Wastewater Treatment and Disposal

When central sewer facilities are not available, individual wastewater treatment systems have generally been considered an acceptable alternative. This is placing extraordinary faith in a method which was designed for use on farms and isolated sites, but increasingly has been used to serve higher concentrations of development.

Central wastewater collection and treatment facilities serve municipal residents and a limited rural population located within the four sanitary districts. Most rural residents and businesses utilize an on-site wastewater treatment (septic) system. There are approximately 4,800 residential septic systems presently in use within Minnehaha County. Additionally, rural commercial and industrial uses, churches, and park facilities dispose of sewage by individual means, usually a septic system or a holding tank in which the contents are routinely pumped and disposed off-site.

Central sewer facilities are generally not economical to construct in the rural, predominately agricultural areas of the county, and existing on-site systems will probably be replaced only when they are in the path of municipal growth. Therefore, much of the projected rural growth will be served by individual systems. Further dependence on individual wastewater systems will necessitate safeguards to protect public health and the environment.

An on-site system treats wastewater in a two-step process. In the first stage, wastewater flows from the structure to a septic tank where the solids settle out. The tank must have sufficient volume to retain the wastewater long enough to allow for some primary treatment. Otherwise more extensive treatment is needed after the wastewater leaves the tank. An outlet in the tank allows the liquid waste or effluent to be dispersed throughout the soil by a drain field. Aerobic bacteria then break down and treat the wastewater elements. An on-site system must provide adequate treatment and not merely act as a means to dispose of sewage. For on-site systems to function properly, operate free of problems, and be environmentally safe, they must be properly located, designed, installed, and maintained.

Location is the single most important determinant. Even the best built system is bound to fail if improperly sited. A system must be located where soils have an acceptable percolation rate, the seasonally high water table and bedrock are more than four feet below the drain field, steep slopes are avoided, and surface drainage is directed away from the absorption field. A test hole should first be dug in the area of the proposed absorption field at least four feet below the bottom of the trench. If the soil profile indicates a seasonally high water table, adjustments to the trench depth are necessary.

Since soil type can change within the building site, percolation tests must be taken at the proposed location of the system to accurately calculate the proper sizing of the absorption field. Soils where the effluent is absorbed slowly will require a larger drain field. On the other hand, soils with a very rapid absorption rate are not acceptable because effluent will reach the groundwater before proper filtration occurs.

An on-site system which is properly designed and installed can still experience operational problems and even fail if routine maintenance is not performed. This situation can result in environmental and health problems for both the occupants of the structure and the general public.

People who move from the city to the country should make major changes in their lifestyle when

using an on-site system. Water consumption and the use of cleansers should be reduced, extra care should be taken to restrict certain substances from entering the wastewater system, and appliances such as garbage disposals should not be used. If these changes do not occur, the wastewater treatment system should be completely upgraded to accommodate the additional demands. On-site systems also require periodic maintenance such as pumping to ensure proper long term operation.

Improperly treated sewage poses a number of dangers, particularly health related. A variety of bacterial, viral and parasitic diseases can be spread through contact with untreated wastewater. Outbreaks of diseases in the United States such as typhoid, cholera, hepatitis, gastroenteritis, dysentery, giardiasis and others have been directly linked to improperly treated sewage. There have been incidents in the last few years of illnesses in South Dakota which were attributed to contact with wastewater in the soil or groundwater.

Septic system failures place people at risk for exposure to untreated waste if sewage surfaces on the ground or backs up into the structure. Effluent which enters the groundwater before being properly treated broadens this risk of exposure. Aerobic or oxygen-using bacteria is an important part of the on-site wastewater treatment process. These bacteria are not found in soils which are frequently water saturated, resulting in the improper treatment of the effluent before it reaches surface or groundwater and contamination occurs.

Even when a septic system is ideally designed, sited, constructed and maintained, there is still the potential for exposure to some potentially harmful components. A correctly operating on-site system can remove most micro-organisms and phosphates found in the wastewater. On-site systems, however, do not adequately remove nitrogen compounds such as nitrates. Nitrates, which are a common component of wastewater, have been responsible for health problems such as methemoglobinemia, or "blue baby disease." This potentially fatal disease interferes with the oxygen transporting capability of blood in infants.

It is inaccurate to conclude that a system is operating properly simply because wastewater has not surfaced or backed up. The old saying “out of sight, out of mind” should not be used to rate the success of these systems. Nor should it be assumed that proper system installation and maintenance results in 100 percent treatment efficiency.

On-site wastewater systems pose the least risk to human health and the environment when used in low density, large acreage type settings. In addition to restricting the concentration of on-site systems, larger lot sizes allow failing systems to be replaced elsewhere on the property. The degree of risk can generally be expected to increase in direct proportion to the concentration of development. Although dilution should not be the solution, poorly operating systems on scattered sites pose a lesser chance of polluting the groundwater. But when systems are more concentrated and not operating properly, nature’s safeguards become overloaded and contamination is much more likely to occur.

The discharge from a central treatment plant can be monitored for compliance with water quality standards, but such is not the case for wastewater entering the ground from septic systems. The difference between these two situations is termed point and non-point source pollution. If nitrates are present in private wells, contamination may be coming from one or more sources and locations, septic systems, animal feeding operations and farm chemicals being the most common sources, but it is difficult if not impossible to identify the exact source. Although sites near the problem area are most suspect, the exact location cannot be determined - hence the reference to non-point source pollution.

Several concentrated rural housing areas have been required to install costly central sewer

systems due to the failure of on-site treatment systems. The Prairie Meadows, Wall Lake, Renner and Corson Sanitary Districts were all created due to conditions such as high groundwater level, proximity to shallow aquifers and other water features, poor soils, inadequate design and concentration of development. The
physical limitations of soils tend to be amplified as septic systems become more concentrated.

The effluent from both Prairie Meadows and Renner is pumped into the Sioux Falls wastewater collection system. The Renner area developed over the Big Sioux aquifer where the sandy soil provided little opportunity for septic systems to cleanse the effluent prior to reaching shallow groundwater. Since the city depends heavily on the aquifer for its water supply, the Renner Sanitary District was critical to eliminating a potential source of contamination. Nearly 300 users are connected to the system.

The Prairie Meadows Sanitary District was created after federal and state environmental officials determined that residents were being exposed to a severe health threat from sewage that was surfacing due to high water table conditions. The district services 46 houses. Although there was no immediate danger to Sioux Falls residents or municipal water supplies, the city authorized the district to connect to the municipal sanitary system. Two other sanitary districts, Norton-Froehlich and Hayward, were annexed into Sioux Falls in the early 1980's.

The Wall Lake Sanitary District was created to provide central sewage collection and treatment to lake side homes. A combination of poorly constructed on-site systems, small lots and the change from seasonal to permanent residents contributed to partially treated and, in some instances, raw effluent entering the lake. The district operates a lagoon to treat the sewage from approximately 70 users.

Sanitary districts can potentially impact future growth patterns by pulling development toward areas where urban uses are not planned, thus altering the orderly expansion of municipal utilities. In some cases, large rural lots and random development interspersed with large tracts of vacant land substantially increase construction costs and generally work contrary to the efficient and economical provision of services.

Federal grant and loan programs have traditionally funded a large portion of the construction costs associated with sanitary districts. Federal monies result in a substantial reduction in monthly customer charges for service and debt retirement. A reduction in federal funding for wastewater projects is a very real possibility. Reduced cost sharing assistance or program elimination would place future districts in jeopardy simply because the cost will increase substantially for a relatively small customer base. This situation underscores the importance of managing future growth based on density considerations so there is no need to create additional sanitary districts.