

What is an onsite or decentralized wastewater system?

This is the first article in a series about onsite/decentralized wastewater systems that RCAP will be featuring in this newsletter. This article presents the basic layouts of these systems, and future articles later this year will talk about other aspects.

When water is used, it becomes contaminated and is then known as *wastewater*. Wastewater has to be treated so it does not harm the environment when it is returned to a body of water, such as a river or lake. In many places, especially large cities, wastewater is treated at a plant far from where it is created. To get to the remote treatment facility, it is collected from its many sources and transported to a centralized wastewater treatment plant, where millions of gallons are treated at once on an industrial scale.

Wastewater can also be treated near the source on a smaller scale. In these cases, it is called *onsite wastewater treatment* or *decentralized wastewater treatment*. All of the treatment equipment is located at the site where the wastewater is generated.

The wastewater comes from sinks, drains, toilets, showers, washing machines, and other appliances. The wastewater is mostly water with a small amount of solids. Organic solids can be treated or "broken down" by bacteria.

The onsite wastewater treatment system is usually called a septic tank or septic system. In a septic system, the wastewater drains from the building where it is generated into a septic tank. This is only one type of onsite system and is generally the simplest type. There are many other types.

The septic tank receives the wastewater from all of the drains and toilets in the building. Hopefully the septic tank will *not* receive any non-treatable solid materials like paper, plastics, cloth, wood, rocks, etc. Also, the septic tank should not receive any harmful chemicals like motor oil, gasoline, bleach, and acids. If harmful chemicals get in the septic tank, the helpful bacteria could die, and the wastewater would not be treated.

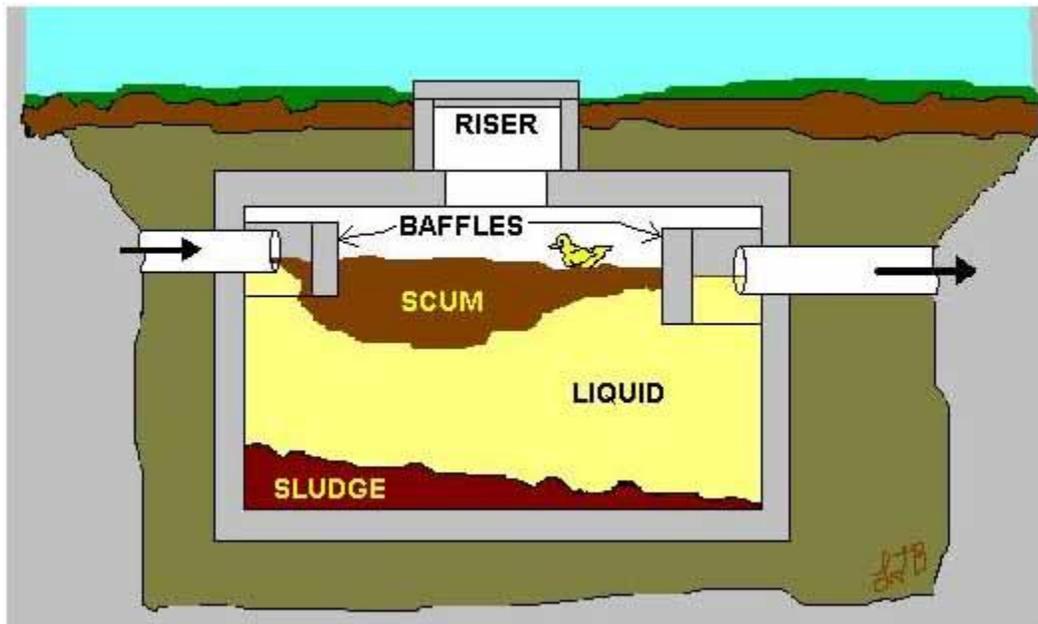
A traditional septic tank is completely underground. The wastewater drains by gravity from the building into the septic tank. Usually there is no filter or screen on the drain line leading to the septic tank. So if any small solids are put in the drain, they could flow into the septic tank.

Inside the septic tank, a biological degradation process takes place. Bacteria consume the organic (carbon) material and convert much of it to water, carbon dioxide and gases. The solids that are not converted fall to the bottom of the tank and form a thick sludge layer. The treated wastewater fills the tank to the overflow outlet. The liquid overflows and leaves the tank to go to a distribution system. If the liquid needs to go uphill, a pump is required.

The liquid overflows to a set of pipes with holes, or slits, which is buried in the ground. The distribution system is a series of parallel pipes located about 18 inches below the surface. The field where the wastewater is distributed is called the drain field or leach field. The treated wastewater flows slowly through the slots in the pipe and is absorbed in the ground near the pipes. The ground has the capacity to absorb the wastewater so it does not get into any streams or rivers nearby.

The diagram below is of a typical residential septic tank.





The wastewater enters in the upper left pipe and leaves by the upper right pipe. The solid sludge collects at the bottom of the tank. The scum, which is grease, oil and fats, floats on the top. The liquid that discharges comes from the clear center layer in the tank.

Larger onsite, decentralized wastewater treatment systems use the same principle of a collection tank that overflows or is pumped to a drain field or leach field. These larger systems have to be designed by an engineer who is trained and experienced in the design of large, decentralized systems. When several buildings, like many houses or businesses, have their wastewater flow to one collection tank, this is called a "cluster" system.

Regular maintenance of decentralized systems is necessary for their proper operation. If pumps are not needed to deliver the raw wastewater to the tank or to deliver the overflow liquid to the drain field, the maintenance is minimal.

The liquid flowing into the leach field is evenly distributed throughout the piping system. The ability of the soils surrounding the piping system to absorb liquid determines if the liquid moves down, sideways or upwards through these soils. It is customary for some of the liquid to move toward the surface of the soils in the leach field and evaporate or be taken up by the vegetation growing on the surface. If the liquid level in the distribution lines fills the piping system, nearly all of it will eventually move upward and evaporate or be transpired into the air from leaf surfaces.

For proper operation, do not add to the drain or flush solid items that will not decompose like paper, plastic, and coffee grounds. These items will foul the system and prevent proper treatment.

Thanks to Robert P. Britts, P.E. and Val Green B.S., M.S. of Southeast Rural Community Assistance Project, the Southeast RCAP, for writing this article.

More on wastewater treatment

How is your
DRINKING WATER
&
WASTEWATER
treated?

Find out how
in this interactive
experience



Will it flush? video

"What comes out of you and toilet paper" are the only things, according to this video, that should be flushed down the toilet. This informative video shows in a visual way what happens to some common bathroom throw-aways when they're flushed down the toilet - so-called "flushable" things like kitty litter or baby wipes. In a demonstration by a sewage pre-treatment technician, wastewater customers can see what happens when facial tissue, cotton swabs and feminine napkins are sent through the wastewater system.

A Drop of Knowledge: The Non-operator's Guide to Wastewater Systems

This guide explains in simple, everyday language the various components and operations of a small wastewater system from when the customer flushes his/her toilet through collection, treatment, and return to source. This guide is an ideal orientation and background primer for new small utility board members and decision makers in small communities.

We welcome your feedback, questions, and suggestions of topics to cover. [Contact us](#)



Got a question for an expert? Submit a question to be answered by one of RCAP's field staff members. Questions can be about technical, managerial or financial matters in your system. Submit your question at www.rcap.org/askexpert



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