Texas On-Site Insights
Information about On-Site Wastewater Treatment Systems in Texas
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Local, State, Agencies Respond to Damages to On-Site Systems from Tropical Storm Frances

When Frances, a violent tropical storm, battered Galveston Island and much of the Texas coast last fall, it created some staggering problems for local homeowners who utilize on-site wastewater treatment and disposal systems. It also prompted a team of local and state officials to step in and assess the situation and advise homeowners as to what, if anything, they could do to rebuild or repair damaged systems.

Background Information

Frances packed winds of up to 65 miles per hour when it attacked the coast from September 10th through the 13th, 1998. It dumped more than a foot of water onto the region, flooded major freeways, and worsened beach erosion. Damages to individual residences have been estimated at more than $95 million.

For homeowners using on-site systems, the storm brought some unique headaches. Many of the picturesque resort homes built on stilts collapsed and tumbled into bay waters. In many cases, soils covering drainfields were washed away, leaving these systems exposed and unable to function. In other cases, the storm eroded away land used for drainfields, leaving homeowners with systems which could no longer meet regulatory codes. The storm also worsened problems for coastal homeowners who already had small lots, since it eroded and further reduced the amount of land available for drainfields. In some cases, homeowners in this circumstance ound they did not have enough land remaining for a properly functioning drainfield.

As a result of the erosion, some beachfront homeowners found that their structures, which may have been legally sited before Frances, were now on official beach easements and may have to be moved or removed. For example, when coastal lands were washed away, the natural line of vegetation (which is used to set easements) moved landward.

State regulations prohibit structures and on-site wastewater systems within the beach easement. If beachfront homes were located too close to the shore after erosion damage from the storm, they could be required to move their on-site system away from the beach so that it would not be in the beach easement.

"The problem was not so much high winds as is the case with many tropical storms and hurricanes," says Jack Denman of the Texas General Land Office (GLO). "In this case, the storm sat in the Gulf of Mexico a few days, created a lot of waves, and caused significant amounts of beach erosion."

Some of the areas that were hardest hit include Bermuda Beach, which is on Galveston Island, and Surfside, located in Brazoria County. In Surfside, as many as 50 homes suffered damage to on-site systems and many of these still cannot meet regulatory code requirements. On the Bolivar Peninsula, a few homes and on-site systems were crippled but they didn't suffer as much beach and dune erosion.

Although many on-site systems were severely damaged, it is unknown if fecal coliform levels in the waters of Galveston Bay increased following Frances. However, many public beaches were closed in the days following the storm, due to debris which washed ashore - not necessarily because of fears that sewage from damaged on-site systems would flow onto these sites and present a public health threat.

Regulatory Agencies Respond

A team of people responded, including Jack Denman and Jamie Mitchell of the Coastal Division of the GLO; Donna Phillips and Larry Dodd of the Houston regional office of the Texas Natural Resource Conservation Commission (TNRCC); Martin Entringer of the Galveston County Health Department; Donald Mudd and Robbie Drake of the Brazoria County Health Department; and Kelly Hamby of the City of Surfside Beach. "We were there every day for about two months," Denman says. "We spent a lot of time visiting sites which had been damaged and talking with local health department officials and homeowners to determine how we could help them."

The first major task facing this team was damage assessment. Roughly 200 field inspections were performed based on initial reporting. Following that, the emphasis was on examining individual systems which may have been damaged. Staff members of the Galveston and Brazoria county health departments identified which systems were not safe and should be condemned and "red tagged" them. In order to avoid condemnation, a homeowner had to show that their system was OK; that there was enough sand or fill left for drainfields to function properly; and that repairs were made in accordance with local and state regulations. In some cases, though, homeowners were told that their system could not be safely repaired or replaced or would be unable to meet state standards, even if it were rehabilitated. In those cases, homeowners had to mull over the prospect of abandoning homes or looking for prospective buyers.

"Most of the damage that we observed," Denman says, "was to vacation cabins and other homes which were occupied only during part of the year. Fortunately, we didn't see as much damage to permanent year-round homes. Only a few people, relatively speaking, were left with primary residences without functioning on-site systems."

Following the storm, the GLO issued emergency guidelines about how damaged on-site systems on beachfront property should be repaired. Many meetings were held where staff from GLO, local health departments, and TNRCC personnel developed strategies about which types of repairs should be allowed. Artificially filling a drainfield with sand was not allowed because it was likely to wash away again during the next big storm. Instead, suitable fill materials had to be imported. The TNRCC printed guidelines describing agency rules about the siting of on-site systems in regulatory floodplains.

Another challenge facing regulatory agencies was to decide whether requests from individual homeowners to repair damaged systems should be approved. For example, some people asked if they could use holding tanks as a temporary solution. These requests were largely not approved, because it was thought these systems may not adequately protect public safety.

Other GLO On-Site Wastewater Efforts

Denman explains that this was just one instance of GLO's involvement with on-site systems along the coast. GLO staff provide comments on beachfront construction and dune protection permits, which often include plans for on-site systems which have been approved by local health departments. GLO personnel also make field visits, as time and resources allow. The amount of activity GLO performs in reviewing construction permits that may include an on-site wastewater systems is sizeable, Denman says. For example, in 1998 the agency reviewed and commented on plans for roughly 200 systems for Galveston County. Many plans were also submitted for other Texas coastal counties.

NOTE: The GLO World Wide Web site, http://www. glo.state.tx.us, contains the full text of emergency measures which were developed for on-site systems after Frances. For more information, contact Denman at (512) 936-2314 or JDenman@wpgate.glo.state.tx.us, Phillips at (713) 767-3650 or dphilli@tnrcc.state.tx.us, or Entringer at (409) 938-2309 or mentringer@gchd.co.galveston.tx. us.

TOWTRC Annual Conference Will Meet in Waco February 15-17, 1999

The Texas On-site Wastewater Treatment Research Council will hold its 7th Annual Conference February 15-17, 1999 in Waco, TX. The meeting site is the Waco Convention Center.

Exhibits for the Conference open and registration begins on the afternoon of February 15. Technical sessions begin on February 16 and run through the 17th. The Conference will end at noon on Wednesday, February 17. Some of the topics that will be discussed at the Conference include a comparative study of the costs of constructing on-site systems under the old and new Texas rules, the development of on-site training facilities, and the

process the Texas Natural Resource Conservation Commission (TNRCC) goes through when reviewing on-site regulations. Other sessions will discuss such issues as pump selection and maintenance, permitting requirements, field evaluation of low pressure dosing systems and aerobic systems, and managing systems with effluent filters. A round table format will be used to let experts and Conference attendees learn more about special problems facing designated representatives and installers.

Continuing Education credits will be offered to those who participate. To obtain more details about featuring an exhibit at the Conference, contact Paula Callaway of the TNRCC at (512) 239-6323. For more information about registering for the Conference or for hotel information, contact Diane Stallings of the TNRCC at (512) 239-6333.

New Feature of TNRCC WWW Site Helps Users Find People Qualified to do OSSF Work

The World Wide Web site of the Texas Natural Resource Conservation Commission (TNRCC) now lets users instantly locate people working in the on-site wastewater industry in Texas.

The home page, located at http://www.tnrcc.state.tx.us/enforcement/csd/ics/ossf_search.shtml, lets people search for individuals holding a current and valid TNRCC permit to work as an Installer, Installer II, Site Evaluator, or Designated Representative. You can also search by the person's name, by the geographic region they work in, or by ZIP code. Search results include the person's name and address as well as the license number and when that license was issued.

"This search tool should be helpful for those wanting more information about people involved in the on-site profession in their area," says Warren Samuelson of the TNRCC On-Site Wastewater (OSSF) Program. "You can use this site to determine if a specific individual actually holds a valid permit to do on-site wastewater work, or you can use it to get an idea of which people in your region are qualified to install basic or advanced systems or evaluate soils."

The home page also contains links to general information about on-site sewage facility (OSSF) certification as well as eligible courses which provide continuing education (CE) opportunities. For example, users of this site can view a list of certified CE providers, the courses they teach, some of the dates and times at which training is offered, and a way to contact these organizations. In addition, the site provides a link to the official TNRCC rules.

For more information about the TNRCC OSSF program, contact Warren Samuelson at 512/ 239-4799 or wsamuels@tnrcc .state.tx.us. The content for this database was programmed by Irene Ritter of the TNRCC OSSF section. She can be contacted at (512) 239-0914.

Brazos River Authority Uses "Bright" Idea to Search for Failing On-Site Wastewater Systems

When Tom Conry and the water quality staff at the Brazos River Authority (BRA) wanted to find a way to determine if failing on-site wastewater systems could be polluting their lakes, they came up with a really "bright" idea. Why not look for specific phosphorus-based elements which are included in many laundry products - commonly called brighteners - and see which parts of lakes and streams they show up in most often. The theory is simple: brighteners have to originate from man-made sources, especially in rural sites. In most cases, they will likely be discharged through an on-site wastewater system.

As a result of this innovative thinking, Conry, Robert Fuentes, and other colleagues have embarked on a unique journey to determine if searching for brighteners may complement other screening tools used by environmental health professionals to identify where on-site wastewater systems may be failing and need remedial actions.

Background Information

Making sure that on-site wastewater systems work well is a major part of the job of the BRA. For example, roughly 9,000 onsite systems are located within a half-mile of Lake Granbury. At the same time, fecal bacteria levels in the main body of the lake have been as high as 400 colony forming units (cfu) per 100 milliliters, while concentrations in coves and inlets have been as high as 1,000 cfu. Both levels far exceed state standards.

"We found ourselves asking the question - what is a unique, man-made, pollutant that we can quantify? We wanted something we could use in the field and see results right away," Conry says. "At first, we looked at caffeine and prescription drugs, but they were too complicated. Ultimately we settled on brighteners. Brighteners are a good solution for us because they fluoresce at a particular wavelength (400 to 500 nanometers). We can specify that we want to seek only brighteners and not other forms of phosphorus. The goal is to find areas where there are higher than expected nutrient levels as well as many non-point source pollutants. This type of survey tells us if brighteners are present and, if so, at which concentrations."

"We feel this type of study makes sense, especially in isolated areas which are served by on-site wastewater systems," Conry adds. "The rationale is like this - if we find brighteners, they have to be originating from a human source. Most likely, they're being

discharged through an on-site wastewater system because there are no centralized wastewater facilities nearby, and it's unlikely they would run off into streams and creeks."

To detect brighteners, the Brazos River Authority utilizes an instrument called a Turner AU-10 field fluorometer. The device detects the degree to which brighteners fluoresce in river and stream waters by measuring the amount of light which is emitted from the brighteners.

The entire system costs roughly $16,000. In addition, there is the expense of taking two people to waters that need to be sampled as well as laboratory analyses to verify the results.

In the BRA studies, the fluorometer is mounted to an inner tube. A BRA staff member typically wades into a river or stream with the device, and readings are shown on a computerized display which is part of the unit. At the same time, conventional water samples are taken to verify the results obtained with the fluorometer.

"When we first began using the device in 1996, we found it was a little cumbersome and we were not entirely comfortable with the brightener data, since there was no available calibration standard. We knew that we had to go out in the field more and experiment to see what works best. Since then, based on our practical training, we have developed some field guidelines for quality control which let us use the device most effectively." Conry says that BRA has learned that it's best to use the fluorometer early in the morning because brighteners decay under bright sunlight. They also discovered that the tests should be conducted during normal or low flows - not when there are flood flows and runoff. Otherwise, staff members may not be able to carry out testing without risking personal safety or equipment losses.

Field Studies

According to Conry, BRA uses this technique as a screening tool to provide a big picture of the amount of non-point source pollution that may be present in a given area. In many of the studies, BRA personnel first establish background levels of brighteners in the main body of a lake or stream. Then, they gather information on brightener concentrations in stream segments which are closest to on-site discharges and compare the two numbers.

So far, BRA has used the system to screen for potential problems with on-site wastewater systems near Lake Granbury, in the Upper North Bosque River watershed, in Lake Pat Cleburne, on coves and inlets of Lake Whitney, and in creeks that run through the small town of Salado. BRA first experimented with fluorometry studies (for chlorophyll and brighteners) at Lake Granbury in 1996.

In the Salado studies, which are on-going, Conry and his staff have met with community leaders who suspect that several on-site systems in the area may be malfunctioning. "This screening has been useful in helping us determine which individual homes may be having potential problems. After we find trouble spots, we then go to the homeowner and try to

work with them to repair or replace their system." Through the use of this system, BRA was able to locate five specific sites in a four-block area where it is likely that on-site wastewater systems are failing.

At the same time, researchers and graduate students at Baylor University are using fluorometry as one method to determine how on-site wastewater systems may be degrading water quality in Salado. Researcher Joe Yelderman and student Melanie Humphrey of the Geology Department are testing waters in the region for non-point source pollutants using automated samplers, bubble flow meters, a hydrolab and fluorometers. In addition to taking grab samples, they are also trying to estimate how nonpoint pollutants vary throughout the day. Similar to the BRA results, the Baylor studies suggest fluorometers may be useful as a screening tool to pinpoint where on-site systems may be failing.

Summary

"I feel this is a good tool to get a rough idea of water quality problems which might be present and whether on-site systems are failing. I would recommend it be considered as part of a lake manager's toolbox," Conry says. "It's a good way to focus on man-made pollutants, it's inexpensive, and it yields rapid results. The key is that it should be used as a screening tool - it won't tell you for sure if a specific on-site system is failing."

Since this is a new technology, Conry says the BRA is largely on its own in assessing whether this screening tool makes sense to complement other methods to search for failing on-site systems. "The local office of the Texas Natural Resource Conservation Commission and the local health departments have been supportive and open minded about this, but they don't want to incorporate it into their programs yet. It's still up to us to show that it works and how it can be used to help prevent lake pollution from on-site systems."

NOTE: For details, contact Conry at (254) 776-1441 or tomco@brazos.org. Yelderman can be reached at (254) 755-2361 or Joe_Yelderman@Baylor.Edu.

City of Austin WWW Site Includes Description of Research Projects, Detailed Fact Sheets About Many On-Site Systems

The City of Austin Water and Wastewater Utility has created a WWW site which describes their efforts to determine how the City can help manage on-site wastewater systems in the region. Materials on this WWW site were developed by Susan Parten, a consulting engineer with Community Environmental Services, Inc., of Austin.

The WWW site, http://www.ci.austin.tx.us/wri/altern.htm, contains the Executive Summary of the project as well as frequently asked questions about on-site systems. A color map of the region depicts 15 representative land types and provides guidance about the most suitable on-site and alternative wastewater systems for each of these areas in the region. The site describes three monitoring sites now being investigated by the Utility - a subsurface flow wetland and trickling filter located at the Govalle Wastewater Treatment

Plant; a subsurface flow wetland which is followed by sand-lined low pressure dosed trenches at a private residence; and a buried intermittent sand filter which then flows to low pressure dosed trenches and a separate greywater system at a private residence.

The WWW site also includes fact sheets on many on-site treatment and disposal systems. For example, fact sheets have been prepared which discuss such treatment and/or pretreatment methods as septic tanks, sending blackwater to a holding tank, composting toilet or an incinerating toilet, treating greywater in septic tanks, and the use of intermittent and recirculating sand filters. Other treatment and pretreatment methods which are discussed in the fact sheets include constructed wetlands, biological filters, peat filters, sequencing batch reactors, mounds, and denitrification systems. Fact sheets have been created for many on-site disposal systems (conventional absorption beds and trenches, evapotranspiration beds, pressure dosing fields, leaching chambers, drip irrigation, and spray irrigation).

The fact sheets have been prepared in a "consumer reports" style, and include a matrix that describes treatment and disposal options for each of the 15 land types. The fact sheets are comprehensive and include a description of the technology, modifications which are commonly made, the status of the technology, situations in which these methods can be applied, limitations, whether the materials needed to develop or obtain this technology are readily available, and system performance. The fact sheets contain details on residuals which are generated, system reliability, operation and maintenance needs, potential environmental impacts, overall costs, and whether these methods are approved by local and state regulatory agencies.

A paper about this project was given by Crespin "Cris" Guzman at the 1998 National On-Site Wastewater Recycling Association Conference. Guzman heads this effort for the City of Austin. For more information about Austin's on-site wastewater program, contact Guzman at (512) 322-2894 or crespin.guzman@ci.austin.tx.us. To learn more about the WWW site, contact Parten at (512) 443-2733 or SueParten@aol.com.

Baylor WWW Site Presents Overview of Program to Test, Certify, Performance of On-Site Wastewater Treatment Technologies

The Baylor University Department of Environmental Studies has created a World Wide Web (WWW) site for its Individual On-Site Waste Water Treatment System Testing & Certification Program. The WWW site address is http://www.baylor.edu/~Envir_Studies/Wastewater.html.

Baylor's on-site wastewater program is led by Dudley Burton of the Environmental Studies Department (ESD). David Jumper of the ESD is the Inspection and Compliance Manager.

The site describes Baylor's Individual On-Site Waste Water Treatment System Testing and Certification Program, which tests and certifies individual on-site wastewater treatment systems. A useful feature of this site is that it allows users to e-mail detailed correspondence about the program to Baylor.

Baylor's program covers such wide-ranging issues as pretesting, testing, initial and continued certification, issuing a "mark of certification," and support of enforcement issues. The Baylor program provides "third-party" testing and certification for aerobic wastewater treatment units. It has been fully accredited by the American National Standards Institute (ANSI). For manufacturers of on-site systems, Baylor provides a formal testing protocol (carried out over a six- month period according to National Sanitation Foundation standards), as well as a process to assess certification qualifications. Meeting these qualifications can result in product certification and listing of the product.

To evaluate Baylor's program, ANSI assembled an accreditation assessment team consisting of regulators, engineers, and sanitarians from many states. Following an assessment and site visit by the assessment team, Baylor was officially accredited in June 1996. At that time, Baylor was only the third entity in the United States to be accredited for third-party certification of on-site aerobic systems.

For more information about Baylor's program or the WWW site, contact Burton at (254) 710-3405 or Dudley_Burton@baylor.edu.

Pineywoods RC&D Brochure Describes, Illustrates, Use of Constructed Wetlands for On-Site Systems

A new, color, brochure that discusses many wetlands plants which are suitable for use in on-site wastewater systems has been produced by Pineywoods Resource Conservation and Development, Inc. (RC&D) in Nacogdoches, the U.S. Department of Agriculture's East Texas Plant Materials Center, the Arthur Temple College of Forestry at Stephen F. Austin State University, and the Forest Resources Institute. Project leaders included Ken Awtrey of Pineywoods and Melvin Adams of the Plant Materials Center.

The brochure, "Constructed Wetlands for On-Site Septic Treatment: A Guide to Selecting Aquatic Plants for Low Maintenance Micro-Wetlands," explains how micro-wetlands work, how to select plants for these systems, proper methods to install wetlands plants, and system maintenance. The brochure includes color photos and descriptions of eight hard-stemmed plants (blue flag iris, yellow flag iris, dwarf palm, dwarf papyrus, graceful cattail, horsetail, soft rush, thalia) and eight soft-stemmed plants (arrow arrum, elephant ear, canna lily, dwarf canna lily, pickerel rush, duck potato, sweet flag, and woolgrass).

The brochure is available on the WWW as an Adobe Acrobat file at http://Plant-Materials.nrcs.usda.gov:90/pmc/ETPMC/etbrconwet.html. Single printed copies are available by contacting Pineywoods RC&D while supplies last. Additional copies are $1

each or $60 for 100 copies. To order or for more detailed information, contact Awtrey at Pineywoods RC&D at (409) 568-0414 or kawtrey@tx.nrcs.usda.gov.

Fort Worth-Area Subdivision Designed with On-Site Wastewater Treatment Systems in Mind

What should developers consider when creating and building subdivisions with large numbers of on-site wastewater systems? According to Danny Ray Moss, a subdivision developer who represents homebuilding interests on the Texas On-Site Wastewater Treatment Research Council, professionals need to spend a lot of time and energy planning all aspects of development, including on-site wastewater systems, before even the first unit is built.

"I find a lot of people want to move from the city to the country and the suburbs and this usually means that on-site systems will be the way to go to treat wastewater," Moss says. "If you know you're going to use on-site systems, you should really explore many related issues such as soils, lot sizes, platting, and the type of technology you need to make sure the subdivision is a success."

Over the past three years, Moss has been developing Willow Springs West in Haslett, a small town 15 miles northwest of Fort Worth. This subdivision consists of 61 units, which range in size from 1.5 to 4.5 acres. Each house uses an on-site wastewater system and a well. This is specified in the deed restrictions. The first homes were built in April 1996. So far 11 homes have been built.

"One of the first things we had to consider was whether and how fast Fort Worth is growing in our direction," Moss says. "If Fort Worth were to rapidly expand and annex this area, they could require a centralized sewer and eliminate the need for on-site systems. We had to determine if on-site systems were going to be only temporary units in this case or if they were a permanent solution." So far, it looks like the subdivision will not be required to adopt a sewer system, making on-site systems a necessity.

Planning and Designing the Subdivision

Once it was decided that on-site systems would be needed, Moss then set about the process of planning and plotting the layout of the subdivision, with special attention to the needs of on-site systems.

"One of our guiding principles was that we wanted to make sure that this subdivision was platted and individual lots were laid out correctly the first time, so that we could avoid having to go back to local regulators and resize separate units later," Moss says. "It's very expensive and time-consuming to have to re-plat lots to meet homeowners needs."

Early in the process, Moss hired a consultant to lay out the entire subdivision using computer-assisted design, including drinking water wells, on-site systems, streets, easements, and drainage. The goal was to optimize the process, creating as many attractive lots as possible within the subdivision's boundary.

"We tried to incorporate a few philosophies into the planning process," Moss explains. "First, we wanted to create different lot sizes which would reflect the needs and desires of our customers while still meeting regulatory requirements for on-site systems. Then, we wanted to place the on-site systems and drinking water wells on each lot in strategic areas which would lessen contamination risks." Throughout the subdivision, Moss tried to site drinking water wells near the driveways in the front of the properties while setting aside back yards as the area for spray irrigation of treated wastewater. Ultimately, Moss decided that lot sizes should be big enough to meet state and county rules for on-site systems but small enough to be reasonably priced.

Choosing the Right On-Site Treatment Technology

After Moss decided on the appropriate lot sizes and layout, the next chore was to assess the site and determine which type of on-site wastewater treatment system was needed. Most of the subdivision is sited on type IV soils, and feature caliche, black clays, fractured limestone, and table rock only 6 inches to 1 foot beneath the surface. In addition, most of the site is characterized by seasonally high groundwater tables, which can be as little as 6 inches to 3 feet deep.

"Because of the poor soils throughout the region, most people here choose an aerobic system if a standard septic tank and drainfield won't work," he says. Moss settled on an aerobic system that utilizes a large one-part, concrete tank, as the system of choice for the subdivision. This system consists of a 500-gallon tank for pretreatment, a 1,000-gallon compartment treatment tank, and a 750-gallon pump tank. The system is typically 8' wide by 14' long and is 6' deep and it weighs roughly 16,000 pounds. The tank is set by the manufacturer (who in this case comes out of Waco) and a large, semi-tractor truck equipped with winches is needed to place the unit into the ground. The system costs roughly $4,400, which is competitive with other aerobic systems now installed in the region. A required operations and maintenance contract costs $300 over two years.

Moss chose this technology because of concerns about possible shifting of clay soils and the impact of their movement on system performance. "This system is big enough that it's stable and won't float out of the hole. It's anchored in the soil, even during wet weather because of its weight. This lets it stay level in the ground, and helps wastewater flow evenly throughout the process," Moss says.

After treatment, wastewaters are spray irrigated, mainly into back yards. Irrigation cycles are automatically activated by a computer-controlled electrical panel which regulates when pumps will be turned on and activates them. The system provides what Moss calls a "self-diagnosis" for homeowners, in that it provides obvious warnings in case things go awry. "In the event of a malfunction, lights flash and alarms sound. The system can also guide the homeowner as to when chlorine is needed or other maintenance is required," Moss says.

To make sure things run smoothly in the future, water quality and performance will be tested quarterly. Measurements will be taken for total suspended solids in the treatment tank and pH in the pump tank as well as chlorine residual in the pump tank. Results will be reported to homeowners as well as regulators.

Summary

In the future, Moss anticipates that more subdivisions which rely exclusively on on-site systems will likely be developed. "In so many cases, people in this industry try to meet the needs of one customer at a time and this will obviously continue to occur," Moss says. "But, I also think there's a real opportunity, and some advantages, to building pre-planned communities in which on-site systems are the wastewater treatment method of choice."

For details, contact Moss at (817) 439-3032.