SERVICE IN ACTION
COLORADO STATE UNIVERSITY EXTENSION SERVICE

Non-soil dispersal sewage systems

Robert C. Ward and
Ralph W. Hansen[1/]

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Quick Facts

- Much of Colorado mountain land is not suitable for a standard septic tank-leachfield system because of inadequate soil cover and improper slope.
- Alternatives to septic tank systems must be professionally designed for a homesite and usually are more complicated and considerably more expensive.
- The use of a mound to form a leachfield at a site with natural limitations can be a reliable alternative to the standard leachfield system; it is dependent on a power source and use of a pump.
- The evapotranspiration system relys on evaporation from the surface or through transpiration by plants; it does not return water used back to the groundwater and may encounter water right problems.
- Treatment of wastewater with aeration systems requires semi-skilled personnel to operate them and they need regular and frequent maintenance and attention.

The standard septic tank-soil absorption disposal system is widely accepted as an on-site wastewater treatment and disposal technology. Design of the waste disposal system is rather straightforward if proper conditions exist at a site—proper slope, adequate depth of soil, sufficient percolation rate and sufficient depth to groundwater. Design procedures are described in detail in local health department regulations.

In the mountains of Colorado, there seldom is adequate soil cover and proper slope, thus much of the land in the mountains is not suitable for the standard septic tank-leachfield system. This does not, however, preclude using on-site sewage systems in the mountains. It does mean that design, installation and operation of an acceptable alternative probably will be more complicated and considerably more expensive.

What are the available alternatives? The purpose of this Service in Action sheet is to briefly review the alternatives to the standard septic tank-absorption field system and provide the potential on-site system owner with information for planning and working with a professional hired to design an alternative. Local regulations normally require the alternative to be designed by a professional when a homesite cannot use a standard septic tank system.

Mound Systems

In selecting an available alternative it often is helpful to first review the reasons the standard septic tank-absorption field system is unacceptable. The alternatives are designed around the limitations of the site.

Soil, the basis for a properly operating absorption system, may be too shallow to provide proper filtration and, therefore, treatment. Compounding the problem, it may be located over creviced or fractured bedrock. In this case, an alternative would be to add more soil to obtain the depth needed to ensure proper effluent treatment in the disposal field. The soil can either be added as a mound or placed in an excavation for the leachfield.

If the soil is too tight, with low percolation capabilities, a mound can be built to increase the total area available to provide proper treatment as the water infiltrates the soil.

If the water table is too high, soil can be mounded on the existing surface to provide the soil depth and surface area for treatment and eventual discharge from the leachfield to the groundwater.

The use of a mound to form a leachfield at a site with natural limitations is not a new concept, however, it has only recently been thoroughly researched and documented as a reliable alternative to the standard leachfield. The "Nodak" system, a mound system, has been used successfully in North Dakota for over 30 years. The University of Wisconsin recently has developed detailed design procedures for mound systems based on extensive research.

Design plans for the mound system are available from the Small Scale Waste Management Project, 3201 Engineering, University of Wisconsin, Madison, Wis. 53760. Order publication #155, "Design and Construction of Wisconsin Mounds," and enclose $1.95 prepaid. This publication also is available from the Colorado State University Extension Agricultural Engineering Office, 202 Glover Building, Colorado State University, Fort Collins, Colo. 80523, at the same cost.

Briefly, the mound system operates in the following manner. The wastewater from the house drains to a standard septic tank to settle and break down solids. The effluent from the septic tank is collected in a "pumping chamber," which is approximately one-half the size of the septic tank. When a prescribed amount of wastewater has

1/ *Robert C. Ward, CSU associate professor; Ralph W. Hansen, CSU extension associate professor, both department of agricultural and chemical engineering (12/1/79)*

accumulated in the chamber, it is pumped to the mound. The periodic "dosing" created by the pumping chamber greatly increases the ability of the mound to effectively treat the wastewater.

The mound itself is constructed on or near the ground surface. It is built of sand (the major material), gravel and soil. The sand is formed to create a mound two to three feet (.6 to .9 meter) high. The mound area covered depends upon the projected flow; a minimum top area of 20 x 30 feet (6 x 9 meters) is recommended. The gravel bed is formed over the sand mound. The distribution pipes from the pumping chamber are laid on top of the gravel with a few inches (centimeters) of gravel cover over the pipes. The entire mound is then covered with a layer of topsoil and seeded to grass.

Being dependent upon a power source and using a pump does mean that the mound system is more complex than the standard septic tank-leachfield system. The complexity, however, is necessary to overcome the limitations of the site. Mound systems must be designed to meet local regulations. In Colorado this normally means that the homeowner must hire a registered professional engineer.

Evapotranspiration Systems

The evapotranspiration system (ET system) is basically a shallow "drainfield" with a sealed bottom. This means that the only disposal for the effluent is out the top either through evaporation from the surface or through transpiration by plants. Unlined "beds" are used in areas where soil percolation is insufficient as the sole means of disposal. ET systems should be used only where pan evaporation rates exceed the precipitation for all months.

Since ET systems do not return the water used in the home to the groundwater, there may be water right problems encountered with their use. This is especially true in many mountain situations where a domestic well is used as the water source.

The use of an ET system should include the practice of flow reduction methods at the wastewater source. Also during periods of heavy rainfall or sudden snow melt, seepage or overflow from the bed may occur. As the ET system ages, salts will accumulate in the bed and may require periodic removal and renovation.

Aeration Systems

Treatment of wastewater with aeration systems also has been proposed as a way to reduce the need for a leachfield. The highly variable effluent quality, however, has resulted in little, if any, reduction of leachfield requirements.

An aeration system includes a biological wastewater treatment process employing high concentrations of microorganisms under aerobic conditions. For individual homes, the systems are quite small and therefore greatly affected by variations in the wastewater flow from the home. Aeration systems require semi-skilled personnel to operate them and they need regular and frequent attention and maintenance.

Summary and Conclusion

There are many areas in Colorado where the "standard" septic tank-leachfield system cannot be used due to geological conditions. If a person is considering buying land for a home or cabin, the site should be evaluated as to suitability for installation of a septic tank-leachfield system. This may greatly affect the development costs and value of the land.

Alternative on-site wastewater treatment and disposal systems can be constructed for sites unsuitable for septic tank-leachfield systems but generally these systems are much more expensive.