Decentralized Wastewater Management Systems

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Definitions

In the EPA's *Handbook for Managing Onsite and Clustered (Decentralized) Wastewater Treatment Systems*, "blackwater" is defined as "the term given to domestic waste water that carries, animal human, or food wastes." The handbook defines "gray water" as "domestic wastewater composed of wash water from sinks, showers, washing machines (does not include toilet wastewater)."[3]

The State of Vermont Agency of Natural Resources Department of Environmental Conservation Wastewater Management Division, defines blackwater as "sanitary waste or used water from any building or structure or campground, including, but not limited to, carriage water, shower and wash water, and process wastewater…storm water shall not be considered wastewater." Graywater is defined as "wastewater from normal domestic activities such as bathing, clothes washing, food preparation, and cleaning but excluding wastewater from toilets."

Additionally EPA provides definitions for primary, secondary and tertiary wastewater water treatment. Primary treatment is defined as "consisting of primarily physical process (settling or skimming) that remove a significant percentage of the organic and inorganic solids from wastewater." Secondary treatment is defined as "treatment [that] depends on biological action to remove fine suspended solids, dispersed solids, and dissolved organics by volatilization,

Septic tanks can fail for a number of reasons, which include poor design, insufficient maintenance, inadequate soil on site, steep sloped landscape, or high groundwater table. When a septic tank fails, untreated sewage is released into the environment. A failed system can release as much as 76,650 gallons into the surrounding groundwater.[6] This introduces excess nitrogen, phosphorous, and organic matter, which can alter surrounding ecosystems in many ways. Poorly treated wastewater also has the potential to release disease-causing pathogen and nitrates into surface and groundwater.

Aerobic Treatment Systems

Aerobic treatment systems are an alternative option on sites that have limited space and/or lack ideal soil. These types of primary treatment systems work similarly to traditional septic tanks except air is introduced to the waste water in the tank. Aerobic systems have the ability to carry out a higher level of wastewater treatment than traditional systems. This difference in performance is a result of the oxygen that is present in the system which creates a stable environment for aerobic microbes, which are more efficient at breaking down organic matter than anaerobic microbes (which are found in traditional septic systems).[7]

Aerobic systems have a higher capacity to remove biochemical oxygen. Rates of suspended solid removal are similar between aerobic and traditional systems. Aerobic systems are successful at carrying out nitrification. The EPA defines nitrification as "a microbial process by which reduced nitrogen compounds (primarily ammonia) are sequentially oxidized to nitrite and nitrate."[8] Since the system allows for a higher standard of treatment the effluent that is released is cleaner which allows for the possibility of smaller leach fields or leach fields that have a longer lifespan. Smaller leach fields and less contaminated effluent result in lower environmental impacts. Generally, aerobic systems are more expensive, require electricity, and include more mechanical parts and therefore greater possibility of these components breaking and requiring maintenance.[9]

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[6] Lee, Brad; Jones, Don; Peterson, Heidi, "Home & Environment: Septic System Failure," Purdue University: Department of Agronomy and Department of Agricultural and Biological Engineering, West Lafayette, Indiana, accessed March 28, 2015, https://www.extension.purdue.edu/extmedia/henv/henv-1-w.pdf

[7] U.S. Environmental Protection Agency, "Handbook for Managing Onsite and Clustered (Decentralized) Wastewater Treatment Systems," accessed March 28, 2015.

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less excavation is required. Mound systems generally have higher construction and installation costs. Additionally systems require pumps or siphons; more mechanical moving parts results in greater maintenance requirements of the system.[15]

Gravel-less dispersal technologies

Gravel-less dispersal technologies work the same way as traditional leach field but use plastic or multi-me

the Indirect Discharge Rules. The General Permit requires annual inspection of the wastewater system. Additionally nutrient sampling is required under The Aquatic Permitting Criteria.[25]

New Hampshire

The individual designing, installing, repairing, or replacing a subsurface sewage system is required to hold a permit issued by the New Hampshire Department of Environmental Services.[26] The only permit exception is "that a homeowner may design and install or repair and replace a subsurface sewage disposal system for his/her own primary domicile." Even if homeowners are installing or repairing the systems on their own, “both an Approval for Construction and an Approval for Operation must be obtained,” prior to use of the septic system.[27]

Regarding alternative/innovative systems, all alternative wastewater treatment technologies are approved under Env-Ws 1024.[28] There is not a specific list of approved alternative wastewater treatment technologies. Instead, installation of alternative systems is determined on a case-by-case basis through the methodology established in statute 485-A:29, taking the distances from cemeteries and groundwater sources into account.[29] When a homeowner decides to implement an approved alternative he or she is required to have a “maintenance contract,”[30] this means that the owner of the Individual Sewage Disposal System (ISDS) must have a long-term service contract with a maintenance professional prior to installation approval.[31] .P ≠MCID 47 h 0 12 /MCID 476 375.42 Tm-2(Di)-1(t(w)1(racCID 2is)2(,05 4(n)1(an3(t)1(a s)2(p)1(e

associated legislation and permitting processes. Due to the possible danger of a decentralized wastewater treatment system malfunction, specifically the threat of groundwater contamination, most states have strict and lengthy approval processes for installation of septic systems and alternative or innovative wastewater treatment systems. Differences in state legislation can provide Vermont with innovative ideas to improve private wastewater treatment, such as providing loan options to replace and repair malfunctioning systems. Vermont could also clarify and streamline the permitting process, thus making installation of new or alternative systems more accessible to the typical Vermont homeowner.

This report was completed on April 14, 2015 by Erin Dickinson, Quin Mann, and Olivia Taylor