Environmental Impact

A pretreatment system including UV disinfection placed on a tiny brookside lot helps protect the clean-water supply at New York's Lake George

By Scottie Dayton

Algae blooms at the mouth of Smith Brook, a Lake George tributary, concerned residents in the Village of Lake George, New York. Nicknamed the Queen of American Lakes, the oligotrophic (low biological activity) lake is a source of drinking water and one of the state's top vacation destinations.

Soil surveys conducted along the road paralleling the brook revealed a cesspool on each tiny residential lot. Fast-perking soils and seasonal homes never allowed biomats to develop and systems to backup.

Kathy Bozony, head of the Septic Initiative Program run by the Lake George Consolidated Board of Health, contacted Eric Murdock, P.E., proprietor of Onsite Engineering in Syracuse. "The owner of a three-bedroom home wanted to sell and realized the cesspool was an impediment," says Murdock. "The town offered to assist in paying the engineering costs of a replacement system if I found a solution."

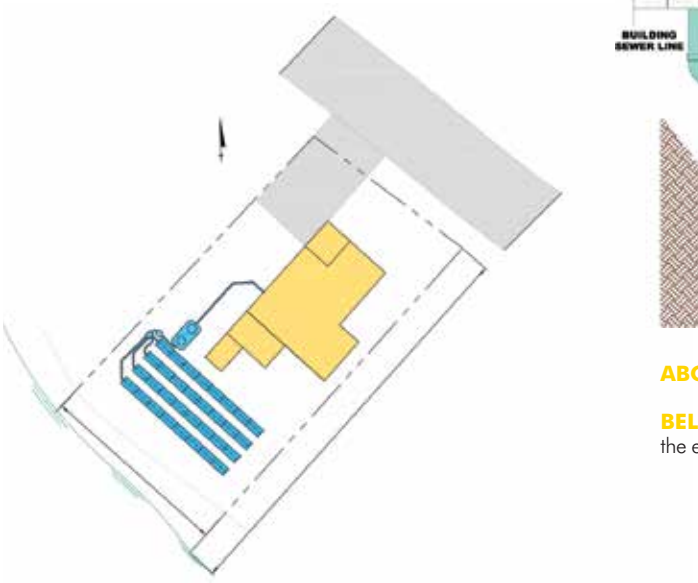
The 44- by 81-foot-long lot was the greatest challenge, necessitating an all-in-one treatment unit to fit the footprint. Because the drainfield would be less than 50 feet from surface water, code mandated an NSF Standard 40 Class 1 treatment system with disinfection. "I also wanted nutrient removal, shock load capabilities and ease of operation with no mechanical components," says Murdock.

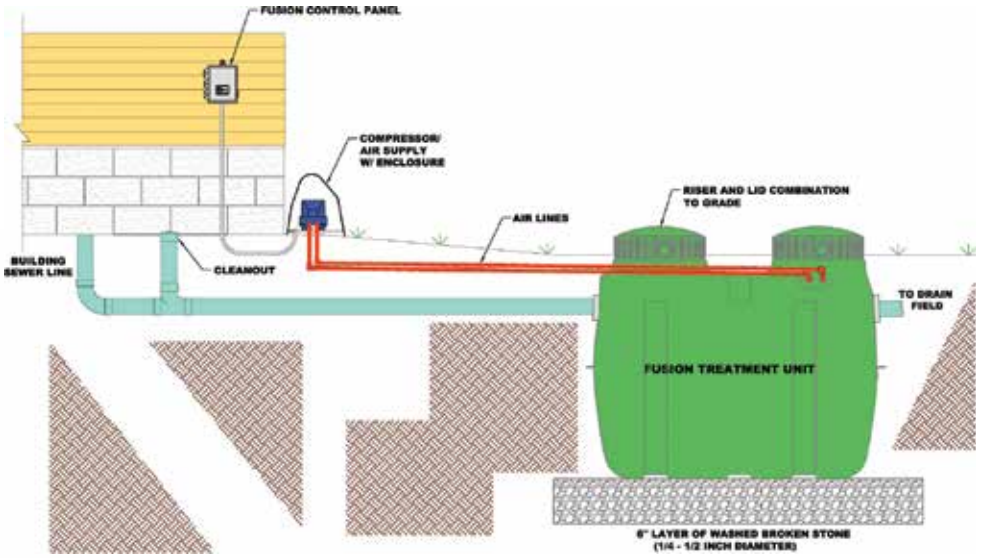
SYSTEM PROFILE

Location:	Lake George, New York
Facility served:	3-bedroom home
Designer:	Eric Murdock, Onsite Engineering, Syracuse
Installer:	Dean Burdick, Stone Installations, Saratoga Springs
Site conditions:	Sand and gravel; percolation rate 6 to 8 minutes per inch
Type of system:	Fusion ZF-450 purification unit, Clarus Environmental, a Division of Zoeller
Hydraulic capacity:	330 gpd

<< OPPOSITE PAGE: Larry Blanchard of Stone Installations checks the lifting straps on the Fusion purification unit while Dean Burdick, vice president of operations, observes. Foreman Brian Ramos operates the excavator. (Photos courtesy of Stone Installations/graphics courtesy of Onsite Engineering)

BELOW: A tiny 44- by 81-foot waterfront lot in Lake George, New York, necessitated an onsite system with a compact footprint. The layout shows the footprint of the three-bedroom house and the Fusion treatment unit with effluent flowing into a chamber drainfield.





ABOVE: This graphic shows the installation of the Fusion treatment unit.

BELOW: Lack of space forces operator Brian Ramos from Stone Installations to dig and backfill trenches with the excavator straddled over them.

The drop-in Fusion ZF-450 purification unit (Clarus Environmental Products) with gravity flow design met all the requirements. As the first installation of its kind in the area, the system treats effluent to less than 9 mg/L BOD and TSS (as low as instruments register), and less than 1 cfu/100 mL total coliform.

SITE CONDITIONS

Soils are sand and gravel with a percolation rate of 6 to 8 minutes per inch. Smith Brook, 30 feet from the system, defines the south boundary of the 0.09-acre lot.

SYSTEM COMPONENTS

Murdock designed the system to handle 330 gpd. Onsite Sales and Service (also owned by Murdock) provided the major components. They include:

- Fusion ZF-450 purification unit from Clarus Environmental, a Division of Zoeller
- 3G ultraviolet disinfection chamber from Salcor Inc.
- 32 Equalizer 36 chambers from Infiltrator Systems
- Fusion control panel

SYSTEM OPERATION

Wastewater flows by gravity through a 4-inch PVC pipe to the 85- by 44- by 62-inch-high purification unit with four chambers. The sedimentation compartment acts like a septic tank. In the anaerobic chamber, microorganisms on fixed 4-inch spherical-skeleton type media digest nutrients at the same time suspended solids are captured. The media provides a stable environment that leaves bacterial colonies unaffected by high-flow events.

The aeration chamber, with an upper aeration section and a lower filter media section, is filled with 3/4-inch-long hollow cylinders. Incoming air from a compressor keeps them agitated.

Microorganisms growing in a thin biofilm on the cylinders remove impurities. Residual suspended solids are captured by the stationary filter media in the chamber's lower portion.

Because sludge develops rapidly in the third chamber, the filter is backwashed twice daily in 10-minute cycles.

Air vigorously stirs the media to break up accumulated materials. An airlift pump transfers waste back to the first chamber for further digestion and to aid in denitrification. The anaerobic and aeration chambers have risers.

The fourth chamber temporarily stores effluent before it flows by gravity through the disinfection chamber to the distribution box feeding four 32-foot-long trenches. Each has eight 48- by 22- by 12-inch-high chambers on 48-inch centers.

"The Fusion's operation with recirculation is very dynamic to watch, yet the design is uncomplicated."
Eric Murdock

INSTALLATION

In August 2014, Murdock gave a Powerpoint presentation about the Fusion system to the town board. He planned a hands-on installation training session for contractors until the preconstruction meeting with Dean Burdick, vice president of operations for Stone Installations, Saratoga Springs.

"Walking the site helped us realize that it was too small to accommodate such an event," says Murdock. "Furthermore, the property lines as defined by the homeowner were wrong." Wary of installing components on someone else's lot, Murdock insisted on a property survey, which took a month to complete.

"I wasn't the most popular guy on the project because everyone wanted the job done ASAP," he says. "As the engineer, I won't show a property line unless it's on a survey." The survey revealed the lot was even narrower than originally thought.

Burdick and foreman, Brian Ramos, used a 3-ton Caterpillar tracked excavator to dig the tank hole, then bedded it with 6 inches of washed stone.

Air lines and recirculation valves are shown in the Fusion's aeration chamber.

"The Fusion installs just like a septic tank," says Murdock. "After leveling it, we connect the four pipes, then fill the tank to the mid-seam with water to equalize the pressure from the backfill."

Murdock's original design had five 32-foot-long drainfield laterals paralleling the brook, but that didn't leave enough maneuverability beside the riverbank. Board of health members on site during installation agreed to reduce the footprint by one lateral based on the pretreatment and disinfection of effluent.

"The trick was to set the Bosch laser level and not move it while installing the drainfield," says Murdock. Working from the brook toward the house, the men installed one 24-inch-wide trench at a time, tracking in and out following the same path. Once a trench was backfilled, they added 12 inches of cover, then straddled the excavator over that trench while digging the next one about 30 inches deep. The entire installation took two days.

Early this March, Murdock invited design engineers, regulators and contractors to another training event. The morning classroom sessions covered the system's design aspects. In the afternoon, they visited the property. "The Fusion's operation with recirculation is very dynamic to watch, yet the design is uncomplicated," says Murdock.

MAINTENANCE

Onsite Sales and Service holds the service contract. From each compartment, technicians pull samples to record transparency, pH, alkalinity and nitrate, and they measure the thickness of floatables and depth of sludge.

The data develops a baseline to help identify a disturbance in the tank's biological activity. "I've never seen [a disturbance], even when owners are undergoing cancer treatments," says Murdock.

MORE INFO:

Clarus Environmental Products
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(See ad page ??)

Infiltrator Systems, Inc.
800/221-4436
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Robert Bosch Tool Corporation
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Salcor Inc.
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