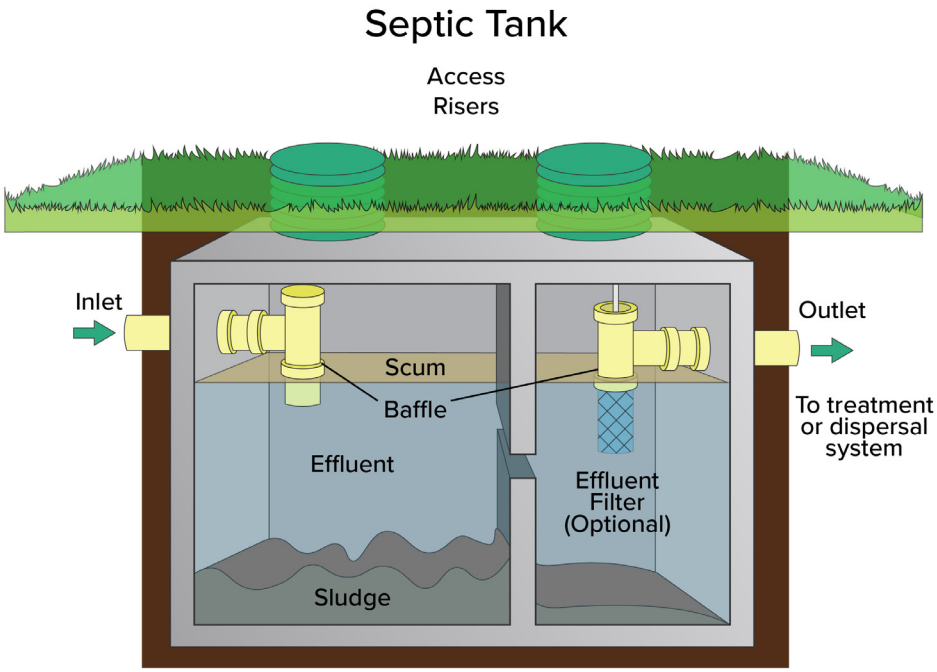
CONVENTIONAL SEPTIC SYSTEMS EXPLAINED

There are many different forms of wastewater treatment depending on the parish. Typically, in dense urban clusters, the city collects sewage water and transports it to a single, high-volume wastewater treatment plant for processing. These municipal wastewater treatment facilities receive effluent from businesses, homes and industries for mechanical treatment to remove contaminants. Other community clusters may have a small, premanufactured treatment facility called a packaging plant that is close in proximity and provides mechanical treatment of lower-volume effluent. To reduce the cost of collecting, processing and treating wastewater in some areas, the use of individual septic units or on-site wastewater treatment systems is a method of treating wastewater from household plumbing fixtures (toilet, shower, laundry, etc.) through more natural processes. Also known as decentralized wastewater treatment, these underground units use primary and secondary treatment to treat and disperse small volumes of effluent generated in residential settings. In Louisiana, approximately 54,750,000,000 gallons of wastewater per year are treated by on-site wastewater treatment systems with over 475,299 individual units permitted for installation as of August 2023. Though these on-site systems are convenient to use and reduce the cost of infrastructure (transport, processing and treatment), they also require maintenance to prevent public health and environmental contamination.

How It Works



General schematic for a conventional septic system.

The typical design for a decentralized system consists of a septic tank as the primary treatment and a soil absorption field as the secondary treatment method. In some cases, additional components may need to be added to the series including pumping stations where gravity flow is insufficient, a chlorine contact chamber for additional treatment before dispersion or an effluent reduction method due to higher volumes of wastewater. This schematic outlines the processes of the conventional septic tank and soil absorption field processes.

To start the process, the household water from appliances, showers and toilets runs from one main drainage pipe into an underground septic tank. This liquid wastewater is called the effluent.

The tank is a watertight container usually made of concrete, fiberglass or polyethylene. In the tank, anaerobic bacteria will digest the organic matter and produce sludge material that will settle to the bottom and small amounts of gas. Additionally, floatable matter (e.g., oils and grease) will rise to the top of the liquid level. The longer the effluent stays in the septic tank, the more chance it has to be properly treated, therefore it is important to maintain a balanced water usage to not create hydraulic overload in your septic system.

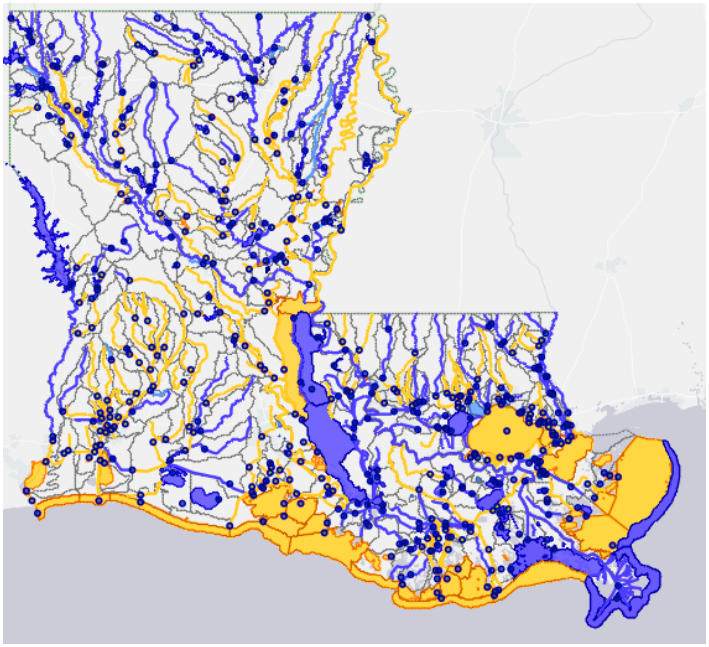
The design of the unit has multiple compartments or units in series to help preclude floating materials. The T-shaped outlet is lower than the inlet, thus allowing for intermediate water to exit the tank as water fills the unit. The T-shaped pipe can also be installed with a filter to reduce particulates that leave the tank, but this requires additional maintenance.

After the water exits the tank, it is transported to a distribution box which allows the effluent to equally disperse to the absorption field lines. The absorption field is a series of perforated pipes buried in a large area designed to slowly release the effluent into the soil.

The absorption field should be located in unsaturated soil to promote the discharge of effluent through piping onto porous surfaces. The soil is used as a natural filter for microbial activity to further convert residual organic matter to mineral components before reaching any groundwater table. For adequate distribution of the effluent, a percolation test must be performed to ensure the soil type will allow for effluent to pass through. If the absorption field is overloaded with too much water from the system or surrounding water inputs like gutters, it can flood, causing sewage to flow to the ground surface or create backups into the house.

Water Quality and Septic Systems

Using conventional septic systems, the natural anaerobic bacteria and soil microbes help remove harmful coliform bacteria, viruses and nutrients. The most predominant bacteria in the intestines of humans or other warm-blooded animals is coliform. These bacteria can be used as an indicator of human fecal contamination. The Louisiana Department of Environmental Quality produces a Water Quality Integrated Report to show impaired waterways across the state. This report showcases types of impairments and the source, if known. Over 40% of Louisiana waterways are impaired due to bacteria found in fecal matter with the majority of sources attributed to decentralized septic systems or small packaging plants. These disease-causing and nutrient impairments can cause issues with surface and groundwater systems. It is critical to preserve our state's natural resources. Louisiana



Map of Louisiana tributaries.

waters are the state's heritage and home to many activities such as boating, fishing, hunting and other recreational activities. Additionally, over 1.7 million residents — or about 37% of Louisianans — get their drinking water from surface water sources. The addition of contaminates to surface water can drastically increase the cost of chemicals and energy to process drinking water for communities downstream.

The Louisiana Department of Health and parish local governments provide regulatory information and trainings for decentralized septic systems. Courses are designed for onsite wastewater installers to be trained for the installation and design of systems in Louisiana. To maintain adequate treatment, septic tanks should be inspected every six years after installation and pumped every eight years or as necessary to prevent solid overflow to the soil absorption trench which could lead to clogging and failure. As a homeowner and user of a decentralized system, it is important to understand the function of your unit, preventative maintenance and warning signs of issues to prevent downstream contamination in your community.

References

- https://www.doa.la.gov/media/j3hnpfdy/51.pdf
- https://www.deq.louisiana.gov/page/louisiana-water-quality-integrated-report
- https://www.epa.gov/septic/types-septic-systems#septictank
- https://www.epa.gov/septic/how-septic-systems-work
- https://19january2021snapshot.epa.gov/septic/septic-systems-overview_.html
- https://ldh.la.gov/page/wastewater

Authors

M.P. Hayes, Assistant Professor in the School of Plant, Environmental and Soil Science and Louisiana Sea Grant

Richard Grabert, Sanitarian Program Specialist for the Louisiana Department of Health

Paula Guient, Assistant Program Administrator, Onsite Wastewater and Compliance for the Louisiana Department of Health

LSU AgCenter Research · Extension · Teaching

Sea Grant LOUISIANA

LOUISIANA DEPARTMENT OF HEALTH

Visit our website: www.LSUAgCenter.com

P3986-A (online) 7/25