DEPARTMENT OF HEALTH

Wellhead Protection Issues Related To Subsurface Wastewater Treatment and Disposal

The purpose of this document is to communicate Minnesota Department of Health (MDH) concerns about the potential impacts to drinking water from subsurface wastewater treatment and disposal systems located in geologically sensitive wellhead protection areas. An area is geologically sensitive where layers of fine-grained material, such as clay or shale, are not of sufficient thickness to prevent the vertical movement of contaminants from reaching groundwater resources over a time period of weeks to less than a decade. Geologically sensitive areas also include areas where karst or fractured rock aquifers are within 50 feet of the land surface.

Subsurface sewage treatment systems (SSTSs), formerly referred to as individual sewage treatment systems, that meet Minnesota regulations are designed to treat and dispose of 1) pathogens, 2) biochemical oxygen demand, and 3) solids related to sewage. SSTSs consist of three parts: septic tank, distribution system, and soil treatment area. Naturally occurring bacteria in the sewage break down most of the solid wastes, and the liquids flow out of the septic tank into the distribution system and the soil treatment area. Here, the liquid, or effluent, seeps into the soil profile for further treatment by bacteria and adsorption to soil particles.

SSTSs are not designed, constructed, or regulated for the complete removal of nitrogen compounds that may impact drinking water. In addition, SSTSs are not designed to properly treat or dispose of 1) industrial or commercial production wastes; 2) fuel, grease and oils; 3) chemicals; or 4) stormwater. Moreover, subsurface wastewater disposal practices were not uniformly regulated throughout Minnesota prior to the mid-1980s and included methods that are illegal today.

State and local regulations governing the design and operation of subsurface wastewater disposal systems have been developed to address basic sanitation principles and to minimize the impact of human sewage on water resources. However, substandard practices and the misuse of subsurface wastewater treatment systems still occur, especially in unsewered areas of the state. Some of these practices pose a direct threat to drinking water, such as 1) using old wells to dispose of sewage and liquids directly into the groundwater, and 2) connecting septic tanks to agricultural tile lines or straight pipes to surface water.

The U.S. Environmental Protection Agency (U.S. EPA) has characterized some types of wastewater disposal systems as Class V Injection Wells. Class V Injection Wells of special concern include large- capacity drainfields, large-capacity cesspools, and septic systems that dispose of motor vehicle wastes. The U.S. EPA is responsible for administering the federal underground injection control regulations that address Class V wells.

Contamination from SSTSs may limit the current and future use of geologically sensitive aquifers used to provide drinking water. Contamination of drinking water wells from SSTSs could result in the need to install expensive treatment equipment, use an alternative water supply, or limit future capabilities to construct additional wells. Furthermore, contamination of water supply wells may result in expensive legal and remediation costs to the owners of the properties that contributed the contaminants.

The following drinking water protection issues concern subsurface wastewater disposal practices in portions of a wellhead protection area that exhibit high geologic sensitivity:

- **The movement of pathogens into drinking water sources.** Pathogens include microorganisms, such as bacteria, viruses, and protozoa, that are capable of causing disease in animals and humans. Some pathogens may remain viable in groundwater for as long as one year. The greatest risk of pathogens contaminating drinking water supplies occurs when SSTSs are located within a one-year time of travel capture zone for water supply wells constructed into geologically sensitive aquifers. Of particular concern are failed systems where untreated sewage reaches the land surface or enters groundwater that supplies drinking water wells.
- **Excessive nutrient loading may contaminate drinking water supplies.** Most subsurface wastewater disposal systems are not designed to remove nitrate-nitrogen before releasing it to the subsurface. Therefore, either active or abandoned SSTSs that are located in geologically sensitive portions of wellhead protection areas may present a potential source of nitrate contamination to drinking water. Concentrated numbers of these systems, such as in an unsewered community, are of particular concern because of their potential to generate a significant plume of nitrate-contaminated groundwater.
- **Disposing chemical wastes through SSTSs can contaminate drinking water supplies.** SSTSs are not designed to treat household hazardous wastes, industrial or commercial processing wastes, fuel, oil, grease, antifreeze or other types of automotive fluids, pharmaceuticals, legal or illegal drugs, or any other types of waste except sewage. Using an SSTS to dispose of any waste other than sewage in geologically sensitive portions of a wellhead protection area may present a contamination risk to drinking water.
- **Improper maintenance and operation of SSTSs by owners may lead to treatment failure and contamination of drinking water supplies.** The majority of SSTSs are designed and installed in Minnesota to serve single-family homes. Overuse, improper operation and maintenance, the use of additives, the lack of periodic pumping and inspection, or overloading the system by adding appliances which generate high water usage may affect the ability of the SSTS to treat wastewater. SSTS owners are responsible for their long-term maintenance. Typically, owners do not understand the basic concepts of how an SSTS actually functions or the importance of its proper operation and maintenance.
- **Improperly applying sewage effluent in geologically sensitive portions of wellhead protection areas is a threat to drinking water.** Spreading effluent may affect drinking water when it infiltrates or provides recharge to a geologically sensitive aquifer, especially within the one-year time of travel for a well.