INFILTRATOR
water technologies




Flows and Loads – Wastewater Design Considerations

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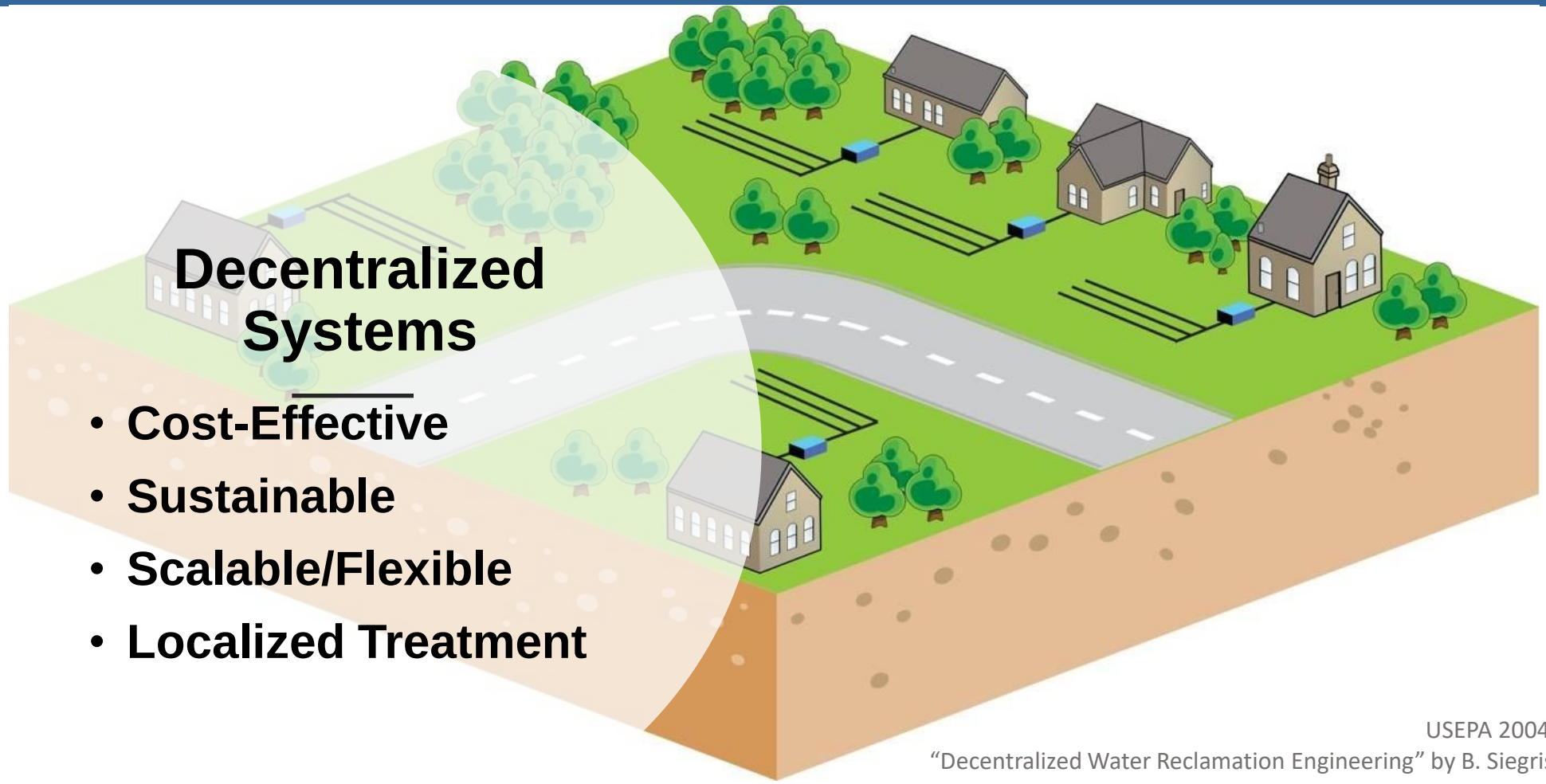
About Us

The materials being presented represent our own opinions, and do NOT reflect the opinions of NOWRA.

Agenda

- Benefits of Decentralized Wastewater Treatment
- Important Design Parameters
- Interrelationship Between Parameters
- Design for Efficiency and Sustainability
- Summary
- Questions

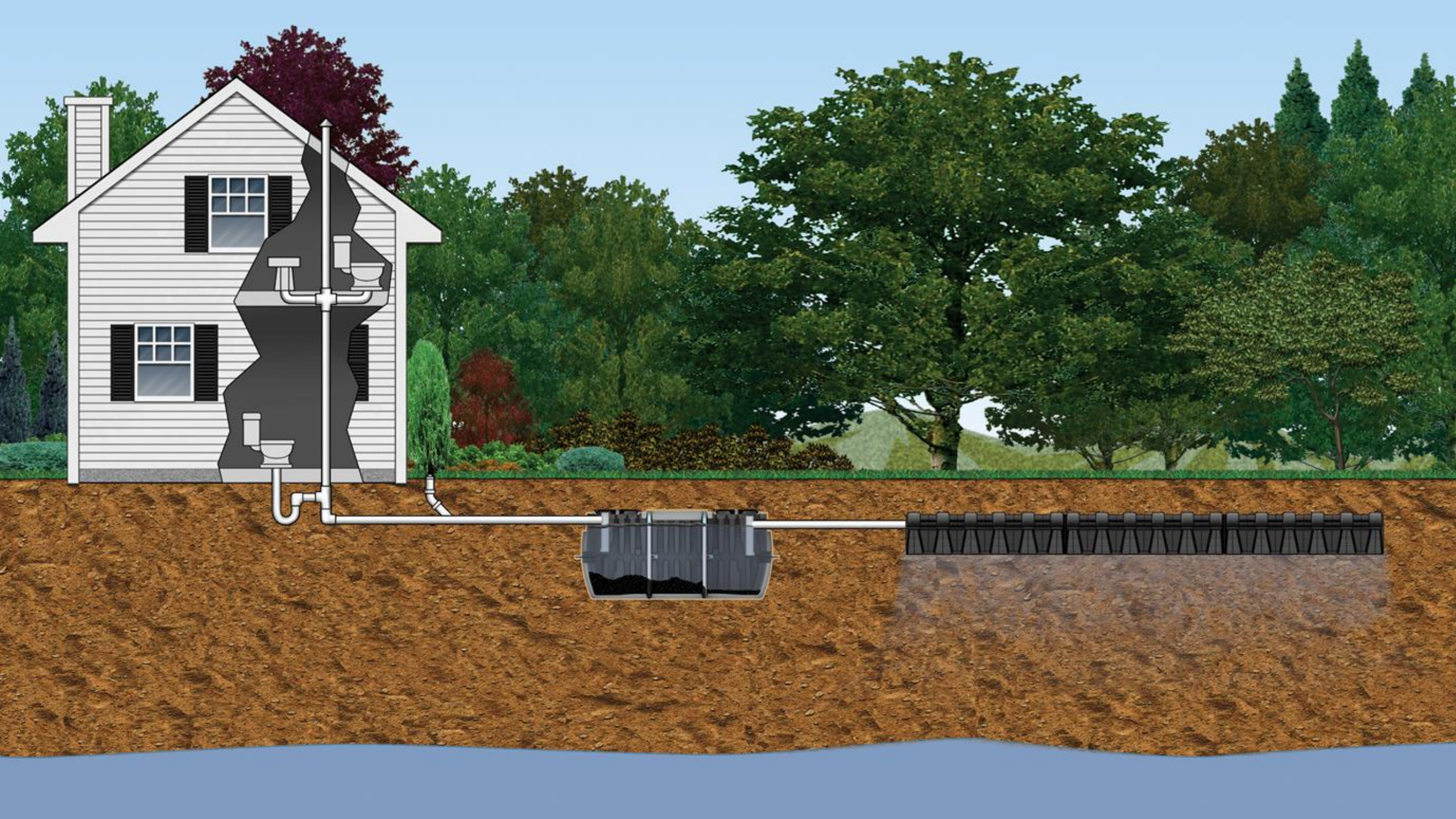
Benefits of Decentralized Wastewater Treatment



Decentralized Systems

- Cost-Effective
- Sustainable
- Scalable/Flexible
- Localized Treatment

USEPA 2004 Report
"Decentralized Water Reclamation Engineering" by B. Siegrist, 2017



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Important Design Parameters

- Hydraulic Flows
  - Daily design flow, actual flow, peak flow
  - System capacity
  - Desired retention
- Organic Loading
  - BOD – Facility/Source
- Nutrient Loading
  - Nitrogen, Phosphorus
  - Facility/Source

https://waterfm.com/wef-recognizes-utilities-for-reducing-nutrient-loading-to-waterways/

Hydraulic Flows

Definition: the volume of wastewater entering the system per unit time

Importance:

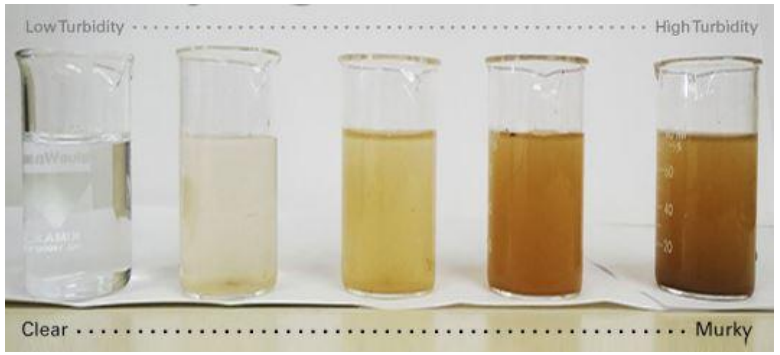
- Affects sizing of tanks and reactors
- Influences hydraulic retention time (HRT)
- Ensures proper treatment
- Prevents overflows

Considerations:

- Peak flows
- Variability in daily flows
- Seasonal variations

https://stock.adobe.com/search/images?k=water+flow+pipe

Organic Loading



Definition: the amount of biodegradable organic matter (measured as BOD/COD) entering the system

Importance:

- Dictates biological treatment capacity
- Impacts oxygen demand and different microbial activity
- Helps build accurate designs to meet effluent standards

Considerations:

- Source of wastewater (residential, high strength, etc.)
- Fluctuations
- Balance between organic load and treatment capacity

https://water.mecc.edu/courses/Env149/lesson2.htm

Nutrient Loading

Definition: the concentration of nutrients, primarily nitrogen and phosphorus, in wastewater

Importance:

- Prevents eutrophication in receiving waters
- Changes treatment technology
- Impacts compliance with environmental regulations

Considerations:

- Source of nutrients
- Treatment options (biological nutrient removal, chemical precipitation)
- Effluent discharge standards and discharge location

https://www.fishsens.com/eutrophication-can-have-a-harmful-effect-on-dissolved-oxygen-in-aquaculture/

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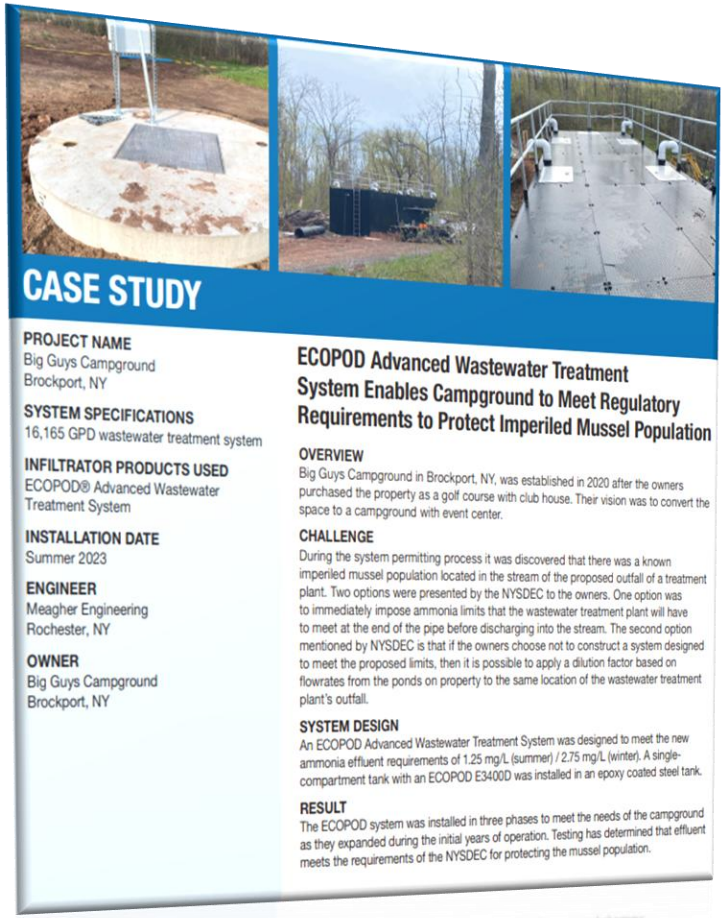
Interrelationship Between Parameters

- Hydraulic flows influence retention times
  - Affects both organic and nutrient removal efficiencies
- Organic loading affects microbial activity
  - Influences nutrient removal
  - Nutrient levels affect the selection of treatment processes
- Proper balance ensures optimal treatment and system longevity

- Example:
- Daily design flow = 1,000 gpd
- Influent BOD concentration = 1,000 mg/L
- Organic loading = $1{,}000\ gpd\ x\ 1{,}000\ \frac{mg}{L}\ x\ \frac{8.34}{1{,}000{,}000} = 8.34\ lbs\ BOD/day$

With the high organic loading and moderately high flows, robust biological processes may be utilized.

Case Study



CASE STUDY

PROJECT NAME
Big Guys Campground
Brockport, NY

SYSTEM SPECIFICATIONS
16,165 GPD wastewater treatment system

INFILTRATOR PRODUCTS USED
ECOPOD® Advanced Wastewater Treatment System

INSTALLATION DATE
Summer 2023

ENGINEER
Meagher Engineering
Rochester, NY

OWNER
Big Guys Campground
Brockport, NY

ECOPOD Advanced Wastewater Treatment System Enables Campground to Meet Regulatory Requirements to Protect Imperiled Mussel Population

OVERVIEW
Big Guys Campground in Brockport, NY, was established in 2020 after the owners purchased the property as a golf course with club house. Their vision was to convert the space to a campground with event center.

CHALLENGE
During the system permitting process it was discovered that there was a known imperiled mussel population located in the stream of the proposed outfall of a treatment plant. Two options were presented by the NYSDEC to the owners. One option was to immediately impose ammonia limits that the wastewater treatment plant will have to meet at the end of the pipe before discharging into the stream. The second option mentioned by NYSDEC is that if the owners choose not to construct a system designed to meet the proposed limits, then it is possible to apply a dilution factor based on flowrates from the ponds on property to the same location of the wastewater treatment plant's outfall.

SYSTEM DESIGN
An ECOPOD Advanced Wastewater Treatment System was designed to meet the new ammonia effluent requirements of 1.25 mg/L (summer) / 2.75 mg/L (winter). A single-compartment tank with an ECOPOD E3400D was installed in an epoxy coated steel tank.

RESULT
The ECOPOD system was installed in three phases to meet the needs of the campground as they expanded during the initial years of operation. Testing has determined that effluent meets the requirements of the NYSDEC for protecting the mussel population.

- ~16,000 gpd campground in NY
- Environmentally sensitive area
  - Endangered mussel population downstream of campground area
- NYSDEC imposed ammonia limits for a new wastewater treatment system.
- Solution: Aerobic treatment unit in an epoxy coated steel tank
  - Meets ammonia requirements of 1.25 mg/L (summer) and 2.75 mg/L (winter).

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Design for Efficiency and Sustainability

Points to Consider:

- Minimizing environmental footprint through energy efficient mechanical components
- Operation and maintenance
- Design for use and longevity

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Summary Discussion:

Assuming a design flow of 10,000 GPD, what other factors should be considered, and what would be the recommended treatment?

Winery

School

Campground

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A Final “Public Service Announcement”

PLEASE use a secondary safety lid whenever the lid to a septic tank is exposed.

Questions?

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