# You and Your Septic System

by Ted Moore, P.E.
Flattop Technical Services

*Note: The following is an updated version of an article that first appeared in the April, 1988 HALO Newsletter. In this issue we describe conventional septic tank and soil absorption systems, which are the most commonly-used solution to on-site wastewater disposal on the Hillside. Subsequent articles will discuss (1) Septic system maintenance and troubleshooting common problems, as well as "the dreaded upgrade", (2) Advanced treatment wastewater systems, (3) Neighborhood cluster wastewater systems, (4) Municipal and State regulations governing on-site wastewater disposal, and (5) Certificates of On-Site Approval (COSA).*

Hillside residents are fiercely protective of their semi-rural lifestyle that comes with large lot zoning. In addition to our quiet neighborhoods and relatively undisturbed natural environment, we have access to most of the urban amenities that Anchorage offers. One notable exception, however, is the lack of access to public sewer and water, which means that individual homeowners must assume the responsibility of providing for their own water supply and wastewater disposal on-site. The costs of installing public sewers to transport wastewater to the municipal treatment plant are simply too high for owners of large lots with their long street frontage to be able to afford. While a number of subdivisions and smaller groupings of homes have been banded together to provide community water systems on the Hillside at a reasonable cost, this has almost invariably not happened with wastewater disposal.

The only cost-effective solution to wastewater disposal available to most hillside residents is individual on-lot septic systems. In theory, on-site septic systems provide a higher level of treatment than many centralized facilities, but a range of potential problems can limit their effectiveness. This article provides an overview of the types of conventional septic systems that are found on the Hillside.

In olden times (back before the 60's, that is) when the original homesteaders tired of running outdoors to use their pit privies, most simply installed a cesspool consisting of a junk car or log crib buried in the ground. Wastewater flowing from their toilets, showers and kitchens was piped directly into the cesspool and from there the liquid portion percolated into the ground. These were cheap to install, often effective if surrounded by porous soils, and usually a good way to contaminate the groundwater because there was no way to ensure that pathogens received any treatment before entering the groundwater. But with the nearest neighbor a quarter mile away, who cared – the natural environment was big enough to be able to handle pollution on this scale. Or was it?

As subdivisions were developed (often reducing lot sizes down to 1.25 acres or smaller) something better was needed. That "something" was the conventional septic system consisting of a watertight septic tank to receive wastewater and hold it for about a day - allowing much of the solids to settle out and many of the pathogens to die - before discharging the clarified effluent to a soil absorption system. To this day, the vast majority of on-site wastewater disposal systems on the Hillside consist of these two components. Of course, there are a number of permutations, some of which work better than others in different applications, but all feature these two basic components. The Municipal Development Services Department regulates wastewater disposal in Anchorage and a permit is required before any system is installed or modified. Systems must be designed and installed in accordance with Municipal code which contains numerous requirements regarding sizing and materials as well as vertical and horizontal

separations from groundwater and surface water and wells, etc. These design requirements will be discussed in a subsequent article.

***Septic Tanks:***

Most septic tanks sold in Anchorage are fabricated of steel with a bituminous costing to inhibit rust. The size depends on the number of bedrooms – typically 1000 or 1250 gallons for a 3 or 4 bedroom home. Septic tanks have two compartments to promote better separation of solids before the effluent flows on into the soil absorption system. Interestingly, steel tanks are not allowed in most of the rest of the country because they tend to rust out within 15 – 20 years and then allow untreated sewage to leach directly into the groundwater. Is our situation really any different?? Fiberglass and concrete tanks have both been tried in Anchorage in the past; unfortunately the original fiberglass model used here had structural design problems allowing it to collapse, and some of the concrete tanks leaked and/or suffered from poor quality concrete. Nowadays, good-quality tanks made of high-density polyethylene and fiberglass are available (at a slightly higher cost). Theoretically, these should last indefinitely, but many contractors still don't like them because they demand more careful bedding and backfill to avoid puncture. The biggest inherent drawback of a concrete septic tank is that it is too heavy for most small backhoes to lift, necessitating either a large excavator or a boom truck; as a result concrete septic tanks are not presently marketed in Anchorage.

***Soil Absorption Systems:***

The basic function of a soil absorption system is to distribute septic tank effluent over a large enough area that it can be absorbed into the native soil without backing up into the septic tank or coming out onto the surface of the ground. The theory is that once septic tank effluent percolates through unsaturated soil for even a short distance most harmful constituents are adequately treated or removed. In fact, a properly functioning soil absorption system downstream of a septic tank provides a significantly higher level of treatment than Anchorage's municipal wastewater treatment plant… and it doesn't pollute Cook Inlet! The trick is to ensure that on-site soil absorption systems function properly.

Conventional soil absorption systems come in several types. The oldest design is called a **seepage pit** and consists of a log crib or perforated concrete rings constructed in the center of a large excavation, which is then backfilled with gravel. Septic tank effluent is piped into the crib structure and percolates out through its sidewalls and gravel into the surrounding native soil. While this type of system is no longer being installed in Anchorage, many old seepage pits continue to function well in the Hillside up to this day.

The type of soil absorption system most frequently being installed in Alaska is called a soil absorption **trench**. In essence it is a narrow trench dug by a backhoe along a contour of the land and backfilled with washed gravel. Septic tank effluent is distributed throughout the length of the trench by means of a perforated pipe buried near the top of the gravel, and then percolates laterally through the trench sidewalls into the native soil. This type of system is very cost-effective to construct and works very well in many situations.

When shallow groundwater or impermeable soils or bedrock precludes installation of a trench, a **bed** system must be installed. A bed system consists of a thin layer of washed gravel containing a network of perforated distribution pipes constructed over a level surface of native soil or imported sand. Unlike

in a trench where the primary absorption occurs in a horizontal direction, in a bed the primary direction of absorption is vertically downward into the receiving soil. Experience has shown that bed systems tend to clog up faster than trench systems.

Permutations of the bed concept include a soil absorption **mound**, which is nothing more than a bed constructed on an elevated surface built up with imported sand. Because they are elevated, mounds usually require that a lift station be incorporated to pump effluent up from the septic tank up into the distribution pipe network. Depending on topography, lift stations may be necessary with other types of soil absorption systems as well.

Another permutation of a bed is called a **five-foot wide drainfield**; this incorporates one or more long thin beds that are designed primarily to allow absorption through the bottom, but if soil conditions permit, additional gravel depth may be installed to create some sidewall area for soil absorption as well. Thus, this functions as a hybrid absorption system, somewhere between a trench and a bed, with some of the advantages and disadvantages of each.

As mentioned earlier, subsequent articles will discuss: (1) Septic system maintenance, troubleshooting common problems, and "the dreaded septic upgrade", (2) Advanced treatment wastewater systems, (3) Neighborhood cluster wastewater systems, and (4) Municipal and State regulations governing on-site wastewater disposal, and (5) Certificates of On-Site Approval (COSA).

*Ted Moore is a local civil engineer who specializes in septic system design, construction and testing.*