

Identifying and Solving Common Drainfield Malfunctions

By Dennis F. Hallahan, PE, Technical Director, Infiltrator Water Technologies

Introduction

Reducing onsite septic system malfunctions and developing best practices to prevent and correct them is a major ongoing effort in the onsite/decentralized wastewater treatment industry. With challenging sites, remote locations, poor soils, and regulatory challenges among the many issues that face designers and installers, manufacturers are developing new and specialized products to address the ever-changing onsite wastewater treatment landscape.

Common drainfield malfunction causes include improper system siting, hydraulic overload, homeowner abuse from excess usage or high strength waste, and a malfunctioning tank to name a few. Homeowner education can be critical in preventing many of these issues and homeowners can provide key information to help diagnose the problem.

When a septic system is failing, the first step is to conduct a thorough inspection of the septic tank, distribution box, and drainfield. It may be necessary to get regulators, soil scientists, and engineers involved as well depending on what is discovered.

The Inspection Process

Often the factors that impact drainfield performance have no relation to the type of drainfield media used on the site, but assessing the cause of the problem starts with determining if the malfunction is media related. Interviewing the system owner followed by a thorough inspection of the system's components is the first step in moving toward a solution. This, of course, is easier said than done, as the homeowner may not be forthcoming with information. For example, when asking a homeowner if they have a garbage disposal the reply is typically, "Well yes, I have a disposal but I never use it."



Figure 1- Homeowner abuse

Distribution Box – The condition of the distribution box can provide valuable information on the cause of the malfunction. If excessive solids are present within the distribution box, it indicates that the septic tank is not adequately separating solids and liquid. This leads to clogging of the soil pore matrix resulting in impaired hydraulic capacity. Also, if the distribution box was disturbed during or after installation, adverse changes in the outlet pipe invert elevations may be present leading to overloading of one or more trenches with no flow to others. If the piping network has been affected, effluent may not be able to move from the septic tank to the drainfield.

Drainfield – A visual inspection of the media, infiltrative surface, and underlying soil layers is critical to determining the cause of a malfunction. This may require the pumping of effluent from the drainfield media to allow for proper observation. Once the trench has been excavated, use a shovel to allow a cross-sectional view of the interface between the biomat and underlying soil to be viewed. Staining and discoloration is typical, usually grey or black, where the soil beneath the drainfield has been subjected to the flow of effluent. If no discoloration is present, the soil interface may be clogged preventing the infiltration of effluent from the drainfield. Also, a visual inspection of the infiltrative surface will identify if solids from discharges of latex paint or other foreign substances are present. This may be a very thin layer because it does not take much to seal up the soil interface.



Figure 2 - Drainfield inspection reveals paint in system

Another possibility is that the soil type within the drainfield footprint was classified incorrectly resulting in an undersized drainfield that cannot handle the daily design flow. Compare the soil type determined during the soil classification with the soil type observed in the field to verify proper system sizing. Check the design calculations and effluent loading rate in the applicable regulations to verify that the malfunction is not due to a drainfield sizing calculation error.

Septic Tank – Excessive sludge levels in the tank can have a significant impact on operation including reduced tank working volume and reduced hydraulic residence time. Also, if the sludge accumulation forms a blockage at the bottom of either the inlet or outlet tee, the discharge of wastewater in or out of the tank will be affected. If sludge accumulation obstructs the outlet tee, the liquid level in the tank will rise to the top of the outlet tee allowing the discharge of scum to the drainfield, which can clog the soil pore matrix.



Figure 3 - Septic tank maintenance issue

Common Causes of Drainfield Malfunctions and Solutions

After investigating the problem and diagnosing the source of the malfunction, the next step is to determine a viable remedy to return the system to proper operation. In some cases, this means a system restoration is needed, but in others, the system might require replacement. Here are a few of the most common drainfield malfunction issues and suggested solutions. No solution is applicable to all sites so it's important to check state and local regulatory requirements and always employ onsite wastewater treatment system best practices when determining the most effective remedy.

System Siting

Problem - If the drainfield is located at a low point on the property where surface water runoff or seasonal standing water accumulates, where the groundwater table is shallow, or where roof stormwater runoff is discharged, this can compromise the hydraulic performance of the drainfield.

Solution - If possible, relocate the system to a higher location or elevate the system above the groundwater table. Divert surface water discharge such as roof drains, basement sump pump discharge, lawn irrigation system, and rainwater runoff.



Figure 4 - Construction over the system

Vegetation Near the Drainfield

Problem - The presence of deep-rooted or water-loving vegetation near the drainfield may indicate root intrusion into the piping, distribution box, or drainfield. Also, the presence of stressed vegetation at the ground surface may indicate saturated soil conditions or shallow groundwater table conditions affecting drainfield function.

Solution - Remove vegetation from the area if possible or relocate the drainfield. Coach the system owner on what to avoid planting in the drainfield area.



Figure 5 - Saturated soil conditions

Hydraulic Overload

Problem - When homeowners overwhelm the system with high volumes of wastewater over short spans of time due to activities such as a home daycare operation or multiple loads of laundry then hydraulic overload of the system may occur. Reduced hydraulic residence time in the septic tank can allow solids to pass into the drainfield clogging the soil pore matrix and reducing hydraulic capacity. Leaky plumbing fixtures can also produce a continuous flow of water to the system with similar results. In combination with daily household wastewater production, the actual flow can easily exceed the daily design flow and cause a malfunction because the drainfield is undersized.

Solution - To detect leaks, have the homeowner turn off all fixtures in the house and then check the inlet tee on the septic tank for incoming flow. Also, repair any leaky plumbing fixtures to stop continuous water discharge to the drainfield. Coaching system owners to modify water use habits to spread wastewater discharges over time and eliminating sump pump and water softener back wash discharges from the onsite wastewater treatment system are important steps. It may also be necessary to expand the drainfield to an appropriate size for the number of occupants in the home. In the case of an old system, installing an aerobic bacterial generator to remediate the drainfield will reduce biomat accumulation and allow the hydraulic capacity of the system to be restored.

Clogged Infiltrative Surface

Problem - Clogging from solids, grease, oil, or similar substances may irreparably damage the drainfield requiring replacement. In some cases, restoration of drainfield function may be possible.

Solution - Eliminate the discharge of these substances to the septic tank by finding the source and coaching the system owner on what not to put down the drain. Pump the tank to remove accumulated solids and clean the effluent filter to allow for proper discharge to the drainfield. Fixing piping and distribution box blockages to allow flow from the tank to the drainfield may also be necessary.

Conclusion

A properly conducted investigation will uncover the cause of a malfunction and help to identify the best way to restore the system to proper operation. Some issues, such as plumbing fixture leakage and homeowner water usage habits, are simple to address. More challenging remedies involve vertical separation, siting, mischaracterized soil, excessive biomat accumulation, collapsed soil pore networks, and solids and other deleterious materials blocking the soil pore matrix in the drainfield.

Getting to the most effective solution quickly and efficiently may increase the possibility of restoring the existing drainfield to full operation. Whether a restoration or replacement is needed, explaining the cause of the problem and how to prevent it from occurring again to the system's owner is critical in ensuring a properly functioning system in the future.



Figure 6 - Clogged infiltrative surface