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G08-1475 Residential Onsite Wastewater Treatment: Mounds for Effluent Treatment

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NebGuide

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Residential Onsite Wastewater Treatment: Mounds for Effluent Treatment

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A mound wastewater treatment system may be right for lots that have slowly permeable soils, sandy soils, or a high water table. Learn the advantages, disadvantages and maintenance considerations of a mound system.

Several areas in Nebraska have soils inappropriate for onsite wastewater treatment using conventional septic tank/drainfield systems. These include soils with slow or fast permeability, shallow soils over bedrock or a high water table.

Mounds are one of a number of alternative effluent treatment units that have been developed to overcome site conditions that limit the use of a conventional drainfield. A mound creates suitable conditions for treatment above the natural soil surface. After preliminary treatment in a septic tank, effluent flows to a dosing chamber. From there it is pumped to the mound for further treatment and also uses the existing soil beneath the mound, where final treatment occurs and the water re-enters the environment.

In areas of Nebraska without public wastewater treatment services, a septic tank and effluent treatment system is an approved method of wastewater treatment. Effluent — wastewater that has received initial treatment in a septic tank — contains bacteria, viruses, organic particles, chemicals, and nutrients. A properly designed, installed and maintained effluent treatment component reduces risk to people and the environment. A septic tank/mound system consists of the septic tank, dosing chamber or pump tank, and the mound *(Figure 1)*. In Nebraska, only a professional engineer may design an onsite wastewater treatment system that has a mound for effluent treatment. A registered environmental health specialist, professional engineer, certified installer, or someone under their direct supervision may install a septic tank/mound system.

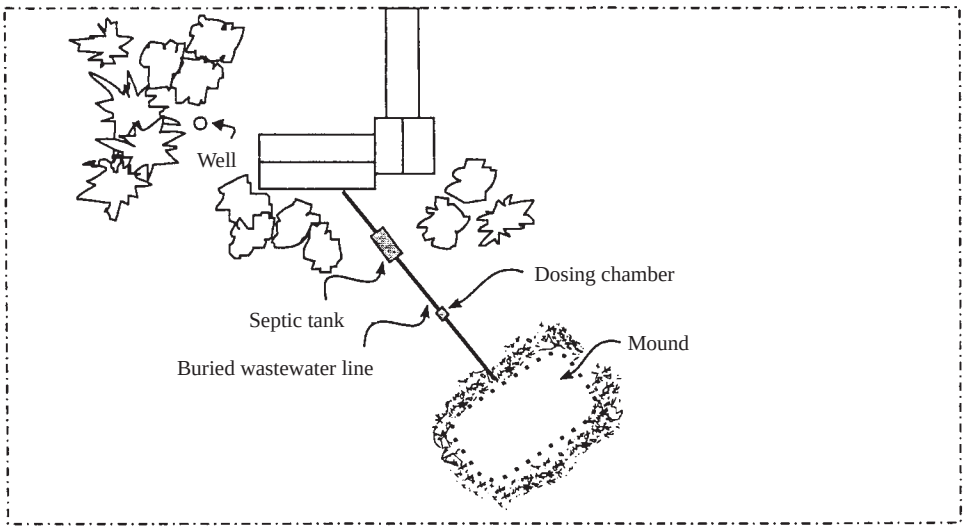

Figure 1. Mound system on a residential site.

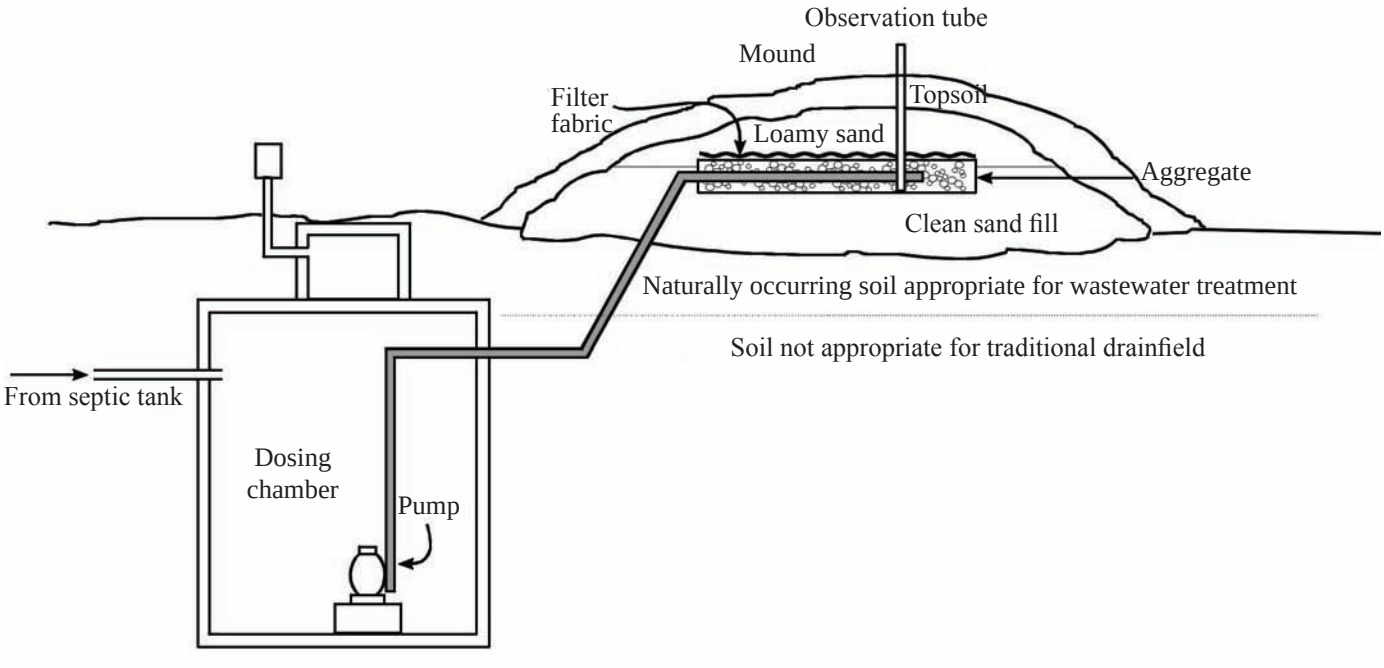

Figure 2. Side view of dosing chamber and mound.

How Does Treatment Occur?

Wastewater from the house flows through the building sewer line to the septic tank, where it receives preliminary treatment. From there, septic tank effluent goes to the dosing chamber, made of concrete, fiberglass or plastic. It contains a pump, pump control floats and a high-water alarm float. When the effluent rises to the "on" float position in the dosing chamber, the pump delivers effluent to the mound. Once a sufficient amount of effluent has been discharged, the level falls to the "off" float position and the pump stops. The control floats are adjustable so that a specific amount of effluent is pumped to the mound.

Many dosing chambers have an alarm float to warn of pump or other system problems. The float is set so that an alarm is triggered if the effluent rises above the "on" float level. The alarm, typically a buzzer and a light, must be wired to a circuit separate from that of the pump. If the alarm sounds, the owner should immediately stop using water and call for service. The pump discharge pipe should have a quick disconnect coupler so that the pump can be easily removed for inspection, repair or replacement.

The mound *(Figure 2)* is a drainfield raised above the natural soil surface. It consists of sand fill that contains a gravel-filled bed and network of small diameter pipes, called the distribution system. Effluent is pumped from the dosing chamber through the mound's distribution system in controlled, low-pressure doses. These doses distribute effluent evenly throughout the mound. Effluent flows out of the distribution system pipes through small holes and trickles through the gravel bed into a sand layer. Some treatment occurs in the sand layer; large particles are filtered from the wastewater, and some pathogens are destroyed. However, because wastewater travels through sand rapidly, more treatment is needed. There must be a layer of suitable naturally occurring soil beneath the mound that is thick enough to complete the treatment process. The soil filters out smaller particles, removing some chemicals and nutrients, and acts as a site for pathogens to be inactivated. There must be a cap of topsoil over the sand mound to shed rain, protect against frost and allow vegetative cover to grow.

What Are Advantages and Disadvantages of a Mound?

One advantage of a septic tank/mound system is that it often can be used on land that is not suitable for a traditional septic tank/drainfield system. Also, the septic tank/mound system uses the top layer of naturally occurring soil, which is typically the most permeable. Since minimal excavation is required, construction damage to the site is minimized. Mounds can be used in most climates and, with creative landscaping, can be attractive.

There are disadvantages to a mound system. Design and construction costs are typically much higher than those of conventional septic tank/drainfield systems. Mounds require a more highly skilled installer than is needed for a standard drainfield. Since there usually is limited permeable topsoil available at mound system sites, installers must be careful not to damage this layer. Mound placement may affect site drainage patterns and limit land use options. In addition, mounds are not suitable for steeply sloping sites. Mounds are difficult and often expensive to repair. The quality of construction materials (clean sand and gravel) is extremely important to the success or failure of the system. A septic tank/mound system requires a pump instead of gravity to move wastewater through the system. If there is no power, the pump, and therefore the

system, will not work and treatment will not occur. Lastly, mounds can be overloaded by high water use, resulting in repairs or, in extreme cases, replacement.

Mound Design and Sizing

An engineer must consider a number of factors when determining the size of a mound, including the number of bedrooms in the home, which dictates the wastewater flow rate to be used; the soil percolation rate of the top 12 inches of soil where the mound will be placed; the allowable loading rate (how many gallons of effluent per square foot the soil can absorb) of the soil; and the slope, among others. For example, a mound system for a three-bedroom home with a flow rate of 450 gallons per day (using tables based on number of bedrooms), a soil percolation rate of 20 minutes per inch, and a 2 percent slope might need a mound with a "footprint" approximately 45 feet wide and 70 feet long. This includes the area beneath the sloping sides. The mound could be smaller if the percolation rate was faster, the soil's allowable loading rate was greater, there were fewer bedrooms or other factors were more favorable to effluent treatment.

Landscaping

The mound can be shaped in a variety of ways to suit individual landscaping and lot size needs. Properly landscaped areas around the mound can serve as a privacy barrier, a windbreak for homes, and to screen unsightly views. Building a contoured mound works well for slightly sloping hillsides, while one built in the shape of a right angle can be placed on a corner. A rectangular mound is acceptable for uniform slope locations.

Vegetation will help to make the mound look attractive, as well as keep it intact. Do not plant or allow large trees, shrubs or plants with extensive root systems to grow within 20 feet of the mound because of the possibility of damage caused by roots. Low maintenance grasses or perennial flowers may be planted on the mound, with those that are resistant to water stress planted at the top, where the soil will tend to be dry. Wear gloves when landscaping and working around the mound after it is in operation.

Maintenance

Septic tank/drainfield systems are the simplest types of onsite wastewater management treatment systems. Due to site limitations such as high groundwater, shallow soils over bedrock, or soils with permeability that is too fast or too slow, a drainfield may not be the appropriate effluent treatment component for a particular lot. Alternative effluent treatment units, such as a mound may be suitable; however, they are more complex and require more maintenance than a conventional drainfield. Some studies have shown that without maintenance, alternative systems failed twice as often as conventional systems. In addition, the lack of a maintenance program was a major cause of poor performance for about 40 percent of the alternative systems studied.

Mounds do a good job of treating effluent if they are designed, installed, used and maintained properly. Maintenance consists of having a knowledgeable professional periodically check the septic tank and effluent filter, if present, the dosing chamber, pump, and mound itself. The owner of a septic tank/mound system has an important role, as well: to not overuse water, be careful of what is put down the drain, and have the system on a regular maintenance schedule. These are the same suggestions for the owner of a conventional septic tank/drainfield system. However, due to having a more complex and therefore costly system, and being in a situation where failure of the system might have a more immediate impact on groundwater, it is even more important for the owner of a septic tank/mound system to have a good maintenance program.

Owners of alternative effluent treatment components such as a mound are strongly advised to contract the services of a professional to check the system on a regular basis. During the first year after construction it would be a good idea to have frequent checks to make sure the system is working correctly and is adjusted as needed. Then, annual checks may be sufficient.

Septic Tank

Some maintenance of the septic tank, consisting of checking the tank and pumping, is required to prevent solids from entering the mound. Several factors determine tank-pumping frequency, including the number of people living in the home, wastewater generation rates and the amount of solids in wastewater, including whether a garbage disposal is used. Many experts recommend pumping a tank every two to three years. Depending on the factors listed above, a tank may need to be pumped more or less frequently. A safe approach is to have the tank inspected by a professional annually until pumping is required. Once the pumping interval is established, use that until there is a change in water use patterns. Additional people living in the home, children becoming teenagers, the installation of a garbage disposal, or the addition of a whirlpool tub all could increase water usage. Conversely, fewer people living in the home could decrease water use.

Septic Tank Effluent Filter

Due to the higher cost of a mound, you may want to protect your investment and reduce the risk of failure by having an effluent filter installed at the outlet baffle of the septic tank. This filter captures larger particles that might otherwise flow to and clog the mound. The effluent filter is cleaned when the tank is pumped, typically every few years. It may need more frequent cleaning, depending upon the characteristics of the wastewater generated, and the type of filter. Some systems need the effluent screen cleaned every three months, others may need cleaning every two years. Failure to clean the filter could result in wastewater backing up into the house.

Dosing Chamber

As with the septic tank, have the dosing chamber checked for sludge and scum buildup and have it pumped as needed. The pump and floats in the dosing chamber should be checked

annually for signs of wear and replaced as necessary. Follow the manufacturer's recommendations for pump maintenance. The electrical parts and conduits should be checked for corrosion. Also, the alarm should be checked to make sure it is in working condition.

Mound

The owner must maintain grass or vegetative cover to prevent erosion and also use some of the wastewater. If the mound has a lawn grass cover, mow it only two or three times a year. To reduce the chance of compaction, never mow grass on the mound if the soil is wet. Don't allow vehicular, animal or human traffic on the mound, as these also may compact soils. Consider fencing the mound area to keep pets or young children off the mound. The owner can periodically check for ponding or seepage at the edges of the mound. If there is wastewater present, immediately contact the service provider.

Permits

Factors such as mound location, size, and shape; construction procedures; distribution of effluent; and dosing quantity all determine how well the mound will function. Each component must be properly designed by a professional engineer and constructed with good quality materials to reduce the possibility of premature failure of the system. Currently, the Nebraska Department of Environmental Quality (NDEQ) has no specific regulations on design and construction of mound systems. Instead, NDEQ engineers review each system design on a case-by-case basis. Documents consisting of a construction permit application, soils information, plans and specifications prepared by a Nebraska licensed professional engineer must be submitted to obtain a permit. A construction permit from NDEQ is required prior to construction of a mound system. NDEQ is in the process of developing a mound endorsement. A certified professional who passes a mound endorsement exam and pays the appropriate fees would be allowed to design a septic tank/mound system. Contact NDEQ to find out the status of this program.

Summary

Consider a mound for effluent treatment when the lot has slowly permeable soils, sandy or gravelly soils, or a high water table. Currently, a professional engineer must design the septic tank/mound system, and a construction permit from NDEQ is required. NDEQ is working toward implementating an endorsement for mounds in the regulations. In the future, after paying the appropriate fees and passing an endorsement exam, a certified professional with a mound endorsement would be allowed to design a mound system. The mound system includes a septic tank, pumping chamber and mound, all of which must be sized according to potential wastewater generation from the home. A properly designed, installed and maintained septic tank/mound system will protect human health and the environment.

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