATION ALGORITHM BACKGROUND

Chapter 4 provided a comprehensive review of the status of onsite wastewater treatment systems in the Town of Lake George from numerous perspectives including public outreach, system design, town oversight, and maintenance. From the evaluation of these data, there are concerns about the state of OWTSs in the Town that may have resulted in documented impacts to water quality and the natural resources of the Town. There is a lack of knowledge by property owners about their systems and, when information on the systems is known, many systems are undersized, aged, or apply outdated technology. Maintenance appears to be falling well short of what is necessary for systems to function properly and provide adequate treatment.

Site conditions are another factor that can significantly affect any system's treatment capability. The previously discussed geology and topography constraints of the Lake George basin do create limitations on treatment systems' efficiency. These factors include types of soils (sands and coarse materials), depths of soils (shallow depth to bedrock), and slopes, which all influence the overall treatment. (See Figure 5-1)

Based on the site conditions and the status of existing systems as determined by design, technology, and maintenance, it can be difficult for the Town to develop an effective management strategy. Antiquated and outdated systems will cause water quality impacts that can result in health and environmental impacts. How can the Town make the type of management decisions necessary? For example, where are the priorities and what are these decisions based on? In addition, the Town has limited resources (manpower and funds) to cover all systems in the Town during initial inspections and it can feel like a "needle in the haystack" situation. Furthermore, how can the limited resources available to the Town successfully be applied to these suspect systems?

This is where The FUND for Lake George and the Lake George Waterkeeper developed a system to help the Town prioritize their decisions and to base those decisions on scientific data and engineering principles. First, site suitability conditions were determined, analyzed, and weighted to create a data set. Second, the elements of the system inventory were assessed and weighted based on their influence on the level of treatment the existing system can provide to create another data set. Third, algae samples were taken and analyzed to determine water quality impacts and potential sources. These data sets were then merged to create a Prioritization Algorithm that will assist the Town in determining systems and areas to focus on with limited resources during initial stages of a Town management plan.

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The following sections will focus on the development of the GIS-based data system and Prioritization Algorithm.

5.1.0 SITE SUITABILITY ANALYSIS METHODOLOGY

Site suitability analysis is used in GIS (global information system) to determine the best sites for an onsite wastewater treatment system. This is accomplished by selecting factors that will influence how effectively the system will function, and rating or weighing these factors to create the database.

A steering committee of engineers familiar with onsite wastewater treatment design consisting of the report author, Sean Doty (Chazen Companies), Leo LaBuda (Catskill Watershed Corporation) and Kathy Suozzo (Cedarwood Engineering) were consulted to determine the site conditions that would have the greatest constraints on a treatment system's ability to function and/or result in the greatest impact to water quality. The following factors were established:

- **Separation to Surface Water (lake, stream and/or wetlands) –** The separation of an OWTS to surface waters will have a significant influence on water quality. Typical horizontal setbacks are 100 feet to surface water courses unless it is a drinking supply, where the separation (such as for Lake George) is increased to 200 feet. Since this factor is for potential influences, the setback was determined to be the Critical Environmental Area for the Lake George shoreline (500 feet) and 100 feet for tributaries.
- **Hydraulic Conductivity (k_{sat}) –** Hydraulic conductivity is the volume of water that will move through a unit area of porous medium in a unit of time. This volume will vary with the media's permeability and degree of saturation. The soil below the system's absorption surface must be capable of accepting and transmitting the wastewater effluent to maintain unsaturated conditions. There are two ranges of concern with the hydraulic conductivity – if water flows too slow, which reduces the efficiency of treatment due to slow movement, and if water flows too fast, which reduces the efficiency of treatment due to a lack of contact with soils particles where adsorption and/or chemical exchanges can occur.
- **Depth to Bedrock –** Depth to bedrock limits the soil available to provide adequate wastewater treatment. Generally, 2-4 feet of separation is adequate for the removal of fecal coliforms in septic tank effluent. The concern with depth to bedrock is the restriction of oxygen to assist the aerobic biological treatment process. When the aerobic process is reduced, anaerobic conditions can result, and the anaerobic biological treatment process is less efficient resulting in reduced water quality. This can result in clogging and premature failure of the system.
- **Depth to Groundwater –** Very similar to depth to bedrock, depth to groundwater limits the soil available to provide adequate treatment. The higher groundwater will increase soil saturation, possibly reducing hydraulic conductivity and airflow reducing oxygen availability. The shallow depth to groundwater will also increase the potential for contaminants to enter the groundwater.
- **Steep Slopes –** Steep slopes are an important factor in the distribution of effluent to absorption field to limit the velocity for effective distribution and to limit the impacts of construction due to grade alteration.

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FIGURE 5-1 – *Lakefront construction demonstrating difficult site constraints for onsite wastewater treatment systems including setbacks, slopes, and depth to bedrock.*

These factors were then weighed as to the influence on how an OWTS treats effluent and the potential for impacts to water quality. Table 8 summarizes the determination of the weighting of the factors:

TABLE 8 - SITE SUITABILITY FACTORS AND WEIGHTING

Item	Characteristic/Range	Weighted
Steep Slopes	Above 15% = 1	16%
	Below 15% = 0	
Depth to Bedrock	Less than 1' = 1	16%
	less than 2' = 0.5	
	2' and above = 0	
Depth Seasonal High Groundwater	Less than 1' = 1	16%
	less than 2' = 0.5	
	2' and above = 0	
Stream Buffer	Greater than 100' = 0	26%
	Less than 100' = 1	
Shoreline Buffer	Greater than 500' = 0	26%
	Less than 500' = 1	
APA wetland	Within wetland = 1	26%
	Outside wetland = 0	
hydraulic conductivity (K_{sat})	0 to 3.52 micrometers/sec= 1	26%
	3.52 to 7.06 micrometers/sec= 0.5	
	7.06 to 423.33 micrometers/sec= 0	
	423.33 to 705 micrometers/sec= 0.5	

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For the computer design, a raster, graphic image that represents a rectangular grid of pixels, was created in ESRI ArcGIS software using several publicly available data layers. Slope data were derived from a USGS 10-meter (~32.8'x32.8' pixel size) digital elevation model and resampled to a 20' x 20' pixel size. Depth to bedrock, depth to seasonal high groundwater, and hydraulic connectivity (Ksat) were obtained from USDA NRCS soil data and rasterized to match the 20'x 20' slope data. Stream and shoreline buffers were created using water features from the APA, and wetlands from the APA were also utilized. These layers were also rasterized. Scores were assigned to each layer and a weighted adding of the layers provided an overall septic suitability score as previously described. Natural breaks were used to divide the scores into seven classes from low suitability to high suitability. A reclassified raster, based on the seven breaks, also was created, with values from one to seven.

5.1.1 Site Suitability Analysis Results

The Site Suitability GIS mapping for Phases 1-4 is shown in Appendix A, Figures A-9 through A-12 at the end of the report. The mapping results are based on the previously detailed weighted scoring of the suitability criteria with a maximum of seven, indicating very acceptable conditions for an OWTS, down to a minimum of zero, indicating very unacceptable conditions for an OWTS. The scoring is color-coded for ease of interpretation – green for more acceptable conditions to red for unacceptable conditions.

Results of the Site Suitability mapping highlight the greater influence of soils and setbacks to surface waters in the model more than slopes and/or depths of soils. Within the Project Area (500 feet to the Lake George shoreline or 100 feet to tributaries), the differences in the natural breaks (i.e., color changes) are evidence of the influence soils and/or slopes have to impact the score rating of parcels and corresponding potential to the effectiveness of OWTSs. There is a clear change in score rating along the surface water setback boundary where areas within the Project Area are weighted higher indicating a greater potential for water quality impacts.

5.2.0 EXISTING SYSTEM INVENTORY RATING ANALYSIS METHODOLOGY

The existing system inventory analysis used GIS to determine how the OWTS is functioning based on a series of factors and placed the system on a map for location and analysis. The factors that were selected were taken from the inventory review and assessment and were determined to be the most influential on assessing the functioning and potential impacts from the OWTS.

The following factors were determined to be the most influential for the assessment of existing systems:

- **System Age** - The age of a system has an impact on its effectiveness and efficiency due to the impact of system's treatment on the soils and buildup of a biomat underneath the absorption area. The buildup of the biomat will reduce oxygen to subsurface soils and decrease aerobic treatment resulting in more anaerobic conditions and reducing treatment efficiency. The life expectancy of a properly designed, constructed, and maintained system is 25-40 years. The assessment placed system age into three categories: 0-30 years, 30-40 years, and greater than 40 years/unknown.
- **System Components** - System components and treatment technology will have the greatest effect on the level of treatment and the potential of water quality impacts. Undersized septic tanks lack of adequate settling volume/detention time allowing migration of solids to the absorption system and inadequate dispersal field area both result in hydraulic overloading that can result in clogging

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of the soils. Older, underperforming technologies (i.e. cesspools, seepage pits) and component construction reduce the effectiveness of system's treatment with reduced oxygen availability reducing treatment efficiencies. The assessment ranked systems based on: compliant systems, undersized septic tanks, system not compliant with current code (undersized absorption field), seepage pits, and cesspools.

- **System Maintenance/Pumpouts –** Conventional OWTSs are passive and contain septic tanks for primary treatment and removal of solids. If the septic tank is not emptied periodically, excess solids will pass to the absorption system, rapid clogging will occur resulting in premature failure. The solids should be removed when the total depth of sludge in the tank exceeds one-third the liquid depth. The estimated pumpout period is every 3-5 years based on normal use but the most effective manner to determine is to check the sludge depth with a "Sludge Judge" or tube. The assessment placed the pumpout maintenance into four categories: 0-4 years, 4-8 years, greater than 8 years, and unknown/never.
- **System records –** Record drawings and permits provide documentation on a system's design, components, and location that can assist in operation and maintenance. This can extend the life of a system and reduce the potential for premature failure. The assessment credited parcels that had information in Town files and/or returned surveys with system information.
- **OWTS Certification –** Town or design professional signoff/certification documents the compliance of an OWTS construction with the approved design plans or system inspection completed by the Town. Systems constructed to approved plans are more likely to function through a normal life expectancy assuming proper operation and maintenance occurs. This is also a good aspect of a management program to improve overall onsite wastewater treatment. The assessment credited parcels that had been certified and/or inspected by the Town or the design professional.

FIGURE 5-2 – *Recent lakefront onsite wastewater treatment system*

These factors were weighted based on how much each could affect how the parcel's OWTS is functioning, could indicate a noncompliant system, and/or the system could be close to premature failure. The points assessed for system inventory evaluation were:

- System Age – 2 points
- System Components – 3 points

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- System Maintenance – 3 points
- System Records – 1 point
- System Certification – 1 point

The data were used to score the septic systems on a 10-point total scale. The scores from this process were joined with the Warren County parcel data to identify parcels within the four phase areas that defined the program area. Using University of Vermont (UVM) Spatial Data Lab's impervious coverage as a base, the "disturbed area" for each of the scored parcels was digitized. This area then was joined with the scoring data, and a new raster was created to represent the septic system scores for each property. The raster resolution was set at 10'x10', half of the septic suitability scoring raster. The two rasters then were added to create a combined suitability and septic system score. The resultant raster then was divided into eight equal interval classes, representing a range of two points, with the exception of the "worst" interval which encompasses three points. This process was repeated for each of the four phase areas.

5.2.1 Existing System Inventory Rating Analysis Results

As the evaluation of the existing system inventory was assessed for each parcel, it was realized that the GIS analysis and scoring should not pertain to the entire parcel of land, but should be limited to area of disturbance/development. To accomplish this, a layer was utilized in the GIS analysis that was the developed/cleared land for each parcel and the existing system inventory scoring was assessed to that specific layer. The rationale for this process will become more evident upon review of the mapping associated with the Prioritization Algorithm.

There is not separate mapping for the Inventory Rating due to the limited range of application to the developed/disturbed areas. Instead, the Inventory Rating was merged with the Site Suitability database.

5.3.0 PRIORITIZATION ALGORITHM METHODOLOGY

The Existing System Inventory Rating Analysis resulted in a 10-point total scale. Using GIS, the scores from this process were joined with the Warren County parcel data to identify parcels within the four phase areas that defined the program area. However, as the evaluation of the existing system inventory was assessed to each parcel, it was realized that the scoring should not pertain to the entire parcel of land, but rather where systems were more likely located on the property. For the purpose of this analysis, it was determined that the area of disturbance and development would help narrow the focus of the analysis. Using impervious coverage that was recently developed by the University of Vermont Spatial Data Lab's as a base, the "disturbed area" for each of the scored parcels was digitized. This area was then joined with the scoring data, and a new raster was created to represent the septic system scores for each property. The raster resolution was set at 10'x10', half of the septic suitability scoring raster. The two rasters were then added to create a combined suitability and septic system score. The resultant raster was then divided into eight equal interval classes, representing a range of two points, with the exception of the "worst" interval which encompasses three points. This process was repeated for each of the four phase areas.

5.3.1 Prioritization Algorithm Results

The Prioritization Algorithm GIS maps for Phases 1-4 are shown in Appendix A, Figures A-13 through A-16, at the end of the report. The mapping results are based on the combined scores from the suitability analysis and existing system inventory

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rating analysis. Similar to the suitability analysis, the scoring is color coded for ease of interpretation. However, in this instance, green illustrates lower priority areas and red represents higher priority areas.

The algae biomonitoring indices results were categorized based on Palmer Pollution Index and Trophic Index ranges based on the following levels of concern:

1. Palmer > 14 , Trophic 70+;
2. Palmer 11-14, Trophic 70+;
3. Palmer 11-14, Trophic <70;
4. Palmer <11, Trophic 70+; and,
5. Palmer <11, Trophic <70.

Based on the analysis of the maps and GIS layers, the following is a list of Priorirty Areas for the Town of Lake George to focus management efforts:

1. North Diamond Point;
2. South Diamond Point;
3. Smokey Bear Area;
4. South Green Harbour;
5. Stebbins Brook Area;
6. Sunnyview Area;
7. Westover Cove;
8. Wiawaka Area;
9. Sand Pebble Cove; and,
10. Plum Point.

Refer to Figure 5-3 for a Priority Area Location Map. This list is based primarily on the assessment of results from water quality indices of algae biomonitoring and existing system evaluation. The site suitability data helped distinguish areas where system's efficiency may be reduced due to site constraints. Several areas are located at the mouths of tributaries that may indicate influence from upland properties and this should be taken into account if future management actions are implemented. There were sites with higher algae biomonitoring indices excluded based on recent system replacements with the consideration of legacy effects from nutrient accumulation in the soils. This would be justification for continued algae biomonitoring in these locations. In general, areas of red on the map where algae samples were taken indicate impacts of nutrients and should be considered by the Town in future management actions.

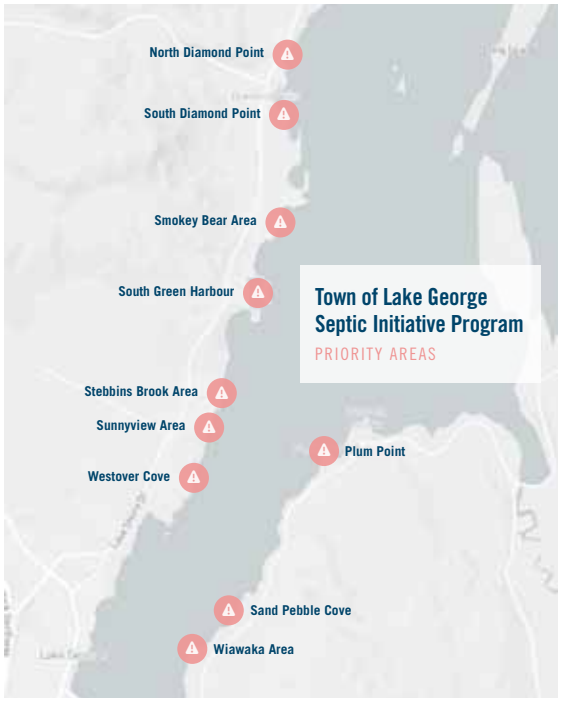

FIGURE 5-3 – *Priority Area Location Map*

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CHAPTER 6 - ALGAE BIOMONITORING SAMPLING AND WATER QUALITY ANALYSIS

6.0 ALGAE BACKGROUND AT LAKE GEORGE

Wastewater management is an important component of water quality protection. Treatment system failure can have health, environmental, and economic effects. Nutrients (especially phosphorus) from leaky septic systems play a major role in causing excessive algae growth in lakes and ponds. When overgrown algae and plants die rapidly and decompose, oxygen is removed from the water, which threatens fish and other aquatic animals. Wastewater from septic systems that reaches adjacent surface waters also increases the chance that wildlife, swimmers, and downstream users are exposed to infectious bacteria and viruses that are associated with wastewater. (Cornell University 2011)

Algae are plant-like organisms that live in a variety of environments and are a natural component of water bodies. Algae, being the base of the aquatic food web, are an important component as many organisms feed on them including macroinvertebrates and fish. Some algal species are naturally occurring, but excessive amounts may occur and are referred to as a "bloom". An algal bloom occurs when the amount of algae within a specific location grows rapidly and covers a large area in response to excessive nutrients and environmental cues.

Assessing both soft forms of algae and diatoms within periphyton near-shore habitats provides a distinct advantage over other biota and water quality monitoring.

FIGURE 6-1 – *Excessive algae growths or blooms as seen in Lake George*

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Littoral periphyton monitoring is an effective tool that can indicate changes due to anthropogenic disturbances that may not be detected in chemical monitoring.

Algae are an important component of biological monitoring—or biomonitoring—programs for evaluating water quality. Algae species can be specific to the particular water conditions and levels of nutrients containing nitrogen(N) and phosphorus(P) that enter the water body. The N:P ratio generally determines the specific dominant algae and can be based upon sources, which include organic pollution from sewage-related sources such as leaky septic systems. In addition, calcium, carbon, and sodium levels can shift algal dominance. The Palmer Algae Pollution indices were compiled from reports by 165 authors and rank the genera/species most often encountered in water with high rates of organic pollution. (Washington State Lake Protection Association, 2016)

Excessive algae growth has been used to identify poorly operating septic systems on Lake George dating back to 1973. A sanitary sewer survey performed by the New York State Department of Environmental Conservation (NYSDEC) from 1973 used excessive algae growth to look at questionable systems in the more heavily developed, non-sewered residential communities in the southern basin of Lake George. Excessive algae growth observed in 1973 was used as a basis for resurveys of continuing problems through 1981. It was stated that "Algae growth, which is noted along nearby shorelines, was used as a visual indicator of septic system problems". During the study, 24 systems were identified with increased levels of algae growth along the shoreline and they had no other apparent problem with their onsite systems from survey evaluation. These systems were reevaluated and 12 of the systems were determined to be problem systems and were impacting water quality through transport of

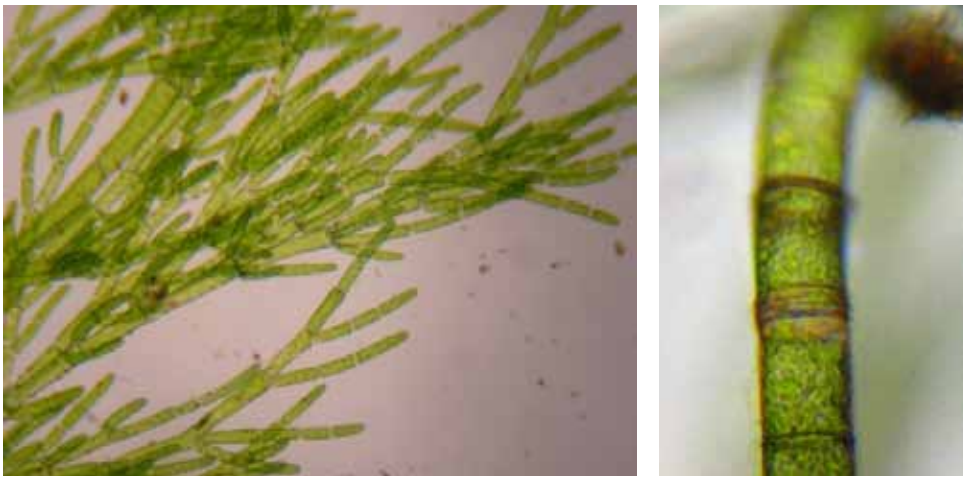

FIGURE 6-2 – *Microscopic photos of algae that are applied to biomonitoring indices*

nutrients to the lake. These data were included in the Needs Survey Report as part of the Lake George-Upper Hudson Region Wastewater Facilities Plan EIS, 1981.

Algal Biological Assessments were incorporated in the Lake George Waterkeeper Stream Assessment Project in 2009 to use algae as a biomonitoring indicator for water quality conditions. In the Town of Lake George, Algal Biological Assessments conducted along Smith Brook in Diamond Point that indicated downstream sections were slightly impacted based on the Pollution Tolerance Index. Additionally, excessive algae growth had been observed by the Lake George Waterkeeper Algae Biomonitoring Project in the vicinity of the Town of Lake George Diamond Point Public Beach and south along the Lake George shoreline to Smith Brook. This was one of the factors that lead to the Town of Lake George Septic Initiative Project.

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FIGURE 6-3 – *Lake George Waterkeeper Stream Assessment Project monitoring (2008)*

Algae sampling and assessment based on established protocols and standards are being applied as evidence of water quality impacts with possible connections to inadequately operating onsite wastewater treatment systems. Observations of excessive algae growth in Dunhams Bay in the Town of Queensbury prompted sampling that identified algae species indicating organic pollution. This initiated the Town of Queensbury to form the North Queensbury Wastewater Disposal District No. 1, encouraging septic system upgrades and replacements and after 3 years, the nuisance algae species have been reduced.

6.1 PROTOCOLS AND METHODOLOGY

The methods and metrics for algae biomonitoring summarized are a modified version of the United States Environmental Protection Agency Periphyton Protocols, New York State Department of Environmental Conservation Periphytic Biomonitoring Protocols, Palmer C.M. Pollution Tolerance Index, Nutrient Requirements under the National Water-Quality Assessment Program data set, and Lake George Index created under the Lake George Algae Biomonitoring Program.

FIGURE 6-4 – *Lake George Waterkeeper collecting algae samples in Lake George*

The collection of samples focused on areas of observed algal growth. Samples were collected from all available substrates and habitats, within a reach, as per the United States Environmental Protection Agency Periphyton Protocols. (See Figure 6-4) The objective is to collect a single composite sample that is representative of

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the periphyton assemblage present within the targeted reach. Samples were collected in a water-tight container. No preservatives were added, as all forms of algae (soft and diatom) are analyzed and in lab; propagation of soft forms may be necessary to distinguish fruiting bodies of Chlorophyta forms and for application of live diatoms metrics. Samples were placed in a cooler on ice and transported to the lab for full analysis. Samples were identified and enumerated within two weeks of collection, unless propagation was necessary. In addition to this protocol, dissolved oxygen concentration and saturation, conductivity, total dissolved solids (TDS), and pH were measured at the collection site. All data and observations were recorded on field sheets. A Chain of Custody Form was required for all samples.

All algal samples were individually homogenized and allowed to settle; a sub sample was taken and prepared according to the United States Environmental Protection Agency's alternate preparation technique, and placed on a gridded wet-mount slide. All forms of algae (soft and diatom) were identified to lowest taxonomic level possible and 300 algal "cell units" were counted. From the identification and numeration, the following were determined, and metrics based on composition will be applied:

- Taxa (Genera) richness were calculated as the number of forms and taxa within the subsample.
- Documentation of forms of cyanobacteria within sample (excessive nitrogen can cause some forms of cyanobacteria to produce toxic conditions.)
- Percent Sensitive Diatoms (indicates health and can detect water quality impacts when other metrics underestimate changes, used to confirm other metrics.)
- Percent Achnanthes minutissma (indicates chemical insults and toxic pollution.)
- Palmer Algae Pollution Index (PPI) (assessing a specific group of algae associated with municipal sewage treatment plants and organic pollution; assesses organic pollution levels.) The Palmer Algae Pollution Index was compiled from reports by 165 authors and ranks the species/ genera most often encountered in the waters with high rates of organic pollution. The algae are assigned a pollution index value of 1-6. A score of 20 or more is regarded as confirmation of high organic pollution in the body of water. A score of 15-19 indicates probable organic pollution, while scores from 10-14 indicate less organic pollution present. Scores under 10 normally indicate clean water.
- Pollution Tolerance Index (PTI) (indicates the level of pollution.) The Pollution Tolerance Index is calculated as the sum of relative abundance of each species or genus multiplied by the pollution tolerance class of that form (Bahls 1993). Levels of impact are >2.50 non-impacted; 2.01-2.50, slightly impacted; 1.51-2.00, moderately impacted; and <1.50, severely impacted.
- Trophic Index (TRI) (indicates the level of excessive nutrients through the measure of mesotrophic to hypereutrophic individuals.) The Trophic Index levels of impact are: 0-50, non-impacted; 51-70, slightly impacted; 71-85, moderately impacted; and 86-100, severely impacted.
- Salinity Index (SI) (indicates the level of dissolved salts through the measure of halophilous [salt loving] individuals.) Salinity Index levels of impact are: 0-10, non-impacted; 11-30, slightly impacted; 31-50, moderately impacted; and 51-100, severely impacted.
- Acidity Index (AI) (indicates the impacts from acid effects through the measure of acidophilous [acid loving] individuals.) The Acidity Index levels of impact are: 0-20, non-impacted; 21-50, slightly impacted; 51-75, moderately impacted; and 76-100, severely impacted.
- Siltation Index (SI) (the measure of the percent relative abundance of individuals belonging to motile genera which are adapted to living on unstable substrates). Siltation Index levels are - in streams: < 20, no siltation, 20-39, minor

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siltation, 40-60, moderate siltation, and >60, heavy siltation. For low elevation/low slope the ranges are: < 60, no siltation; 60-69, minor siltation; 70-80, moderate siltation; and >80, heavy siltation.

- Similarity Index (sample site will be compared against forms from previously collected samples in wastewater treatment facilities within the Lake George basin and other known organic polluted sites.)
- Eutrophic Forms present, documents the number of forms of algae within the sample that are known to indicate eutrophic conditions.
- Nuisance Filamentous Chlorophyta present. Filamentous forms of algae can clog intake pipes, smother fish breeding and feeding habitat, and wash up onto beaches and decompose.
- Ankistrodesmus sp. present. This form of algae has been documented within regional wastewater treatment facilities and within days of septic spills within Lake George.

6.2 2016-2017 ALGAE BIOMONITORING RESULTS

Based on the samples taken at the sites where excessive algae was observed over the 2016-2017 seasons (17 sites in 2016 and 22 sites in 2017) and applying the referenced protocols, the following are the results:

TABLE 9 - 2016-17 ALGAE BIOMONITORING RESULTS

Index	2016 Sample Results	2017 Sample Results
Palmer Pollution Index	2 sites (12%) probable organic pollution 2 sites (12%) less organic pollution	3 sites (18%) probable organic pollution
Pollution Tolerance Index	4 sites (24%) slight impact	1 site (5%) slight impact
Acidity Index	4 sites (24%) slight acid impact	1 site (5%) severe acid impact 1 site (5%) moderate acid impact 4 sites (24%) slight acid impact
Trophic Index	1 sites (6%) severe impact 3 sites (18%) moderate impact 7 sites (41%) slight impact	3 sites (14%) severe impact 1 site (5%) moderate impact 6 sites (27%) slight impact
Salinity Index	13 sites (76%) severe impact 3 sites (18%) moderate impact 1 site (6%) slight impact	15 sites (68%) severe impact 7 sites (32%) moderate impact
Cyanobacteria	14 sites (82%) had 1 or more forms	15 sites (68%) had 1 or more forms
Eutrophic Forms	17 sites (100%) had 1 or more forms	22 sites (100%) had 1 or more forms
Nuisance Filamentous Chlorophyta	5 sites (29%) had 1 or more forms	6 sites (29%) had 1 or more forms
Ankistrodesmus	1 site (6%) had genus in sample	0 sites (0%) had genus in sample

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Index	2016 Sample Results	2017 Sample Results
Generic Richness	ranged from 8-21 genera at each site	ranged from 11-21 genera at each site
Siltation Index	1 site (6%) moderate impact 2 sites (12%) slight impact	4 sites (18) slight impact
Sensitive Diatoms	ranged from 0-20 %	ranged from 0-19 %
Similarity Index	2 sites (12%) moderate level	3 sites (18%) moderate level

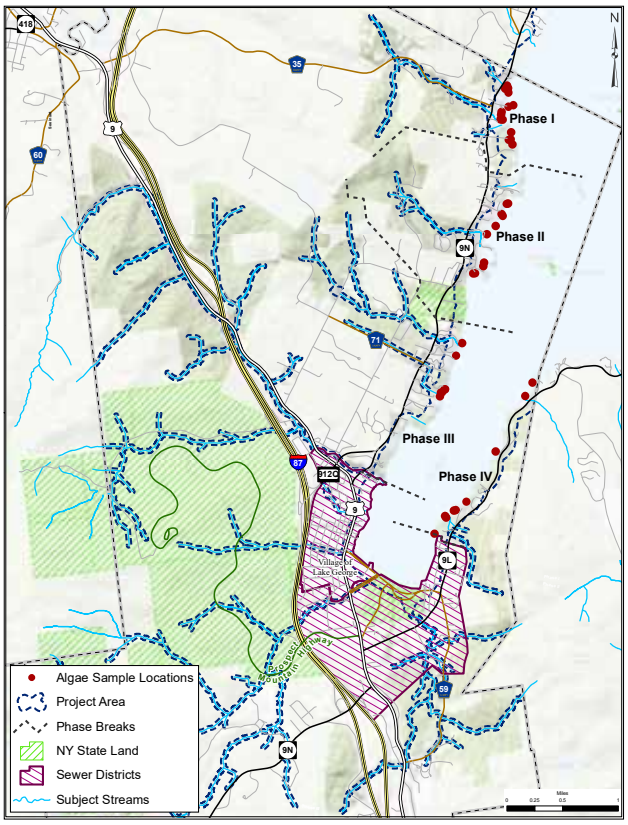

FIGURE 6-4 – *Algae Biomonitoring Sample Sites*

6.4 ALGAE DISCUSSION AND CONCLUSIONS

The following conclusions have been developed after careful consideration of the data from the Algae Biomonitoring collected for the Town of Lake George Septic Initiative Project (SIP):

- Sites potentially indicating probable organic pollution analyzed with the Palmer Pollution Index remained consistent over the two study seasons at approximately 14 percent. The overall percentage of potential organic pollution sites decreased from 24 percent to 14 percent.
- Impacted sites determined by the Trophic Index indicating excessive nutrients decreased from 65 percent to 46 percent but the percentage of severely impacted sites increased from 6 percent to 14 percent.

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- All sites sampled are impacted based on the Salinity Index during both seasons indicating excessive levels of dissolved salt in the water column, an issue that environmental organizations have been attempting to address.
- A majority of sites had one or more forms of cyanobacteria (blue-green algae) during both seasons. It should be noted that blue green algae do occur naturally, but concerns are raised when it reaches particular percentage of growth.

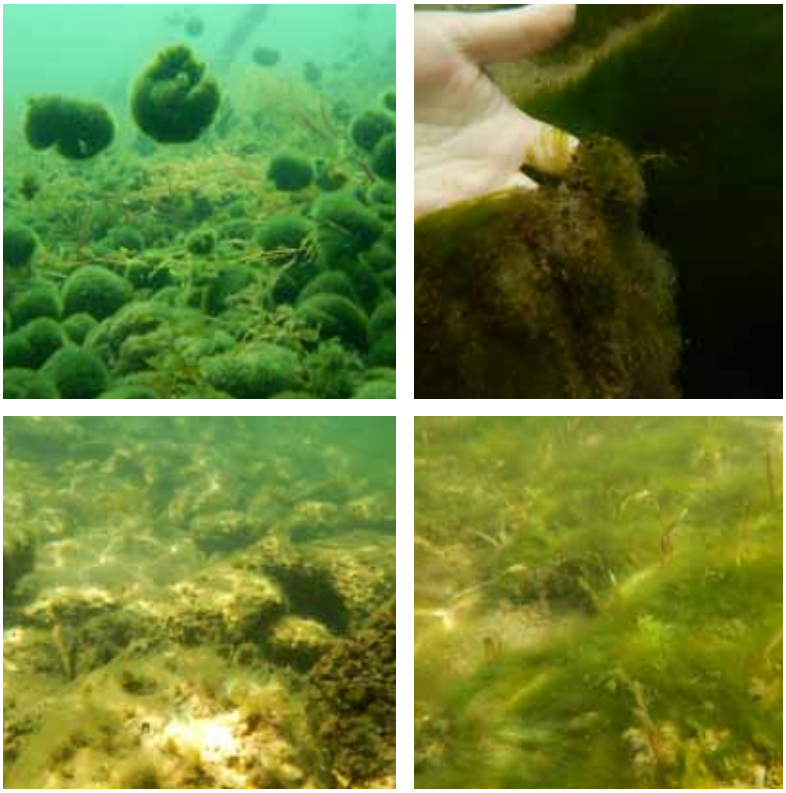

FIGURE 6-5 – *Excessive algae growth along the Town of Lake George shoreline documented during biomonitoring sampling in 2017.*

Overall, there is a concern regarding excessive levels of nutrients promoting excessive algae growth as identified by algae analysis protocols in the littoral (nearshore) zone along the shoreline indicating anthropogenic impacts and sources. There is also concern about the potential for Harmful Algae Blooms (HABs) as Lake George has been listed on the New York State Department of Environmental Conservation Priority List for Water Bodies and samples are indicating an increase in benthic cyanobacteria growth. In the NYSDEC HABs Action Plan for Lake George, onsite wastewater treatment systems replacement was listed as a Priority Project for the elimination of excessive nutrients, one of the causes of HABs.

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CHAPTER 7 - BACKGROUND, SEPTIC INITIATIVE PROGRAM, RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

7.0 BACKGROUND

The majority of the Lake George basin is rural without centralized utilities such as wastewater treatment. It is reported that almost 6,000 parcels utilize onsite wastewater treatment systems. Although there is a high number of systems, limited information is available on the status of the systems such as evaluation, inspection, or maintenance records to determine if the systems are functioning properly or impacting important water resources, such as the Class-AA Special water quality of Lake George.

The need for evaluating the impact of onsite wastewater treatment systems has been a long-standing concern in the Lake George basin. An evaluation was part of the 1982 United States Environmental Protection Agency (USEPA) Environmental Impact Statement on Wastewater Treatment Facilities for the Lake George-Upper Hudson Region that concluded there were areas where systems have existing or potential problems and are more prone to failures particularly where the density of buildings and/or small lots limit the land area available for treatment and disposal with minimal soils. There have been several other studies on the status and impacts of OWTSs in the Lake George basin prepared by state agencies and organizations. But these studies have had little success in addressing the concern of aging and outdated OWTSs and the need for improved onsite wastewater treatment and management.

7.1 TOWN OF LAKE GEORGE SEPTIC INITIATIVE PROGRAM

The FUND for Lake George and the Lake George Waterkeeper have monitored water quality to assess the impacts of changes in the watershed around Lake George through various projects. One documented area of concern was the Diamond Point area and Smith Brook, a tributary in Diamond Point, in the Town of Lake George and this is where the concept of the Town of Lake George Septic Initiative originated. These impacts, including excessive algae growth, chemical and biological assessments, prompted the Town of Lake George Board to formalize the program and the Lake George Consolidated Board of Health introduced the Septic Initiative Program, which mandated that all existing onsite wastewater treatment systems within the Town are to be catalogued and inspected with the goal that all OWTSs are functioning optimally.

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In 2015, the Town of Lake George Septic Initiative Program (SIP) was awarded a $104,000 grant through a New York State Department of Environmental Conservation (NYSDEC) Water Quality Improvement Program Grant. The goals and objectives for the grant include:

1. Detailed inventory and mapping assessment of all OWTSs in the Septic Initiative Program boundaries through an inspection and maintenance program;
2. Final Report that includes an analysis of this inventory, rated systems, and implementation actions;
3. Public workshops and training sessions;
4. Program outreach to adjacent municipalities in the Lake George basin;
5. Algae sampling and water quality sampling of problem areas found;
6. Partnership with THE FUND for Lake George to identify the most crucial properties in need of replacement systems, for which The FUND would provide grant funding to assist private property owner costs;
7. Installation of risers to grade for all septic system properties;
8. Education of homeowners and contractors; and,
9. Revisions to the Town Consolidated Board of Health Regulation Code.

The SIP involved all parcels within 500 feet of the shoreline of Lake George, the Critical Environmental Area surrounding Lake George as determined by the Lake George Park Commission, and 100 feet from Class AA-Special streams tributary to Lake George as well as wetlands designated by the Adirondack Park Agency. This totaled 548 parcels, including 137 vacant parcels, and were divided into four phases to allow for survey contact of property owners and to proceed with scheduling of inspections. The Diamond Point area was designated as the first phase since this was where the impacts first were determined through water quality and algae assessment and an inventory of existing systems was performed. Subsequent phases then were determined based on shoreline and geography.

The SIP was initiated with the mailing of a pre-inspection worksheet/survey that was designed to educate and assist the property owner to document their OWTS. This survey requested information on the design flows, number of bedrooms, septic tank and material, disposal field, age of the system, distance to surface waters, septic tank pumpout information, and a sketch of the system. This commenced the development of a detailed database that would be utilized throughout the project as a basis for evaluations and recommendations.

Town files were reviewed to add to the database, collecting the following information to evaluate and assess OWTS:

- **Age of Single-Family Dwelling/Structure –** The age of the structure could provide information of the age of the OWTS, potential system components, and pumpout requirements.
- **Age of OWTS –** Although the life expectancy of an onsite wastewater treatment system depends on many factors, most important being the maintenance, most experts place the typical range of life expectancy from 25-40 years until the system soil disposal area is ineffective. This occurs for several reasons. First, most systems are constructed to disperse effluent from the septic tank via gravity, which is the most simple and inexpensive to construct. However, gravity distribution of standard septic tank effluent is the least efficient method as distribution is uneven over the infiltration surface resulting in localized overloading creating a biomat (i.e. layer of sludge) that starts to clog the soils. Clogging of the soils can reduce the reaeration of the soil (flow of oxygen) necessary for biological treatment resulting in anaerobic conditions. The organisms that thrive under these conditions are less efficient at processing the waste material, which

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promotes the accumulation of waste materials causing further soil clogging and loss of infiltrative capacity. To compound the situation, biological forms that could break down the biomat (worms, insects, plants, etc.) would not be attracted by anaerobic conditions increasing clogging and loss of infiltration leading to system failure.

- **System Components –** There are three primary components of a conventional onsite wastewater treatment system – the septic tank, the wastewater absorption system (trench, absorption field, seepage pit), and the soil. Details of the system components include the number of units served, septic tank (size and material) and specific dispersal/treatment field and design (type [absorption field/bed, dimensions and distribution arrangement], and drywells [volume, dimensions]). The septic tank is the most commonly used wastewater pretreatment unit for OWTS and creates a condition that will slow the wasteflow down to allow the settling of solids as well as partially digesting organic solids in the form of sludge. Tanks that are undersized will allow the migration of solids, sludge, and scum from the tank to the absorption system where it will contribute to clogging and eventual system failure. Subsurface wastewater infiltration systems (absorption fields, trenches, seepage pits, etc.) provide both dispersal and treatment of water. The absorption systems are effective and passive treatment systems rely on the soils to treat the effluent through biological, physical (adsorption), and chemical means. The size of the systems should be based upon amount and type of wasteflow, soil's hydraulic capacity and texture, and the site conditions. Systems are typically trenches with high length-to-width ratios to increase the contact surface area with the soils to improve treatment. Seepage pits can be effective for wastewater dispersal, but they provide little treatment because they extend deep into the soil profile, where oxygen transfer and treatment are limited and the separation distance to groundwater is reduced. They are not recommended for onsite wastewater treatment. Cesspools are a form of seepage pits without the benefits of a septic tank for pretreatment for solids removal, resulting in very poor treatment and health and environmental impacts.
- **Record Documentation –** Review of the information available for the record of the system design and/or installation including engineering design drawings, permit drawings, as-built drawings/sketches, and/or owners sketch. Basically, any information that can detail the location and estimated age of the treatment system.
- **Pumpout/Maintenance –** Information provided by the owner regarding the recent pumpout of septic tanks, preferably documented with receipts or pumpout report.
- **Inspection/certification –** Information provided by the owner, design engineer, and/or the Town regarding the construction of the system, evaluation of the system during a pumpout, and/or determination the system is functioning adequately.

The typical conventional onsite treatment system is passive and requires little operator involvement. Periodic inspections and pumping are the only operation and maintenance requirements. Pumping is recommended to ensure proper performance and reduce the potential for failure by migration of solids from the septic tank out to the infiltration beds where they can clog the soils. Typically, the tank should be pumped every 3-5 years depending on the size of the tank, number of occupants, and water usage.

Once the data were evaluated from the surveys and the system inventory review, there was significant variance with the system design, maintenance, and understanding that will impact system performance and increase potential for failure. Typical causes of failure include unpumped and sludge-filled septic tanks, which

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result in clogged absorption fields and hydraulic overloading caused by increased occupancy and water use. Many high-use vacation homes served by systems installed under outdated standards can cause water quality impacts; outdated technologies like drywells and cesspools can result in contamination problems.

In an attempt to prioritize the need for system management, an evaluation system was developed to rank the properties in need of inspection. This ranking was based on four criteria – submission of a survey response (public awareness and involvement), pumpout records (property owner maintenance responsibility), system information (any knowledge of system components through property owner and/or Town records), and system inspection records (design professional certification, construction inspection and/or municipal oversight). These criteria were the basis for a three-tiered system to prioritize management and inspection:

- **Tier 1** – High Priority (no information on system, no survey response, no system compliance records);
- **Tier 2** – Mid-Level Priority (minimal system information [sketch or description/applicatio], no system compliance records); and,
- **Tier 3** – Lower Level Priority – only pumpout required (system information on file, survey received).

Based on the site conditions and the status of existing systems as determined by design, technology, and maintenance, it can be difficult for the Town to develop an effective management strategy. Antiquated and outdated systems will cause water quality impacts that can result in health and environmental impacts, but the Town needs to make the management decision necessary, such as where are priorities and what are such decisions based on. The FUND for Lake George and the Lake George Waterkeeper developed a system to help the Town prioritize their decisions and base those decisions on scientific data and engineering principles. First, site suitability conditions were determined, analyzed, and weighted to create a data set. Second, the elements of the system inventory were assessed and weighted based on the influence on the efficiency of treatment the existing system can provide to create another data set. Third, algae samples were taken and analyzed to determine potential water quality impacts. These data sets were then joined to create a Prioritization Algorithm to assist the Town in determining systems and areas to focus limited resources during initial stages of a Town management plan.

Site suitability analysis used GIS (global information system) to determine the best site for an onsite wastewater treatment system. This is accomplished by selecting factors that will influence how the system will function, and rating or weighing these factors to create the database. Table 10 details the site suitability characteristics and weightings:

TABLE 10 - SITE SUITABILITY FACTORS AND WEIGHTING

Item	Characteristic/Range
Steep Slopes	Above 15% = 1
	Below 15% = 0
Depth to Bedrock	Less than 1' = 1
	less than 2' = 0.5
	2' and above = 0
Depth Seasonal High Groundwater	Less than 1' = 1
	less than 2' = 0.5
	2' and above = 0

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Item	Characteristics/Range	Weighted
Stream Buffer	Greater than 100' = 0	26%
	Less than 100' = 1	
Shoreline Buffer	Greater than 500' = 0	
	Less than 500' = 1	
APA wetland	Within wetland = 1	
	Outside wetland = 0	
hydraulic conductivity (K_{sat})	0 to 3.52 micrometers/sec= 1	26%
	3.52 to 7.06 micrometers/sec= 0.5	
	7.06 to 423.33 micrometers/sec= 0	
	423.33 to 705 micrometers/sec= 0.5	

The existing system inventory analysis used GIS to determine how the OWTS is functioning based on a series of factors and placed the system on a map for location and analysis. The factors that were selected were taken from the inventory review and assessment and were determined to be the most influential on assessing the functioning and potential impacts from the OWTS. These factors were weighted based on the extent to which each factor could determine how the parcel's OWTS is functioning, could indicate a noncompliant system, and/or the system could be close to premature failure. The points assessed for system inventory evaluation were:

- System Age – 2 points
- System Components – 3 points
- System Maintenance – 3 points
- System Records – 1 point
- System Certification – 1 point

These two GIS databases were then merged through joins and relates process with the Algae Analysis to form the Priorization Algorithm and Map.

Wastewater management is an important component of water quality protection and treatment system failure can have health, environmental, and economic effects. Nutrients (especially phosphorus) from leaky septic systems play a major role in causing excessive algae growth in lakes and ponds. Excessive algae growth has been used to identify poorly operating septic systems on Lake George dating back to 1973. A sanitary sewer survey performed by the NYSDEC from 1973 was using excessive algae growth to look at questionable systems in the more heavily developed, non-sewered residential communities in the southern basin of Lake George. Excessive algae growth observed in 1973 was used as a basis for resurveys of continuing problems through 1981. It was stated that "Algae growth, which is noted along nearby shorelines, was used as a visual indicator of septic system problems". Algal Biological Assessments were incorporated in the Lake George Waterkeeper Stream Assessment Project in 2009 to use algae as a biomonitoring indicator for water quality assessments.

Algae sampling and assessment based on established protocols and standards have started to be applied as evidence of water quality impacts with possible connections to inadequately operating onsite wastewater treatment systems. Methods and

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metrics for algae biomonitoring summarized are a modified version of the United States Environmental Protection Agency Periphyton Protocols, New York State Department of Environmental Conservation Periphytic Biomonitoring Protocols, Palmer C.M. Pollution Tolerance Index, Nutrient Requirements under the National Water-Quality Assessment Program data set, and Lake George Index created under the Lake George Algae Monitoring Program. Analysis is performed for many protocols, but the Palmer Pollution Index and the Trophic Index are applied to the Priorization Algorithm.

Based on the analysis of the maps and GIS layers, the following is a list of Priorirty Areas for the Town of Lake George to focus management efforts:

1. North Diamond Point;
2. South Diamond Point;
3. Smokey Bear Area;
4. South Green Harbour;
5. Stebbins Brook Area;
6. Sunnyview Area;
7. Westover Cove;
8. Wiawaka Area;
9. Sand Pebble Cove; and,
10. Plum Point.

7.2 RESULTS AND CONCLUSIONS

The following results and conclusion have been developed after careful consideration of the data that was collected for the Town of Lake George Septic Initiative Project (SIP):

- There was a 34 percent response rate for the surveys sent to 397 property owners, which is much better than the 10 percent standard response rate based on research reported in the literature. The higher response rates for Phase I and II demonstrate the importance of additional municipal outreach consisting of phone calls and site visits.
- For system age, it can be estimated that just over one-third of the OWTSs are operating within their life expectancy of 30 years, one-third are near or past the life expectancy (30-40 years or greater); and there is no information for just under one-third of the systems. Based on these results and the number of older and unknown systems, there is a definite need for an inspection program.
- Nearly one out of five septic tanks are undersized for the required volume, which could result in hydraulic overloads to the treatment absorption area leading to premature system failure. Additionally, over one-third of the septic tanks volumes are unknown indicating a failure of maintenance pumpouts and/or lack of any understanding of the system, which can also result in premature system failure.
- There is a very low percentage of known metal tanks. It was felt this percentage would be higher due to the number of older systems; however, it should be noted that the septic tank material is not known for many of the properties in the inventory and may actually be more based on the number of unknown tanks.
- Over 40 percent of the residential properties are serviced by wastewater treatment systems that appear to have compliant systems with properly sized septic tanks and absorption fields, based on assumptions of standard percolation rates for the region.

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- One in five parcels (20 percent) have no information on their wastewater treatment systems, which indicates that there has been no inspection and/or maintenance, which is the leading cause of failure.
- One in five systems (20 percent) utilize drywells that have reduced treatment efficiencies and have a greater potential for input of pollutants into groundwater.
- There is not a high number of cesspools but there are significant health and environmental impacts from a single cesspool.
- Over half of the parcels that were surveyed and/or reviewed for the project have no record of maintenance/pumpout and/or have never been pumped out, which is a concern from an operational perspective as this will lead to increased system failures and from a treatment perspective through reduced efficiency.
- When the unknown pumpout percentage per phase is analyzed, Phase I is much lower than any other phase(28 percent). This could be attributed to more time and contact with the property owners through the survey and individual contact. This demonstrates that greater municipal involvement and education outreach lead to increased maintenance.
- Inspection analysis shows the benefit of the municipal outreach regarding educating property owners on inspection and maintenance. Phase I has the highest percentage for Tier 3 requiring just pumpouts and demonstrates the success of the additional time the Town had for homeowner outreach and subsequent inspections.
- Overall, one-third of the properties are classified as Tier 1 and lack significant information on the OWTS, design, and maintenance, a factor leading to system failure.

These results and conclusions provide justification for the development of a Town management program for onsite wastewater treatment systems based on the overall age, amount of unknown information, and lack of routine maintenance.

7.3 RECOMMENDATIONS

The following recommendations have been developed after careful consideration of the survey and site inventory data collected for the Town of Lake George Septic Initiative Program:

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MANAGEMENT

Short-term (Year 0-1)	Mid-Term (Year 1-3)	Long-Term (Year 3-5)
• Set inspection program as per recommended inspection priority properties focusing on Tier 1 • Develop GIS Database of Inventory Assessment for the Town Planning and Zoning Department	• Review NYSDEC State Pollutant Discharge Elimination System (SPDES) Permits and Inspections and add to inventory database. • Work with NYSDEC to ensure routine inspections of SPDES Permit systems. • Consider the establishment of subwatershed management districts for improved inspection, management, and funding similar to the Town of Queensbury. • Investigate a reduced cost pumpout program secured by the Town for properties within the Project Area. This would require properties to guarantee to schedule a routine pumpout once every 3 years and could be arranged through establishing a management district. • Consider improving treatment methodologies including time dosed dispersal for better effluent distribution reducing soil impacts and reducing dispersal depth to increase biological uptake and treatment.	• Research development of test pilot program for new technologies and practices in the Lake George basin. Partner with organizations like New England Interstate Water Pollution Control Commission (NEIWPCC), National Sanitary Foundation (NSF), Massachusetts Test Center to identify products and collect performance data for residential onsite treatment systems to become a center for OWTS testing in New York State. • Create an Operation and Maintenance Service through the Planning & Zoning Department, a professional providing service to the public (check operation, perform routine maintenance and repairs, upgrade when necessary, collect system records, troubleshoot).

OUTREACH

Short-term (Year 0-1)	Mid-term (Year 1-3)	Long-term (Year 3-5)
• Provide presentation to Town Planning and Zoning Board, and Consolidated Board of Health • Contact municipal Town Boards and Planning/Zoning Departments in the basin to schedule presentations.	• Prepare educational brochure for Town residents on the LGSIP, available information, and the findings of the assessment. • Create a page on the Town website dedicated to onsite wastewater treatment systems to provide information on new technologies, maintenance, publications, and links to websites. • Co-host the second Septic Summit with The FUND for Lake George.	

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REGULATION

Short-term (Year 0-1)	Mid-term (Year 1-3)	Long-term (Year 3-5)
Adopt Septic System Inspection Transfer Law.		Require all dwellings to install water conservation fixture devices to reduce burden on absorption systems and have the Town seek sustainability grant funding to accomplish.

MONITORING

Short-term (Year 0-1)	Mid-term (Year 1-3)	Long-term (Year 3-5)
Compare algae biomonitoring results to inspection priority properties.	Develop a monitoring study of onsite wastewater treatment systems with residents to collect data on system efficiency and impacts.	Implement long-term algae biomonitoring program to create database and document improvements to water quality.

FUNDING

Short-term (Year 0-1)	Mid-term (Year 1-3)	Long-term (Year 3-5)
• Work with The FUND for Lake George for grant funding to address identified Priority Areas. • Work with other Warren County municipalities and Warren County Planning Department to have Warren County apply to New York State Environmental Funding Corporation to be placed on NYS Infrastructure Grant Program for funding for septic system replacement. • Apply for funding for system upgrade program listed in the NYSDEC Lake George Harmful Algal Bloom (HAB) Action Plan under Consolidated Funding Application NYSDEC HAB Initiative.	• Investigate partnership with local lending organizations for water quality improvement loans to provide low or no interest loans for onsite treatment system upgrades/replacements. • Seek financial support from environmental foundation for water quality protection through application of innovative solution(s).	Create a watershed management improvement district for the Project Area that would establish a PILOT (Payment In Lieu of Taxes) Program to allow property owners who replace and/or upgrade their septic systems to take that cost off their property assessment, which could be implemented within an established management district.

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APPENDIX A – TOWN OF LAKE GEORGE SEPTIC INITIATIVE PROGRAM MAPPING

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FIGURE A-3 – *Phase III Phase Map*

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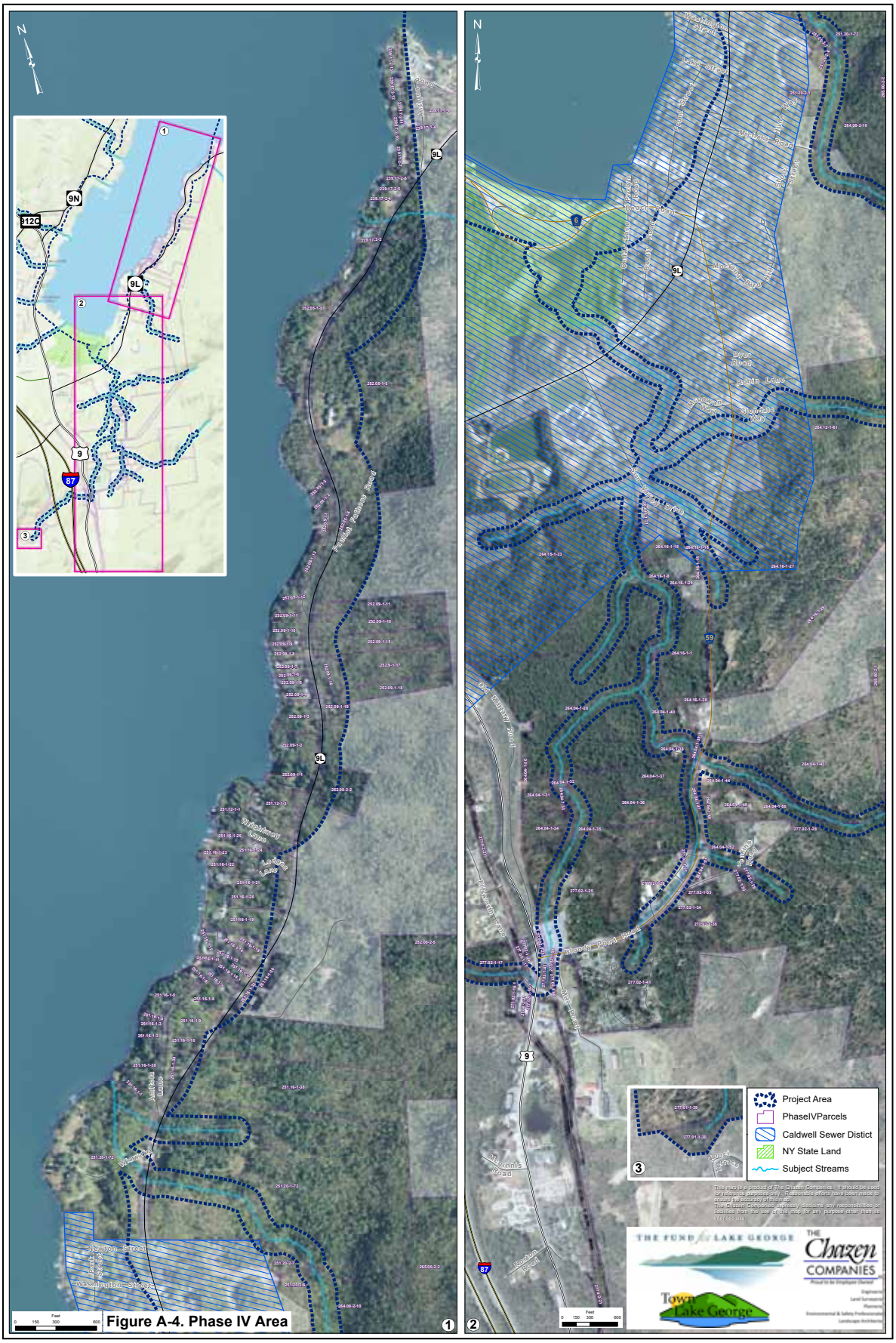

Figure A-4. Phase IV Area

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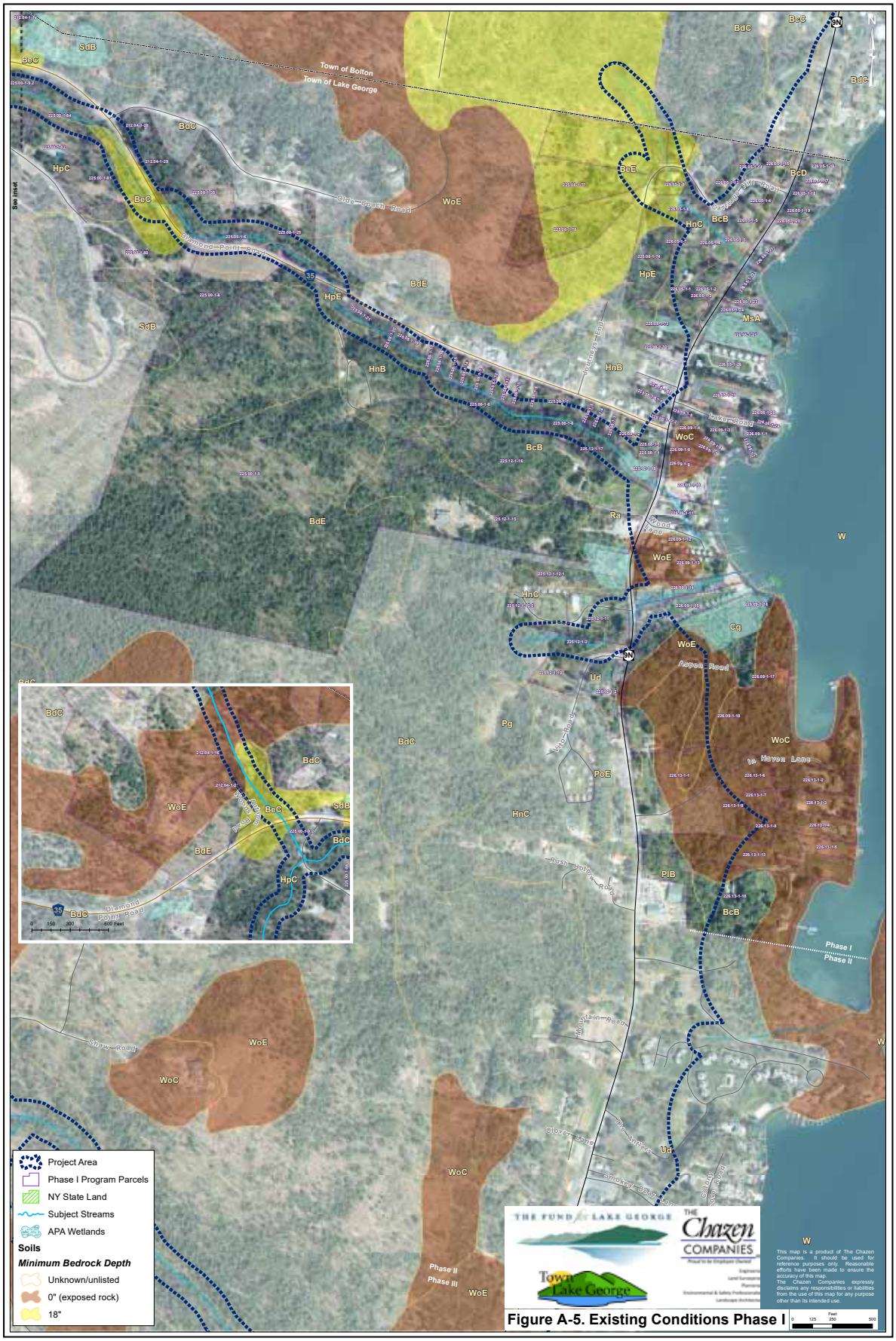

Figure A-5. Existing Conditions Phase I

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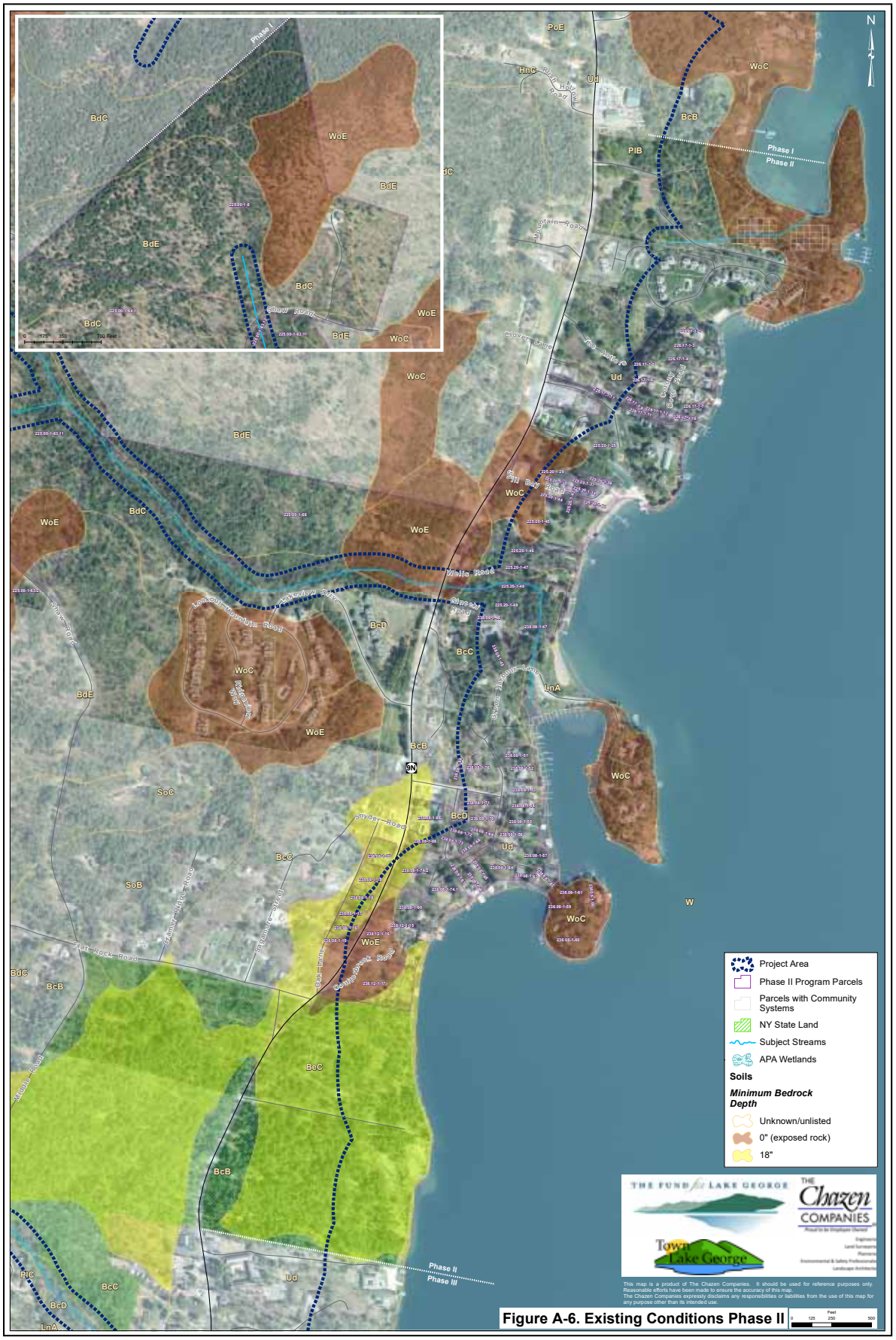

Figure A-6. Existing Conditions Phase II

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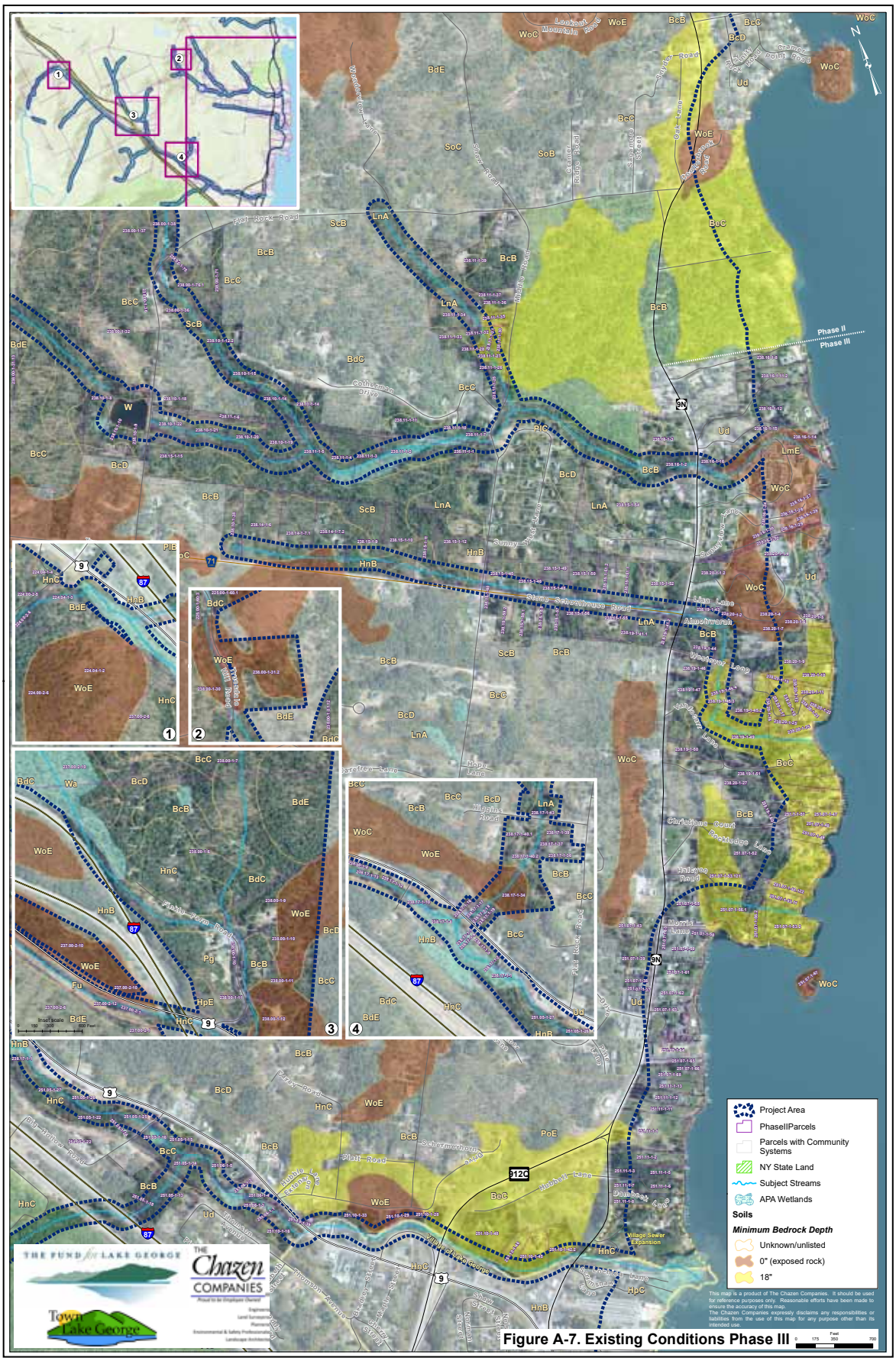

Figure A-7. Existing Conditions Phase III

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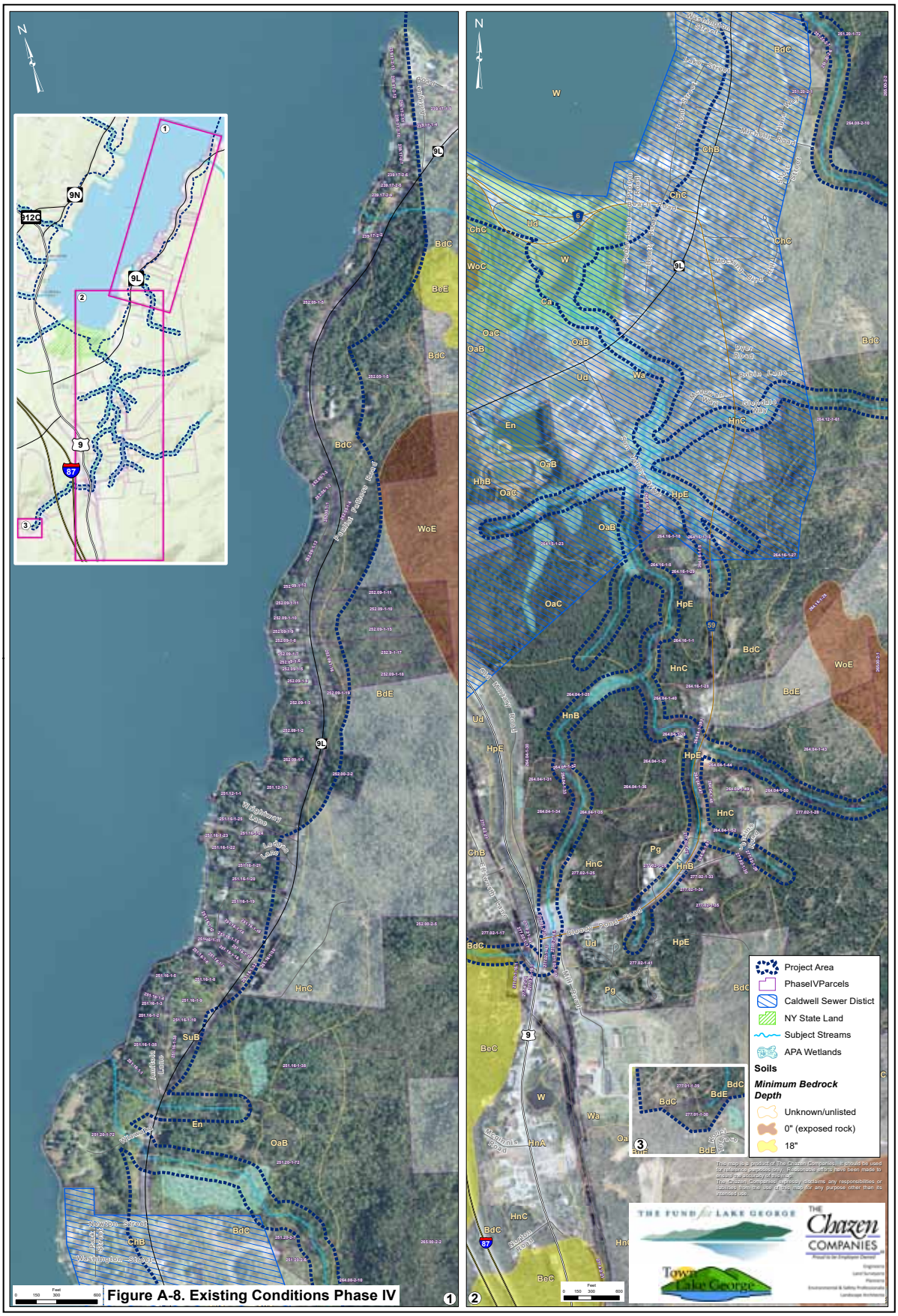

Figure A-8. Existing Conditions Phase IV

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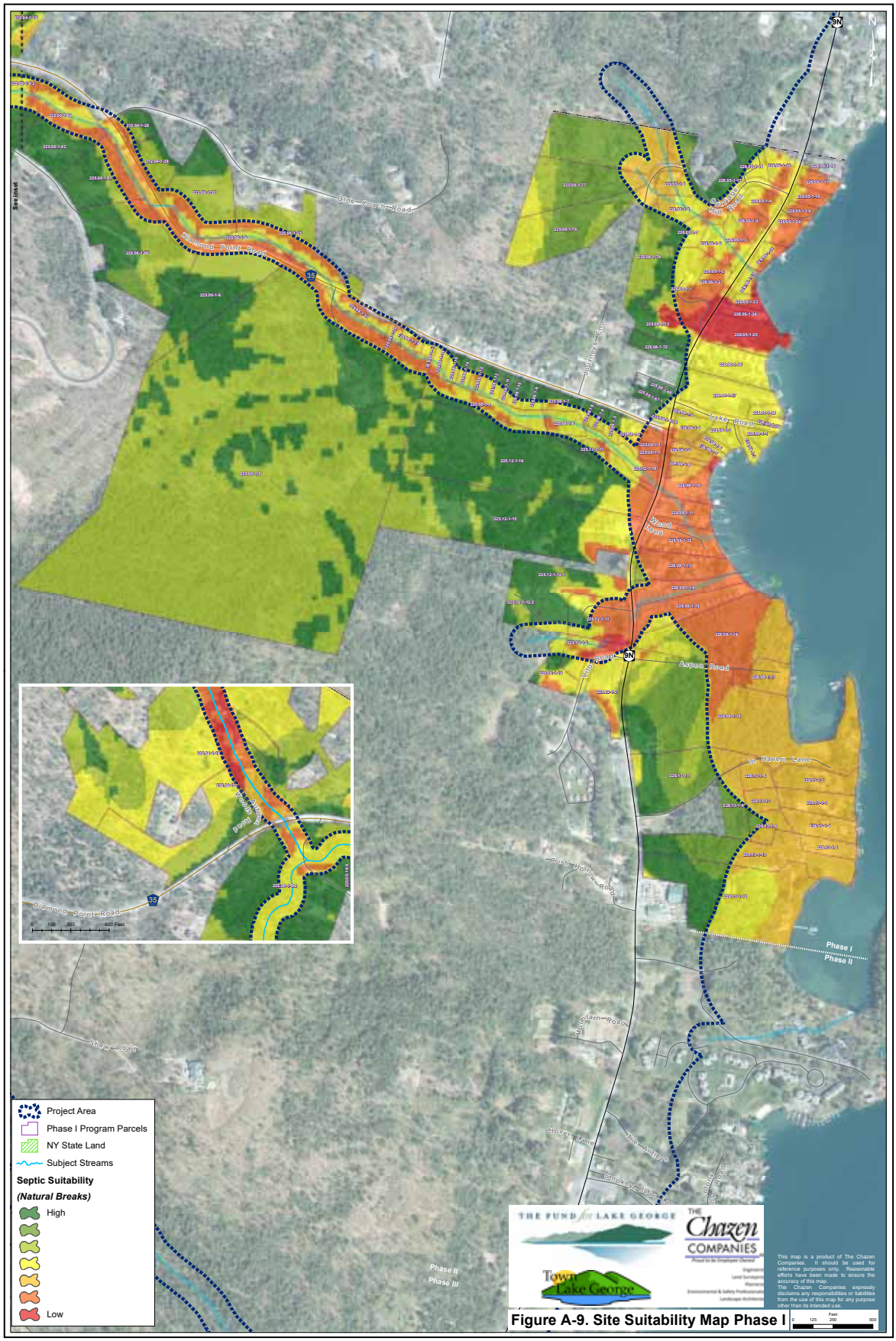

FIGURE A-9 – *Phase I Site Suitability Map*

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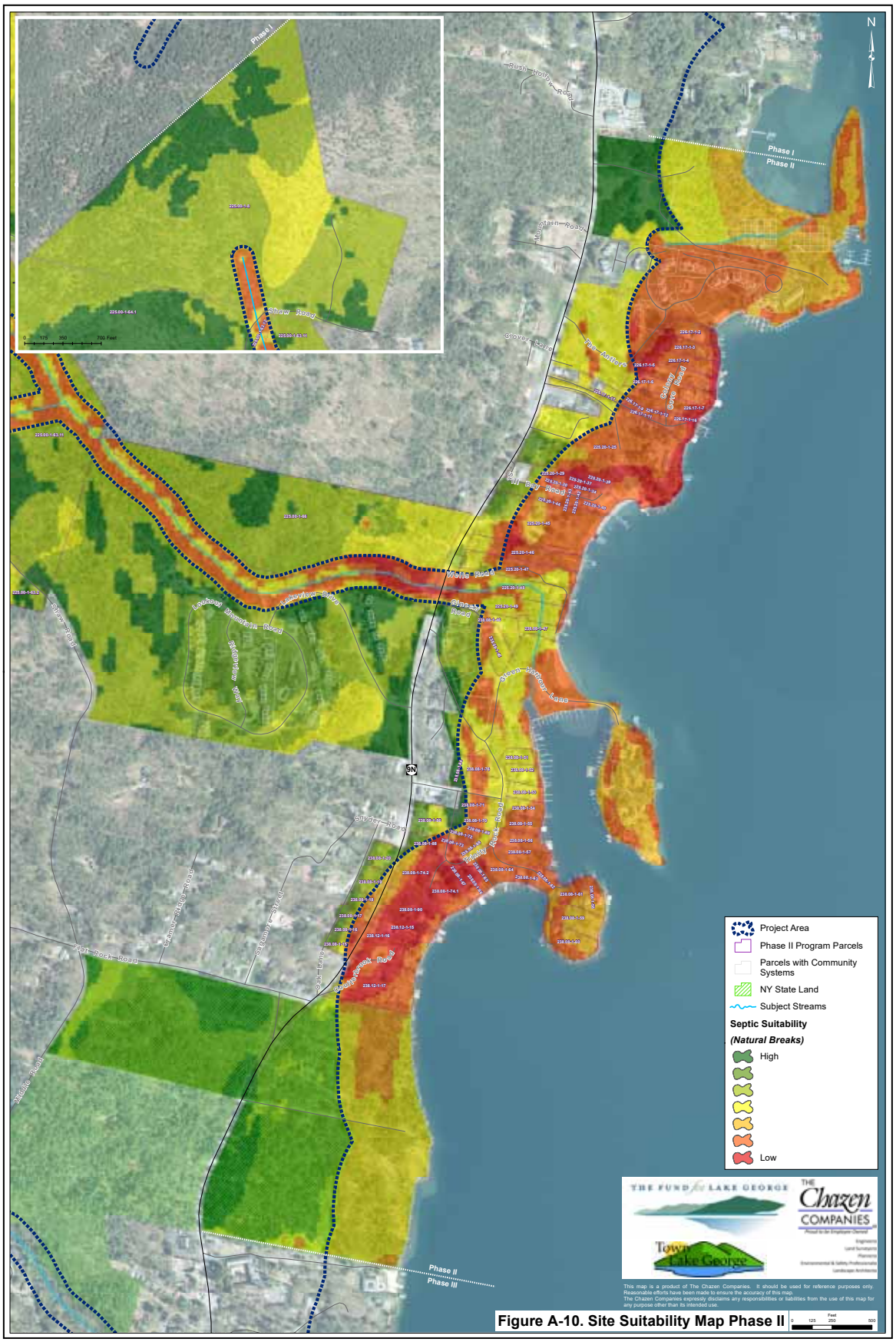

Figure A-10. Site Suitability Map Phase II

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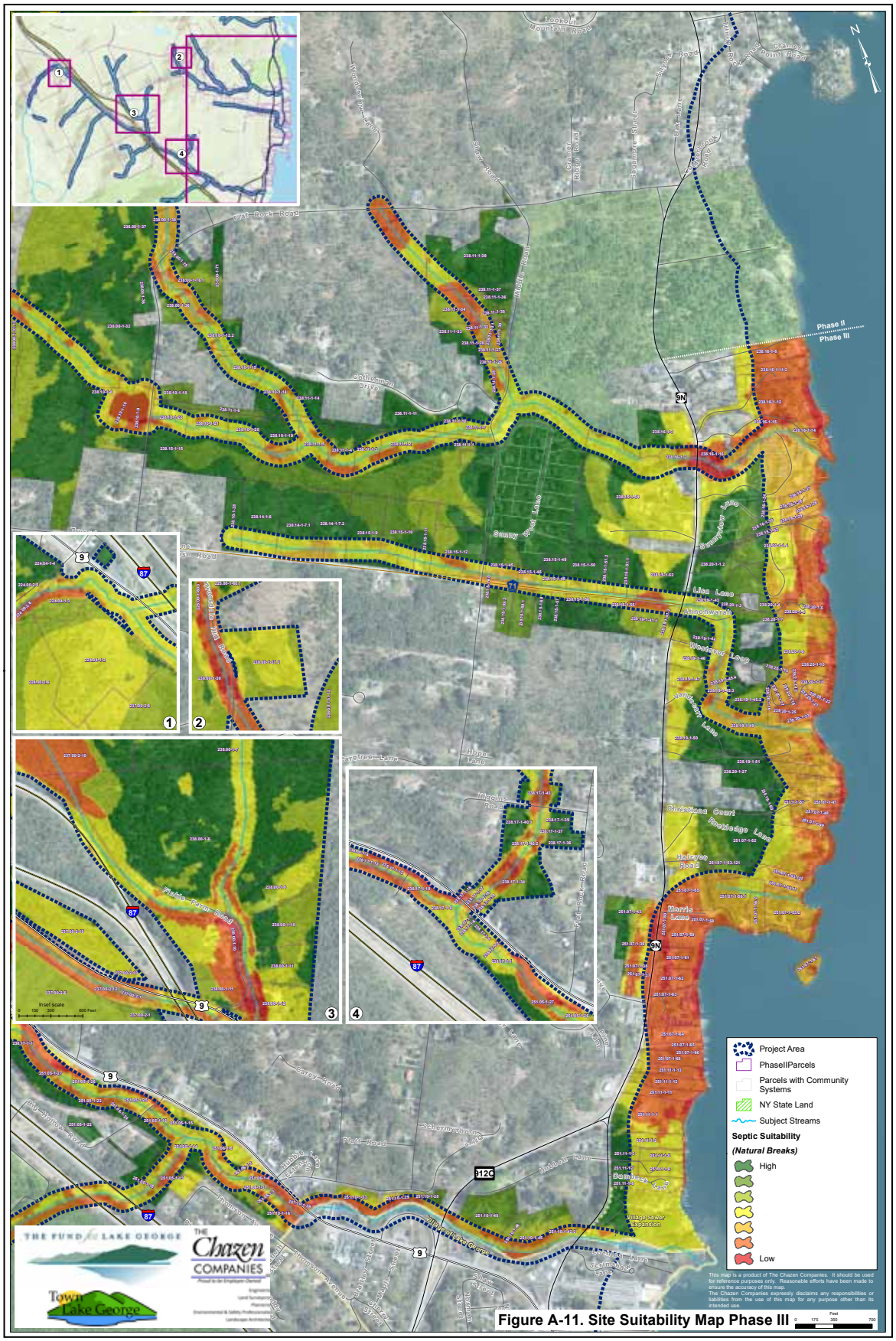

Figure A-11. Site Suitability Map Phase III

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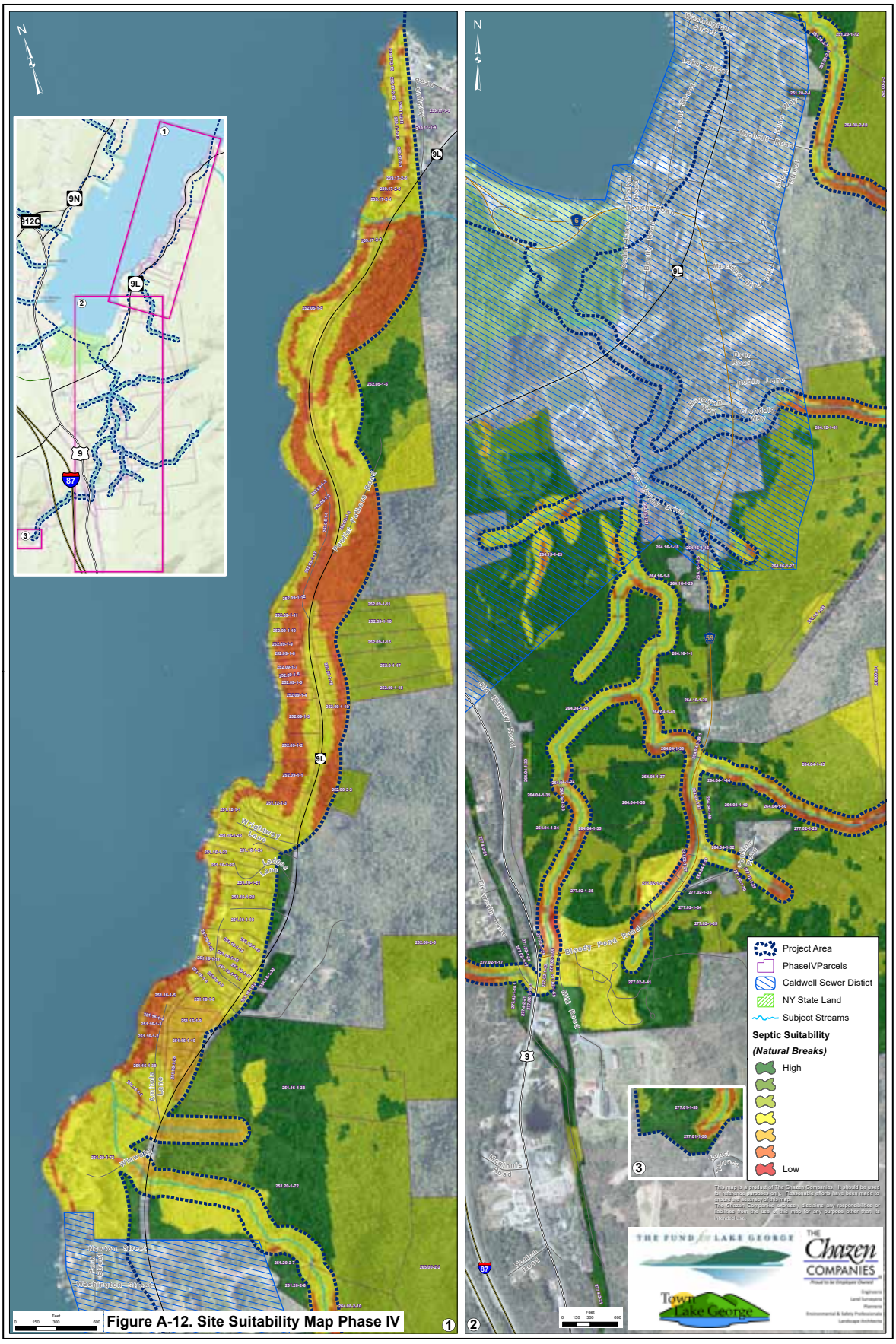

Figure A-12. Site Suitability Map Phase IV

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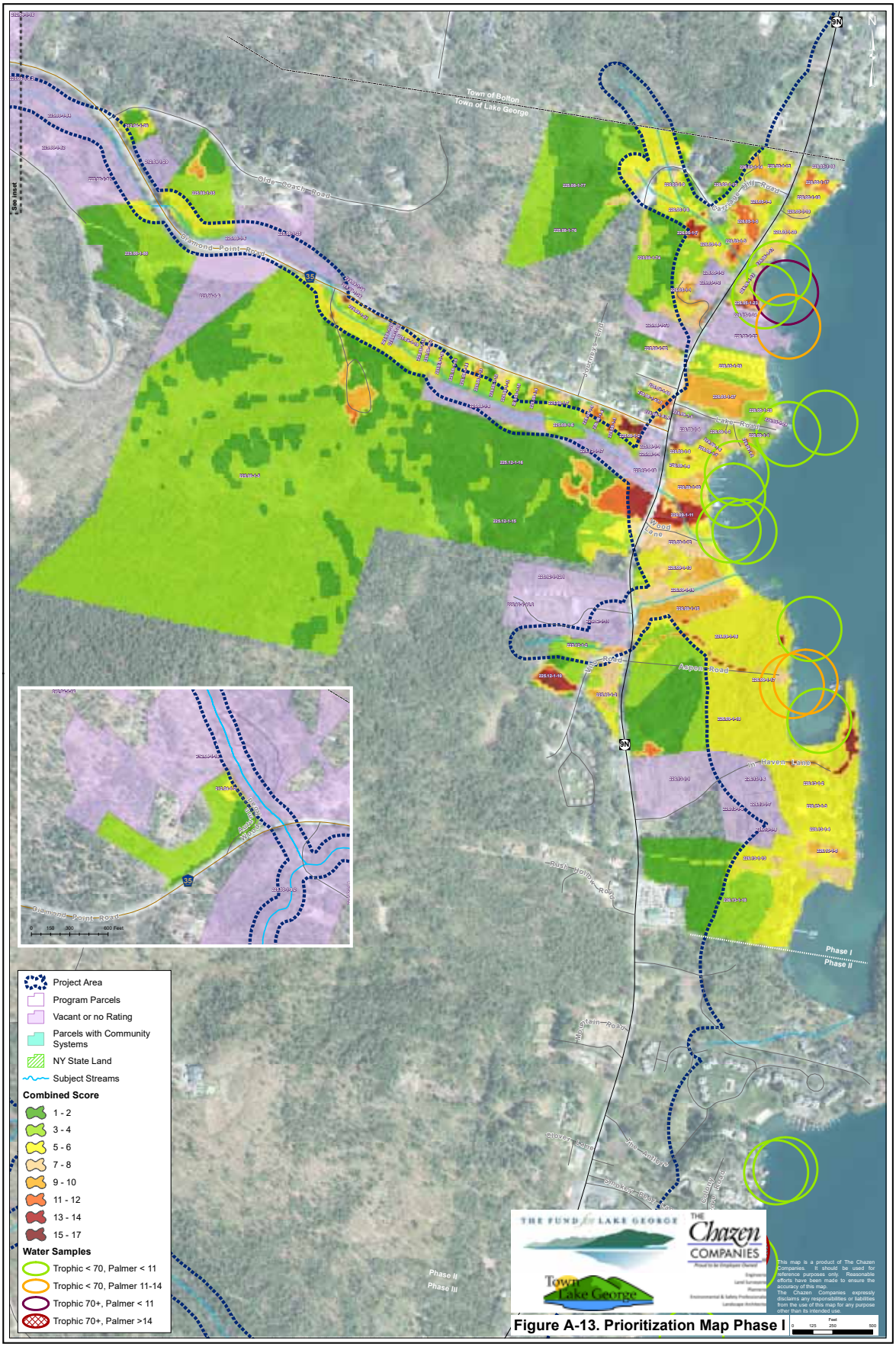

Figure A-13. Prioritization Map Phase I

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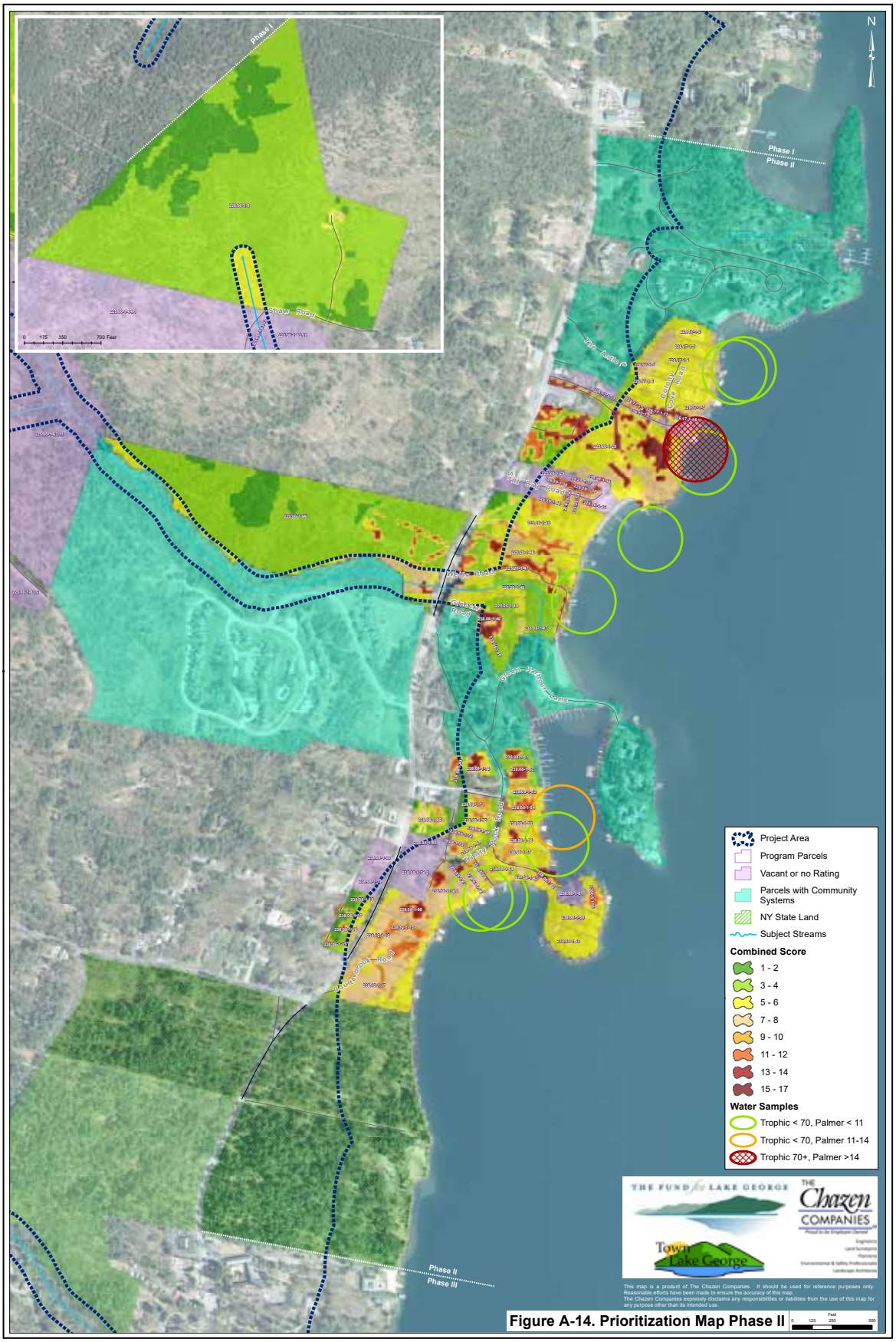

Figure A-14. Prioritization Map Phase II

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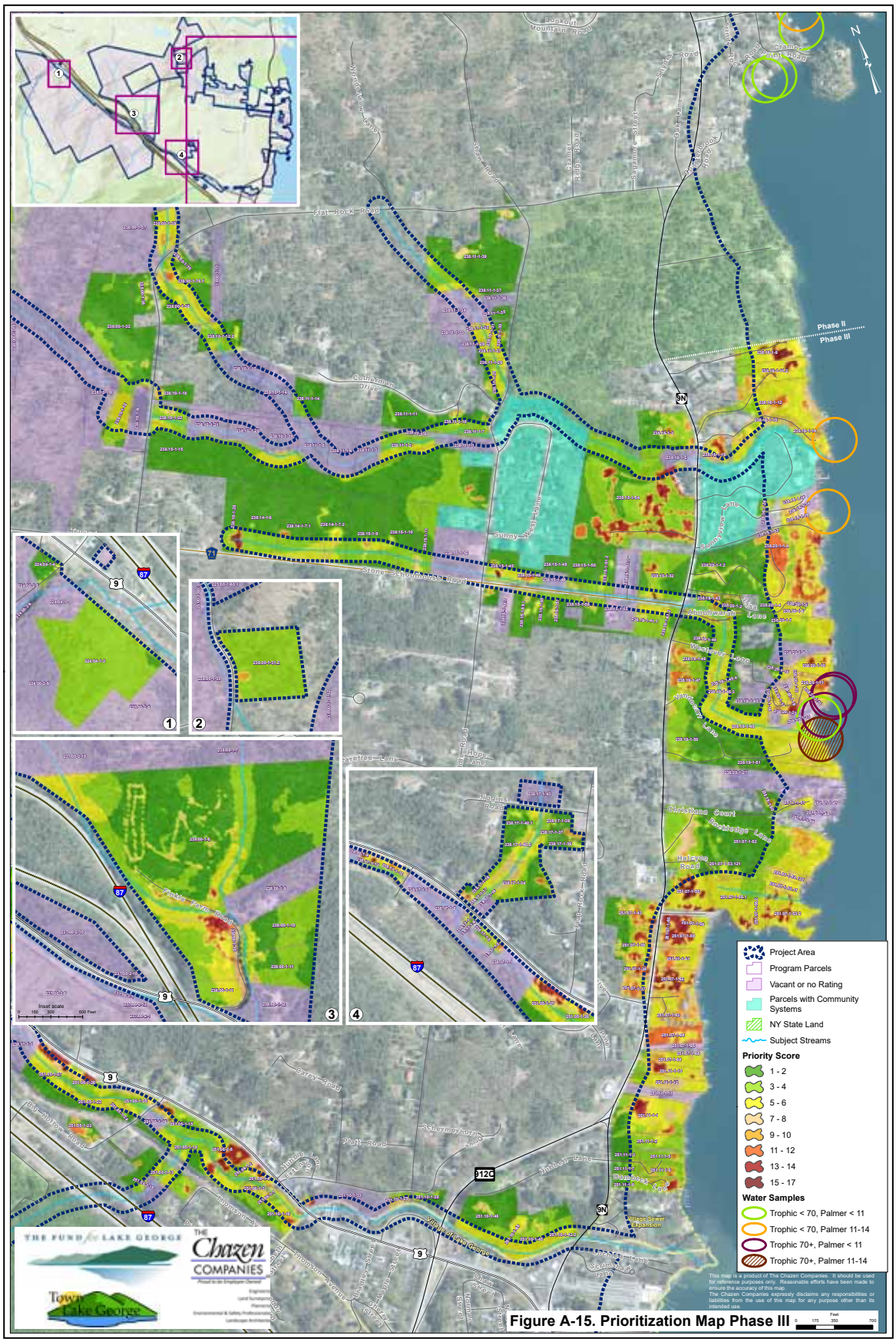

Figure A-15. Prioritization Map Phase III

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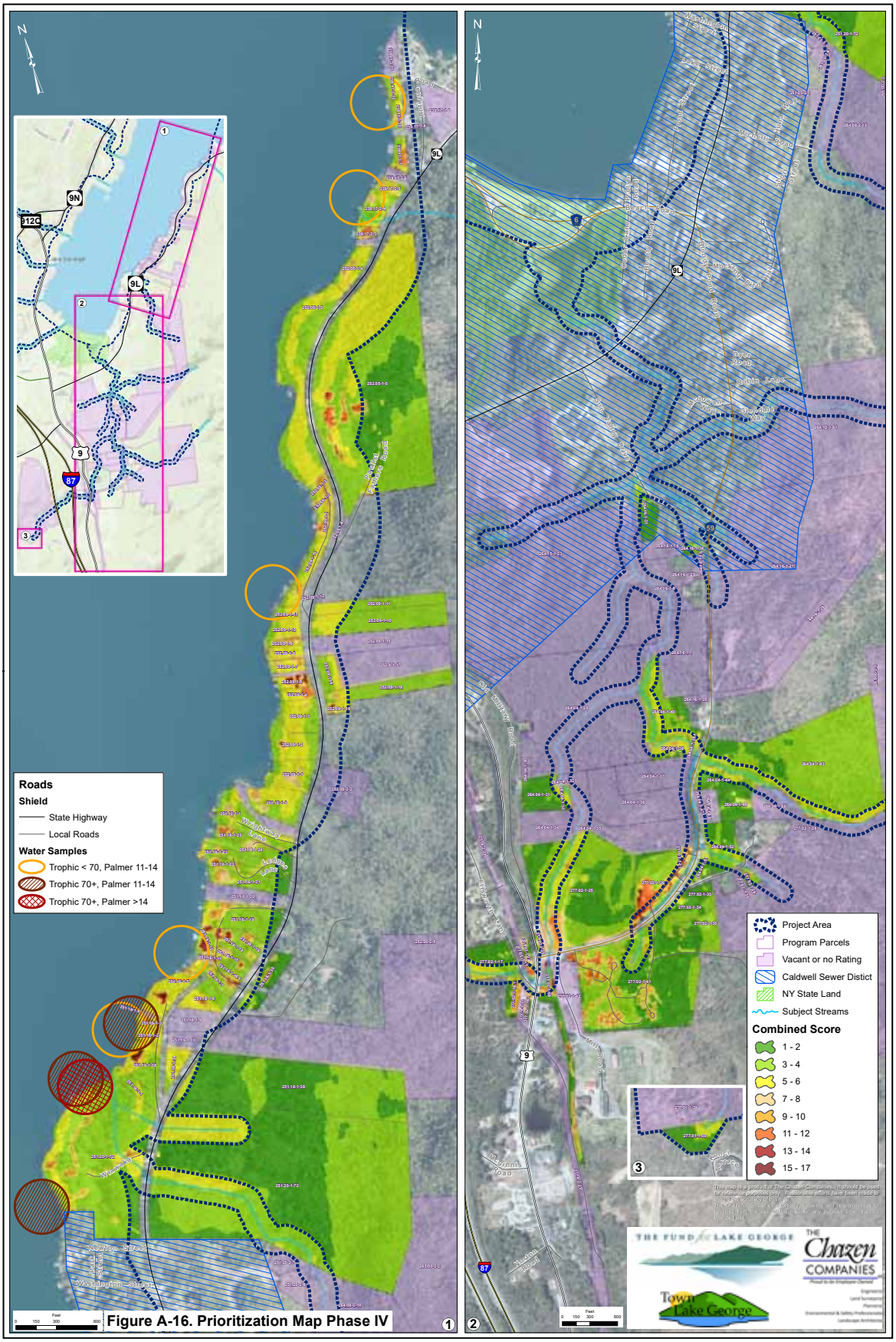

Figure A-16. Prioritization Map Phase IV

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APPENDIX B – TOWN OF LAKE GEORGE SEPTIC INITIATIVE PROGRAM PUBLIC OUTREACH

Public Outreach

Septic Summit & Training Sessions

Municipal Outreach

TOWN OF LAKE GEORGE SEPTIC INITIATIVE PROGRAM
PUBLIC MEETING #1
SEPTEMBER 13, 2016

GENERAL INFORMATION:

The Town of Lake George is designated to promote the health, safety and welfare of the Town and its residents as well as preserve and protect the beauty and character of the Lake George Park and the waters of Lake George and its tributaries to the benefit of the community. (*Town of Lake George Code 175-3).* The majority of properties in the Town are serviced by onsite wastewater treatment systems or septic systems, which work well if they are installed in areas with appropriate soils and hydraulic capacity; designed to treat the incoming wasteloads to meet public health and groundwater standards; installed properly and maintained to ensure long-term performance. For these reasons, the Town of Lake George determined it was necessary to evaluate the condition of onsite wastewater treatment systems and began the Lake George Septic Initiative Program in 2013.

HISTORICAL INFORMATION:

- The rate of failure of septic systems in the Lake George watershed is probably between 5% and 15%, depending on which set of survey data is used and how "failure" is defined. *(The Plan for the Future of the Lake George Park, 1987)*
- Nutrients from leaky or failing septic systems play a major role in causing excessive algae growth in lake and ponds and when overgrown algae and plants die rapidly and decompose, oxygen is removed from the water, which threatens dish and other aquatic animals. Wastewater from septic systems that reaches adjacent surface waters also increases the chance that wildlife, swimmers and downstream users are exposed to infectious bacteria and viruses that are associated with wastewater. *(Cornell University, 2011)*
- Stream Assessment Studies by the Lake George Waterkeeper observed changes in the Smith Brook watershed in the Diamond Point area where specific conductance (indicator of instream pollution) of all monitoring points were higher than the mean for the entire Lake George basin, biological monitoring indicated downstream sections were slightly impacted and algae assessment indicated downstream sections were slightly impacted based on Pollution Tolerance Index. *(Keppler, 2009) (Parnapy, 2009*

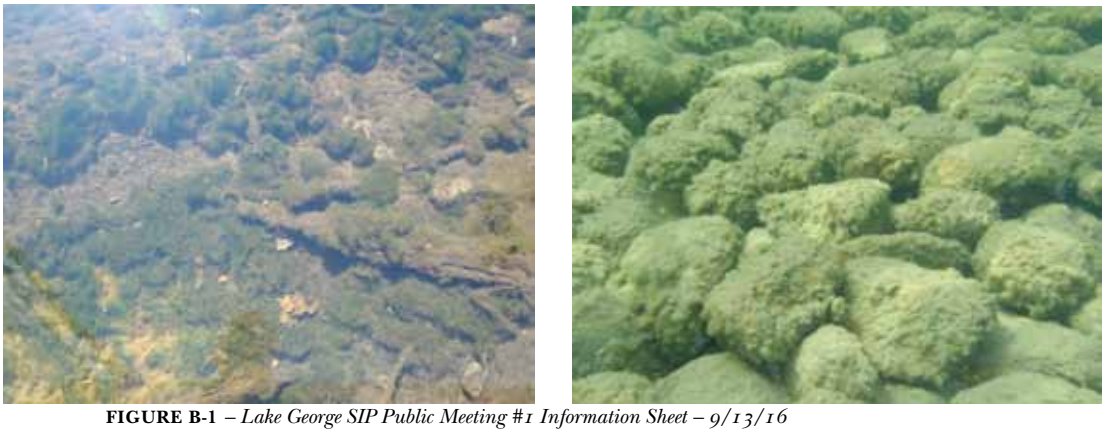

FIGURE B-1 – *Lake George SIP Public Meeting #1 Information Sheet – 9/13/16*

PROPOSED PROGRAM:

- The Town of Lake George will work with consultants to develop a data inventory of all properties within the designated Project Area, which was determined to be properties within 500 feet of Lake George and 100 feet from streams flowing into Lake George.
- The inventory will assimilate information from Town files regarding the design and construction of systems, including but not limited to the age, components, design size and maintenance. Any properties where information was not available in Town files would be sent a simple survey form and request for a non-invasive site observation/inspection.
- The Town will work with consultants to develop GIS mapping of the Project Area to delineate influencing factors on the operation of septic systems including slope and soil conditions and assist in designating potential areas of prioritization.
- The Town will work with consultants to develop an algae and water quality sampling program to determine potential connections between negative sampling results and condition of septic systems in the vicinity.
- The Town with work with consultants to develop a report to prioritize areas for system upgrade and replacement based on the assessment of the compiled data including system inventory, limiting site conditions, and sampling results.
- The Town with work from the consultants will hold Public Workshops to discuss the proposed program, objectives, goals, findings and summary of Final Report.
- The Town with work from consultants will host Training Sessions for professional designers and contractors on inspection and system design to improve knowledge of how systems function, to determine condition and improved design options.
- The Town will hold municipal outreach to other municipalities within the Lake George watershed to demonstrate how the Septic Initiative can be implemented to benefit the residents and preserve the water quality of Lake George and its tributaries.

FIGURE B-1 – *Lake George SIP Public Meeting #1 Information Sheet – 9/13/16*

Lake George Septic Initiative Program

September 13, 2016

Public Information Meeting #1

Download full PDF of the Power Point Presentation
https://www.dropbox.com/s/li7fttb2p5u8zbb/B2%20-%20SIP%20information%20meeting%209.13.2016.%20FINAL.pdf?dl=0

FIGURE B-2 – *Lake George SIP Public Meeting #1 Presentation – 9/13/16*

TOWN BOARD MEETING ATTENDANCE SIGN-IN

DATE: 12-10-18 (530pm Septic Initiative Workshop)

Please ***PRINT*** your **Name and Address** clearly to assure the correct spelling in the minutes of this meeting.

	NAME	ADDRESS
1.	J R Cox	LC
2.	CHRIS HAVITSKY	LAKE GEORGE WATERKEEPER
3.	Marylou Vosburgh	28 Beach
4.	Melissa Santabarbara	31 Beatty Rd
5.	Lorenzo Santabarbara	31 Beatty Rd
6.	[illegible]	#5 Sixth St
7.	Haley Posenowski	Queensbury
8.	Kim Rodrigues	16 Beatty Rd
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FIGURE B-3 – *Lake George SIP Public Meeting #2 Public Sign-In – 12/10/18*

Lake George Septic Initiative Program

December 10, 2018

Lake George Town Board Information Meeting

Download full PDF of the Power Point Presentation
https://www.dropbox.com/s/82mt76k6z8aqiof/B4%20-%20SIP%20information%20meeting.LGTB.%2012.10.2018.%20FINAL.pdf?dl=0

FIGURE B-4 – *Lake George SIP Public Meeting #2 Presentation – 12/10/18*

FIGURE B-5 – *Septic Summit Flyer – 3/30/17*

AGENDA

TIME: 8:00AM – 4:30PM

VENUE: Six Flags Great Escape Lodge

WELCOME (8:30-8:35)
- Dennis Dickinson, Town of Lake George Supervisor
- Eric Siy, Executive Director, The FUND for Lake George

INTRODUCTORY REMARKS (8:35-8:45)
- *Septic Systems: The Good, The Bad and The Unknown* - Tom West, West Law Firm
- Chris Navitsky – Lake George Waterkeeper

KEYNOTE SPEAKER (8:45-9:20)
- *An Overview of New York City's Source Water Protection Program and Septic Strategies* - Dave Warne – Assistant Commissioner, New York City Department of Environmental Protection

RESEARCH (9:20 – 10:20)
- *Pharmaceuticals, Artificial Sweeteners, and Other Emerging Contaminants as Indicators for Septic System Impact* – Laurel Schaider, PhD, Silent Spring Institute
- *Algae and Biomonitoring Indicating Organic Pollution* – Corrina Parnapy, Winooski Natural Resources Conservation District

BREAK (10:20 - 10:50)

FIGURE B-6 – *Septic Summit Presentation Agenda – 3/30/17*

REGULATORY/MANAGEMENT (10:50 – 12:00 noon)

- *Septic Systems – Making the Best Using What You Have* - George Heufelder, Massachusetts Alternative Septic System Test Center
- *Lake George Septic Initiative Program* – Dan Barusch, Director of Planning, Town of Lake George; Paul Cummings, The Chazen Companies

LUNCH (12:00 – 1:00)

PRODUCTS (1:00 – 3:00)

- *Eljen GSF Overview* – Jim King, Vice President, Eljen Corporation
- *Clarus Systems* – Darren Meyers, PE, Applications Engineer, Zoeller Company
- *PuraSys and Puraflo System Overview and Nitrogen reduction for lake communities* – Justin DaMore, Morning Star Distributors
- *Advanced Enviro-Septic (AES) Treatment & Disposal System Training Presentation* - Justin DaMore, Morning Star Distributors

BREAK (3:00 – 3:30)

CASE STUDIES (3:30 – 4:15)

- *Otsego Lake Onsite Wastewater Treatment Systems Management Program* – Win McIntyre, Watershed Coordinator, Water Resources Management
- *North Queensbury Wastewater Disposal District No. 1 (Dunhams Bay)* – Alan Wrigley, Chair, & Barbara Simms, Vice-Chair, Dunhams Bay Advisory Committee

CLOSING REMARKS - Future of Wastewater Management in the Lake George Watershed

FIGURE B-6 – *Septic Summit Presentation Agenda – 3/30/17*

Thank you to our Sponsors!

Please visit their displays in the foyer today and
their websites found at fundforlakegeorge.org/septicsummit.

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Orenco Orenco Systems, Incorporated

Presby Environmental PEI THE NEXT GENERATION OF WASTEWATER TREATMENT TECHNOLOGY

FIGURE B-7 – *Septic Summit Sponsors and Vendors – 3/30/17*

Septic System Inspection Training

Town of Lake George

TUESDAY MARCH 17, 2015

8:00 AM — 4:00 PM

Location: Town of Lake George Offices
20 Old Post Rd
Lake George, NY

New York Onsite Wastewater Treatment Training Network

Participants are instructed on how to conduct and document a thorough septic system inspection typical of a realty transfer. Various aspects of the inspection process are reviewed using training scenarios, videos and standardized OTN inspection and reporting forms for New York.

PDH 's
- Design Professionals
- Code Enforcement Officers
- Land Surveyors
- Architects

COST: $199.00



Register Today
Name_____ Title_____
Bus/Org_____ Email_____
Address_____
Day Phone_____

Make Check Payable to NYOTN
Return registration form and payment to: Lisa Jackson CEO OTN
609 Kings Rd. Catskill NY 12414
For questions please call: 518-772-6139

FIGURE B-8 – *Lake George Onsite Training Network Inspection Class – 3/17/15*

ONSITE SALES & SERVICE, LLC

ENGINEER DESIGN TRAINING

Presby Environmental Advanced Enviro-Septic treatment system

Onsite Sales & Service and Miller's Ready Mix will be hosting an engineer design training for Presby Environmental Advanced Enviro-Septic treatment system. The training will cover design, installation, and maintenance using the Presby Environmental AES system. This is a wonderful opportunity to see firsthand how this revolutionary system should be designed. There are NO fees for this opportunity, but it is invite only and we require advanced RSVP to kbozony@nycap.rr.com. Lunch will be provided. There will be 3 CEU credits earned from P.I.E. for attending this training. Please join us!

Miller's READY MIX CONCRETE & BLOCK

August 5, 2014 Tuesday

11am – 2pm

Town of Lake George Town Hall
20 Old Post Rd
Lake George, New York 12845

NSF

Sponsored by:

Presby Environmental PEI

RSVP by August 1, 2014

Kathy Bozony, Environmental Program Manager
Septic Initiative Program Town of Lake George

FIGURE B-9 – *Lake George Presby Training – 8/5/14*

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Come to Our Certification Training Session

Friday, Nov. 16, 2018
9:00 am – 1:00 pm

GSF®

Lake George Town Hall
(right behind the High School)
20 Old Post Road
Lake George, NY 12845

Lunch will be provided

For more information or to register, please call 800-444-1359

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FIGURE B-10 – *Lake George Eljen Corporation Training – 11/16/18*

Town of Lake George

Dennis Dickinson, Supervisor
Vinnie Crocitto, Deputy Supervisor
Marisa Muratori, Councilperson
Dan Hurley, Councilperson
Nancy Stannard, Councilperson
Dan Barusch, Director P&Z

Deborah Foley, Town Clerk
20 Old Post Road *Rachel Jacobs, Comptroller*
Lake George, NY 12845 *Lori Barber, Assessor*
518-668-5722 *Doug Frost, Enforcement Assistant*
Fax: 518-668-5721 *Dan Davis, Superintendent, Highway*
www.lakegeorgetown.org *Jim Martino, Buildings & Grounds*

January 8, 2018

Ron Conover, Supervisor
Town of Bolton
P.O. Box 7
Bolton Landing, NY 12814

Supervisor Conover,

On May 29, 2013 the Lake George Consolidated Board of Health instituted a *Septic Initiative Program* to catalogue and inspect existing onsite wastewater treatment systems (OWTS) within the town. Based on this initiative, the town is in the process of gathering information regarding individual OWTS from all residents and businesses within 500ft of Lake George and 100ft of all classified AA-Special streams. Residents are asked to complete and submit a **Pre-Inspection Worksheet for Onsite Wastewater Treatment Systems**. This worksheet requests information about the type of septic system on each property, the location of individual OWTS (tank and field), the age of the home, the age of the OWTS, the system's overall functionality and requires the property owner to submit their most recent pump out information if available.

The Consolidated Board of Health within the Town of Lake George governs the design of replacement onsite wastewater treatment systems and is responsible to implement the Public Health Law and Sanitary Code of the State of New York. Therefore, it is the responsibility of the town to ensure that all onsite wastewater treatment systems are functioning properly and fall within appropriate criteria.

When properly designed, installed and maintained an OWTS can be very effective. Unfortunately, Lake George's water quality, and most importantly its drinking water, is being impacted by septic systems not functioning optimally or in certain cases, failing. Inadequate septic systems, lack of routine OWTS maintenance, increased seasonal usage, undersized and overused systems, and the installation of OWTS on sites with unacceptable soil conditions are contributing factors to wastewater treatment failure and resulting pollution.

This *Septic Initiative Program,* which has been funded for the Town of Lake George by a Department of Environmental Conservation (DEC) Water Quality Improvement Program (WQIP) grant, will be truly successful if all municipalities surrounding Lake George participate (or start their own similar program) and commit to address individual OWTS that are of concern within each community. In the past two years, DEC has allocated more grant funding for these WQIP projects focused on septic

FIGURE B-11 – *Letter to Supervisors Re: Lake George Septic Initiative*

system management, and it is likely that if the Town were interested in joining in the Initiative or start their own program it could be funded by the State.

We would like to coordinate a meeting with all Supervisors and/or select Town Board members and Planning/Zoning Administrators surrounding Lake George to discuss your thoughts on joining with the Town of Lake George in this important program lake wide, or to potential jump start a similar pilot program of your own based on the Lake George program. This invitation has been sent to all Town Supervisors within the Lake George Park in anticipation that one or two collective meetings may be scheduled.

We would appreciate it if you would please contact Dan Barusch, Director of Planning and Zoning (dbarusch@lakegeorgetown.org or 518-668-5131[x5]), or Chris Navitsky - Lake George Waterkeeper and the Lake George Septic Initiative Program consultant (cnavitsky@lakegeorgewaterkeeper.org or 518-668-5913) to coordinate and schedule a meeting to discuss your participation in this program. We look forward to talking with you about this program and improving water quality of Lake George. Thank you.

Sincerely,

Dennis Dickinson
Town Supervisor
supervisor@lakegeorgetown.org
518-668-5722

"Lake George…America's Family Playground"

FIGURE B-11 – *Letter to Supervisors Re: Lake George Septic Initiative*

Town of Lake George

Dennis Dickinson, Supervisor
Vinnie Crocitto, Deputy Supervisor
Marisa Muratori, Councilperson
Dan Hurley, Councilperson
Nancy Stannard, Councilperson
Dan Barusch, Director P&Z

Deborah Foley, Town Clerk
20 Old Post Road *Rachel Jacobs, Comptroller*
Lake George, NY 12845 *Lori Barber, Assessor*
518-668-5722 *Doug Frost, Enforcement Assistant*
Fax: 518-668-5721 *Dan Davis, Superintendent, Highway*
www.lakegeorgetown.org *Jim Martino, Buildings & Grounds*

January 8, 2018

Paul Ferguson, Supervisor
Town of Dresden
1 Lillians Way
Clemons, NY 12819

Supervisor Ferguson,

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FIGURE B-11 – *Letter to Supervisors Re: Lake George Septic Initiative*

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Sincerely,

Dennis Dickinson
Town Supervisor
supervisor@lakegeorgetown.org
518-668-5722

"Lake George…America's Family Playground"

FIGURE B-11 – *Letter to Supervisors Re: Lake George Septic Initiative*

Town of Lake George

Dennis Dickinson, Supervisor
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Deborah Foley, Town Clerk
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Lake George, NY 12845
518-668-5722
Fax: 518-668-5721
www.lakegeorgetown.org

Rachel Jacobs, Comptroller
Lori Barber, Assessor
Doug Frost, Enforcement Assistant
Dan Davis, Superintendent, Highway
Jim Martino, Buildings & Grounds

January 8, 2018

Richard Moore, Supervisor
Town of Fort Ann
80 George Street
Fort Ann, NY 12827

Supervisor Moore,

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www.lakegeorgetown.org *Jim Martino, Buildings & Grounds*

January 8, 2018

Edna Frasier, Supervisor
Town of Hague
9793 Graphite Mountain Road
P.O. Box 509
Hague, NY 12836

Supervisor Frasier,

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FIGURE B-11 – *Letter to Supervisors Re: Lake George Septic Initiative*

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www.lakegeorgetown.org *Jim Martino, Buildings & Grounds*

January 8, 2018

John Strough, Supervisor
Town of Queensbury
742 Bay Road
Queensbury, NY 12804

Supervisor Strough,

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January 8, 2018

Joseph Giordano, Supervisor
132 Montcalm Street
PO Box 471
Ticonderoga, NY

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FIGURE B-11 – *Letter to Supervisors Re: Lake George Septic Initiative*

Lake George Septic Initiative Program

December 6, 2018

Supervisors Information Meeting

Download full PDF of the Power Point Presentation
https://www.dropbox.com/s/fqnpa53laaskimt/B12%20-%20SIP%20information%20meeting.Supervisors.%2012.06.2018.%20FINAL.pdf?dl=0

FIGURE B-12 – *Lake George SIP Supervisor Information Presentation – 12/6/18*

APPENDIX C – TOWN OF LAKE GEORGE CODE AMENDMENTS

Chapter 115

ON-SITE WASTEWATER TREATMENT SYSTEMS

GENERAL REFERENCES

Sewer districts — See Ch. 136.

Subdivision of land — See Ch. 150.

Zoning — See Ch. 175.

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

ARTICLE I
General Provisions

§ 115-1. Title.

Chapter 115 shall be known as the "Town of Lake George Onsite Wastewater Treatment System (OWTS) Ordinance."

§ 115-2. Applicability.

Chapter 115 shall apply to on-site wastewater treatment systems serving properties and receiving sewage without the admixture of industrial wastes or other wastes, as defined in Environmental Conservation Law § 17-0701, in quantities of less than 1,000 gallons per day. New York State Department of Health, Lake George Basin and applicable New York State Department of Environmental Conservation standards shall be followed for nonresidential systems and for residential systems with a design flow of more than 1,000 gallons per day.

§ 115-3. Scope.

A. Minimum requirements for systems less than 1,000 gallons per day are hereby set forth governing the design, construction, installation, operation and maintenance of on-site wastewater treatment systems, together with procedures relating thereto, in implementation of the Public Health Law and Sanitary Code of the State of New York (NYS 75-A). No person shall construct, alter, enlarge or extend any sewage treatment system contrary to the provisions of these regulations.

B. In the case of a new or existing on-site wastewater treatment system which exhibits evidence of septic system failure, as judged by the Consolidated Board of Health, the rehabilitation and/or reconstruction of the system shall be in compliance with this chapter.

C. Any extension, addition or alteration to any on-site wastewater treatment system shall be in compliance with Chapter 115.

§ 115-4. Purpose.

The purpose of the Consolidated Board of Health Regulations is to promote the health, safety and general welfare of the community by the elimination of existing pollution and the prevention of new pollution with control over proposed on-site wastewater treatment systems and the modification of existing on-site wastewater treatment systems in order to ensure adequate protection of water resources.

§ 115-5. Definitions.

As used in this Chapter 115, the following words or acronyms shall have the meanings ascribed to them unless a contrary meaning is clearly indicated in

the content of the chapter. Words not defined in this section shall have the ordinary meaning found in common usage.

APA — The Adirondack Park Agency.

BAFFLE — A flow-deflecting device used in septic tanks to check or inhibit the velocity of a stream of flow or the discharge of floating and suspended solids. See the definition of "sanitary tee."

BUILDING — A structure wholly or partially enclosed with exterior or party walls and a roof, affording shelter to persons, animals or property.

CBOH — The Lake George Consolidated Board of Health.

CENTRALIZED WASTEWATER AND/OR POTABLE WATER SUPPLY FACILITIES — Facilities serving three or more structures.

COMMUNITY SEWAGE SYSTEM — Any system, whether publicly or privately owned, serving three or more individual premises for the collection and disposal of sewage or industrial wastes of a liquid nature, including various devices for the treatment of such sewage or industrial wastes.

DISTRIBUTION BOX or DEVICE — A device used to uniformly distribute sewage to the distribution lines.

DISTRICT — The Lake George Consolidated Health District.

DOMESTIC WASTE — Normal household waste, including waste from garbage grinders and automatic washing machines.

EMERGENCY REPAIRS — Repairs designed to prevent or abate an imminent threat to the public health, safety or welfare, caused or about to be caused by an individual sewage disposal system.

ENFORCEMENT OFFICER — The person appointed by the Town Board whose duty and authority it is to administer and enforce the provisions of an order, with assistance from the Lake George Consolidated Board of Health.

GARBAGE — Organic solid wastes from domestic and commercial preparation, cooking or dispensing of food or from the handling, storage and sale of produce.

GRADE — The slope of a line of pipe, trench bottom or ground surface in reference to a horizontal surface.

GRAVEL — A mixture of mineral soil particles whose individual diameters range from 1/4 inch to three inches.

GROUNDWATER — Subsurface water occupying a zone of saturated soil.

HEALTH OFFICER — The duly appointed and acting health officer of the Town of Lake George Consolidated Health District.

IN EXISTENCE/EXISTING SYSTEM — With respect to individual sewage disposal systems, that such structure has been substantially commenced or completed.

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

INDIVIDUAL SEWAGE TREATMENT SYSTEM — A complete system of piping, tanks or other facilities for the on-site collection, treatment and disposal of sewage and not connected to a community or public sewerage system.

INDUSTRIAL WASTE — Liquid waste, other than domestic waste, resulting from the processes employed in industrial and commercial establishments.

INSPECTOR — A person designated by the Town Board of Lake George to inspect properties which are covered by the regulations of the Lake George Consolidated Health District.

INVERT — The bottommost point of an open conduit or the bottommost point on the inside of a closed conduit.

LGPC — The Lake George Park Commission [Environmental Conservation Law (ECL) § 43-0105].

NYSDEC — The New York State Department of Environmental Conservation.

NYSDOH — The New York State Department of Health.

PARK — The Lake George Park.

PERCOLATION — The movement of water downward through the pores of a soil or other porous medium following infiltration through the soil surface.

PERCOLATION TEST — A standard procedure for testing soil permeability to determine the sewage application rate.

PLANNING AND ZONING OFFICE — The Town of Lake George Planning and Zoning Office.

REGULATIONS — The regulations of the Lake George Consolidated Health District, as amended from time to time by the Lake George Consolidated Board of Health and adopted by the Town Board.

SANITARY TEE — Pipe fitting used in septic tanks to reduce flow velocities so as to increase solids settling in the tank and prevent carryover of solids.

SEEPAGE PIT — A covered pit with open-jointed lining through which septic tank effluent may seep or leach into surrounding ground.

SEPTIC SYSTEM FAILURE — The condition produced when a subsurface sewage treatment system does not properly contain or treat sewage or causes or threatens to cause the discharge of sewage on the ground surface or into adjacent surface or groundwaters.

SEPTIC TANK — A watertight receptacle which receives any discharge, exclusive of industrial wastes, from the sanitary drainage system of a building or facility. The tank is designed to provide sufficient detention time to segregate and digest solid organic matter and discharge the settled liquid for eventual dissipation into surrounding soils by means of a soil treatment area or a system of open-joint or perforated piping.

SEWAGE — The combination of human and household wastes with water which is discharged to the home plumbing system; the waste from a flush

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

toilet, bath, sink, lavatory, dishwashing or laundry machine or the water-carried waste from any other fixture or equipment or machine.

STATE SANITARY CODE — The Public Health Law and Sanitary Code of the State of New York.

SUBSURFACE ABSORPTION SYSTEM — Any system constructed below the surface of the ground, employed to dissipate sewage effluent.

SURFACE WATER BODY — Any lake, pond, river, stream, wetland or an intermittent stream with a defined bed and banks.

TOWN — The Town of Lake George.

TOWN BOARD — The Town Board of the Town of Lake George.

TOWN CLERK — The Town Clerk.

WATER RESOURCES — Sources of water those are used, or potentially useful for potable consumption. This includes, but is not limited to, water drawn from private wells, public water systems, and aquifers.

WATERCOURSE — A channel fed from permanent or natural sources, including rivers, creeks, runs and rivulets. There must be a channel, usually flowing in a particular direction (though it need not flow continuously) and usually discharging into some other channel or body of water.

WETLANDS — Any land annually subject to periodic or continual inundation by water and commonly referred to as a "bog," "swamp" or "marsh," which is one acre or more in size, or located adjacent to a body of water, including a permanent stream, with which there is free interchange of water at the surface, in which case there is no size limitation. Open waters immediately adjacent to wetlands and lands entirely surrounded by wetlands will be considered part of the wetlands if these areas are essential to the preservation of the wetland vegetation.

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

ARTICLE II
Requirements

§ 115-6. Compliance required.

The following criteria shall govern the installation of on-site wastewater treatment systems:

A. Installation. On-site wastewater treatment systems, or other private means of wastewater treatment, shall not be approved where a public sewer system, such as a municipal wastewater treatment plant and collection system, is available. All sewage treatment systems shall be discontinued when public sewers are made available. The treatment of industrial waste shall be in accordance with the regulations of the NYSDEC and the District.

B. Design. The design of the sewage treatment system shall take into consideration location with respect to wells, surface water bodies, topography, water table, soil characteristics, percolation rate, wastewater flows, area available and maximum occupancy of the building.

C. Type of system. The type of system to be installed shall be determined on the basis of location, soil permeability and groundwater conditions, including, but not limited to, depth to the seasonal high groundwater, and bedrock.

D. Sewage. The system shall be designed to receive and treat all sewage from the building or buildings, including wastes from garbage grinders and automatic washing machines. Drainage from basement footings or from roofs shall not enter the system. Industrial wastes shall not be discharged into the individual sewage treatment system when their introduction would interfere with proper operation of the system.

E. Site requirements (APA Q4).

(1) Conventional systems. The following criteria for conventional systems must be evaluated for all new on-site wastewater treatment systems. The CBOH and/or the Planning and Zoning Office have the ability to vary/waive these standards as necessary. Additionally, 100% replacement areas for soil treatment areas may be considered.

(a) Conventional trench (including gravelless systems).

[1] Depth to seasonal high groundwater: minimum 48 inches.

[2] Depth to bedrock: minimum 72 inches.

[3] Slope equal to 15% or less.

[4] Percolation rate of one to 60 minutes per inch.

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

[5] Trenches are constructed wholly within the existing native soil.

(b) Conventional absorption bed.

[1] Depth to seasonal high groundwater is minimum 48 inches.

[2] Depth to bedrock: minimum 72 inches.

[3] Slope equal to 8% or less.

[4] Percolation rate of one to 30 minutes per inch.

[5] Beds are constructed wholly within the existing native soil.

(c) Conventional shallow trench.

[1] Depth to seasonal high groundwater: minimum 24 inches.

[2] Depth to bedrock: minimum 48 inches.

[3] Slope should be 8% or less, with a maximum of 15% or less.

[4] Percolation rate of one to 60 minutes per inch.

[5] Trenches are constructed with the bottom of the trench within the existing native soil.

(2) Deep-hole test pit requirements.

(a) At least one deep-hole test pit is required for each proposed system.

(b) Deep-hole test pits must be described by a qualified soil evaluator.

(c) Minimum depth of deep-hole test pit is six feet.

(d) Sewage treatment systems are not allowed on sites where the natural soil materials have been disturbed by excavation, removed or covered by more than 12 inches of fill.

(e) In areas that have percolation rates faster than 10 minutes per inch and overlie primary and principal aquifers as defined by NYSDEC, the absorption system design may need to be modified to provide enhanced treatment.

(3) Soil treatment area (STA) slope calculation. Maximum slope allowed is 15% where slopes are calculated as the ratio of the maximum vertical rise or fall of the land in 50 feet of horizontal distance, measured across the absorption field and expressed as a percentage.

(4) Soil percolation rates.

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

(a) Percolation rates must be one to 60 minutes per inch.

(b) Percolation rate of zero to one minute per inch is not suitable for subsurface absorption systems unless the soils are amended and the site is modified by blending with a less permeable soil to reduce the infiltration rate throughout the area to be used (Appendix 75-A, Soil and Site Appraisal).

(c) Percolation rate of one to three minutes per inch requires the separation distance from water bodies to be 200 feet unless soils are amended and the site is modified by blending with a less permeable soil to reduce the infiltration rate throughout the area to be used (Appendix 75-A, Soil and site appraisal).

(5) Piping distances.

(a) No piping a distance of 250 feet or more.

(b) No piping across wetlands, water bodies, rights-of-way, property lines or soils with any limiting feature.

(6) Alternative systems. If unable to comply with § 115-6E(1), alternative systems, as defined in NYSDOH Appendix 75-A standards for alternative systems, may be considered upon review by the Consolidated Board of Health if the minimum site requirements on individual parcels cannot be met for preexisting lots, vacant lots permitted prior to the effective date of this chapter, or the replacement of lawfully existing on-site wastewater treatment systems installed prior to the effective date of this chapter. A separate approval from NYSDOH for an alternative system may also be required.

F. Elements of on-site wastewater treatment systems.

(1) House sewer; collecting sewers and related components.

(2) Septic tank or other type of approved treatment method.

(3) Wastewater distribution device such as a distribution box or dosing chamber.

(4) Subsurface effluent treatment system or approved enhanced treatment unit (ETU).

G. Only wastes from plumbing fixtures shall be connected to the sewage treatment system. Stormwater control devices, including roof, cellar, foundation, yard and road drainage, shall not only be directly excluded from the sewage treatment system, but shall be disposed of so that they will not adversely affect the system. Disposition of stormwater in proximity to treatment systems shall be satisfactory to the CBOH.

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

H. Backwash from water softeners shall be kept out of the sewage system. Backwash may be discharged into pits or trenches located downgrade and at least 250 feet from any well or water supply.

I. Drawings. The pictorial representation of the projects discussed in these regulations is one of the most important aspects of the review of these projects. Therefore, it is important that engineering plans be presented in such a way as to make their detailed review as expeditious as possible. All plans must be prepared by or under the supervision of a New York State licensed design professional, e.g., NYS licensed professional engineer, NYS licensed architect, or exempt licensed land surveyor, and shall:

(1) Measure a maximum of 24 inches wide by 36 inches long.

(2) Each sheet should be numbered "1 of 3," "2 of 3," and so forth, and bear the seal and signature of the project engineer.

(3) Be oriented so that North is generally at the top of the sheet.

(4) Have a plan title box located, if possible, in the lower right-hand corner with a four-by-seven-inch space reserved over it for an approval stamp.

(5) Be folded so that the title box is visible whenever possible.

(6) Contain a location sketch which identifies the general location of the site showing major streets in the area.

(7) Contain a plot plan drawn to scale. All information necessary to properly describe the sewage treatment facility must be included. For lots of realty subdivision which are not rectangular, the typical plot plan should be shown for the lot with the smallest street frontage. As a minimum, the items listed below must be included. Other items may be required. Include the following items:

(a) Property lines.

(b) Lot dimensions.

(c) Existing and proposed easements.

(d) Topography, including the original and final elevations.

(e) Street grades and distances from the nearest corner indicating street names.

(f) Existing and proposed structures.

(g) Water service lines.

(h) Proposed sewage treatment facilities.

(i) Storm drainage facilities.

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

(j) Rock outcroppings.

(k) Driveways, walkways and other paved areas.

(l) Water wells within 200 feet of the proposed sewage treatment facility.

(m) The names of all abutting property owners shall be clearly shown on the plans, as well as rights-of-way that go through the area proposed to be subdivided.

(n) For realty subdivisions, the maximum allowable number of bedrooms per lot.

(8) Contain plan and section views for all individual components of the sewage treatment facility. The views should be drawn to scale and contain sufficient detail and dimensioning to identify clearly and completely the proposed construction. The piping into and out of components should be shown and specified, and invert elevations where piping enters and leaves components should be specified along with the proposed piping pitch between components.

(9) Contain the log, location and soil rate of all test holes.

(10) Detail the design criteria and calculations used in establishing design flow and component sizing.

(11) Include the following notes as detailed below on Page 1 of the plans:

Approval of plans and acceptance by the Planning and Zoning Office or the CBOH of an on-site wastewater treatment system herein described does not constitute a guaranty of the system's design, adequacy or structural stability by the Planning and Zoning Office or the CBOH, including but not limited to any of its members or agents. Submissions are examined only for review of processes utilized and general conformance with regulations; and the Planning and Zoning Office or the CBOH review does not relieve the design engineer of his responsibility for the system's adequacy and details of design.

I certify, as design engineer, that the construction of all facilities shown on these plans, including but not necessarily limited to all component parts of the system, all excavation, construction, and backfilling, will be inspected by a professional engineer from this firm, and I shall certify to the Lake George Consolidated Board of Health, following completion of construction, that all facilities have been constructed in accordance with the approved plans and in conformance with best practice and construction standards.

Name and Seal of Professional Engineer Date

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

If there is any change or changes in the project or the use or occupancy of the entity served by facilities shown on the plans submitted herewith which may cause a change in the strength or volume of the wastewater or quantity or quality of water utilized, the owner shall notify the Lake George Consolidated Board of Health, and appropriate plans addressing the change or changes shall be submitted for review.

Owner Date

(12) When plans are revised and/or reissued under a subsequent date or dates, state the nature of all revisions enacted.

§ 115-7. Change in use of or alterations to premises.

The owner, lessee or occupant of any premises is responsible to notify the Planning and Zoning Office of any modifications of the premises, including, but not limited to, a use change or other alteration that will result in a change in the type or quantity of wastewater discharged from said premises.

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

ARTICLE III
Inspections and Maintenance

§ 115-8. Inspections and maintenance.

A. Any officer or duly authorized agent of the Planning and Zoning Office and the CBOH may make such inspections as are necessary to determine satisfactory compliance with these regulations. An owner or occupant of the property has the right to deny or allow said access to the property at their discretion, for the purpose of making such inspections as necessary.

(1) The CBOH reserves the right to conduct such tests and inspections as it deems necessary to ensure new or altered on-site wastewater treatment systems are constructed, operated and maintained in accordance with applicable codes, approved plans, specifications and good engineering practice. These tests and inspections may include, but are not limited to, materials inspection, inspection of installation procedures, exfiltration, infiltration, air or water pressure tests of conduits, equipment tests, flow measuring and metering.

(2) As a condition of approval of any on-site wastewater treatment system for multiple residences, commercial premises and subdivisions, the Board reserves the right to require the following, at its option, when and if it is deemed advisable:

(a) The CBOH may require the installation of groundwater monitoring wells in areas adjacent to the projects effluent treatment area.

(b) If wells are to be installed, the CBOH may decide the best locations where wells should be installed, the type of wells to be utilized, depth to which wells will be placed, and may supervise the installation.

(c) The CBOH will, at its discretion, periodically have samples of water collected from these wells and undertake laboratory analysis of samples performed to ascertain the quality of the groundwater. If the analysis of the well water samples show an increase in water pollution above the quality of water samples taken prior to the construction of these sewerage facilities and related appurtenances, the CBOH can require the developer or entity responsible for the operation and maintenance of any centralized wastewater facilities serving this development to undertake necessary measures to cease the pollution and return the quality of the groundwater to its initial status.

(d) The developer or entity responsible for the operation and maintenance of the wastewater facility shall bear all costs associated with, but not limited to, the furnishing, installing,

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

supervision, collecting, and testing of water samples and reports associated with this undertaking, as well as all costs pertaining to any and all corrective measures required.

(e) Testing.

[1] Parameters of testing shall include, but not necessarily be limited to:

[a] Temperature.

[b] Coliform, total and fecal.

[c] Dissolved oxygen.

[d] Total dissolved solids.

[e] Nitrite as N.

[f] Nitrate as N.

[g] Ammonia.

[h] Chlorides.

[i] Phosphate, total and soluble.

[j] pH.

[2] The frequency of testing will be established on a case-by-case basis.

B. Maintenance of septic tanks.

(1) Septic tanks protect the absorptive ability of the soil. Without a septic tank, the soil will clog. Therefore, it is very important that the effluent from the septic tank which percolates into the ground contain minimum amounts of suspended solids. To secure optimum conditions and to prevent complete abandonment of the existing effluent treatment area and construction of a new effluent treatment area involving great expense (Sometimes there will not be sufficient land available for a new effluent treatment area), it is extremely important that a septic tank be pumped out before too much sludge and scum accumulate.

(2) The recommended septic tank sizes serving single-family residences should give about three years of satisfactory operation before cleaning becomes necessary. However, since there are wide differences in the rate that sludge and scum will accumulate from one tank to another, it is recommended that the tank be inspected once a year during the first few years of operation and later at greater intervals, depending upon the information obtained. It should be remembered that while one family may be required to clean its tank once every three to four years, another family of

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

equal size may find it necessary to clean a similar tank every two years. Furthermore, the amount of sludge and scum accumulation from the same family may vary from year to year.

(3) Periodic inspection of the tank is recommended to determine the need for cleaning. Money can be saved by avoiding the expense of unnecessary tank pumping and the expense of rehabilitating clogged effluent treatment areas by pumping when needed. However, as a rule of thumb (without prior inspection), the tank may be cleaned every three years, if the tank size is adequate for the size of the family and for appliances such as garbage grinders. If the tank is undersized due to poor design or an increase in loading, it may have to be cleaned every one or two years. To be certain, measure the accumulation of sludge and scum every one or two years.

(4) During the inspection, measure the depth of sludge and scum in the vicinity of the outlet baffle or sanitary tee pipe. The tank should be pumped out if either:

(a) The bottom of the floating scum mat is within three inches of the bottom of the outlet device (baffle or tee); or

(b) When sludge exceeds 1/3 the liquid depth of the tank.

(c) Scum can be measured with a six-foot stick to which a weighted flap has been hinged or any device that can be used to determine the bottom of the scum mat. The stick is forced through the mat, the hinged flap falls into a horizontal position and the stick is lifted until resistance from the bottom of the sum is felt. With the same tool, the distance to the bottom of the outlet device can be found.

(d) Sludge can be measured with a sludge sampler or long stick wrapped with rough, white toweling and lowered into the bottom of the tank. The stick should be lowered behind the outlet device (baffle or tee) to avoid scum particles. After several minutes, if the stick is carefully removed, the sludge line or mark can be distinguished by sludge particles clinging to the toweling.

(e) Cleaning is usually accomplished by pumping the contents of the tank into a tank truck for off-property disposal. Septic tanks should not be washed or disinfected after pumping. Pumping out of septic tanks should be performed by New York State Department of Environmental Conservation licensed haulers.

(f) If the cover and baffles or pipes are not in place and the rest of the tank appears to be satisfactory, they should be replaced. If the tank is cracked and leaking, it should be replaced.

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

(g) It is dangerous to enter the tank until it has been thoroughly ventilated. Do not discharge large quantities of chemical or oily wastes into a septic tank. Normal use of household detergents and chemicals will not harm the system. Items including, but not limited to, paper towels, newspapers, rags, and diapers should be excluded from the septic tank.

(h) The value of adding disinfectants or other chemicals to improve the operation of septic tanks has not been demonstrated. Generally, addition of chemicals to the septic tank is not recommended. Some products which claim to "clean" septic tanks contain compounds which may provide temporary relief immediately, but may also damage the effluent treatment area by clogging soils.

C. Maintenance of soil treatment area (STA).

(1) The planting of trees, shrubs, bushes, and other similar vegetation, in close proximity to effluent treatment areas or conduits conveying sewage or effluent, should be avoided as this can result in clogging of the system with roots. It is desirable to cover the effluent treatment area with lawn grass. Prevent puddles of stormwater from accumulating on or adjacent to effluent treatment areas by diverting rain and melted snow. Do not build a driveway over an effluent treatment area or run cars, trucks or tractors over it as displacement of grades of lines and breaking of tiles will necessitate digging and resetting or replacing them. Do not use chemicals to clean systems. Be careful that mud or silt does not enter the system before and after construction by diverting through ditches all surface water. Keep roof, foundation, cellar and garage floor drainage away from effluent treatment areas.

(2) To properly maintain the effluent treatment areas and to assure its longer life, pump out the septic tank when necessary. It is better to pump the tank too often than not often enough.

(3) The cost of replacement of effluent treatment areas is much greater than the cost of inspection and maintenance of the septic tank. Sometimes it is impossible to abandon a clogged area and replace it because of lack of lot space. Waste brines from household water softener units should not be discharged into on-site, subsurface treatment systems. A separate dry well should be employed for this purpose.

(4) It is good practice to show the location of the various units of the on-site wastewater treatment system on a sketch and reference them to permanent land marks. This is best done when the system is under construction and will prove useful in the future when earth-covered units have to be located for maintenance purposes.

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

ARTICLE IV
Administrative Provisions

§ 115-9. Permit required.

No person shall construct or alter an on-site wastewater treatment system connected to a private dwelling or occupy a private dwelling within the Town unless a permit from the Planning and Zoning Office has been obtained. Once issued, the permit shall be valid for the entire period of time necessary for each construction or alteration, but shall become invalid if the construction, alteration or use of such system is not completed or used in accordance with the approved plans and with the regulations.

§ 115-10. Application for permit; specifications.

Application for a permit shall be made to the Planning and Zoning Office on a form to be provided by the Planning and Zoning Office. The permit fee shall accompany the application. The application shall include all the material and information required and set forth in the regulations and may be submitted to the Planning and Zoning Office as a single filing or in steps as may be required by the District.

A. Application for a permit to construct, alter, enlarge or extend an individual on-site wastewater treatment system shall be made only by the owner, owner representative or lessee of the property, who shall submit to the Planning and Zoning Office the following information as may be necessary to determine whether the construction, alteration, enlargement or extension will conform to the provisions of these regulations:

   (1) The name and address of the applicant.

   (2) The specific location of the property on which the construction, alteration, repair or extension is proposed, including delineation of property lines and location of wells.

   (3) A complete plan of any existing on-site wastewater treatment system and plan of the proposed treatment system with substantiating data attesting to its compliance with the minimum requirements of the District. All new development within the Town needs an engineered stamped plan for any new on-site wastewater treatment systems. While additions or alternations of existing systems may require the submittal of engineered stamped plans, any repairs or in-kind replacements of OWTS components do not require the involvement of a licensed design professional.

   (4) Detailed information, on forms furnished by the Planning and Zoning Office, showing the absorptive qualities of the soil involved and a conclusion as to the suitability of such soil for the proposed use thereof. This requirement may be waived if the CBOH has sufficient information to make such determination. The CBOH may

require that authorized personnel of the town or village be present during the performance of tests designed to show the absorptive qualities of the soil.

(5) Pertinent groundwater and geological data as the CBOH may require.

(6) Evidence to demonstrate to the satisfaction of the Planning and Zoning Office that there is no community sewer or other part of a community sewage system within a reasonable distance of such building or premises into which the sewage can be discharged, or that it is impracticable to discharge the sewage concerned into a community sewage system or into the sewer or other facility connecting with such sewage system.

B. On-site wastewater treatment systems for multiple residences, subdivisions or commercial premises shall be designed, with drawings and specifications signed and stamped, by a professional engineer licensed to practice in the State of New York. Applications for a permit to construct, alter, or extend the above facilities shall be made only by the owner, owner representative or lessee of the property, who shall submit to the Planning and Zoning Office all information listed under § 115-12A(1) through (6). In addition to said subsections, the following regulations shall be enforced before a permit is issued:

(1) Plans for multiple residences subdivisions or commercial premises that include a design flow of more than 1,000 GPD must be submitted to the New York State Department of Environmental Conservation for review and approval.

(2) Plans for individual treatment facilities of multiple residences and subdivisions designed for less than 1,000 GPD, or commercial premises using individual on-site wastewater treatment systems designed for less than 1,000 GPD must be submitted to the Planning and Zoning Office for review and approval.

(3) An environmental impact statement, as defined by the New York State Department of Environmental Conservation, shall accompany applications for approval as required by the State Environmental Quality Review Act (SEQRA)[1] and those proposed for areas affecting endangered species.

C. When, upon review of the application, the Planning and Zoning Office is satisfied that the proposed design meets the requirements of these regulations and, in addition, meets the requirements of the NYSDEC as evidenced by the receipt of a certificate from the NYSDEC, a written permit to proceed with construction shall be issued by the Planning and Zoning Office. It is to be noted that this permit (to construct) automatically expires one year after its issuance, unless the Planning and Zoning Office grants an extension prior to the expiration date.

1. **Editor's Note: See 6 NYCRR Part 617.1 et seq.**

Existing lots located in approved subdivisions may be reevaluated on an individual basis for reapproval if a change in design of the original septic system that was approved in the subdivision is necessary. The Planning and Zoning Office, Planning Board and/or the CBOH reserve the option of individual lot septic design reapproval for a specified period of time or to decline reapproval and require a revised submission for septic design of any particular individual lot.

D. When, upon review of the application, the Planning and Zoning Office is convinced that the proposed design does not meet the requirements of these regulations, or soil and geological conditions are such as to preclude safe and proper operation of the desired installation, or the applicant is unable to produce a certificate from the NYSDOH or NYSDEC, a permit to proceed with construction shall be denied.

E. No installation shall be made without a written permit from the Planning and Zoning Office to the owner, owner representative, or lessee of the lot.

F. It shall be the duty of the holder of the permit to notify the Planning and Zoning Office when the installation is ready for inspection. The Inspector may make inspections during construction to determine compliance with these regulations. No part of any installation shall be covered until inspected and given final written approval by the Planning and Zoning Office. Any part of any installation which has been covered prior to final approval shall be uncovered upon order of the CBOH. Final written approval shall not be given until all pertinent data required has been submitted. Upon notification to the Planning and Zoning Office that the installation is available for inspection, the installation shall be deemed approved after three days from date of official notification and may be covered.

G. Following the issuance of a permit to construct an on-site wastewater treatment system, and satisfactory inspections of the installation, the Planning and Zoning Office will issue an occupancy permit for the premises. The premises may not be occupied and utilized until this occupancy permit has been duly issued by the Planning and Zoning Office.

H. Any person whose application for a permit under this section has been denied shall be notified, in writing, as to the reasons for denial, and such person may, within 30 days after official notification of such action, file a written request for a hearing before the CBOH. Such hearing shall be held within 10 days after the receipt of the request by the CBOH and upon reasonable notice to the applicant. The CBOH shall affirm, modify or revoke the denial or issue the permit on the basis of the evidence presented at the hearing.

I. Whenever wastewater treatment facilities are, altered, enlarged, expanded or extended, the owner shall submit the existing and

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

proposed sewage treatment facilities plans for approval by the Planning and Zoning Office.

§ 115-11. Permit fee.

The fee for the permit shall be as set forth from time to time by resolution of the Town Board and on file in the office of the Town Clerk.

A. Application made pursuant to these regulations shall be accompanied by a fee in the amount as set forth by the Town Board, payable to the Town Clerk. In the event that such application is submitted after construction, alteration, or extension has been physically undertaken on the wastewater treatment system, such fee shall be in the amount as set forth by the Town Board which shall be on file in the office of the Town Clerk.

B. Applications made pursuant to these regulations shall be accompanied by the fee in an amount as set forth by the Town Board, payable to the Town Clerk. Special project fees will be charged to those projects utilizing a unique or unusual method of sewage treatment. In addition, a special fee may be required whenever test hole and/or soil evaluation go beyond the normal machine dug test hole.

C. Special consulting fees.

(1) The Consolidated Board of Health, in its review of applications, may employ consultants, legal counsel, professional engineers and/or inspection services to provide assistance and advice in the review of any application, including on-site investigations, evaluation and inspection, verification of the adequacy of plans and the sufficiency of submitted reports; study of the impact of proposals upon the resources and environment of the Town; preparation and/or review of environmental impact statements; inspection of installed improvements; and such other services or technical assistance as the Consolidated Board of Health deems necessary for its review of the application.

(2) All costs incurred for these special consulting services shall be borne by the applicant. As further provided below, a deposit shall be required in advance to cover the estimated cost of these services. This deposit shall be in the amount determined by the Town Board or its duly authorized agent, as sufficient to cover all such special consulting costs. Fees for the preparation or review of environmental impact statements shall be as determined by 6 NYCRR Part 617, adopted pursuant to Article 8 of the Environmental Conservation Law.

(3) The deposit due for the special consulting services deemed by the CBOH to be necessary for its appropriate review of any particular application shall be filed with the application in the Planning and Zoning Office by certified check made payable to the Town of Lake

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

George. An application shall not be deemed complete until the requirements of this section have been complied with.

(4) After the CBOH has rendered its decision on any application, the balance of the deposit, if any remains in excess of actual incurred cost, shall be returned to the applicant without payment of interest.

(5) Payment of any deficiency in the amount of the deposit to cover incurred costs in full shall be a condition to final approval of any application by the CBOH. No final approval shall be signed, stamped, sent or otherwise be valid until and unless such amount is paid.

§ 115-12. Effect on other permits.

Nothing in this article shall limit or otherwise relate to any other permit requirements relating to local use, construction requirements or other legally adopted requirements by any governmental entity having jurisdiction over the area of the Town.

§ 115-13. Variances.

A. If an applicant for a permit is unable to meet the requirements set forth in this chapter for reasons including, but not limited to, insufficient area, separation distances, or an unnecessary hardship that would deprive the owner of the reasonable use of the land involved, the applicant or the applicant's representative may apply to the for a variance. In considering the request for a variance, the CBOH will consider the following criteria that need to be met.

(1) That there are special circumstances or conditions, fully described in the findings of the CBOH, applying to such land and that such circumstances or conditions are such that strict application of the provisions of this Chapter would deprive the applicant of the reasonable use of such land.

(2) That the variance would not be materially detrimental to the purposes and objectives of this Chapter, or to other adjoining properties, or otherwise conflict with the purpose or objectives of any plan or policy of the Town.

(3) That, for reasons fully set forth in the findings of the CBOH, the granting of the variance is necessary for the reasonable use of the land and that the variance as granted by the CBOH is the minimum variance which would alleviate the specific unnecessary hardship found by the CBOH to affect the applicant.

B. In granting any variance, the CBOH shall prescribe and attach any reasonable conditions that it deems to be necessary or desirable.

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

ARTICLE V
Enforcement; Penalties for Offenses

§ 115-14. Penalties for offenses.

Any person who constructs an on-site wastewater treatment system connected to a structure without obtaining a permit as required in this article or any person who occupies a private dwelling and alters, enlarges, or expands an on-site wastewater treatment system for which no valid permit exists as required in this chapter (for each day for each person so charged and convicted and occupying such dwelling) or any violation of this chapter shall be punishable, for each violation, by a fine of not more than $250 or imprisonment for not more than 15 days, or both.

A. In the enforcement of these rules and regulations or of the State Sanitary Code, the CBOH may impose penalties for such violation of, or failure to comply with, any of its orders or regulations not exceeding $250 for a single violation or failure and may sue for and recover it in any court of competent jurisdiction. (Each day shall be considered a single violation).

B. In addition, the CBOH shall also have the authority to institute any other civil or criminal proceeding in a court of competent jurisdiction which is authorized by the Public Health Law generally, and §§ 12-b, 12-c and 229 of that law specifically, where a violation of law has occurred and penalties may be imposed as provided for by law. If the CBOH or its agent determines that life and health are endangered by the failure or misoperation of an on-site wastewater treatment system subject to these regulations, the CBOH or agent shall order that remedial action be taken by the owner of such system.

C. In addition to other penalties imposed by these regulations and other ordinances, such owner and such property shall be liable for costs of any work performed by any municipal agency to remedy such failure or misoperation.

§ 115-15. Misrepresentation.

Any permit or approval granted under these regulations which is based upon or is granted in reliance upon any material representation or failure to make a material fact or circumstance known, by or on behalf of an applicant shall be void. This section shall not be construed to affect the remedies available to the CBOH under § 115-16 of these regulations.

§ 115-16. Conflicts; savings clause; repealer.

A. The rules and regulations of the District are designed to promote and protect the general health, safety and welfare of the community. The Town Board, in adopting these rules, is aware of the fact that other governmental units which have similar objectives and authority have adopted laws, rules, and regulations which relate to the same area

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

of concern. Where provisions of these regulations are found to be in conflict with any law, rule or regulation adopted by any appropriate governmental unit having jurisdiction to adopt such law or rule, the CBOH shall determine which imposes the higher standard and shall require compliance with the higher standard. In the event that a dispute arises as to which law governs, the Consolidated Board of Health may make a determination and its determination is final.

B. Savings clause. If a court of competent jurisdiction finds that any section or sections of these rules and regulations are invalid for any reason, such finding of invalidity shall not affect the remaining sections of these regulations, and they shall remain in full force and effect.

C. Repeal of prior inconsistent rules and regulations. Any rules or regulations adopted by the Town Board which relate to the same matter as those herein enacted are hereby repealed and have no future force and effect. The repeal hereby of any such prior rules and regulations shall in no way affect the past validity of such rules and regulations, and no person shall gain or lose any past rights, duties or obligations existing under the prior rules and regulations.

§ 115-17. Effective date.

These regulations shall be effective on and after August 8, 2016.

FIGURE C-1 *Lake George Town Code – Chapter 115 – Onsite Wastewater Treatment Systems*

Resolution by the Town Board
Town of Lake George
To Request APA Board Approval of the Town Code Chapter 115 Amendments
Resolution #111-2016

On a motion by Board member Muratori, seconded by Board member Hurley

Resolution of the Town Board of the MUNICIPALITY of the Town of Lake George, requesting the review and approval of the amended Town of Lake George Code Chapter 115 'Onsite Wastewater Treatment Systems', by the Adirondack Park Agency.

WHEREAS, the Town Board of the Town of Lake George desired to amend the Town's Septic regulations to be consistent with New York State Department of Health (NYS DOH) regulations, and the Lake George Planning and Zoning Office has worked with the APA staff on amending the Town regulations for Onsite Wastewater Treatment Systems (Code Chapter 115), using NYS DOH Regulations 75-A as a baseline;

WHEREAS, the Town of Lake George shall, per Code Section 175-98 (B) 'Amendments Procedure', send the proposed amendment to the APA for approval under Section 807 of the Adirondack Park Agency Act;

WHEREAS, the Town of Lake George is an Approved Local Land Use Plan (ALLUP) and must receive approval on code amendments from the APA Board prior to acceptance by the Lake George Town Board;

WHEREAS, The Town Board of the Town of Lake George has prepared and reviewed the records of the State Environmental Quality Review, Short Environmental Assessment for the listed Septic Code amendments (as an unlisted action) and additions and have determined no significant impact to the environment would result, and therefore declared a Negative Declaration for the action on March 14, 2016;

NOW, THEREFORE, it is hereby

RESOLVED, that the Town Board of Lake George unanimously requests the review and approval of the amended Town of Lake George Code Chapter 115 'Onsite Wastewater Treatment Systems', by the Adirondack Park Agency (APA) Board pursuant to Article 27 of the Executive Law, Section 807.

AYES: Hurley, Crocitto, Muratori, Stannard
NAYES:
ABSENT: Dickinson
Adopted: June 13, 2016

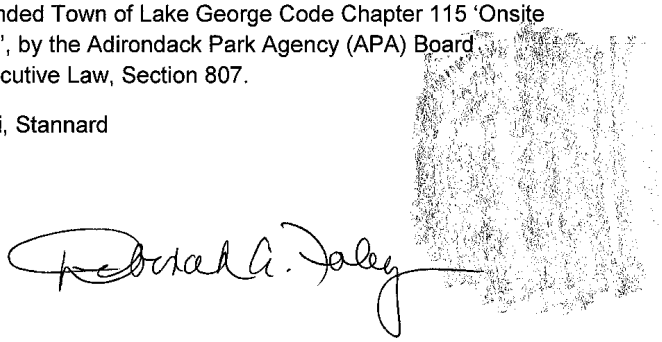

FIGURE C-2 *Lake George Town Board Resolution 111-2016 Requesting Adirondack Park Agency Approval of Chapter 115*

NEW YORK STATE OF OPPORTUNITY. Adirondack Park Agency

SHERMAN CRAIG
Chairman

TERRY MARTINO
Executive Director

July 19, 2016

Honorable Dennis Dickinson
Town of Lake George
20 Old Post Rd
Lake George, NY 12845

Dear Supervisor Dickinson:

I am pleased to enclose a copy of Resolution 2016-01 unanimously adopted by the Adirondack Park Agency at its July 14, 2016 meeting. The resolution approved the amendment to the Town of Lake George's Agency-approved Local Land Use Program involving the "Town of Lake George Chapter 115 - Onsite Wastewater Treatment Systems." Please be advised that the Town must provide the Agency with a clerk-certified copy of the sanitary code upon enactment by the Town.

If you have any questions, please contact Robyn Burgess, Principal Adirondack Park Local Planning Assistance Specialist. Agency staff look forward to assisting the Town on future planning efforts.

Sincerely,

Terry Martino
Executive Director

TDM:REB:sas

Enclosure

cc: Deborah Foley, Town Clerk
Dan Barusch, Town Director of Planning & Zoning
Doug Frost, CEO

P.O. Box 99 • 1133 NYS Route 86 • Ray Brook, NY 12977 • Tel: 518 891-4050 • Fax: 518 891-3938 • www.apa.ny.gov

FIGURE C-3 *Adirondack Park Agency Cover Letter Approving Town of Lake George Chapter 115*

NEW YORK STATE OF OPPORTUNITY. Adirondack Park Agency

SHERMAN CRAIG
Chairman

TERRY MARTINO
Executive Director

AMENDMENTS TO THE TOWN OF LAKE GEORGE
LOCAL LAND USE PROGRAM
(To amend the Town of Lake George Sanitary Code)

July 14, 2016

WHEREAS, the Town of Lake George ("Town") administers a Local Land Use Program ("Local Program") conditionally approved by the Adirondack Park Agency ("Agency") pursuant to Section 807 of the Adirondack Park Agency Act, the Agency having approved the Local Program on November 10, 1978; and

WHEREAS, the Town proposes to amend its Local Program by repealing Chapter 134, Sewage Disposal Systems and Chapter A180, Lake George Consolidated Health District Regulations and adopting a new Chapter 115, Onsite Wastewater Treatment Systems; and

WHEREAS, the action of adopting sanitary regulations was determined by the Town to be an Unlisted Action under the State Environmental Quality Review Act and a Negative Declaration was adopted by the Town on March 14, 2016, and

WHEREAS, the Town submitted the proposed amendment to the Agency for review and approval on June 14, 2016 pursuant to Town Board Resolution 111-2016; and

WHEREAS, the proposed amendment satisfies the approval criteria set forth in Section 807(2) of the Adirondack Park Agency Act and 9 NYCRR 582.2; and

NOW, THEREFORE, BE IT RESOLVED that the Town's proposed amendment to its Local Program is hereby approved by the Adirondack Park Agency.

BE IT FURTHER RESOLVED that upon adoption by the Town, the Town shall provide a copy of the final version of the amended local law to the Agency's Planning Division so that the Agency may update its copy of the Town's local laws.

BE IT FINALLY RESOLVED that the Agency further directs its staff to continue to provide technical assistance to the Town on its Local Program plan and to coordinate in the review of projects of regional significance.

Resolution adopted on this date, July 14, 2016.

P.O. Box 99 • 1133 NYS Route 86 • Ray Brook, NY 12977 • Tel: 518 891-4050 • Fax: 518 891-3938 • www.apa.ny.gov

FIGURE C-4 *Adirondack Park Agency Resolution Approving Town of Lake George Chapter 115*

AYES: Sherman Craig, Chairman, Chad Dawson, John Ernst, Karen Feldman, Arthur Lussi, Barbara Rice, William Thomas, Dan Wilt, Brad Austin, Lynne Mahoney, Bob Stegemann

NAYS: None

ABSTENTIONS: None

ABSENT: None

FIGURE C-4 *Adirondack Park Agency Resolution Approving Town of Lake George Chapter 115*

Resolution by the Town Board
Town of Lake George
To Amend the Town Code with the adoption of Ch. 115 OWTS
Resolution #133-2016 / Local Law #1-2016

On a motion made by Board Member Dickinson, and seconded by Board Member Hurley,

WHEREAS, as part of the Town's Septic Initiative Program, the Lake George Planning and Zoning Office has worked with the APA staff on amending the Town regulations for Onsite Wastewater Treatment Systems (current code Chapters A180 and 134), using NYS DOH Regulations 75-A as a baseline; and

WHEREAS, the Town of Lake George held numerous public workshops on the amended code chapter, new Town Code Chapter 115 on April 7th 2016, and on May 3rd 2016 to include the participation of the residents of the Town of Lake George; and

WHEREAS, the Town of Lake George has prepared and reviewed the records of the State Environmental Quality Review, Short Environmental Assessment for the listed Ch. 115 amendments (as an unlisted action) and additions and have determined no significant impact to the environment would result, and therefore declared a Negative Declaration for the action on March 14, 2016; and

WHEREAS, the Town of Lake George also sent the proposed amendments to the County Planning Department pursuant to GML 239m, and to the APA Board for approval pursuant to Section 807 of the APA Act and per Town Code Section 175-98(B); and

WHEREAS, the Town of Lake George has received a unanimous approval of the proposed amendment by APA Board on July 14, 2016 and has received a "no county impact" determination from the Warren County Planning Department; and

WHEREAS, the Town Board of Lake George is holding this public hearing on the proposed amendment based on Resolution 111-2016 which fixed the time and place of said public hearing, per Town Code Section 175-98(C);

NOW, THEREFORE, it is hereby

RESOLVED, that the Town Board of Lake George hereby adopts the amended Town Code Chapter 115 'Onsite Wastewater Treatment Systems' as Local Law 1-2016.

AYES: Hurley, Crocitto, Dickinson, Muratori, Stannard
NAYES: None
ABSENT: None

FIGURE C-5 *Lake George Town Board Resolution 133-2016 Adopting Chapter 115*

Duly adopted on the following date: August 8, 2016

STATE OF NEW YORK)

)S.S:

COUNTY OF Warren)

I, Deb Foley, Clerk of the Town of Lake George New York, do hereby certify that I have compared the foregoing copy of the resolution with the original resolution of file in my office and that the same is a true and correct transcript of said original resolution and of the whole thereof as duly adopted by said Lake George Town Board at a meeting duly called and held at Town Hall on Aug 8, 2016 by the required necessary vote of the members to approved the resolution.

WITNESS, my hand and the official seal of the Clerk of the Town of Lake George, New York, the 9 day of August, 2016.

Deb Foley, Town Clerk

FIGURE C-5 *Lake George Town Board Resolution 133-2016 Adopting Chapter 115*

LOCAL LAW OF THE TOWN OF LAKE GEORGE
FOR THE YEAR 2016
No. 1-2016

Introduced by Board Member Dickinson and seconded by Board member Hurley,

A LOCAL LAW
To amend the municipal code of the Town of Lake George, in relation to the regulation of Onsite Wastewater Treatment Systems.
Be it enacted by the Town Board of the Town of Lake George as follows:

Section 1. Chapter 115 of the Municipal code of the Town of Lake George is created, to read as follows:

Article I - General Provisions

§115-1. Title.

Chapter 115 shall be known as the "Town of Lake George Onsite Wastewater Treatment System (OWTS) Ordinance."

§115-2. Applicability.

Chapter 115 shall apply to on-site wastewater treatment systems serving properties and receiving sewage without the admixture of industrial wastes or other wastes, as defined in Environmental Conservation Law, Section 17-0701, in quantities of less than 1,000 gallons per day. New York State Department of Health, Lake George Basin and applicable New York State Department of Environmental Conservation standards shall be followed for non-residential systems and for residential systems with a design flow of more than 1,000 gallons per day.

§115-3. Scope.

A. Minimum requirements for systems less than 1,000 gallons per day are hereby set forth governing the design, construction, installation, operation and maintenance of on-site wastewater treatment systems, together with procedures relating thereto, in implementation of the Public Health Law and Sanitary Code of the State of New York (NYS 75-A). No person shall construct, alter, enlarge or extend any sewage treatment system contrary to the provisions of these regulations.

B. In the case of a new or existing on-site wastewater treatment system which exhibits evidence of septic system failure, as judged by the Consolidated Board of Health, the rehabilitation and/or reconstruction of the system shall be in compliance with this Chapter.

C. Any extension, addition or alteration to any on-site wastewater treatment system shall be in compliance with Chapter 115.

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§115-4. Purpose.

The purpose of the Consolidated Board of Health Regulations is to promote the health, safety and general welfare of the community by the elimination of existing pollution and the prevention of new pollution with control over proposed on-site wastewater treatment systems and the modification of existing on-site wastewater treatment systems in order to ensure adequate protection of water resources.

§115-5. Definitions.

As used in this Chapter 115, the following words or acronyms shall have the meanings ascribed to them unless a contrary meaning is clearly indicated in the content of the chapter. Words not defined in this section shall have the ordinary meaning found in common usage.

APA
The Adirondack Park Agency.

BAFFLE
A flow-deflecting device used in septic tanks to check or inhibit the velocity of a stream of flow or the discharge of floating and suspended solids. See the definition of "sanitary tee."

BUILDING
A structure wholly or partially enclosed with exterior or party walls and a roof, affording shelter to persons, animals or property.

CBOH
The Lake George Consolidated Board of Health.

CENTRALIZED WASTEWATER AND/OR POTABLE WATER SUPPLY FACILITIES
Facilities serving three or more structures.

COMMUNITY SEWAGE SYSTEM
Any system, whether publicly or privately owned, serving three or more individual premises for the collection and disposal of sewage or industrial wastes of a liquid nature, including various devices for the treatment of such sewage or industrial wastes.

DISTRIBUTION BOX OR DEVICE
A device used to uniformly distribute sewage to the distribution lines.

DISTRICT
The Lake George Consolidated Health District.

DOMESTIC WASTE
Normal household waste, including waste from garbage grinders and automatic washing machines.

EMERGENCY REPAIRS
Repairs designed to prevent or abate an imminent threat to the public health, safety or welfare, caused or about to be caused by an individual sewage disposal system.

ENFORCEMENT OFFICER
The person appointed by the Town Board whose duty and authority it is to administer and enforce the provisions of an order, with assistance from the Lake George Consolidated Board of Health.

GARBAGE
Organic solid wastes from domestic and commercial preparation, cooking or dispensing of food or from the handling, storage and sale of produce.

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GRADE
The slope of a line of pipe, trench bottom or ground surface in reference to a horizontal surface.

GRAVEL
A mixture of mineral soil particles whose individual diameters range from one-fourth (1/4) inch to three inches.

GROUNDWATER
Subsurface water occupying a zone of saturated soil.

HEALTH OFFICER
The duly appointed and acting health officer of the Town of Lake George Consolidated Health District.

INDIVIDUAL SEWAGE TREATMENT SYSTEM
A complete system of piping, tanks or other facilities for the on-site collection, treatment and disposal of sewage and not connected to a community or public sewerage system.

INDUSTRIAL WASTE
Liquid waste, other than domestic waste, resulting from the processes employed in industrial and commercial establishments.

INSPECTOR
A person designated by the Town Board of Lake George to inspect properties which are covered by the regulations of the Lake George Consolidated Health District.

INVERT
The bottommost point of an open conduit or the bottommost point on the inside of a closed conduit.

IN EXISTENCE / EXISTING SYSTEM
With respect to individual sewage disposal systems, that such structure has been substantially commenced or completed.

LGPC
The Lake George Park Commission [Environmental Conservation Law (ECL) § 43-0105].

NYSDEC
The New York State Department of Environmental Conservation.

NYSDOH
The New York State Department of Health.

PARK
The Lake George Park.

PLANNING AND ZONING OFFICE
The Town of Lake George Planning and Zoning Office.

REGULATIONS
The regulations of the Lake George Consolidated Health District as amended from time to time by the Lake George Consolidated Board of Health and adopted by the Town Board.

PERCOLATION
The movement of water downward through the pores of a soil or other porous medium following infiltration through the soil surface.

PERCOLATION TEST
A standard procedure for testing soil permeability to determine the sewage application rate.

SANITARY TEE
Pipe fitting used in septic tanks to reduce flow velocities so as to increase solids settling in the tank and

FIGURE C-5 *Lake George Town Board Resolution 133-2016 Adopting Chapter 115*

prevent carry-over of solids.

SEEPAGE PIT
A covered pit with open-jointed lining through which septic tank effluent may seep or leach into surrounding ground.

SEPTIC SYSTEM FAILURE
The condition produced when a subsurface sewage treatment **system** does not properly contain or treat sewage, or causes or threatens to cause the discharge of sewage on the ground surface or into adjacent surface or groundwaters.

SEPTIC TANK
A watertight receptacle which receives any discharge, exclusive of industrial wastes, from the sanitary drainage system of a building or facility. The tank is designed to provide sufficient detention time to segregate and digest solid organic matter and discharge the settled liquid for eventual dissipation into surrounding soils by means of a soil treatment area or a system of open-joint or perforated piping.

SEWAGE
The combination of human and household wastes with water which is discharged to the home plumbing system; the waste from a flush toilet, bath, sink, lavatory, dishwashing or laundry machine or the water-carried waste from any other fixture or equipment or machine.

STATE SANITARY CODE
The Public Health Law and Sanitary Code of the State of New York

SUBSURFACE ABSORPTION SYSTEM
Any system constructed below the surface of the ground, employed to dissipate sewage effluent.

SURFACE WATER BODY
Any lake, pond, river, stream, wetland or an intermittent stream with a defined bed and banks.

TOWN
The Town of Lake George.

TOWN BOARD
The Town Board of the Town of Lake George. .

TOWN CLERK
The Town Clerk

WATERCOURSE
A channel fed from permanent or natural sources, including rivers, creeks, runs and rivulets. There must be a channel, usually flowing in a particular direction (though it need not flow continuously) and usually discharging into some other channel or body of water.

WATER RESOURCES
Sources of water those are used, or potentially useful for potable consumption. This includes but is not limited to, water drawn from private wells, public water systems, and aquifers.

WETLANDS
Any land annually subject to periodic or continual inundation by water and commonly referred to as a bog, swamp or marsh, which is (i) one acre or more in size, or (ii) located adjacent to a body of water, including a permanent stream, with which there is free interchange of water at the surface, in which case there is no size limitation. Open waters immediately adjacent to *wetlands* and lands entirely surrounded by *wetlands* will be considered part of the *wetlands* if these areas are essential to the preservation of the wetland vegetation.

Article II - Requirements

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§115-6. Compliance Required.

The following criteria shall govern the installation of on-site wastewater treatment systems:

A. Installation. On-site wastewater treatment systems, or other private means of wastewater treatment, shall not be approved where a public sewer system, such as a municipal wastewater treatment plant and collection system, is available. All sewage treatment systems shall be discontinued when public sewers are made available. The treatment of industrial waste shall be in accordance with the regulations of the NYSDEC and the District.

B. Design. The design of the sewage treatment system shall take into consideration location with respect to wells, surface water bodies, topography, water table, soil characteristics, percolation rate, wastewater flows, area available and maximum occupancy of the building.

C. Type of system. The type of system to be installed shall be determined on the basis of location, soil permeability and groundwater conditions, including, but not limited to, depth to the seasonal high groundwater, and bedrock.

D. Sewage. The system shall be designed to receive and treat all sewage from the building or buildings, including wastes from garbage grinders and automatic washing machines. Drainage from basement footings or from roofs shall not enter the system. Industrial wastes shall not be discharged into the individual sewage treatment system when their introduction would interfere with proper operation of the system.

E. Site Requirements (APA Q4).

1. Conventional Systems. The following criteria for conventional systems must be evaluated for all new on-site wastewater treatment systems. The CBOH and/or the Planning and Zoning Office have the ability to vary/waive these standards as necessary. Additionally, 100% replacement areas for soil treatment areas may be considered.

a. Conventional Trench (including gravelless systems)
   i. Depth to seasonal high groundwater minimum 48 inches.
   ii. Depth to bedrock minimum 72 inches.
   iii. Slope equal to 15% or less.
   iv. Percolation rate of one to sixty minutes per inch.
   v. Trenches are constructed wholly within the existing native soil.

b. Conventional Absorption Bed
   i. Depth to seasonal high groundwater is minimum 48 inches.
   ii. Depth to bedrock minimum 72 inches.
   iii. Slope equal to 8% or less.
   iv. Percolation rate of one to thirty minutes per inch.
   v. Beds are constructed wholly within the existing native soil.

c. Conventional Shallow Trench
   i. Depth to seasonal high groundwater minimum 24 inches.
   ii. Depth to bedrock minimum 48 inches.

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iii. Slope should be 8% or less, with a maximum of 15% or less.
iv. Percolation rate of one to sixty minutes per inch.
v. Trenches are constructed with the bottom of the trench within the existing native soil.

2. Deep-hole test pit requirements:
   a. At least one deep-hole test pit is required for each proposed system.
   b. Deep-hole test pits must be described by a qualified soil evaluator.
   c. Minimum depth of deep-hole test pit is 6 feet.
   d. Sewage treatment systems are not allowed on sites where the natural soil materials have been disturbed by excavation, removed or covered by more than 12 inches of fill.
   e. In areas that have percolation rates faster than 10 minutes per inch and overlie primary and principal aquifers as defined by NYSDEC, the absorption system design may need to be modified to provide enhanced treatment.

3. Soil treatment area (STA) slope calculation:
   a. Maximum slope allowed is 15% where slopes are calculated as the ratio of the maximum vertical rise or fall of the land in 50 feet of horizontal distance, measured across the absorption field and expressed as a percentage.

4. Soil percolation rates:
   a. Percolation rates must be one to sixty minutes per inch.
   b. Percolation rate of zero to one minute per inch is not suitable for subsurface absorption systems unless the soils are amended and the site is modified by blending with a less permeable soil to reduce the infiltration rate throughout the area to be used (Appendix 75-A Soil and Site Appraisal).
   c. Percolation rate of one to three minutes per inch requires the separation distance from waterbodies to be 200 feet unless soils are amended and the site is modified by blending with a less permeable soil to reduce the infiltration rate throughout the area to be used (Appendix 75-A Soil and Site Appraisal).

5. Piping distances:
   a. No piping a distance of 250 feet or more.
   b. No piping across wetlands, waterbodies, right-of-ways, property lines or soils with any limiting feature.

6. Alternative systems:
   a. If unable to comply with 115-6(E) 1, alternative systems, as defined in NYSDOH Appendix 75-A standards for Alternative Systems may be considered upon review by the Consolidated Board of Health if the minimum site requirements on individual parcels cannot be met for pre-existing lots, vacant lots permitted prior to the effective date of this Chapter, or the replacement of lawfully existing on-site wastewater treatment systems installed prior to the effective date of this Chapter. A separate approval from NYSDOH for an alternative system may also

FIGURE C-5 *Lake George Town Board Resolution 133-2016 Adopting Chapter 115*

be required.

F. Elements of on-site wastewater treatment systems:
   1. House sewer; collecting sewers and related components.
   2. Septic tank or other type of approved treatment method.
   3. Wastewater distribution device such as a distribution box or dosing chamber
   4. Subsurface effluent treatment system or approved enhanced treatment unit (ETU).

G. Only wastes from plumbing fixtures shall be connected to the sewage treatment system. Stormwater control devices, including roof, cellar, foundation, yard and road drainage, shall not only be directly excluded from the sewage treatment system, but shall be disposed of so that they will not adversely affect the system. Disposition of stormwater in proximity to treatment systems shall be satisfactory to the CBOH.

H. Backwash from water softeners shall be kept out of the sewage system. Backwash may be discharged into pits or trenches located downgrade and at least 250 feet from any well or water supply.

I. Drawings. The pictorial representation of the projects discussed in these regulations is one of the most important aspects of the review of these projects. Therefore, it is important that engineering plans be presented in such a way as to make their detailed review as expeditious as possible. All plans must be prepared by or under the supervision of a New York State licensed design professional, e.g. NYS licensed professional engineer, NYS licensed architect, or exempt licensed land surveyor, and shall:

   1. Measure a maximum of 24 inches wide by 36 inches long.

   2. Each sheet should be numbered 1 of 3, 2 of 3, and so forth, and bear the seal and signature of the project engineer.

   3. Be oriented so that North is generally at the top of the sheet.

   4. Have a plan title box located, if possible, in the lower right hand corner with a four-by-seven-inch space reserved over it for an approval stamp.

   5. Be folded so that the title box is visible whenever possible.

   6. Contain a location sketch which identifies the general location of the site showing major streets in the area.

   7. Contain a plot plan drawn to scale. All information necessary to properly describe the sewage treatment facility must be included. For lots of realty subdivision which are not rectangular, the typical plot plan should be shown for the lot with the smallest street frontage. As a minimum, the items listed below must be included. Other items may be required. Include the following items:
      a. Property lines.
      b. Lot dimensions.
      c. Existing and proposed easements.

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d. Topography including the original and final elevations.
e. Street grades and distances from the nearest corner indicating street names.
f. Existing and proposed structures.
g. Water service lines.
h. Proposed sewage treatment facilities.
i. Storm drainage facilities.
j. Rock outcroppings.
k. Driveways, walkways and other paved areas.
l. Water wells within 200 feet of the proposed sewage treatment facility.
m. The names of all abutting property owners shall be clearly shown on the plans, as well as rights-of-way that go through the area proposed to be subdivided.
n. For realty subdivisions, the maximum allowable number of bedrooms per lot.

8. Contain plan and section views for all individual components of the sewage treatment facility. The views should be drawn to scale and contain sufficient detail and dimensioning to identify clearly and completely the proposed construction. The piping into and out of components should be shown and specified, and invert elevations where piping enters and leaves components should be specified along with the proposed piping pitch between components.

9. Contain the log, location and soil rate of all test holes.

10. Detail the design criteria and calculations used in establishing design flow and component sizing

11. Include the following notes as detailed below on Page 1 of the Plans:

Approval of plans and acceptance by the Planning and Zoning Office or the CBOH of an on-site wastewater treatment system herein described does not constitute a guaranty of the system's design, adequacy or structural stability by the Planning and Zoning Office or the CBOH, including but not limited to any of its members or agents. Submissions are examined only for review of processes utilized and general conformance with regulations; and the Planning and Zoning Office or the CBOH review does not relieve the design engineer of his responsibility for the system's adequacy and details of design.

I certify, as design engineer, that the construction of all facilities shown on these plans, including but not necessarily limited to all component parts of the system, all excavation, construction, and backfilling, will be inspected by a professional engineer from this firm, and I shall certify to the Lake George Consolidated Board of Health, following completion of construction, that all facilities have been constructed in accordance with the approved plans and in conformance with best practice and construction standards.

Name and Seal of Professional Engineer Date

If there is any change or changes in the project or the use or occupancy of the entity served by facilities shown on the plans submitted herewith which may

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cause a change in the strength or volume of the wastewater or quantity or quality of water utilized, the owner shall notify the Lake George Consolidated Board of Health, and appropriate plans addressing the change or changes shall be submitted for review.

Owner Date

12. When plans are revised and/or reissued under a subsequent date or dates, state the nature of all revisions enacted.

§115-7. Change in Use of or Alterations to Premises.

The owner, lessee or occupant of any premises is responsible to notify the Planning and Zoning Office of any modifications of the premises, including, but not limited to, a use change or other alteration, that will result in a change in the type or quantity of wastewater discharged from said premises.

Article III – Inspections and Maintenance

§115-8. Inspections and Maintenance.

A. Any officer or duly authorized agent of the Planning and Zoning Office and the CBOH may make such inspections as are necessary to determine satisfactory compliance with these regulations. An owner or occupant of the property has the right to deny or allow said access to the property at their discretion, for the purpose of making such inspections as necessary.

1. The CBOH reserves the right to conduct such tests and inspections as it deems necessary to ensure new or altered on-site wastewater treatment systems are constructed, operated and maintained in accordance with applicable codes, approved plans, specifications and good engineering practice. These tests and inspections may include, but are not limited to, materials inspection, inspection of installation procedures, exfiltration, infiltration, air or water pressure tests of conduits, equipment tests, flow measuring and metering.

2. As a condition of approval of any onsite wastewater treatment system for multiple residences, commercial premises and subdivisions, the Board reserves the right to require the following, at its option, when and if it is deemed advisable:
   a. The CBOH may require the installation of groundwater monitoring wells in areas adjacent to the projects effluent treatment area.
   b. If wells are to be installed, the CBOH may decide the best locations where wells should be installed, the type of wells to be utilized, depth to which wells will be placed, and may supervise the installation.
   c. The CBOH will, at its discretion, periodically have samples of water collected from these wells and undertake laboratory analysis of samples performed to ascertain the quality of the groundwater. If the analysis of the well water samples show an increase in water pollution above the quality of water samples taken prior to the construction of these sewerage facilities and related appurtenances, the CBOH can

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require the developer or entity responsible for the operation and maintenance of any centralized wastewater facilities serving this development to undertake necessary measures to cease the pollution and return the quality of the groundwater to its initial status.

d. The developer or entity responsible for the operation and maintenance of the wastewater facility shall bear all costs associated with, but not limited to, the furnishing, installing, supervision, collecting, and testing of water samples and reports associated with this undertaking, as well as all costs pertaining to any and all corrective measures required.

e. Parameters of testing shall include, but not necessarily be limited to:

i. Temperature.
ii. Coliform, total and fecal.
iii. Dissolved oxygen.
iv. Total dissolved solids.
v. Nitrite as N.
vi. Nitrate as N.
vii. Ammonia.
viii. Chlorides.
ix. Phosphate, total and soluble.
x. pH.

The frequency of testing will be established on a case-by-case basis.

B. Maintenance of septic tanks.

1. Septic tanks protect the absorptive ability of the soil. Without a septic tank, the soil will clog. Therefore, it is very important that the effluent from the septic tank which percolates into the ground contain minimum amounts of suspended solids. To secure optimum conditions and to prevent complete abandonment of the existing effluent treatment area and construction of a new effluent treatment area involving great expense (sometimes there will not be sufficient land available for a new effluent treatment area), it is extremely important that a septic tank be pumped out before too much sludge and scum accumulate.

2. The recommended septic tank sizes serving single-family residences should give about three years of satisfactory operation before cleaning becomes necessary. However, since there are wide differences in the rate that sludge and scum will accumulate from one tank to another, it is recommended that the tank be inspected once a year during the first few years of operation and later at greater intervals, depending upon the information obtained. It should be remembered that while one family may be required to clean its tank once every three to four years, another family of equal size may find it necessary to clean a similar tank every two years. Furthermore, the amount of sludge and scum accumulation from the same family may vary from year to year.

3. Periodic inspection of the tank is recommended to determine the need for cleaning. Money can be saved by avoiding the expense of unnecessary tank pumping and the expense of rehabilitating clogged effluent treatment areas by pumping when needed. However, as a rule of thumb (without prior inspection), the tank may be cleaned every three years, if the tank size is adequate for the size of the family and for appliances such as garbage grinders.

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If the tank is undersized due to poor design or an increase in loading, it may have to be cleaned every one or two years. To be certain, measure the accumulation of sludge and scum every one or two years.

4. During the inspection, measure the depth of sludge and scum in the vicinity of the outlet baffle or sanitary tee pipe. The tank should be pumped out if either:
   a. The bottom of the floating scum mat is within three inches of the bottom of the outlet device (baffle or tee); or
   b. When sludge exceeds one-third ([1/3) the liquid depth of the tank.
   c. Scum can be measured with a six-foot stick to which a weighted flap has been hinged or any device that can be used to determine the bottom of the scum mat. The stick is forced through the mat, the hinged flap falls into a horizontal position and the stick is lifted until resistance from the bottom of the sum is felt. With the same tool, the distance to the bottom of the outlet device can be found.
   d. Sludge can be measured with a sludge sampler or long stick wrapped with rough, white toweling and lowered into the bottom of the tank. The stick should be lowered behind the outlet device (baffle or tee) to avoid scum particles. After several minutes, if the stick is carefully removed, the sludge line or mark can be distinguished by sludge particles clinging to the toweling.
   e. Cleaning is usually accomplished by pumping the contents of the tank into a tank truck for off-property disposal. Septic tanks should not be washed or disinfected after pumping. Pumping out of septic tanks should be performed by New York State Department of Environmental Conservation licensed haulers.
   f. If the cover and baffles or pipes are not in place and the rest of the tank appears to be satisfactory, they should be replaced. If the tank is cracked and leaking, it should be replaced.
   g. It is dangerous to enter the tank until it has been thoroughly ventilated. Do not discharge large quantities of chemical or oily wastes into a septic tank. Normal use of household detergents and chemicals will not harm the system. Items including, but not limited to, paper towels, newspapers, rags, and diapers should be excluded from the septic tank.
   h. The value of adding disinfectants or other chemicals to improve the operation of septic tanks has not been demonstrated. Generally, addition of chemicals to the septic tank is not recommended. Some products which claim to "clean" septic tanks contain compounds which may provide temporary relief immediately but may also damage the effluent treatment area by clogging soils.

C. Maintenance of soil treatment area (STA).

1. The planting of trees, shrubs, bushes, and other similar vegetation, in close proximity to effluent treatment areas or conduits conveying sewage or effluent should be avoided as this can result in clogging of the system with roots. It is desirable to cover the effluent treatment area with lawn grass. Prevent puddles of stormwater from accumulating on or adjacent to effluent treatment areas by diverting rain and melted snow. Do not build a driveway over an effluent treatment area or run cars, trucks or tractors over it as displacement of grades

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of lines and breaking of tiles will necessitate digging and resetting or replacing them. Do not use chemicals to clean systems. Be careful that mud or silt does not enter the system before and after construction by diverting through ditches all surface water. Keep roof, foundation, cellar and garage floor drainage away from effluent treatment areas.

2. To properly maintain the effluent treatment areas and to assure its longer life, pump out the septic tank when necessary. It is better to pump the tank too often than not often enough.

3. The cost of replacement of effluent treatment areas is much greater than the cost of inspection and maintenance of the septic tank. Sometimes it is impossible to abandon a clogged area and replace it because of lack of lot space. Waste brines from household water softener units should not be discharged into onsite, subsurface treatment systems. A separate dry well should be employed for this purpose.

4. It is good practice to show the location of the various units of the onsite wastewater treatment system on a sketch and reference them to permanent land marks. This is best done when the system is under construction and will prove useful in the future when earth-covered units have to be located for maintenance purposes.

Article IV – Administrative Provisions

§115-11. Permit Required.

No person shall construct or alter an onsite wastewater treatment system connected to a private dwelling or occupy a private dwelling within the Town unless a permit from the Planning and Zoning Office has been obtained. Once issued, the permit shall be valid for the entire period of time necessary for each construction or alteration, but shall become invalid if the construction, alteration or use of such system is not completed or used in accordance with the approved plans and with the regulations.

§115-12. Application for Permits; Specifications.

Application for a permit shall be made to the Planning and Zoning Office on a form to be provided by the Planning and Zoning Office. The permit fee shall accompany the application. The application shall include all the material and information required and set forth in the regulations and may be submitted to the Planning and Zoning Office as a single filing or in steps as may be required by the District.

A. Application for a permit to construct, alter,enlarge or extend an individual onsite wastewater treatment system shall be made only by the owner, owner representative or lessee of the property, who shall submit to the Planning and Zoning Office the following information as may be necessary to determine whether the construction, alteration, enlargement or extension will conform to the provisions of these regulations:

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1. The name and address of the applicant.

2. The specific location of the property on which the construction, alteration, repair or extension is proposed, including delineation of property lines and location of wells.

3. A complete plan of any existing onsite wastewater treatment system and plan of the proposed treatment system with substantiating data attesting to its compliance with the minimum requirements of the District. All new development within the Town needs an engineered stamped plan for any new onsite wastewater treatment systems. While additions or alternations of existing systems may require the submittal of engineered stamped plans, any repairs or in-kind replacements of OWTS components do not require the involvement of a licensed design professional.

4. Detailed information, on forms furnished by the Planning and Zoning Office, showing the absorptive qualities of the soil involved and a conclusion as to the suitability of such soil for the proposed use thereof. This requirement may be waived if the CBOH has sufficient information to make such determination. The CBOH may require that authorized personnel of the town or village be present during the performance of tests designed to show the absorptive qualities of the soil.

5. Pertinent groundwater and geological data as the CBOH may require.

6. Evidence to demonstrate to the satisfaction of the Planning and Zoning Office that there is no community sewer or other part of a community sewage system within a reasonable distance of such building or premises into which the sewage can be discharged, or that it is impracticable to discharge the sewage concerned into a community sewage system or into the sewer or other facility connecting with such sewage system.

B. Onsite wastewater treatment systems for multiple residences, subdivisions or commercial premises shall be designed, with drawings and specifications signed and stamped, by a professional engineer licensed to practice in the State of New York. Applications for a permit to construct, alter, or extend the above facilities shall be made only by the owner, owner representative or lessee of the property, who shall submit to the Planning and Zoning Office all information listed under **§115-12. A (1)** through **(6)**. In addition to said subsections, the following regulations shall be enforced before a permit is issued:

1. Plans for multiple residences subdivisions or commercial premises that include a design flow of more than 1000 GPD, must be submitted to the New York State Department of Environmental Conservation for review and approval.

2. Plans for individual treatment facilities of multiple residences and subdivisions designed for less than 1000 GPD, or commercial premises using individual onsite wastewater treatment systems designed for less than 1000 GPD must be submitted to the Planning and Zoning Office for review and

FIGURE C-5 *Lake George Town Board Resolution 133-2016 Adopting Chapter 115*

approval.

3. An environmental impact statement, as defined by the New York State Department of Environmental Conservation, shall accompany applications for approval as required by State Environmental Quality Review Act (SEQRA) and those proposed for areas affecting endangered species.

C. When, upon review of the application, the Planning and Zoning Office is satisfied that the proposed design meets the requirements of these regulations and, in addition, meets the requirements of the NYSDEC as evidenced by the receipt of a certificate from the NYSDEC, a written permit to proceed with construction shall be issued by the Planning and Zoning Office. It is to be noted that this permit (to construct) automatically expires one year after its issuance unless the Planning and Zoning Office grants an extension prior to the expiration date. Existing lots located in approved subdivisions may be re-evaluated on an individual basis for re-approval if a change in design of the original septic system that was approved in the subdivision is necessary. The Planning and Zoning Office, Planning Board and/or the CBOH reserve the option of individual lot septic design re-approval for a specified period of time or to decline re-approval and require a revised submission for septic design of any particular individual lot...

D. When, upon review of the application, the Planning and Zoning Office is convinced that the proposed design does not meet the requirements of these regulations, or soil and geological conditions are such as to preclude safe and proper operation of the desired installation, or the applicant is unable to produce a certificate from the NYSDOH or NYSDEC, a permit to proceed with construction shall be denied.

E. No installation shall be made without a written permit from the Planning and Zoning Office to the owner, owner representative, or lessee of the lot.

F. It shall be the duty of the holder of the permit to notify the Planning and Zoning Office when the installation is ready for inspection. The Inspector may make inspections during construction to determine compliance with these regulations. No part of any installation shall be covered until inspected and given final written approval by the Planning and Zoning Office. Any part of any installation which has been covered prior to final approval shall be uncovered upon order of the CBOH. Final written approval shall not be given until all pertinent data required has been submitted. Upon notification to the Planning and Zoning Office that the installation is available for inspection, the installation shall be deemed approved after three days from date of official notification and may be covered.

G. Following the issuance of a permit to construct an onsite wastewater treatment system, and satisfactory inspections of the installation, the Planning and Zoning Office will issue an occupancy permit for the premises. The premises may not be occupied and utilized until this occupancy permit has been duly issued by the Planning and Zoning Office.

H. Any person whose application for a permit under this section has been denied shall be notified in writing as to the reasons for denial, and such person may, within 30 days after official notification of such action, file a written request for a hearing before the

FIGURE C-5 *Lake George Town Board Resolution 133-2016 Adopting Chapter 115*

CBOH. Such hearing shall be held within 10 days after the receipt of the request by the CBOH and upon reasonable notice to the applicant. The CBOH shall affirm, modify or revoke the denial or issue the permit on the basis of the evidence presented at the hearing.

I. Whenever wastewater treatment facilities are, altered, enlarged, expanded or extended, the owner shall submit the existing and proposed sewage treatment facilities plans for approval by the Planning and Zoning Office.

§115-13. Permit fee.

The fee for the permit shall be as set forth from time to time by resolution of the Town Board and on file in the office of the Town Clerk.

A. Application made pursuant to these regulations shall be accompanied by a fee in the amount as set forth by the Town Board, payable to the Town Clerk. In the event that such application is submitted after construction, alteration, or extension has been physically undertaken on the wastewater treatment system, such fee shall be in the amount as set forth by the Town Board which shall be on file in the office of the Town Clerk.

B. Applications made pursuant to these regulations shall be accompanied by the fee in an amount as set forth by the Town Board, payable to the Town Clerk. Special project fees will be charged to those projects utilizing a unique or unusual method of sewage treatment. In addition, a special fee may be required whenever test hole and/or soil evaluation go beyond the normal machine dug test hole.

C. Special consulting fees.

1. The Consolidated Board of Health, in its review of applications, may employ consultants, legal counsel, professional engineers and/or inspection services to provide assistance and advice in the review of any application, including onsite investigations, evaluation and inspection, verification of the adequacy of plans and the sufficiency of submitted reports; study of the impact of proposals upon the resources and environment of the town; preparation and/or review of environmental impact statements; inspection of installed improvements; and such other services or technical assistance as the Consolidated Board of Health deems necessary for its review of the application.

2. All costs incurred for these special consulting services shall be borne by the applicant. As further provided below, a deposit shall be required in advance to cover the estimated cost of these services. This deposit shall be in the amount determined by the Town Board or its duly authorized agent, as sufficient to cover all such special consulting costs. Fees for the preparation or review of environmental impact statements shall be as determined by 6 NYCRR Part 617, adopted pursuant to Article 8 of the Environmental Conservation Law.

3. The deposit due for the special consulting services deemed by the CBOH to be

FIGURE C-5 *Lake George Town Board Resolution 133-2016 Adopting Chapter 115*

necessary for its appropriate review of any particular application shall be filed with the application in the Planning and Zoning Office by certified check made payable to the Town of Lake George. An application shall not be deemed complete until the requirements of this section have been complied with.

4. After the CBOH has rendered its decision on any application, the balance of the deposit, if any remains in excess of actual incurred cost shall be returned to the applicant without payment of interest.

5. Payment of any deficiency in the amount of the deposit to cover incurred costs in full shall be a condition to final approval of any application by the CBOH. No final approval shall be signed, stamped, sent or otherwise be valid until and unless such amount is paid.

§115-14. Effect on Other Permits.

Nothing in this article shall limit or otherwise relate to any other permit requirements relating to local use, construction requirements or other legally adopted requirements by any governmental entity having jurisdiction over the area of the Town.

§115-15. Variances.

If an applicant for a permit is unable to meet the requirements set forth in this Chapter for reasons including, but not limited to, insufficient area, separation distances, or an unnecessary hardship that would deprive the owner of the reasonable use of the land involved, the applicant or the applicant's representative may apply to the for a variance. In considering the request for a variance, the CBOH will consider the following criteria that need to be met.

A. That there are special circumstances or conditions, fully described in the findings of the CBOH, applying to such land and that such circumstances or conditions are such that strict application of the provisions of this Ordinance would deprive the applicant of the reasonable use of such land.

B. That the variance would not be materially detrimental to the purposes and objectives of this Ordinance, or to other adjoining properties, or otherwise conflict with the purpose or objectives of any plan or policy of the Town.

C. That, for reasons fully set forth in the findings of the CBOH, the granting of the variance is necessary for the reasonable use of the land and that the variance as granted by the CBOH is the minimum variance which would alleviate the specific unnecessary hardship found by the CBOH to affect the applicant.

In granting any variance, the CBOH shall prescribe and attach any reasonable conditions that it deems to be necessary or desirable.

Article V – Enforcement

FIGURE C-5 *Lake George Town Board Resolution 133-2016 Adopting Chapter 115*

§115-16. Penalties for Offenses.

Any person who constructs an onsite wastewater treatment system connected to a structure without obtaining a permit as required in this article or any person who occupies a private dwelling and alters, enlarges, or expands an onsite wastewater treatment system for which no valid permit exists as required in this Chapter (for each day for each person so charged and convicted and occupying such dwelling) or any violation of this chapter shall be punishable, for each violation, by a fine of not more than $250 or imprisonment for not more than 15 days, or both.

A. In the enforcement of these rules and regulations or of the State Sanitary Code, the CBOH may impose penalties for such violation of, or failure to comply with, any of its orders or regulations not exceeding $250 for a single violation or failure and may sue for and recover it in any court of competent jurisdiction (each day shall be considered a single violation).

B. In addition, the CBOH shall also have the authority to institute any other civil or criminal proceeding in a court of competent jurisdiction which is authorized by the Public Health Law generally, and §§ 12-b, 12-c and 229 of that law specifically, where a violation of law has occurred and penalties may be imposed as provided for by law. If the CBOH or its agent determines that life and health are endangered by the failure or misoperation of an onsite wastewater treatment system subject to these regulations, the CBOH or agent shall order that remedial action be taken by the owner of such system.

C. In addition to other penalties imposed by these regulations and other ordinances, such owner and such property shall be liable for costs of any work performed by any municipal agency to remedy such failure or misoperation.

§115-17. Misrepresentation.

Any permit or approval granted under these regulations which is based upon or is granted in reliance upon any material representation or failure to make a material fact or circumstance known, by or on behalf of an applicant shall be void. This section shall not be construed to affect the remedies available to the CBOH under §115-16 of these regulations.

§115-18. Conflicts; Savings Clause; Repealer.

A. The rules and regulations of the District are designed to promote and protect the general health, safety and welfare of the community. The Town Board, in adopting these rules, is aware of the fact that other governmental units which have similar objectives and authority have adopted laws, rules, and regulations which relate to the same area of concern. Where provisions of these regulations are found to be in conflict with any law, rule or regulation adopted by any appropriate governmental unit having jurisdiction to adopt such law or rule, the CBOH shall determine which imposes the higher standard and shall require compliance with the higher standard. In the event that a dispute arises as to which law governs, the Consolidated Board of Health may make a determination and its determination is final.

B. Savings clause. If a court of competent jurisdiction finds that any section or sections

FIGURE C-5 *Lake George Town Board Resolution 133-2016 Adopting Chapter 115*

of these rules and regulations are invalid for any reason, such finding of invalidity shall not affect the remaining sections of these regulations, and they shall remain in full force and effect.

C. Repeal of prior inconsistent rules and regulations. Any rules or regulations adopted by the Town Board which relate to the same matter as those herein enacted are hereby repealed and have no future force and effect. The repeal hereby of any such prior rules and regulations shall in no way affect the past validity of such rules and regulations, and no person shall gain or lose any past rights, duties or obligations existing under the prior rules and regulations.

§115-20. Effective date.

These regulations shall be effective on and after August 8, 2016.

Section 2. This local law shall supersede and repeal Municipal code of the Town of Lake George, Chapter 134 Sewage Disposal Systems (adopted May 12, 1986), and Appendix A180 Lake George Consolidated Health District Regulations (adopted August 5, 1986);

Section 3. This local law shall take effect immediately.

Final Town Local Law for OWTS Regulations

FIGURE C-5 *Lake George Town Board Resolution 133-2016 Adopting Chapter 115*

APPENDIX D – TOWN OF LAKE GEORGE DOCUMENTS

RESOLUTION NO.: 160-2014
INTRODUCED BY: Supervisor Dickinson
SECONDED BY: Councilperson Muratori
DATED: Oct 28, 2014

LAKE GEORGE TOWN BOARD

RESOLUTION DESIGNATING THE CONSOLIDATED HEALTH DISTRICT A RESPONSIBLE MANAGEMENT ENTITY

WHEREAS, the Town of Lake George and Village of Lake George formed a Consolidated Health District pursuant to Section 390 of the New York State Public Health Law; and

WHEREAS, wastewater disposal systems within the Town fall within the purview of the Regulations of the Consolidated Health District; and

WHEREAS, pursuant to the New York State Public Health Law, the Consolidated Health District has all the powers previously exercised by the Town Board and the Village Board of Trustees as the Local Boards of Health including the necessary authority and capacity to enforce its Regulations as they relate to wastewater disposal systems; and

WHEREAS, the Town Board is the Legislative Body of the Town of Lake George having the authority to designate an appropriate entity as a Responsible Management Entity;

NOW, THEREFORE, BE IT

RESOLVED, that the Town Board hereby finds that the Consolidated Health District of the Town and Village of Lake George is a Responsible Management Entity as that term is defined by State Department of Health Regulations and the Town Board further designates the Consolidated Health District as such; and be it

FURTHER RESOLVED, that this designation shall immediately take effect and shall remain in effect unless or until the Town Board repeals this Resolution.

Duly adopted this _28th__ day of October, 2014, by the following vote:

AYES : 5 Hurley, Crocitto, Muratori, Stannard, Dickinson
NOES : 0
ABSENT:

FIGURE D-1 *Lake George Town Board Resolution 160-2014 Designating The Consolidate Health District as Responsible Management Entity (10/28/14)*

Dennis Dickinson, Supervisor
Vincent Crocitto, Councilperson
Marisa Muratori, Councilperson
Dan Hurley, Councilperson
Nancy Stannard, Councilperson

Town of Lake George
20 Old Post Road
PO Box 392
Lake George, NY 12845
518-668-5722
Fax: 518-668-5721
email: townclrk@nycap.rr.com
www.townoflakegeorge.org

Debra Foley, Town Clerk
Wendy Baird, Comptroller
Keith Oborne, Director of Planning
Lori Barber, IAO, Assessor
Dan Davis, Highway Superintendent
Jim Martino, Buildings & Grounds

January 9, 2014

Dear Lake George Landowner,

Please find attached a **Pre-Inspection Worksheet for Onsite Wastewater Treatment Systems** (OWTS). On May 29, 2013, the Lake George Consolidated Board of Health instituted a *Septic Initiative Program* to catalogue and inspect existing OWTS within the Town. Based on this initiative, you are required to complete and submit the attached worksheet with the requested information regarding what type of septic system you are using to treat wastewater, its location, age, overall functionality and most recent pump out date (please include a copy of your Septic Hauler's pump out receipt). If you do not have knowledge about your OWTS, please check **'Unknown'** and return the worksheet. Completed worksheets can be mailed back to the Planning and Zoning Office or hand delivered during business hours (Mon-Fri 8:30am to 4:30pm).

The Consolidated Board of Health within the Town of Lake George governs the design of replacement OWTS and is responsible to implement the Public Health Law and Sanitary Code of the State of New York, and therefore is requesting this information. Onsite wastewater treatment systems are effective when properly designed, installed and maintained. However, an inadequate OWTS, lack of routine maintenance, increased seasonal usage, undersized and overused systems, or the installation of systems on sites with unacceptable soil conditions can all lead to wastewater treatment failure. In addition, an OWTS in close proximity to Lake George or a stream/tributary can negatively impact water quality and your drinking water.

At this time, the town is in the process of information gathering. We will contact you in the future to schedule an inspection of your OWTS. At that time, we will witness your pump out and assess the condition of your OWTS. In the event of a system failure, we will be offering assistance with a design to increase functionality to your existing OWTS, or to design a compliant system to replace what you are currently using. If you have any questions or concerns regarding the need for this information, or questions about completing the worksheet, do not hesitate to contact my office. Thank you for your attention to this important public health initiative.

Sincerely,

Keith Oborne
Director of Planning and Zoning
Town of Lake George
518-688-5131 ext. 311
koborne@nycap.rr.com

"Lake George...America's Family Playground"

FIGURE D-2 *Town of Lake George Planning & Zoning Department Homeowner Sample Outreach Letter*

TOWN OF LAKE GEORGE
20 Old Post Road
Lake George, New York 12845
518.668.5131

Pre-Inspection Worksheet for Onsite Wastewater Treatment Systems (OWTS)

This Pre-Inspection Worksheet has been designed to assist you, the landowner within the Town of Lake George, to document your existing onsite wastewater treatment system (OWTS), also referred to as a septic system. Submission of this worksheet is required by the Lake George Consolidated Board of Health based on its adopted *Septic Initiative Program*. Please complete the requested information regarding your OWTS and return this worksheet with attachments and a copy of recent pump out receipts from your septic hauler to the Planning and Zoning Office (by mail or drop off during business hours Mon-Fri 8:30am to 4:30pm). If you need assistance in filling out this worksheet or have questions regarding the requested information, please contact the Planning and Zoning Office during business hours. Thank you in advance for participating in this public health initiative.

Date _____ **Tax Map ID #** _____

Name _____

Address _____ **Lake address** _____

_____ **Lake phone** _____

Phone _____ (home) _____ (cell)

Email _____ _____ **# acres**

SEPTIC SYSTEM SKETCH

On the back of this worksheet, please sketch your onsite wastewater treatment system. If available, include a copy of your property's site plan map showing your OWTS as-builts. Your OWTS design sketch should include:

- **the approximate shape of your house, labeling its front and back;**
- **your property lines;**
- **your well, driveway, roads, accessory structures, rock outcroppings and distances to lake, stream, and wetlands labeled;**
- **the distance of your existing OWTS (tank and effluent treatment) from your house and adjacent waterbodies.**

FINDINGS

- **UNKNOWN** _____ *[check here if you do not know the specifics about wastewater treatment on your property]*
- **Septic system sewage flows into:**

  Concrete septic tank _____ **gals** *(size of tank)*

  Plastic septic tank _____ **gals** *(size of tank)*

  Metal septic tank _____ **gals** *(size of tank)*

  Holding Tank _____ **gals** *(size of tank)*

  Cesspool _____ **gals** *(size and construction of cesspool)*

- **Effluent from septic tank flows to:**

  Soil Treatment Area (STA) _____
  Seepage pit / drywell _____
  Eljen ETU _____
  Puraflo ETU _____

  Other (*please describe*) _____

OTHER INFORMATION

- **Age of septic system** _____ **Distance to lake or stream** _____ **feet**
- **Age of home** _____ **# of bedrooms** _____
  - ✗ **Garbage disposal?** **Yes** **No** *(please circle)*
  - ✗ **Water treatment system?** **Yes** **No** *(please circle)*
  - ✗ **Sump pump to OWTS?** **Yes** **No** *(please circle)*

DATE of last septic tank pump out _____ **Septic hauler** _____

→ *[Please attach a copy of your recent inspection and pump out receipts]* ←

FIGURE D-3 *Town of Lake George Septic Initiative Program Survey/Pre Inspection Worksheet for Onsite Wastewater Treatment Systems*

ATTACHMENT C – WORK PLAN

Summary

PROJECT NAME: Septic Initiative Program

CONTRACTOR SFS PAYEE NAME: Town of Lake George

CONTRACT PERIOD: From: 05/01/2015

To: 04/30/2020

Provide an overview of the project including goals, tasks, desired outcomes and performance measures:

The TLG Septic Initiative Program began in 2013, to begin inventory and cataloging all OWTS on properties within 500 feet of Lake George and 100 feet from streams flowing to the lake. With well over 400 properties in the program and the fact that property participation is voluntary at this time, additional administrative time is required to work with each individual for buy-in of the program. Training to certify Inspectors, managing the inspection schedule and coordinating additional meetings with town Supervisors within the watershed to discuss participation in a similar program will be completed within the next two years.

Goals and outcomes include (1) a detailed inventory and mapping assessment of all OWTS in the Septic Initiative boundaries through an inspection and maintenance program, (2) a final report that includes an analysis of this inventory, rated systems, and implementation actions, (3) various public workshops and training sessions, (4) spreading of the program to adjacent municipalities / other Towns and Cities in the Lake George watershed, (5) algae testing and water sampling of problem areas found during inspections, (6) working with the Fund for Lake George to identify the most crucial properties in need of replacement systems, to which the Fund has matching monies to match private property owner costs, (7) promoting the installation of risers to grade at all septic system properties, (8) education of homeowners and contractors in the Town, and (9) continue the revisions of the Town Consolidated Board of Health regulations code.

Population served will be roughly 460 properties (approximately 1,000-1,500 people, or 30% of the Town population). Location of program is within 500 feet of Lake George, and within 100 feet of class AA-S streams in the Town of Lake George. Hours of operation will always be during normal Town business hours (830am-430pm) and service delivery method will be home visits and inspections through an inspection "appointment" system.

Contract Number: # C00119G

Page **1** of **8**; Attachment C – Work Plan

FIGURE D-4 *Town of Lake George Septic Initiative Program NYSDEC WQIP Work Plan*

ATTACHMENT C – WORK PLAN

The Town of Lake George employees various people who will be involved in this grant endeavor, including the Director of Planning and Zoning and the Comptroller. Additionally, various town board members will be involved. The Planning and Zoning qualifications include a Director who has a Masters degree in urban and environmental planning and several years of experience, and a comptroller with nearly 15 years of experience. Ongoing staff development includes meetings to review and discuss the use and controls associated with Grants Gateway, and experience / knowledge of administering over 20 grants previously. The Town staff will be critical components of the training sessions and public workshops held for this initiative program.

Contract Number: # C00119G
Page **2** of **8**; Attachment C – Work Plan

FIGURE D-4 *Town of Lake George Septic Initiative Program NYSDEC WQIP Work Plan*

ATTACHMENT C – WORK PLAN

Detail

OBJECTIVE	BUDGET CATEGORY/ DELIVERABLE (if applicable)	TASKS	PERFORMANCE MEASURES
1: Detailed inventory and mapping assessment of all OWTS in the Septic Initiative boundaries	Budget Categories: • Contractual Services • Personal Services • Travel Deliverables: • Excel spreadsheets for Phase I-IV • Inspection schedule / log	a. Continue Inventory of all properties in the four (4) phases of the Septic Initiative Boundaries	i. Work with consultant(s) to continue mailing out "inventory questionnaires" and request for inspections
			ii. Keep an excel worksheet of all properties within the boundaries of the Septic Initiative Program – update with results from inspections
			iii. Log in the inventory all relative information – age of system, pump out dates, type of system, etc.
		b. Continue assessment of all properties in the four (4) phases of the Septic Initiative Boundaries	i. Consultant(s) to assess all OWTS that are inventoried and inspected, in terms of efficiency
			ii. Rate all OWTS with one of the following codes, "good, standard, substandard, or failing"
			iii. Prioritize each property's OWTS in regards to need for repairs, either "high, medium or low priority"
		c. Develop an "inspection schedule"	i. Work with consultant(s) to develop a routine inspection schedule, with identified days and times of inspections for people to schedule inspections
			ii. Keep a record log with each inspection completed – update the excel worksheet inventory with results / date
			iii. Propose scheduled maintenance / pump out dates to OWTS owners following completed inspections

Contract Number: # C00119G
Page **3** of **8**; Attachment C – Work Plan

FIGURE D-4 *Town of Lake George Septic Initiative Program NYSDEC WQIP Work Plan*

ATTACHMENT C – WORK PLAN

OBJECTIVE	BUDGET CATEGORY/ DELIVERABLE (if applicable)	TASKS	PERFORMANCE MEASURES
2: Develop a final "Town of Lake George Septic Initiative Report"	Budget Categories: • Contractual Services • Personal Services Deliverables: • Septic Initiative Report Document and PDF • ArcGIS shapefiles for mapping	a. Report Section 1: Inventory and Assessment	i. Using data collected and catalogued in Task 1a, develop a report sub-section on the inventory of all OWTS in the program boundaries
			ii. Using data collected and catalogued in Task 1b, develop a report sub-section on the assessment of all inventoried OWTS in the program boundaries
			iii. Develop assessment calculations (no response, unknown OWTS, good, standard, failing, etc.)
		b. Report Section 2: Analysis and Mapping	i. Using the information combined into Section 1 of the report (task 2a), complete a summary analysis sub-section of each "phase" of the initiative (all four phases)
			ii. Using the information combined into Section 1 of the report (task 2a), complete a GIS map of each "phase" of the initiative (all four phases), using colors for ratings
			iii. Map critical areas where potential contamination / pollutants may be attributed to OWTS leakage
		c. Report Section 3: Implementation Actions	i. Using data collected and catalogued in Task 1b(iii), develop a report sub-section on the prioritization of needs of all inventoried OWTS in the program boundaries
			ii. Compile potential implementation actions for homeowners to update failing systems / install risers
			iii. Recommend owners of highest priority systems work with the Fund for Lake George on system replacement

Contract Number: # C00119G
Page **4** of **8**; Attachment C – Work Plan

FIGURE D-4 *Town of Lake George Septic Initiative Program NYSDEC WQIP Work Plan*

ATTACHMENT C – WORK PLAN

OBJECTIVE	BUDGET CATEGORY/ DELIVERABLE (if applicable)	TASKS	PERFORMANCE MEASURES
3: Public Outreach and Education	Budget Categories: • Contractual Services • Personal Services • Travel • Other Deliverables: • Workshops (Presentations, handouts, etc.) • Training Sessions (Presentation, handouts, etc.) • Letters to Town Supervisors and Logs of outreach to jurisdictions	a. Host 2-3 Public Workshops (including refreshments)	i. Host an initial Public Workshop at the Town hall that described the Septic Initiative, the WQIP grant, and the potential / hopeful outcomes and goals
			ii. Host a near-end program Public Workshop at the Town hall that details findings and a summary of the Septic Initiative Report
			iii. Host an OPTIONAL Public Workshop halfway through that caters to specific problem areas / neighborhoods
		b. Host 2-3 Training Sessions (including refreshments)	i. Sponsor an initial OWTS Inspection Training Seminar for local consultants and engineers at the Town Hall
			ii. Sponsor a second OWTS Inspection Training Seminar for local consultants and engineers at the Town Hall
			iii. Sponsor an OPTIONAL Enhanced Treatment Unit Educational Seminar for local consultants and engineers
		c. On-going Municipal Program Outreach	i. Outreach to adjacent and nearby jurisdictions to gauge their interest in joining the Septic Initiative
			ii. Phase 1: Meet with Supervisors for the Towns of Fort Ann, Queensbury, Bolton and Hague to gauge interest
			iii. Phase 2: Meet with Supervisors for the Towns of Ticonderoga, Dresden and Putnam to gauge interest

Contract Number: # C00119G
Page **5** of **8**; Attachment C – Work Plan

FIGURE D-4 *Town of Lake George Septic Initiative Program NYSDEC WQIP Work Plan*

ATTACHMENT C – WORK PLAN

OBJECTIVE	BUDGET CATEGORY/ DELIVERABLE (if applicable)	TASKS	PERFORMANCE MEASURES
OBJECTIVE	BUDGET CATEGORY/ DELIVERABLE (if applicable)	TASKS	PERFORMANCE MEASURES
4: Algae Testing and Water Sampling	Budget Categories: • Contractual Services • Personal Services • Equipment • Travel Deliverables: • Algae inspection report • Water sampling report	a. Conduct Algae testing	i. Collect and test algae in problem areas (if and when) found during inspections
			ii. Analyze and document the algae's connection to potential nearby OWTS
			iii. Identify measures to reduce the entrance of pollutants from OWTS into Lake George
		b. Water sampling	i. Use the water quality test kits to sample water quality of Lake George waters proximate to excessive algae
			ii. Document results of the water testing, where the tests were taken, and what (if any) pollutants were found
			iii. Identify measures to reduce the entrance of pollutants from OWTS into Lake George
		c.	i.
			ii.
			iii.

Contract Number: # C00119G
Page **6** of **8**; Attachment C – Work Plan

FIGURE D-4 *Town of Lake George Septic Initiative Program NYSDEC WQIP Work Plan*

ATTACHMENT C – WORK PLAN

OBJECTIVE	DELIVERABLE (if applicable) BUDGET CATEGORY/ DELIVERABLE	TASKS	PERFORMANCE MEASURES
5: Work with the Fund for Lake George on implementation	Budget Categories • Contractual Services • Personal Services • Travel	a. Identify priority properties for OWTS upgrade funding	i. Using the Septic Initiative Report, identify highest priority properties with failing OWTS for potential funding match to replace / upgrade system
			ii. Distribute information from 5a(i) (and the overall Septic Initiative Report) to the Fund for Lake George to analyze
			iii. Suggest potential new systems for homeowner / FUND purchase and coordination with the Town Consolidated Board of Health
		b.	i.
			ii.
			iii.
		c.	i.
			ii.
			iii.

ATTACHMENT C – WORK PLAN

	(if applicable)		
6: Continue to revise Town of Lake George Consolidated Board of Health (CBOH) Regulations	Budget Categories: • Contractual Services • Personal Services	a. Revise and adopt new Septic / OWTS Regulations	i. Continue to revise and update the CBOH regulations for review adoption. Consider any findings from the Septic Initiative Report
			ii. Coordination with the Town CBOH and Adirondack Park Agency (APA) on review of code revisions
			iii. Adopt the revised CBOH regulations at the Town level following APA Board approval
		b.	i.
			ii.
			iii.
		c.	i.
			ii.
			iii.

Contract Number: # C00119G
Page **8** of **8**; Attachment C – Work Plan

FIGURE D-4 *Town of Lake George Septic Initiative Program NYSDEC WQIP Work Plan*

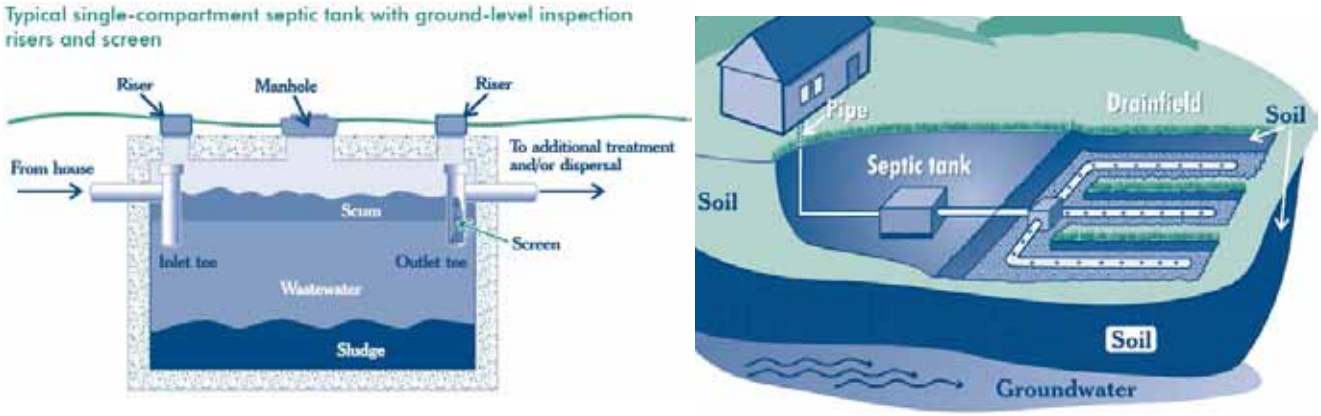
Your Septic System

Millions of suburban and rural New York residents depend on septic systems to treat and dispose of household wastewater. The purpose of a septic system is to store, distribute, and treat liquid wastes from your home on your property while preventing contamination of groundwater, drinking water wells, and nearby lakes and streams. When a septic system is properly located, designed, installed, and maintained, it serves as an effective, economical, and safe on-site wastewater treatment system. **Maintenance is the key to a lasting, properly functioning septic system.** This publication will help you learn how a septic system works, how to maintain it, how to prevent and recognize problems, records you should keep, and where to go for more help.

Septic System Function and Maintenance

How Your Septic System Works

Household wastewater carries water, solids, grease, and dissolved substances, including household chemicals. It also carries bacteria that can decompose waste, and bacteria and viruses which can cause disease. A septic system treats wastewater in stages to manage these substances. A failing septic system is one that cannot perform these tasks, putting human health and water resources at risk.



The figures above show the basic parts of a septic system (from A Homeowner's Guide to Septic Systems, US EPA 2005). Wastewater flows from the house via a pipe into the **septic tank**. Bacteria decompose some of the waste materials. Heavy solids settle to the bottom of the tank, to form sludge. Oils and grease float to the top, forming a scum layer. Wastewater between those two layers can flow out through the exit pipe, which should have a screen or filter to block large particles. Note that two-compartment septic tanks or two septic tanks in series are recommended and sometimes required in New York State.

The partially treated wastewater is discharged from the septic tank to a **distribution box** and through perforated pipes into an **absorption area**, also called a **leachfield** or **drainfield**. Here, the water is further treated by filtration through gravel and soil, chemical reactions, and decomposition by soil microorganisms. The water itself is recycled back into the environment, making this a decentralized or **on-site wastewater treatment system (OWTS).**

Cornell University

FIGURE D-5 *Cornell Cooperative Extension Your Septic System Publication*

Maintaining Your Septic System

The design life of a septic system is usually several decades. Keep your septic system functioning properly with regular maintenance.

Pumping Out Your Septic Tank

- Generally, sludge and scum should be pumped from the septic tank every three to five years, depending on the size of the tank and the amount and composition of wastewater entering the tank. Use of a kitchen sink grinder greatly increases solids loading so the tank must be pumped more often.
- To determine a maintenance schedule for your household, have the tank inspected every two to three years and pumped as needed. Use that baseline information to plan your regular tank pumping interval.
- Contact a commercial septic tank inspection and pumping service, which must have permits from the New York State Department of Environmental Conservation to transport and properly dispose of the waste. Pumping the septic system will cost a few hundred dollars. This is much less expensive than replacing parts of your system.

Finding Your Septic System Components

- In order to maintain your system, the septic tank needs to be accessible for pumping and the absorption area should be protected. Check with your county health department to find out what records they have about your system. Septic tanks are sometimes indicated on property survey maps. If the access riser to the tank is at ground level, it is easy to find, but it may be buried under the lawn.
- Locate the sewer pipe leaving your home. Try to find the absorption area by checking the yard for an area where the grass grows differently or there are mounded areas or trenches. The tank is located between the sewer pipe and the absorption area. Any likely site can be probed with a thin metal rod that can reach through the soil to the top of the tank. In the winter warmth from household water may melt snow above the tank. If you are unable to find the tank, your septic tank inspection and pumping service will use a device to find it. You may want to have an access riser extended to the surface or just below ground level and marked clearly with a stake, rock, or other easily moved structure.
- Draw a map of your septic system on the back of this publication or a copy of your property survey map. Sketch your house, driveway, water well, and other landscape features such as trees, rocks, or fences. Sketch your sewer pipe, septic tank, and absorption area in relation to other features. Measure and record distances from your house to your septic tank and to the corner of your absorption area, if possible. As long as the distances are correct, do not be concerned whether or not the drawing is to scale.

Recordkeeping

- Keeping a record of your septic system maintenance will help you anticipate when the next pumping is needed. You can pass this information to subsequent owners when you sell your property. Write information about the tank, pumping history, and local contractors directly on the back of this publication or keep receipts and notes in the folder. Store this folder with other records about your home.

FIGURE D-5 *Cornell Cooperative Extension Your Septic System Publication*

Daily Care of Your Septic System

Protect the Tank and Absorption Area

- Grass and other plants with shallow roots are beneficial over an absorption area. Deep roots of trees and shrubs can damage the tank or absorption area. Do not fertilize the soil above the absorption area.
- Do not build patios or other structures over the septic tank or absorption area.
- Keep automobiles and heavy equipment off the absorption area to protect system parts and avoid soil compaction.
- Keep surface water runoff from rain, downspouts, driveways, and sidewalks from flowing toward or pooling on top of your absorption area. If necessary, modify the landscaping to drain this water away from the septic system.

Watch What Goes Down the Drain

- Do not put substances such as motor oil, gasoline, paints, solvents, or pesticides into your wastewater. Don't flush medications. Take these chemicals to household hazardous waste collection events or dispose of them properly with household trash. These materials may pollute groundwater and are often toxic to the microorganisms that break down wastes. For disposal info see dontflushyourdrugs.net and www.dec.ny.gov/chemical/8485.html
- Use household cleaners, disinfectants, detergents, and bleach in moderation.
- Oils, fats, grease, and solids such as coffee grounds, paper towels, sanitary pads, and disposable diapers will clog your septic system. Dispose of them in household garbage.
- Food scraps should be composted or disposed in household garbage. Kitchen sink grinders use extra energy and water, and put an extra burden on your septic system.

Avoid Commercial Septic System Additives

- Commercial additives are not needed after pumping. The sludge residue and incoming household wastewater already contain active microorganisms. Yeasts, bacteria, enzymes, and various chemicals are sold with the claim that they help a system work better; however, there is no scientific evidence that such additives are effective. In fact, some additives can cause the solids in an overloaded tank to be re-suspended and clog the drainage lines and absorption area. Additives are not an alternative to proper maintenance and do not eliminate the need for routine pumping of your septic tank.

Conserve Water and Limit the Water Entering the Tank

- Conserve water and choose fixtures and appliances that reduce water use.
- Large amounts of water entering the system in a short time can stir up solids on the bottom of the tank and push wastewater into the absorption area too quickly. Spread laundry and other tasks that use a lot of water over the entire week.
- Do not connect gutter downspouts, basement sump pumps, or footing drains to the septic tank. This water does not need to be treated with the household wastewater.
- Water softeners and other water treatment devices have parts that must be regenerated to continue to work. This produces a very salty brine that can negatively affect septic systems. It is important that treatment devices recharge based on actual use and concentrations rather than by the clock. Since the brine rinse does not need to be treated with the rest of the household wastewater, it can be sent to a separate drainfield. For more information, consult your county health department and see the NYS DOH Residential OWTS Design Handbook (link on the back cover) and the NOWRA and WQA guidance document http://www.nowra.org/newsrelease/Softnerguidance.pdf.

FIGURE D-5 *Cornell Cooperative Extension Your Septic System Publication*

Septic System Records

Location of Septic System Components: Make a rough sketch below or on a copy of your property survey map. Note landmarks and the location of the sewer pipe, septic tank, distribution box, and absorption area.

System Information

Installation date: _____

Tank volume: _____ gallons

Tank dimensions: ____L____W____D

Tank material: _____

Absorption system type:

_____

System designer: _____

Phone:_____

System installer: _____

Phone:_____

Maintenance Record - Inspection, Pumping, Repairs

Date	Work done	Company	Cost	Notes

Service Companies

Name:_____

Phone:_____

Name:_____

Phone:_____

Name:_____

Phone:_____

Contact Information and References

Consult your County Health Department for guidance and permit information. http://www.health.ny.gov/contact/
Many municipalities and watersheds have local regulations about on-site wastewater treatment.
Some counties receive environmental health services from a regional NYS Department of Health District Office

New York State Department of Health sets design standards for on-site wastewater treatment and certifies water testing laboratories
http://www.health.state.ny.us/environmental/water/drinking/appendix_75a.htm
http://www.health.ny.gov/environmental/water/drinking/wastewater_treatment_systems/design_handbook.htm
http://www.wadsworth.org/labcert/elap/comm.html

Cornell Cooperative Extension Consumer Water Quality Program,
Cornell University, Ithaca NY 14853, 607-255-1943
http://waterquality.cce.cornell.edu/septic.htm

A Homeowner's Guide to Septic Systems
U.S. Environmental Protection Agency (2005)
http://www.epa.gov/owm/septic/pubs/homeowner_guide_long.pdf

Maintaining Your Septic System - A Guide for Homeowners
National Small Flows Clearinghouse (2004)
http://www.nesc.wvu.edu/pdf/ww/septic/pl_fall04.pdf

Your local Cornell Cooperative Extension (CCE) County Office
http://cce.cornell.edu

New York State Federation of Lake Associations
Diet for a Small Lake
http://www.nysfola.org/diet/

County Soil and Water Conservation District Office, Lakeshore or Watershed Associations or Other Local Groups

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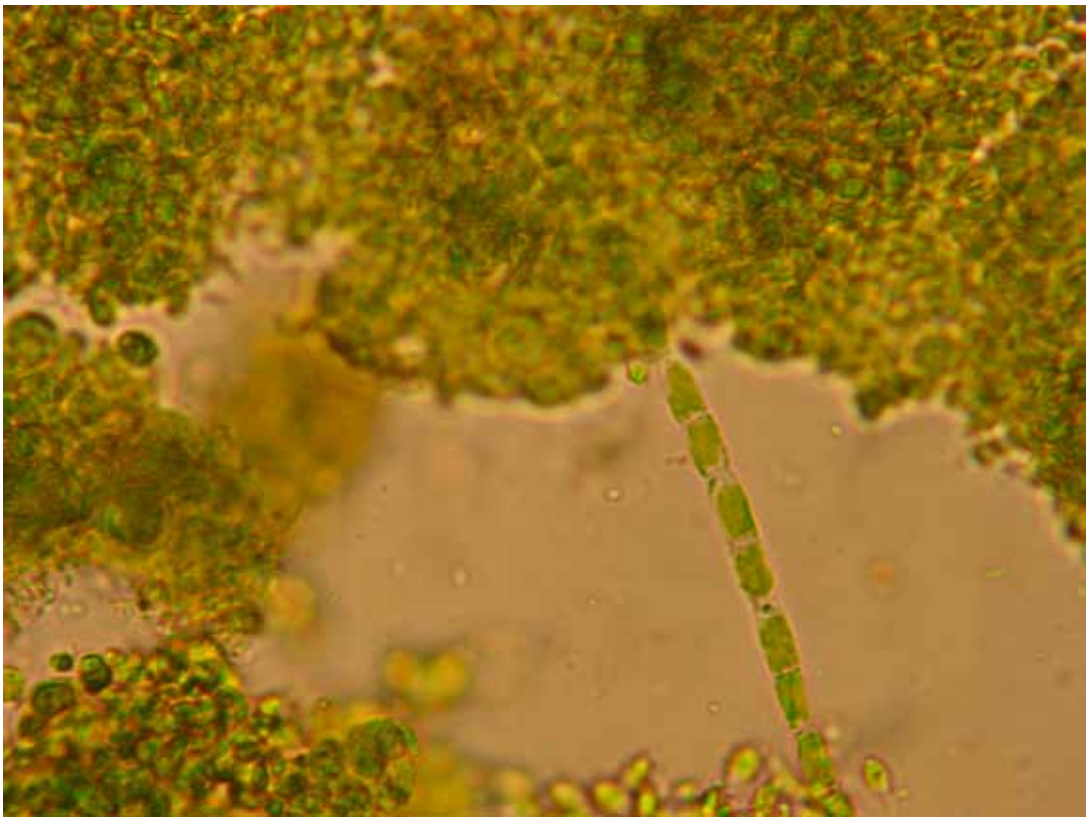
FIGURE D-5 *Cornell Cooperative Extension Your Septic System Publication*

APPENDIX E – ALGAE BIOMONITORING WORK PLAN

Town of Lake George Septic Initiative Program

A Program for Sampling Algae and Monitoring Water Quality



Prepared For

Town of Lake George
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Lake George, New York 12845

Prepared By

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Lake George Waterkeeper
PO Box 591
Lake George, New York 12845

June 2016

FIGURE E-1 *Town of Lake George Septic Initiative Program Algae Biomonitoring Work Plan*

Executive Summary

There is concern about the potential influence of effluent from onsite wastewater treatment systems (OWTSs) in the Town of Lake George on water quality and their effects on nutrient levels in Lake George. There has been observed increased algal growth along the Lake George shoreline and in particular streams within the Town of Lake George that supports this concern.

The Town of Lake George (Town) started a Septic Initiative Program (SIP) in 2013 to begin to inventory and catalog all OWTSs on properties within 500 feet of Lake George and 100 feet from streams flowing into Lake George. In 2015, the Town received a New York State Department of Environmental Conservation (NYSDEC) Water Quality Improvement Project (WQIP) Grant to assist in the development of the SIP, which would include (1) a detailed inventory and mapping assessment of all OWTSs within the project boundary, (2) a final report that includes an analysis of the inventory, rated systems and implementation actions, (3) public workshops and training sessions, (4) outreach to other municipalities within the Lake George basin, (5) sampling algae and water quality monitoring in problem areas, (6) identification of crucial properties in need of replacement systems, (7) education of homeowners and contractors in the Town, and (8) continuation the revisions of the Town Consolidated Board of Health Regulations..

The draft document presented here describes an algae sampling and water quality monitoring plan that, when implemented, will provide the data necessary to assess the potential impact to water resources in areas with OWTSs of concern. These sampling programs will be conducted based on the analysis of an OWTS Database complied with septic system permit records on file with the Town, voluntary survey information, site inspections, and near-shore observations of algal growth.

Based upon the outcome of the sampling and analyses proposed herein, the Town of Lake George would have protocol to identify OWTSs that could be compromising the important natural resources of the Town.

Sampling will occur during the Summer 2016 when usage of OWTS will be the greatest and water temperatures would be the highest for algal growth. Algal sampling will occur the end of July and beginning of August. Water quality sampling will occur during the same time frame with additional sampling at the end of the summer.

The results from the sampling will be incorporated into a Final Report to be prepared for the Town and NYSDEC. Results from the sampling also will be incorporated into GIS mapping for the project that will be available on The FUND's and the Town's website.

Data on existing OWTSs will be provided by the Town through the initial work that was compiled by Town employees under the supervision of the Director of Planning and Zoning. The Town also has conducted a voluntary property participation program where surveys were sent to all properties within the project area. Information from the survey as well as subsequent site inspections have been incorporated into a data base to assist in the determination of potential areas of concern for water quality impacts.

Chris Navitsky will conduct project field sampling, data collection and overall project management during the proposed project. Contractual assistance for algal testing will be with Corrina Parnapy through Avacal Biological and the Winooski Natural Resources Conservation District. Water quality sampling will be processed and contracted through the Darrin Fresh Water Institute. Dr. James Sutherland, retired research scientist with the NYSDEC, will provide professional services for project oversight and quality assurance of sampling data.

FIGURE E-1 *Town of Lake George Septic Initiative Program Algae Biomonitoring Work Plan*

Introduction

The majority of properties within the Town of Lake George are serviced by onsite wastewater treatment systems (OWTSs), more commonly known as septic systems, to treat and dispose of residential and/or commercial wastewater. The purpose of the OWTS is to store, treat and distribute wastewater while preventing contamination of water resources. Septic systems work well if they are (1) installed in areas with appropriate soils and hydraulic capacities, (2) designed to treat the incoming waste load to meet public health, ground water, and surface water performance standards, (3) installed properly, and (4) maintained to ensure long-term performance. (EPA 2002).

The Town of Lake George began the Septic Initiative Program (SIP) in 2013 to inventory and assess OWTSs on properties within 500 feet of Lake George and within 100 feet from streams flowing into the lake to protect the water quality of Lake George, which is listed as priority of the recently adopted Town Comprehensive Plan. The SIP will involve approximately 260 properties through the entire town from Diamond Point on the western shore to Plum Point on the eastern shore.

Historical Information

Wastewater management is an important component for water quality protection and treatment system failure can have health, environmental and economic effects. Nutrients (especially phosphorus) from leaky septic systems play a major role in causing excessive algae growth in lakes and ponds. When overgrown algae and plants die rapidly and decompose, oxygen is removed from the water, which threatens fish and other aquatic animals. Wastewater from septic systems that reaches adjacent surface waters also increases the chance that wildlife, swimmers and downstream users are exposed to infectious bacteria and viruses that are associated with wastewater. (Cornell University 2011)

The Plan for the Future of the Lake George Park, prepared by The Task Force for the Future of the Lake George Park (1987), listed wastewater management as a water quality management concern. Their report stated that it appears the approval and construction inspection process for wastewater treatment systems in the Lake George Park is adequate for protecting human health. The rate of failure over the whole watershed probably is between 5 and 15% depending on which set of survey data is used and how "failure" is defined. And in any case, no estimate of the nutrient loading to the lake can be accurately calculated from the results of sanitary surveys. It further states, there are no provisions for upgrading existing systems, few monitoring requirements and little emphasis on nutrient (phosphorus) removal. The report recommends the following:

> "A regular and continuing program for sanitary surveys should be conducted in the Lake George Park. The program should consist of door-to-door interviews of property owners, direct inspection of wastewater systems, dye and leachate surveys and an evaluation of phosphorus loadings from on-site systems, especially in areas adjacent to significant lake habitats (e.g. shallow enbayments). Sanitary surveys should be conducted each year on about one fifth of the systems so that all private and commercial facilities will be surveyed in a five year period. The results (of) such surveys should be published annually."

The Lake George Waterkeeper has monitored water quality as well as observed changes in the watershed in the Diamond Point area of the Town of Lake George. The Lake George Waterkeeper Stream Assessment Project performed chemical analysis of Smith Brook in three locations. Each of the sample points had specific conductance values higher than the mean for the entire watershed. (Keppler 2009) The average specific conductance for the downstream sampling station (below 9N) was 230 µS/cm. Specific conductance is the measure of electrical conductance of water and is used as an indicator of instream pollution. Biological monitoring was also performed at the same locations, which indicated that the downstream sections of Smith Brook (just upstream and downstream of Route 9N) were slightly impacted based on the Biological Assessment Profile. (Keppler 2009) Algal Biological Assessments were also performed, which again indicated

FIGURE E-1 *Town of Lake George Septic Initiative Program Algae Biomonitoring Work Plan*

that the downstream sections of Smith Brook were slightly impacted based on Pollution Tolerance Index. (Parnapy 2009)

Algae growth has also been observed over the past few years by the Lake George Waterkeeper Algae Assessment Project. There has been a concern about increased algae growth in the vicinity of the Diamond Point public beach and south to Smith Brook as well as in Smith Brook.

Sutherland *et al*. (2001) reported the mean concentrations of conductivity in Smith Brook (T-46) was 177 µS/cm, which is 30% below 2009 levels indicating increasing stream pollution over time.

The information summarized above provides the basis for this 'draft' algae sampling and water quality monitoring plan that will be reviewed and edited, as appropriate, by all of the interested parties and then finalized and implemented. It is the intention of the author to develop an overall plan of action to (1) inventory OWTS in the project area to determine condition and (2) determine areas of water quality concern based on the OWTS data base and field observations, and (3) conduct algae sampling and water quality monitoring to identify problem areas and (4) recommend the implementation of corrective actions as warranted.

Program Background

The chemical and biological components described in this section are considered essential toward understanding the hydrologic connection between the disposal of effluent from OWTSs into groundwater and potential signs in adjacent water bodies that indicate potential of nutrient contamination.

Algae. Algae are plant-like organisms that live in a variety of environments and are a natural component off water bodies. Algae, being the base of the food web are an important component, as many organisms feed on them including macroinvertebrates and fish. Some algal species are naturally occurring, but excessive amounts may occur and are referred to as a "bloom". An algal bloom occurs when the amount of algae within a specific location grows rapidly and covers a large area in response to excessive nutrients and environmental ques.

Assessing both soft forms of algae and diatoms within periphyton near-shore habitats possess a distinct advantage over other biota and water quality monitoring. Littoral periphyton monitoring is an effective tool that can indicate changes due to anthropogenic disturbances that may not be detected in chemical monitoring.

Algae are an important component of biological monitoring programs for evaluating water quality. Algae species can vary specific to the particular water conditions and levels of nutrients containing nitrogen (N) and phosphorus (P) that enter the water body. The N:P ratio generally determines the specific dominant algae and can be based upon sources, which include organic pollution from sewage-related sources such as leaky sewage systems. In addition, calcium, carbon and sodium levels can shift algal dominance. Palmer Algae Pollution indices were compiled from reports by 165 authors and rank the genera/species most often encountered in water with high rates of organic pollution. (Attachment 2) (Washington State Lake Protection Association, 2016)

Coliform. Fecal Coliform (FC) and Fecal Streptococcus (FS) bacteria are indicators of the presence of animal or human waste. The New York State Department of Health has determined the maximum allowable bacterial levels of contact recreation in New York State which are 1000 per 100 milliliters for a single FC result. (DFWI 2007) A FC/FS greater than 4 is generally considered indicative of contamination from a human origin and a FC/FS less than 1 suggests contamination from other animals.

FIGURE E-1 *Town of Lake George Septic Initiative Program Algae Biomonitoring Work Plan*

Chlorophyll-a. Chlorophyll-a is a plant pigment that is used as a surrogate of water column algal density and productivity. As concentrations of this plant pigment increase, lake water will be perceived as being green in color.

Total Nitrogen (TN). TN is the total amount of nitrogen as well as bound in cellular materials and detritus. Nitrogen is a naturally occurring element that is necessary for life. It is often abundant in many water bodies, but can be added from fertilizers and human waste.

Total Phosphorus (TP). Similar to nitrogen, phosphorus is also a natural element required for life. Typically oligotrophic lakes like Lake George are phosphorus limited, which limits the algal growth or productivity in the system. However, phosphorus can be added to waterbodies from stormwater runoff, excessive fertilizer application, and failed septic systems or wastewater treatment plants. Sufficient in-lake phosphorus levels create suitable habitat for algae and aquatic plants to proliferate.

Soluble Reactive Phosphorus (SRP). SRP is the amount of phosphorus in the water column that is readily available for consumption by the phytoplankton.

Nutrient Ratios (TN:TP). The ratio of TN to TP is commonly used to predict phytoplankton communities, which require certain proportions of the nutrients for growth. This is commonly referred to as the Redfield ratio, which estimates the uptake ration of phytoplankton as 16N:1P. Typically, rations less than 30 favor blue-green algae and diatoms, whereas higher ratios favor green algae.

For the monitoring program described here, sampling sites will be selected based on the evaluation of the OWTS database along with field observations of algal growth and other factors.

Statement of Goal and Objectives

While it is known that failing and antiquated septic systems release nutrients into groundwater that can appear in surface waters, which results in algae growth and water quality impacts, it is difficult to make a direct indisputable connection due to unknown hydrogeological patterns and other potential sources. The goal of the program described here is to apply rational assumptions from a database of an OWTS survey to determine areas of concern, observe field conditions of near-shore algal growth and collect water quality data to evaluation the condition of OWTS and use as an outreach and educational component for the consideration to upgrade suspect OWTSs .

The program objectives include the development of a OWTS database based on file review, voluntary survey and site inspection, field observation of algal growth which could be an indicator of nutrient pollution and the implementation of algal sampling and water quality monitoring that are designed to provide results based on known pollution standards.

Description of the Monitoring Program

The algal sampling and water quality monitoring will be conducted during the summer of 2016, with possible additional sampling to be determined based on initial results. Algal samples will be collected near-shore from all available substrates and habitats. Water quality samples will be collected from the water column in close proximity to the algal samples.

The data and samples collected from near-shore water column will include the following: (1) weather conditions, (2) any water odors present, (3) algae appearance information, (4) water temperature, (5) dissolved oxygen (concentration, percent saturation), and (6) the collection of a water sample that will be analyzed for nutrient chemistry including total phosphorus (TP), soluble reactive phosphorus (SRP), total nitrogen (TN), nitrate-nitrogen (NO_3-N), chlorophyll-a, coliform samples, conductivity, pH, and total dissolved solids.

FIGURE E-1 *Town of Lake George Septic Initiative Program Algae Biomonitoring Work Plan*

Methodology

This section describes the field procedures that will be used to collect the samples and any processing that will occur following collection.

Algal Sampling Collection. The collection of samples will focus on areas of observed algal growth. Samples will be collected from all available substrates and habitats, within a reach, as per The Environmental Protection Agency Periphyton Protocols. The objective is to collect a single composite sample that is representative of the periphyton assemblage present within the targeted reach. Samples will be collected in a water-tight container. No preservatives will be added, as all forms of algae (soft and diatom) will be analyzed and in lab propagation of soft forms may be necessary to distinguich fruiting bodies of Chlorophyta forms and for application of live diatoms metrics. Samples will be placed in a cooler on ice and transported to the lab for full anlysis. Samples will be identified and enumerated within two weeks of collection, unless propoagation is necessary. In addition to this protocol, dissolved oxygen concentration and saturation, conductivity, total dissolved solids (TDS) and pH will be measured. All data and observations will be recorded on field sheets (Attachment 1). A Chain of Custody Form will be required for all samples. (Attachment 1)

Algal Analysis. Methods and metrics summarized are a modified version of the Environmental Protection Agencies Periphyton Protocols, The New York State Department of Environmental Conservation Periphytic Biomonitoring Protocols, Palmer C.M. Pollution Tolerance Index, Nutrient Requirements under the National Water-Quality Assessment Program data set, and Lake George Index created under the Lake George Algae Monitoring Program.

All algal samples will be individually homogenized, allowed to settle and a sub sample will be taken and prepared according to the Environmental Protection Agencies alternate preparation technique, and placed on a gridded wet-mount slide. All forms of algae (soft and diatom) will be identified to lowest taxonomic level possible and 300 algal "cell units" will be counted. From the Identification and numeration, the following will be determined and metrics based on composition will be applied:

- Relative abundance and taxa richness;
- Nutrient requirements for dominant form (Indicates known tolerance levels for nutrients);
- Documentation of forms of cyanobacteria within sample (Excessive nitrogen can cause some forms of cyanobacteria to produce toxic conditions);
- Percent Live Diatoms (Indicates the health of the diatom assemblage and if the algal assemblage is old indicating the nutrient source was episodic);
- Percent Aberrant Diatoms (Indication of heavy metal contamination);
- Percent Sensitive Diatoms (Indicates health and can detect water quality impacts when other metrics underestimate changes, used to confirm other metrics);
- Percent *Achnanthes minutissma* (Indicates chemical insults and toxic pollution);
- Palmer Algae Pollution Index (Assessing a specific group of algae associated with municipal sewage treatment plants and organic pollution, assesses organic pollution levels);
- Pollution Tolerance Index (PTI) (Indicates the level of pollution);
- Trophic Index (Indicates the level of excessive nutrients through the measure of mesotrophic to hypereutrophic individuals);
- Salinity Index (Indicates the level of dissolved salts through the measure of halophilous individuals);
- Acidity Index (Indicates the impacts from acid effects through the measure of acidophilous individuals); and,
- Similarity Index (Sample site will be compared against forms from previously collected samples in wastewater treatment facilities within the Lake George basin, and against a reference site sample from an undeveloped, natural sample site).

FIGURE E-1 *Town of Lake George Septic Initiative Program Algae Biomonitoring Work Plan*

The analytical results will be reported to the Program cooperators within reasonable and regular time period for data entry and data management.

Water Quality Monitoring Sample Collection. A 2-liter amber PE bottle will be used for sample collection. Preliminary on-site measurements will include temperature, dissolved oxygen concentration and saturation, specific conductance and pH, and will be recorded on field sheets. Field measurements determined *in-situ* will include temperature and dissolved oxygen concentration and saturation (YSI® Model 55 dissolved oxygen and temperature meter), conductivity, total dissolved solids (TDS) and pH (Myron Ultrameter 4PII).

All samples collected will be placed in a cooler on ice immediately following collection. Once the sampling is completed, the samples will be delivered to the DFWI laboratory, accessioned into the program log book, processed and submitted for analysis. All samples submitted to the lab for analysis will be accompanied by appropriate Chain Of Custody documentation including Program Identification, Date, Time, Sampled By, Sampling Site, Tests Required, and Preservative. The analytical results will be reported to the Program cooperators by the DFWI lab within reasonable and regular time periods for data entry and data management.

Additional Monitoring

Additional monitoring may be considered for the Monitoring Plan based on the field observations and results. Tracer testing could be considered in areas where algal blooms are located with high Palmer Pollution Tolerance Indices but inconclusive water quality monitoring results. Methods for possible testing is under discussion. This program would require the cooperation of property owners in the vicinity along the shoreline to allow the testing to be placed in their systems.

Other monitoring could include sampling for caffine.

Reporting

FIGURE E-1 *Town of Lake George Septic Initiative Program Algae Biomonitoring Work Plan*

Two (2) report of the program progress will be prepared and submitted to the Town, with the first to be completed by the end of the third quarter 2016. The first report will include observations, data received from algal testing and DFWI and recommendations for any future monitoring and areas of concern. The second report, "Draft" Final, will be prepared to be incorporated into the Project Final Report by December 2017, which will include a summary of summary, analysis and discussion of all data collected.

Schedule

A schedule of Project components is as follows:

	---------2016----------|...----------2017----------														
Program Component	J	A	S	O	N	D	A	M	J	J	A	S	O	N	D
Lake Observations	x	x							x	x					
Algae Sampling	x	x													
Water Quality Monitoring	x	x													
Data Management	x	x	x												
Additional Monitoring			x	x					x	x	x				
Quarterly Reports			x												
Final Report												x	x	x	
Town Board Presentation				x											x

Personnel

The lake observations will be conducted by the Project Manager Chris Navitksy (CN). CN will lead the excursions for sampling algae and water quality monitoring. Avacal Biological will perform the field sampling of algae and processing of paperwork. CN will collect water quality monitoring samples and process paperwork for delivery to DFWI for analytical analysis. Date entry will be performed by CN. Project management, including data analysis and report writing will be performed by CN with assistance from Jim Sutherland, PhD.

Deliverables

The deliverables for the specific workplan described in this document include the following:

- An Excel spread sheet file containing surface water data collected.
- Algal report summary sheets with information regarding.
- Quarterly report of project progress including observations and results received from analytical analysis and recommendations on potential additional monitoring.
- Final report to be included in the Final Report for the WQIP Grant including summary of all data and discussion of results with recommendations.
- Data on sampling and monitoring to be incorporated in GIS mapping.
- Presentation to Town of Lake George officials and other personnel after quarterly report and final report has been completed.

FIGURE E-1 *Town of Lake George Septic Initiative Program Algae Biomonitoring Work Plan*

Attachment 1

Algal Sampling

Algae Analysis Field Data Sheet

Algae Analysis Chain of Custody Form

FIGURE E-1 *Town of Lake George Septic Initiative Program Algae Biomonitoring Work Plan*

LAKE•GEORGE WATERKEEPER

Algae Analysis Field Data Sheet

Town of Lake George Septic Initiative Program Algae Sampling

LAKE•GEORGE WATERKEEPER

Site Name: _____ Sample Date/Time: _____

Latitude: _____ Investigators: _____

Longitude: _____ Landmarks: _____

Weather Conditions	Current:
	Past:

Water Quality	Temp: _____	DO %: _____
	SpCond: _____	DO mg/L: _____
	Cond: _____	pH: _____

Water Odors

Chemical ☐ Fishy ☐ Petroluem ☐ Other: _____

Algae Appearance	Substrate (s): _____	
	Color: _____	Bloom: Y or N
	Phytoplankton or Periphyton	Sample Collected: Y or N

Possible indications of source of growth:

Additional notes:

Collection container label:

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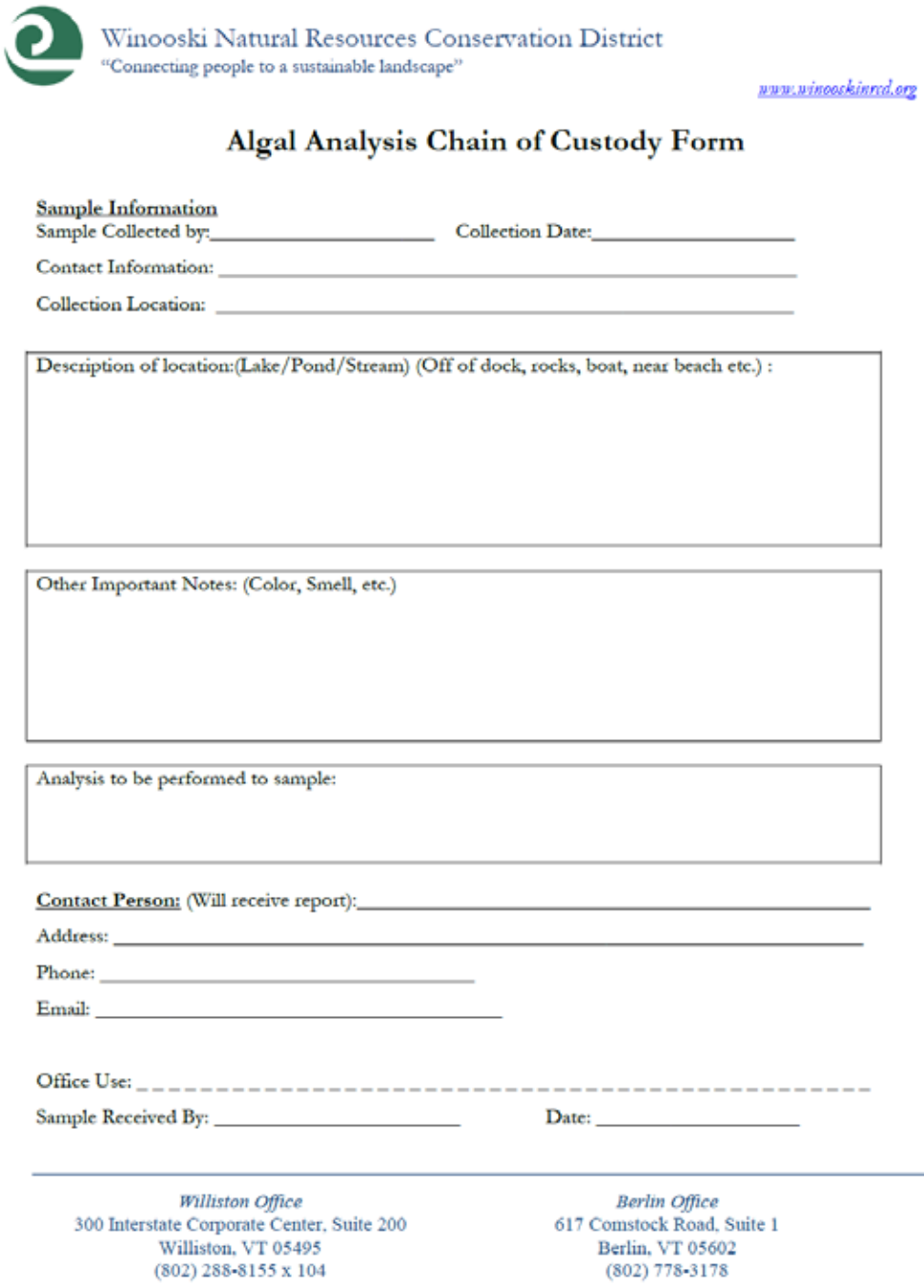
FIGURE E-1 *Town of Lake George Septic Initiative Program Algae Biomonitoring Work Plan*



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Algal Analysis Chain of Custody Form

Sample Information
Sample Collected by:_____ Collection Date:_____

Contact Information: _____

Collection Location: _____

Description of location:(Lake/Pond/Stream) (Off of dock, rocks, boat, near beach etc.) :

Other Important Notes: (Color, Smell, etc.)

Analysis to be performed to sample:

Contact Person: (Will receive report):_____

Address: _____

Phone: _____

Email: _____

Office Use: _____

Sample Received By: _____ Date: _____

Williston Office
300 Interstate Corporate Center, Suite 200
Williston, VT 05495
(802) 288-8155 x 104

Berlin Office
617 Comstock Road, Suite 1
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(802) 778-3178

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FIGURE E-1 *Town of Lake George Septic Initiative Program Algae Biomonitoring Work Plan*

Attachment 2

A Composite Rating of Algae Tolerating Organic Pollution

C. Mervin Palmer

FIGURE E-1 *Town of Lake George Septic Initiative Program Algae Biomonitoring Work Plan*

J. Phycol. 5, 78–82 (1969)

A COMPOSITE RATING OF ALGAE TOLERATING ORGANIC POLLUTION[1,2]

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SUMMARY

From information on pollution-tolerant algae compiled from reports from 165 authors, the genera and species most often referred to as significant fall into a relatively stable series. Diatoms, pigmented flagellates, green, and blue-green algae are all well represented among the pollution-tolerant genera and species. The top 8 genera are Euglena, Oscillatoria, Chlamydomonas, Scenedesmus, Chlorella, Nitzschia, Navicula, *and* Stigeoclonium, *and the top 5 species,* Euglena viridis, Nitzschia palea, Oscillatoria limosa, Scenedesmus quadricauda, *and* Oscillatoria tenuis. *In some genera, e.g.,* Euglena, *a single species is far more significant than all others as a pollution-tolerant form. In other genera, e.g.,* Oscillatoria, *only a slight difference distinguishes the pollution tolerance of 2 or more species. Algal genus and species pollution indices are presented for use in rating water samples with high organic pollution.*

The experience of many field workers throughout the world who have studied water polluted with organic wastes points to an enormous diversity of algae. More than 1000 algal taxa have been reported 1 or more times as pollution-tolerant forms. They include approximately 240 genera, 725 species, and 125 varieties and forms. Blue-green algae, green algae, diatoms, and pigmented flagellates are well represented.

It is essential to determine from this group the genera and species most emphasized by these many workers if their results are to be utilized for rating water in regard to organic pollution. To the present time 269 reports of 165 authors have been reviewed. Earlier tabulations were published when 56 and later 110 authors' reports had been compiled (***21,22***).

To combine the results of the various workers, a simple procedure was used. A score of 1 or 2 was given for each alga reported by an author as tolerating high organic enrichment, the larger figure being reserved for the algae that an author emphasized as particularly significant. When an author had published several reports, these were pooled before determining the score for any particular alga for that author.

[1] *Received November 2, 1968; revised December 19, 1968.*

[2] Presented at Symposium: *Algae as Indicator Organisms,* sponsored by the Phycol. Soc. Am., and the Phycological Section, Bot. Soc. Am., Columbus, Ohio, September 1968.

The compilation presented here is restricted to algae tolerating high organic pollution. Apparently, organic pollution tends to influence the algal flora more than other factors in the aquatic environment, such as water hardness, light intensity, pH, DO (dissolved oxygen), rate of flow, size of water body, temperature and, often, other types of pollutants.

By totaling the scores for each genus and species, the ranking of each taxon as emphasized by the 165 authors collectively was determined.

Genera and species are considered separately. Table 1 lists genera in order of decreasing total scores and the number of authors recorded for each particular genus. The list is limited to the 60 genera having the highest total points.

The 8 genera heading the list are *Euglena, Oscillatoria, Chlamydomonas, Scenedesmus, Chlorella, Nitzschia, Navicula,* and *Stigeoclonium.* The list includes a blue-green alga, a filamentous green, a coenobial green, and a unicellular green alga, as well as 2 diatoms and 2 pigmented flagellates. Of the 165 authors, 97 emphasized *Euglena* as tolerant to organic pollution, resulting in a total score of 172 points. In contrast, *Arthrospira,* 25th on the list, was emphasized by only 18 authors and scored only 34 points. Table 2 gives distribution of the highest total scoring genera by algal groups. All 4 algal groups are well represented among the top 25, 50, and 75 genera; green algae predominate.

Few changes have occurred in the top 10 genera since the earlier compilations. *Phormidium* has dropped out of the 10, while *Ankistrodesmus* is now included. Even the genera listed in 11th through 20th positions have not changed considerably since the compilation of reports by 110 authors. *Micractinium* has moved up to 17th from 23rd place and *Anacystis* to 19th from 21st, while *Spirogyra* and *Chlorogonium* have dropped below the 20th position.

Reports on species of algae are less frequent than those on genera. The species of algae at the top of the pollution-tolerant list (Table 3), are arranged in order of decreasing total scores. This list is limited to the 80 species having the highest total scores out of more than 700 emphasized by one or more authors.

As with the genera, the most tolerant species are distributed among the 4 groups of algae. Of the first 10 species, 3 were green and 3 blue-green algae; among the first 25, the diatoms were best represented;

FIGURE E-1 *Town of Lake George Septic Initiative Program Algae Biomonitoring Work Plan*

TABLE 1. *Pollution-tolerant genera of algae. List of the 60 most tolerant genera, in order of decreasing emphasis by 165 authorities.*

No.	Genus	Group[a]	No. authors	Total points
1	*Euglena*	F	97	172
2	*Oscillatoria*	B	93	161
3	*Chlamydomonas*	F	68	115
4	*Scenedesmus*	G	70	112
5	*Chlorella*	G	60	103
6	*Nitzschia*	D	58	98
7	*Navicula*	D	61	92
8	*Stigeoclonium*	G	50	69
9	*Synedra*	D	44	58
10	*Ankistrodesmus*	G	36	57
11	*Phacus*	F	39	57
12	*Phormidium*	B	37	52
13	*Melosira*	D	37	51
14	*Gomphonema*	D	35	48
15	*Cyclotella*	D	35	47
16	*Closterium*	G	34	45
17	*Micractinium*	G	27	44
18	*Pandorina*	F	32	42
19	*Anacystis*	B	28	39
20	*Lepocinclis*	F	25	38
21	*Spirogyra*	G	26	37
22	*Anabaena*	B	27	36
23	*Cryptomonas*	F	27	36
24	*Pediastrum*	G	28	35
25	*Arthrospira*	B	18	34
26	*Trachelomonas*	F	26	34
27	*Carteria*	F	21	33
28	*Chlorogonium*	F	23	33
29	*Fragilaria*	D	24	33
30	*Ulothrix*	G	25	33
31	*Surirella*	D	27	33
32	*Stephanodiscus*	D	22	32
33	*Eudorina*	F	23	30
34	*Lyngbya*	B	17	28
35	*Oocystis*	G	20	28
36	*Agmenellum*	B	19	27
37	*Spirulina*	B	17	25
38	*Pyrobotrys*	F	16	24
39	*Cymbella*	D	19	24
40	*Actinastrum*	G	20	24
41	*Coelastrum*	G	21	24
42	*Cladophora*	G	22	24
43	*Hantzschia*	D	18	23
44	*Diatoma*	D	19	22
45	*Spondylomorum*	F	16	21
46	*Golenkinia*	G	14	19
47	*Achnanthes*	D	16	19
48	*Synura*	F	14	18
49	*Pinnularia*	D	15	18
50	*Chlorococcum*	G	13	17
51	*Asterionella*	D	14	17
52	*Cocconeis*	D	14	17
53	*Cosmarium*	G	14	17
54	*Gonium*	F	15	17
55	*Tribonema*	G	10	16
56	*Stauroneis*	D	14	16
57	*Selenastrum*	G	13	15
58	*Dictyosphaerium*	G	11	14
59	*Cymatopleura*	D	13	14
60	*Crucigenia*	G	13	14

[a] Groups: B, blue-green; D, diatom; F, flagellate; G, green.

TABLE 2. *Pollution algae. Most tolerant genera, by groups.*

First:	10	25	50	75
Green algae	4	8	15	27
Blue-green algae	1	5	8	10
Flagellates	2	6	13	17
Diatoms	3	6	14	21

TABLE 3. *Pollution-tolerant species of algae. List of the 80 most tolerant species, in order of decreasing emphasis by 165 authorities.*

No.	Species	Group[a]	No. authors	Total points
1	*Euglena viridis*	F	50	93
2	*Nitzschia palea*	D	45	69
3	*Oscillatoria limosa*	B	29	42
4	*Scenedesmus quadricauda*	G	26	41
5	*Oscillatoria tenuis*	B	26	40
6	*Stigeoclonium tenue*	G	25	34
7	*Synedra ulna*	D	25	33
8	*Ankistrodesmus falcatus*	G	21	32
9	*Pandorina morum*	F	23	30
10	*Oscillatoria chlorina*	B	17	29
11	*Chlorella vulgaris*	G	19	29
12	*Arthrospira jenneri*	B	15	28
13	*Melosira varians*	D	22	28
14	*Cyclotella meneghiniana*	D	20	27
15	*Euglena gracilis*	F	18	26
16	*Nitzschia acicularis*	D	18	26
17	*Navicula cryptocephala*	D	19	25
18	*Oscillatoria princeps*	B	16	24
19	*Oscillatoria putrida*	B	13	23
20	*Gomphonema parvulum*	D	14	23
21	*Hantzschia amphioxys*	D	18	23
22	*Oscillatoria chalybea*	B	14	22
23	*Stephanodiscus hantzschii*	D	16	22
24	*Euglena oxyuris*	F	15	21
25	*Closterium acerosum*	G	16	21
26	*Scenedesmus obliquus*	G	16	21
27	*Chlorella pyrenoidosa*	G	11	20
28	*Cryptomonas erosa*	F	15	20
29	*Eudorina elegans*	F	16	20
30	*Euglena acus*	F	16	20
31	*Surirella ovata*	D	16	20
32	*Lepocinclis ovum*	F	14	19
33	*Oscillatoria formosa*	B	14	19
34	*Oscillatoria splendida*	B	14	19
35	*Phacus pyrum*	F	11	18
36	*Micractinium pusillum*	G	12	18
37	*Agmenellum quadriduplicatum*	B	13	18
38	*Melosira granulata*	D	14	18
39	*Pediastrum boryanum*	G	15	18
40	*Diatoma vulgare*	D	17	18
41	*Lepocinclis texta*	F	12	17
42	*Euglena deses*	F	13	17
43	*Spondylomorum quaternarium*	F	13	17
44	*Phormidium uncinatum*	B	15	17
45	*Chlamydomonas reinhardii*	F	10	16
46	*Chlorogonium euchlorum*	F	10	16
47	*Euglena polymorpha*	F	11	16
48	*Phacus pleuronectes*	F	11	16
49	*Navicula viridula*	D	13	16
50	*Phormidium autumnale*	B	13	16
51	*Oscillatoria lauterbornii*	B	8	15
52	*Anabaena constricta*	B	9	15
53	*Euglena pisciformis*	F	11	15
54	*Actinastrum hantzschii*	G	13	15
55	*Synedra acus*	D	9	14

FIGURE E-1 *Town of Lake George Septic Initiative Program Algae Biomonitoring Work Plan*

TABLE 3 (*Continued*).

No.	Species	Group*	No. authors	Total points
56	*Chlorogonium elongatum*	F	10	14
57	*Synura uvella*	F	11	14
58	*Cocconeis placentula*	D	12	14
59	*Nitzschia sigmoidea*	D	12	14
60	*Coelastrum microporum*	G	13	14
61	*Achnanthes minutissima*	D	10	13
62	*Cymatopleura solea*	D	12	13
63	*Scenedesmus dimorphus*	G	8	12
64	*Fragilaria crotonensis*	D	9	12
65	*Anacystis cyanea*	B	10	12
66	*Navicula cuspidata*	D	10	12
67	*Scenedesmus acuminatus*	G	10	12
68	*Euglena intermedia*	F	11	12
69	*Pediastrum duplex*	G	11	12
70	*Closterium leibleinii*	G	8	11
71	*Oscillatoria brevis*	B	8	11
72	*Trachelomonas volvocina*	F	8	11
73	*Dictyosphaerium pulchellum*	G	9	11
74	*Fragilaria capucina*	D	9	11
75	*Cladophora glomerata*	G	10	11
76	*Cryptomonas ovata*	F	10	11
77	*Gonium pectorale*	F	10	11
78	*Euglena proxima*	F	7	10
79	*Pyrobotrys gracilis*	F	7	10
80	*Tetraedron muticum*	G	7	10

* Groups: B, blue-green; D, diatom; F, flagellate; G, green.

and in the first 50, pigmented flagellates outnumbered all others (Table 4).

Numerous species of certain genera were reported. In *Euglena*, one species is rated as much more tolerant of organic pollution than the others (Table 5); *E. viridis* was emphasized by 50 authors and totaled 93 points, while 2nd place *E. gracilis* was emphasized by 18 authors and totaled only 26 points. After the 2nd place species, points and numbers of authors for the next 10 species gradually decrease.

Two species of *Oscillatoria*, on the other hand, are close in scores at the top of the species list for this genus. *O. limosa* scored 42 points, being mentioned by 29 authors; *O. tenuis* scored 40 points and was mentioned by 26 authors. The step-by-step decrease for the next 10 species is relatively gradual (Table 6).

The diatom *Nitzschia* is similar to *Euglena* in the pollution tolerance of its species, *N. palea* being much higher in total points and in number of authors than the 2nd place species *N. acicularis* (Table 7). *Scenedesmus* and *Navicula* tend to fall in

TABLE 4. *Pollution algae. Most tolerant species, by groups.*

First:	10	25	50	80
Green algae	3	5	9	18
Blue-green algae	3	7	12	16
Flagellates	2	4	16	25
Diatoms	2	9	13	21

TABLE 5. *Species of* Euglena. *12 most tolerant of pollution.*

		Authors	Points
1	*viridis*	50	93
2	*gracilis*	18	26
3	*oxyuris*	15	21
4	*acus*	16	20
5	*deses*	13	17
6	*polymorpha*	11	16
7	*pisciformis*	11	15
8	*intermedia*	11	12
9	*proxima*	7	10
10	*spirogyra*	9	10
11	*velata*	7	9
12	*mutabilis*	8	9

TABLE 6. *Species of* Oscillatoria. *12 most tolerant of pollution.*

		Authors	Points
1	*limosa*	29	42
2	*tenuis*	26	40
3	*chlorina*	17	29
4	*princeps*	16	24
5	*putrida*	13	23
6	*chalybea*	14	22
7	*formosa*	14	19
8	*splendida*	14	19
9	*lauterbornii*	8	15
10	*brevis*	8	11
11	*guttulata*	3	6
12	*sancta*	4	6

the intermediate range, the first species having slightly less than twice the total number of points of the 2nd rated species (Tables 8, 9).

Algal pollution indices (Tables 10, 11) were developed for use in rating water samples for high or low organic pollution. Two indices, one based upon genus and the other on species, are presented in the Tables; the species index is the more reliable since it deals with more specific taxonomic units. In each case, identification of algae in a water sample is limited to the 20 at the top of the genus or species list. For each of the 20, a pollution index factor was

TABLE 7. *Species of* Nitzschia. *12 most tolerant of pollution.*

		Authors	Points
1	*palea*	45	69
2	*acicularis*	18	26
3	*sigmoidea*	12	14
4	*thermalis*	5	8
5	*communis*	6	8
6	*linearis*	5	7
7	*amphioxys*	3	5
8	*filiformis*	3	5
9	*vermicularis*	3	5
10	*fonticola*	4	5
11	*dissipata*	3	4
12	*gracilis*	2	3

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TABLE 8. *Species of* Scenedesmus. *12 most tolerant of pollution.*

		Authors	Points
1	*quadricauda*	26	41
2	*obliquus*	16	21
3	*dimorphus*	8	12
4	*acuminatus*	10	12
5	*opoliensis*	7	7
6	*abundans*	4	6
7	*acutus*	3	5
8	*armatus*	4	4
9	*bijuga*	2	3
10	*longus*	2	3
11	*bijugatus*	3	3
12	*falcatus*	3	3

assigned; this factor was determined by the relative number of total points credited to the listed algae.

In analysis of a water sample, all of the 20 genera or species of algae that are present are recorded. An alga is called "present" if there are 50 or more individuals per milliliter. The pollution index factors of the algae present are then totaled. A score of 20 or more for a sample is taken as evidence of high organic pollution, while a score of 15 to 19 is taken as probable evidence of high organic pollution. Lower figures indicate that the organic pollution of the sample is not high, that the sample is not representative, or that some substance or factor interfering with algal persistence is present and active.

Analysis of water samples exemplify the application of the pollution index. At Lancaster, California, the sewage stabilization pond near the influent, on October 28, 1968, contained *Ankistrodesmus, Chlamydomonas, Chlorella, Cyclotella, Euglena, Micratinium, Nitzschia, Phacus,* and *Scenedesmus,* with a rating of 25, thus confirming the high organic content of the water. Greenville Creek, Greenville, Ohio, April 7, 1966, contained *Euglena, Nitzschia, Oscillatoria, Navicula,* and *Synedra,* with a rating of 18, indicating probable high organic pollution. Grand Lake, Celina, Ohio, November 21, 1968, contained *Anacystis, Ankistrodesmus, Melosira, Navicula, Scenedesmus,* and *Synedra,* with a rating of 13, indicating that the algae did not give evidence of high organic pollution, possibly due to the cool November temperature. Lake Salinda, Salem, Indiana, June 5, 1968, contained *Chlamydomonas, Melosira,* and *Synedra,* with a rating of 7, indicating its lack of organic enrichment.

TABLE 9. *Species of* Navicula. *12 most tolerant of pollution.*

		Authors	Points
1	*cryptocephala*	19	25
2	*viridula*	13	16
3	*cuspidata*	10	12
4	*accomoda*	5	9
5	*rhynchocephala*	6	6
6	*meniscula*	2	4
7	*pelliculosa*	2	4
8	*viridis*	3	4
9	*atomus*	2	3
10	*brebissonii*	2	3
11	*cincta*	2	3
12	*gregaria*	3	3

TABLE 10. *Algal genus pollution index.*

	Pollution index		Pollution index
Anacystis	1	*Micractinium*	1
Ankistridesmus	2	*Navicula*	3
Chyamydomonas	4	*Nitzschia*	3
Chlorella	3	*Oscillatoria*	5
Closterium	1	*Pandorina*	1
Cyclotella	1	*Phacus*	2
Euglena	5	*Phormidium*	1
Gomphonema	1	*Scenedesmus*	4
Lepocinclis	1	*Stigeoclonium*	2
Melosira	1	*Synedra*	2

Additional experience obtained from the use of the pollution index may suggest modifications that need to be made in index factors for particular genera and species or in the range of the total score representing positive, probable, or negative organic pollution of water.

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TABLE 11. *Algal species pollution index.*

	Pollution index
Ankistrodesmus falcatus	3
Arthrospira jenneri	2
Chlorella vulgaris	2
Cyclotella meneghiniana	2
Euglena gracilis	1
Euglena viridis	6
Gomphonema parvulum	1
Melosira varians	2
Navicula cryptocephala	1
Nitzschia acicularis	1
Nitzschia palea	5
Oscillatoria chlorina	2
Oscillatoria limosa	4
Oscillatoria princeps	1
Oscillatoria putrida	1
Oscillatoria tenuis	4
Pandorina morum	3
Scenedesmus quadricauda	4
Stigeoclonium tenue	3
Synedra ulna	3

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FIGURE E-1 *Town of Lake George Septic Initiative Program Algae Biomonitoring Work Plan*

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Town of Lake George Septic Initiative Program
A Program for Algae Sampling and Water Quality Monitoring
Algal Sampling and Analysis Component

A report for the Lake George Waterkeeper
Prepared by: Corrina Parnapy, Phycologist

Introduction:

Within the littoral zone of Lake George New York, Town of Lake George, there is concern about the potential influence of effluent from onsite wastewater treatment systems (OWTSs) on water quality and increased nutrient loading. There has been an observed increased of benthic algal growth within the littoral zone and in streams tributary to Lake George located within the Town of Lake George that supports this concern.

In September 2013, the Town of Lake George started a Septic Initiative Program (SIP) to begin to inventory and catalog all OWTSs on properties within 500 feet of Lake George and 100 feet from streams flowing into Lake George. In 2015, the Town received a New York State Department of Environmental Conservation (NYSDEC) Water Quality Improvement Project (WQIP) Grant to assist in the development of the SIP, which would include (1) a detailed inventory and mapping assessment of all OWTSs within the project boundary, (2) a final report that includes an analysis of the inventory, rated systems and implementation actions, (3) public workshops and training sessions, (4) outreach to other municipalities within the Lake George basin, (5) algae testing and water quality monitoring in problem areas, (6) identify crucial properties in need of replacement systems, (7) education of homeowners and contractors in the Town, and (8) continue the revisions of the Town Consolidated Board of Health Regulations. This document reports the algae identification and analysis and water quality sampling of the program.

The Lake George Waterkeeper in collaboration with the Town of Lake George contracted with the Winooski Natural Resources Conservation District (WNRCD) to conduct littoral algal collection and analysis to document anthropogenic sources of excessive nutrients feeding benthic algal blooms. WNRCD staff member: Corrina Parnapy, District Manager/ Staff Scientist having over 10 years' experience in the field of phycology, specifically in the Lake George watershed conducting both littoral and stream algal collection and analysis, targeting water quality impacts and anthropogenic sources partnered with the Lake George Waterkeeper and Dr. James Sutherland on the coordination and collection of algal samples within the pre-determined locations with potential OWTS issues. The project is being funded through a New York State Department of Environmental Conservation (DEC) grant.

Project Location: Lake George

Located 50 miles north of Albany, Lake George is known internationally for its crystal-clear waters with a depth of up to 200 feet. It is considered to be among the clearest and cleanest large lakes in the world. Rich in natural and cultural history, Lake George is 32 miles long and up to 2.5 miles wide. Designated by New York State as Class AA-Special, drinking water quality, the Lake serves as the primary source of drinking water for surrounding communities and residents. Established as a Park by State law in 1961, Lake George

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was deemed "an area so distinctive in natural qualities and scenic beauty that it is deserving of special protection.

A historically oligotrophic body of water, scientific studies are indicating a decrease in water quality standards that could impact the aquatic ecosystem, and the economic vitality of the region. (Boylen 2014) While deep water sampling is indicating a healthy lake with minor shifts in standards, the littoral zone is experiencing more drastic water quality changes (Parnapy unpublished), as evident by the excessive littoral benthic algal blooms. Land use and development is closely linked to increases in phosphorus loading from runoff and septic systems. (Rosenberger et al 2008)

Historic littoral sampling

The Lake George Waterkeeper initiated the Algae Monitoring Project to document benthic littoral algal blooms and excessive algal growth within streams surrounding Lake George beginning in 2008. Since that time the Lake George Waterkeeper has monitored water quality as well as observed and documented changes in the watershed. Monitoring efforts within the Diamond Point area of the Town of Lake George have documented algal growth. The Lake George Waterkeeper Stream Assessment Project performed chemical analysis on three locations of Smith Brook located within Diamond Point. Each of the sample points had specific conductance (Specific conductance correlates to Chloride levels) values higher than the mean for the entire watershed. (Keppler 2009) The average specific conductance for the downstream sampling station (below 9N) was 230 µS/cm. Specific conductance is the measure of electrical conductance of water and is used as an indicator of instream pollution. Biological monitoring was also performed at the same locations, which indicated that the downstream sections of Smith Brook (just upstream and downstream of Route 9N) were slightly impacted based on the Biological Assessment Profile. (Keppler 2009) Algal Biological Assessments were also performed, which again indicated that the downstream sections of Smith Brook were slightly impacted based on Pollution Tolerance Index. (Parnapy 2009)

Algae growth has also been observed over the past few years by the Lake George Waterkeeper Algae Assessment Project. There has been a concern about increased algae growth in the vicinity of the Diamond Point public beach and south to Smith Brook as well as in Smith Brook. Sutherland et al. (2001) reported the mean concentrations of conductivity in Smith Brook (T-46) was 177 µS/cm, which is a 30% below 2009 levels indicating increasing in stream pollution over time.

Technical Methodology

Algal field data collection: The collection of samples focused on areas of observed algal growth within the littoral zone. Samples were collected from all available substrates and habitats within a reach, as per The Environmental Protection Agencies Periphyton Protocols. (Bahls 1999, and Bahls 1993) The objective was to collect a single composite sample that is representative of the periphyton assemblage present within the targeted reach. Samples were collected in a water-tight container. No preservatives were added, as all forms of algae (soft and diatom) were to be analyzed and in lab propagation of soft forms potentially would be necessary to distinguish fruiting bodies of Chlorophyta forms and for application of live diatom metrics. Samples were placed in a cooler, on ice and transported to the lab for full analysis. Samples were identified

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and enumerated within two weeks, unless propagation was necessary. All data and observations were recorded on field sheets and underwater photographic evidence documented. A Chain of Custody Form was required for all samples.

Algal Analysis: Methods and metrics summarized are a modified version of the Environmental Protection Agencies Periphyton Protocols (Bahls 1999), The New York State Department of Environmental Conservation Periphytic Biomonitoring Protocols (Passy 2000), Palmer C.M. Pollution Tolerance Index (Palmer 1969), Nutrient Requirements under the National Water-Quality Assessment Program data set (Porter 2000), and Lake George Index created under the Lake George Algae Monitoring Program (Parnapy unpublished).

All algal samples were individually homogenized, allowed to settle and a sub sample was taken and prepared according to the Environmental Protection Agencies alternate preparation technique, and placed on a gridded wet-mount slide. All forms of algae (soft and diatom) were identified to lowest taxonomic level possible and 100-300 total algal "cell units" were counted depending on form. From the Identification and numeration, the following were determined and metrics based on composition were applied. Regression analysis were run between results from algal metrics applied and water quality data collected to determine any correlations.

- Relative abundance and taxa richness is calculated as the number of forms and taxa within the subsample.
- Documentation of forms of cyanobacteria within sample (Excessive nitrogen can cause some forms of cyanobacteria to produce toxic conditions.)
- Percent Sensitive Diatoms (Indicates health and can detect water quality impacts when other metrics underestimate changes, used to confirm other metrics.)
- Percent Achnanthes minutissma (Indicates chemical insults and toxic pollution)
- Palmer Algae Pollution Index (PPI) (Assessing a specific group of algae associated with municipal sewage treatment plants and organic pollution, assesses organic pollution levels.) The Palmer algae pollution index was compiled from reports by 165 author and ranks the species/ genera most often encountered in the waters with high rates of organic pollution. The algae are assigned a pollution index value of 1-6. A score of 20 or more is regarded as confirmation of high organic pollution in the body of water. A score of 15-19 indicate probable organic pollution, while scores from 10-14 indicate less organic pollution present. Scores under 10 normally indicate clean water.
- Pollution Tolerance Index (PTI) (Indicates the level of pollution) The Pollution Tolerance Index is calculated as the sum of relative abundance of each species or genus multiplied by the pollution tolerance class of that form (Bahls 1993) Levels of impact are >2.50 non-impacted; 2.01-2.50, slightly impacted; 1.51-2.00,mederatly impacted; and <1.50, severely impacted.
- Trophic Index (TRI) (Indicates the level of excessive nutrients through the measure of mesotrophic to hypereutrophic individuals.) The Trophic Index levels of impact are: 0-50, non-impacted; 51-70, slightly impacted; 71-85, moderately impacted; and 86-100, severely impacted.
- Salinity Index (SI) (Indicates the level of dissolved salts through the measure of halophilous individuals.) Salinity Index levels of impact are: 0-10, non-impacted; 11-30, slightly impacted; 31-50, moderately impacted; and 51-100, severely impacted.

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- Acidity Index (AI) (Indicates the impacts from acid effects through the measure of acidophilous individuals.) The Acidity Index levels of impact are: 0-20, non-impacted; 21-50, slightly impacted; 51-75, moderately impacted; and 76-100, severely impacted.
- Siltation Index (SI) (The measure of the percent relative abundance of individuals belonging to motile genera which are adapted to living on unstable substrates). Siltation Index levels are: in streams: < 20, no siltation, 20-39, minor siltation, 40-60, moderate siltation; and >60, heavy siltation. For low elevation/ low slope the ranges are: < 60, no siltation, 60-69, minor siltation; 70-80, moderate siltation; and >80, heavy siltation.
- Similarity Index (Sample site will be compared against forms from previously collected samples in wastewater treatment facilities within the Lake George basin and other known organic polluted sites.)

Results

Palmer Pollution Index: Of the 17 samples collected in 2016, identified and metrics applied, 2 indicated probable organic pollution present and 2 indicate less organic pollution present. Regression analysis was run between the Palmer Pollution ratings and the water quality data collected. There was a mild correlation between the Palmer metric and Total Nitrogen in addition to Total Nitrogen and the Chlorophyll a readings.

Of the 22 samples collected in 2017, identified and metrics applied, 3 indicated probable organic pollution present. Regression analysis was run between the Palmer Pollution ratings and the water quality data collected. There was a no correlation between the Palmer metric and Total Nitrogen in addition to Total Nitrogen and the Chlorophyll a readings from the 2017 dataset.

Pollution Tolerance Index: Of the 17 samples collected in 2016, identified and metrics applied, 4 indicated slight impact from pollution.

Of the 22 samples collected in 2017, identified and metrics applied, 1 indicated slight impact from pollution.

Acidity Index: Of the 17 samples collected in 2016, identified and metrics applied, 4 indicated slight acid (pH) impact.

Of the 22 samples collected in 2017, identified and metrics applied, 4 indicated slight acid (pH) impact, 1 indicated moderate acid (pH) impact and 1 indicated severe acid (pH) impact.

Trophic Index: Of the 17 samples collected in 2016, identified and metrics applied, 1 indicated severe impact, 3 indicated moderate impact and 7 indicated slight impact.

Of the 22 samples collected in 2017, identified and metrics applied, 3 indicated severe impact, 1 indicated moderate impact and 6 indicated slight impact.

Salinity Index: Of the 17 samples collected in 2016, identified and metrics applied, 13 sites indicated severe impact, 3 indicated moderate impact, and 1 indicated slight impact.

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Of the 22 samples collected in 2017, identified and metrics applied, 15 sites indicated severe impact, and 7 indicated moderate impact.

Cyanobacteria: Of the 17 samples collected in 2016, identified and metrics applied, 14 sites had one or more forms of cyanobacteria identified within the sample.

Of the 22 samples collected in 2017, identified and metrics applied, 15 sites had one or more forms of cyanobacteria identified within the sample.

Eutrophic Forms: Of the 17 samples collected in 2016, identified and metrics applied, 17 sites had one or more forms of Eutrophic associated algal forms identified within the sample.

Of the 22 samples collected in 2017, identified and metrics applied, 22 sites had one or more forms of Eutrophic associated algal forms identified within the sample.

Nuisance Filamentous Chlorophyta: Of the 17 samples collected in 2016, identified and metrics applied,5 sites had one or more forms of nuisance filamentous Chlorophyta identified within the sample.

Of the 22 samples collected in 2017, identified and metrics applied, 6 sites had one or more forms of nuisance filamentous Chlorophyta identified within the sample.

Ankistrodesmus: Of the 17 samples collected in 2016, identified and metrics applied, 1 site had Ankistrodesmus identified within the sample.

Of the 22 samples collected in 2017, identified and metrics applied, 0 sites had Ankistrodesmus identified within the sample.

Generic Richness: Of the 17 samples collected in 2016, identified and metrics applied, the generic richness ranged from 8 to 21 different genera identified at each site.

Of the 22 samples collected in 2017, identified and metrics applied, the generic richness ranged from 11-21 different genera identified at each site.

Siltation Index: Of the 17 samples collected in 2016, identified and metrics applied, 1 site indicated moderate impact and 2 indicated slight impact.

Of the 22 samples collected in 2017, identified and metrics applied, 4 indicated slight impact.

Sensitive Diatoms: Of the 17 samples collected in 2016, identified and metrics applied, the percentage of sensitive diatoms ranged from 0 to 20 percent.

Of the 22 samples collected in 2017, identified and metrics applied, the percentage of sensitive diatoms ranged from 0 to 19 percent.

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Similarity Index: Of the 17 samples collected in 2016, identified and metrics applied, 2 sites showed a moderate level similarity against a known septic impacted littoral zone.

Of the 22 samples collected in 2017, identified and metrics applied, 3 sites showed a moderate level similarity against a known septic impacted littoral zone.

Discussion

In oligotrophic lakes like Lake George, the littoral zone provides important feeding and breeding habitat for aquatic organisms. The littoral zone is the area of the lake where upland anthropogenic sources of pollutants will have an initial impact. Sources include excessive nutrients from stormwater runoff and sewage effluent. These nutrients are rapidly up taken by periphyton before they can be detected in offshore monitoring efforts (Rosenberger et al 2008, Hawden 2005, & Schneider et al 2014). Studies have shown that utilizing water column nutrient analysis and stable isotope nutrient analysis are not useful in distinguishing between developed and undeveloped sites. Methods for utilizing algal metrics within littoral zones to determine anthropogenic causes of water quality impact are just emerging in the United States but have been used within the European Water Framework Directive and in monitoring efforts in other countries. Studies have shown the use of periphytic algae, specifically diatoms as a means of assessing impacts and point source organic pollution is effective (Dela-Cruz et al, 2006) Using littoral periphytic algae to pinpoint septic related issues in oligotrophic lakes has been successfully demonstrated (Timoshkin 2018) The Lake George Waterkeeper Algae Monitoring Program has been collecting, analyzing and applying metrics to samples collected within the littoral zone of Lake George since 2008.

This study focused on using the Palmer Pollution index to determine potential faulty septic systems impacting the littoral zone within the Lake George Town, Lake George NY. The Palmer Algae Pollution Index (PPI) assesses a specific group of algae associated with municipal sewage treatment plants and organic pollution, and levels of impact. The Palmer algae pollution index was compiled from reports by 165 author and ranks the species/ genera most often encountered in the waters with high rates of organic pollution. The algae are assigned a pollution index value of 1-6. A score of 20 or more is regarded as confirmation of high organic pollution in the body of water. A score of 15-19 indicate probable organic pollution, while scores from 10-14 indicate less organic pollution present. Scores under 10 normally indicate clean water. However potential chemicals could be present that hinder the growth of specific forms of algae. (Palmer 1969) On running a regression analysis against the water quality data collected (TN, TP, SRP and Chlorophyll a) a mild correlation between the Palmer Pollution Ratings and the TN was noted, in addition to a mild correlation between the TN and Chlorophyll a readings. On running a comparison against the diatoms collected at each site against diatoms collected at a known impacted by septic issue site within the region, there was a mild to moderate relationship between the sites with higher Palmer readings and the known impacted site. In addition the form of algae *Ankistrodesmus sp.* Which has been documented in locations within Lake George that had received organic waste from septic spills was found in a site with a higher Palmer reading. Ankistrodesmus is an indicator of moderate to high organic pollution and eutrophication.

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Other metrics including the Pollution Tolerance Index, Acidity Index, Trophic Index and Salinity Index were used to help verify the accuracy of the Palmer Pollution Index and to identify any other potential sources of contaminants or environmental impacts.

Eutrophic forms of algae were noted within each sample to determine the overall impact to water quality from nearby development to the sample site. All sites had one or more eutrophic forms of algae indicating that while the overall lake is still classified as oligotrophic, the littoral zone is changing.

Nuisance forms of algae (chlorophyta) were noted within 5 samples sites in 2016 and six sites in 2017. A nuisance form of algae most common is Cladophora sp. This form of alga can smother the substrate hindering fish spawning and when it dies it can wash up on beaches and cause issues when it decomposes including smell, bacteria and bird kills.

Form of cyanobacteria were identified and of the samples collected in 2016, 14 sites had one or more forms of cyanobacteria identified. Within the 2017 samples collected, 15 sites had one or more forms of cyanobacteria identified. Many of the forms of cyanobacteria identified within samples were those that could potentially produce toxic conditions. New research on benthic cyanobacteria blooms is indicating that they can be more dangerous to humans and pets than a deep water bloom, due to they are found at the water/ land interface and are easier for pets and children to come into contact with.

Recommendations

- Review sample findings against documented upland field observations, further water quality data.
- Review nutrient requirements and indictors of dominant forms of algae within samples.
- Add in Ammonium sampling to determine what % of TN is inorganic vs organic, specifically as many forms of cyanobacteria utilize inorganic nitrogen.
- Further reference sites for comparison are needed. Both natural and known impacted.
- Increase data set to better correlate water quality data and determine impacts and potential sources.

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