Texas On-Site Insights
Information about On-Site Wastewater Treatment Systems in Texas
Volume 10, Number 3, January 2002

Texas Legislature Passes HB 2912; Governs Permitting of Multiple OSSFs, Charge-Back Fees

By Warren Samuelson Texas Natural Resource Conservation Commission (TNRCC), On-Site Sewage Facilities (OSSF) Program

During the 77th Legislative session, the Legislature included language in House Bill (HB) 2912 regarding the permitting of multiple wastewater systems as on-site sewage facilities (OSSF).

Under current rules in 30 Texas Administrative Code (TAC) Chapter 285, the total combined flow from all systems on one tract of land is limited to not more than 5,000 gpd. In some instances, there are tracts of land that contain several systems which have a combined flow that exceeds 5,000 gpd, but are used infrequently. The owners of these tracts of land may be able to obtain an OSSF permit instead of being required to obtain a municipal wastewater treatment permit provided certain requirements are met.

Under the provisions included in Section 366.0512 in Chapter 366 of the Texas Health and Safety Code, a multiple system of treatment devices and disposal facilities may be permitted as an OSSF system if the following conditions are met:

1. The system is located on a tract of land of at least 100 acres in size;
2. The system produces not more than 5,000 gpd on an annual average basis;
3. The system is used only on a seasonal or intermittent basis; and
4. The system is used only for disposal of sewage produced on the tract of land on which any part of the system is located.

Owners of camps and parks with large tracts of land have expressed concerns about having to obtain a municipal wastewater treatment permit, which is a lengthy and costly process, for a system that may exceed the needs of the camp or park facility. This provision will provide environmental protection and a common-sense remedy for owners of large tracts of land with multiple OSSF systems.

The statute became effective September 1, 2001, and rules are currently being developed by the TNRCC to address all parts of this statute. These rules are proposed to be published for comments in February of 2002.

The Legislature also included language in HB 2912 clarifying the charge-back fee process in Section 366.059(b) of Chapter 366 of the Texas Health and Safety Code.

The statute provides the TNRCC with the authority to assess local governments a charge-back fee, if the local governmental entity repeals its order, ordinance, or resolution that established the entity as an authorized agent (AA). It also provides the TNRCC with the authority to charge a local governmental entity a charge-back fee, if its delegation as an AA is revoked by the commission. The statute mandates that the charge-back fee be reasonable and appropriate and not exceed $500 for each permit issued within that entity's area of jurisdiction. Finally, the TNRCC is not allowed to assess a charge-back fee to local governmental entities that have repealed their order, ordinance, or resolution or to local governmental entities that have lost delegation as an authorized agent due to a material change in the commission's rules under this chapter.

This statute also became effective September 1, 2001, and rules are currently being developed. These rules are proposed to be published for comments in late December of 2001.

Note: For more information, contact Warren Samuelson of the TNRCC OSSF Section at (512) 239-4799 or wsamuels@tnrcc.state.tx.us.

TOWTRC 2002 Conference Set for March in Waco

The 2002 Conference of the Texas On-Site Wastewater Treatment Research Council will meet March 5–6, 2002, in Waco. The exhibitors will set up on March 4.

More details will be forthcoming soon, but if you potentially want to exhibit or just attend, you may want to make your plans now.

To learn more about the Conference, contact Warren Samuelson of the Texas Natural Resource Conservation Commission at (512) 239-4799 or wsamuels@tnrcc.state.tx.us.

Florida Develops CD to Provide Interactive Training for Septic Systems

An updated Onsite Sewage Treatment & Disposal System Interactive Training CD–ROM is now available from the Volusia County Health Department in DeLand, Florida.

The CD contains basic information on effluent characteristics, public health issues, and the development of on-site wastewater treatment over time. It also includes examples and guidelines about the design and construction of several components of on-site treatment systems, including tanks, distribution boxes, trenches, and disposal options such as irrigation. Other topics covered by the CD include how to conduct inspections, and how to diagonose and maintain systems that may be failing. The CD also features a test through which individuals can assess how well they know these topics.

For more info or to order, call Chuck Luther at (386) 822-6241, or Dawn Hewitt at (386) 736-5583 or dawn_hewitt@doh.state.fl.us.

The TNRCC Adopts New Rules for Licensing of OSSF Professionals, Regulators

By Warren Samuelson, Texas Natural Resource Conservation Commission (TNRCC), On-Site Sewage Facilities (OSSF) Program

The Texas Natural Resource Conservation Commission (TNRCC) adopted new licensing rules for adoption on November 20, 2001. These rules implement requirements in House Bill (HB) 3111 and HB 2912 (both of which were passed by the 77th Legislature in 2001), as well as Sunset Commission recommendations for occupational licenses and registrations.

The TNRCC administers 10 occupational licensing programs that originated in several agencies, under statutory authority in the Texas Water Code (TWC), the Texas Health and Safety Code (THSC), and the Texas Plumbing License Law. As a result, requirements for applications, fees, renewals, continuing education, revocation, and suspension have varied over time.

During the Sunset review of the TNRCC in 2000, the Sunset Commission made several recommendations concerning the agency's occupational licensing programs, including the following:

- Establishing requirements for standard time frames for licensees who are delinquent in the renewal of licenses;
- Requiring continuing education for all licensees;
- Providing timely examination results and analyses to persons taking examinations;
- Establishing procedures for licensing applicants who hold a license in another state;
- Staggering the renewal of licenses;
- Using the full range of penalties, and
- Revising restrictive rules to allow advertising and competitive bidding practices that are not deceptive or misleading.

HB 3111 created new Chapter 37 of the TWC to address Sunset Commission recommendations and to consolidate the administrative requirements for the 10 licensing and registration programs administered by the TNRCC. The TNRCC is required to implement this consolidation by December 2001. The new rules implement the requirements in this Legislation and establish uniform procedures for issuing and renewing licenses, setting terms and fees, enforcing licensing requirements, and approving training for all individuals required to be licensed or registered by the TNRCC before engaging in an activity, occupation, or profession described in Sections 26.0301,

26.3573, 26.452, 26.456, 34.007, or 37.003 of the TWC. They also affect Sections 341.033, 341.034, 341.102, 361.027, 366.014, or 366.071 of the THSC.

These rules also implement HB 2912, Articles 7 and 18.04, which requires the TNRCC to adopt rules for the licensing of water treatment specialists, and which establishes renewal requirements, fees, and sanctions for this new program. Further, the rules implement HB 2912, Article 8, which amends Chapter 34 of the TWC, and Chapter 366 of the THSC, which establishes new requirements for irrigators and on-site sewage facility (OSSF) installers. Finally, the rules also reinstate the site evaluator licensing for the OSSF program.

As a result of the Legislation, licensing requirements that existed in Section 30 of the Texas Administrative Code (TAC), Chapters 285, 290, 325, 330, 334, and 344, have been moved to new Section 30 of the TAC, Chapter 30, titled Occupational Licenses and Registrations.

This new chapter consolidates the administrative requirements for several categories of individuals that work with OSSF systems, including installers, apprentices, designated representatives, and site evaluators. Others covered by the new Chapter 30 include backflow prevention assembly testers, customer service inspectors, landscape irrigators and installers, leaking petroleum storage tank (LPST) corrective action project managers and specialists, and municipal solid waste facility supervisors. The new rules also affect water treatment specialists, underground storage tank (UST) contractors and on-site supervisors, wastewater operators and operations companies, and public water system operators and operations companies.

The rules also establish uniform procedures for issuing and renewing licenses and registrations, setting terms and fees, initiating enforcement activities, and training approval. The adopted rules allow the agency to contract for certain functions of occupational licensing, if necessary. Further, the new rules also establish rules for renewal requirements and fees. For the first time, they establish guidelines for sanctions for customer service inspectors, and backflow prevention assembly testers.

In addition, the TNRCC has determined that the standard licensing fee for all programs will be $35 per year. Previously, the fee for OSSF licenses had been $75 per year.

Finally, 30 TAC Chapters 285, 290, 325, 330, 334, and 344 have been either been revised or repealed due to the changes made in Chapter 30.

The rules are scheduled to become effective on January 1, 2002.

These rules will change licensing and renewal procedures for nearly everyone who holds a license issued by TNRCC. License holders will be advised of the proper procedures when renewal notices are sent out. It is important that licensees keep TNRCC advised of their current address. The revised rules may be viewed through the TNRCC web site at http://www.tnrcc.state.tx.us.

House Bill 3111 Brings Back Requirements for Training, Duties, of Site Evaluators

By Warren Samuelson Texas Natural Resource Conservation Commission (TNRCC), On-Site Sewage Facilities (OSSF) Program

As a result of Legislation in House Bill (HB) 3111, an individual performing a site evaluation starting September 1, 2002, will be required to either have a current site evaluator or a professional engineer's license. The licensing rules, which were adopted November 20, 2001, address the requirements for obtaining a site evaluation license.

The Texas Health and Safety Code, Section 366.071, provides the statutory authority to license site evaluators. The statute also provides that an individual licensed as a professional engineer is not required to obtain a site evaluator license to perform site evaluations.

The rules provide the following procedures for obtaining the site evaluator license. In March 2002, the TNRCC will mail an application to all individuals who have previously held a site evaluator license, and all individuals who have previously taken the site evaluator basic training course and passed the site evaluator examination, but did not hold a site evaluator license.

Individuals who previously held a site evaluator license may obtain a new site evaluator license by submitting a signed application, the application fee of $70, and documentation that the individual holds either a current Installer II, designated representative, or professional sanitarian's license, or a current certified professional soil scientist certificate. These individuals are not required to retake the site evaluator course.

Individuals who have previously taken the site evaluator basic training course and passed the site evaluator examination, but did not hold a site evaluator license, may obtain a site evaluator license by submitting a signed application, the required statements for experience, the application fee of $70, and documentation that the individual holds either a current Installer II, designated representative, or professional sanitarian license or a current certified professional soil scientist certificate. These individuals are not required to retake the site evaluator course. However, these individuals will need to show two years of experience performing OSSF work as either an Installer II, designated representative, professional sanitarian, or certified professional soil scientist.

Other individuals wanting to obtain a site evaluator license must attend the site evaluator course, pass the examination, meet the experience requirements, and submit the required application, application fee, and documentation. Applications for new applicants will be available for the next site evaluator class scheduled for February, 2002.

The bottom line is that individuals holding a current professional engineer license are not required to possess a site evaluator license to perform site evaluations. However, an individual who holds a current professional engineer license and wants to obtain the site

evaluator license may obtain it by complying with the same requirements (explained above) as other individuals.

For additional information, contact the TNRCC OSSF Program at (512) 239-0914.

National Ground Water Association Conference Will Examine Issues Associated with OSSF Treatment

The National Ground Water Association (NGWA) conference, set for March 13-15, 2002 in Denver, will focus on issues pertaining to fractured bedrock aquifers. The Conference will have a component that focuses on septic systems and other small wastewater treatment methods.

The goal of the conference is to foster communication between policy makers, land-use planners, and ground-water scientists to promote the sustainable use of ground water. This conference is a unique opportunity for researchers and planners to engage in discussion of meaningful issues related to ground water in fractured-rock settings.

The conference is co-sponsored by the National Small Flows Clearinghouse, the U.S. Environmental Protection Agency, the U.S. Geological Survey, and the National Ground Water Association.

Some of the presentations at the conference that will discuss issues associated with individual sewage disposal systems (ISDS) include the following:

- Performance and suitability in fractured-rock settings
- Innovative technologies, designs, and remediation
- Calculating evaporation and transpiration, and
- Case studies of system failures and contamination

Making Research Relevant

This conference is a challenge to the science and non-science communities to join in a dialog where we will explore answers to the following questions:

- What hydrogeologic information is needed for land-use decisions in fractured-rock settings?
- What is the current scientific understanding of ground-water processes in fractured-rock aquifers?
- How should scientific investigations progress to evaluate sustainability of ground-water resources in fractured-rock settings?

Note: For more details, contact the National Ground Water Association at (800) 551-7379, or check out the conference website: http://www.ngwa.org/education/fracrock.html

TOWTRC Funds Projects on Absorption Capacity of Drainfields; Reasons OSSFs in South Texas May Be Failing

At its November, 2001 meeting, the Texas On-Site Wastewater Treatment Research Council (TOWTRC) funded a number of projects, including the following:

- A study by researcher Lloyd Urban of the Texas Tech University Civil Engineering Department to evaluate the absorption and evapotranspiration capacity of drainfields used for on-site wastewater treatment systems (OSSFs);
- A follow-up study by Scott Pasternak of Reed, Stowe & Yanke, LLC. to determine the magnitude of, and reasons for, chronically malfunctioning OSSFs in South Texas;

In the future, we will provide detailed information about these projects in the Texas On-Site Insights newsletter.

Meetings and Conferences; Training Opportunities

The Texas Engineering Extension Service (TEEX) offers many excellent continuing education classes related to on-site wastewater treatment. The Installer I class will be taught December 11-12 in San Antonio, January 15-16 in Mesquite, February 12-13 in Victoria, and February 26-27 in Austin. The Installer II class will be offered January 29-31 in Mesquite. The Designated Representative class will be taught December 4-7 in Austin and February 5-8 in Weslaco. The OSSF Site Evaluator class will meet February 12-14 in San Antonio. To learn more, visit the TEEX web site at http://teexweb.tamu.edu, or call them at (877) 833-9638.

The WWW site of the Texas Natural Resource Conservation Commission (TNRCC) contains an 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 the number of CE units available for participants are listed. For details, call the TNRCC OSSF Section at (512) 239-0914, or visit their WWW site at 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. NSFC has published many reports on specific topics relating to this field. For details, visit them at http://www.nsfc.wvu.edu, or call (800) 624-8301.

The Texas Onsite Wastewater Association (TOWA) provides continuing education programs for installers and designated representatives. TOWA classes help people obtain continuing education credits required by the Texas Natural Resource Conservation Commission (TNRCC). The TOWA Annual Winter Conference will meet January 30-

February 1 in College Station. Their Summer Conference will convene July 18-20 in San Antonio. Both conferences will provide information on a variety of issues, including soils, high strength wastes, the design and layout of drip irrigation systems, troubleshooting and maintenance, the use of spray irrigation systems, and much more. These conferences provide continuing education credits to those who attend. To learn more, contact TOWA at (512) 494-1125 or visit them on the WWW at http://txowa.org.

The University of Minnesota at Duluth (UMD) is sponsoring a Conference titled, "Head of the Watersheds: Decentralized Wastewater Treatment." The Conference meets April 9–11, 2002 in Duluth. For details, contact Barbara McCarthy at UMD at (218) 720-4322 or bmccarth@nrri.umn.edu.

Texas Cooperative Extension offers an on-line course for CEU credit under the TNRCC on-site certification program. The 8-hour credit "Web-based Soil and Site Evaluation Basic Introduction" can be accessed at http://agextonline.tamu.edu, or call Jacque Hand at (979) 845-7692 to register. For questions on the course, call John Jacob at (281) 333-9216

UTEP Initiates "Dry Sanitation" Toilets Project on the U.S.-Mexico Border

By Jay Graham, Center for Environmental Resources Management, University of Texas at El Paso (UTEP)

As urban growth continues in the U.S.-Mexico border region, municipal governments have not been able to meet the demand for piped water and sewage services. Sewage treatment is particularly costly, so the installation of treatment systems often lags behind the need, especially in rapidly growing areas.

In Ciudad Juarez, families living in areas lacking water and sewage services receive water from tanker trucks. These families pay much more for their water than those having a piped supply, and use much less (an estimated 10 gallons per person per day for all activities). Most of the households in these areas generally use pit latrines for disposing of wastewater.

In early 1999, with support from the Paso del Norte Health Foundation, the Center for Environmental Resource Management (CERM) at the University of Texas at El Paso

launched a new project focused on dry sanitation. The purpose of the project was to provide a low-cost, zero water use, sustainable system that could be used in areas lacking sewage infrastructure. From the resident's point of view, the key determinants of a successful sanitation system are that it produces no smell or flies. This system achieves this goal, when it is maintained properly.

Approximately 300 prefabricated, dry composting toilets (manufactured by GTA, in Naucalpan, México) were installed in three semi-urban communities near Ciudad Juarez, Mexico. These units, called SIRDOs (Sistema Integral de Reciclamiento de Desechos Orgánicos) are single-vault, self-contained, fiberglass and plastic structures that stand separate from a home and usually serve a single family.

CERM staff visited several of these systems within a year of the date they were installed. The visits included gathering data on the water quality that results from the use of these treatment units. Monitoring and analyses are still ongoing, and special attention is being paid to examining the rates at which pathogens die-off, as a result of treatment.

In a related effort, CERM installed 120 double-vaulted urine-diverting toilets at the Tonantzin Women's Center (Centro de Mujeres Tonantzin). However, no follow-up research has been done on these systems.

As a result of this project, studies researching the effectiveness and safety of these systems have been initiated. CERM has also received funding to test four additional waste disposal systems that use a very simple design that enable households to can construct their own systems.

Collaborators on these projects comprise of scientists and community based organizations from both sides of the border, including: Thomas Redlinger, Verónica Corella-Barud, and Jay Graham of CERM and the University of Texas at El Paso; Raquel Avitia de Diaz of the Autonomous University of the City of Juarez (La Universidad Autónoma de Ciudad Juárez); Rafael Hernández, Herminia Rangel, and Herlinda Valadez of the Northern Youth Development Association (Desarrollo Juvenil del Norte); Teresa Almada Mireles of the Youth Promotion and Counseling Center (CASA), Sonia Torres and Patricia Monreal of Sonia Torres and Patricia Monreal of the Independent Popular Organization (Organización Popular Independiente); Petra Peña of the Tonantzin Women's Center (Centro de Mujeres Tonantzin); Jesús Odín Balanzar of the Construction and Architectural Development Association (CODEASA), and José Manuel Mascareñas of the Friends of the Margarita Miranda de Mascareñas Foundation (AMIGOS).

For more information, contact Jay Graham at (915) 747-5961 or jgraham@utep.edu, or Verónica Corella-Barud at (915) 747-8852 or vcorella@utep.edu.

Important Note: We are providing information on this system merely as an item of public interest, with the hope that this technology may stimulate thought about how innovative systems are being used in Texas. However, this system or technology is not

currently approved for use in Texas by the Texas Natural Resource Conservation Commission (TNRCC).

National Small Flows Clearinghouse Allows Users to Search On-line for Information About OSSFs

The National Small Flows Clearinghouse (NSFC) maintains six databases that provide information about all aspects of sewage treatment. Two of these data sets—the Bibliographic and Manufacturers and Consultants Databases—can now be searched online. The website is http://www.nesc.wvu.edu/nsfc/nsfc_databases.htm.

The Bibliographic Database stores thousands of articles dealing with onsite and small community wastewater collection, treatment, disposal, and related topics. The articles are collected from more than 90 journals and magazines, as well as conference proceedings, U.S. Environmental Protection Agency (EPA) documents, and research papers.

Customers can search for a particular technology and receive the latest literature on the subject. For example, a homeowner with questions about a clogged drainfield can obtain articles about successful techniques as well as methods that have failed.

The Manufacturers and Consultants Database houses a list of industry contacts for wastewater products and consulting services. This database serves both as a reference for engineers, private citizens, and small community officials and a referral database for wastewater products and trade items.

Currently, the database contains more than 1,200 entries. Customers can search for a specific type of manufacturer or consultant, and searches can be conducted based upon one or more product or service categories. For instance, a homeowner interested in purchasing a composting toilet can obtain a list of product manufacturers.

Other NSFC databases include information about:

- approximately 1,000 facilities using conventional, innovative, and alternative wastewater treatment technologies;
- regulations for onsite wastewater systems in 48 states;
- contacts and referrals (a list of organizations involved in onsite and small community wastewater infrastructure at the national, state, and local levels); and
- health departments and other local or regional agencies that serve as the local permitting and inspection authority for onsite systems in all states.

Presently, these other databases are not online. However, you may call the NSFC at the numbers below to request a search. An NSFC technical assistant will discuss the results with you to generate a list of desired contacts or other information as appropriate.

For more information, visit the NSFC Web site at http://www.nsfc.wvu.edu or call (800) 624-8301 or (304) 293-4191.

TWDB Funds Help Roma Complete Wastewater Plant; Will Take Several Colonia Residents Off of OSSFs

By Carla Daws, Public Information Officer Texas Water Development Board (TWDB)

In June 2001, the City of Roma, which is located in the Lower Rio Grande Valley, completed Phase I of the a new wastewater plant. The project was funded by the Texas Water Development Board (TWDB).

This new wastewater plant represents the end of a 10-year problem of inadequate wastewater treatment capacity for Roma. It will provide adequate wastewater treatment for approximately 10,000 colonia residents, most of whom had previously used unapproved, improperly sized, or inadequate on-site wastewater treatment systems.

In 1997, the City of Roma received approval from the TWDB for funding of $28.9 million for proposed water and wastewater improvements under the agency's Economically Distressed Areas Program. The project area includes 68 "colonias," some of which are in the City of Roma, while others are on the outskirts. These funds were awarded through the TWDB Colonias Improvement Project, and were used to design and construct 10 miles of water lines, 90 miles of sewer lines, 22 lift stations, an elevated storage tank, booster pump stations, and expansion of the City's water and wastewater treatment plants.

A unique feature of this effort is that only a small portion of the project area is served by Roma's wastewater treatment and distribution system. The collection system serves a few of the neighborhoods within the city limits that represent about 33% of the possible service connections in the area. Still, the remainder of the households have traditionally utilized substandard septic tanks and drainfields and/or cesspools for wastewater treatment and disposal. These systems are thought to potentially pose a health threat to the community, especially if they are located on inadequately sized lots or soils that are unsuitable for septic systems.

Until this new project was completed, Roma's wastewater treatment plant had been operating at or near their capacity and had been cited by the TNRCC for inadequate treatment capacity. The new wastewater plant was proposed to be expanded in two phases, with each phase providing 1 mgd of treatment capacity. On May 9, 2001, Phase 1 of Roma's Wastewater Treatment Plant was put into service.

This new "state-of-the-art" wastewater treatment plant was constructed at a cost of $3.8 million. The construction involved over 3,500 man hours of labor, 180 tons of steel, and roughly 2,900 cubic yards of concrete. The wastewater treatment plant was completed ahead of schedule and approximately $300,000 under budget.

Note: The TWDB is the state agency charged with collecting and disseminating water-related data, assisting with regional planning and preparing the State Water Plan for the development of the state's water resources and administering cost-effective financial

programs for the construction of water supply, wastewater treatment, flood control and agricultural water conservation projects. You can learn more about their involvement with on-site wastewater treatment issues at http://www.twdb.state.tx.us.

Septic Tank Manufacturing Video and Manual Available from National Small Flows Clearinghouse

A new video, "Producing Watertight Concrete Septic Tanks," and an accompanying manual, "Septic Tank Manufacturing Best Practices," are available from the National Small Flows Clearinghouse (NSFC). Developed by the National Precast Concrete Association and the National Onsite Wastewater Recycling Association, this 37-minute video and accompanying 28-page manual explain every step in producing a water-tight septic tank.

The video demonstrates the process of producing a water-tight septic tank as it describes the steps, from selecting aggregate to installation. Professionals from the precast concrete and onsite wastewater industry narrate the video, discussing the selection of raw materials and mix design; constructing forms and reinforcement; placing and curing procedures; and seals, joints, and fittings. They also cover tank installation, including site inspection and preparation. Two methods for testing these tanks are described and illustrated.

The purpose of the manual is to provide information and education about materials and techniques that could be used to manufacture and install watertight concrete septic tanks. It is not intended to be used as a regulatory code or as a minimum design standard, but rather as an aid to manufacturers, engineers, and owners.

It should be noted that the recommendations in these products are not intended to exclude any products or techniques that will achieve the goal of producing water tight, structurally sound, quality precast concrete septic tanks.

This video and the manual can serve as a resource for engineers, managers, local officials, contractors, developers, finance officers, operators, researchers, state regulatory agencies, planners, state officials, the general public, and public health officials. To order, call the NSFC at (800) 624-8301 or (304) 293-4191 or send an email to nsfc_orders@mail.nesc.wvu.edu.

Note: Funded by the U.S. Environmental Protection Agency, the NSFC helps small communities find affordable sewage treatment options to protect public health and the environment. Located at West Virginia University, the NSFC offers more than 450 free and low-cost educational products, a toll-free technical assistance hotline, five computer databases, two free publications, and an online discussion group. For more information, visit NSFC's Web site at http://www.nsfc.wvu.edu.