

Wastewater systems have evolved considerably from the early systems in the 1800's. Although the purpose has always been to collect human waste and to transport it away from urban areas in order to protect human health, early systems merely transported the wastewater to a nearby stream, where it was discharged. Today, wastewater systems are not only expected to protect public health, but to protect the environment as well. In 1972, the U.S. Congress passed landmark legislation entitled the "Clean Water Act" which ensured environmental protection as a performance benchmark for all wastewater systems. Long before the passage of this act, and every day since, the protection of public health and the environment have been the operating standard of the City of Raleigh's wastewater system.

This report provides information about the performance of the City's four (4) wastewater treatment plants (WWTP): the Neuse River WWTP, the Wrenn Road WWTP, the Smith Creek WWTP, the Little Creek WWTP and the City's wastewater collection system for the period of July 1, 2011 – June 30, 2012. This report is required by the State of North Carolina. All of the information contained in this report is accurate and complete.

To learn even more about the City's wastewater collection system or the wastewater treatment plants, please contact the City of Raleigh Public Utilities Department at (919) 996-4540 or visit the City's web site – [www.raleighnc.gov](http://www.raleighnc.gov).

J. Russell Allen  
City Manager

En Español

Éste folleto contiene información importante acerca del sistema de alcantarillado sanitario de la Ciudad de Raleigh. Si tiene preguntas acerca del sistema, llame al Departamento de Servicios Públicos al (919) 996-4540 durante las horas de trabajo.



## **WASTEWATER COLLECTION SYSTEM**

Wastewater collection in Raleigh dates from 1890, when the City built a system of sewers that carried wastewater to discharge points on the Walnut Creek and Crabtree Creek tributaries to the Neuse River. The Walnut Creek WWTP, the City's first wastewater treatment plant, was constructed in 1955. In 1976, the Neuse River WWTP was completed to replace the Walnut Creek Plant. In addition to the Neuse River WWTP, the City utilizes three other wastewater plants for wastewater treatment. Those plants include Wrenn Road WWTP, Smith Creek WWTP and Little Creek WWTP.

The City of Raleigh provides wastewater collection and treatment services for areas within the City's corporate limits and many areas in the City's Extraterritorial Jurisdictional area (ETJ). Raleigh provides wastewater collection and treatment services for the merger areas, which include Garner, Rolesville, Wake Forest, Knightdale, Wendell and Zebulon. Temporary contracts are also in place to treat specific amounts of wastewater from the Towns of Apex, Clayton, Middlesex and Johnston County.

The City's wastewater collection system functions primarily by gravity flow and it consists of approximately 2,300 miles of pipeline ranging in diameter from six inches to six feet. Every day an average of 42 million gallons per day (MGD) of wastewater for this reporting period travels through the City's sanitary sewer collection system.

The sewer pipes of the collection system are connected by a series of sewer manholes needed for maintenance of the collection system. Some manholes are flush with the pavement, some are located one foot above the ground and sometimes higher due to flood plain conditions and some are located above ground (aerial mains), particularly across streams. Ventilation is necessary at most manholes and is provided through vent holes in the lids or separate vent stacks. Although the collection system functions primarily by gravity, 114 public pump stations are necessary to keep the wastewater flowing to the wastewater treatment plants.

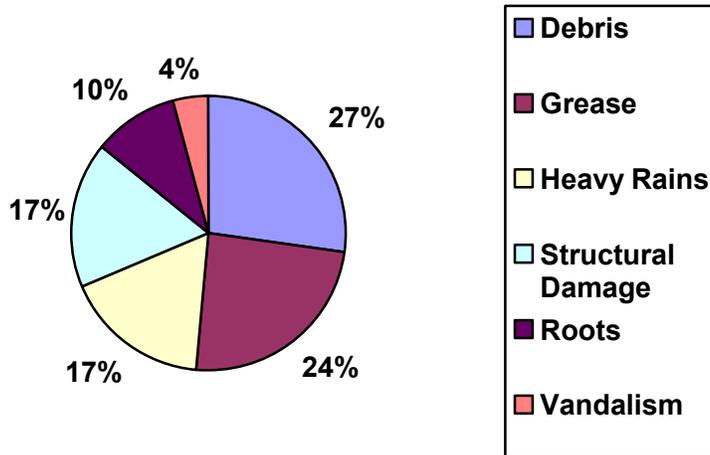
## **SANITARY SEWER OVERFLOWS (SSOs)**

Sanitary sewer overflows (SSOs) occur when problems in the system cause sewage to come out of manhole covers, service cleanouts or plumbing fixtures.

During the fiscal year from July 1, 2011 through June 30, 2012, the City of Raleigh experienced 29 SSOs that were each estimated at a volume of 1,000 gallons or greater and that reached surface waters of the State. This is approximately a **24%** decrease over the SSOs experienced from the previous fiscal year. The City continues to pursue its goal to reduce the number that occurs each year and spends millions of dollars in that effort. In order to reduce the number of SSOs, the City also needs the help of each sewer customer by using the sewer system responsibly (see Customer Responsibility section).

Debris in the collection system was again the leading cause of SSOs at 28%. Debris can be such items as rags, flushable wipes, sticks, rocks, feminine hygiene products, etc., all of which are illegal to discharge into the sanitary sewer system. Excessive grease illegally discharged into the sewer collection system was the second leading cause of SSOs at 24%. Heavy rains and structural damage followed close behind, each accounting for approximately 17% of the overflows. The City of Raleigh has an ongoing, aggressive program to educate residents and business owners regarding the need to keep grease and other inappropriate materials out of the sewer system, as well as a comprehensive preventive maintenance program. Thanks to the hard work of you, our customers, and the sewer maintenance crews, SSOs attributable to grease again is not the number one cause for the third year in a row.

Cause of SSO	Percentage of Total SSOs
Debris	27%
Grease	24%
Heavy Rains	17%
Structural Damage	17%
Roots	10%
Vandalism	4%



## SSO LOCATION AND CAUSES

### August 2011

Total: 381,855 gallons

Rothgeb Dr. (Park)

Anderson Dr.

Marlowe Rd.

Alleghany Dr. & Alamance Dr. Greenway

Sanderford Rd.

Heavy Rains

Heavy Rains

Heavy Rains

Heavy Rains

Debris

Cooper Rd.	Structural Damage
<b>September 2011</b>	
<i>Total: 1,800 gallons</i>	
Greenway beside North Hills Dr.	Roots
<b>October 2011</b>	
<i>Total: 30,240 gallons</i>	
E. Lenoir St.	Structural Damage
<b>November 2011</b>	
<i>Total: 8,640 gallons</i>	
Van Thomas Dr.	Roots
<b>December 2011</b>	
<i>Total: 4,300 gallons</i>	
Lake Boone Trail	Debris
Toscana Dr.	Debris
<b>January 2012</b>	
<i>Total: 6,600 gallons</i>	
Coltrane Ct.	Grease
Courtney Ln.	Grease
E. Fourth St. (Wendell)	Grease
<b>February 2012</b>	
<i>Total: 63,840 gallons</i>	
Hadley Dr.	Grease
Lash Ave. & Yarmouth Rd.	Structural Damage
Corporate Center Dr. Easement	Debris
Corporate Center Dr.	Debris
<b>March 2012</b>	
<i>Total: 60,380 gallons</i>	
Avent Ferry Rd.	Grease
Shallcross Way	Vandalism
Century Dr.	Structural Damage
S. Saunders St.	Debris
Mayview Rd.	Debris
<b>April 2012</b>	
<i>Total: 140,900 gallons</i>	
Thoroughbred Ln.	Grease
Oakwood Ave.	Roots
St. Albans Dr.	Grease

**May 2012**

*Total: 6,000 gallons*

S. Wingate St. (Wake Forest)

Debris

**June 2012**

*Total: 115,200gallons*

Stanhope Ave.

Structural Damage

**TREATMENT FROM START TO FINISH**

The Neuse River Wastewater Treatment Plant, Smith Creek Wastewater Treatment Plant, and the Little Creek Wastewater Treatment Plant process wastewater for approximately 177,000 metered customers and a service population of approximately 489,000.

For National Pollutant Discharge Elimination System (NPDES) permitted wastewater treatment facilities (Neuse River WWTP, Smith Creek WWTP and Little Creek WWTP), wastewater is treated both physically and biologically. The first stage of treatment is referred to as primary treatment and is a physical process to remove debris, sand, heavy organic solids and grease. The second stage of treatment is a biological process referred to as “activated sludge” in which microorganisms consume organic matter and convert ammonia-nitrogen to nitrogen gas through the process of nitrification/denitrification. In the next stage, separation of the microorganisms from the treated water by secondary clarification takes place and returned to the biological process. The clarified water is filtered by sand filters and disinfected by UV disinfection before it is metered and returned to the Neuse River.

**WASTEWATER TREATMENT FACILITIES****Neuse River Wastewater Treatment Plant**

The Neuse River WWTP was designed to serve the City of Raleigh and surrounding communities. The plant is located in Wake County, approximately 12 miles southeast of Raleigh, near the Johnston County line and operates with a capacity of 60 MGD.

The City of Raleigh’s Neuse River WWTP did not experience any NPDES permit (NC0029033) performance violations during the past fiscal year, while treating over 15 billion gallons of wastewater. Through improvements and excellent operation of the plant, the NRWTP has experienced nine consecutive years of 100% compliance, resulting in the plant’s Platinum IX Award issued by the National Association of Clean Water Agencies. The City is proceeding with a project to expand the plant’s capacity from 60 million gallons per day to 75 million gallons per day.

**Smith Creek Wastewater Treatment Plant**

The Smith Creek WWTP was designed to serve the Town of Wake Forest and was transferred to the City of Raleigh on July 1, 2005. The plant is located in Wake Forest, approximately 14 miles north of Raleigh and operates with a capacity of 3.0 MGD.

The Smith Creek WWTP did not experience any NPDES permit (NC0030759) performance violations during the past fiscal year, while treating 482 million gallons of wastewater. As a result of the SCWWTP experiencing 100% compliance, it received the Platinum Award VII, which is issued by the National Association of Clean Water Agencies for seven straight years of such compliance.

### **Little Creek Wastewater Treatment Plant**

The Little Creek WWTP was designed to serve the Town of Zebulon and was transferred to the City of Raleigh on October 1, 2006. The plant is located in Zebulon, approximately 24 miles east of Raleigh and operates with a capacity of 1.85 MGD.

The Little Creek WWTP did not experience any NPDES permit (NC0079316) performance violations during the past fiscal year, while treating 217 million gallons of wastewater. As a result of the LCWWTP experiencing 100% compliance, it received the Platinum Award VI issued by the National Association of Clean Water Agencies for six consecutive years of compliance.

The following table shows the permit limits and performance history of the wastewater treatment plants for this past fiscal year.

	<b>Permit Limit</b>	<b>NRWWTP</b>	<b>SCWWTP</b>	<b>LCWWTP</b>
<b>Ammonia-Nitrogen (mg/l)</b>	<b>2.0</b>	<b>0.04</b>	<b>0.03</b>	<b>0.02</b>
<b>Fecal Coliform (col/100mls)</b>	<b>200 col/100 mls</b>	<b>3.17</b>	<b>1.30</b>	<b>2.39</b>
<b>Biological Oxygen Demand (BOD) (mg/l)</b>	<b>5.0</b>	<b>0.05</b>	<b>0.50</b>	<b>0.10</b>
<b>Total Suspended Solids (TSS) (mg/l)</b>	<b>30.0</b>	<b>0.00</b>	<b>0.60</b>	<b>0.00</b>
<b>Total Phosphorus (mg/l)</b>	<b>2.0</b>	<b>1.17</b>	<b>0.72</b>	<b>0.35</b>
<b>Total Nitrogen (Annual Pounds)</b>		<b>Permit Limit 676,496</b>	<b>Permit Limit 67,580</b>	<b>Permit Limit 26,660</b>
		<b>Actual Pounds 261,917</b>	<b>Actual Pounds 11,455</b>	<b>Actual Pounds 3,642</b>

Further information concerning the wastewater treatment program can be obtained by calling 919-996-3700 or by email at [Wastewater.treatment@raleighnc.gov](mailto:Wastewater.treatment@raleighnc.gov).

## **REUSE PROGRAM**

Reuse or reclaimed water [used interchangeably] is defined in North Carolina as effluent from a wastewater treatment plant that is treated to an exceptional high level. Reuse water has many benefits which include preservation of potable water by provision of reuse water for irrigation, process cooling water, construction, dust control, ornamental fountains, indoor toilet flush water, fire protection and the reduction of nutrients in receiving waters.

### **Wrenn Road Spray Irrigation Wastewater Treatment Plant**

The Wrenn Road Spray Irrigation WWTP is a one (1) MGD non-discharge system that utilizes spray irrigation to agricultural land and forests as the means for disposal (permit WQ0002708). During this fiscal report year, zero gallons were spray irrigated at this facility and received no permit violations due to this facility being redesigned and modified to accommodate plant process flows from the D.E. Benton Water Treatment Plant.

### **Reuse Distribution System**

The Neuse River WWTP uses reuse water for irrigation of the agricultural land that serves the facility. From July 1, 2011 to June 30, 2012, approximately 39 million gallons of reuse water was used to irrigate cropland. The construction of the third phase of expansion of the irrigation system is complete, and all three phases of the system are fully functional.

The reuse system has bulk reuse water loading stations at the E. M. Johnson, Neuse River, Little Creek and Smith Creek water and wastewater treatment plants. “Bulk” distribution of reuse water allows certified landscape contractors or citizens to obtain reclaimed water at no cost if that person will transport and responsibly use the reclaimed water for approved purposes.

The Raleigh Service Area system also includes a pipeline distribution system and elevated storage tank. The construction of the third pipeline phase was completed during this fiscal year. The reuse distribution system was also extended towards New Bern Avenue along Sunnybrook Road. Utilization Permits have been issued to Wilders Grove Solid Waste Services Facility, Wake Med, and the Wake county Human Services building located on Swinburne Road.

The City also operates the Zebulon Service Area reclaimed water distribution system, which takes treated effluent from the Little Creek WWTP and provides this product to seven permitted customers through 21,400 linear feet of distribution pipe and a 250,000 gallon elevated storage system.

The chart below shows the total amount of reuse water distributed by the various reuse systems for the reporting period of July 1, 2011 – June 30 – 2012.

## 2011 - 2012 Reuse Distribution

	E.M. Johnson WTP Bulk Reuse Flow	Neuse River WWTP Bulk Reuse Flow	Smith Creek WWTP Bulk Reuse Flow	Little Creek WWTP Reuse Distribution (includes bulk) Flow	Neuse River WWTP Reuse Irrigation Flow	Neuse River WWTP Reuse Distribution (off-site)
	(Gal)	(Gal)	(Gal)	(Gal)	(Gal)	(Gal)
Annual Total	45,050	157,128	0.00	41,174,500.00	39,415,000	40,781,100

There were no violations of the reuse water program during this fiscal year.

Further information concerning the reuse program can be obtained by calling 919-996-3700 or by email at [Water.reuse@raleighnc.gov](mailto:Water.reuse@raleighnc.gov).



## BIOSOLIDS PROGRAM

Biosolids are produced at three of the City's wastewater treatment plants. The city chooses to beneficially reuse these biosolids by processing them into products that can be utilized by local farmers, landscapers and homeowners on both public and privately owned land. Close monitoring of these biosolids product constituents, environmental conditions and the utilization of extensive pretreatment methodologies allow the city to ensure that these products are safe for their intended use.

### Putting Biosolids to Work

The biosolids from the Smith Creek WWTP are discharged into the city's sewer collection system and are recovered and processed at the Neuse River WWTP. The Little Creek WWTP and a portion of the solids produced at the Neuse River Plant are processed into a Class B biosolids product. This product is then beneficially reused, by local farmers, as a fertilizer on agricultural crops. The nutrients in the biosolids are taken up by the crops, which are then harvested and sold for non-consumptive uses such as animal feed.

The Neuse River Plant also processes a large percentage of its biosolids into lime stabilized Class A biosolids. In this process, sludge is dewatered with belt presses and blended with lime kiln dust to produce Class A biosolids by raising the product pH and temperature. This material is marketed under the name “Raleigh Plus” and is distributed as a soil amendment to agricultural and institutional properties in the region. Interested customers should call (919) 996-3700 Monday – Friday, 8:00 a.m. to 4:00 p.m.

The final process utilized at the Neuse River plant to ready its biosolids for beneficial reuse is carried out by a private firm that receives a portion of the dewatered primary sludge and produces a Class A biosolids product in the form of compost. Once regulatory requirements are met, the compost is distributed to the public as a soil amendment and growing media.

Further information concerning the biosolids program can be obtained by calling 919-996-3700 or by email at [Biosolids@raleighnc.gov](mailto:Biosolids@raleighnc.gov).

In December of 2006, the NRWTP became the fourteenth agency in the nation and the first in North Carolina and the southeast to have its Environmental Management System (EMS) program verified through the independent third party audit process to become a National Biosolids Partnership certified agency, making the biosolids program at the plant an accredited model program. In February 2012 the plant was re-verified and has retained its prestigious Platinum Level certification after successfully completing all audit requirements for maintaining EMS certification. “The Platinum Level designation represents the highest achievement of biosolids management and environmental stewardship.”

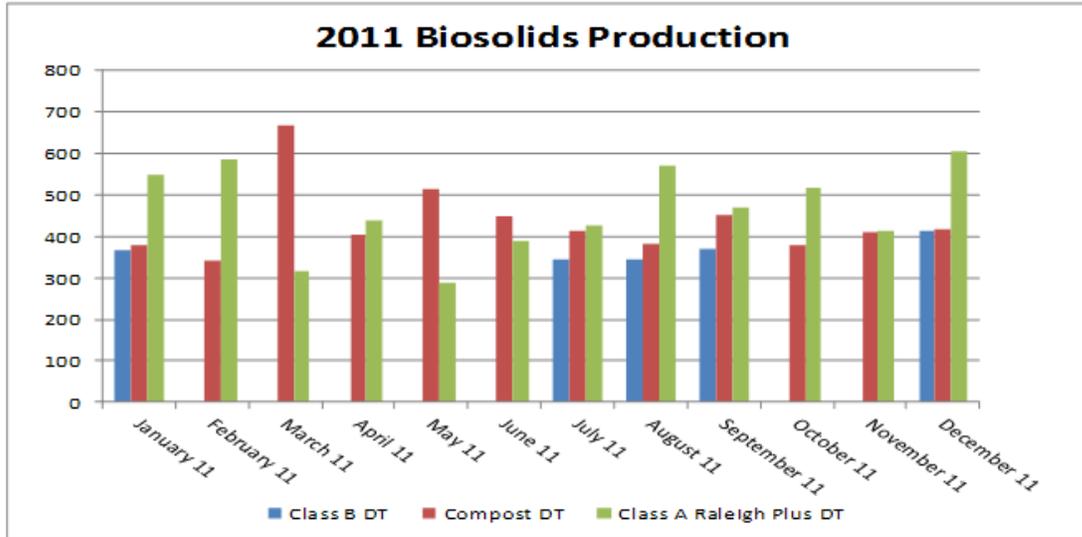
The results of the re-verification audit are available by contacting Marti Gibson at [Marti.gibson@raleighnc.gov](mailto:Marti.gibson@raleighnc.gov) or calling (919) 996-4540.

## **2011 Biosolids Program Annual Report**

**The annual biosolids program data is reported on a calendar year basis. Therefore, all data in this report for the biosolids production, distribution and program summary are based on calendar year 2011.**

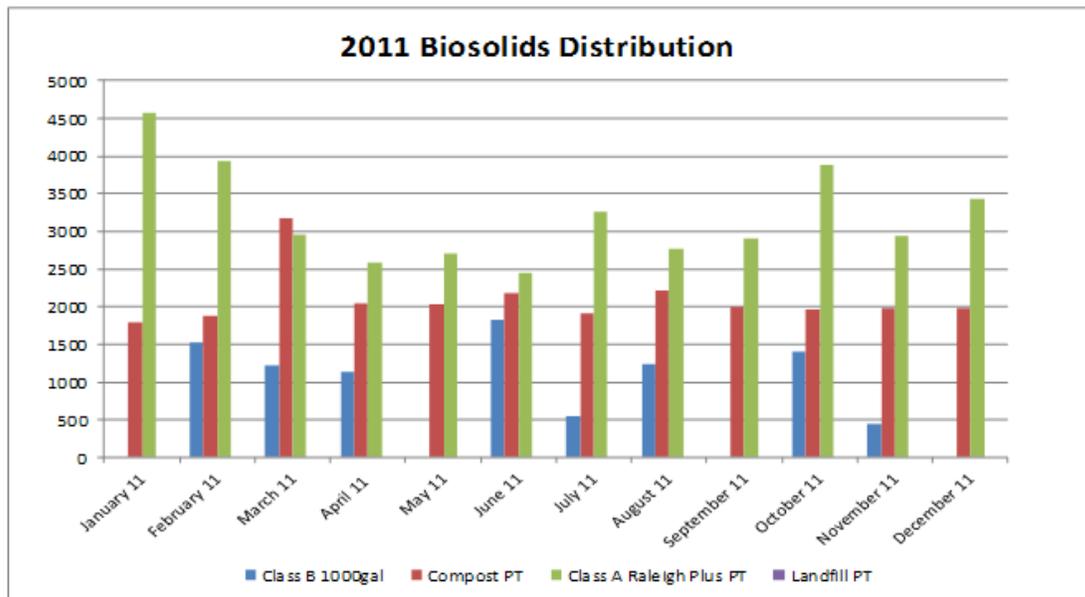
### **2011 Biosolids Production**

The following chart demonstrates the amount of biosolids produced by the NRWTP for calendar year 2011. The majority of the product produced is a Class A fertilizer product, which is the highest quality of biosolids that can be produced.



### 2011 Biosolids Distribution

The chart below demonstrates the amount of biosolids distributed from the NRWTP for calendar year 2011. All the biosolids produced at the NRWTP are beneficially reused and distributed, leaving no significant storage of biosolids on-site. Also, no biosolids products were sent to the landfill.



### Annual Biosolids Management Program Summary

The biosolids program at the Neuse River Wastewater Treatment Plant (NRWWTP) is continuing to improve through the use of an EMS approach to managing the program. Some of the highlights of this year's program include:

**Regulatory Compliance:** The NRWTP biosolids management program had zero regulatory non-compliances in 2011. There were no NPDES permit violations for the NRWTP. The NRWTP received the Platinum Award from the National Association Clean Water Agencies (NACWA) for eight consecutive years without a permit violation. An EPA audit in 2011 found no negative findings or comments within the treatment plant operations.

**Environmental Performance:** 100% of the biosolids produced at the NRWTP were beneficially reused with no biosolids products sent to the landfill. Demand for biosolids products continues to be greater than production. Sanitary sewer overflows have reduced from approximately 95 to approximately 35 in the past 8 years.

**Quality Management Practices:** All Class A products produced were consistently below 25% of the ceiling concentrations for exceptional quality biosolids per the Federal 503 regulations for biosolids. Management system planning and discussion has improved inter-Division communication, improving efficiency and making more resources available. Expanded use of the Management of Change procedure has improved planning and communication of changes. The internal audit process is being used to find deep causes of operating problems.

**Relations with Interested Parties:** The annual stakeholders meeting was held in December 2011. A Facebook page (City of Raleigh Biosolids Program) for the biosolids program was developed as an additional outlet to disseminate information about the program. Recognition for the management system has increased Wastewater Division credibility to a point where it is being used as an example for management system development throughout the Department. Actuators have been installed on louvers in the blower room and sound blankets have been installed on blowers to reduce noise in response to public requests.

**Continual Improvement:** The Corrective and Preventive Action (CAPA) process continues to be a vital tool for identifying and fixing weaknesses in the system as well as identifying opportunities for improvement to the system. The EMS completed a successful re-verification audit and obtained recertification status for the Biosolids EMS.

**Contractor Performance:** There were zero regulatory violations for the contractors working in our biosolids management system but there were two management system non-conformances relating to contractors not attending the annual stakeholders meeting. Those non-conformances were addressed and closed.

**Goals and Objectives:** In 2011 there were four voluntary goals set for the biosolids management system and ten objectives or targets. 50% of goals and objectives were met. Two of the objectives/targets were not met but were in process by year-end and will be continued over to the following year. The remaining three of the objectives were not completed and also will be continued over to 2012. Those in process will take some time to be fully integrated and implemented. The re-verification audit identified areas of improvement needed for goals and objectives for 2012. Due to this finding the 2012

goals and objectives are currently being revised and revamped to be more useful to the continual improvement of the program.

## **CUSTOMER RESPONSIBILITIES**

The City of Raleigh is committed to protecting the quality of the Neuse River and the environment. The water returned to the Neuse River from the City's NPDES permitted wastewater treatment plants is higher quality water by most parameters than when it was removed for drinking water treatment from Falls Lake.

While grease continues to be a primary cause of sanitary sewer overflows in Raleigh's sewer system, you can help the City of Raleigh reduce the number of overflows by following these simple steps.

- Collect grease, fats and oils from cooking in a container and dispose of it in the garbage instead of pouring it down the drain.
- Place a wastebasket in each bathroom for the disposal of solid waste, disposable diapers, condoms, and personal hygiene products. These products **DO NOT** belong in the sewer system. Never use a toilet as a wastebasket.
- Place food scraps in the garbage for disposal with your household solid waste. Even better, start a compost pile using your food scraps instead of disposing of them down the kitchen sink.

Wastewater collection systems are designed to handle three things – used water, human body waste and toilet paper. It is very important to keep all foreign materials, such as grease and other household debris from entering the system, as these can cause blockages. Most sewer backups occur between the house and the City's sewer main. The property owner is responsible for correcting this problem.

Property owners are responsible for the care and maintenance of service lines from their homes or businesses to the sanitary sewer mains in the street. The Raleigh City Code also prohibits property owners from planting trees, shrubs and other vegetation on sewer lines and easements, covering manholes, erecting fences or permanent structures on sewer lines and easements, or damaging sewer lines in any manner. These conflicts may not contribute directly to a sanitary sewer overflow, but they could hinder access and/or response time in correcting a sewer backup.

Be aware of whether you may be vulnerable to a back-up of City sewage into your home or business. In some instances a serious risk of back-up exists if any points of entry into the plumbing system, such as floor drains, toilets, etc., are located at a level that is lower than the elevation of the next upstream manhole. In such cases, the sewer may back-up into the building if there is an obstruction in the City main below that service location. This problem can be avoided with the proper installation and maintenance of a sewer backflow valve. A backflow valve will allow the sewage to flow in one direction only, and will prevent the overflowing of sewage in buildings or residences. It is the home builder/property owner's responsibility to determine whether this situation exists. If you

are vulnerable you should install a sewer backwater valve and/or maintain adequate home insurance. To obtain an informational brochure or schedule a free evaluation of your home or business plumbing, call (919) 996-4540.

Managing unused medications is a safety as well as an environmental concern. Proper disposal will prevent medications from entering soil and groundwater. The City encourages the following guidelines when disposing of medications.

- Where available, take unwanted or expired medications to a local collection site.
- Remove all medications from their original containers.
- Place the medications in an impermeable, non-descript container (such as an empty laundry detergent bottle or coffee can), and mix with water or coffee to dissolve the medications.
- Mix with an undesirable substance such as used coffee grounds or kitty litter. Tightly seal the container and dispose of it in your household trash.

## **REPORT SANITARY SEWER OVERFLOWS (SSOs) AND WATER**

**MAIN BREAKS:** Please call the City of Raleigh Public Utilities Department to report a sanitary sewer backup or overflow or a water main break. To report a sewer backup/overflow or main break during normal business hours (**M-F, 7:30 a.m. – 4:00 p.m.**) please call **(919) 250-2737**. When calling at times other than normal business hours, please dial the after-hours emergency number, **(919) 829-1930**. Thanks for your help!

## **\$50 SSO REWARD PROGRAM**

The City of Raleigh has an SSO Reporting Reward Program. In this program, concerned citizens who are the first to notify the City of an SSO that they observe are rewarded monetarily with a **\$50** check. By promptly reporting the overflow, the City is able to minimize the impact of the overflow to the environment. Although the City has staff that inspects the sanitary sewer collection system every day, with 2,300 miles of sewer mains in the City's service area to maintain, the City certainly needs the help of customers and citizens to find and report these problems when they occur.