DRIP DISPERsal OF septic tank effluent

Getting the most out of your soil absorption system area

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Two Types of Drip Application

Geoflow® Drip
FOLLOWING SECONDARY TREATMENT

Perc-Rite® Drip
FOLLOWING SEPTIC TANK EFFLUENT

J & R Sales and Service
44 Commercial Street
Raynham, MA 02767

Oakson, Inc.
6 Sargent Street
Gloucester, MA 01930
Types of Drip Application

Geoflow® Drip

FOLLOWING SECONDARY TREATMENT

Treatment in this case is the BioMicrobics Inc. BioBarrier®

Source:

CASE STUDY

Noquochoke Village Affordable Housing project with stringent effluent requirements for Total Nitrogen

Source:
What is “secondary” treatment?

Total Suspended Solids (TSS):
- 150 mg/l

Biochemical Oxygen Demand (BOD):
- 250 mg/l

- <30 mg/l
There are many secondary-treatment units available. To use any particular unit in conjunction with a drip dispersal product, you should check with the manufacturer of the drip dispersal proposed. Not all secondary treatment units are alike!

https://www.mass.gov/guides/approved-title-5-innovativealternative-technologies#-overview-

General Use - Secondary Treatment Units

Standard Conditions for Secondary Treatment Units for General Use

- Standard Conditions for Secondary Treatment Units Certified for General Use

These conditions apply only to the approvals listed below. Please be advised that if designed in accordance with these conditions, MassDEP approval is no longer required. Revised March 20, 2015.
Types of Drip Application

Focus Here

Distributing primary treated effluent (septic tank effluent) directly on the soil treatment area......studies at MASSTC
Massachusetts Alternative Septic System Test Center
“If it works, we’ll tell the world... if it doesn’t work, we’ll tell the world !”

Third party evaluation of wastewater related products
Early in 2021, Oakson, Inc. commissioned MASSTC to perform third-party testing of the Perc-Rite® drip dispersal system using septic tank effluent using 24 inches of two soil types beneath the dispersal area.

* REMEMBER THAT PERC-RITE® AND GEOFLOW® ARE APPROVED FOR DISPOSAL FOLLOWING SECONDARY TREATMENT, BUT OF THE TWO DRIP DISPERSAL SYSTEMS ONLY PERC-RITE® IS APPROVED FOR SEPTIC TANK EFFLUENT

Perc-Rite® Drip Dispersal
• Side by side cells
• Sand and Loamy Sand (2 ft deep)
• Title 5 application rates
• Regular sampling
• Comparisons with other treatment strategies where possible
• Lined cells to collect all percolate
What makes drip dispersal a candidate for consideration as a treatment technology?
The study done presented an unprecedented opportunity to compare selected advanced treatment modes with the drip dispersal of septic tank effluent in conjunction with 24 inches of soil media.
**Perc-Rite® DRIP DISPERSAL**
(and standard pipe-in-stone trench following septic tank)

Septic tank effluent

- Perc-Rite drip dispersal
- 24” sand
- Sample collection point

**ADVANCED ONSITE TREATMENT TECHNOLOGIES**
Advanced Treatment Units Compared
- Recirculating media filter
- Sequencing batch reactor
- Activated sludge treatment

- Standard pipe-in-stone trench dispersal
- Sample collection point
- 24” sand
- Sample collection point

Comparison
Fecal coliform are the generally-accepted indicators of public health risk. In raw domestic wastewater, the densities are in the millions per 100 ml of sample. The vertical setbacks to groundwater from the bottom of the dispersal area across the country are generally-believed to be based on the densities of these organisms at some vertical depth. Some fecal coliform, like Escherichia coli, are enteric in origin while others may not be. As such, they are a conservative estimate of human enteric bacterial pathogens.
Trickling Filter
Sequencing Batch Reactor
Activated Sludge
Septic Tank

Fecal Coliform CFU/100 ml

TRF#1, TRF#2, TRF#3 at 2-ft depth
SBR#1, SBR#2, SBR#3 at 2-ft depth
AS#1, AS#2, AS#3 at 2-ft depth
STE#1, STE#2, STE#3 at 2-ft depth
STE#3 at Sand at 2-ft depth
Oakson Drip in Loamy-Sand at 2-ft depth
Raw wastewater
With few exceptions, fecal coliform densities in percolate beneath the Perc-Rite® Drip Dispersal System were below 100 colonies/100 ml, compared with an excess of this density in nearly all occurrences beneath treatment unit dispersal trenches at the 24” vertical depth as well as at that depth beneath standard septic tank effluent disposal. (41 samples)
What can we say about nitrogen?
The majority of advanced treatments tested removed at least 50% of the influent nitrogen.
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Standard Title 5 trenches removed 25-30% of the influent nitrogen.
The majority of advanced treatments tested removed at least 50% of the influent nitrogen. Standard Title 5 trenches removed 25-30% of the influent nitrogen. Perc-Rite® application performance compared favorably with some advanced treatments.
Conclusion:

Without consideration of the impacts of evapotranspiration, the Perc-Rite® drip dispersal with 24 inches of sand or loamy sand removed 50% of the influent nitrogen for the period tested (48 samples each soil type).
Phosphorus
The gift that keeps on giving

What can we say about phosphorus from onsite septic systems?
• No gaseous phase to return to atmosphere like nitrogen
• Continuously recycles once in the environment unless sequestered
• Many natural sources
• No General Use Approvals in the Commonwealth for its removal

Source: PHIL.CDC.gov
Most advanced technologies tested and the standard Title 5 trench removed < 20% of the influent phosphorus*.

* Technologies compared did not purport to remove phosphorus
Perc-Rite® underlain with sand or sandy loam removed more phosphorus than treated effluent in sand.

Loamy-sand enhances Phosphorus retention to <1 mg/L.

Most advanced technologies tested and the standard Title 5 trench removed < 20% of the influent phosphorus.
Summary of Recent Work

• The Perc-Rite® drip system in conjunction with two feet (24 inches) of sand or loamy sand reduces fecal coliform entrainment beneath the soil treatment area to <100 fecal coliform/100 ml (~4-5 log_{10}) reduction.

• Total nitrogen (TN) reduction with the Perc-Rite® drip system in conjunction with two feet (24 inches) of sand or loamy sand exhibited a median 50% reduction of the influent during the study period.

• The Perc-Rite® drip system in conjunction with two feet (24 inches) of loamy sand reduced total phosphorus to levels to < 1 mg/L over the study period.
Investigation of the Treatment of Drip Dispersal Onsite Septic Systems for the Removal of Selected Micro-Constituents and Contaminants of Emerging Concern

Project Number 01-05-319

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Figure 2. a) Cell liner installed with sloped sides (toward center drain) and washed peastone around distally-sloped center drain; b) drip tubing placed within each cell, 16 inches on center, and outer tubing lengths six inches from liner sides; c) drip tubing with two inches of sand cover before loam cover; d) two inches of loam spread and raked into sand cover to provide sand-loam transition; e) finished cells with soil in place; f) tipper tray inside riser receiving bottom drain pipe—not magnetic-switch operated data logger for recording approximate volume by number of tips.
Hoping to encourage a complex and diverse biological community to treat CEC.
Removal of selected contaminants of emerging concern by drip dispersal
Removal of selected contaminants of emerging concern by drip dispersal

COMPARATIVE TENDENCY OF WWTP % REMOVALS
Likely factors that enhance CEC removal in wastewater treatment.

- Organism diversity
- Aerobic status of treatment environment
- Residence time in treatment unit
- Alternation of aerobic-anaerobic conditions
SCIENCE TO ACHIEVE RESULTS (STAR) RESEARCH GRANTS PROGRAM

The U.S. Environmental Protection Agency’s (EPA) Science to Achieve Results (STAR) Program aims to stimulate and support scientific and engineering research that advances EPA’s mission to protect human health and the environment. It is a competitive, peer-reviewed, extramural research program that provides access to the nation’s best scientists and engineers in academic and other nonprofit research institutions. The STAR program funds research on the environmental and public health effects of air quality, environmental changes, water quality and quantity, hazardous waste, toxic substances, and other topics.
Redefining wastewater reuse

What are my possibilities?
Vegetable bed irrigated with septic tank effluent via Perc-Rite drip.

Vegetable bed irrigated with tap water.
Finally

In the end, there is no wastewater, there’s only water.
Questions?