

Session 2

Septic Tank Drainfield Site Suitability and Evaluation Workshop 2-Field Function DEQ Septic.doc

Frame 1: Likely all of you have a better understanding or working knowledge of how septic tanks and drain fields function than I do. In order to gain a better understanding of what constitutes a functioning drain field and the importance of accurate and true drain field site suitability assessment, let's review briefly the functioning of septic systems – primarily **with attention to the function of the drain field.**

Let's take a look at three questions:

- 1) what goes into the drain field;
- 2) how does the drain field properly function; and
- 3) what causes the drain field to fail.

Frame 2: What goes into the drain field? Household waste water that has gone through a first and/or second stage treatment within the septic tank. The **tank removes settleable solids and greases and facilitates the breakdown or decomposition of some of the organic and inorganic substances from the household.** In properly functioning septic systems, the **wastewater exiting the tank contains dissolved organic and inorganic materials, some suspended solids, and microorganisms, including bacteria and viruses.** The wastewater also contains salts, caffeine, detergents, cleaners, household chemicals, OTC and other drug derivatives.

The average person produces about 50 to 75 gallons of wastewater per day.

Septic tanks provide anaerobic digestion (breakdown) of the solids, and storage of the sludge and scum. **Septic tanks do not remove large numbers of bacteria and viruses.**

Frame 3: How does the drain field properly function? Effluent from the septic tank flows by gravity or is pumped to a leach field. The **wastewater effluent** is absorbed into the soil and **moves both horizontally and vertically through the soil pores.** The dissolved organic material in the effluent is removed by bacteria which live in the top ten feet of the soil. As the effluent moves through the soil, the temperature and chemical characteristics of the wastewater change and create an unfavorable habitat for most bacteria and viruses. Therefore, **as the septic tank effluent moves through the soil, organic material and microorganisms are removed.** The wastewater generally percolates downward through soil and eventually enters a groundwater aquifer. A portion of the wastewater moves upwards by capillary action and is removed at the ground surface by evaporation and transpiration of plants.

Frame 4: What causes the drain field to fail? Probably first and foremost, drain field operation is affected by the soil percolation rates. The **drain field** can fail:

Hydraulic failure – water no longer infiltrates fast enough to accept wastewater being introduced into the drain field

- **Treatment failure** – water infiltrates at such a rapid rate that there is not sufficient time or opportunity for treatment of waste water
- **Biological (or treatment) failure** – the drain field and soil above and below become anaerobic (without oxygen) and biological breakdown of organics and destruction of bacteria and viruses does not occur
- **Chemical failure** – either the soil fails, becomes plugged, sealed due to dispersion or chemicals are introduced which either kill functionally beneficial microbes or are not absorbed and/or degraded in the soil: example: OTC, solvents, sodium-rich water, nitrate, chloride salts, sulfates.

To ensure that the sewage is treated adequately in the soil, minimum separation distances have been established between leach fields, fractured bedrock, groundwater, streams, cut banks, wells, water supply pipelines, houses, and property lines. We'll talk more about this later. When adequate soil depth is not available, untreated sewage seeps from sides of sloping cut banks, enters streams, or contaminates groundwater.

As the leach field becomes older, a bacterial slime mat grows in the soil under the trench. The mat functions as part of the wastewater treatment process, however, the mat also reduces the percolation rate and the mat can contribute to or lead to excessive anaerobic conditions. Percolation rates are also reduced by solids which flow from septic tanks that have not been pumped and by flooding due to high groundwater or sewage flowing from neighboring leach fields.

Frame 5: What causes hydraulic failure? Basically – the percolation rate decreases or is inadequate for the field size and waste water load. There are a multitude of causes for hydraulic failure:

- due to clay particles being flushed or leached into or below the drain trench
- due to abundance of clay in the soil and excessive dosing resulting in persistent swelling and pore plugging
- due to clay aggregate and particle dispersion due to sodium-rich water dosing
- due to build-up/accumulation of excessive bacterial slim mat below the trench line
- due to pore plugging by solids which flow from septic tanks that have not been pumped
- due to flooding due to high groundwater or sewage flowing from neighboring leach fields.

Most often, the failure is a result of **'too much water'** and the **soil around and below the drain field going anaerobic.**

Frame 6: Aerobic zone: this circumstance – desirable – occurs under conditions of **unsaturated flow.** The drain field is sized to accept all of the waste water, the soil has properties that will allow for water movement into the soil below the drain field. Aerobic conditions are needed from organic material decomposition. Anaerobic conditions are needed for nitrate conversion to nitrogen gas.

Frame 7: Questions

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