Texas On-Site Insights
Information about On-Site Wastewater Treatment Systems in Texas
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40 Gregg County Families to Recieve New On-Site Systems through SEP Programs

Thanks to the combined efforts of a state environmental agency, a county health department, and an East Texas non-profit organization, many families in Gregg County are getting their on-site wastewater treatment systems replaced free of charge.

Background Information

The story begins this way.

In 1999, Koch Industries was charged with being responsible for more than 100 oil spills in Texas and neighboring states. As a result, they paid a settlement of roughly $35 million, nearly half of which went to Texas. The fines paid to Texas were administered through the Texas Natural Resource Conservation Commission (TNRCC). In this case, Koch decided to participate in a TNRCC Supplemental Environmental Project (SEP). By taking part in the SEP program, a portion of the fines can be directed to solving environmental problems in the areas where the actions leading to the fines took place.

Koch funds were sent to Gregg County, which includes Longview, and Wilson County near San Antonio. Early in the process, Gregg County judge Mickey Smith and other county leaders prioritized which environmental problems they would like to see addressed if SEP funds became available. The County and Pineywoods RC&D identified replacing failing on-site wastewater systems as something they would like to see done, in part because many families may not be able to pay for the upgrade on their own.

Workers install this constructed wetland at this home in Gregg County as part of the SEP Program.

Once it was announced the county would receive $250,000 of SEP monies, the Commissioners then began working with the Gregg County Environmental Health Department (GCHD) to estimate how many systems needed to be replaced, to identify where these systems were located, to gauge the number of systems which could be fixed, and to establish criteria for eligibility. According to Jerry Pierce of GCHD, the availability of SEP funds gave the county a unique opportunity to address an environmental and quality of life need and to assist those who really deserve a helping hand.

Still, the final piece of the puzzle still had to be filled in. A group still had to come forward to administer these funds, process the applications, and get the process moving. In many cases, a Resource Conservation and Development, Inc. (RC&D) council– a local non-profit agency, which is affiliated with the United States Department of Agriculture – helps manage and distribute SEP funds. In this case, however, local agencies in the area (the Sabine–Neches RC&D and the Northeast Texas RC&D) didn't have the staff to take charge of this big a program. That's when another local program – the Pineywoods RC&D in Nacogdoches – stepped in and offered assistance. Pineywoods has a long history of spurring the development and use of innovative on-site wastewater treatment systems in the area, especially constructed wetlands but other technologies as well.

Administering the Program

One of the first steps was to publicize the program, using both newspaper ads and television public service announcements. Once applicants applied, GCHD staff worked to determine if they were eligible. To participate, families must own the home and land they live on, earn less than 80% of the median household income, and not owe the County money for other items.

After eligible families were identified, the Pineywoods RC&D, Richard Stolle of the Sabine—Neches RC&D, and GCHD cooperated to find local professionals in the on-site wastewater treatment field who would design and install systems in this program. Eventually, three system designers and three qualified installers decided to participate.

A unique part of this program is that each family decided which technology it wanted to implement for its circumstance. Pineywoods RC&D Coordinator Kenneth Awtrey urged participants to consider constructed wetlands systems on the basis of their perceived low cost, minimal maintenance needs, and high levels of performance. However, when conditions permit, homeowners are encouraged to use conventional systems. Most of the systems installed in this program are constructed wetlands, though some homeowners opted for aerobic units and conventional septic tanks and drainfields.

Originally, the goal was to provide roughly 40 families, as well as an elementary school, with new on-site wastewater systems. So far, four new systems have been installed for single-family homes in the area.

Lessons Learned

In general, everyone seems to agree that this program has been an outstanding success. At the state level, SEP has proven to be a winning strategy to assist counties or localities in taking a small step to replace failed septic systems or to solve other environmental problems. For the county, this effort was an opportunity to give a few families a properly functioning on-site treatment system and to lessen a potential source of pollution. For Pineywoods RC&D, the chance to help a nearby region utilize SEP funds was an extension of their mission to help protect local environments and foster economic development.

"Projects like this are the reason RC&Ds exist," Awtrey said. "If one of our partnering RC&Ds does not have the staff to manage a program like this, we are more than happy to step in and help as much as we can."

NOTES: The TNRCC SEP program can be contacted on the World Wide Web at http://www.tnrcc.state.tx.us/legal/sep/index.html or (512) 239-6120. The phone number for the GCHD is (903) 237-2621. Pineywoods RC&D can be contacted at (936) 568-0414.

Workshop Prompts Discussion of Graywater Rules for On-Site systems

Recently, a workshop funded by the Texas On-Site Wastewater Treatment Research Council (TOWTRC) brought together regulators and professionals from the on-site wastewater and plumbing industries to identify technical and regulatory issues associated with graywater reuse.

The workshop convened August 25, 2000 in Austin. It was facilitated by W. Bruce Ray of PSI Net, Inc. Workshop participants included 19 people representing the Texas Natural Resource Conservation Commission (TNRCC), the Texas State Board of Plumbing Examiners (TSBPE), and other stakeholder groups. Warren Samuelson was the lead spokesperson for the TNRCC, while Bob Maxwell was the main representative for TSBPE. During the meeting, technical and regulatory issues associated with graywater reuse in on-site wastewater treatment systems were identified. Participants also spoke about whether additional regulations may be necessary.

Samuelson says the workshop was very productive. "If we can come up with a strategy for overcoming the obstacles which currently limit graywater reuse, and if we can aid in the development of new regulations, it would greatly assist the users of on-site wastewater systems," he says. "There is a significant amount of graywater which should be available for reuse in association with on-site wastewater systems, if we can resolve the policy issues and technical questions."

Information developed for the workshop included a review of each agency's regulations and rules for graywater, including contrasting definitions of exactly what constitutes

graywater. As a result of this workshop, both agencies are now planning to meet again on a regular basis to tackle this challenging issue.

NOTE: Samuelson can be contacted at wsamuels@tnrcc.state.tx.us or (512) 239-4799. A report describing the workshop is expected to be published in the near future.

Researchers from UTEP, Texas A&M, Study How Well Wetlands Remove Viruses

UTEP student Everado Vega takes a wastewater sample from this septic tank and constructed near El paso.

A team of scientists from the University of Texas at El Paso (UTEP), Texas A&M University (TAMU), and the Universidad Autonoma de Ciudad Juarez (UACJ) have teamed up to investigate how well constructed wetlands remove viruses commonly found in domestic wastewater. The project, which will begin later this year, is important because it incorporates field studies and laboratory experiments.

The project is led by Dirk Schulze-Makuch of the UTEP Geological Sciences Department, Suresh Pillai of the TAMU Poultry Sciences Department, and Thomas Kretzschmar of the UACJ Civil and Environmental Engineering Department. Others associated with this project include Ari Michelsen, who is the director of the TAMU Research and Extension Center at El Paso, and UTEP graduate students Huade Guan and Everado Vega. The work is funded by the Southwest Center for Environmental Research and Policy, which is supported by the U.S. Environmental Protection Agency. The research is expected to begin in the Fall of 2000 and run for 18 months.

Background Information

The project originated because of concerns about the alarming rate at which people living in colonias (areas without proper drinking water or wastewater treatment) were becoming infected with viral diseases like hepatitis. In many colonias, the chance of suffering from these diseases is 300% higher than in the rest of the United States. The researchers came together because Pillai previously worked for the Texas A&M University Agricultural Research and Extension Center in El Paso, where he studied the extent to which on-site wastewater treatment systems may remove viruses. This research was funded by the Texas On-Site Wastewater Treatment Research Council. Pillai moved to TAMU in the Spring of 2000. Throughout the process, the research team has gathered input about how to develop and manage this project from federal, state, and local environmental agencies in both the United States and Mexico.

"I think constructed wetlands have the potential to be very effective in removing viruses from domestic wastewater," Schulze-Makuch says. "You can put a lot of water through these systems and they are sound ecologically. An interesting aspect of these systems is

that bacteria which grow on the roots of wetlands plants consume viruses. The viruses are a source of food for the bacteria."

According to Schulze-Makuch, the goals of this study are to test the efficiency of submerged flow wetlands to remove viruses, and to evaluate the extent to which such water quality parameters as pH, redox potential, temperature, and salinity may enhance virus removal. Another research objective is to learn more about geological, chemical, and physical parameters that may influence the survival and transport of viruses.

How the Research Will Be Conducted

This project will include both laboratory and field experiments.

The laboratory studies will take place on the UTEP campus. The intent of the lab studies is to mimic natural conditions in area aquifers. This will allow the research team to study hydrogeologic and geochemical parameters which may affect virus survival in groundwater systems.

The research team wants to explore the relative ability of clay soils and other media to influence virus removal. Schulze-Makuch suspects that clay soils may enhance how well these systems treat viruses. "Many of the virus particles and other contaminants are expected to sorb onto clay soils providing a chance for better treatment," he says. "Clay surfaces are typically negatively charged while viruses are often positively charged, thus providing an opportunity to lessen virus populations."

The field studies will be carried out at the TAMU Agricultural Research and Extension Center a few miles east of El Paso. The site is equipped with a home which uses a septic tank which then flows into a submerged constructed wetland. The constructed wetland is lined with pea gravel.

In this field research, three types of bacteriophages (viruses similar to hepatitis which are not harmful to humans) are flushed through a toilet into a septic tank. They then flow into a constructed wetland system cell at the site which is designed for on-site wastewater treatment. Schulze-Makuch will regularly take water quality samples at different parts of the system, including in the septic tank as well as where effluents enter and exit the wetlands.

"By doing this, we're hoping to learn more about how constructed wetlands remove viruses and which components of the system may be most effective at treatment," Schulze-Makuch says.

Another emphasis of the research is to explore how managing pH levels may also remove viruses. For example, Schulze-Makuch says that viruses exhibit a charge, depending on the pH values of the surrounding liquid medium (referred to as the isoelectric point). Varying pH levels are associated with a virus' positive or negative charge. The

researchers want to learn what pH levels are most suitable to remove the largest number of viruses.

Summary

One of the anticipated outcomes of this project, Schulze-Makuch says, is to develop recommendations that can be used to better manage constructed wetlands. "We want to be able to provide advice as to whether adding clay materials or carbonates to soils used for constructed wetlands or if regulating pH levels may provide for greater virus removal," he says. "We believe that constructed wetlands can be a feasible, low-cost way to limit the spread of viruses and to possibly limit the outbreak of diseases like hepatitis in the region."

NOTE: For details, contact Schulze-Makuch at (915) 747-5168 or dirksm@geo.utep.edu, or Pillai at spillai@poultry.tamu.edu or (979) 845-2994.

Council Funds Project to Study Caliche, Effluent Disposal Rates

At its September 2000 meeting, the Texas On-Site Wastewater Treatment Research Council awarded three projects.

The Council voted to contract with Larry Wilding, a researcher in the Texas A&M University Soil and Crop Sciences Department, to study issues associated with the suitability of caliche soil as a filter medium for the treatment and disposal of wastewater.

The Council also approved a contract with Clifford Fedler, a civil engineer with Texas Tech University in Lubbock, to investigate surface application rates for effluents in various regions of Texas.

Navigant Consulting, Inc., of Austin was chosen for a contract to study the magnitude of, and reasons for, chronically malfunctioning on-site wastewater treatment systems throughout Texas.

More details on these projects will be presented in future issues of the newsletter. For more information about the Council or its programs, contact Warren Samuelson of the Texas Natural Resource Conservation Commission at (512) 239-4799 or wsamuels@tnrcc.state.tx.us.

EPA Begins "Decentralized" E-mail List Server

The United States Environmental Protection Agency (EPA) has established a new e-mail list server to facilitate discussion of onsite and decentralized wastewater management issues. The purpose of the list server, titled "Decentralized," is to encourage communication and information exchange among stakeholders regarding the management of on-site and decentralized wastewater systems and technologies. The system can be used to post notices of upcoming conferences, special events, new

publications, and success stories. It can also be used to ask and respond to questions about various on-site wastewater issues.

For more details on this server and how you can subscribe, contact Lisa Knerr of Tetra Tech at Knerrli@tetratech-ffx.com, or send an e-mail request to decentralized@epamail.epa.com.

Council-Funded Projects Maps County-level Sites with Shallow Groundwater

A project funded by the Texas On-Site Wastewater Treatment Council (TOWTRC) is now underway to develop computerized maps displaying zones of potential shallow groundwater in a few Texas counties. The project is led by John Jacob, a soil scientist with the Texas Agricultural Extension Service (TAEX) and the Texas Sea Grant Program, Ricardo Lopez, a graduate student with the Environmental Institute of Houston (EIH) at the University of Houston—Clear Lake, and Jay Bell of the Soil, Water, and Climate Department at the University of Minnesota. The research began in May 2000.

The purpose of this research is to develop a predictive model of where shallow groundwater occurs in the landscape. In the project, the team will rely on models that use topographic information to predict runoff, as well as data from the U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) to develop a geographic information system to map shallow groundwater that may be unsuitable for septic tanks and drainfields.

Jacob explains that water-logged soils are one of the main causes of septic system failure in Texas. Currently, people performing site evaluations examine the soils to determine if seasonally shallow groundwater table exists at the site. The problem is that many soils are wet for lengthy periods but may show no signs of seasonally high groundwater tables. As a result, many people making site assessments have a difficult time sorting out some of the nuances of soil colors and patterns like mottling.

The only sure sign of wetness in a soil is to observe the groundwater, Jacob says. "If you dig a hole during the wet season, there is a good chance you may find seasonally high groundwater. But if you perform that same test during the summer there may be no indication that seasonally high groundwater tables are an issue."

The crux of the problem is that the site evaluator has to make an educated guess or an inference about the presence of the shallow groundwater," Jacob says. "In this research, we hope to provide more information about water movement in the landscape. We want to help people make better estimates about where seasonally high groundwater may exist, before they have to dig a hole to look at soil colors."

As a first step, soils which indicate the presence of seasonally high groundwater tables are being located on existing maps. As a follow-up, digital elevation models will be used to double-check whether selected sites which may appear to have suitable soils may have

potential problems associated with runoff and drainage. "We know that low-lying sites or areas at the bottom of hills will likely be areas where a lot of water may accumulate, and this may lead to potential difficulties with shallow groundwater. We want to apply computerized methods to assess if these sites may too have vulnerability to seasonally high groundwater tables."

At the same time, the team is now going into the field to compare real world conditions with existing information from the NRCS maps. Jacob has been taking global positioning systems (GPS) to rural areas, and, using extremely accurate satellite positioning, pinpointing the precise location of specific sites. The GPS provides a reality check, or verification, that the information on the NRCS maps can be found and is accurate.

Once the project is completed, Jacob hopes to develop soil maps on CDs, which can be used with user friendly GIS software. The hope is that local regulatory agencies can use these products to make decisions about which soils are unsuitable for septic tanks and drainfields, based on shallow groundwater tables.

NOTE: For details, contact Jacob at jjacob@tamu.edu or (281) 291-9252. Lopez can be reached at EIH at (281) 283-3949.

HGAC Report Describes Septic Problems in Houston Area

The Houston Galveston Area Council (HGAC) has produced a report which contains detailed information about many of the neighborhoods in its service area which may have inadequate on-site wastewater treatment. The report, On-Site Sewage Target Communities, was developed by Scott Bean, who manages on-site wastewater programs for HGAC. It summarizes much of the information generated through a Section 319 project funded by the U.S. Department of Agriculture. Cooperators on this project were Bruce Lesikar of the Texas Agricultural Extension Service and John Blount of the Harris County Engineer's Office.

In the report, detailed information about on-site wastewater systems is presented about each of 26 areas in the greater Houston area. Photos showing the boundaries of each neighborhood are presented along with data on lot sizes, housing density, and property values. Most importantly, HGAC and other participating agencies developed recommendations for which type of system or technology may be best suited to replaced failing septic systems in each instance. Wherever possible, potential funding sources were also identified.

For more details on this report, contact Scott Bean of HGAC at (713) 627-3200 or bean@hgac.cog.tx.us. A summary of the report is on the World Wide Web at http://www.hgac.cog.tx.us/intro/introwater.html

Meetings and Conferences

The Texas Engineering Extension Service (TEEX) offers a variety of opportunities for training associated with on-site wastewater treatment systems. The Installer I course will be taught December 20 in Houston and February 7 in San Antonio. The Installer II class will be offered December 12 in Bryan, January 23 in Abilene, and February 27 in Tyler. The site evaluator class will be taught November 30 in Tyler and February 22 in Bryan. The designated representative class will be taught November 28 in Mesquite and January 16 in Austin. Operation and Maintenance of Surface Irrigation Systems with Aerobic Treatment will be offered January 1 in Abilene and January 11 in Bryan.

The TEEX World Wide Web site offers extensive information on each of these classes, including the cost, the number of CE units that will be provided, a description of each course, prerequisites that may be needed, the intended audience, and major topics that will be covered.

For details, call TEEX at (979) 458-6775 or (800) 824-7303. The TEEX World Wide Web (WWW) site can be accessed at http://teexweb.tamu.edu.

<P**The Texas On-Site Wastewater Association (TOWA) regularly sponsors continuing education programs.** Upcoming training sessions are scheduled for November 13 and December 5 in San Antonio. For more detailed information, contact TOWA at (512) 494-1125 or visit them on the WWW at http://www.txowa.org.

The WWW site of the Texas Natural Resource Conservation Commission (TNRCC) contains an extensive list of resources describing opportunities for training and continuing education (CE). The WWW site lists approved providers for education relating to on-site sewerage facilities (OSSF), including educational institutions, governmental entities, and private companies. Dates and places classes are offered, and course codes and the number of CE units available for participants are listed. The WWW site address is http://www.tnrcc.state.tx.us/enforcement/csd/ics/ossf_ceu.html.

The National Small Flows Clearinghouse (NSFC) is a tremendous resource for all kinds of information regarding on-site wastewater treatment and disposal. Free products available from NSFC include magazines, newsletters, and fact sheets. In addition, NSFC has published many special reports on specific topics relating to this field. For more details, visit them at http://www.nsfc.wvu.edu, or call (800) 624-8301.

The National On-Site Wastewater Recycling Association (NOWRA) sponsored its Annual Conference and Exposition November 1-4 2000 in Grand Rapids, MI. The conference featured sessions on systems management, new technology, government and regulatory issues, biosolids, soils and soil processes, and business management. For more information about this conference or to inquire about purchasing the proceedings, visit the NOWRA WWW site at http://www.nowra.org or call (800) 966-2942.

Pineywoods RC&D Publishes Wetlands Manuals

Four manuals which describe the use of constructed wetlands for on-site wastewater treatment have recently been published by Pineywoods RC&D. The manuals are intended to help the public anticipate what a wetland project might entail.

Volume 1 discusses issues related to single family wetlands or rock filters. It covers the basic steps in design, permitting, and installation of constructed wetlands systems. Volume 2 relates to larger on-site systems that might be used for small rural schools, clusters of homes, or trailer parks. Model plans, costs, and performance standards are included in this manual. Volume 3 relates to large, municipal systems with flows over 5,000 gallons per day that must discharge into public waterways. This manual emphasizes the operations and maintenance needs of wetlands of this size. Volume 4 discusses how to prepare all three of the above systems for planting and notes the most useful plants for optimum treatment for each type of wetland. It includes color photographs to help identify plant species, planting requirements, the ideal water depth and soil media for many types of plants, and even suggestions of plants to avoid.

For more information or to purchase these reports, contact Pineywoods RC&D at (936) 568-0414 or e-mail Ken Awtrey at Ken.Awtrey@tx.usda.gov.

Williamson County District Begins Program to Automatically Monitor System Performance

The Williamson County and Cities Health District (WCCHD) is one of the first authorized agents in Texas which has begun to require electronic monitoring of a variety of on-site wastewater technologies which generate secondary treated effluent for surface application. The monitoring requirements cover aerobic treatment units, sand filters, and other methods which ultimately dispose of treated effluents via surface irrigation. The goal of the program is to rapidly detect instances when systems are not functioning properly and to alert homeowners as well as monitoring and maintenance companies so that these situations can be remedied.

Paulo Pinto of the Williamson County and Cities and Health District overseas the installation of many non-standard onsite wastewater treatment systems like this one.

Background Information

To deal with environmental health concerns, WCCHD worked to develop a strategy to that allows new on-site wastewater treatment units to be installed and used as long as wastewater is properly disinfected and secondary treatment is being produced. But, when on-site wastewater treatment systems stop producing disinfected effluents, or treated

wastewater which does not meet secondary treatment standards, the system automatically shuts off. These technologies automatically disconnect on-site wastewater treatment systems if a pump or a compressor fails or if disinfection is not being provided. In effect, they prevent these units from being able to apply effluents for irrigation.

The WCCHD requirement for automatic monitoring took effect in June 2000. The idea was first proposed when the County began the process of writing new rules in 1998. Shortly after the initial idea was developed, the County worked with the state agency which oversees on-site systems, the Texas Natural Resource Conservation Commission (TNRCC), as well as with local regulators and industry representatives to see that an acceptable program could be developed. Since being implemented, a handful of systems have been installed which meet the new requirements for automated electronic monitoring.

How the System Works

To monitor the performance of on-site wastewater systems, WCCHD is using a number of different technologies. To ensure that effluents are disinfected, two methods are being considered. In one system, an electronic monitoring device regularly weighs the content of tubes where chlorine tablets are inserted. When the weight of tube becomes less than two chlorine tablets (which suggests that disinfected wastewater is no longer being applied), the pump automatically shuts off, preventing any effluent from being irrigated. Another method to detect if effluents are being chlorinated uses an "electronic eye" to sense if any light is being emitted from the tube. The idea is that the presence of chlorine tablets in the tube should block light from leaking out.

Systems which monitor if secondary treatment is being achieved typically take automatic readings of the air pressure being generated by a pump or compressor. If a pump or compressor fails, the pressure drops markedly or stops, thus preventing the unit from producing secondary quality effluent. When this occurs, the monitoring system is activated.

All these monitors are equipped with buzzers and lights, signaling the homeowner that a problem exists. When a problem is detected, the system automatically dials one of a number of local companies, which monitor on-site wastewater treatment systems, and informs them that there is a potential problem. It is then up to the monitoring company to contact the operation and maintenance firm the homeowner has contracted with to fix the problem.

According to Pinto, adding these monitoring units to on-site wastewater systems is relatively inexpensive. Typically, the cost of purchasing the hardware and software for the monitoring system is less than $200. In addition, homeowners have to enter a contract with a company which keeps track of system failures reporting by the monitoring devices.

A homeowner's failure to simply add a chlorine tablet or to ensure their system is producing secondary effluent will likely be costly and unpleasant. For example, when the monitoring system is triggered it will often result in a visit by a maintenance company, which may cost more than $40. If the family chooses to ignore the problem, the technologies are designed to prevent the system from irrigating effluents, potentially allowing for wastewater to back up.

"For many years, we've been discussing ways to make sure that chlorine is regularly being applied," says Paulo Pinto, who manages the on-site wastewater program for the Williamson County Health Department. "We know that people don't like to put chlorine in the tube. It's a nasty job. But we also know that failing to add chlorine will mean that effluents which have not been disinfected will be applied to the environment. This tool will help us make sure that new systems produce and apply only disinfected effluents."

Results of this Program

Pinto says the program has the promise to improve management of on-site systems. Similar efforts have been started by other regional agencies, including the Lower Colorado River Authority, the Brazos River Authority, and the Bastrop County Health Department. "Although installers and salesman of aerobic units and other technologies that produce secondary treated effluent have not been overly enthused about the program, they are agreeable to complying with it," Pinto says.

"With this program in place, we can assure people that new aerobic systems will not have the capability to produce and apply poor quality effluent," Pinto says. "That's good for the environment and public health of the county, it's good for the homeowner, and it's good for the aerobic industry too. I would like to see this safeguard extended to cover the whole state."

NOTE: For details, contact Paulo Pinto at ppinto@wilco.org or (512) 930-4390.

Newsletter Goes Bilingual

This is the first issue in which Texas On-Site Insights will feature Spanish and English versions of all articles. A grant from the Texas On-Site Wastewater Treatment Research Council supports this effort. The Spanish translation is being done by American International Translators of Austin. The Spanish proofreading is being done by John Jacob of the Texas Agricultural Extension Service. We hope you enjoy this effort. We will continue with Spanish translators in future issues.

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John Jacob is working to map area with shallow groundwater in Montgomery County.

The purpose of this research is to develop a predictive model of where shallow groundwater occurs in the landscape. In the project, the team will rely on models that use topographic information to predict runoff, as well as data from the U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) to develop a geographic information system to map shallow groundwater that may be unsuitable for septic tanks and drainfields.

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