

SEPTIC SYSTEM HANDBOOK

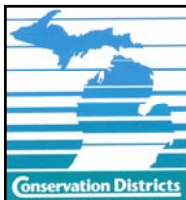
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This publication was developed through the cooperative efforts of
The Les Cheneaux Watershed Council
The Luce-Mackinac-Alger-Schoolcraft District Health Department
The Michigan State University Extension
The Michigan Department of Environmental Quality
and
The Chippewa/East Mackinac Conservation District

For more information regarding septic systems or other water quality issues in the Les Cheneaux area please contact:

THE LES CHENEAUX WATERSHED PROJECT



PAT CARR, PROJECT MANAGER
M-134
CEDARVILLE, MICHIGAN
PHONE: 906-484-3031



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SEPTIC SYSTEM HANDBOOK



A GUIDE FOR RESIDENTS OF THE LES CHENEAUX WATERSHED

This manual has been prepared by the Les Cheneaux Watershed Project to provide homeowners with important information to help them understand and properly maintain their septic systems. In the manual you will find information covering:

- How your septic system works
- Types of septic systems
- Tips for using your septic system
- How to maintain your septic system
- How to locate your septic tank and drainfield
- Who to contact if your tank needs service or pumping
- Who to contact if your septic system needs replacement
- Shoreline property concerns



THE LES CHENEAUX WATERSHED PROJECT

A PARTNERSHIP BETWEEN
THE CHIPPEWA/EAST MACKINAC CONSERVATION DISTRICT
AND
THE LES CHENEAUX WATERSHED COUNCIL



The Les Cheneaux Watershed

The Les Cheneaux Watershed encompasses 115 square miles in Marquette, Clark, and Raber Townships that drain into Lake Huron. Within this area lies the 36-island archipelago known as the Les Cheneaux Islands. The unique landscape contains small creeks, drains, and inland lakes that make up the area's surface water.



A large portion of our watershed's topography is considered *Karst*— that is, formed over limestone, dolomite, or gypsum and characterized by sinkholes, caves, fractured stone, and cracked bedrock near the ground's surface. Karst topography facilitates the quick movement of water underground. In addition, the watershed lacks deep filtering soils to cleanse surface water and septic system drainage as it makes its way to the water table. These characteristics make the Les Cheneaux waters, used for drinking, recreation and wildlife habitat, especially susceptible to contamination.

Many existing homes in the watershed area still rely on older, undersized on-site septic systems. As residents and seasonal home owners in this fragile area, it is essential that we install and maintain septic systems that work efficiently and safely.

Septic Systems

Households not served by public sewers must depend on on-site sewage disposal systems (septic systems) to dispose of wastewater. There are many different types of septic systems designed to fit a wide range of soil and site conditions. These include (but are not limited to) conventional systems, mound systems, aerobic treatment systems, and pressure distribution systems. A brief description of each system follows.

Resource Agencies

There are a number of agencies that are available to assist property owners in dealing with land and water resource issues in the Les Cheneaux Watershed:

The Les Cheneaux Watershed Project

P. O. Box 578
Cedarville, Michigan 49719
Phone: 906-484-3031
Fax: 906-484-4114

The Luce-Mackinac-Alger-Schoolcraft District Health Department (LMAS)

749 Hombach Street
St. Ignace, Michigan 49781
Phone: 906-643-1100
Fax: 906-643-0239

The Michigan State University Extension

100 Marley Street
St. Ignace, Michigan 49781
Phone: 906-643-7307
Fax: 906-643-0353

The Chippewa/East Mackinac Conservation District

2847 Ashmun Street
Sault Ste. Marie, Michigan 49783
Phone: 906-635-1278
Fax: 906-632-0341

Chippewa County Government

Building Department
Phone: 906-635-6362

Clark Township
Blindline Road
Cedarville, Michigan 49719
Phone: 906-484-2533

Marquette Township
E7177 James Street
Pickford, Michigan 49774
Phone: 906-647-6103

Raber Township
Phone: 906-297-3805

Shoreline Strategies

Consider the following recommendations if you own shoreline property:

- If you convert or expand your home, improve the septic system at the same time.
- Plant a buffer strip of plants and bushes between the drainfield and the shoreline. These buffers can absorb some of the nutrients before they reach the water.
- Hook up to the community's sewage system, where possible, or investigate some of the alternative treatment systems discussed earlier in the handbook.
- If you are building a new home, construct the septic system as far away from the shoreline as possible.
- If you are planning to build a new home, contact the District Health Department early in your planning process to get your property evaluated for the appropriate system.
- Learn more about your existing system before it becomes a crisis situation. Remember, contamination can occur even though the septic system appears to be working fine.

“Poking at a Sleeping Bear”

Early in the planning process, the Les Cheneaux Watershed project staff became aware of concerns many property owners have about discussing or uncovering potential septic problems; thus, waking the “sleeping bear”. There are understandable fears about costly repairs or replacement of an old system especially if the system appears to be working. The Les Cheneaux Watershed Project is not a regulatory agency. The project office has taken a position of providing information and education to property owners to allow you to make informed decisions about your particular situation.

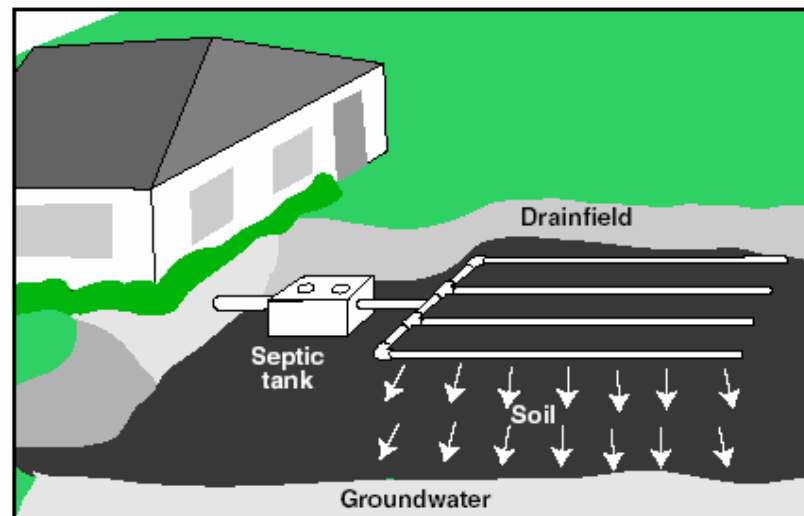


Representatives of the Watershed Project are available to discuss and evaluate your septic and water systems. We have developed a network of professionals in water and septic services that are available to help analyze and fix any problem that you might encounter. Financing options, especially for those in financial hardship, are being explored by watershed staff.

How Septic Systems Work

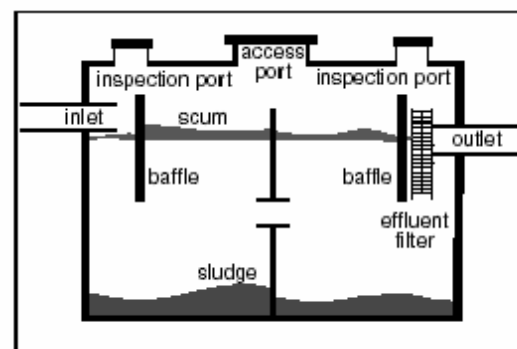
Conventional Gravity Flow System

A conventional gravity flow septic system has four main components: a pipe from the home, a septic tank, a drainfield, and the soil. All of your household wastewater exits your home through a pipe to the septic tank.



Source: Michigan State University Extension, Bulletin WQ 39

A septic tank (watertight container typically made of concrete) works by allowing wastewater to separate into layers and begin the process of decomposition while being contained within the septic tank. Light solids, such as soapsuds and fat, float to the top and form a scum layer. This layer remains on top and gradually thickens until you have the tank pumped. The liquid waste goes into the drainfield, while the heavier solids settle to the bottom of the tank where they are gradually decomposed by bacteria.



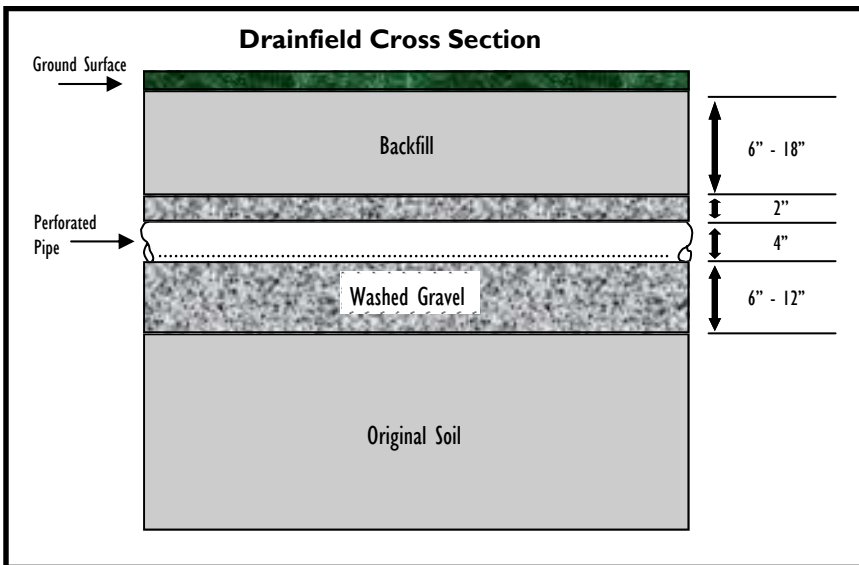
Cross-section of a two-compartment septic tank

Source: Michigan State University Extension, Bulletin WQ 39

Bacteria, which are naturally present in all septic systems, digest the solids that have settled to the bottom of the tank, transforming up to fifty percent of these solids into liquids and gases. Some non-decomposed solids remain, forming a sludge layer that eventually must be pumped out.

When liquids within the tank rise to the level of the outflow pipe, they enter the drainfield. A T-shaped outlet baffle in the tank prevents the sludge and scum from leaving the tank and traveling into the drainfield.

The drainfield is a network of perforated pipes (or “laterals”) laid in gravel-filled trenches or beds. Effluent trickles out of the pipes, through the gravel layer, and into the soil where further treatment occurs. The soil filters the wastewater as it passes (or “percolates”) downward and outward through the pore spaces. The soil microbes treat it before it eventually enters the groundwater or a limiting layer such as hardpan, bedrock, or clay soil. These processes work best where the soil is somewhat dry, permeable, and contains plenty of oxygen for several feet below the drainfield.



Source: Michigan State University Extension, Bulletin WQ 39

Mound Systems

Soil conditions or a high water table may make it impossible to use a conventional system for wastewater treatment and disposal. On these problem sites, mound systems may be an alternative.

In a mound system, specially selected sand is placed on top of the natural soil to help treat and dispose of septic tank effluent. The depth of sand is determined by the depth of the natural soil above a limiting layer. A limiting layer can be bedrock, a soil layer with a poor percolation rate, or seasonally high groundwater. The depth of sand added to the depth of the natural soil must equal the minimum 4 foot treatment depth required in the Upper Peninsula.

Septage Haulers and Septic Contractors

Michigan law requires that persons in the business of pumping septic tanks and those repairing or replacing septic systems be licensed. The Les Cheneaux Watershed office or the LMAS District Health Department can provide a list of licensed haulers and contractors.

Shoreline Properties

If you live on lake or stream property, you have a special responsibility to prevent pollutants from entering the water. Soil and water conditions make your system less efficient in treating waste. Soil type and distance from the drainfield to the shore and to groundwater are important factors that determine the risk your system places on water quality.

Many of the septic systems in the Les Cheneaux watershed are old, undersized systems that would not meet current standards. Many seasonal homes have been converted to year-round use or have been expanded to accommodate more people but the septic systems have not been improved. An undersized septic system is stressed when the amount of household wastewater exceeds the system’s capacity. The increased load on the septic system may cause contaminants to enter the lake or stream. Under these conditions, suspended solids may also enter the drainfield and clog the drain lines. This can cause system failure and back-ups into the home.

Current standards require that the minimum depth of soil between the drainfield and groundwater be four feet or greater. This soil layer is essential in breaking down contaminants in the effluent before it reaches groundwater. On shoreline property, it is difficult to maintain the four feet distance in a conventional gravity flow system during high groundwater periods such as Spring melt or heavy rain periods. Under these conditions, an elevated mound system would provide the necessary depth to properly treat the discharge.

Septic systems are expected to last anywhere from 15 to 40 years depending on how they are maintained and if they are appropriately designed for the site. Many of the old tanks currently in use in our watershed are made of steel and are rusting away. These tanks will eventually collapse and need replacement. The older your system, the more likely it doesn’t meet the latest standards. Even a relatively new system can fail, however, if it is undersized or not properly located and maintained.

Process to Replace an Old, Inadequate Septic System

If you have determined that your system is undersized, deteriorating, or will need to be replaced in the near future, it is recommended that you contact a septic contractor to evaluate your property for a replacement system. The contractor will be familiar with District Health Department requirements and should be able to recommend a replacement strategy that will meet current code requirements. Once you and your contractor have determined a potential replacement plan, contact the District Health Department office in St. Ignace to request a plan review and site evaluation. Prior to the site review, the health officer will ask that you provide one or two test holes to evaluate soils, percolation capability, and ground water level.

When your plan and the type of replacement system are approved, the District Health Department will issue a permit to allow construction of the new system. Permit fees vary depending upon the type of system being installed.

Emergency Replacement of a Failed System

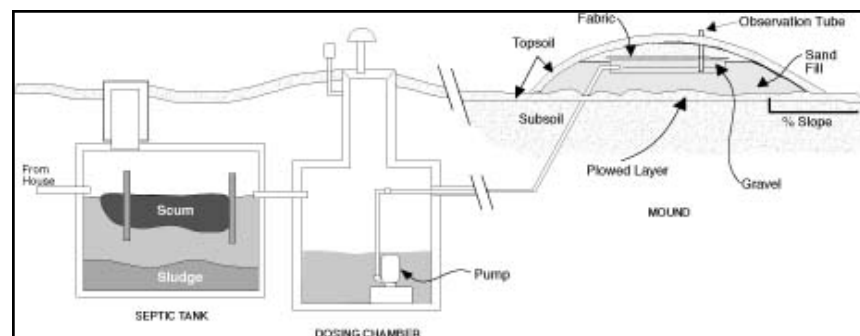
If you are certain that your septic system is failing or has failed, contact the District Health Department immediately. A health officer will make arrangements to visit your site as soon as possible – usually within a day or two. If the health officer determines that your drainfield has failed but your tank is operational, a “pump and haul” schedule may be established to allow use of the tank on a short-term basis. The next step would be to contact a licensed septic contractor to draft a replacement plan. As previously described, the District Health Department will then review the plan, perform a site review, and, upon approval, issue a permit.

New Construction on an Undeveloped Site

When purchasing a parcel with the intent to construct a new home or business, the site should be evaluated to determine whether it is suitable for development. This would include wetland assessment, soil type determination, percolation capability, depth to groundwater, and proximity to shoreline. If any of these are overlooked, the price to develop and maintain the home or business could be significantly higher than expected. Agencies such as the Chippewa/East Mackinac Conservation District and the Natural Resource Conservation Service (NRCS) are good resources for soil and hydrologic information.

Extreme care should be taken to ensure appropriate placement of the building, well, and septic treatment area. The first step for new construction is to visit your township or county building department to discuss your building plans and apply for approvals and permits to develop the site. This would include building permits, soil erosion and sedimentation control permits, wetland permits, well, and septic permits.

A mound system consists of a septic tank, dosing chamber, and elevated absorption mound. The dosing chamber is an additional tank that receives effluent from the septic tank. The effluent is held in this chamber and then periodically pumped into the absorption mound. Because the soil in the mound receives the effluent evenly and over set intervals, it is much less likely to become overly wet than a traditional system. When the soil in the drainage area of a septic system becomes waterlogged, it loses some of its ability to treat the effluent. Consequently, a mound system works more effectively and has a longer life span than a conventional system. Furthermore, because the mound is constructed over the original ground level of the drainage area, it adds additional vertical filtering capacity to the site.



Layout of a typical mound system

Aerobic Treatment Systems

There are two types of bacteria, anaerobic and aerobic. Aerobic septic systems are similar to conventional septic systems in that they both use natural processes to treat wastewater. But unlike conventional septic “anaerobic” treatment, the aerobic treatment process requires oxygen. Aerobic bacteria work much faster than anaerobic bacteria, which means they process septic tank waste more quickly.

Aerobic treatment units use a mechanism to inject and circulate air inside the treatment tank, which accelerates or speeds up the treatment process. This mechanism requires electricity to operate. For this reason, aerobic systems cost more to operate and need more routine maintenance than most septic systems. However, when properly operated and maintained, aerobic systems can provide a high quality wastewater treatment alternative to septic systems.

Such a variety of designs exist for home aerobic units and systems that it is impossible to describe a typical system. Instead, it is more practical to discuss how some common design features of aerobic systems work and the different stages of aerobic treatment.

Stage 1 - Pretreatment tank (anaerobic bacteria)

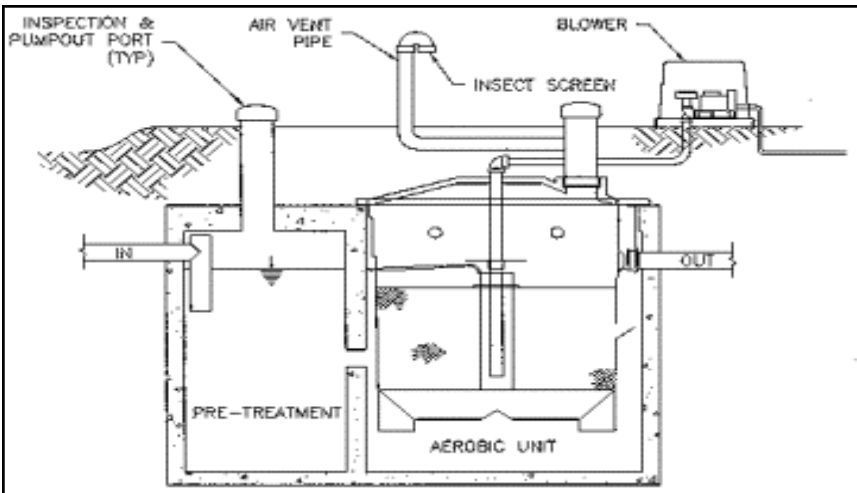
Some pretreatment methods include a septic tank, a primary settling compartment in the treatment unit, or a trash trap. The pretreatment step reduces the amount of solids in the wastewater before it enters the aerobic treatment unit. Solids include greases, oils, toilet paper, and other materials that are put down the drain or flushed into the system.

Stage 2 - Aerobic treatment tank

In the main compartment, or aeration chamber, air is mixed with the wastewater. Since most home aerobic units are buried underground, the air must be forced into the chamber by an air blower or a compressor. The main function of the aerobic tank is to treat household wastewater, which includes all water from toilets, bathtubs, showers, sinks, and laundry. Bacteria that thrive in oxygen-rich environments work to break down and digest the wastewater. (Many aerobic units include another chamber called a settling chamber or clarifier where excess solids can settle. In these units, the sludge returns to the aeration chamber either by gravity or by a pumping device).

Stage 3 - Final treatment and disposal

Methods for final treatment include discharge to a soil absorption field and/or a sand filter. Soil absorption fields (or drainfields) are the most common method of final treatment.



Example of an aerobic tank system

Aerobic systems require periodic pumping and cleaning to operate efficiently. To ensure proper operation, the District Health Department will require a maintenance agreement to operate this type of system.

The assessment will include an evaluation of your septic system, which pinpoints risks before they become problems. The assessment includes:

- Design and location. Knowing your septic tank capacity, soil type in the drainfield and system's location.
- Maintenance. Pumping the septic tank, protecting the drainfield, watching for signs of trouble.
- Inputs to the system. Reducing the amount of water, solids and harmful chemicals going into your system.

Contact the Michigan State University Extension for more information.

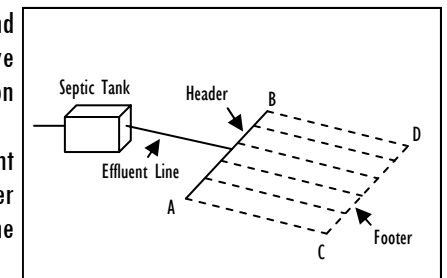
Existing Facility Evaluation – District Health Department

If you are planning to connect a dwelling to an existing sewage system or add a bedroom(s) to an existing home, you are required by Section 5.9 of the Superior Environmental Health Code to get approval, in writing, by the health officer. This will require an "Existing Facility Evaluation" from the District Health Department. You can also request an "Existing Facility Evaluation" when buying or selling a home; when determining whether your system is adequately treating household sewage; or if you suspect the system may be failing.

A properly sited, designed, and installed sewage treatment system along with a water supply is very important in protecting public health and groundwater resources. During the existing facility evaluation, the existing system will be evaluated to determine if the system was properly installed.

A septic evaluation will:

- Assess the soils around the septic system. The applicant will need to provide a test hole to a depth of six feet with a minimum dimension of two feet by two feet near the septic system for the soil evaluation.
- Assess septic tank construction and design. The applicant will need to have the tank pumped during the evaluation for this purpose.
- Assess the drainfield. The applicant will need to uncover the entire header (A to B) of the drainfield along with the corners of the footer (C & D).



There are local septic contractors and excavators who are available to prepare your site for the evaluation. Contact the Luce-Mackinac-Alger-Schoolcraft District Health Department (LMAS) office in St. Ignace to get an application form and fee schedule. Contact a local septic contractor or excavating company for site preparation estimates.

Safety Considerations

Certain features of the septic tank can cause serious injury or death, so the tank should be treated with extreme caution.

- Never enter the septic tank. It contains life-threatening gases and little oxygen.
- Explosion or electrical shock can occur when light, appliances or tools are used in or near the septic tank. Smoking can also trigger an explosion.
- Infectious diseases can be acquired from contact with liquids and solids in the septic tank.
- Secure exposed manhole covers and inspection ports to prevent tampering or entry by children.
- If sewer gas odors are detected in the home, immediately call your plumber or a septic system maintenance firm. Evacuate the building if the odor is strong.
- Keep children and spectators away when the septic system is being maintained or excavated.

Signs of System Failure

Signs of system failure include:

- Odors, surfacing sewage, wet spots or lush vegetation on or near the drainfield
- Plumbing or septic tank backups
- Slow-draining fixtures
- Gurgling sounds in the plumbing system

If you notice any of these signs or if you suspect any other problems with your septic system, contact the sanitarian of the District Health Department, the Les Cheneaux Watershed office, or a septic system contractor for assistance.

Process to Evaluate an Existing System

If you are interested in learning more about your septic and water systems, there are resource agencies available to assist you. Depending on the condition of your existing system, you can contact representatives of the following programs:

Home*A*Syst

If your septic and water systems appear to be working fine but you are interested in learning more about the specifics of your system and potential problems, the Michigan Groundwater Stewardship Program provides information and assessment tools to help Michigan residents identify risks to groundwater. One of these assessment tools is the Home*A*Syst Program. This is a confidential, self-assessment program you can use to evaluate your home and property for possible pollution and health risks.

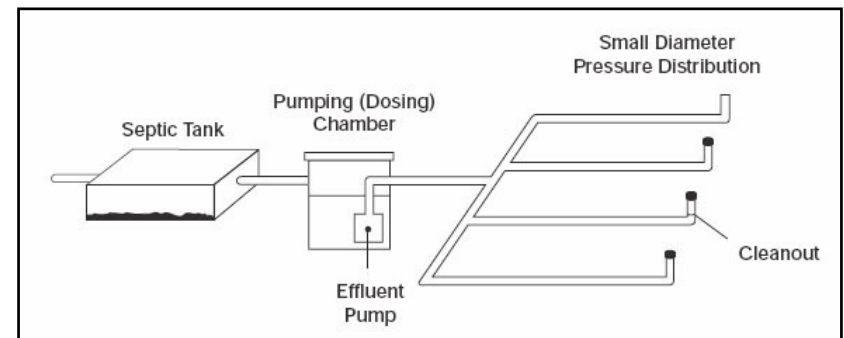
Pressure Distribution Systems

A pressure distribution system consists of a septic tank and pump tank with pressurized lines leading to individual trenches. This allows dosing of the drainfield and use of the entire drainfield at once. Pressure distribution systems are usually installed when there is less than optimal soil depth available for complete treatment of the effluent by a gravity system.

Pressure distribution systems always have a pump and, therefore, dose the drainfield with effluent. The drainfield is allowed to rest until the pumping chamber accumulates enough effluent from the household for another dose. A series of pressurized lines from the pump tank to the drainfield make sure the entire drainfield receives effluent at the same time. Maintenance is required to ensure the orifices do not plug over time.

There are several types of septic effluent dosing systems available. Each has its particular operating characteristics, so one type may be more suitable than others to a particular site. These pressure dosing septic systems are:

- **Pressure manifold:** multiple independent trenches receive effluent from a larger manifold pipe which is fed by an effluent pump from a pumping chamber.
- **Rigid pipe pressure network:** multiple independent trenches at the same elevation receive effluent from an effluent pump and pumping chamber (shown below).
- **Drip line pressure dosing network:** multiple independent pressure drip trenches on flat or sloping sites receive effluent from a pump and pumping chamber at low pressure (potentially even by gravity) where effluent is fed through small pipe openings permitting it to drip at a slow, controlled rate, into the trench and soils.



Rigid pipe pressure distribution network with flushing cleanouts

Tips For Using Your System

Even a properly designed and installed septic system cannot treat wastewater if the system is not used and maintained properly. Here are a few tips:

1. Reduce household water use. Household water use directly controls how quickly waste travels through the septic system. Wastewater that enters the tank requires time to allow the solids to settle to the bottom. The higher the volume of water that is introduced to the system, the less opportunity the wastewater has to settle in the holding tank and the less opportunity the bacteria have to break down the solids. Therefore, limiting the use of water in the home will go far in prolonging the life of the system.
 - Use water-saving showerheads and faucet aerators
 - Install low-flow toilets
 - Repair leaking toilets and fixtures
 - Make sure sump pumps, roof drains, yard drainage and water softeners are not connected to the system or are not allowed to drain over the system
 - Space out time between laundry and dish loads
 - Have full loads with washing
2. Watch what goes down the drain.
 - Do not flush non-biodegradable material such as plastics, disposable diapers, sanitary napkins and applicators — they rapidly fill up the tanks and will clog the system
 - Restrict the use of your kitchen garbage disposal — it increases the amount of solids in the tank, making them slower to decompose.
 - Do not pour grease or cooking oils down the sink drain because they solidify and clog the drainfield
 - Don't allow paints, motor oil, pesticides, fertilizers or disinfectants to get into your system. They can pass directly through the system and contaminate groundwater; kill the microorganisms which decompose wastes; and can damage the soil in the drainfield
 - Do not use caustic drain openers for a clogged drain. Instead use boiling water or a drain snake to free up clogs.
 - Clean your toilet, sinks, shower and tubs with a mild detergent or baking soda.
 - Do not use powdered detergents. These build up in the tank and are difficult to remove.

3. Protect your drainfield — the drainfield is an often overlooked aspect of the septic system, yet it is more important than the tank for proper operation of the entire system.
 - Never park vehicles or place other large objects on the drainfield, as this will compact soil and reduce its ability to treat wastewater. It may also damage the network of pipes within the field, causing them to need to be replaced.
 - The area over the drainfield should be left undisturbed, with only a mowed grass cover. Roots from nearby trees and shrubs may clog and damage pipe.
 - Do not plan any building additions, pools, driveways, or other construction work near the septic tank, drainfield, or the replacement drainfield area.

Maintaining Your System

How often your tank needs cleaning depends on the size of the tank and the use it gets. The health department recommends pumping the septic tank every 3-5 years and that no “additives” be put into the system.

Check the sludge and scum levels and baffle in your septic tank each year. If the sludge line is within 12 inches of the outlet baffle or if the scum surface is within one inch of the top of the outlet baffle, the tank requires pumping.

If you do not pump your tank at these critical points, solid material will begin to leave your tank and enter your soil absorption field. This can lead to early and costly failure of the drainfield.

Locating Your Tank

The tank is usually located about 10 to 20 feet from the point where the sanitary drain leaves the house. It can usually be found by gently inserting a steel rod (soil probe) into the ground where the tank is most likely to be. Another way to locate the tank is to wait for a light snowfall and observe where the snow first melts.

Most tanks have two access ports (lids) - one over the inlet baffle, the other over the outlet baffle. To save money, you can remove the dirt covering the access port prior to the arrival of the septic hauler.

If you are not able to locate the tank or have other questions regarding your septic system, contact the watershed project office for assistance.