Texas On-Site Insights
Information about On-Site Wastewater Treatment Systems in Texas
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TNRCC Combines OSSF Program, Compliance Support Division

The Texas Natural Resource Conservation Commission (TNRCC) has consolidated its On-Site Sewage Facility (OSSF) Program responsibilities into the Occupational Certification Section (OCS) of the Compliance Support Division. The consolidation, which took effect July 1, is part of a continuing effort to improve its administration of the OSSF Program, according to Warren Samuelson who heads the OCS. "This change will promote better coordination, implementation, and agency oversight of the OSSF program throughout the State," Samuelson says.

The reassignment of the OSSF program involved the transfer of Ken Graber and James McCaine from the Field Operations Division to the Occupational Certification Section. The OCS program will include the certification and enforcement programs.

Oversight of the new training requirements established by the recent adoption of the new OSSF rules is a major component of the program. New Installer I and Installer II classes are now being provided by the Texas Engineering Extension Service, with the new Site Evaluator and Designated Representative classes being scheduled in the near future. Response to the first nine Installer I classes has been tremendous. More than 340 individuals have taken the exams in the nine classes. The pass rate is approximately 80%. The two Installer II classes held to date have had 92 individuals in the classes.

"We feel the new installer classes have been very successful," said Doretta Conrad, Manager of the OCS. "Our review of the applications submitted in the classes has indicated that between 25% and 30% of the individuals who have passed the Installer I exams may have been unlicensed installers. The intent of the training requirements is to raise the level of on-site proficiency in the state and to encourage unlicensed installers to take the classes and become licensed."

TNRCC's certification enforcement program has increased its level of activity over the last two years. Since September 1995, program staff have reviewed 174 complaints against licensed and unlicensed OSSF installers. Of these, 54 complaints have been resolved, resulting in the issuance of 12 TNRCC Enforcement Orders, the revocation of four installer licenses, and the assessment of administrative penalties ranging from $500 to $10,080. A total of 91 Notices of Violation have been sent.

"TNRCC staff and TNRCC Authorized Agents are to be applauded for their efforts in resolving homeowner complaints and enforcing OSSF regulations," Samuelson says.

For more information regarding the OSSF program, contact Warren Samuelson at (512) 239-4799 or wsamuels@tnrcc.state.tx.us.

NOWRA to Meet in College Station October 22-25

The National Onsite Wastewater Recycling Association (NOWRA) will hold its 6th Annual Conference and Exhibits on October 22-25 in College Station.

The conference theme is "Performance: Form, Function, and Final Results." It will include 21 educational sessions presented by leaders from university research, regulatory agencies, and the private sector. Topics for some of these sessions include the role of the National Sanitation Foundation in developing standards for products used in the on-site wastewater industry, research on system performance, training others how to monitor and sample on-site wastewater systems, aerobic and anaerobic treatment, the use of performance-based standards, homeowner management of constructed wetlands, and many other issues. Many Texas speakers are on the program and will discuss issues of concern to this region.

A tour of the Texas On-Site Wastewater Treatment Training Center on the Texas A & M University-Riverside campus will be offered where conference attendees will be introduced to the hands-on training opportunities. The site features demonstrations of septic tanks, aerobic units, sand filters, trickling filters, constructed wetlands, and many other technologies. The meeting features exhibits, hands-on exhibits of soils, and computer demonstrations.

To learn more about the meeting, contact NOWRA at (800) 966-2942 or fax them at (847) 559-9235. A brochure about this meeting is posted on the Council's World Wide Web (WWW) site at http://towtrc.tamu.edu. The NOWRA WWW site is located at http://www.tuns.ca:80/~mooersjd/nowra.htm.

NOTE: TWRI has published a brochure with extensive information about this meeting. To obtain a copy, contact TWRI at (409) 845-1851 or twri@tamu.edu. TWRI also hopes to demonstrate the World Wide Web site it developed for the Council at the meeting.

TEEX Offers Installer I and Installer II Classes Throughout Texas

The Texas Engineering Extension Service (TEEX) Water and Wastewater Training Program is offering many training classes for on-site wastewater professionals at sites throughout Texas.

Here's a brief rundown of their upcoming schedule.

The Installer I class will be taught September 4-5 in Houston, September 23-24 in Bryan, October 1-2 in Nederland, October 14-15 in Mesquite, November 5-6 in Houston,

November 24-25 in San Antonio, December 2-3 in Houston, and December 9-10 in Longview.

The Installer II class is being offered September 9-11 in Bryan, September 16-18 in Tyler, September 22-24 in Waco, October 7-9 in San Antonio, October 14-16 in Amarillo, October 28-30 in Bryan, November 11-13 in Mesquite, November 18-20 in Bryan, December 2-4 in Corpus Christi, December 9-11 in Bryan, and December 16-18 in Houston.

TEEX notes that pre-registration for these courses is required. To register or for more information, contact TEEX at (409) 862-8710 or visit the TEEX World Wide Web site at http://www.tamu.edu/teex.

Council Issues RFP to Compare System Costs Under Old, New, Rules

The Texas On-Site Wastewater Treatment Research Council has issued a Request for Proposals (RFP) to perform a study to advise the Council on potential cost differences associated with the design and installation of on-site sewage facility (OSSF) systems. The study will evaluate potential differences in the cost of OSSF systems designed and installed under the previous regulations in comparison to the current regulations, which were passed earlier in 1997. The study should advise the Council about any relationship between cost differences and the quality of treatment provided by OSSF systems.

The Council anticipates having an amount to fund this study which will not exceed $10,000. It is estimated that the time frame for completion of the study will be four months. The study is expected to begin by November 1, 1997, and continue through February 28, 1998. Individuals wishing to respond to this proposal must submit 14 copies of a proposal work plan. This plan should describe the potential contractor's approach to the project and must be submitted no later than 5 p.m. on September 11, 1997. Proposal work plans will not be accepted by fax. The selection will be based upon demonstrated competence, knowledge, qualifications, and the reasonableness of the proposed fee for service. The selection criteria is contained in the Council's RFP.

In order to have a proposal work plan considered, applications must be prepared and submitted in accordance with printed guidelines which are available from the Texas Natural Resource Conservation Commission (TNRCC) as part of Application Packet No. 98OSSF.01. Prospective qualified applicants who would like to receive this packet should write Warren Samuelson at the TNRCC, Occupational Certification Section, MC-178, P.O. Box 13087, Austin, TX 78711-3087. The RFP packet may also be requested by fax (512) 239-0533) or e-mail at wsamuels@tnrcc.state.tx.us.

Council Issues Call for Papers for `98 Conference

The Texas On-Site Wastewater Treatment Research Council has announced a call for papers for its 1998 annual conference. The conference will be May 20-22 in Corpus Christi. The meeting, titled "Texas With a Tropical Twist," is the Council's 6th annual conference.

Abstracts are being solicited from many areas relating to on-site wastewater treatment and disposal. Some of the topics that will be featured at the conference include innovative (non-standard) systems, conventional systems (septic tanks and drainfields), technical issues, public outreach and education, soils, site evaluations, local programs, success stories, system failures, issues facing installers, enforcement, research projects, health effects and risk assessment, and project economics, pricing, and financing.

The conference is expected to attract 450-500 professionals. All conference participants will be eligible to receive Continuing Education Credits. There are opportunities to present individual papers and to participate in panels.

Individuals from many fields relating to on-site wastewater treatment and disposal including regulators, inspectors, professional engineers, registered sanitarians, installers, manufacturers' representatives, and university researchers are invited to submit abstracts.

One copy of the abstract information must be mailed to Warren Samuelson, Texas Natural Resource Conservation Commission (TNRCC), MC-178, P. O. Box 13087, Austin, Texas 78711-3087, or be sent by fax to (512) 239-6390. If you send your abstract by fax, do not mail a hard copy. Abstracts must be received by October 1, 1997. Abstracts must be typed or copied and fit on one page. Supplemental materials will not be accepted. The size of lettering can be no smaller than 11 points. The abstract must include the presentation title, author(s), the title, the company or agency the author represents, the address, telephone number, and fax number.

Presenters must agree to submit a disk (Word Perfect) and hard copy manuscript to the TNRCC by March 1, 1998. The manuscript will be published in the conference proceedings, which will be available at the conference. Manuscripts must be limited to 15 pages, including figures and tables. Presenters whose abstracts are accepted will be asked to give 20-minute presentations at the conference, followed by a 10-minute discussion period. Speakers whose abstracts are accepted will be responsible for paying all their costs, including registration and travel. For details, contact Samuelson at (512) 239-4799 or wsamuels@tnrcc.state.tx.us.

Innovative Systems Being Implemented in Harris County

A pair of one-of-a-kind systems in Harris County provides a glimpse of the innovation and efficiency that can be achieved in on-site wastewater. John Blount manages the on-site wastewater program for the Harris County Engineering Office and serves on the Texas On-Site Wastewater Treatment Research Council. His office serves Houston and outlying areas. "As the county grows and the most suitable sites for on-site systems are taken, it may take a little more thought and creativity to make on-site wastewater treatment successful. The great thing is that individuals have designed and managed systems that are very effective and efficient, in response to these challenges."

Treating Fast Food Wastes

John Blount stands on the deck of a public restroom at Old Town Spring. The restroom uses an on-site wastewater system.

At a new Jack in the Box restaurant in northeast Harris County, an on-site wastewater system has been installed that stores wastes in grease traps and septic tanks. The system was designed by Frank Mouawad.

The volume of waste generated by the restaurant is generally 600 to 1,000 gallons per day (gpd). Another complication is that flows from the restaurant contain extremely high levels of biochemical oxygen demands (BOD), that are often five times greater than those typically generated by individual residences.

To reduce water and waste flows, the restaurant has installed a number of extremely efficient plumbing fixtures, including 0.5-gallon air-flush toilets, sinks with sensors that only release water when a person places a hand beneath the faucet, and waterless urinals. Effluents first flow to three 1,500-gpd aerobic units and are then sent to a high pressure sand filter. Treated wastewaters are disposed of in a large drip-irrigated landscape that includes grasses and shrubs. The system has been operating since early 1997 and wastewaters are sampled monthly. Blount says the results have been outstanding.

"A positive result of this type of system is that it lets fast food restaurants expand into areas that are not serviced by centralized sewer systems," Blount says. "For many years, Jack in the Box and other chains would not even consider sites that had to be served by on-site wastewater treatment. Developing on-site systems for these facilities actually improves the climate for development in outlying areas because it makes it more feasible that other business will be able to locate here." Blount notes that Burger King and McDonald's have also recently developed on-site systems that incorporate spray irrigation for wastewater disposal.

An Aesthetically Pleasing System for `Old Town Spring'

Virtually everyone who visits Old Town Spring, in the extreme northern part of Harris County, comes to take a step back in time and to have a great experience. This village features many antique stores and specialty shops and a variety of restaurants. The

atmosphere is pleasant and easygoing. Until recently, one vitally needed feature the village lacked was a public restroom. Because centralized sewers don't extend to Old Town Spring, an on-site system was the appropriate choice. Mouawad also designed this system.

The on-site wastewater system that was designed for the village consists of several septic tanks followed by an aerobic system. Effluents are disinfected and flow to a high pressure sand filter. This wastewater is recycled to flush toilets. This effluent is colored with a blue-green tint so people will know it is wastewater -- not potable water. Waterless urinals and other high efficiency plumbing units are used here, too, including ultra low-flow 0.5-gallon toilets. Effluents are distributed to a small 5,000-square foot drainfield that provides landscaping around the building that houses the public restrooms and a small, nearby museum. The system is designed so that a gallon of wastewater is recycled and reused five times before it is sent to the disposal field. Mouawad also designed this system.

"This system is a real blessing for this area, because more than 1,000 people come to visit and shop here on a typical weekend. Obviously, they needed a public restroom, because so many of the shops are small and lack such facilities," Blount says. "People were so excited when this was built two years ago that community leaders hosted and participated in a `Potty Parade' to celebrate the opening of the system."

Blount says the system performs well, although there have been concerns that high levels of biosolids have built up in the septic tank. As a result, managers of the site have had to mix up the solids in the tank and pump the tank periodically.

NOTE: For details, contact Blount at (713) 956-3015.

South Texas On-Site Training Center Now Open; Provides Valuable Resource for Region

After a lot of work and effort, the South Texas On-Site Wastewater Treatment Training Center in Weslaco is now up and running. Construction of the Training Center was completed in August.

The Training Center is located at the Texas A&M University (TAMU) Agricultural Research and Extension Center in Weslaco. Individuals who played a key role in developing and planning the Center include Robert McGee of the Center and Bruce Lesikar of the TAMU Agricultural Engineering Department. John Drawe and Ralph Morgan of the Center worked with Lesikar on

much of hands-on construction and installation activities. Drawe took charge of many of the day-to-day activities associated with making the center a reality. Construction of the Center was funded in part by grants from the Texas On-Site Wastewater Treatment Research Council. In addition, many companies donated equipment, labor, and services for the Training Center.

"We've looked forward to having a Center here ever since the idea first came up a couple of years ago," McGee says. "We need something like this in the Lower Valley because roughly 40% of our rural residents still live in colonias and desperately need proper wastewater treatment. In addition, everyone projects the population in this region will continue to expand dramatically. As that occurs, it is essential to bring the latest in wastewater treatment technology to South Texas."

The foundation for the training center was actually laid a few years ago. In 1993, a constructed wetlands cell was constructed to provide wastewater treatment that can receive up to 250 gallons per day. Planted with vibrantly-growing thalia, pickerel rush, green tara, Egyptian papyrus, pseudo char and cannas, the wetland provides additional treatment and an attractive landscape.

Other wastewater treatment facilities that were installed in association with the constructed wetland include a drip irrigation system and a low-pressure dosing system Lesikar used for research.

The training center includes many on-site wastewater treatment technologies, including conventional systems, a septic tank effluent pump, aerobic systems, and sand filters. In addition, many distribution systems are featured, including leaching chambers, sprinkler and drip irrigation, low pressure dosing and gravel-less pipe. Two microbial rock filter systems are also in place that treat black- and graywater.

"We wanted to showcase a variety of systems at this site," Lesikar says, "to give interested parties in this region a chance to observe and learn about the many choices that may be most appropriate for them. In addition, we are gathering data from many of these systems so we can evaluate which systems will work best in specific situations."

The training center has already seen a lot of use. For example, a workshop was hosted this spring in which regulatory officials from throughout South Texas participated in a soil evaluation short course and also learned about the new state regulations. Lesikar, Drawe, Morgan and John Jacobs of the Texas Agricultural Extension Service taught the course. In addition, Drawe and Morgan helped teach the Texas Engineering Extension Service's Installer I and Installer II classes at the center in July.

"We believe this training center will become a real asset for the people of this region," McGee says. "We want this to become a resource people will be eager to come to often to learn about and explore on-site wastewater treatment issues and technologies."

NOTE: For details, contact McGee at (210) 968-5585 or d-mcgee@tamu.edu, Drawe at (210) 968-5585 or B-Lesikar@tamu.edu.

Additional photographs of the Center are available at http://primera.tamu.edu/slides/.

TAEX Utilizes AmeriCorps Volunteers to Help Correct Failing On-Site Systems in Lower Rio Grande Valley Colonia

Sometimes connecting sewage hookups in impoverished colonias in South Texas border requires legwork and an extra set of hands. Recently, the Texas Agricultural Extension Service (TAEX) found this kind of help by using volunteers from the AmeriCorps program.

The AmeriCorps program was established by President Bill Clinton in 1993. It provides a monthly stipend to members who join for one- or two-year stints, plus an educational voucher. In South Texas, TAEX has placed more than 46 AmeriCorps volunteers in 13 TAEX offices where they work with county Extension agents. AmeriCorps members take to the communities to help bring people together for neighborhood and natural environment improvements.

Recently, TAEX utilized AmeriCorps volunteers to help roughly 80 families in the Los Palmas colonia north of Harlingen get connected to a municipal wastewater system. Previously, residents of this colonia used septic tanks on small lots (as little as 20' x 40'), cesspools, and outhouses. There are concerns about the potential health and environmental impacts caused by failing septic tanks and drainfields and other on-site wastewater systems. As a result, many area leaders want to get colonias such as this one "on-line" and hooked up to community wastewater systems.

"Leaders from the City of Harlingen and county governments in the region wanted to connect the people to a properly functioning community wastewater system," says Ruben Saldana who coordinates AmeriCorps efforts for TAEX in South Texas. Terry Lockamy, the Cameron County Extension Agent for Agriculture, works with Saldana to supervise AmeriCorps volunteers in South Texas. "Before these residents could be connected, they had to be surveyed about how many people lived in each dwelling, the condition of each home and its wastewater system, household income, and related issues," Saldana says.

"An added benefit is that many of the AmeriCorps members are from South Texas and are bilingual, which facilitated the effort."

Much of the work performed by the AmeriCorps volunteers probably could not have been done by county staff in a timely manner because the manpower simply wasn't there. "The volunteers helped guide these people through the process and shortened the time it took to get them connected to proper wastewater service," Saldana says.

The AmeriCorps volunteers also worked with residents with failing on-site wastewater systems in the Altas Palmas colonia in Cameron County. The volunteers interviewed the residents so they could be connected to a community sewer. They worked with more than 45,000 children and taught them about recycling, waste management, how landfills work, water conservation and cholera education.

For details about how TAEX uses AmeriCorps, contact Saldana at (210) 968-5581 or rj-saldana@tamu.edu. The AmeriCorps program WWW site at http://www.AmeriCorps.org.

New WEF Reports Discuss Septage Handling, Odor Control

Two new reports from the Water Environment Federation (WEF) focus on issues related to on-site wastewater treatment and disposal.

Septage Handling (Manual of Practice Report 24) was produced by the WEF Septage Handling Task Force. The book describes the quantity of septage generated by residences, businesses and industries. Many characteristics of septage are described, including suspended solids, biochemical oxygen demands, nitrogen, phosphorus, alkalinity, oil and grease, metals, and toxic organic compounds. The book covers many administrative and management issues including regulatory requirements and the permitting of septic haulers. Other sections of the book provide an overview of septic management alternatives, co-treatment of septage and municipal wastewater, methods to discharge septage, independent septage treatment processes, and odor control. Many case studies are presented.

Control of Odors and VOC Emissions is the proceedings of a conference WEF hosted in Houston earlier this year. Broad topics covered in this proceedings include odors from sewers, how to estimate emissions, the use of biofilters to control odors, and atmospheric modeling. Many of the principles apply for on-site wastewater treatment and disposal systems.

For details, contact WEF at (800) 666-0206 or e-mail pubs@wef.org. The World Wide Web site address is http://www.wef.org

TNRCC Rule Changes Require Continuing Education

One of the rule changes approved by the Texas Natural Resource Conservation Commission (TNRCC) to Chapter 285 of the 30 Texas Administrative Code (TAC) involves the certification renewal process. The rules became effective February 4, 1997.

Beginning with the August 1998 renewal, installers I and II, designated representatives, and site evaluators will be required to complete a minimum of 8 hours of continuing education per year. The training must be completed by August 31 of each year in order to renew each of the certifications, and no credit hours will be carried forward to the next year.

"The importance of completing the continuing education training and renewing licenses by August 31 of each year cannot be overemphasized," says Doretta Conrad, Manager of TNRCC's Occupational Certification Section. "If the requirements are not met by August 31, the individual is considered operating without a license, even though the individual has an additional two years to renew."

In order to receive credit, a continuing education class must be approved by the TNRCC prior to attending class. If anyone is interested in offering continuing education classes and would like to be approved, or have questions concerning the continuing education process, please contact Bob Tinstman at TNRCC (512) 239-0178 or rtinstma@tnrcc.state.tx.us.

Small Flows Report Summarizes On-Site Wastewater in U.S.

The National Small Flows Clearinghouse (NSFC) recently published a comprehensive report about the status of on-site wastewater systems across the nation.

The report, *National Onsite Wastewater Treatment: A National Small Flows Clearinghouse Summary of Onsite Systems in the United States*, 1993, is a 414-page document containing information from local health departments and on-site agencies in 46 states.

The report provides information on various issues related to on-site technologies. Among the data provided are commonly cited problems with on-site systems, which local agencies work with onsite systems, permit and system costs, and who has responsibility for on-site system maintenance.

The NSFC, which initiated the project in 1994, compiled information from more than 1,500 local health departments and on-site agencies involved with wastewater technologies. A unique reference source for those affiliated with on-site wastewater technologies, the report costs $17.50, plus shipping and handling.

More information about programs and publications of the Small Flows Clearinghouse at http://www.nfsc.wvu.edu. This report can be ordered from NSFC at (800) 624-8301 or by e-mail at nsfc_orders@estd.wvu.edu. Orders may also be faxed to (304) 293-3161. Request item WWBKGN89 when placing the order.

City of Austin Evaluates Management Structure for On-Site Wastewater Treatment Systems

One of the complaints that is often expressed about on-site wastewater systems is that there is often no single agency that manages these systems and makes sure they are functioning properly. For example, it's difficult to ensure that enough treatment to protect public and environmental health is being provided by thousands of systems in a county. Now, the City of Austin is studying if a management system could be developed that would address such wide-ranging issues as system design, operations and maintenance, certification of management professionals, and the rates customers would be charged.

Consultant Susan Parten looks at a sinkhole that is part of a site that will be serviced by an on-site wastewater treatment system.

The studies are being performed by Susan Parten, a consultant with Community Environmental Services, Inc., of Austin. Crespin "Cris" Guzman of the City of Austin Water and Wastewater Utility is managing the project for the City.

"The goal of this project is to develop ideas about local management of on-site systems that we can give to City of Austin leaders," Guzman says. "These policies may cover such issues as how on-site wastewater systems can be managed within Austin's extraterritorial jurisdiction (ETJ), which extends 5 miles beyond the official city limits."

Among other issues, the policies will clarify who is financially responsible, which agency will regulate these systems, and how the city would handle permitting and enforcement.

"Tentatively, we are recommending a system design and approval process, in which you would still need a physical site evaluation," Guzman says. "You can use the matrices and tables Susan Parten developed previously as screening tools to identify which technologies may be appropriate for your site and how much they will cost."

"This type of policy assessment is needed if on-site wastewater systems are to be managed effectively over the long-term," Guzman says. "The policies have to cover such issues as how often septic tanks need to be pumped, and which agency will supervise sampling, testing, and fee collection."

Many management concerns that need to be addressed have been identified and are now being evaluated in this study. The project is investigating how Austin, Travis County, and other counties in the region will address reinspections and repermitting in the ETJ.

Another subject being discussed is a determination of which types of systems in specific settings may require long-term maintenance and who will be responsible for ongoing operations and maintenance. Guzman and Parten are developing qualifications and criteria that maintenance professionals will have to meet before they can be certified by the city. A thorny issue that has to be resolved is how can a city compare the reliability and quality of wastewater treatment and collection provided by on-site systems and sewers, and can the levels of service be considered equal or comparable.

"Typically, the perception is that on-site wastewater treatment and disposal systems are inferior to centralized wastewater systems, and that the treatment on-site systems provide is much more variable between individual customers," Guzman says. "We want to determine if a management system could be developed so that on-site systems could continue to be widely used and still provide excellent treatment and disposal in the area."

Some local governments in the region already conduct local management programs. For example, the City of Westlake Hills supervises such activities as permitting and repermitting, initial inspection and reinspections, adherence to pumping schedules, designating alternate disposal areas, and requiring 1-acre minimum lot sizes. "From talking to neighboring communities that regulate on-site systems, we've found that a very friendly relationship can exist between the regulating agencies, homeowners, and other affected parties," Guzman says. "We're responding to concerns that people in the region have expressed to us. Our goal is make people satisfied with the wastewater service they receive."

"The ultimate goal is to make sure systems can effectively serve the public and effectively protect the environment for the next Century," Guzman says. "Once we go through this process, we hope the project will be a management structure that other cities can and will consider using it."

Research and Demonstration Projects

A key component of developing these management strategies involves field testing to determine how well specific systems perform in different, difficult environments.

Three demonstrations are now being conducted. The first case study involves a subsurface wetland being tested at the Govalle wastewater treatment plant in East Austin. This system is designed to treat 1,000 gallons per day -- roughly the amount of waste that would normally flow from four homes. This system uses a trickling filter for nitrogen removal. The second site is an individual residence on the west shore of Lake Austin. This site is faced with a small lot and a yard that would typically be insufficient to provide proper treatment. At this site, wastewater would first receive septic tank pretreatment and then flow to a buried sand filter. Effluents would then be distributed to a drainfield with low-pressure dosing. The third site being tested is an upland hilly site that features a deep ravine with a flowing natural spring that emanates from one slope. Here, effluents will be pretreated and receive more treatment from a subsurface wetland.

Effluents will be applied to a drainfield through a low-pressure dosing system that includes sand-lined trenches.

"The goal of the case studies is to gather data on how these non-standard systems perform in difficult environments," Parten says. "We're carrying out these studies to troubleshoot potential problems. Of course, if these systems work well, we want to showcase them to others who may want to use them and who can benefit from them."

Other research of interest to the City is being conducted by Jerome Perales, a University of Texas at Austin Civil Engineering Department student who interned with Guzman this summer. Perales is working under the direction of UT Civil Engineering Department researcher Joseph Malina. Perales is conducting experiments with a subsurface drip irrigation system. Computer and physical studies are being carried out to determine the amount of wastewater that can be treated by this system before it would fail and drip emitters associated with it would clog. Perales hopes this system may be useful in areas where conventional systems may not work, including sites with high groundwater tables and shallow soils.

NOTE: For details, contact Guzman at (512) 322-2894 or crespin.guzman@ci.austin.tx.us or Parten at (512) 443-2733 or SueParten@aol.com.