THE CITY OF KNOXVILLE
TENNESSEE

NPDES Permit Annual Report

CITY OF KNOXVILLE
BILL HASLAM, MAYOR

National Pollutant Discharge Elimination System
Stormwater Discharge Permit TNS068055
July 1, 2005 - June 30, 2006

Signature and Certification

NPDES STORMWATER PERMIT TNS068055
2005/2006 MUNICIPAL ANNUAL REPORT

FOR: City of Knoxville, Tennessee

Federal regulations, 40 CFR 122.22 (a) (3) and 122.22 (d), require the application and reports for the NPDES permit to be signed and certified as follows:

> *For a municipality, State, Federal, or other public facility, by either a principal executive officer or ranking elected official.*
>
> *"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."*

Bill Haslam
Mayor

12-15-06
Date

Stephen J. King, P.E.
Engineering Director

12-15-2006
Date

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1.0 INTRODUCTION

The Tennessee Department of Environment and Conservation, Division of Water Pollution Control issued the City of Knoxville a National Pollutant Discharge Elimination System (NPDES) Permit (TNS068055) for the discharge of stormwater from the municipal separate storm drain system (MS4). Stormwater from the City of Knoxville discharges directly to the Tennessee River and to major creeks that drain to the Tennessee River. Only a small portion of the MS4 runoff will drain to sinkholes, ponds, and lakes throughout the area. The City's first NPDES Permit was issued on July 1, 1996 and expired on June 28, 2001. In December 2000, the City submitted a reapplication as part of the Year Four annual report. The current permit was approved and made effective July 1, 2004.

The NPDES Permit requires an annual progress report for the Stormwater Management Program outlined in the Part I and Part II applications. This annual report was completed in accordance with the reporting requirements of Part VI of the permit and will complete the requirements for the permit year from July 1, 2005 through June 30, 2006.

The Stormwater Quality Section of the City of Knoxville Engineering division coordinated preparation and submittal of the system-wide annual report. Information for the annual report has been provided by the Engineering Division, Public Service Division, Solid Waste Management office, and Knoxville/Knox County Emergency Management Agency (KEMA). The Engineering Division has compiled the available information into the format outlined in Part VI of the current NPDES Permit.

2.0 CONTACTS LIST

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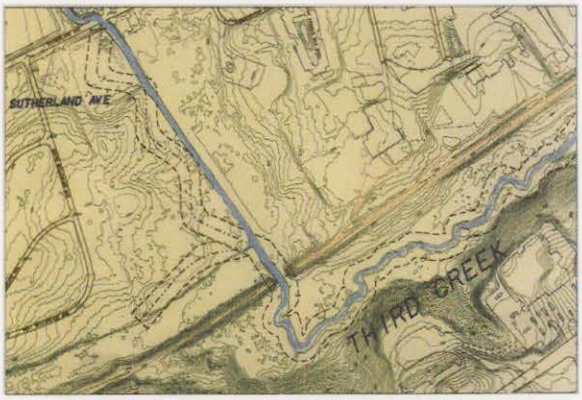
3.0 STORMWATER MANAGEMENT PROGRAM (SWMP) EVALUATION

The objective of the City of Knoxville's SWMP is to protect the taxpayer's health, safety, and welfare through an economically viable comprehensive stormwater quality and quantity program. Although it would be impossible to list all of the City's water quality related accomplishments in this report, the City is proud to report some of the major accomplishments related to the SWMP that occurred during the second year of the new NPDES permit term.

- The City initiated a major improvement project on Third Creek that will restore approximately 7,602 feet of degraded and channelized stream. The Tennessee Stream Mitigation Program (TSMP) will provide the primary funds and administration for the project while the City provides land, coordination, and matching funds. The City met with each of the private land-owners to obtain permanent conservation easements. The project is expected to reduce sediment, hydromodification and flooding while improving habitat, riparian zones and water quality. In year two, Buck Engineering substantially completed the plans. Construction began in the Fall of 2006. The initial focus is to meander the channelized section of stream downstream of Sutherland Avenue (see map inset). The section of creek was apparently straightened in the past, which has caused slow widening of the channel and a steady loss of trees. Soil will be removed from the floodplain to provide some storage and reduce erosive flows. More information on the project and plans is available at www.tsmp.us.



- The City of Knoxville continued to expand the greenways/buffers zones along the major waterways. The City currently maintains over 40 miles of trail distributed over 31 greenways. These linear parks help protect the adjacent waterways with natural buffers and provide opportunities for stream enhancements.

- A total of 4,882.36 tons of recyclables was collected at the City's eleven solid waste drop-off recycling centers in 2005. One of the temporary drop-off centers will be relocated to a permanent facility when construction is complete in year three.

- The City successfully passed a TDEC inspection at the beginning of year one. The following five areas of improvement were identified and are included with the City's improvement plan for each item in this report:
  1. Additional inspections for small residential infill development – funding was approved for two new inspectors to begin in year three (CS-3, pp. 39-40),
  2. Maintain/repair stormwater treatment devices at the bus facility - the units were maintained in June 2005 and repaired in December 2005 (IN-2, pp. 32-33),
  3. Improve runoff from Loraine Street equipment storage lot – two stormwater treatment BMPs were installed at the facility's outfall in year two (IN-2, p. 33),
  4. The Loraine Street car wash seemed too short for large trucks/trailers – the roof was expanded in year two and trench drains funded for year three (IN-2, p. 33),
  5. Improve industrial/commercial program inspections – an additional Stormwater Technician was added in March 2005 to perform additional education and inspections for industry and certain commercial areas (IN-2, pp. 30-31).

- In 2005, the City partnered with other local MS4s in the region to sponsor Waterworks public service announcements in the local media. Each of the television and radio PSAs target specific stormwater pollutants or activities that impact clean water. All of the MS4s benefited by pooling resources to maximize airtime and public exposure. Each of the PSAs is available for viewing at www.tennesseewaterworks.com.

- The year 2006 was the 17th year for the River Rescue. The spring 2006 River Rescue attracted 650 volunteers who collected 12 tons of trash and tires from the shores of the Tennessee River.

- The City assisted TDEC with development of the Policy Statement on Local Enforcement of Unpermitted or Illicit Discharges by State Entities into Local Government MS4s. This statement became effective on May 1, 2006 and has clarified the authority of the MS4s.

During the first ten years of the stormwater quality program, the City defined a baseline to compare future surface water improvements and/or degradations. Although the improvements may not be measured quantitatively at this time, many programs initiated during the first ten years have undeniably made improvements in the state of water quality throughout the city. The long-term results should become apparent in future years. The City implemented many of the SWMP tasks beyond the minimum permit requirements and will continue to advance the water quality programs beyond the minimum requirements as economically feasible.

4.0 STORMWATER MANAGEMENT PROGRAM SUMMARY TABLE

SWMP activity summary tables for the last year of the NPDES permit program were compiled in accordance with the reporting requirements specified in Part VI(A)(2)(c) of the permit and included on the next few pages. Although the summary tables concisely document many program activities, some activities could not be quantified and have therefore been omitted.

4.0 Stormwater Management Program Summary Table

MONITORING TASKS WET/DRY WEATHER	SCHEDULE OF ACTIVITIES	SCHEDULE FOLLOWED	ACTIVITIES ACCOMPLISHED	COMMENTS
Repeat High Parameter Sites	20 Outfalls repeated from year six	Yes	17	Each outfall tested at least four times this year
Field Screening Industrial Outfalls	Visits to Industrial outfalls	Yes	27	Continued retesting outfalls from Industrial areas (four times)
Total Field Screening Outfalls	High Parameter repeats + 30 to 40	Yes	155	All field data sheets available for inspection. Outfalls tested four times this year.
Full Suite Stormwater Analysis (one station per year)	One Station pr year	Yes	1 sample	Full Suite sample obtained at Williams Monitoring Station.
Storms Sampled at 5 monitoring stations	1 storm / quarter / 5 sites	Yes	22 storms	Summer: 6 storms, Fall: 6 storms, Winter: 5 storms, Spring: 5 storms
Ambient Samples at 5 monitoring stations	1 sample / quarter / 5 sites	Yes	20 samples	Summer: 5 samples, Fall: 5 samples, Winter: 5 samples, Spring: 5 samples
Storm Drain Televised	As Needed	Yes	3,308 feet	Pipes are defined as sections between inlets, catch basins, junction boxes, or outlets.

STORMWATER MANAGEMENT & INDUSTRIAL PROGRAM TASKS	SCHEDULE OF ACTIVITIES	SCHEDULE FOLLOWED	ACTIVITIES ACCOMPLISHED	COMMENTS
Stormwater Quantity Requests for Service (Received / Resolved)	As Needed	Yes	518/1314	Complaints are investigated as received and resolved as solutions or resources are available
Stormwater Quality Requests for Service (Received / Resolved)	As Needed	Yes	197/179	Complaints are investigated as received and resolved as solutions or resources are available
Site Develop Workshops	Annually	Yes	Over 150	Included Engineers, contractors, developers, & surveyors involved in land disturbing activities.
Stormwater GIS Field Investigations for Annexations	As Required	Yes	44	Newly annexed areas are investigated within 60 days for all storm drain features and possible pollution sources.

4.0 Stormwater Management Program Summary Table

STRUCTURAL CONTROLS	SCHEDULE OF ACTIVITIES	SCHEDULE FOLLOWED	ACTIVITIES ACCOMPLISHED	COMMENTS
Street Cleaning	Daily/Bi-Weekly	Yes	25,821 Miles	Daily for downtown streets. Frequency varies for other streets.
Litter Pick-up, Hand	As Needed	Yes	60,228 Bags	Routine Schedule
Catch Basin Cleaning and Repair	As Needed	Yes	4,115 Jobs	Per work order and requests
Ditching: Hand, Truck, & Track/Gradall	As Needed	Yes	39,267 Feet	Per work order and requests
Storm Drain Installation & Repair	As Needed	Yes	223 Jobs	Per work order and requests
Brush & Leaf Pick-up	Bi-Weekly	Yes	14,615 Loads	Bi-Weekly curb pick-up
Seed/Sod, ROW	As Needed	Yes	560 Jobs	Per work order and requests
Storm Drain Cleaning	As Needed	Yes	39,267 Feet	Per work order and requests
Grate Replacement	As Needed	Yes	85 Jobs	As Needed
Field Inventory & Inspection of On-Site Detention Facilities	Within 60 Months	Yes	As needed	All new facilities are mapped after construction is complete. Existing facility's inventory is complete.
Creek Cleaning by Creek Restoration Crew	As Needed	Yes	76 Jobs	Creeks are inspected and cleaned on a routine schedule
Tree and Plant Planting	When Applicable	Yes	305 trees	Trees were planted by the City's Service Department
Total Waste Recycled	As Brought In	Yes	39,595 tons	5,486 tons of paper, metal, plastic, glass, etc. and over 33,085 tons of yard wastes

4.0 Stormwater Management Program Summary Table

EDUCATIONAL PROGRAM TASKS	SCHEDULE OF ACTIVITIES	SCHEDULE FOLLOWED	ACTIVITIES ACCOMPLISHED	COMMENTS
Publicize Hotline Number	Within 24 Months	Yes	Undetermined	Hotline number has been published in phone book, on road signs, pamphlets, magnets, radio PSA's, etc.
River Rescue	Annual Event	Yes	1 day event	12.75 tons of trash and 89 tires removed by 666 volunteers from 30 sites.
Water Quality Forum	Meets Monthly and Quarterly	Yes	Undetermined	Three committees meet monthly to plan projects focused on urban water quality.
Storm Drain Marking	As Needed or by volunteers	Yes	Approx.	Catch Basins marked with decals labeled "Dump No Waste-Drains to Waterway"
Volunteer Creek Cleanups	Volunteers	Yes	Several sites on several creeks	A citizen based program that periodically hosts several creek cleanups in the spring and fall
Waterfest	Annual Event	Yes	1 Day Educational Event	A unique community event dedicated to educate citizens about water quality. Over 820 youths, 300 teachers & parents, and 100 volunteers participated.
Pooper Scoopers	As Needed or by volunteers	Yes	~7,700	Disposable dog waste containers were distributed to 9 different pooper scooper stations.

NEW DEVELOPMENT PROGRAM TASKS	SCHEDULE OF ACTIVITIES	SCHEDULE FOLLOWED	ACTIVITIES ACCOMPLISHED	COMMENTS
New Development Inspections	As Required	Yes	~3100	As Required
Building Permits Issued	As Required	Yes	683	As Required
Site Development Permits Issued	As Required	Yes	159	As Required
Right of Way Permits Investigated	As Required	Yes	59	As Required
Citizen Concerns Investigated	As Required	Yes	880	Development Complaints include erosion, sediment, grading, dumping, etc.

5.0 NARRATIVE REPORT

The following narrative report is divided into the five main programs of the SWMP plus an additional section for specific TMDL activities. The SWMP is described in the program element schedules listed in Part II of the permit application and Part III of the permit. The main programs are listed as follows:

5.1 Residential and Commercial Program (RC).
5.2 Illicit Discharges and Improper Disposal Program (ILL).
5.3 Industrial and Related Facilities Program (IN).
5.4 Construction Site Runoff Program (CS).
5.5 Comprehensive Monitoring Program (MN).
5.6 TMDL Implementation and Activities.

Each of the above programs are further divided into separate program elements and related tasks that correspond to the Implementation Schedules listed in Part IV of the Permit and to the requirements listed in 40 CFR 122.26(d)(2)(iv). Each specific task is briefly discussed in accordance with the reporting guidelines outlined in Part VI of the NPDES Permit. Some sections of this report may be an abbreviated version of earlier reports when the particular task elements are ongoing. Changes for the new permit cycle are discussed where applicable.

5.1 RESIDENTIAL AND COMMERCIAL PROGRAM (RC)

Program of Structural and Source Controls for Reducing Pollutants to the Municipal Separate Storm Sewer System, 40 CFR 122.26(d)(2)(iv)(A).

RC-1 Maintenance Activities for Structural Controls

SWMP Task: Continue Existing Maintenance Activities from Part 2 application, pp. 5-5 to 5-9.
Status: Ongoing

The City's Public Service Department (PSD) currently performs maintenance of the municipal stormwater system. The PSD has developed and maintained an extensive database to track work tasks performed during the year. The database not only tracks labor category (e.g., Equipment Operator) and labor hours devoted to each task, but also includes equipment type and costs. The PSD database produces summary reports for monthly and annual work production and costs. The database includes more than 80 task activities of which 18 were identified as relating directly or indirectly to stormwater management. Only a small portion of the stormwater conveyance system is located on public rights-of-way and city-held easements. The City generally assumes no responsibility for maintenance or improvements on private property even though crews may work in some of those areas to remove blockages, spills, and trash with permission or in emergencies.

Maintenance by the City within rights-of-way and easements is normally performed on an as-needed basis by the PSD. Approximately 75 percent of the storm drainage system maintenance work performed by the PSD is in response to direct calls from property owners and requests from the Engineering division. The remainder of the storm drainage system maintenance work is in response to maintenance needs detected by the PSD, such as repairing collapsed pipes. Under normal conditions, the PSD can respond to all complaints that are the responsibility of the City as defined by

the City's stormwater policy.

Under the current system, the PSD has divided the City into six geographic maintenance zones, for routine work. Duties performed in each zone relating to stormwater are brush collection, leaf collection, street sweeping, and the cleaning of curb inlets. Catch basins are inspected annually. Cleaning and maintenance of catch basins are performed "as-needed". Most drainage facility maintenance is performed in response to complaints or known problems. The PSD logs all complaints by address and by category into the computerized database. The Construction Division of the PSD performs non-routine storm drain maintenance and installation.

The City has three 7-person multipurpose construction crews that perform storm drain installation. One of their primary responsibilities includes installing various sizes of corrugated metal pipe and reinforced concrete pipe, major repair to existing storm drains, and building catch basins. Each of the crews has seven employees, a backhoe, two single-axle dump trucks, and one 3/4-ton pickup truck. A 12-ton tool truck services all crews. These crews also provide emergency response in the event of flooding. The Storm Drain Maintenance Crew has five employees. They perform such tasks as: clearing culverts of debris, flushing storm drains, hand and mechanical ditching, and performing minor catch basin repair. A Storm Drain Vacuum Machine, a ditching machine, and a 3/4-ton pickup truck with a small crane are used to perform these tasks.

SWMP Task: Develop Improved Stream Restoration and Channel Maintenance Program.

Status: Complete

Stream restoration and channel maintenance were addressed with two new programs during the first permit cycle. These programs included stream bank stabilization projects to reduce erosion and sediment and a creek restoration crew to remove litter, debris, and flow blockages. The City has improved this program by providing an annual grant to the Tennessee Izaak Walton League for removing debris and blockages on the major urban creeks. The summary report for the TN IWL's efforts are included in appendix of this report. Removal of the dams helps prevent streambank erosion and reduce large destructive pools of silt and trash. The IWL primarily used chain saws and hand tools to restore flow and remove the unnatural dams. Large or heavy objects require assistance by heavy equipment. The City properly disposes all of the trash and debris.

With the addition of the Izaak Walton League's work in the creeks, the 4-person Creek Restoration Crew that was added to the Public Service Department in 1996 will now be able to focus their attention on the maintaining the stormdrain system as the Stormwater Maintenance Crew. Obviously, the crew will still respond on a work order basis for work in the creek when needed. This new division of responsibilities has proven to be an improvement over the initial program that was created in the first permit term. The crew still has access to a knuckle boom and a single-axle dump truck for performing their work. The crew has been trained and is used to assist with illicit discharge investigations in the MS4.

Since the City's NPDES permit program began in 1996, several bank stabilization projects have been completed with the help of TDEC, TVA, USCOE, UTK, and CAC Americorps along urban creeks throughout the city. The first demonstration project was completed Fall 1997 at Inskip Ball Field by using natural fiber coconut rolls and jute fiber mats and a synthetic mattress to protect the grass and live stakes during high water. Similar projects have been completed on Goose Creek, First Creek, Love Creek, and along Second Creek above the Worlds Fair Park.

Since sediment, hydromodification, and habitat alteration are the most common impairments

in our urban creeks, the City will continue to focus on stream restoration projects where possible. Although these projects will certainly vary in scope, biostabilization techniques will be used instead of concrete or riprap. Whenever possible, the adjacent riparian zone will be enhanced with trees and native vegetation to provide cooling effects and help restore habitat. The City will work with TDEC to obtain the appropriate ARAP permits before work begins.

SWMP Task: Implement Improved Stream Restoration and Channel Maintenance Program.
Status: Ongoing

The City has completed some initial flood control projects in the upper portion of First Creek. These projects focus on improving flow capacity but include the benefit of stabilized creek banks and improved high-flow bench. The design for the lower sections of the First Creek project will include the same concept for stabilizing the low-flow channel and creating access to the floodplain. Stream improvements and watershed modeling in First Creek will continue to be a priority in the next year. One million dollars is budgeted in 2006/2007 to continue improvements in First Creek.

The 2003 ordinance revisions added a significant improvement to the stream restoration program. The City began requiring private development to stabilize eroding creek banks on their project sites before completing their development. The ordinance specifically prohibits the use of hard armor unless no better alternative exists. TDEC can exempt the work if they determine that stabilization efforts would do more harm than good.

The City initiated a major improvement project on Third Creek in 2005 to restore over 7,600 feet of degraded and channelized stream. The goals of the restoration project are to reduce sediment, hydromodification and flooding while improving habitat, riparian zones and water quality. Projects of this magnitude should help comply with the TMDLs for sediment and habitat alteration.

The proposal for the restoration project was presented to the Tennessee Stream Mitigation Program (TSMP) in year one and was approved. In year two, City Council approved $100,000 of matching funds for the restoration project, which was estimated at over $1,000,000.

The City obtained letters of commitment from each the private landowners and later obtained signed Land Preservation Agreements for the areas adjacent to the project site. The City owns the largest portion of property to be impacted by the restoration project and signed the LPA for the construction area in 2006. The preservation areas are approximately 100' wide in most areas.

Buck Engineering completed the design of the project in the summer of 2006 and construction started in Fall 2006. More information about this project can be obtained at www.tsmp.us. The first section of creek below Sutherland Avenue will be significantly improved by restoring the original meanders. The 90-degree bend will be smoothed out and the entire reach stabilized. Restoration and plantings should be completed in year three.

Opportunities to implement large-scale restoration projects such as the First Creek and Third Creek projects may not be feasible every year. However, the City will continue to focus when feasible on large projects, which may produce significant and measurable impacts.

SWMP Task: Implement Structural Controls To Prevent Floating Discharges To The TN River.

Status: Ongoing

Since the summer of 1999, the City has coordinated with TVA, UTK, TDEC, USACOE, the Isaac Walton League (IWL), Keep America Beautiful and area businesses to reduce the amount of floating pollution entering the river from the urban creeks. The City has studied and identified several possible solutions. Short-term solutions have included increasing the frequency of the maintenance at the mouths of the major creeks, adding more trash receptacles at bus stops, increasing public awareness, installing temporary skimmers, etc.

During the first permit term, the City donated a new boat and hundreds of feet of trash skimmers to help the IWL collect litter and debris along the riverfront in the downtown area. The City will continue to fund replacement of the skimmers (left) as long as they remain effective. The City has contracted with the IWL to maintain a "Litter Free Zone" from the South Knoxville Bridge to the Alcoa Highway Bridge. Although the focus of this initiative has largely been to reduce unsightly trash from entering the river, the floating trash skimmers at the mouths of the creeks have also effectively detained oil spills until remediation personnel could respond. According to the IWL, the booms have successfully prevented tons of floating material that would otherwise have been discharged from the creeks into the river. All of the trash skimmers have been purchased with penalty funds collected from polluters. Due to the age of the skimmers, the City will likely replace a major portion in year three.

SWMP Task: Require Standard Maintenance Agreement for On-site Facilities.

Status: Ongoing

Since 1997, permanent maintenance agreements and/or covenants have been required for all new stormwater detention facilities and special pollution abatement devices (i.e. oil/water separators). To speed up the permit review process the original "Agreement" referred to in the Part II application and Part IV of the permit has been replaced with a "Covenants", which does not require the Mayor's signature. The end result for water quality protection is the same. The Stormwater and Street Ordinance section 22.5-34 (see appendix) now requires the owner of the property to execute a legal document entitled "Covenants for Permanent Maintenance of Stormwater Facilities" and record it in the office of the Knox County Register of Deeds before a site development permit is issued.

In the case of a lessee, the Stormwater and Street Ordinance Section 22.5-5 allows the City to require a Performance and Indemnity Agreement along with a surety bond or letter of credit to assure the stormwater facilities will be maintained and removed, if necessary, at the end of the lease. This is a new provision to allow some property owners the ability to share the responsibility of maintenance with the lessee who will use the land and create the need for the stormwater facility. The lessee must also pay the City no less than $5,000 to compensate for any

perpetual maintenance that may be required after the expiration of their lease.

The City will retain the right to inspect to insure that the stormwater facilities are properly maintained, however, the responsibility for the maintenance of stormwater facilities will remain with the property owner unless legally transferred to another person or entity by a properly recorded legal agreement. If the property owner does not maintain the facility properly, the City may authorize the maintenance to be completed and place a lien against the property for double the cost. To ensure access to the facility, a traversable access easement is recorded on the plat.

SWMP Task: Require Routine / major maintenance of BMP facilities. Status: Ongoing

All stormwater facilities constructed since 1997 are required to be maintained according to the detailed agreement or covenant, which was recorded before the site development permit was issued. These agreements and covenants are discussed in the previous section above and also in the Stormwater and Street Ordinance sections 22.5-5 and 22.5-34. At a minimum, woody vegetation must be cut annually and sediment must be removed as necessary from detention ponds to maintain proper function of the facility. The standard maintenance requirements for large underground facilities (i.e. detention or oil/water separators) include a minimum of quarterly visual inspections and annual maintenance. Smaller BMPs, such as catch basin inserts, must be inspected at least monthly and maintained quarterly.

Sediment from the maintenance of detention/water quality ponds, treatment devices, or from stream restoration activities must be removed from the stormwater facility and disposed properly in a landfill classified for such material or used as fill outside the stormwater drainage system. The City does not propose to duplicate TDEC's efforts to regulate contaminated sediments from any stormwater management sources.

RC-2 Planning for New Development

SWMP Task: Review Stormwater & Streets Ordinance to evaluate possible improvements to existing water quality and quantity requirements for new development. Status: Complete

The City of Knoxville revised the Stormwater and Street Ordinance in 2005. The ordinance may be accessed on the Internet at www.cityofknoxville.org/engineering/stormwater. A brief summary of the current development requirements for stormwater detention and water quality control is included in the following paragraphs.

Stormwater detention is required for the following categories of development:

(1) All road construction exceeding one-half (1/2) acre of impervious area;

(2) All commercial, industrial, educational, institutional and recreational developments of one (1) acre or more of disturbed area;

(3) Large single-family or duplex residential developments of five (5) acres or more of disturbed area or five (5) lots or more;

(4) Any site development which contains one-half (1/2) acre or more of additional impervious area.

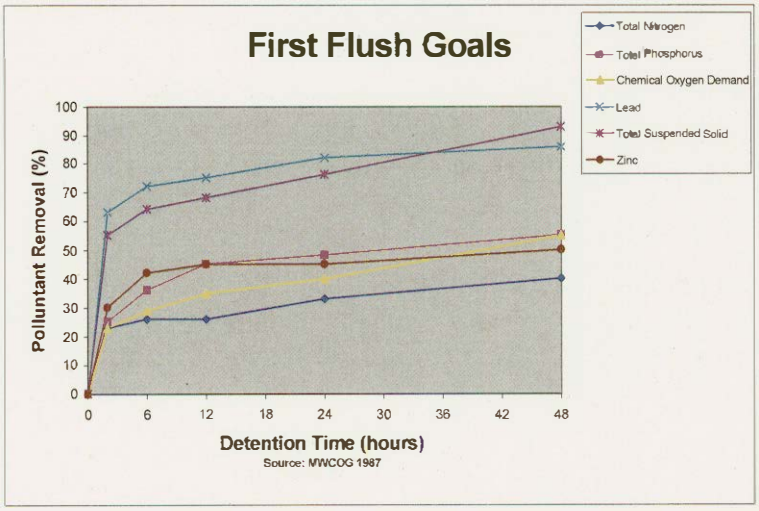
(5) Any redevelopment that meets any of the four criteria above.

When a stormwater quantity detention pond is required, the engineer must design the pond to

control the runoff from the 1-year, 2-year, 5-year, 10-year and 100-year return frequency 24-hour storm events. The design Engineer must submit calculations to show that the detention facility will control the post development as required and that the downstream system is adequate to convey the flow. Detention may be waived for some developments discharging directly into a main stream (i.e. TN River) or if the developer submits supporting hydrologic and hydraulic computations to show that detention is unnecessary. For areas of redevelopment, detention requirements may be waived if the downstream stormwater system is adequate to convey the 2-year and 10-year 24-hour storms. The ordinance clearly states that a waiver of detention requirements "does not exempt the developer from providing the first flush and/or water quality requirements."

The standard management method for water quality control from new development and redevelopment includes first flush control outlets in the quantity pond or in a separate quality pond. The quality pond must be designed to collect the first one-half inch of direct runoff from the contributing drainage basin or the first 4500 cubic feet of stormwater runoff, whichever is greater, and attenuate that runoff for a minimum 24-hour period. Alternate treatment methods are accepted if they provide equivalent or better pollutant removal efficiencies than the standard first flush detention ponds.

The target removal efficiencies for the first flush treatment were estimated from the research and chart provided by the Metropolitan Washington Council of Governments' 1987 report titled "Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs." The target removal efficiencies for a 24-hour detention are estimated as follows: Total Suspended Solids – 76%, Lead – 81%, Zinc – 47%, Total Phosphorus – 44%, COD – 40%, and Total Nitrogen – 33%. The City chose 24-hour attenuation of the first flush since the pollutant removal rates for detention longer than 24 hours did not increase significantly.



In addition to first flush treatment, Section 22.5-37 of the ordinance requires a Special Pollution Abatement Permit (SPAP) for certain land uses that are known to either contribute a disproportionate amount of stormwater pollution (a.k.a. hotspots) or contribute pollutants which would not be effectively removed by the standard first flush control. The SPAP requires the operator to submit the management and structural controls necessary to address the expected pollutants and sources of pollution from the site after development. The typical special pollution abatement requirement has been a minimum of an oil/water separator for large parking lots of 400 spaces or 120,000 square feet of area along with a management plan to keep the site free of illicit discharges and pollution sources. Other special land uses that need a SPAP include any type of vehicle maintenance, fueling, washing, and storage areas; scrap and recycling facilities; restaurants; grocery stores; animal housing facilities; and other areas with concentrated bacteria sources. Most of these land uses are expected to have

a much higher potential for either floatable pollutants (e.g. oil, grease, hydrocarbons) or soluble pollutants (e.g. bacteria, nutrients) that will not be collected in a standard first flush pond.

After implementing the illicit discharge program for a few years, some of these land uses were added when they proved to be common hotspots for pollution. The pollution is typically caused by illicit dumping/discharges from employees and contractors or from an increased volume of vehicle traffic. The SPAP program has effectively reduced pollution in our waterways by requiring planning and education to prevent pollution before it occurs from these new sources. This is more economical for the operator and the City since it reduces the need for enforcement, penalties, structural retrofits, and downstream remediation. Some businesses have reported that the pollution control requirements have paid for themselves by reducing other normal costs. A local mall expects to greatly reduce their cost of roof replacement by implementing our grease controls around the grill exhaust vents for every restaurant. The controls keep the grease off their roof and out of our stormwater system.

As the City implements the requirements of the new NPDES permit and as other TMDLs are issued, other land uses may be added to the SPAP program to control specific pollutants.

The ordinance also requires protective streamside buffer zone along blue-line creeks. The three-tier restricted buffer zone requirement varies from 100', to 70' to 30', centered on the centerline of the low-flow channel of the creek. The width required for the buffer depends on whether the creek is a FEMA studied named creek, unstudied named creek, or unnamed tributary respectively. The natural streamside buffer zone must be shown on the plat and maintained in a stable condition for the life of the development. This may require the stream bank to be stabilized as part of the construction project. If stabilization is necessary, hard armor may only be used when bioengineering alternatives are not technologically feasible.

SWMP Task: Require "No Dumping" message cast into all curb irons and solid stormwater catch basin covers installed on new developments. Status: Complete

In January 2000, the City set a new standard to require a "No Dumping" message to be cast in all new curb irons and solid stormwater catch basin covers. The following year, the City included covers for stormwater treatment devices in this requirement. The message is an attempt to educate the public that our stormdrain system is not a sewer for their waste. When polluters are caught discharging or dumping pollutants into the stormdrain, they often plead ignorance to the fact that the stormdrain is directly connected to the creeks. After using stencils and plastic curb markers for years, the City decided to halt the growing number of curb irons that needed the temporary markers by requiring the permanently cast message.

Before setting the standard, the City contacted the major foundries to be sure they could manufacture the new irons and remain competitive in Knoxville. East Jordon Iron Works, NEENAH, John Bouchard & Sons, Acheson, and Deeter are the primary foundries that provide irons in Tennessee. Each of the foundries could provide the new pattern without any additional cost to the development community. Since there was no additional cost for the messages and the message will never need to be replaced unlike the plastic markers or stencils, this new standard may be the most cost effective educational program in the City.

SWMP Task: Plan and site location for regional BMP facilities for areas of new development.
Status: Ongoing

During the term of the permit, the City will target large development projects or strategically located smaller developments that are suitable for siting regional BMPs. Regional BMPs would serve multiple upstream developments and typically have drainage areas ranging from 50 acres to several hundred acres. Since most development activity within the City is primarily "infill" that occurs on the limited number of remaining vacant parcels, there are limited opportunities for siting regional BMPs without impacting existing developments.

The City only owns and maintains three regional detention facilities. Those facilities include the detention pond at the Acker Place development, the detention pond located at the Northwest Crossing shopping center on Clinton Highway, and the retention pond at Victor Ashe Park. However, private developers continue to build regional ponds for developments that have drainage areas over 50 acres.

In year two, the City agreed to partner with Knox County to hire a consultant to review the stormwater ordinances for each agency and to develop a master planning computer model for First and Whites Creek. This project did not kick off until year three and will be reported in the next annual report. One benefit of the watershed model will be to help identify beneficial locations for regional detention. If successful, the City may replicate the model in other watersheds.

SWMP Task: Review, update, and maintain guidance criteria for BMPs on City web page (www.cityofknoxville.org/engineering). Status: Ongoing

The City has successfully completed a comprehensive BMP manual during the first permit term. The manual may be accessed at www.cityofknoxville.org/engineering on the Engineering Division's web page. The guidance criteria describe acceptable types of BMPs, design standards, and maintenance requirements for BMPs to be used throughout the City to meet the requirements of the new Stormwater and Street Ordinance. The guidance criteria will be kept on file in the Engineering Division and distributed to developers as the official reference to ensure proper selection, design and maintenance criteria for BMPs.

Because maintenance of BMPs is critical to their long-term effectiveness in reducing pollutant loading from stormwater, the guidance criteria incorporates maintenance considerations with the design criteria to ensure that effective and maintainable BMPs are constructed in the City. The guidance criteria addresses the goals of the NPDES stormwater program by only allowing BMPs which are effective in reducing pollutants targeted by the NPDES stormwater regulations.

This manual is intended to be a live document that changes as new technology or future needs develop. Therefore, the website version is the preferred method of free distribution while CDs and paper copies may be made available for a fee at a local copy center. Free CD versions are typically distributed during the new development seminars each spring. The website and BMP content will be updated at least annually.

TDEC and the UT Water Resources Research Center have adopted the BMP manual as a basic model for use by Phase II NPDES communities. The City provided an electronic copy and

has authorized modifications by the State for this purpose. Several other municipalities have obtained electronic copies of the Knoxville BMP manual for edit and adoption in their community. The City intends to continue providing the editable version of the BMP manual to other MS4s to help develop some consistency in the region.

RC-3 Maintenance Activities for Public Streets, Roads, and Highways

SWMP Task: Continue street maintenance activities outlined in Part 2 application, p. 5-8.

Status: Ongoing

Street cleaning is performed daily for the downtown streets and less frequently for all other streets throughout the City. Large Vac-All trucks are used in most service areas while smaller Tymco vacuum sweepers are used in the downtown areas where maneuverability is key. The Vac-All trucks are also used to vacuum debris from catch basins and remove leaves in the Fall. Mowing in City rights of way is typically performed on a two to four week schedule between the months of April and September.

SWMP Task: Evaluate current deicing program and study alternatives and improvements.

Status: Complete

Snow removal, anti-icing, and de-icing of roadways are performed by the PSD and are essential programs to ensure public safety. Sodium chloride, stored undercover at the Loraine Street facility, mixed with liquid calcium chloride is applied to highways and streets by spreaders as necessary. Application of de-icing/anti-icing materials targets highways and major arteries first, and residential streets next. Priorities follow the adopted Major Roads Plan of the City of Knoxville. Because of the importance of maintaining public safety and public commerce, the City aggressively pursues its road clearing operations.

The Public Service Division evaluated the snow removal activities and materials and revised the Snow Removal Plan in November 2002. The City has been able to significantly reduce the quantity of deicing materials used by improved equipment, chemicals, and operator training. The City will continue to look for opportunities to minimize the use of deicing materials to reduce costs and protect the environment.

RC-4 Evaluation of Flood Management Projects

SWMP Task: Evaluate regional BMP facilities for water quality retrofit. Status: Ongoing

The City only owns and maintains three regional detention facilities. Those facilities include the detention pond adjacent to Middlebrook Pike and Weisgarber Road at the Acker Place development, the detention pond located at the Northwest Crossing shopping center on Clinton Highway, and the regional retention pond at Victor Ashe Park. Although the regional basins were designed for flood control, the City found that it was possible to retrofit the sites to achieve additional water quality benefits as well. All ponds built since 1997 were required to comply with the water quality requirements for new development.

The City has assumed the responsibility of continued maintenance and water quality improvements at the large regional pond (Acker Place) in the Fourth Creek Watershed. The City restored a large section of Fourth Creek downstream of the pond in the first year of the permit. In order to reduce the vast amount of sediment in the stormwater effluent and to prevent future accumulation of sediment downstream, two rock check dams and an 18-inch weir plate were placed in the pond's low flow channel. These velocity dissipaters allow the sediment time to settle out of the stormwater while still in the pond. The sediment is removed to prevent migration into Fourth Creek. In the first permit term, volunteers replanted riparian zone vegetation in the pond including red osier, silky dogwood, black willow, and willow oak in addition to the existing species of white pine, cedar, and red oak trees. Since this pond is a site of one of the permanent stormwater monitoring stations, the City will continue to monitor the water quality enhancements and improve the pond as needed in the future.

The regional pond at Northwest Crossing on Clinton Highway serves the Wal-Mart, Lowe's, and surrounding area. The City accepted the maintenance of this pond and immediately designed a water quality retrofit to reduce the pollution in the stormwater runoff. Three large Crystal Stream stormwater treatment devices (www.crystalstream.com) were installed. The units have effectively removed large amounts of trash, sediment, hydrocarbons and organic material from the runoff and prevented the discharge of those pollutants into the receiving stream.

The retention pond at Victor Ashe Park was designed and built with water quality in mind. Three Crystal Stream stormwater treatment vaults were installed to improve the quality of the stormwater runoff from the contributing parking lots, park, and subdivisions. Maintenance and inspection of the Crystal Stream units has been contracted out to Crystal Stream's service company to ensure proper function at both regional ponds.

SWMP Task: Maintain existing GIS inventory of on-site BMP facilities. Status: Ongoing

When the NPDES permit program first started, the City implemented a systematic method of inventorying the existing detention ponds by using a GIS grid of the city. Field crews inspected drainage features in each map grid and recorded the detention facilities in the GIS with a circled D. Since all new development must be certified to confirm that constructed facilities were built as planned, all new stormwater facilities will be properly recorded in the GIS after construction. During the year three reorganization of the stormwater section, the City may dedicate one technician to mapping and maintenance inspections. If this occurs, it will be

reported in next year's annual report.

Engineering staff will continue to maintain and update the existing inventory of ponds, pipes, water quality facilities and other drainage features as part of an ongoing GIS maintenance program. A GIS analyst inspects newly annexed areas in the field to verify the accuracy of the GIS stormwater features and to edit the stormwater layers as necessary.

RC-5 Monitoring of Solid Waste Facilities

This program is described in the management section IN-3 for industrial facilities.

RC-6 Management Program for Pesticides, Herbicides, and Fertilizer

SWMP Task: Evaluate possible improvements to existing public education program as part of the illicit connection and improper disposal program. Educate City staff, public, etc.

Status: Ongoing

Public education programs for pesticides, herbicides, and fertilizer use have already been implemented in conjunction with City public education programs for collection and recycling of household hazardous waste. In addition to the solid waste and household hazardous waste informational programs, the City has developed a stormwater pollution program that includes helpful information regarding pesticide and fertilizer use. The City's online Best Management Practices manual located at www.cityofknoxville.org/engineering/bmp_manual/ offers two BMPs for proper pesticide, herbicide, and fertilizer use and disposal. The BMP AM-13 is targeted towards institutional and commercial applications while the BMP RH-05 is directed towards residential and homeowner uses.

The HHW collection program, which includes collection of pesticide, herbicide, and fertilizer waste material, was officially implemented when the facility opened on April 22, 1997. More information about the HHW facility is included in the Illicit Discharges and Improper Disposal Program section ILL-6.

SWMP Task: Reevaluate effect of fertilizers as part of the City's ongoing monitoring program.

Status: Ongoing

Pesticides, herbicides, and fertilizer used by the City are stored in a building at the Loraine Street Operations Center. This building is in compliance with all regulations regarding the storage of hazardous materials. The Horticulture and Grounds Maintenance section of the PSD is responsible for the application of pesticides, herbicides, and fertilizer. The herbicide "Roundup" is applied annually to City parks and rights-of-way to control unwanted weed growth. PSD personnel, who have been certified and licensed by the University of Tennessee, spray the herbicide. Fertilizer is only used for minor landscaping projects and stormwater runoff from these projects is not considered a threat to receiving water quality.

The City does not currently require registration by commercial applicators; however, commercial applicators must be licensed under State and Federal Regulations. There are no regulations restricting the use of these substances by individual landowners; however, a

household hazardous waste collection facility has been opened to collect all types of hazardous wastes including pesticides, herbicides, and fertilizer.

For pesticide, herbicide, and fertilizer pollutants, the control program is difficult to define since the presence of pesticides, herbicides, and fertilizers in urban runoff is not always evident. Current problems with pesticide, herbicide, and fertilizer pollutants are not believed to be significant. As part of the ongoing stormwater-monitoring program, the City will continue to monitor the significance of these pollutants. Pesticides, PCBs, and nutrients are tested as part of the ongoing monitoring program described in Sections 5.5 and 6.0 of this report. To date, no significant traces of pesticides have been detected in the annual full-suite grab sample.

5.2 ILLICIT DISCHARGES AND IMPROPER DISPOSAL PROGRAM

Program to Detect and Remove Illicit and Improper Discharges to the Municipal Storm Sewer System, 40 CFR 122.26(d)(2)(iv)(B).

ILL-1 Ordinances.

SWMP Task: Evaluate the prohibitions and exemptions of non-stormwater discharges in the original Stormwater & Streets Ordinance. Maintain authority for $5,000 penalties.

Status: Complete (see below).

SWMP Task: Implement any new revisions to the Stormwater and Street ordinance.

Status: Complete

The Stormwater and Street Ordinance was developed to specifically prohibit non-stormwater discharges, increase penalties for illegal discharges, and to provide water quality regulations for new development. The first ordinance was effective June 20, 1997. The ordinance has been updated several times since then. The revised ordinance is available on the Internet at www.cityofknoxville.org/engineering/stormwater.

The ordinance section 22.5-52 specifically prohibits illicit discharges and illegal dumping to any portion of the MS4 or any area draining to the MS4. Illicit discharges were defined according to 40 CFR 122.26(b)(2) as any non-stormwater discharge to the MS4, which is not specifically exempted in the ordinance. This definition, along with the $5,000 penalty for violations, has formed the cornerstone of our successful enforcement program and will remain in place during this permit term.

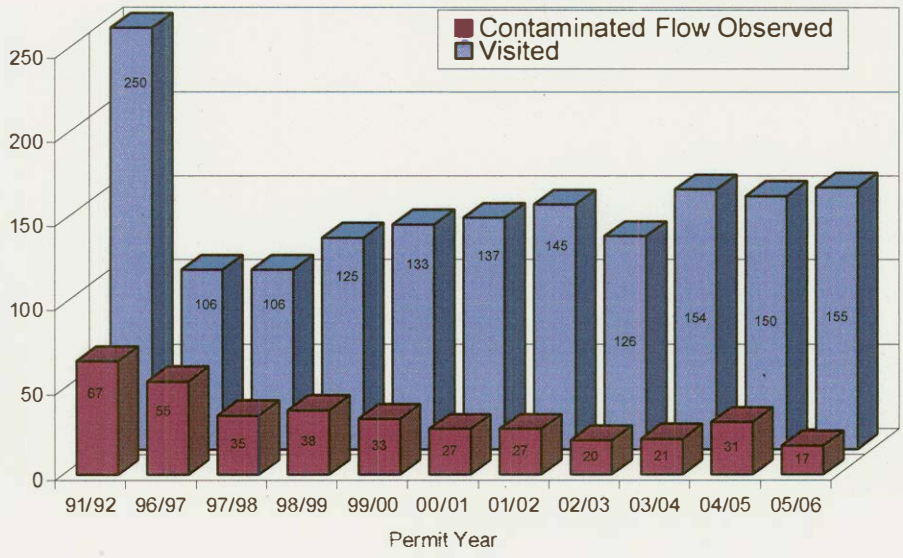
Exemptions to the non-stormwater prohibition are listed in the ordinance in accordance with the list in 40 CFR 122.26(d)(2)(iv)(B)(1). The City added language to the exemption for individual car washing on residential property to include fund-raising washes by non-profit organizations for no more than two consecutive days in duration. The City has reevaluated these exemptions allowed in the CFR but did not make any changes to the current list in the ordinance.

ILL-2 Field Screening

SWMP Task: Perform follow-up analysis at all high-risk screening sites. Status: Ongoing

The Dry-Weather Screening Program was developed and implemented during the first permit term to evaluate both randomly chosen outfalls and high-risk outfalls, which were tested during the previous year. Each high-risk stormwater outfall was checked for flow after a period of dry weather. If flow was present, the discharge was tested with a Chemetrics colorimetric field test kit (shown) for the following parameters: phenols, ammonia, detergents, copper, chlorine, pH, turbidity, color, temperature, and flow rate. If ammonia is greater than one part per million, then a fecal coliform and E-coli sample is collected for laboratory testing. The outfall test was repeated again between four and forty-eight hours after the first test. After one month, this process was repeated for each outfall to complete a total of four tests each year.

Number of Dry Weather Screening Sites



Since this program has successfully identified many illegal dumps and illicit discharges during the first permit term, the City will continue to annually retest all sites that have high parameters or signs of illegal dumping until the outfall is clean during all four annual visits. Once the outfall has tested clean or dry during four site visits in a single year, it will only be retested if randomly selected from the list of inventoried outfalls.

As illustrated by the bar graph, the percentage of high-risk outfalls decreased each year since 1991 except for 2004/2005. The number of high-risk outfalls that need to be retested each year will obviously vary depending on the tested results of the previous year.

As required by Part VI (A)(2)(f)(ii) of the NPDES permit, the results of the dry-weather screening are included in the appendix of this report. Since the beginning of the program, 5861 outfall-screening visits have been conducted. The results from each of those visits are tabulated in the database by outfall identification number, testing date, and visit number. The testing results from the outfall screenings that occurred during the last permit year are included in the appendix of this report.

SWMP Task: Investigate 150 field-screening sites four times per year. Status: Ongoing

To insure that all outfalls are eventually tested each permit cycle, the City will continue to monitor a minimum of 150 outfalls each year throughout the new permit term. Last year the City visited 155 outfalls four times each and one additional outfall was visited twice. The monitored outfalls consisted of the previous year's 31 high-risk outfall sites plus 125 randomly selected outfalls from the general outfall inventory. The randomly selected sites were selected from areas of primarily industrial use and from areas that had not been previously tested. The City also selected outfalls throughout the city with some preference given to the highly developed areas.

The Engineering Division has developed an outfall database to maintain the testing data and site information for each outfall in the inventory. This outfall database is linked to the GIS to allow data access geographically for a single point or by report/query functions for many outfalls at a time. By maintaining a history of each outfall, illicit discharge trends may become apparent and therefore may be resolved with education or enforcement.

The dry-weather-screening program has been one of the most successful programs during the last permit term and will continue to be a high priority throughout this permit cycle.

ILL-3 Investigation of the Storm Drain System

SWMP Task: Implement procedures for mapping, field surveys and upstream source identification. Status: Ongoing

The procedures for mapping, field surveys and upstream source identification were developed and included in the Part II Application section 5.3.5. These procedures were adopted as policy and successfully implemented during the first permit term. The City will continue to utilize these procedures to maintain the effectiveness of the Illicit Discharge and Illegal Dumping Program. These updated procedures were included for the Division's review in monitoring section 6.1.3 of the first annual report in 1997. Last year there were no updates to report for this procedure. If the procedure is updated, it will be included in the following annual report.

SWMP Task: Evaluate and update enforcement procedures, policies, monitoring and inspections. Status: Complete

The schedule for this task appropriately coincided with the schedule for ordinance updates. The existing enforcement procedures and policies have been effective and were not amended when the ordinance was updated in 2005.

Depending on the violation, a first-time offender is usually educated and asked to remediate the damage or correct the violation if possible. This is usually followed up with a letter to inform the violator of the City's expectations and to provide helpful BMPs to prevent future problems. More severe or repeated violations will merit a Notice of Violation (NOV), which is issued in the field directly to the violator if available on site. Copies of the NOV are distributed to the property owner or developer by certified mail, the City Law Department, and the Engineering Division's file. The NOV may order specific remedies and require the violator to submit reports and/or pollution prevention plans. Penalties, if any, are only issued after the NOV expires so the violation and remedies may be fully evaluated.

In the event that a penalty is assessed, a violator may appeal the penalty before a five-member Environmental Appeals Board. The five volunteer members of the Environmental Appeals Board are appointed by the Mayor and consists of individuals with an expertise as follows:

1) One licensed professional engineer with civil engineering expertise.
2) One licensed professional engineer.
3) One representative of the development or industrial community.
4) One neighborhood representative.
5) One member at large.

Board members serve a 5-year term and may be re-appointed at the end of their term.

Some research has already begun to determine appropriate penalties for discharges that cannot be recovered but do not cause a fish kill or other quantifiable immediate damage. The City's current evaluation method does not account for incremental contributions to the overall pollutant loading or degradation of the waterway.

To help identify repeat violators, the City maintains an updated record of every NOV issued and a database for stormwater complaints. Follow-up monitoring and inspections will be a combination of City and self-inspections by industries. Enforcement actions resulting from the dry-weather screening program will be followed as defined within that program as a minimum. Any outfall that is tested for high parameters or identified as an illicit connection/ illegal dump source, will be tested four times a year, every year, until the outfall is dry or clean on all four visits. Sources of pollution identified by other means will be monitored as needed or specified for the individual situation. The ordinance Section 22.5-53 requires immediate reporting of spills and illicit discharges and Section 22.5-54 allows the City to require additional monitoring.

SWMP Task: Inspect stormdrain system and update features on GIS. Status: Ongoing

The City is dedicated to updating and maintaining reliable stormdrain data on the GIS. This task is implemented by a concerted effort within the Engineering Division. All employees are instructed to submit their completed stormwater work orders to a designated GIS analyst for the purpose of updating the GIS stormwater layer. That same analyst personally inspects all new annexations to insure that all existing stormdrain features are added to the system shortly after the parcel becomes part of the city. All new developments require a development certification submitted by a design professional upon completion. The analyst in the stormwater quality group records the stormdrain features from the development certifications into the GIS. Field personnel are instructed to log and report any discrepancies that are found between the maps and actual system in the field. The GIS analyst is responsible for completing the proper updates.

During the first permit term, the GIS analyst and two engineering interns began to systematically inspect the entire stormdrain system by grid to find and correct the parts of the stormwater GIS layer that may be in error. Now that much of this work has been verified and the procedures for maintaining accurate data are in place, the grid-by-grid investigations will be conducted as needed or as part of specific updates for areas of significant development. Because maintaining the integrity of the GIS via field verification is extremely time-consuming, it is reasonable to believe this will be an ongoing task. As the Stormwater program reorganizes staff in year three, a Stormwater Technician may be dedicated to inspections for mapping accuracy and maintenance needs. If this occurs, it will be reported in next year's report.

ILL-4 Spill Response Program

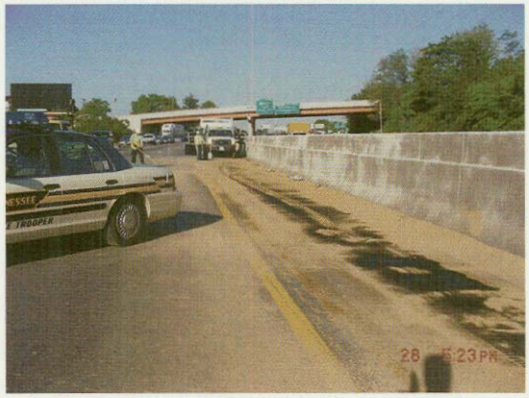
SWMP Task: Coordinate with Knoxville Emergency Response Team (KERT) and TDEC.

Status: Ongoing

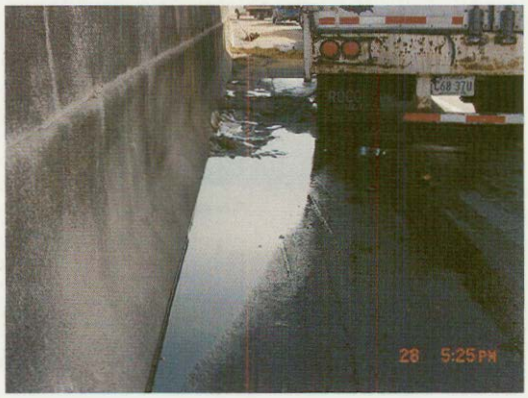
The City of Knoxville Stormwater Quality Section of the Engineering Division continued to coordinate with both the KERT and TDEC during emergency situations. Each agency has specific roles to play during an emergency event. When discharges enter the MS4, the City's Stormwater Quality Section assists with information gathering, investigations, GIS support, containment, remediation, follow-up monitoring, and enforcement when necessary.

The Knoxville- Knox County Emergency Management Agency (KEMA) and Knoxville Fire Department (KFD) coordinate most major spills when they are called in to 911. KEMA also coordinates routine training and simulations for various situations throughout the year. Workshops are provided to simulate real scenarios and allow coordination of the field teams and the Emergency Operations Center (EOC). Engineering Division staff participates in the EOC while the KEMA, KFD, Police Department, and Rural Metro units perform the field exercises.

The KFD and Engineering Division coordinate to respond to small spills and possible hazards as they are reported. The two groups will continue to work closely together to contain and remediate discharges in the street, stormdrain system, creeks or wherever necessary. The KFD maintains a fireboat downtown on the waterfront and a Hazardous Materials truck in one fire hall to assist with spills and signification discharges into the river, creeks or stormdrains.



When a responsible party is identified for a spill or hazardous discharge, the Engineering Division staff will follow normal investigation and enforcement procedures to order the containment and remediation at the violator's expense. The HAZMAT team will work to contain the spill until the responsible party takes over. The City's HAZMAT team will then report back to the station to be ready for the next emergency while the Stormwater Section personnel monitor the remediation of site until the stormdrain and creek are restored.



Last year, the Stormwater staff responded to assist the Fire Department with a variety of spills including traffic accidents that lost fuel, illegal dumping, and discharges from permanent facilities. The small releases from accidents and illegal dumping were contained by the Fire Department and Stormwater management staff. Stormwater staff and/or Service Department will remove and dispose of the materials from the small spills. Larger spills are typically referred to a private remediation company.

One recurring after hours release identified a leaking fill-line at a fuel station. The

cooperative effort between KFD, Stormwater, TDEC and the station management prevented the fuel leak from continuing to discharge into the stormdrain and stream. A groundwater treatment and vapor recovery system has been installed along with new watertight stormdrains to prevent future discharges.

Engineering staff will continue to closely coordinate with other emergency personnel by attending the monthly Local Emergency Planning Committee meetings and by maintaining a staff member on call after hours and on weekends to help respond to water quality emergencies.

ILL-5 Reporting of Illicit Discharges

SWMP Task: Maintain and monitor the "Water Quality Hotline" for public reporting.

Status: Ongoing

The Water Quality Hotline for public reporting of water quality concerns was established as planned during year one of the first permit term. The hotline was operational in November of 1996 but did not receive mass publicity until December 1996. The hotline phone number is a local Greater Knoxville Area number listed in the blue pages as follows:

WATER QUALITY HOTLINE-
To Report Illegal Dumping Into Ditches
Creeks Or Catch Basins 24-Hours/Day.....[865] 215-4147

The hotline has received a variety of calls including: industrial discharges, gray water discharges, broken laterals, commercial washing, and neighbors dumping, etc. The hotline has been a popular and convenient method for callers to anonymously report problems that they have witnessed or created. Common calls are from neighbors or dissatisfied employees of polluters. This program has been very successful and will be continued throughout the permit term.

The Water Quality Hotline is a dedicated phone line attached to a phone in the Stormwater Quality Section of the Engineering Division. Employees in the section also have the hotline linked as a second line on their individual office phones so anyone may answer the phone during the day. After hours and on weekends, the messages are recorded and routinely retrieved by the on-call supervisor. If the water quality concern is within the City limits, the Engineering Division investigates the problem. Otherwise, the problem is referred to the Knox County Health Department, TDEC Environmental Assistance Center, or other appropriate agency.

The objective of this task is to increase the public awareness of the City's role in water quality issues and to create a quick and anonymous method for citizens to report water quality concerns. The publicity of the hotline has already provided a consistent and convenient resource for concerned citizens.

The City includes the hotline number in thousands of mass produced stormwater pollution prevention educational handouts such as magnets, brochures, presentations, business cards, and routine correspondence with residents. The hotline is prominently displayed at the bottom of the Second Creek watershed boundary road signs to let travelers know where they may report water quality concerns.

Recently, the Hotline was advertised by placing the number on the plastic stormdrain markers, which are placed on curb iron inlets. Although the curb iron markers have been used for years, this custom design helps identify the markers specifically for Knoxville. The City will continue to seek out and develop innovative methods to advertise this successful program as a

method for citizens to anonymously report complaints. Future opportunities to advertise may include: utility bills, public access TV, radio PSAs, signs on city buses, refrigerator magnets, pamphlets, brochures, BMP manual CDs, permits, etc. The innovative methods of publicity will vary each year as opportunities are developed.

SWMP Task: Maintain public education program. Status: Ongoing

River Rescue

The year 2006 was the 17th year for the River Rescue. The spring 2006 River Rescue attracted 650 volunteers who collected 12 tons of trash and tires from the shores of the Tennessee River. This annual event is coordinated through Ijams Nature Center in cooperation with the City of Knoxville and Sea Ray Boats and more than 20 other partners, including members of the business community, government agencies, private organizations, and individuals. There are over 30 sites or "zones" that stretch from the forks of the river above Knoxville to Fort Loudoun Dam. River Rescue is also held in partnership with Lake User groups on Watts Bar Lake, Melton Hill Lake, and the Clinch River. Ijams Water Quality Specialists plan for this event throughout the year by recruiting volunteers, surveying riverbank conditions, securing additional sponsors, and pinpointing areas in need of cleanup.

Operation Storm Drain

The Blue Thumb Coalition started this ongoing program in 1994 in an effort to educate the public that there is a difference between the stormdrain system and the sanitary sewer. Operation Storm Drain attempts to reduce the amount of pollutants dumped into our waterways through education instead of enforcement.

The message "DUMP NO WASTE, DRAINS TO STREAM" was stenciled on over ten thousand storm drains earlier in the first permit term. In the last few years, the City replaced the stenciling program with plastic curb markers. These brightly colored plastic disks are affixed to the curb irons and carry the message "Dump no Wastes, Drains to Stream". Although the curb markers are a temporary retrofit for the existing storm drains, they are more economical and environmentally friendly since they do not wear off as quickly as the painted stencils. When the disks were first introduced, volunteers and City staff placed several thousands of markers on storm drains in the city. Currently, several hundred of the informational disks are purchased and distributed to volunteers each year to attach to curb irons. A local company recently revised the disks to include the Water Quality Hotline phone number and some Spanish text. Self-adhesive backing also helps volunteers place the disks quickly.

In January 2000, a permanent version of this educational program was initiated. The City has adopted a new development standard for all new curb irons and solid stormwater manhole covers (see task in RC-2). The new standard requires the iron to be cast with the educational message included on top of all new curb irons and solid manhole lids. In an effort to make the curb irons more eye-catching, several foundries have cast into the iron a graphic of a fish in addition to the environmental message. The foundries offer these designs to the surrounding communities to simplify their stock requirements. This program should offer long-term educational benefits as citizens become familiar with the message and it's meaning.

Water Quality Forum

The WQF is a consortium of agencies, organizations, academic institutions, public utilities, and interested citizens working to protect and restore the waterways in Knox and the eight surrounding counties. It was initiated by the City of Knoxville in 1990. Currently it has twelve dues paying Partners; the City, TVA, Ijams Nature Center, Knox County, UTK-WRRC, the Town of Farragut, KGIS, the Knox County Soil Conservation District, KUB, the Sevier County Water Board, The League of Women Voters, and the Hallsdale –Powell Utility District. There are numerous other stakeholders, who attend the quarterly meetings ranging from concerned individuals to agencies from other counties seeking information and guidance.

Adopt-a-Watershed

Currently, fifteen area high schools and middle schools are participating in the program. The Americorps volunteers coordinate the program with the individual schools. This program has helped implement the goals of the NPDES program and increased public awareness of water quality issues. The primary goals of the Adopt-a-Watershed program include:

- Characterizing the school's watershed using, at minimum, two AAW characterization tools (e.g., watershed inventory, watershed mapping, windshield survey, stream walk).
- Monitor the school's watershed stream(s), conducting, at minimum, chemical testing twice and a biological (i.e. macroinvertebrate and/or fish) assessment once.
- Conduct at least one water quality improvement activity (e.g., tree planting, storm drain stenciling, stream cleanup, stream bank restoration, presentations to school groups/community organizations on the "state of the watershed" as determined by the students' characterization/monitoring efforts).

The City will continue working with the schools and provide support such as information, solid waste support for cleanups, GIS maps, stencils, testing supplies, training, and grants.

Adopt-A-Stream

The City of Knoxville, in conjunction with Knox County and The Town of Farragut is in the fifth year of administering the Adopt-A-Stream program. In the past fiscal year we have trained 13 Adopters and six volunteer coordinators in the AAS program. They have performed over 10 creek clean-ups and other evaluation and education programs on their section of creek. The City has provided the supervision and training in addition to gloves, trash bags, pitchforks, wheelbarrows, waders, and other tools for these activities.

Clean, Protect and Restore (CPR)

This annual project coordinated by the Americorps Volunteers with the assistance of the Water Quality Forum, coordinates creek cleanups at seven sites throughout the City of Knoxville in October. The projected collected 4.5 tons of trash, with 55 volunteers, and logged in over 115 volunteer hours.

Stock Creek Watershed Initiative

The Stock Creek Watershed Initiative (SCWI) was established in 2002 under the direction of the Water Quality Forum to assess Stock Creek conditions, prioritize problems, educate and involve residents, and implement solutions.

The following agencies have made significant contributions to Stock Creek Watershed protection projects and will continue to do so during the implementation of this project: City of Knoxville, Knox County Soil Conservation District, Knox County, Knox-Chapman Utility District, KGIS, MPC, Little River Water Quality Forum, Little River Watershed Association, NRSC, TDEC, EAC, TVA, USGS and UT.

The 21 square mile Stock Creek Watershed, a sub basin of the Little River Watershed, is located in the southern part of Knox County with a small portion in Blount County. Stock Creek is experiencing degradation related to development and land use. Significant progress has been made in the areas of building partnerships, educating citizens, assessing conditions and identifying pollution sources over the last three years. Last year the partners in the WQF developed and printed an education brochure on failing septic systems. In order to focus our efforts and ensure development of a comprehensive plan that has community buy-in and support, we are requesting funding in this proposal to validate existing modeling data through visual assessments, involve stakeholders in a participatory planning process and write a watershed restoration plan for Stock Creek. This plan will be based on EPA's Nine Components of Watershed Plans and the Center for Watershed Protection's (CWP) Eight Tools of Watershed Protection.

Public Displays And Presentations

In cooperation with the COK Solid Waste Office staff presented displays and informational materials at several public events including the Dogwood Arts Festival Home Show, Ivan Allen Annual Pumpkin Contest, and Earth Day Celebration. Various environmental presentations were also made to citizens through groups such as the Kiwanis Club, Boy Scouts, and University classes.

WaterFest

WaterFest is an annual festival designed to educate youth about the many values of water. It was initiated in 1995 by the Water Quality Forum (WQF) and has grown into an event with hundreds of elementary and middle school children attending from across Knox County. Ijams Nature Center hosts and coordinates this springtime event that is planned by forum partners throughout the year. It is designed to be fast-paced, engaging, educational, entertaining and just plain fun for the students. On the day of this event, WQF partners come together to make WaterFest happen. The CAC Americorps Team takes the lead in conducting games, arts and crafts and model-building activities with the students. Storytellers and musicians engage students in audience participation performances and forum partners run informational/demonstration booths. Local high school and university students provide great volunteer support.

City Employee Training

Status: Ongoing

The City purchased a stormwater pollution prevention video from Excal Visual to train City employees. The eighteen-minute long video outlines BMPs for stormwater pollution prevention and has been shown to two hundred & sixty four City employees in six different departments. To learn more about the video, go to www.excalvisual.com.

Waterworks

In 2005, the City partnered with other local municipalities and participated in the Waterworks clean water campaign. The television and radio announcements concentrated on stormwater pollution activities and featured the City's Water Quality Hotline number. To learn more about the Waterworks program, go to www.tennesseewaterworks.com.

ILL-6 Used Oil & Toxic Materials Program

SWMP Task: Continue coordination of Recycling Program. Status: Ongoing

The Solid Waste Division manages the City of Knoxville's recycling program. The entire annual report of these programs is included in the appendix of this report.

SWMP Task: Maintain and Operate Household Hazardous Waste Facility. Status: Ongoing

The City continues to operate the Household Hazardous Waste (HHW) Collection Center, which first opened on April 22, 1997. This is the first permanent HHW Collection Center in the State of Tennessee, which is open five days a week. The center accepts HHW from both Knoxville and Knox County residents. Knox County shares the annual costs of operation. The capital expenditures associated with construction of this facility were paid for through a $500,000 grant from the State of Tennessee. Activities at the center include:

- diverting reusable products;
- collecting, blending and recycling latex paint;
- collecting car batteries, oil and antifreeze;
- diverting selected acid and bases to waste water treatment;
- bulking flammable materials; and
- packing miscellaneous HHW materials for safe shipment and disposal.

Upon entering the HHW Collection Center, individuals pull into a covered drive-through where staff removes HHW from vehicles. Material that is collected and is still "good" is separated and made available for pickup by the public free of charge. "Good" material includes containers that have never been opened or material that has not exceeded its useful shelf life. The staff then processes materials that are not reusable. This includes testing of unknown materials, diverting selected acids and bases to the wastewater treatment facility, bulking flammable materials, lab packing, and blending paint. Latex paint is reconditioned at the facility and is used by the City and sold wholesale to local thrift stores and other groups. After materials are processed, they are packed into 55-gallon drums, which are placed in one of two prefabricated storage units. Each of these units has a special fire suppression system, and drainage/spill containment systems. The hazardous materials are then stored in the units and held until sufficient quantities are collected. The City has hired a chemist and two technicians to operate the collection center.

5.3 THE INDUSTRIAL AND RELATED FACILITIES PROGRAM (IN).

Program to Monitor and Control Runoff from TSD and Industrial Facilities Subject to SARA Title III, Section 313, requirements, 40 CFR 122.26(d)(2)(iv)(C).

IN-1 Ordinances

SWMP Task: Evaluate and implement revisions to the prohibitions and exemptions of non-stormwater discharges in the existing Stormwater & Streets Ordinance. Status: Complete

The Stormwater and Street Ordinance was developed in 1996 to specifically prohibit non-stormwater discharges, increase penalties for illegal discharges, and to provide water quality regulations for new and redevelopment. The ordinance was updated in 2005 but the non-stormwater discharge prohibition was not altered. The current Stormwater and Street Ordinance was included in last year's report and may be accessed on the Engineering Division's web page at www.cityofknoxville.org/engineering/stormwater.

The ordinance section 22.5-52 specifically prohibits illicit discharges and illegal dumping to any portion of the MS4 or any area draining to the MS4. Illicit discharges were defined according to 40 CFR 122.26(b)(2) as any non-stormwater discharge to the MS4 except those discharges pursuant to a valid NPDES permit, firefighting, or specifically exempted in the ordinance. The exemptions were copied directly from the list of possible exemptions in the CFR with the addition of charitable car washes for no longer than two days duration. This definition, along with the $5,000 penalty for violations, has formed the cornerstone of our successful enforcement program and will remain in place throughout the permit term.

IN-2 Inspection Element

SWMP Task: Develop inspection program for non-permitted commercial facilities (i.e. car lots, restaurants, service stations, grocery stores, etc.). Status: Complete

Over the course of the first permit term, the City has identified many common discharges from facilities that were not required to be permitted under the TDEC multi-sector general stormwater permit or individual NPDES permit program. Rather than spend limited resources attempting to duplicate the efforts of TDEC and EPA by monitoring existing permitted facilities, the City added a Special Pollution Abatement Permit (SPAP) program for those specific land-uses that have proven to cause polluted runoff problems. This program has been developed to fill in the gaps in the existing permit programs of those agencies with a local inspection program for otherwise non-permitted facilities.

In past years, the City had benefited from industrial inspections that were performed by another agency during their pre-treatment inspections. The City had proposed but had not replaced that program entirely with an alternate program to be performed by City staff. This deficiency was identified during the TDEC NPDES permit inspection conducted in July 2004. In response to the audit, the City added a new Stormwater Technician to perform additional education and inspections for industry and certain commercial areas. The new technician started work in March 2005 and completed 50 industrial and commercial facility inspections on sites

that currently have a Special Pollution Abatement Permit (SPAP) in year one. In year two, 25 sites were inspected. A complete list of the facilities that were inspected during this permit year can be found in the appendix.

Each of the SPAP facilities is required to have some type of structural stormwater treatment device (i.e. oil/water separators, catch basin insets, sand filters, grass swales, etc.) in addition to their pollution prevention management controls. During the SPAP inspection, the City normally reviews the facilities maintenance records, provides technical advice on proper maintenance scheduling, records the devices GPS coordinates if needed, and updates the City's industrial and commercial facilities database. Inspection of the SPAP permitted facilities will occur systematically to insure that the structural controls are maintained and the management controls are being followed.

In addition to inspections of sites that have SPAPs, the City will select for inspection some existing sites that were built before the SPAP program was implemented. These sites will be targeted for education rather than enforcement to bring the sites into compliance using proper BMPs from the City's manual. Other commercial site inspections will need to be performed in direct response to specific complaints from citizens or tips from the water quality hotline. The City will decide on a case-by-case basis whether this group of inspections will use education or enforcement to correct any problems found. In some cases, the old facility may be required to apply for a SPAP to correct violations.

The inspection program will focus on performing routine and/or random inspections on a variety of commercial sectors. The inspectors can work with the business to develop site-specific pollution prevention plans, employee training and structural modifications, if needed. The City's BMP manual has a wide assortment of information for a variety of businesses. Since these businesses are not regulated in a permit program now, many of the operators are not focused on how their actions impact water quality in the area streams.

Section 22.5-37 of the ordinance requires a Special Pollution Abatement Permit (SPAP) for certain land uses and Section RC-2 of this report provides more details on this program.

SWMP Task: Collect and analyze NOIs from Industrial Permit applicants. Status: Ongoing

When the NOIs are received from TDEC or directly from the private industry, the City reviews and evaluates the information for potential impacts to the municipal storm drain system. In the past, the NOIs have been instrumental in locating and removing discharges from local industries. During inspections or enforcement actions with an industry, the City will verify that an NOI has been filed. If an NOI has not been filed, the City will coordinate with TDEC to obtain the NOI. Future NOIs may be obtained annually from TDEC in bulk or electronically.

SWMP Task: Identify potential industrial discharges through Illicit Connection and Improper Disposal Program. (Both stormwater & non-stormwater discharges). Status: Ongoing

The illicit connection and improper disposal program defined in the City's Part II NPDES stormwater permit application and in the previous section of this report, primarily addresses runoff from industrial facilities. The majority of dry weather screening occurs from areas of industrial use or outfalls indicated by a "300" in the identification number. Illicit connections or improper disposal from industrial facilities that are discovered while inspecting the storm drain

system under this program are recorded in the facilities' file in the database. The City contacts the industrial facility directly, along with TDEC if necessary, to identify the problem and work on an appropriate solution. If enforcement action is necessary, the City will track the situation until the illicit connection is corrected, the illegal dumping stopped, or until the facility receives a valid NPDES permit for the discharge.

In addition to the illicit connection and improper disposal program inspections, the City routinely performs inspections at commercial and industrial sites through a random selection process using the MPC inventory of industrial space and in response to citizen concerns reported to the water quality hotline. Some inspections have occurred as the City gained experience with common sources of pollution. Areas such as loading docks, food distributors, fuel storage/sales, restaurants, and car lots have become reoccurring areas for enforcement. These areas are now being targeted for education and inspection to prevent discharges. Some of these land uses are targeted during the pre-development phase with the Special Pollution Abatement Permit (SPAP) process described in section RC-2 of this report. The SPAP will be refined as an ongoing pollution prevention program throughout the permit term.

SWMP Task: Review and update inspection program as part of Pollution Prevention Plans for Municipal Industrial Facilities. Conduct annual inspections at MIFs. Status: Ongoing

During the first permit term, the City developed an inspection and pollution prevention program for municipal industrial facilities. Currently only four municipal industrial facilities are operated in the City. These facilities include:

- the Solid Waste Management Facility (SWMF) on Elm Street,
- the fleet truck & heavy equipment garage on Loraine Street,
- the fleet and police garage at Prosser Road, and
- the Knoxville Area Transit (KAT bus station) on Magnolia Avenue.

Each facility has been evaluated and inspected regularly by Engineering personnel during the first permit term and will continue to be inspected at least annually in the future. Since the bus terminal is owned by the City but managed by KAT, they developed their own PPP, which was submitted in the first annual report in 1997.

Some structural pollution control measures have been implemented at several MIF sites. The KAT bus station installed two large Stormceptor stormwater treatment devices in November 1999. The total project cost was nearly $300,000. A strip of the concrete parking lot along First Creek was removed and replaced with a new slope directed away from the creek. The reversed slope and a large curb prevent the runoff from entering First creek directly. The runoff is now routed through the two oil/water separators before being discharged. Other measures at KAT include their commitment for ongoing upgrades to their fleet and fuels to produce less air and water pollution.

During the NPDES permit inspection conducted by TDEC at the beginning of year one, the KAT facility was visited. After discussing the maintenance and repair of the structures, the KAT scheduled Enterprise Oil, Inc. to perform the necessary maintenance of both structures during year one. The largest structure near the intersection of Jessamine Street and First Creek appeared to be leaking water, which may prevent optimal performance. KAT contracted with a company to find and repair the leak in year two. The repair required a man to be lowered into the Stormceptor, find the leak, and plug the hole. The contractor found and documented a leaking

lift hole. That lift hole was plugged with a series of materials to insure a permanent watertight seal. After the City purchased these units in 1999, Stormceptor started using embedded hooks instead of lift holes in their units to prevent leaks in their current models.

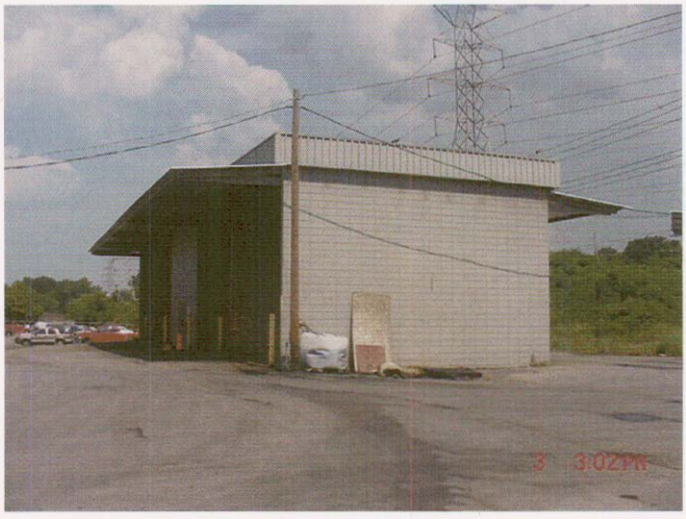
The SWMF has installed some above ground filters and catch basin inserts to mitigate potential pollution. The entire transfer facility is covered and the drain in the loading dock for the transfer trucks is routed to the sanitary sewer system. At the end of year two, the City's inspection of the SWMF identified several areas for improvement and began working on a plan. A draft Stormwater Pollution Prevention Plan has been included in the appendix of this report but is still being reviewed in year three. The final SWPPP will be included in the annual report for year three. The SWPPP includes provisions for structural controls, retrofits, employee training, routine maintenance, inspections, and monitoring. Soon after work began on the new SWPPP, the City started closing the SWMF on Wednesday afternoons to allow complete site maintenance, inspection, and employee training.

Both maintenance garages have adopted spill protection policies and all mechanical work is done inside. A hydrocarbon absorbent boom is maintained in a trench drain at the police garage as a secondary control for emergency spills.

The TDEC inspection of the Loraine Street facility revealed two areas of concern. The large parking lot where all of the heavy equipment, truck, and trailers are parked receives a concentrated amount of oil/grease drippings and debris, which may be washed into the storm drain system during rain events. The car wash facility did not seem long enough to adequately handle the longest truck/trailer combinations in the City fleet.

To improve the quality of stormwater runoff from the entire facility, a stormwater system retrofit project was designed to add two underground stormwater treatment structures at the outfall from the Loraine Street facility. Construction was completed in the summer of 2006. The retrofit successfully updated the facility to comply with the new ordinance requirements for vehicle storage and maintenance facilities. The two stormwater treatment units were installed in parallel to allow the City to perform full-scale performance study on more than one type of stormwater treatment BMP. Both units appear to be functioning properly. However, the effluent pipe from one of the units did not protrude as designed to provide free fall for sampling. Monitoring should begin in year three as soon as the slight modification can be completed.

Capital funds for design and construction of the car wash extension project were approved for the 2005-2006 budget. The project did begin in year two. The roof over the wash bays was extended a total of twenty feet (ten foot on either side of the existing building). The trench drains inside the drip edge of the new roof are under construction in year three. Once completed, all washwater will be routed to a grit chamber before discharging to the sanitary sewer. The project will be complete in year three.



IN-3 Monitoring Element

SWMP Task: Collect monitoring data from industrial stormwater dischargers and/or from TDEC. Assess impacts to the storm drain system. Status: Ongoing

As part of the NPDES Permit for stormwater discharges associated with industrial activity, applicants are required to monitor, at least bi-annually, representative stormwater outfalls identified on the facilities' Pollution Prevention Plans. Applicants must monitor in accordance with TDEC Rule 1200-4-10-.04. The City currently receives copies of the results of the industrial outfall self-monitoring from some of the regulated industries. The City will continue to work with TDEC or directly with the industrial discharger to obtain copies of the information, as it becomes available. The City will maintain this information in the City's industrial files, and will assess the impact of the monitored discharges on the water quality of the storm drain system as the City receives the data.

If the City determines that additional data needs to be provided in the monitoring program for an industry (reports on additional parameters, etc.), requirements for an expanded program for subsequent monitoring events will be coordinated with TDEC and/or the industrial discharger.

The Stormwater and Street Ordinance authorizes the City to require additional monitoring from industries not covered under the TDEC programs whenever necessary. This will usually be required in conjunction with some enforcement action after a problem has been observed.

SWMP Task: Develop ongoing monitoring program at non-permitted commercial facilities using guidelines pursuant to 40 CFR 122.26(d)(2)(iv)(c)(2). Identify pollutants/sources as applicable.
Status: Complete

In the first permit cycle, the City's Ongoing Monitoring Program, defined in the Part 2 NPDES stormwater permit application, included the monitoring of stormwater runoff from two areas of industrial facilities (e.g. industrial parks). Stormwater samples were collected, analyzed, and recorded for 12 to 15 storms per year per site using flow weighted composites from ISCO monitoring stations. Each of the monitoring locations received runoff from small watersheds approximately 1/4 square mile with several different industries included. Therefore specific pollutants were not easily traced back to a specific industry but the general data did allow implementation of industry wide BMPs requirements through the SPAP program.

In addition to the stormwater sampling above, all outfalls from industrial areas have been tested as part of the dry weather field-screening program to identify potential specific sources of the pollutants. Each year the City will continue to choose random outfalls from industrial areas as the primary dry weather screening locations. These outfalls are tested with field screening kits with additional laboratory tests as necessary.

Additional monitoring and reports from TSDs and industrial facilities subject to SARA Title III, Section 313 may be required when a problem has occurred, when the City has reason to believe a pollution problem exists, when TDEC or EPA do not already require sufficient testing, or if the City is mandated to test and report those facilities. The Stormwater & Streets ordinance Section 22.5-54 states, *"The Engineering Director may require any person engaging in any activity or owning any property, building or facility (including but not limited to a site of industrial activity) to undertake such reasonable monitoring of any discharge(s) to the*

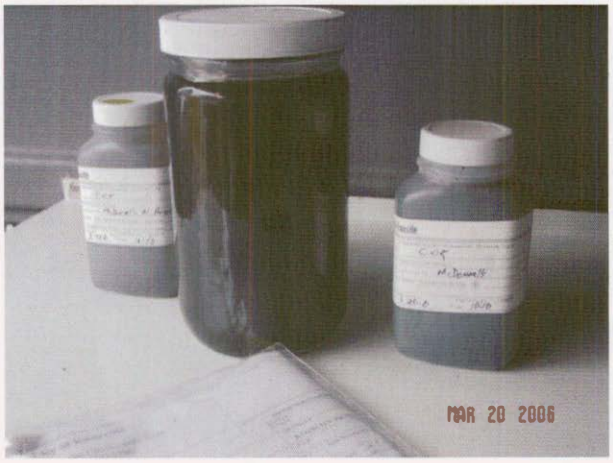
stormwater system operated by the City and to furnish periodic reports of such discharges." The City will maintain this legal authority to require monitoring from all facilities necessary as the Stormwater & Streets ordinance is updated throughout the permit term.

To replace the monitoring by the City on specific permitted industries or industrial homogeneous land uses, the City has begun experimenting with some passive samplers on commercial sites that do not require TDEC or EPA permits. The land uses that require a City of Knoxville Special Pollution Abatement Permit (see section RC-2) will be targeted for samples. The standard operating procedures for the City's wet-weather sampling program will be used except for the automatic sampler stations. The City will modify the passive samplers in the field as problems arise or resort to grab samples.

A wide range of pollutants will be sampled initially from the hotspot land uses until a standard set of expected pollutants can be identified. These pollutants should vary from one land use to the other. For example, restaurants and grocery stores will likely have runoff containing a higher nutrient load from their dumpster/grease bin area than a new auto dealership. Both will likely have oil/grease, sediments, and metals from the vehicle traffic. This monitoring data may play an important role in determining the future direction of the SPAP program. The suitability and effectiveness of the SPAP controls have been questioned by several sources already.

SWMP Task: Implement the ongoing monitoring program at non-permitted commercial facilities and analyze the results from ongoing commercial monitoring program.

Schedule: Begin after 12 months.



During year two, the City sampled the storage and maintenance areas at the City's Loraine Street facility, Solid Waste Management Facility, and the KAT bus station.

Samples were also taken at five non-permitted commercial facilities. Restaurants were targeted this year (see photo) but the commercial group may change each year to allow a broader range of study. The sampling locations will change each year to ensure a wide variety of sites within each commercial group.

SWMP Task: Maintain adequate legal authority to require monitoring and reports from TSDs and Industrial facilities subject to SARA Title III, Section 313. Schedule: Ongoing

The Stormwater & Streets ordinance Section 22A-54 states, *"The Director of Engineering may require any person engaging in any activity or owning any property, building or facility (including but not limited to a site of industrial activity) to undertake such reasonable monitoring of any discharge(s) to the stormwater system operated by the City and to furnish periodic reports of such discharges."* The City will maintain this legal authority to require monitoring from all facilities necessary if the Stormwater & Streets ordinance is updated in the next permit term. Additional monitoring may be required when a problem has occurred or still exists, when the City has reason to believe a pollution problem exists, when TDEC or EPA do

not already require sufficient testing, or if the City is mandated to test and report those facilities.

SWMP Task: Evaluate and update the monitoring program for Municipal Industrial Facilities.
Status: Ongoing

The City has implemented limited testing at these facilities including ambient monitoring, dry-weather screening, and industrial stormwater inspections conducted by the Engineering Division. Initial monitoring inspections resulted in some of the structural modifications mentioned above in section IN-2 as well as some management policies and procedures. The City evaluated the current monitoring at MIFs and updated the plan to include some laboratory analysis to help evaluate the effectiveness of the installed structural controls. For example, the large Stormceptors that were installed at the bus terminal may be monitored with a before and after treatment sample to determine the removal efficiency of that BMP.

The Loraine Street facility is be the site for a full-scale side-by-side BMP investigation project. Before and after samples will be taken from each of the structural devices to determine the efficiency of each unit. Two different stormwater treatment device manufacturers have donated their BMPs for testing. The City completed installation of the test site in year two and will begin sampling in year three. Obviously, the dry-weather screening program will continue to monitor these outfalls to insure that management controls are sufficient.

The draft SWPPP for the Solid Waste Management Facility is included in the appendix of this report. The City plans to conduct routine monitoring of the SWMF as part of the SWPPP.

SWMP Task: Manage and Conduct Monitoring Program at MIFs. Status: Ongoing

The monitoring program for the municipal industrial facilities was developed during the first permit term and included in the first annual report. The program specified that the only municipal industries included in the City's monitoring program will be limited to the Knoxville Area Transit station, the Prosser Road fleet and passenger vehicle garage, and the Loraine Street maintenance and storage facility. However, the City added additional monitoring and testing of the parking lot runoff from the Solid Waste Management Facility (SWMF) on Elm Street during the first permit term. This monitoring program was developed as a Best Management Practices test site to evaluate the usefulness and effectiveness of catch basin filters on ultra-urban land uses. The City partnered with the University of Tennessee Civil & Environmental Engineering Department and with Aqua Shield to put two catch basin filters in place. One filter was installed at the SWMF and one was located on Phillip Fulmer Way outside Neyland Stadium.

A BMP sampling project will begin in 2007 at the Loraine Street Facility. Two vault type stormwater treatment units were installed side-by-side at the Loraine Street facility in 2006.

Each year, the MIF outfalls are inspected at least once for non-stormwater flow in dry weather. If flow is observed, the normal dry weather screening parameters are analyzed, recorded, and investigated. In addition to the dry-weather screening in year two, grab samples were collected from storage/maintenance areas at the City's Loraine Street facility, the Solid Waste Management Facility (twice), and KAT bus station.

5.4 CONSTRUCTION SITE RUNOFF PROGRAM (CS).

Program to Implement and Maintain BMP Plans to Reduce Construction Site Runoff to the Municipal Storm Sewer System, 40 CFR 122.26(d)(2)(iv)(D).

CS-1 Site Planning

SWMP Task: Review & update the Stormwater & Streets Ordinance which requires construction sites greater than 10,000 sq. ft. to submit Erosion and Sediment (E&S) Control Plans.

Status: Complete

The original Stormwater and Street Ordinance was passed in 1997 and specifically required construction sites greater than 10,000 square feet to provide erosion and sediment control plans. The ordinance was revised in 2005 but the requirement for erosion control plans was not removed. The current ordinance may be reviewed or downloaded on the Internet at www.cityofknoxville.org/engineering/stormwater. This requirement is satisfied in Section 22.5-27(j)(1) of the ordinance.

SWMP Task: Require Site Plans Submittals per the City of Knoxville BMP Manual.

Status: Complete

The Stormwater and Street Ordinance requires all erosion and sediment control plan submittals and all site development work to comply with the Erosion and Sediment Control Handbook produced by TDEC, dated March 2002, or as amended by TDEC or its successor, or the City of Knoxville's Best Management Practices Manual, whichever is more restrictive.

SWMP Task: Review and update minimum criteria for plan review and checklists.

Status: Complete

Although the TDEC Erosion and Sediment Control Handbook does provide a checklist for review of Erosion and Sediment Control Plans, the City developed a list of minimum criteria to supplement the State checklist for various categories of site plans (residential, commercial, etc.). The City plans review staff uses the minimum criteria and checklists to insure consistency in the plan review process. The checklist is available on the Stormwater section's web page at www.cityofknoxville.org/engineering/ldmanual as part of the Land Development manual.

SWMP Task: Continue Pre-construction Assistance Meetings with Developers and Contractors.

Status: Ongoing

Since 1999, the City of Knoxville requires a Pre-construction Assistance Meeting with the Developer, contractors, design Engineers, and the City staff before a Site Development Permit is issued. This meeting is scheduled after the Site Development plans are ready for approval but before construction begins. The meeting insures that all parties involved with the

construction project are equally aware of the City's expectations. Topics covered in the meeting may include:

- The Development Inspection Checklist,
- The Stormwater & Streets Ordinance,
- The Engineering Department Enforcement Policy,
- Construction Best Management Practices,
- Inspection Schedules,
- State of Tennessee Erosion & Sediment Control Handbook,
- The City of Knoxville BMP manual,
- Special notes and considerations for the particular site,
- Other important information relevant to the project, and
- The City inspector, which is assigned to the project.

The Pre-construction Assistance Meeting format will continue to be reviewed and updated throughout the permit term as new policies, procedures, BMPs, and other regulations necessitate. Since the assistance meetings have been successful at increasing compliance and reducing enforcement, they will be continued throughout the permit term.

CS-2 BMP Requirements

SWMP Task: Require Construction BMPs from the City BMP manual or equivalent.
Status: Complete

As outlined in the new Stormwater and Street Ordinance section 22.5-27, all erosion and sediment control plans must comply with either the Erosion and Sediment Control Handbook produced by TDEC, dated March 2002, or as amended by TDEC or its successor, or the City of Knoxville's Best Management Practices Manual, whichever is more restrictive. The requirement to use BMPs from the BMP manual or TDEC manual applies to Utility, Single Family Residential (>10,000 s.f), Large Residential and Commercial Developments.

SWMP Task: Evaluate additional BMP requirements and design modifications. Maintain the updated BMP requirements on the City's web page. Status: Ongoing

The Stormwater and Street Ordinance section 22.5-22 authorizes the Engineering Division to compose a development design manual as the standard for which the ordinance requirements will be met. The BMP manual may be accessed on the Stormwater Section's web site at www.cityofknoxville.org/engineering/stormwater.

The guidance criteria in the new manual describe acceptable types of BMPs, design standards, and maintenance requirements for BMPs to be used throughout the City to meet the requirements of the new Stormwater and Street Ordinance. The guidance criteria are maintained on the Internet and distributed to developers as the official reference to ensure proper selection, design and maintenance criteria for BMPs. To ensure that effective post-development BMPs are constructed and maintained in the City, a standard maintenance covenant is executed before site development plans are permitted. The guidance criteria address the goals of the NPDES stormwater program by allowing only BMPs, which are effective in reducing the targeted

pollutants.

The BMP manual was intended to be a live manual with updates to add additional BMPs as necessary and to remove ineffective BMPs when appropriate. Maintaining the manual on the web is the easiest method to keep the manual current and available to the public.

SWMP Task: Continue to require construction site Good Housekeeping practices.

Status: Ongoing

To ensure that construction sites are kept clean and orderly, and to minimize pollutants in stormwater runoff as a result of other construction activities, the City will continue to require good housekeeping measures on all active construction sites. The good housekeeping regulations included in the new BMP manual address the following considerations:

- Designated areas for construction equipment maintenance and repair,
- Prohibition of discharges of oil and grease into the MS4 or receiving waters,
- Designated areas for construction equipment washing to ensure washwater is discharged to a maintained temporary holding basin or sediment trapping device,
- Designated construction site entrances, exits, and staging areas for all site traffic,
- Provision of storage areas for construction materials and receptacles for liquids (solvents, paints, acids) and solids in accordance with manufacturers recommendations,
- Provision of adequate waste storage areas and ensuring that the locations for collection of waste materials do not receive concentrated runoff, and
- Provision of adequate sanitary facilities on construction sites in accordance with Health Department Regulations.

Good Housekeeping issues are reviewed with the contractor, engineer, and developer during the pre-construction assistance meeting.

CS-3 Inspection / Enforcement

SWMP Task: Continue expanded inspections to include smaller construction sites (single family). Status: Implement improved inspections by Year three.

In the first permit term, the City of Knoxville expanded new development construction inspections to include single-family residential sites. Implementation of this program has been problematic due to the nature of these sites. In fact, some of the inspections on the single in-fill sites may have been conducted after the project is substantially complete or after a complaint has been filed. Since these sites are not grouped together like a subdivision, they typically require more time per lot to inspect when travel time is considered. The City's staffing level through year two did not allow scheduled inspections or the number of inspections that the larger commercial sites and subdivision sites receive.

During TDEC's inspection of the City's MS4 NPDES program in July 2004, the deficiencies of this program became apparent. The City had prioritized the inspection of the larger sites over the single lot sites due to the relative risk to the public, potential for erosion, and volume of sediment discharges. The Engineering Division evaluated this issue and determined

that increasing the priority of these inspections over the larger sites is not in the best interest of the public, development community, or the environment. In year two, the Mayor recommended and City Council approved funding for two additional erosion and sediment control inspectors in the budget year beginning July 1, 2006 (year three). At the time of this report, the additional inspectors had already been hired, trained and have begun inspecting of single-family residential projects consistent with the City's ongoing inspections on the larger sites. The Engineering Division created a new triage plans review position by reorganizing resources. This reviewer will focus primarily on small projects that require less intensive review. This may allow the triage reviewer to assist with inspecting some of the small residential sites as needed.

SWMP Task: Implement routine site inspections on commercial and large residential developments (e.g. rough grading, E&S control installation, final grading, and final stabilization.)

Status: Ongoing

The Engineering Division continues to implement site inspections for large residential and commercial developments. These inspections are not a new program and have been occurring since at least 1994. Inspections are performed during rough grading, final grading, and at various other times during the construction process. Although the site inspections are not always scheduled with the contractor or developer, the City staff may visit the construction sites approximately every three weeks or sooner if necessary. The time frame for some project inspections will vary due to the specific project.

These inspections are performed to insure compliance with the approved erosion and sediment control plan, good housekeeping measures, and the design plan.

A significant improvement in this process was implemented after the 2003 ordinance revision. The developer is now given a letter, which authorizes the installation of erosion and sediment controls after the submitted site development plan is approvable but before the permit is issued. After the e/s controls are in place, a licensed professional must certify that the installation has been completed according to the e/s control plan. The site development permit is issued after the Engineering Division receives the certification.

During the permit year, some concerned citizens asked that the City review and clarify the policy for inspections and enforcement on newly annexed areas that are developing under plans previously approved by Knox County government. The City has reviewed the policy and will begin implementing the following procedures in year three for County permitted annexed areas:

1. The City will conduct routine inspections for erosion and sediment control.
2. Inspections will not verify compliance with County-approved plans but will determine if sediment is adequately controlled on site.
3. If sediment is not controlled on site, the City will coordinate with Knox County to conduct a joint compliance inspection.
4. If the County declines to inspect the site for any reason, fail to take action, or if their enforcement is ineffective to control sediment from the site, then the City will proceed with standard enforcement procedures consistent with all other sites within the city limits.

Any changes to this policy will be reported as they occur.

SWMP Task: Continue to require post-construction Development Certifications from licensed professional Engineers, and/or the appropriate design professionals before bond release to insure the stormwater facilities are built as planned. Status: Ongoing

Since 1999, the City required all developments with a bond to submit to a post-construction Development Certification before the bond is released. A licensed professional Engineer and land surveyor must certify that the roads and stormwater features (quality & quantity) will function as intended. Some deviation from the permitted plan may be allowed during construction as long as the final project still meets the City's minimum requirements. If the final certified project does not meet the minimum requirements, further adjustments must be made before the entire bond is released to the developer. This program does require a second plan review by the Engineering Department after construction has finished to insure proper results in the field.

The Development Certification specifically requires the following components:

- As-built drawings
- Complete detention calculations
- Roadway inspection reports
- Final site inspection in accordance with checklist
- Verification that all stormwater quantity and quality facilities are covered by a Covenants for Permanent Maintenance of Stormwater Facilities
- Complete soil retaining calculations for slopes or retaining walls steeper than 2:1.

This program has been successful and will be continued throughout the permit term.

SWMP Task: Maintain enforcement procedures, policies, and follow-up monitoring/ inspections. Status: Ongoing

The schedule for this task appropriately coincided with the schedule for ordinance updates. The existing enforcement procedures and policies have been effective and were not amended when the ordinance was updated in 2005. During year two, 17 civil penalties were collected from violators.

Depending on the violation, a first-time offender is usually educated and asked to remediate the damage or correct the violation if possible. This is usually followed up with a letter to inform the violator of the City's expectations and to provide helpful BMPs to prevent future problems. More severe or repeated violations will merit a Notice of Violation (NOV), which is issued in the field directly to the violator if available on site. Copies of the NOV are distributed to the property owner or developer by certified mail, the City Law Department, and the Engineering Division's file. The NOV may order specific remedies and require the violator to submit reports and/or pollution prevention plans. Penalties, if any, are only issued after the NOV expires so the violation and remedies may be fully evaluated.

In the event that a penalty is assessed, a violator may appeal the penalty before a five-member Environmental Appeals Board. The five volunteer members of the Environmental Appeals Board are appointed by the Mayor and consists of individuals with an expertise as follows:

1) One licensed professional engineer with civil engineering expertise.
2) One licensed professional engineer.

3) One representative of the development or industrial community.
4) One neighborhood representative.
5) One member at large.

Board members serve a 5-year term and may be re-appointed at the end of their term. Follow-up monitoring and inspections will be a combination of City, KUB, and self-inspections by industries. Enforcement actions resulting from the dry-weather screening program will be followed as defined within that program as a minimum. Any outfall that is tested for high parameters or identified as an illicit connection/ illegal dump source, will be tested four times a year, every year, until the outfall is dry or clean on all four visits. Sources of pollution identified by other means will be monitored as needed or specified for the individual situation.

Some research has already begun to determine appropriate penalties for discharges that cannot be recovered but do not cause a fish kill or other quantifiable immediate damage. The City's current evaluation method does not account for incremental contributions to the overall pollutant loading or degradation of the waterway. The City may also consider adopting any standard penalties developed by TDEC for expedited enforcement procedures.

To help identify repeat violators, the City maintains an updated record of every NOV issued and a database for stormwater complaints.

CS-4 Training Programs

SWMP Task: Co-Sponsor E&S Control Practice Seminars for all participants.

Status: Annually

The City and other Water Quality Forum members developed and presented free erosion and sediment control workshops throughout the first five years of the first permit term. To maximize participation, the workshops were typically presented in the early spring or late fall while construction activities are least intense. The workshops were very successful.

Beginning in year six, the City assisted UT and TDEC with promotion and presentation of the new TDEC erosion control certification program. This new certification program effectively duplicates the information the City had been providing in our annual seminars. To reduce the amount of competition for the two programs, the City will continue to promote and support the TDEC certification program in place of a separate competing erosion control workshop. Each year, the City will send inspectors and supervisors to the training program as needed.

SWMP Task: Provide training for City plans review staff. Status: Ongoing

In an effort to fully train the Stormwater Management staff, the City has participated in several stormwater seminars around the region. Most staff members at the Engineer level will attend at least one, but typically more, seminars or training workshops annually. Typical seminars attended each year include: stormwater modeling, NAFSMA conference, regulatory updates, erosion control certification, NPDES updates, ASCE seminars, software workshops, and others. All licensed engineers must complete at least twelve hours of professional development each year. In addition to the stormwater management seminars attended, the Engineering staff have sponsored, planned, and presented a series of annual workshops/seminars to better educate

the staff and development community about the development and plans review processes. Some of the topics of the City sponsored development process training sessions include:

- ***Technical Requirements of the Stormwater & Streets Ordinance***
- ***Construction Site Erosion and Sediment Control design and implementation***
- ***Site Development Permit Review***
- ***Special Pollution Abatement Permit program***
- ***Performance and Indemnity Agreements, Permanent Maintenance Covenants for Stormwater Facilities***
- ***Plat Review Process and Procedures***
- ***Development Certifications***

The City will continue to provide training to the Engineering staff by participating in seminars locally and outside the city; in-house training by professional engineers; tuition reimbursement for university engineering classes; cooperating with TDOT, TDEC, TVA, UTK, and other agencies to provide professional training for the staff. Training of the plans review and inspections staff is an ongoing program within the Engineering Division.

5.5 COMPREHENSIVE MONITORING PROGRAM (MN).

Program to Collect Quantitative Data to Determine the Impacts of Urban Stormwater on the Natural Environment, pursuant to 40 CFR 122.26(d)(2)(iii)(A).

MN-1 Seasonal Storm Event Monitoring

SWMP Task: Review and update the Standard Operating Procedures (SOP) for the seasonal sampling program. Status: Complete

The original SOP was developed and submitted with the first annual report during the first permit cycle. Over time the SOP had become dated and some parts obsolete. During the last year, the City revised the SOP to make it current and valid for the equipment, software, site locations, and procedures that are currently used.

SWMP Task: Maintain at least five (5) automatic monitoring stations. Status: Ongoing

The City moved two of the five ISCO automatic monitoring stations in 2005. The new locations were included in last year's annual report and have not changed this year. The specific locations are noted on the large inventory map in the appendix of this report. The five monitoring stations are currently located First Creek, Love Creek, Williams Creek, Fourth Creek and at the outlet of the regional pond at Acker Place (headwater of Fourth Creek). Each monitoring station consists of a tipping bucket rain gage, an automatic sampler with 24 individual bottles or bags, and a flow meter/data logger. The intake line and flow sensors are installed in the low flow path for constant monitoring. Modems and cell phones were installed to allow City staff to remotely monitor the conditions and station activity. Unfortunately, remote

monitoring has not been available via phone since the City upgraded to Windows XP. The ISCO representative is working with the City to restore this capability. After each rain event, a technician will interrogate the sampler in the field via laptop computer and calculate the appropriate flow-weighted composite sample. The information is then used to prepare the actual sample from the individual bottles. The composite sample is prepared; it is immediately transported to the laboratory for analysis.

SWMP Task: Collect twenty (20) - thirty (30) flow-weighted composite storm samples annually. Schedule: Annually

Each year, the automatic sampling stations should collect at least twenty (20) flow-weighted composite storm samples. Each of the five monitoring stations should collect four (4) to six (6) storm samples each year with at least one storm sample per quarter to help distribute the sampling events seasonally. During dry weather, the stations may also collect ambient samples as described below in section MN-3 unless grab samples are taken manually.

Each of the flow-weighted storm samples will be analyzed for thirteen (13) routine parameters. Only pH will be recorded in the field. The remaining routine parameters will be analyzed and recorded in the laboratory in accordance with 40 CFR part 122.26 and 40 CFR part 136. The routine parameters to be tested in the laboratory are listed in the table below:

Routine Parameters for Laboratory Analysis		
Total Suspended Solids (TSS)	Nitrate + Nitrite Nitrogen (as N)	Total Recoverable Lead
Total Dissolved Solids (TDS)	Total Nitrogen	Total Recoverable Zinc
Total Ammonia Nitrogen (as N)	Biochemical Oxygen Demand (BOD_5)	Dissolved Phosphorus
Total Ammonia + Organic Nitrogen	Chemical Oxygen Demand (COD)	Total Phosphorus

SWMP Task: Collect five (5) wet weather bacteria samples. Schedule: Annually

Five bacteria samples will be collected each year. One grab sample will be collected manually at each monitoring station during a qualified storm event. Since the TMDL includes both fecal coliform and e-coli standards, both parameters will be analyzed in the laboratory.

SWMP Task: Collect five (5) full-suite grab samples (one/station/permit). Schedule: Ongoing

Each year, one monitoring station will be selected for a full-suite grab sample. The five stations will be rotated throughout the permit term to allow one sample from each location.

In addition to the 13 routine parameters listed above, the full-suite grab sample will include analysis for oil & grease and all the pollutants listed in Tables II & III of 40 CFR Part 122 Appendix D including: volatiles, pesticides, acids, base/neutrals, toxic metals, total phenol, and cyanide.

SWMP Task: Analyze Results from Ongoing Monitoring Program. Schedule: Year 5

Sampling data will continue to be collected, evaluated, and analyzed by City staff as part of the ongoing seasonal monitoring program. The updated seasonal pollutant loading and event mean concentration for the major watersheds within the MS4 may be estimated from the City monitoring data and/or from other regional data, which may include:

- NURP study,
- USGS Open-File Report 94-68 titled "Rainfall, Streamflow, and Water-Quality Data for Five Small Watersheds, Nashville, Tennessee, 1990-1992",
- USGS Water-Resources Investigations Report 95-4140,
- USGS Open-File Report 93-xxx titled "Stormwater Data for Knoxville, TN '91-'92.
- Any available data from TVA, EPA, and the State of Tennessee.

The estimates of the seasonal loading and event mean concentrations will be included in the fifth annual report. An estimate of the total annual runoff from each of the major watersheds within the City will be provided in each annual report (see Section 6.2.4 in this report). Due to ongoing annexations, watersheds or portions of watersheds may be added to this estimate as needed.

MN-2 Dry Weather Screening & Industrial/Commercial Site Monitoring

SWMP Task: Dry Weather Screening as described in ILL-2. Status: Ongoing

SWMP Task: Implement Commercial/Industrial Monitoring in IN-3. Status: Ongoing

This year the City began sampling runoff from commercial sites such as restaurants, car lots and large parking lots. The purpose of this sampling is to determine the magnitude and variety of pollutants discharging from sites that have been targeted as pollution hotspots. The City began regulating some hotspots in 1997 through the Special Pollution Abatement Permit (SPAP) program. The list of SPAP land uses was expanded in the 2003 ordinance revision. The current sampling program will help refine the SPAP requirements to better regulate the hotspots.

MN-3 Ambient & Biological Monitoring

SWMP Task: Implement ongoing Ambient sampling program. Schedule: Quarterly.

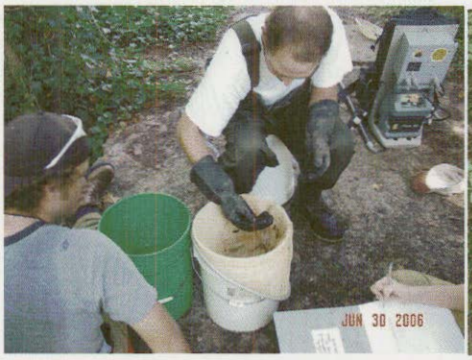
At least twenty (20) ambient samples will be collected each year at a rate of one sample per quarter from each of the five monitoring station locations (detailed by map in section 8.0 and on the inventory map attached). The City had already implemented a quarterly ambient sampling program during the first permit term.

The samples may be collected either by a single grab sample or by using the automatic samplers for a timed composite. Each ambient sample collected was analyzed for the 13 routine parameters listed in MN-1. This program was first implemented after the monitoring stations

were moved to locations that have base flow in dry weather. Since all of the locations have some flow in ambient conditions, the samples can be retrieved at the same location as the storm event samples. This is an added convenience for direct comparison of storm event and ambient samples as well as allowing more options for collecting samples automatically.

SWMP Task: Develop/Implement a Biological-monitoring program to supplement the program previously administered by TVA. Status: Ongoing

For the last few years, the Tennessee Izaak Walton League (IWL) has been contracted to continue their study of the biological health of urban streams. This year the IWL conducted studies at locations on Baker Creek, First Creek, Goose Creek and Williams Creek. The IWL collected the field data and determined an Index of Biotic Integrity (IBI) for multiple locations. The results of this year's IBI studies are include in the appendix. Please note that the reports are dated July 2006, but the actual sampling occurred in June 2006.



Whenever possible the City will partner with TVA and TDEC to perform further IBIs in the urban streams to help identify improvements.

SWMP Task: Develop/Implement a Bacteriological-monitoring program. Status: Ongoing

To insure that adequate bacteriological data is collected throughout the City, a five-part monitoring program has been developed for implementation. Since the bacteria TMDL includes both e-coli and fecal coliform, the City has started requesting both analysis from the laboratory. The five-part program includes bacteria sampling during dry-weather screening (ILL-2), storm event sampling grab samples (MN-1), ambient monitoring (MN-3), TMDL specific studies (6.0), and on demand samples due to specific citizen requests.

The last part of the program involves acquiring data collected from other agencies. Specifically, the City will seek data collected from creek monitoring by sewer utilities. As part of their current Consent Decree, the Knoxville Utilities Board is required to have a bacteriological-monitoring program. The TDEC approved program is located in all of the City's 303(d) listed streams. Copies of the annual water quality report can be obtained at www.kub.org. The City will obtain copies of this data each year and may supplement additional sampling as requested by concerned citizens. For example, the City sampled First Creek and the outfall from the duck pond in Fountain City after a citizen requested this information from TDEC and the City. At the time of sampling, the water bodies did not need warning signs posted.

MN-4 Training Programs

SWMP Task: Develop and Implement Monitoring Training Program for staff and/or volunteers.
Status: Ongoing

During the first permit term, the City partnered with volunteers for dry-weather screening, ambient sampling, and biological monitoring. Last year, no volunteers were used for any monitoring activities. If volunteers are used in the future, the City will hold a training session to insure that proper sampling protocols are used. The City does hold training sessions for the adopt-a-stream volunteers before they begin their activities on their own.

City staff has continued to improve their skills and abilities by assisting other agencies in the field with IBIs and training new employees.

6.0 TMDL IMPLEMENTATION AND ACTIVITIES

A TMDL Implementation Plan was approved by EPA on January 15, 2003 for the Fort Loudoun Lake Watershed (HUC 06010201) for the following creek systems: First Creek, Second Creek, Third Creek, Fourth Creek, and Goose Creek.

The City of Knoxville addressed the following bacteria sources and activities as required by the TMDL and permit.

Farm Animals — Schedule: Complete by Year Five

At the end of year two, the City contracted the CAC Americorps Water Quality Team (AWQT) to begin a study of the potential bacteria impact of farm animals on the 303(d) streams in Knoxville. Using agricultural zoning maps and GIS, the AWQT started to field verify potential livestock sites. They will check each site for signs of livestock access and runoff to the creek as well as erosion caused by access. Samples will be taken to the lab from upstream and downstream of the study sites. The data will continue to be collected, compiled and analyzed during year three. The results will be reported in the next annual report.

Wild Birds — Schedule: Complete by Year Five

During year one, the CAC Americorps Water Quality Team (AWQT) volunteered to study the biological impact that waterfowl populations have on our local waterways. The City identified 56 possible waterfowl locations that could be either a source or sink for bacteria. The AWQT visited those locations in the fall and spring, counted the number of birds, and selectively sampled for ammonia. Six sites that had a large number of waterfowl or high concentrations ammonia were analyzed for fecal Coliform and E. coli. Four sites were considered to be sources of bacterial pollution since they discharged to creeks and two were considered sinks since they had no outlet to waters. The results of the initial investigation were reported in year one.

The initial investigation reduced the original 56 possible locations down to only four sites

that need to be analyzed for structural retrofit or some management control to reduce the bacteria levels entering the stream or river. Since two of those sites enter the Tennessee River directly, the City will concentrate on analyzing, designing and implementing some mitigation measure for the remaining two sites, which discharge directly into 303(d) streams listed in the bacteria TMDLs. Progress on the analysis or mitigation measures will be reported in the future annual reports.

Outside dumping of animal wastes — Status: Ongoing

In year one, the City investigated possible bacterial pollution sources from the Knoxville/Knox County Animal shelter. The City helped the shelter personal setup a maintenance schedule for quarterly inspections and annual cleanout of their Nutrient Baffle Box.

Domestic Pets — Status: Ongoing

The City partnered with the Izaak Walton League and Prestige Cleaners to encourage the use of pooper-scoopers in City parks and the CBID. Four dispensers are located downtown and four are located in two City parks. Approximately 500 pooper-scoopers bags are restocked bi-weekly at the dispenser on Gay and Summit, which indicates a successful start to our pet waste challenge downtown. Additional dispensers may be added in other parks in the future. The City has distributed pooper-scoopers to vet clinics, pet stores, and during two public functions, Bark-in-the-Park and Earth Fest. An attention-grabbing poster was placed on display at each of these functions to help educate the pet owners of their responsibility to manage their pet's waste.

Fish/Bait Shops — Status: Ongoing

The City inspected Rea Springs Live Bait, Seymour Bait & Tackle, and Conservation Fisheries Inc. as possible sources of bacterial pollution. The effluent from Seymour Bait & Tackle and Conservation Fisheries Inc. discharged directly to a KUB sewer line. The effluent from Rea Springs Live Bait shop discharges to a constructed wetland and then into First Creek. Results of the bacterial sampling of the effluent entering First Creek were well below the threshold for human contact. TDEC was notified of the sampling and results.

Private Leaking Laterals — Status: Ongoing

The City has continued to coordinate with KUB to identify and correct sanitary sewer discharges as necessary. A standard procedure has been developed to insure that each possible contamination source is investigated after a problem is identified during dry weather screening. When high ammonia or fecal coliform levels are detected in the MS4, KUB and City personnel cooperate to identify the contamination source through dye testing or manhole by manhole testing. Once a source has been identified, KUB will be responsible for correcting problems in the main sanitary sewer system while the City will work with KUB and the private property owners to correct problems on private property. These coordinated inspections have identified private residences, industries, and businesses with plumbing or floor drains connected to the MS4 instead of the sanitary sewer system. This type of close coordination with all sewer utilities

is essential for solving illicit discharges to the MS4 and will likely continue throughout the new permit term.

A recent Memorandum of Understanding has clarified the cooperative roles and responsibilities of both the City and KUB with respect to stormwater management and compliance with the MS4 NPDES permit. A copy of the MOU was included in the appendix of the 2003/2004 annual report.

Human wastes (Outdoor Elimination by Humans) Schedule: Begin Year Two

In year two, the City implemented a survey and inventory of homeless populations in Knoxville. The Engineering Division was able to add a few questions to the survey to determine how transients use the creeks while living outdoors. Unfortunately, the results of those questions were not available for inclusion in this annual report. Therefore, the study results will be reported next year.

Illicit connections to storm drain system Status: Ongoing

The Illicit Connections and Illegal Dumping Program (ILL) is an ongoing program reported in section 5.2 of this report.

6.0 MONITORING REPORTS SUMMARY

6.1 Dry-Weather Screening Program - New Outfall Inventory.

During the past permit year, five outfalls were removed from the City's outfall inventory and eight outfalls were added. Outfalls are typically added as a result of re-development or annexations and removed as a result of drainage alterations.

All updated outfalls are clearly marked on the inventory map located in the appendix but attached separately. The outfalls removed from the system this year are listed below:

00-400-0135	00-400-0150	00-100-0165
00-400-0145	00-400-0155	

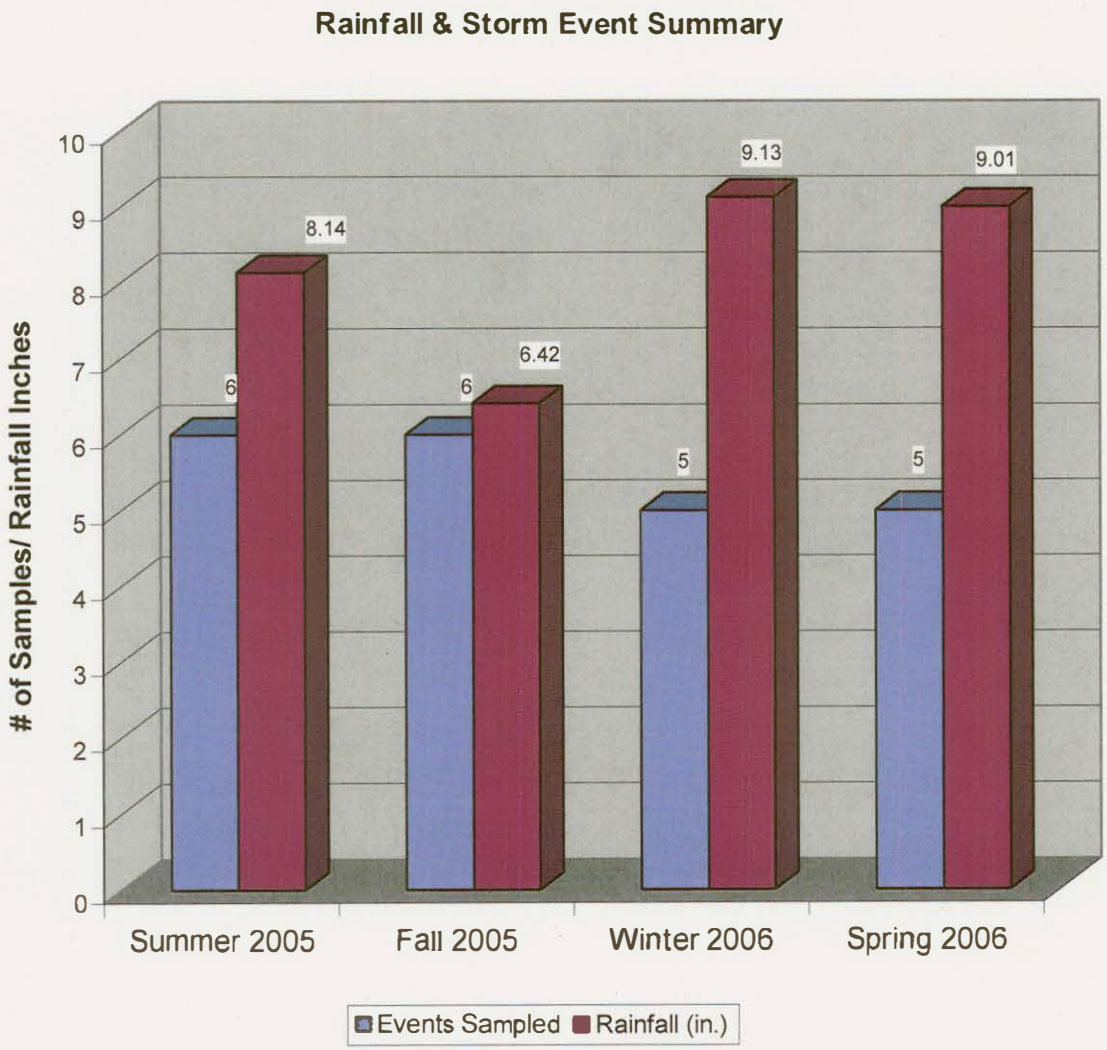
The following outfalls were added to the inventory:

00-400-0132	00-400-0157	00-400-0192
02-400-0096	02-100-0098	02-100-0099
03-400-0396	07-400-0030	

6.2 Ongoing Stormwater Monitoring Program.

6.2.1 Area Rainfall Data & Storm Event Summary.

During the July 1, 2004 to June 30, 2005 monitoring period, an average of 50.22 inches of rainfall was recorded and 21 storm events were sampled from the City's five ISCO monitoring stations. The sampling frequency requirements as described in section V of the NPDES Permit were amended this year to one storm event per season per station. The graph below shows the relationship between the amounts of rainfall received and the number of storm events sampled per season. Monitoring data summaries for each of the sampling locations are included for TDEC's review on the following pages.



6.2.2 Laboratory Analysis Summary

Laboratory Analysis Summary - Seasonal Storm Sampling Program
July 1, 2005 thru June 30, 2006

Site	Quarter	pH	Average Sampled Volume	Rainfall per Event	BOD	COD	Suspended Residue	Dissolved Residue	Nitrate + Nitrite nitrogen	Ammonia nitrogen	Total Kjeldahl nitrogen	Total organic nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate
Units			cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
AP	Sum. '05	7.5	96080	0.35	BDL	32.0	23.0	90.0	0.45	BDL	BDL	BDL	BDL	0.083	BDL	BDL
	Fall '05	7.0	361534	0.73	BDL	21.0	65.6	72.0	0.09	0.21	BDL	BDL	BDL	0.110	0.07	0.0135
	Wtr. '06	6.0	139863	0.08	BDL	BDL	83.0	62.0	BDL	BDL	BDL	BDL	0.0065	0.220	0.22	BDL
	Spr. '06	7.0	**	***	9.6	31.0	60.0	70.0	0.60	BDL	0.51	0.51	BDL	0.170	BDL	0.035
FC	Sum. '05	6.8	2043870	0.27	7.0	17.0	96.0	175.0	1.00	BDL	BDL	BDL	0.0060	0.038	BDL	BDL
	Fall '05	6.5	3031473	0.67	14.0	BDL	77.0	190.0	0.63	BDL	0.58	0.58	0.0065	0.058	0.15	0.029
	Wtr. '06	7.0	687101	0.24	11.0	BDL	36.0	190.0	1.20	BDL	BDL	BDL	BDL	0.130	0.23	BDL
	Spr. '06	7.0	202275	0.11	BDL	BDL	9.0	220.0	1.20	BDL	BDL	BDL	BDL	BDL	BDL	BDL
LC	Sum. '05	8.0	312806	0.34	BDL	28.0	66.0	210.0	1.00	BDL	BDL	BDL	BDL	BDL	BDL	0.044
	Fall '05	6.5	309222	0.83	BDL	BDL	31.0	170.0	0.63	BDL	BDL	BDL	BDL	0.041	BDL	0.055
	Wtr. '06	6.5	41981	0.25	BDL	BDL	10.0	240.0	1.40	BDL	BDL	BDL	BDL	0.110	0.32	BDL
	Spr. '06	7.0	398185	0.85	BDL	57.0	160.0	140.0	0.85	BDL	BDL	BDL	0.0130	0.087	0.21	0.078
WD	Sum. '05	7.0	403943	0.28	BDL	22.0	37.0	170.0	0.72	BDL	0.58	0.58	BDL	0.044	0.10	BDL
	Fall '05	*	2391527	0.59	20.0	49.0	210.0	120.0	0.39	0.33	1.10	0.77	0.0150	0.140	BDL	BDL
	Wtr. '06	6.0	362298	0.25	5.4	34.0	68.0	120.0	0.62	BDL	BDL	BDL	BDL	0.160	0.170	0.084
	Spr. '06	7.0	244154	0.18	BDL	BDL	26.0	180.0	0.99	BDL	0.52	0.52	BDL	0.051	BDL	BDL
WC	Sum. '05	7.0	**	***	BDL	BDL	3.6	280.0	1.40	BDL	BDL	BDL	BDL	0.031	BDL	0.040
	Fall '05	7.0	9868	0.19	BDL	26.0	16.0	160.0	0.86	BDL	BDL	BDL	BDL	BDL	1.40	BDL
	Wtr. '06	7.0	28399	0.28	BDL	32.0	45.0	100.0	0.47	BDL	BDL	BDL	0.0081	0.051	0.13	0.063
	Spr. '06	7.0	9951	0.18	BDL	BDL	14.0	190.0	1.4	0.16	BDL	BDL	BDL	BDL	BDL	BDL
National NURP Study Average					11.9	90.8	na	na	na	*****	2.35	3.31	0.18	0.176	0.16	
Characteristics of Urban Stormwater Range					1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 1.9	na	0.1 - 125	

-The above chart is comprised of seasonal averages from the data collected from each individual storm event.

Winter (Jan., Feb., and March), Spring (April, May, and June), Summer (July, Aug., and Sept.), Fall (Oct., Nov., and Dec.)

-The Characteristics of Urban Stormwater and National NURP Study Average data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS

AP = Acker Place Monitoring Station

FC = First Creek Monitoring Station

LC = Loves Creek Monitoring Station

WD = Walden Drive Monitoring Station

WC = Williams Creek Monitoring Station

* pH not recorded

** Flow not recorded

*** Rain amount not recorded

6.2.2 Laboratory Analysis Summary

Seasonal Ambient Grab Samples 2005-2006

Summer 2005	Date	pH	BOD	COD	Suspended Residue	Dissolved Residue	Nitrate + Nitrite Nitrogen	Ammonia Nitrogen	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate
Acker Place	8/26/05	7.0	BDL	BDL	1.6	240	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
First Creek	8/25/05	7.5	BDL	BDL	3.0	280	1.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Loves Creek	8/25/05	8.0	BDL	BDL	3.4	340	1.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Walden Drive	8/26/05	7.0	BDL	BDL	5.8	260	BDL	BDL	BDL	BDL	BDL	0.034	BDL	BDL
Second Creek	8/26/05	8.0	BDL	BDL	1.4	330	2.0	0.22	0.54	0.32	BDL	BDL	0.22	0.047
Average		7.5	BDL	BDL	3.0	290	0.90	0.04	0.11	0.06	BDL	0.07	0.04	0.09

Fall 2005	Date	pH	BOD	COD	Suspended Residue	Dissolved Residue	Nitrate + Nitrite Nitrogen	Ammonia Nitrogen	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate
Acker Place	12/13/05	*	BDL	BDL	BDL	230	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
First Creek	12/13/05	*	BDL	BDL	1.2	230	0.88	BDL	BDL	BDL	BDL	BDL	0.20	BDL
Loves Creek	12/13/05	*	BDL	BDL	1.2	270	1.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Walden Drive	12/13/05	*	BDL	BDL	2.6	230	0.86	BDL	BDL	BDL	BDL	BDL	0.13	BDL
Williams Creek	12/13/05	*	BDL	BDL	BDL	220	1.1	BDL	BDL	BDL	BDL	BDL	0.11	0.025
Average		*	BDL	BDL	1.0	236	0.8	BDL	BDL	BDL	BDL	BDL	0.09	0.005

Winter 2006	Date	pH	BOD	COD	Suspended Residue	Dissolved Residue	Nitrate + Nitrite Nitrogen	Ammonia Nitrogen	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate
Acker Place	1/27/06	6.5	BDL	BDL	BDL	240	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
First Creek	1/27/06	7.0	BDL	BDL	2.6	210	1.6	0.17	BDL	BDL	BDL	BDL	BDL	BDL
Loves Creek	1/27/06	6.5	BDL	BDL	2.0	250	1.7	0.10	BDL	BDL	BDL	BDL	0.13	BDL
Walden Drive	1/27/06	7.0	BDL	BDL	5.6	200	1.1	0.12	BDL	BDL	BDL	0.032	BDL	BDL
Williams Creek	1/27/06	7.0	BDL	BDL	BDL	210	2.0	0.26	BDL	BDL	BDL	BDL	BDL	BDL
Average		6.8	BDL	BDL	2.0	222	1.3	0.13	BDL	BDL	BDL	0.006	0.03	BDL

Spring 2006	Date	pH	BOD	COD	Suspended Solids	Dissolved Solids	Nitrate + Nitrite Nitrogen	Ammonia Nitrogen	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate
Acker Place	4/17/06	7.0	BDL	BDL	2.0	250	0.28	0.30	BDL	BDL	BDL	BDL	0.10	0.025
First Creek	4/17/06	7.0	BDL	BDL	5.5	210	BDL	0.38	BDL	BDL	BDL	0.034	0.10	BDL
Loves Creek	4/17/06	7.0	BDL	BDL	6.0	290	1.60	0.71	0.67	BDL	BDL	0.060	0.12	BDL
Walden Drive	4/17/06	7.0	BDL	BDL	7.8	190	1.1	0.18	BDL	BDL	BDL	0.064	BDL	BDL
Williams Creek	4/17/06	7.0	BDL	BDL	1.8	250	1.4	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Average		7.0	BDL	BDL	4.6	238	4.4	0.31	0.13	BDL	BDL	0.032	0.064	0.005

U = Analyte requested but not detected

BDL = Below Detection Limit

* pH not recorded

6.2.2 Laboratory Analysis Summary

Acker Place Monitoring Station

Quarter	Date	Type	pH	Flow	Rainfall amount	BOD	COD	Suspended Residue	Dissolved Residue	Nitrate + Nitrite nitrogen	Ammonia	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
SUMMER 2005	08/19/2005	Composite	7.5	96080	0.35	BDL	32.0	23.0	90.0	0.45	BDL	BDL	BDL	BDL	0.083	BDL	BDL
Quarter Average			7.5	96080	0.35	BDL	32.0	23.0	90.0	0.45	BDL	BDL	BDL	BDL	0.083	BDL	BDL
FALL 2005	11/28/2005	Composite	7.0	326107	0.62	BDL	42.0	76.0	110.0	BDL	0.42	BDL	BDL	BDL	0.13	0.13	BDL
	12/16/2005	Composite	6.0	396961	0.83	BDL	BDL	55.0	34.0	0.18	BDL	BDL	BDL	BDL	0.098	BDL	0.027
Quarter Average			7.0	361534	0.73	BDL	21.0	65.6	72.0	0.09	0.21	BDL	BDL	BDL	0.11	0.07	0.0135
***National NURP Study Average**						11.9	90.8	na	na	na	*****	2.35	3.31	0.18	0.176	0.16	
***Characteristics of Urban Stormwater Range**						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 1.9	na	0.1 - 10	

Quarter	Date	Type	pH	Flow	Rainfall amount	BOD	COD	Suspended Residue	Dissolved Residue	Nitrate + Nitrite nitrogen	Ammonia	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
WINTER 2006	01/23/2006	Composite	6.0	139863	0.08	BDL	BDL	83.0	62.0	BDL	BDL	BDL	BDL	0.0065	0.22	0.22	BDL
Quarter Average			6.0	139863	0.08	BDL	BDL	83.0	62.0	BDL	BDL	BDL	BDL	0.0065	0.22	0.22	BDL
SPRING 2006	04/26/2006	Composite	7.0	**	0.56	9.6	31.0	60.0	70.0	0.60	BDL	0.51	0.51	BDL	0.17	BDL	0.035
Quarter Average			7.0	**	0.56	9.6	31.0	60.0	70.0	0.60	BDL	0.51	0.51	BDL	0.17	BDL	0.035
***National NURP Study Average**						11.9	90.8	na	na	na	*****	2.35	3.31	0.18	0.176	0.16	
***Characteristics of Urban Stormwater Range**						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 1.9	na	0.1 - 10	

* Data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS.
** Flow was not recorded

6.2.2 Laboratory Analysis Summary

First Creek (KAT) Monitoring Station

Quarter	Date	Type	pH	Flow	Rainfall amount	BOD	COD	Suspended Residue	Dissolved Residue	Nitrate + Nitrite nitrogen	Ammonia	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
SUMMER 2005	07/31/2005	Composite	6.5	2845660	0.27	14	34	130	130	0.89	BDL	BDL	BDL	0.012	0.076	BDL	BDL
	08/18/2005	Composite	7.0	1242080	0.27	BDL	BDL	61	220	1.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Quarter Average			6.8	2043870	0.27	7.0	17.0	96	175	1.00	BDL	BDL	BDL	0.006	0.038	BDL	BDL
FALL 2005	12/15/2006	Composite	6.5	3031473	0.67	14.0	BDL	77	190	0.63	BDL	0.58	0.58	0.0065	0.058	0.15	0.029
Quarter Average			6.5	3031473	0.67	14.0	BDL	77	190	0.63	BDL	0.58	0.58	0.0065	0.058	0.15	0.029
*National NURP Study Average						11.9	90.8	na	na	na	*****	2.35	3.31	0.18	0.176	0.16	
*Characteristics of Urban Stormwater Range						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 1.9	na	0.1 - 10	

Quarter	Date	Type	pH	Flow	Rainfall amount	BOD	COD	Suspended Residue	Dissolved Residue	Nitrate+ Nitrite nitrogen	Ammonia	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
WINTER 2006	01/30/2006	Composite	7.0	687101	0.24	11	BDL	36	190	1.20	BDL	BDL	BDL	BDL	0.13	0.23	BDL
Quarter Average			7.0	687101	0.24	11	BDL	36	190	1.20	BDL	BDL	BDL	BDL	0.13	0.23	BDL
SPRING 2006	05/12/2006	Composite	7.0	202275	0.11	BDL	BDL	9	220	1.20	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Quarter Average			7.0	202275	0.11	BDL	BDL	9	220	1.20	BDL	BDL	BDL	BDL	BDL	BDL	BDL
*National NURP Study Average						11.9	90.8	na	na	na	*****	2.35	3.31	0.18	0.176	0.16	
*Characteristics of Urban Stormwater Range						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 1.9	na	0.1 - 10	

* Data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS.

6.2.2 Laboratory Analysis Summary

Love Creek Monitoring Station

Quarter	Date	Type	pH	Flow	Rainfall amount	BOD	COD	Suspended Residue	Dissolved Residue	Nitrate + Nitrite nitrogen	Ammonia	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
SUMMER 2005	08/19/2005	Composite	8.0	312806	0.34	BDL	28.0	66	210	1.0	BDL	BDL	BDL	BDL	BDL	BDL	0.044
Quarter Average			8.0	312806	0.34	BDL	28.0	66	210	1.0	BDL	BDL	BDL	BDL	BDL	BDL	0.044
FALL 2005	12/15/2005	Composite	6.5	309222	0.83	BDL	BDL	31.0	170	0.63	BDL	BDL	BDL	BDL	0.041	BDL	0.055
Quarter Average			6.5	309222	0.83	BDL	BDL	31.0	170	0.63	BDL	BDL	BDL	BDL	0.041	BDL	0.055
***National NURP Study Average**						11.9	90.8	na	na	na	*****	2.35	3.31	0.18	0.176	0.16	
***Characteristics of Urban Stormwater Range**						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 1.9	na	0.1 - 10	

Quarter	Date	Type	pH	Flow	Rainfall amount	BOD	COD	Suspended Residue	Dissolved Residue	Nitrate + Nitrite nitrogen	Ammonia	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
WINTER 2006	01/30/2006	Composite	6.5	41981	0.25	BDL	BDL	10	240	1.40	BDL	BDL	BDL	BDL	0.11	0.32	BDL
Quarter Average			6.5	41981	0.25	BDL	BDL	10	240	1.40	BDL	BDL	BDL	BDL	0.11	0.32	BDL
SPRING 2006	05/22/2006	Composite	7.0	398185	0.85	BDL	57.0	160	140	0.85	BDL	BDL	BDL	0.013	0.087	0.21	0.078
Quarter Average			7.0	398185	0.85	BDL	57.0	160	140	0.85	BDL	BDL	BDL	0.013	0.087	0.21	0.078
***National NURP Study Average**						11.9	90.8	na	na	na	*****	2.35	3.31	0.18	0.176	0.16	
***Characteristics of Urban Stormwater Range**						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 1.9	na	0.1 - 10	

* Data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS.

6.2.2 Laboratory Analysis Summary

Walden Drive Monitoring Station

Quarter	Date	Type	pH	Flow	Rainfall amount	BOD	COD	Suspended Residue	Dissolved Residue	Nitrate + Nitrite nitrogen	Ammonia	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
SUMMER 2005	08/18/2005	Composite	7.0	403943	0.28	BDL	22.0	37	170	0.72	BDL	0.58	0.58	BDL	0.044	0.10	BDL
Quarter Average			7.0	403943	0.28	BDL	22.0	37	170	.0.72	BDL	0.58	0.58	BDL	0.044	0.10	BDL
FALL 2005	12/15/2005	Composite	**	2391527	0.59	20.0	49.0	210	120	0.39	0.33	1.10	0.77	0.015	0.14	BDL	BDL
Quarter Average			**	2391527	0.59	20.0	49.0	210	120	0.39	0.33	1.10	0.77	0.015	0.14	BDL	BDL
***National NURP Study Average**						11.9	90.8	na	na	na	*****	2.35	3.31	0.18	0.176	0.16	
***Characteristics of Urban Stormwater Range**						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 1.9	na	0.1 - 10	

Quarter	Date	Type	pH	Flow	Rainfall amount	BOD	COD	Suspended Residue	Dissolved Residue	Nitrate + Nitrite nitrogen	Ammonia	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
WINTER 2006	01/30/2006	Composite	6.0	362298	0.25	5.4	34.0	68	120	0.62	BDL	BDL	BDL	BDL	0.16	0.17	0.084
Quarter Average			6.0	362298	0.25	5.4	34.0	68	120	0.62	BDL	BDL	BDL	BDL	0.16	0.17	0.084
SPRING 2006	04/26/2006	Composite	7.0	244154	0.18	BDL	BDL	26	180	0.99	BDL	0.52	0.52	BDL	0.051	BDL	BDL
Quarter Average																	
***National NURP Study Average**						11.9	90.8	na	na	na	*****	2.35	3.31	0.18	0.176	0.16	
***Characteristics of Urban Stormwater Range**						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 1.9	na	0.1 - 10	

* Data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS.
** pH not recorded

6.2.2 Laboratory Analysis Summary

Williams Creek Monitoring Station

Quarter	Date	Type	pH	Flow	Rainfall amount	BOD	COD	Suspended Residue	Dissolved Residue	Nitrate + Nitrite nitrogen	Ammonia	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
SUMMER 2005	09/16/2005	Full Suite	7.0	**	***	BDL	BDL	3.6	280	1.40	BDL	BDL	BDL	BDL	0.031	BDL	0.04
Quarter Average			7.0	**	***	BDL	BDL	3.6	280	1.40	BDL	BDL	BDL	BDL	0.031	BDL	0.04
FALL 2005	12/29/2005	Composite	7.0	9868	0.19	BDL	26.0	16	160	0.86	BDL	BDL	BDL	BDL	BDL	1.40	BDL
Quarter Average			7.0	9868	0.19	BDL	26.0	16	160	0.86	BDL	BDL	BDL	BDL	BDL	1.40	BDL
***National NURP Study Average**						11.9	90.8	na	na	na	*****	2.35	3.31	0.18	0.176	0.16	
***Characteristics of Urban Stormwater Range**						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 1.9	na	0.1 - 10	

Quarter	Date	Type	pH	Flow	Rainfall amount	BOD	COD	Suspended Residue	Dissolved Residue	Nitrate + Nitrite nitrogen	Ammonia	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate
Units				cu-ft	inches	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
WINTER 2006	01/23/2006	Composite	7.0	28399	0.28	BDL	32.0	45	100	0.47	BDL	BDL	BDL	0.0081	0.051	0.13	0.063
Quarter Average			7.0	28399	0.28	BDL	32.0	45	100	0.47	BDL	BDL	BDL	0.0081	0.051	0.13	0.063
SPRING 2006	05/08/2006	Composite	7.0	9951	0.18	BDL	BDL	14.0	190	1.4	0.16	BDL	BDL	BDL	BDL	BDL	BDL
Quarter Average			7.0	9951	0.18	BDL	BDL	14.0	190	1.4	0.16	BDL	BDL	BDL	BDL	BDL	BDL
***National NURP Study Average**						11.9	90.8	na	na	na	*****	2.35	3.31	0.18	0.176	0.16	
***Characteristics of Urban Stormwater Range**						1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	na	0.1 - 2.5	0.01 - 4.5	na	0.0 - 1.9	na	0.1 - 10	

* Data was taken from tables 4-1 and 4-2 of the Stormwater Management for Maine: BMPS.
** Flow not recorded *** Rain amount not recorded

6.2.3 Noncompliance.

The City of Knoxville has complied with all permit requirements.

6.2.4 Estimated Runoff from Major Watersheds within the MS4 Area.

Part VI (A)(2)(e)(i)(3) of the NPDES permit requires an estimate of the total volume of urban runoff discharged by the City of Knoxville for the year. This estimate is to be based on total rainfall for the year and the estimated imperviousness of different land uses. The total rainfall for the year was determined to be an average of the annual rainfall recorded during the year from the City's five stormwater monitoring stations located throughout the city and the National Weather Service's rain gage at the McGhee Tyson Airport. The average recorded annual rainfall amount was 32.7 inches.

To estimate the total runoff volume, the City utilized the GIS to determine approximate areas for each watershed within the city limits along with the corresponding land uses. Each land use is assigned an approximated impervious percentage according to the Camp Dresser and McKee Watershed Management Model described in the Part 2 application, pages 4-14 to 4-18.

It was assumed for each watershed that 95 percent of the rainfall from the impervious fraction, and 15 percent of the rainfall from the pervious fraction of each land use was converted to runoff. Therefore the impervious runoff coefficient and the pervious runoff coefficient were assumed to be 0.95 and 0.15, respectively. For example, based upon an average annual rainfall volume of 42.99 inches/year, the average annual runoff from a single-family residential land use (25% impervious) is 15.05 in/yr (42.99*[(0.15*0.75)+(0.95*0.25)]). The runoff coefficient for a single land use is the sum of the impervious percentage multiplied times the impervious runoff coefficient plus the pervious percentage multiplied by the pervious runoff coefficient. For the previous example, the average runoff coefficient for the single-family residential land use is 0.35 ([0.15*0.75]+[0.95*0.25]). For a watershed, the average runoff coefficient is an area weighted average of each land use runoff coefficients times the percentage of the area of each land use.

The runoff from the major watersheds within the MS4 area was estimated by a formula in Camp Dresser & Mckee's Watershed Management Module shown below:

$Qi = P \times Ci \times Ai$

Where,

P = total precipitation (inches/year)

C = land use area weighted runoff coefficient = 0.15*Pervious% + 0.95*Impervious%

A = drainage area (acres) = acres x (43,560 ft2/acre) = ft2

$Q = \Sigma Qi$ = total runoff rate / 1,000,000 = Mgal

$Q_{tot\ 05/06}$ = 24,737 Million Gallons

Please find the analysis for the each watershed and for the entire city in table 6.2.4 on the following page.

6.2.4 ESTIMATED RUNOFF FROM MAJOR WATERSHEDS WITHIN THE MS4

July 1, 2005 - June 30, 2006

Watershed	Agricul./ Forest/ Vacant, Public Parks	Vacant (>10)	Rural Res.	Single Family Res.	Private Rec., Public Land	Multi-Family Res., Church	Insti-tutional	Mining, Office/ Service	Manu-facturing/ Whole-sale	Commer., Trans./ Utility/ Commun.	Major Roads/ Hwys/ ROWs	Under Const	Not Loaded	Total Acres in Watershed	Acres in the City Limits	Est. % Imperv-ious	C Value	Total Rainfall during 05/06 (in./yr)	Total Runoff for 05/06 (Mgal/yr)
Baker Cr.	412	2	107	640	90	77	32	1	1	3	269	13	27	1,674	1,674	32	0.41	32.7	606
East Fork	313	0	10	475	302	78	73	31	195	235	584	33	180	2,509	2,509	53	0.57	32.7	1,276
First Cr.	724	0	300	3,152	544	501	110	157	127	556	1,412	51	116	7,750	7,750	44	0.50	32.7	3,435
Fourth Cr.	965	57	423	2,026	468	406	93	206	201	568	881	61	414	6,769	5,920	41	0.48	32.7	2,510
Goose Cr.	639	40	126	669	213	67	8	21	77	131	327	34	29	2,381	1,755	35	0.43	32.7	667
Grassy Cr.	2,230	176	561	610	215	24	0	14	31	95	211	39	95	4,301	433	17	0.29	32.7	110
Holston R.	2,362	69	371	1,222	417	45	5	2	219	33	805	32	50	5,632	2,455	28	0.37	32.7	809
Inman Br.	563	33	214	138	4	12	0	0	0	0	145	0	34	1,143	99	21	0.31	32.7	28
Knob Cr.	1,719	195	481	843	125	84	1	19	1	29	296	4	169	3,966	989	19	0.30	32.7	267
Knob Fork	1,659	26	398	675	182	56	5	93	6	124	257	19	252	3,752	823	22	0.33	32.7	239
Love Cr.	1,735	102	505	1,625	311	212	51	94	178	408	1,038	46	103	6,408	5,090	36	0.44	32.7	1,993
Second Cr.	443	0	90	1,281	346	247	29	107	140	542	1,161	35	82	4,503	4,498	53	0.57	32.7	2,281
Sinking Cr.	1,614	146	459	1,266	284	90	17	33	31	267	881	12	347	5,447	2,434	33	0.41	32.7	897
Swanpond C	3,892	303	833	604	121	36	4	79	240	232	457	65	285	7,151	499	19	0.30	32.7	135
Ten Mile Cr.	1,879	0	638	3,421	165	895	55	115	58	615	1,500	24	641	10,006	3,921	38	0.45	32.7	1,568
Third Cr.	1,757	79	436	3,003	406	512	184	124	225	443	1,252	98	220	8,739	8,417	37	0.45	32.7	3,339
TN River	7,197	503	2,269	4,681	2,910	403	187	72	170	238	990	121	1,113	20,854	8,232	22	0.33	32.7	2,393
Toll Cr.	535	69	154	222	42	26	1	0	37	4	93	42	4	1,229	767	22	0.32	32.7	220
Turkey Cr.	3,353	235	603	2,693	264	343	121	104	91	442	1,161	68	738	10,216	1,677	29	0.38	32.7	572
Whites Cr.	2,733	154	782	1,298	575	59	31	11	49	126	608	51	578	7,055	1,634	23	0.34	32.7	489
Williams Cr.	358	11	47	561	46	96	125	17	10	61	276	3	30	1,641	1,605	37	0.45	32.7	641
Woods Cr.	1,220	106	281	371	0	26	0	2	140	43	261	1	157	2,608	143	23	0.33	32.7	42
Sink-East	1,226	0		728	9	17	0	17	3	27	0	0	0	2,027	91	12	0.24	32.7	20
Beaver Cr	21,174	0	0	21,230	1,292	845	4	259	283	712	0	160	0	45,959	162	16	0.28	32.7	40
Tuckahoe	4,293	0	0	1,829	18	14	0	8	2	1	0	4	0	6,169	229	8	0.22	32.7	44
Fr.Broad riv	8,954	0	0	2,744	73	40	24	24	497	117	0	166	0	12,639	551	11	0.24	32.7	117
COK Total	73,949	2,306	10,088	58,007	9,422	5,211	1,160	1,610	3,012	6,052	14,865	1,182	5,664	192,528	64,357				**24,737**

The runoff from the major watersheds within the MS4 area was estimated by a formula in Camp Dresser & Mckee's Watershed Management Module. Q = P x C x A

where, P = total precipitation (inches/year) = 32.7 in./yr. = 2.725 ft./yr.

C = land use area weighted runoff coefficient = 0.15*Pervious% + 0.95*Impervious%

A = drainage area (acres) = acres in watershed x (4.35E4 ft2/acre) = Ai ft2

Q = total runoff rate = sum of each watershed's Qi.

Total estimated runoff for Year One = 24,737 Mgal

Approximate area and land use for each watershed was determined through the City's GIS. Total yearly rainfall amount was determined by averaging the amount of rain collected from the City's five monitoring stations located throughout the city (refer to map in appendix). Runoff coefficient (C) was calculated by adding 15 % of the pervious fraction to 95% of the impervious fraction in each watershed. This assumes that the fraction of rainfall producing runoff is 15% and 95% from pervious and impervious surfaces respectively. The summary of the runoff calculations are provided in the table above. Calculations for some of the watersheds were left out due to the insignificant amount of runoff that would be produced.

7.0 ASSESSMENT OF CONTROLS: ESTIMATED POLLUTANT LOADING REDUCTIONS FROM THE MS4.

Since the NPDES permit was first issued in 1996, the City of Knoxville has developed and implemented all of the scheduled programs. The ongoing monitoring program and the dry weather-screening program were started in during the 1996-1997 permit year. Each program has been implemented annually since that time. Data has been collected, analyzed, and archived for future reference.

Quantitative estimates of pollutant loads and event mean concentrations were reported as required in the fifth annual report. In the fifth year of the new permit term, the pollutant loads and event mean concentrations will be calculated again and compared to the previous results. Any quantitative reductions or groundwater impacts from the MS4 may become evident at that time and will be reported. However, as described in the dry weather-screening program (ILL-2), noticeable reductions in contaminated outfalls have been observed since the program began.

Although testing data may not be available to substantiate all of the illicit discharges and illegal dumping problems, which have been resolved, the qualitative effect on water quality within the MS4 and waters-of-the State is irrefutable. Many industries have removed illicit discharges, homeowners and utilities have replaced sections of leaking or broken sanitary sewers, the last known sections of the combined sewers were separated, unknown combined sewer systems have been located and planned for repair, creek restoration and cleanup activities have begun, and many educational and volunteer programs have been sponsored, conducted, and/or coordinated to reduce dumping.

Structural controls for water quality control include stormwater treatment facilities on most new development and significant redevelopment throughout the city since 1997. Covenants are in place to require that these water quality facilities are maintained and/or replaced as needed. The City has also installed oil/water separators or stormwater treatment devices at the following locations: the KAT bus facility on First Creek, Victor Ashe Park, Northwest Crossing regional detention pond, the Prosser Road garage, the Loraine Street facility, and the Solid Waste Transfer facility. The City is planning new structural controls at the Solid Waste Transfer Station during this permit term. Floating trash skimmers were installed near the mouth of some major creeks to prevent floating pollutants from discharging to the river. The Izaak Walton League has been contracted to maintain and replace the skimmers as needed.

All of the programs implemented to improve water quality in the creeks and river throughout the city should provide some quantitative evidence of improvement in future years. This data will be reported, as it becomes apparent.

8.0 SUMMARY OF MODIFICATIONS TO THE SWMP.

As expected, the new permit created several modifications to the existing SWMP in year one. However, the City did not make any modifications in year two except for the one wet-weather monitoring station that was relocated from Second Creek to Williams Creek. The station was moved as discussed in section MN-1 of this report. The current locations for all of the monitoring stations are shown on detailed maps in the appendix. Future locations will be reported in each annual report.

9.0 FISCAL ANALYSIS

The Fiscal Analysis for this annual report will list the permit year budget sources and amounts along with estimates for the following permit year. Sources of funds are listed for each major program. Due to complexity, all of the support activities such as purchasing, payroll, legal support, information systems, fleet management, and human resources are not reflected in the table. Future funding sources may change if a stormwater utility fee is implemented.

Program Description	Fund Source	Actual FY 05/06	Est. FY 06/07
Solid Waste Recycling (includes: composting, education, staff, etc.)	Fund 230	$1,781,280	$1,781,280
Household Hazardous Waste Facility	Fund 230	$139,273	$170,000
Stormwater Mgmt Operating expenses	Fund 220	$1,613,610	$1,692,190
Public Service operating/maintenance (brush/leaf/litter pickup; street cleaning; curb/gutter repair; stormdrain/catch basin cleaning, repair, & installation; ditching; seed/sod in R.O.W.; grate replacement; water pumping; tree trimming, removal, and planting.)	General Fund 100	$2,750,270	$2,911,190
First Creek Restoration/Improvements	Growth Bdry	$49,980	$1,000,000
Papermill Road Culverts @ 4th Creek	Fund 401	$ 0	$42,275
Stormwater Education Project	Fund 220	$0	$13,000
Emily Avenue Sinkhole Project Emily Avenue Sinkhole Reclamation	Fund 401	$428,067 $0	$231,432 $112,750
Lower Second Creek Park Project	Fund 401 State Grant	$2,685,000	$0
Loraine St.- Lot Stormwater Treatment - Car Wash Stormwater Improvement	Fund 401	$55,186 $57,293	$0 $93,008
Cross Park Dr. Drainage Improvement	Fund 401	$0	$800,000
Third Creek Restoration Project	Fund 401	$0	$100,000
Neighborhood Drainage Projects	Fund 401	$250,000	$250,000
Total Estimated Stormwater Program Costs		**$9,809,959**	**$9,197,125**

APPENDIX A

City of Knoxville Solid Waste Office 2005 Annual Report

Solid Waste Section
2005 Annual Report

CITY OF KNOXVILLE
BILL HASLAM, MAYOR

Department of Community & Neighborhood Services
Sam Anderson, Director

Public Service Division
Bob Whetsel, Director

Printed on Recycled Paper

INTRODUCTION

In 2005, we continued to show positive progress in the development of our solid waste programs. This is the fourth year of our on-site paint recycling program at the Solid Waste Management Facility. We continued active enforcement of the solid waste ordinances and completed our eighth full year of operations at the Household Hazardous Waste Collection Center. The Public Service Division is in its fourth year of garbage collection service and recycling in the Central Business District at a cost savings of $30,000 per year. All of these programs have been successful and reflect the continued interest in and growth of our comprehensive solid waste management program.

The following pages summarize our activities for the calendar year 2005.

The last page is a residential waste stream analysis of data such as:

* The total waste stream decreased by 3691.56 tons from 2004
* The diversion rate decreased to 55.25% from 56.26% in 2004
* The recycling rate decreased to 27.61% from 28.02% in 2004

The total waste stream shows a decrease for the second time in two years. This decrease is attributed to decreased use of the Solid Waste Management Facility (Transfer Station) by large business customers who took their material to the Waste Connections Transfer Station and a decrease in yard waste collected. Diversion and recycling rates have remained level over the last five years, varying a few points up or down each year.

I. RECYCLING

A total of 4,882.36 tons of recyclables was collected at the City's eleven drop-off recycling centers in 2005. This number is level with recyclables from 2003 to 2004, down by 603 tons. The decrease is believed to come from an unforeseen move of one of the centers to a temporary location because of construction at the permanent site. Commodities of plastics and mixed paper increased while steel and cardboard showed a slight decrease.

Goodwill Industries is in the fifth year of a 5-year contract to assist in on-site operation of the recycling centers. The contract that was negotiated with SP Recycling to haul newspaper paid the City current market value for material collected in the amount of $103,881.06. This, and the contract with Waste Management for the other materials, combined to save the City $147,596.46 in operational costs. Fifth year contract options were approved with both companies.

In 2005, the City continued processing and marketing cardboard brought to the Solid Waste Management Facility (SWMF). We handled 18.54 tons in 2005. Businesses, in particular, are encouraged to bring recyclables to the SWMF free of charge.

II. MUNICIPAL SOLID WASTE (MSW)

A total of 51,258.53 tons of garbage was collected from Knoxville homes in 2005 as part of the

weekly garbage collection service the City offers via its contractor, Waste Connections. This number reflects a less than 1% decrease from the previous year. The City has currently renegotiated a five year contract with Waste Connections that expires in 2011. Current collection costs per this contract are:

. Curbside Collection	$6.03 / house/month	41,469 residents
. Backdoor Collection	$7.54 / house/month	14,326 residents

All garbage is disposed of at the Chestnut Ridge Landfill operated by Waste Management of Knoxville. The City is currently in a 10 year contract with Waste Management that expires in 2010. Disposal costs for 2005 were as follows:

. Jul. - Sep.	$23.90 / ton
. Oct. - Dec.	$25.71 / ton

III. COMPOSTING

A total of 32,411.92 tons of yard waste was collected by City crews in 2005. This number is down by 673.65 tons from last year. The Solid Waste Department sees this as a minor decrease based on weather conditions in the spring of 2004 . All yard waste is taken to Shamrock Organic Products where it is turned into mulch products. The City is currently in a 6 year contract with Shamrock that expires in 2006. Costs for disposal in 2005 at Shamrock were:

. Jan. - Dec.	$34 / ton

IV. SOLID WASTE MANAGEMENT FACILITY

Transfer Station

The design of the Transfer Station encourages separation of Construction and Demolition waste (C&D) from Municipal Solid Waste. This allows us to save money by sending C&D waste to a Class III landfill and also enable us to comply with the State mandate calling for a reduction in the volume of waste placed in Class I landfills. In 2005, we diverted 25,278 tons of C&D waste to a Class III landfill. This was 65% of the waste received at the Transfer Station. The total number of vehicles using the facility in 2005 was over 53,700 including City of Knoxville vehicles. Total revenue from charge and cash customers was $519,310.11

Household Hazardous Waste (HHW) Collection Center

Staffed by City Solid Waste personnel, the HHW Facility is operated jointly by the City and County for all residents. Based on approximately 50/50 usage by City and County residents, the County contributes 50% of the operating and disposal cost. In 2005, this facility was visited by 5,088 vehicles, slightly down 141 from 2004, and processed 169 tons of HHW, 12% of which was latex paint.

Rather than pay the City's contracted hazardous materials hauler to dispose of the latex paint, we have developed an in-house paint re-manufacturing facility. Last year we produced 2,697 gallons of high quality paint of which 2,135 gallons were sold to businesses for an income of $5,337.50.

V. EDUCATION

The Solid Waste Office engaged in many activities and special programs throughout 2005 to educate Knoxvillians about waste reduction, recycling, composting, and other solid waste issues.

America Recycles Day - The City of Knoxville, along with several other local organizations, participated in the ninth annual America Recycles Day, a national education campaign aimed at increasing citizens' commitment to recycling and buying recycled goods.

Telephone Book Recycling - Once again this year the Solid Waste Office coordinated the Knoxville/Knox County schools telephone book recycling program. Forty three Knox County schools competed for cash prizes donated by the City and County. Over 206 tons of old books were collected from the schools and from eight City of Knoxville drop-off centers.

Earth Day - The Solid Waste Office was a part of a city-wide steering committee that developed EarthFest 2005 which celebrated the 34th anniversary of Earth Day at Worlds Fair Park. Over 5,000 people attended the event which had 90 + exhibitors from the environmental community.

One-Day Computer Collection Events - One-day computer collection events were held in January and May with ten sponsors contributing to the success of the event. Approximately 1200 residents participated in the events with just over 52 tons of electronic materials collected. The material was recycled at 5R Processors in Clinton, TN.

Used Residential Thermometer Exchange - The Solid Waste Office started an ongoing mercury thermometer exchange program. The exchanges, conducted in cooperation with the Tennessee Department of Environment and Conservation, the City of Knoxville Public Service Division, and the Safe Kids Coalition of the Greater Knox Area, collected over 1000 mercury thermometers from City and County residents, containing a total of over a pound of mercury. New digital thermometers were given out for each used mercury thermometer that was turned in.

Curbside Recycling – The City's contractor for the collection of residential solid waste, Waste Connections, began a subscription curbside recycling program in the city. The program started in November of 2004 and Waste Connections provided statistics on participation rates to the Solid Waste Office throughout 2005. City of Knoxville residents can call Waste Connections to request the service. Materials collected for recycling are cardboard, glass, aluminum, newspaper, and plastics. The 150 tons was collected from 1500 residents signed up for the service in 2005.

Other - In 2005, the Solid Waste Office continued to produce and distribute educational brochures and promotional items. Staff of the Solid Waste Office participated in several educational events in 2005 using our exhibit booth display at events including the Dogwood Arts' House and Garden Show and America Recycles Day Events. Over 200 school children toured the SWMF and listened to a presentation at the HHW facility.

Annual Report 2005 Drop Off Centers	Kroger 5003 N. Broadway	Goodwill Magnolia & Alice	Kroger 5425 Clinton Hwy	Kroger 4818 Kingston Pk.	Kroger 2217 N. Broadway	Goodwill 225 Moody Av.	Kroger 9305 Kingston Pk.	Kroger 4440 Western Av.	Lowes 210 N. Peters	K-Mart 7428 Kingston Pk.	Food City 5941 Kingston Pk.	Food City 2939 Alcoa Hwy.	Totals
Aluminum	10915 lbs	2770 lbs	8756 lbs	14085 lbs	7572 lbs	9710 lbs	8220 lbs	6930 lbs	11685 lbs	2930 lbs	3460 lbs	7465 lbs	47.25 tons
Steel	18740 lbs	5968 lbs	16936 lbs	27810 lbs	15841 lbs	20440 lbs	19300 lbs	13740 lbs	21255 lbs	5360 lbs	0 lbs	0 lbs	82.70 tons
Plastics	47255 lbs	23617 lbs	47695 lbs	70760 lbs	25095 lbs	49075 lbs	44075 lbs	27826 lbs	44842 lbs	12110 lbs	4050 lbs	9045 lbs	202.72 tons
Clear Glass	51175 lbs	11970 lbs	22115 lbs	86200 lbs	38215 lbs	29585 lbs	60715 lbs	26540 lbs	73480 lbs	20220 lbs	0 lbs	0 lbs	210.11 tons
Brown Glass	38945 lbs	9155 lbs	15295 lbs	66030 lbs	29080 lbs	22530 lbs	46305 lbs	20230 lbs	56005 lbs	15600 lbs	0 lbs	0 lbs	159.59 tons
Green Glass	31580 lbs	7395 lbs	15350 lbs	52880 lbs	23565 lbs	18325 lbs	37500 lbs	16570 lbs	45495 lbs	12420 lbs	0 lbs	0 lbs	130.54 tons
Newspaper	562354 lbs	159420 lbs	433080 lbs	527733 lbs	257660 lbs	366888 lbs	413668 lbs	170951 lbs	430611 lbs	47880 lbs	37646 lbs	36646 lbs	1,722.27 tons
Mixed Paper	437042 lbs	129150 lbs	309790 lbs	747070 lbs	233810 lbs	344520 lbs	366590 lbs	288340 lbs	503160 lbs	97142 lbs	16780 lbs	55780 lbs	1,764.59 tons
Cardboard	130140 lbs	45860 lbs	123377 lbs	175600 lbs	84210 lbs	97990 lbs	149940 lbs	98690 lbs	168060 lbs	34120 lbs	0 lbs	17220 lbs	562.60 tons
Drop Off Center Totals	664.07 tons	197.65 tons	496.20 tons	884.08 tons	357.52 tons	479.53 tons	573.16 tons	334.91 tons	677.30 tons	123.89 tons	30.97 tons	63.08 tons	4,882.36 tons

KPD / Lorain St.	
Cardboard / Paper	12.31 tons

Phone Books	206.53 tons

	Leaves	Brush	Total
Mulching Site	7,095.34 tons	25,316.58 tons	32,411.92 tons

	Scrap Metal	Cardboard	Rec. Tlr. / Backing	HHW REC.	HHW Divert.	Pallets
Transfer Station	644.78 tons	8.18 tons	37.70 tons	50.58 tons	17.15 tons	168.62 tons

	C&D	Compacted	Computers	Tires	Total
Transfer Station Cont.	25,278.88 tons	11,265.01 tons	52.40tons	119.81 tons	37,643.11 tons
				11555	

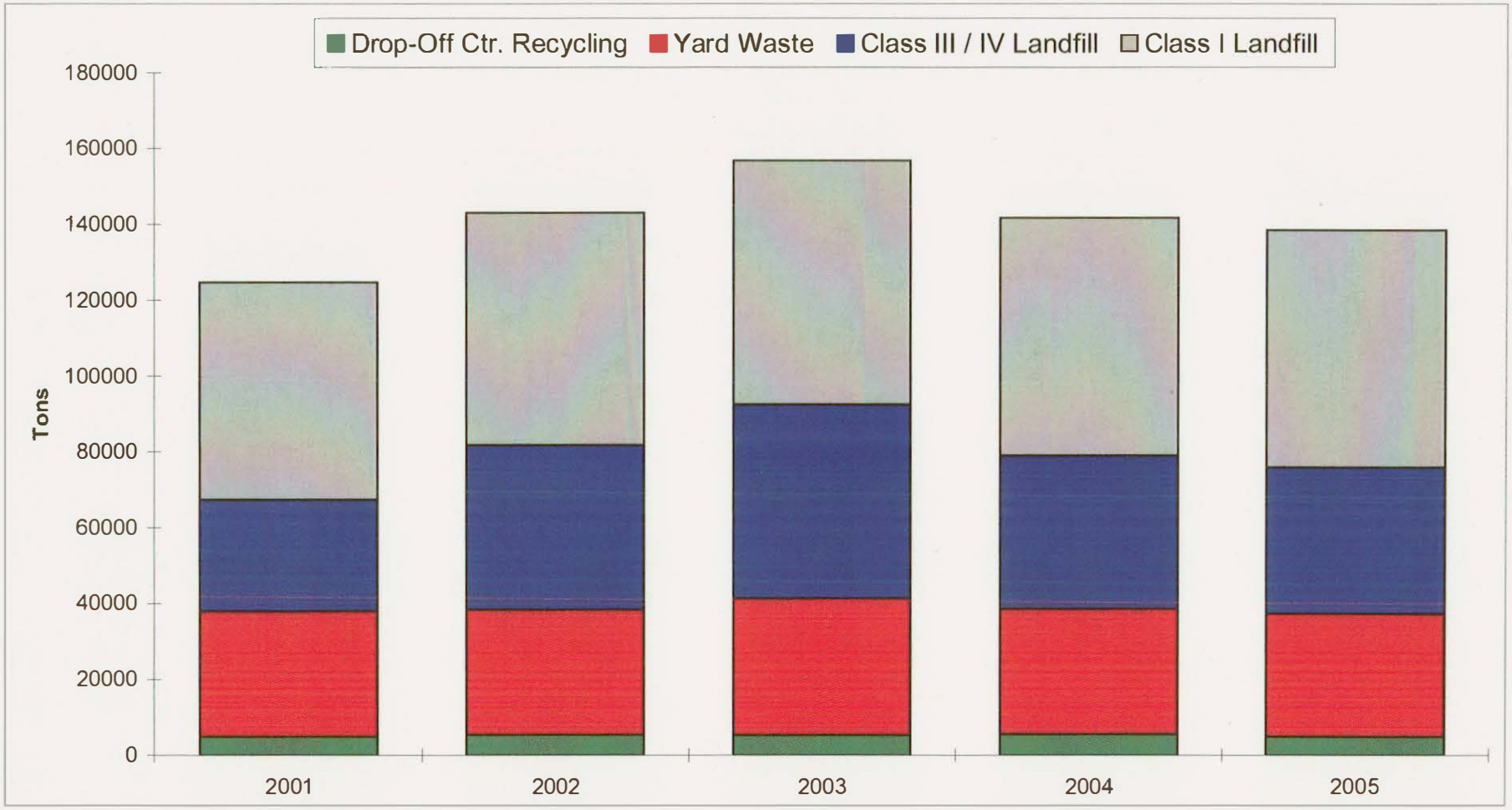
	Household Trash	Misc. Trash	Total
Landfill Class I	51,258.53 tons	47.43 tons	51,305.96 tons

	Transfer Station	Construction	Codes	Total
Landfill Class III	25,278.88 tons	5,124.34 tons	8,224.66 tons	38,627.88 tons

Total Waste Recycled	38,595.20 tons
Total Waste Diverted, Class III & Rec.	77,240.22 tons
Total Wastestream	139,811.19 tons

Recycling	27.61%
Diversion	55.25%
** Recycling / Total WS*	5.76%
* Yard Waste Not Included w/ just residential trash	8.69%

Destination of Knoxville's Residential Waste Stream, 2001 - 2005



	2001	2002	2003	2004	2005
Diversion Rate	**54.65%**	**54.81%**	**59.46%**	**56.26%**	**55.25%**
Recycling Rate	**31.35%**	**27.95%**	**27.16%**	**28.02%**	**27.61%**

APPENDIX B

Summary of Dry Weather Screening Results

1. List of outfalls tested during the permit year with status (6 pages)
2. Table of testing results for outfalls with dry-weather flow (6 pages)

Dry Weather Screening - Sample Events for 2006

Outfall	Outfall Status	Visit #1	Visit #2	Visit #3	Visit #4
00-500-0075	DRY	07/18/2005	07/18/2005	09/12/2005	09/12/2005
00-100-0300	ILLICIT CONNECTION	08/02/2005	08/02/2005	09/12/2005	09/12/2005
00-400-0360	DRY	08/02/2005	08/02/2005	09/12/2005	09/12/2005
00-400-0390	ILLICIT CONNECTION	08/02/2005	08/02/2005	09/12/2005	09/12/2005
01-400-0015	ILLICIT CONNECTION	01/04/2006	01/04/2006	02/06/2006	02/06/2006
01-300-0060	ILLICIT CONNECTION	01/04/2006	01/04/2006	02/06/2006	02/06/2006
01-300-0095	DRY	12/27/2005	12/27/2005	02/06/2006	02/06/2006
01-400-0130	DRY	12/27/2005	12/27/2005	02/06/2006	02/06/2006
01-400-0135	DRY	12/27/2005	12/27/2005	02/06/2006	02/06/2006
01-400-0140	DRY	12/27/2005	12/27/2005	02/06/2006	02/06/2006
01-300-0143	DRY	12/21/2005	12/22/2005	01/27/2006	01/27/2006
01-300-0149	DRY	12/21/2005	12/22/2005	01/27/2006	01/27/2006
01-300-0150	WET	12/22/2005	12/22/2005	01/27/2006	01/27/2006
01-100-0155	DRY	12/22/2005	12/23/2005	01/27/2006	01/27/2006
01-400-0157	DRY	01/27/2006	01/27/2006		
01-300-0160	ILLICIT CONNECTION	12/22/2005	12/23/2005	01/27/2006	01/27/2006
01-400-0235	DRY	12/20/2005	12/20/2005	01/20/2006	01/20/2006
01-400-0236	DRY	12/20/2005	12/20/2005	01/20/2006	01/20/2006
01-400-0238	DRY	12/20/2005	12/20/2005	01/20/2006	01/20/2006
01-400-0240	DRY	12/20/2005	12/20/2005	01/20/2006	01/20/2006
01-100-0245	DRY	12/20/2005	12/20/2005	01/20/2006	01/20/2006
01-400-0250	WET	12/20/2005	12/20/2005	01/20/2006	01/20/2006
01-400-0252	DRY	10/19/2005	10/20/2005	12/07/2005	12/07/2005
01-400-0255	DRY	10/19/2005	10/20/2005	12/07/2005	12/07/2005
01-400-0257	DRY	10/19/2005	10/20/2005	12/07/2005	12/07/2005

Outfall	Outfall Status	Visit #1	Visit #2	Visit #3	Visit #4
01-400-0260	DRY	10/19/2005	10/20/2005	12/07/2005	12/07/2005
01-400-0265	DRY	10/19/2005	10/20/2005	12/07/2005	12/07/2005
01-400-0470	DRY	10/19/2005	10/20/2005	11/18/2005	11/18/2005
01-400-0475	DRY	10/12/2005	10/12/2005	11/23/2005	11/23/2005
01-400-0479	DRY	10/12/2005	10/12/2005	11/18/2005	11/18/2005
01-400-0480	DRY	10/12/2005	10/12/2005	11/18/2005	11/18/2005
01-400-0485	DRY	10/12/2005	10/12/2005	11/18/2005	11/18/2005
01-400-0490	DRY	10/12/2005	10/12/2005	11/18/2005	11/18/2005
01-400-0495	DRY	10/12/2005	10/12/2005	11/11/2005	11/11/2005
01-400-0500	DRY	10/12/2005	10/12/2005	11/11/2005	11/11/2005
01-400-0501	DRY	10/05/2005	10/06/2005	11/18/2005	11/18/2005
01-400-0502	WET	10/05/2005	10/06/2005	11/18/2005	11/18/2005
01-400-0505	DRY	10/05/2005	10/05/2005	11/11/2005	11/11/2005
01-400-0510	DRY	10/05/2005	10/05/2005	11/11/2005	11/11/2005
01-400-0515	WET	10/05/2005	10/05/2005	11/11/2005	11/11/2005
01-300-0520	DRY	10/03/2005	10/04/2005	10/31/2005	10/31/2005
01-400-0525	DRY	10/03/2005	10/04/2005	10/31/2005	10/31/2005
01-400-0530	DRY	10/03/2005	10/04/2005	10/31/2005	10/31/2005
01-400-0535	DRY	10/03/2005	10/04/2005	10/31/2005	10/31/2005
01-500-0630	DRY	10/03/2005	10/04/2005	10/31/2005	10/31/2005
01-400-0635	DRY	09/22/2005	09/22/2005	10/25/2005	10/25/2005
01-400-0640	WET	09/22/2005	09/22/2005	10/25/2005	10/25/2005
01-400-0645	DRY	09/22/2005	09/22/2005	10/25/2005	10/25/2005
01-400-0650	DRY	08/17/2005	08/17/2005	09/22/2005	09/22/2005
01-400-0651	DRY	08/17/2005	08/17/2005	09/22/2005	09/22/2005
01-400-0655	DRY	08/17/2005	08/17/2005	09/22/2005	09/22/2005
01-100-0660	DRY	08/17/2005	08/17/2005	09/22/2005	09/22/2005

Outfall	Outfall Status	Visit #1	Visit #2	Visit #3	Visit #4
01-400-0812	WET	08/17/2005	08/17/2005	09/22/2005	09/22/2005
01-400-0815	DRY	08/17/2005	08/17/2005	09/22/2005	09/22/2005
01-400-0817	DRY	08/17/2005	08/17/2005	09/21/2005	09/21/2005
01-400-0820	DRY	08/17/2005	08/17/2005	09/21/2005	09/21/2005
01-400-0825	DRY	08/17/2005	08/17/2005	09/21/2005	09/21/2005
01-500-0830	WET	08/10/2005	08/10/2005	09/21/2005	09/21/2005
01-400-0835	DRY	08/10/2005	08/10/2005	09/21/2005	09/21/2005
01-400-0900	WET	09/21/2005	09/21/2005	10/21/2005	10/21/2005
02-400-0045	ILLICIT CONNECTION	01/04/2006	01/05/2006	02/07/2006	02/07/2006
02-400-0050	ILLICIT CONNECTION	01/05/2006	01/05/2006	02/07/2006	02/07/2006
02-400-0085	DRY	01/05/2006	01/05/2006	02/07/2006	02/07/2006
02-100-0103	ILLICIT CONNECTION	02/14/2006	02/14/2006	03/15/2006	03/15/2006
02-300-0165	WET	02/14/2006	02/14/2006	03/15/2006	03/15/2006
02-400-0169	WET	02/14/2006	02/14/2006	03/15/2006	03/15/2006
02-200-0205	DRY	02/14/2006	02/14/2006	03/15/2006	03/15/2006
02-100-0210	ILLICIT CONNECTION	02/14/2006	02/14/2006	03/23/2006	03/23/2006
02-400-0215	DRY	02/15/2006	02/15/2006	03/23/2006	03/23/2006
02-400-0220	DRY	02/15/2006	02/15/2006	03/23/2006	03/23/2006
02-400-0225	DRY	02/15/2006	02/15/2006	03/27/2006	03/27/2006
02-300-0230	WET	02/15/2006	02/15/2006	03/27/2006	03/27/2006
02-400-0235	DRY	02/28/2006	02/28/2006	03/29/2006	03/29/2006
02-400-0400	DRY	02/28/2006	03/01/2006	03/29/2006	03/29/2006
02-100-0405	DRY	02/28/2006	03/01/2006	03/27/2006	03/27/2006
02-400-0410	DRY	02/28/2006	03/01/2006	03/27/2006	03/27/2006
02-400-0415	DRY	02/28/2006	03/01/2006	03/29/2006	03/29/2006
02-400-0420	DRY	02/28/2006	03/01/2006	03/27/2006	03/27/2006
02-100-0425	DRY	02/28/2006	03/01/2006	03/27/2006	03/27/2006

Outfall	Outfall Status	Visit #1	Visit #2	Visit #3	Visit #4
03-300-0005	ILLICIT CONNECTION	01/04/2006	01/05/2006	02/07/2006	02/07/2006
03-400-0405	DRY	12/13/2005	12/13/2005	01/19/2006	01/19/2006
03-100-0410	DRY	12/13/2005	12/13/2005	01/19/2006	01/19/2006
03-400-0415	DRY	12/13/2005	12/13/2005	01/19/2006	01/19/2006
03-400-0420	DRY	12/13/2005	12/13/2005	01/19/2006	01/19/2006
03-300-0615	ILLICIT CONNECTION	12/13/2005	12/13/2005	01/19/2006	01/19/2006
03-300-0660	WET	12/13/2005	12/13/2005	01/19/2006	01/19/2006
03-400-0735	DRY	12/12/2005	12/12/2005	01/09/2006	01/09/2006
03-400-0740	DRY	12/12/2005	12/12/2005	01/09/2006	01/09/2006
03-400-0745	DRY	12/12/2005	12/12/2005	01/09/2006	01/09/2006
03-400-0750	DRY	12/12/2005	12/12/2005	01/09/2006	01/09/2006
03-400-0755	DRY	12/12/2005	12/12/2005	01/09/2006	01/09/2006
03-400-0760	DRY	12/12/2005	12/12/2005	01/09/2006	01/09/2006
03-400-0765	DRY	12/12/2005	12/12/2005	01/09/2006	01/09/2006
03-400-0770	DRY	12/12/2005	12/12/2005	01/09/2006	01/09/2006
03-400-0775	DRY	12/12/2005	12/12/2005	01/09/2006	01/09/2006
03-400-0780	DRY	10/28/2005	10/28/2005	12/12/2005	12/12/2005
04-200-0270	WET	10/28/2005	10/28/2005	12/07/2005	12/07/2005
04-400-0295	DRY	10/28/2005	10/28/2005	12/01/2005	12/01/2005
04-400-0300	DRY	10/18/2005	10/19/2005	12/01/2005	12/01/2005
04-400-0305	DRY	10/18/2005	10/19/2005	12/01/2005	12/01/2005
04-400-0310	DRY	10/18/2005	10/19/2005	12/01/2005	12/01/2005
04-400-0317	DRY	10/18/2005	10/19/2005	12/01/2005	12/01/2005
04-400-0320	DRY	10/18/2005	10/19/2005	12/01/2005	12/01/2005
04-100-0325	DRY	10/18/2005	10/19/2005	12/01/2005	12/01/2005
04-300-0327	DRY	10/13/2005	10/14/2005	11/23/2005	11/23/2005
04-300-0337	DRY	10/13/2005	10/14/2005	11/23/2005	11/23/2005

Outfall	Outfall Status	Visit #1	Visit #2	Visit #3	Visit #4
04-400-0340	DRY	10/13/2005	10/13/2005	11/23/2005	11/23/2005
04-300-0345	DRY	10/13/2005	10/14/2005	11/23/2005	11/23/2005
05-400-0055	DRY	09/23/2005	09/23/2005	10/21/2005	10/21/2005
05-400-0060	DRY	09/23/2005	09/23/2005	10/21/2005	10/21/2005
05-400-0120	DRY	09/23/2005	09/23/2005	10/21/2005	10/21/2005
05-400-0125	DRY	09/23/2005	09/23/2005	10/21/2005	10/21/2005
05-200-0130	DRY	09/28/2005	09/28/2005	10/25/2005	10/25/2005
05-400-0135	DRY	09/28/2005	09/28/2005	10/25/2005	10/25/2005
05-400-0140	DRY	09/28/2005	09/28/2005	10/25/2005	10/25/2005
05-500-0145	DRY	09/28/2005	09/28/2005	10/25/2005	10/25/2005
05-400-0150	DRY	09/28/2005	09/28/2005	10/25/2005	10/25/2005
06-500-0110	WET	09/28/2005	09/28/2005	10/28/2005	10/28/2005
07-500-0025	DRY	08/04/2005	08/04/2005	09/13/2005	09/13/2005
07-400-0030	DRY	08/04/2005	08/04/2005	09/13/2005	09/13/2005
07-400-0035	DRY	08/04/2005	08/04/2005	09/13/2005	09/13/2005
07-400-0040	DRY	08/04/2005	08/04/2005	09/13/2005	09/13/2005
07-400-0045	DRY	08/04/2005	08/04/2005	09/13/2005	09/13/2005
07-400-0070	ILLICIT CONNECTION	08/10/2005	08/10/2005	09/20/2005	09/20/2005
07-100-0090	DRY	08/10/2005	08/10/2005	09/20/2005	09/20/2005
08-400-0050	DRY	08/03/2005	08/03/2005	09/09/2005	09/09/2005
08-400-0055	DRY	08/03/2005	08/03/2005	09/09/2005	09/09/2005
08-400-0060	DRY	08/03/2005	08/03/2005	09/09/2005	09/09/2005
08-400-0065	DRY	08/03/2005	08/03/2005	09/09/2005	09/09/2005
08-400-0070	DRY	08/03/2005	08/03/2005	09/09/2005	09/09/2005
08-400-0075	DRY	08/03/2005	08/03/2005	09/09/2005	09/09/2005
08-400-0080	DRY	08/03/2005	08/03/2005	09/09/2005	09/09/2005
08-400-0085	DRY	08/03/2005	08/03/2005	09/09/2005	09/09/2005

Outfall	Outfall Status	Visit #1	Visit #2	Visit #3	Visit #4
08-500-0090	DRY	08/03/2005	08/03/2005	09/09/2005	09/09/2005
08-400-0095	DRY	08/03/2005	08/03/2005	09/20/2005	09/20/2005
08-400-0100	DRY	08/03/2005	08/03/2005	09/20/2005	09/20/2005
08-400-0105	DRY	08/03/2005	08/03/2005	09/20/2005	09/20/2005
08-400-0110	DRY	08/03/2005	08/03/2005	09/20/2005	09/20/2005
12-500-0060	DRY	07/29/2005	07/29/2005	09/02/2005	09/02/2005
12-400-0065	DRY	07/29/2005	07/29/2005	09/02/2005	09/02/2005
12-500-0070	DRY	07/29/2005	07/29/2005	09/02/2005	09/02/2005
12-400-0075	DRY	07/29/2005	07/29/2005	09/02/2005	09/02/2005
12-400-0080	DRY	07/29/2005	07/29/2005	09/02/2005	09/02/2005
13-300-0135	ILLICIT CONNECTION	07/22/2005	07/22/2005	08/23/2005	08/23/2005
13-300-0140	ILLICIT CONNECTION	07/26/2005	07/26/2005	08/24/2005	08/25/2005
13-300-0147	DRY	07/22/2005	07/22/2005	08/23/2005	08/23/2005
13-300-0150	WET	07/22/2005	07/22/2005	08/23/2005	08/23/2005
13-300-0155	WET	07/22/2005	07/22/2005	08/23/2005	08/23/2005
13-300-0184	DRY	07/26/2005	07/26/2005	08/25/2005	08/25/2005
13-300-0185	ILLICIT CONNECTION	07/26/2005	07/26/2005	08/24/2005	08/24/2005
13-300-0226	DRY	07/27/2005	07/27/2005	08/29/2005	08/29/2005
13-300-0227	DRY	07/27/2005	07/27/2005	08/29/2005	08/29/2005
13-300-0228	ILLICIT DUMP	07/27/2005	07/27/2005	08/29/2005	08/29/2005
13-300-0350	DRY	07/26/2005	07/26/2005	08/25/2005	08/25/2005
13-300-0355	DRY	07/26/2005	07/26/2005	08/29/2005	08/29/2005
79-400-0340	ILLICIT CONNECTION	07/27/2005	07/27/2005	08/31/2005	08/31/2005

Dry Weather Screening Data

Outfall / Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
00-100-0300																
2006	8/2/05	1	Yes	16	7.0	0.40	0	0	0	5.00	No	0	40	No	No	No
	8/2/05	2	Yes	19	7.0	0.80	0	0	0	0	No	0	0	No	No	No
	9/12/05	3	Yes	16	7.0	0.10	0.10	0	1	10.00	Yes 840,000	50	40	No	No	No
	9/12/05	4	Yes	16	7.0	0.10	0	0	0.20	3.00	No	25	20	No	No	No
00-400-0072																
2006	8/2/05	1	Yes	5	7.0	0.10	0	0	0	0	No	0	0	No	No	No
	8/2/05	2	Yes	8	6.5	0.20	0	0	0	0	No	0	0	No	No	No
00-400-0390																
2006	8/2/05	1	Yes	10	7.0	1.50	0	0	0	0	No	0	0	No	No	No
	8/2/05	2	Yes	10	6.5	1.50	0	0	0	0	No	0	0	No	No	No
	9/12/05	3	Yes	8	6.0	1.00	0	0	0	0	No	0	0	No	No	No
	9/12/05	4	Yes	8	6.0	1.00	0	0	0	0	No	0	0	No	No	No
01-300-0060																
2006	1/4/06	1	Yes	1	7.0	0	0	0	0.50	0.80	No	0	0	No	No	No
	1/4/06	2	Yes	1	6.0	0	0	0	0	0.80	No	0	0	No	No	No
	2/6/06	3	Yes	13	6.0	0	0	0	0	0.80	No	0	20	No	No	No
	2/6/06	4	Yes	2	6.0	0	0	0	0	0.40	No	0	0	No	No	No
01-300-0150																
2006	12/22/05	1	Yes	38	7.0	0	0	0	0	0	No	0	0	No	No	No
	12/22/05	2	Yes	38	7.0	0	0	0	0	0	No	0	0	No	No	No
	1/27/06	3	Yes	63	6.0	0	0	0	0	0	No	0	0	No	No	No
	1/27/06	4	Yes	76	6.0	0	0	0	0	0	No	0	0	No	No	No
01-300-0160																
2006	12/22/05	1	Yes	5	7.0	0.60	0	0	0	0	No	0	0	No	No	No
	12/23/05	2	Yes	5	6.0	0.50	0	0	0	0	No	0	0	No	No	No
	1/27/06	3	Yes	6	6.5	0.60	0	0	0	0	No	0	0	No	No	No
	1/27/06	4	Yes	6	6.0	0.60	0	0	0	0	No	0	0	No	No	No

Outfall / Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
01-400-0015																
2006	1/4/06	1	Yes	TLTM	6.0	2.00	0	0	0	0.60	No	0	0	No	No	No
	1/4/06	2	Yes	TLTM	6.0	2.00	0	0	0	0	No	0	0	No	No	No
	2/6/06	3	Yes	SLOW	5.5	2.00	0	0	0	0	No	0	0	No	No	No
	2/6/06	4	Yes	SLOW	6.0	2.50	0	0	0	0	No	0	0	No	No	No
01-400-0250																
2006	12/20/05	1	Yes	5	6.5	0	0	0	0	0	No	0	0	No	No	No
	1/20/06	3	Yes	57	6.5	0	0	0	0	0	No	0	0	No	No	No
	1/20/06	4	Yes	57	7.0	0	0	0	0	0	No	0	0	No	No	No
01-400-0502																
2006	10/5/05	1	Yes	2	7.0	0	0	0	0	0	No	0	0	No	No	No
	10/6/05	2	Yes	2	7.0	0	0	0	0	0	No	0	0	No	No	No
	11/18/05	3	Yes	LOW	6.0	0	0	0	0	0.80	No	0	0	No	No	No
	11/18/05	4	Yes	LOW	6.0	0	0	0	0	0	No	0	0	No	No	No
01-400-0515																
2006	10/5/05	1	Yes	MODERA	7.0	0.30	0	0	0	0	No	0	0	No	No	No
	10/5/05	2	Yes	MODERA	7.0	0	0	0	0	0	No	0	0	No	No	No
	11/11/05	3	Yes	MODERA	6.5	0.20	0	0	0	0	No	0	20	No	No	No
	11/11/05	4	Yes	MODERA	6.5	0	0	0	0	0	No	0	40	No	No	No
01-400-0640																
2006	9/22/05	1	Yes	0.19	7.0	0	0	0	0	0	No	0	0	No	No	No
	9/22/05	2	Yes	0.19	7.0	0	0	0	0	0	No	0	0	No	No	No
	10/25/05	3	Yes	0.20	6.5	0	0	0	0	0	No	0	0	No	No	No
	10/25/05	4	Yes	0.20	6.5	0	0	0	0	0	No	0	0	No	No	No
01-400-0812																
2006	8/17/05	1	Yes	3	7.0	0.10	0	0	0	0	No	50	0	No	No	No
	8/17/05	2	Yes	3	7.0	0	0	0	0	0	No	50	20	No	No	No
	9/22/05	3	Yes	2	7.0	0	0	0	0	0	No	25	0	No	No	No
	9/22/05	4	Yes	2	7.0	0	0	0	0	0	No	0	0	No	No	No
01-400-0900																
2006	9/21/05	1	Yes	29	6.5	0	0	0	0	0	No	0	0	No	No	No
	9/21/05	2	Yes	29	7.0	0	0	0	0	0	No	0	0	No	No	No
	10/21/05	3	Yes	19	6.0	0	0	0	0	0	No	0	0	No	No	No
	10/21/05	4	Yes	19	7.0	0	0	0	0	0.30	No	0	0	No	No	No

Outfall / Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
01-500-0830																
2006	8/10/05	1	Yes	NORMAL	7.0	0.20	0	0	0	0	No	0	0	No	No	No
	8/10/05	2	Yes	NORMAL	7.0	0.20	0	0	0	0	No	0	0	No	No	No
	9/21/05	3	Yes	LOW	7.0	0	0	0	0	0	No	0	0	No	No	No
	9/21/05	4	Yes	LOW	7.0	0	0	0	0	0	No	0	0	No	No	No
02-100-0103																
2006	2/14/06	1	Yes	0.50	6.0	0.20	0	0	0	0.60	No	0	0	No	No	No
	2/14/06	2	Yes	0.50	6.5	0.20	0	0	0	6.00	Yes 11,000	0	0	No	No	No
	3/15/06	3	Yes	2	7.0	0.40	0	0	0.25	1.00	Yes 30,000	50	50	No	No	No
	3/15/06	4	Yes	2	7.0	0.40	0	0	0	0.80	No	25	0	No	No	No
02-100-0210																
2006	3/23/06	3	Yes	5	5.0	0.20	0	0	0.50	2.00	Yes 60,000	0	0	No	No	No
	3/23/06	4	Yes	5	6.0	0.40	0	0	0.75	0	No	0	0	No	No	No
02-300-0165																
2006	2/14/06	1	Yes	MODERA	7.0	0.40	0	0	0	0	No	0	0	No	No	No
	2/14/06	2	Yes	MODERA	7.0	0	0	0	0	0	No	0	0	No	No	No
	3/15/06	3	Yes	SLOW	7.0	0	0	0	0	0	No	0	0	No	No	No
	3/15/06	4	Yes	SLOW	6.0	0	0	0	0	0	No	0	0	No	No	No
02-300-0230																
2006	2/15/06	1	Yes	67	6.0	0	0	0	0	0	No	0	0	No	No	No
	2/15/06	2	Yes	67	5.5	0	0	0	0	0	No	0	0	No	No	No
	3/27/06	3	Yes	HEAVY	7.0	0.20	0	0	0	0	No	0	0	No	No	No
	3/27/06	4	Yes	HEAVY	6.0	0	0	0	0	0	No	0	0	No	No	No
02-400-0045																
2006	1/4/06	1	Yes	5	6.0	0	0	0	0	0.20	No	0	0	No	No	No
	1/5/06	2	Yes	16	7.0	0	0	0	0	0	No	0	0	No	No	No
	2/7/06	3	Yes	16	7.0	2.50	0	0	0	0	No	0	0	No	No	No
	2/7/06	4	Yes	13	7.0	2.50	0	0	0	0	No	0	0	No	No	No
02-400-0050																
2006	1/5/06	1	Yes	0.21	6.0	0.60	0	0	0	0	No	0	0	No	No	No
	1/5/06	2	Yes	0.26	6.0	0.60	0	0	0	0	No	0	0	No	No	No
	2/7/06	3	Yes	0.70	6.5	0.40	0	0	0	0	No	0	0	No	No	No
	2/7/06	4	Yes	0.70	6.5	0.40	0	0	0	0	No	0	0	No	No	No

Outfall / Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
02-400-0169																
2006	2/14/06	1	Yes	29	7.0	0.30	0	0	0	0	No	0	0	No	No	No
	2/14/06	2	Yes	29	7.0	0	0	0	0	0	No	0	0	No	No	No
	3/15/06	3	Yes	38	6.0	0.30	0	0	0	0	No	0	0	No	No	No
	3/15/06	4	Yes	19	6.0	0.30	0	0	0	0	No	0	0	No	No	No
03-300-0005																
2006	1/4/06	1	Yes	14	5.0	0.80	0	0	0	0	No	0	0	No	No	No
	1/5/06	2	Yes	14	5.0	0.80	0	0	0	0	No	0	0	No	No	No
	2/7/06	3	Yes	19	7.0	2.50	0	0	0	0.80	No	0	0	No	No	No
	2/7/06	4	Yes	19	7.0	1.00	0	0	0	0	No	0	0	No	No	No
03-300-0615																
2006	12/13/05	1	Yes	LOW	5.0	0	0.10	0.10	0	0.80	No	50	50	No	No	No
	12/13/05	2	Yes	LOW	6.0	0	0.30	0	0	0.80	No	50	85	No	No	No
	1/19/06	3	Yes	LOW	7.0	0.10	0.10	0	0	0.10	No	0	0	No	No	No
	1/19/06	4	Yes	LOW	7.0	0.40	0	0	0	0.10	No	0	0	No	No	No
03-300-0660																
2006	12/13/05	1	Yes	AVERAGE	6.5	0	0	0	0	0	No	0	0	No	No	No
	12/13/05	2	Yes	AVERAGE	6.5	0	0	0	0	0	No	0	0	No	No	No
	1/19/06	3	Yes	MODERA	7.0	0.10	0	0	0	0	No	0	0	No	No	No
	1/19/06	4	Yes	MODERA	7.0	0	0	0	0	0	No	0	0	No	No	No
04-200-0270																
2006	10/28/05	1	Yes	LOW	7.0	0	0	0	0	0	No	0	0	No	No	No
	10/28/05	2	Yes	LOW	6.5	0	0	0	0	0	No	0	0	No	No	No
	12/7/05	3	Yes	FAST	6.0	0	0	0	0	0	No			No	No	No
	12/7/05	4	Yes	FAST	6.5	0	0	0	0	0	No	0	0	No	No	No
06-500-0110																
2006	9/28/05	1	Yes	LOW	6.5	0	0	0	0	0	No	0	0	No	No	No
	9/28/05	2	Yes	LOW	6.5	0	0	0	0	0	No	0	0	No	No	No
	10/28/05	3	Yes	SLOW	7.0	0	0	0	0	0	No	0	0	No	No	No
	10/28/05	4	Yes	SLOW	6.5	0	0	0	0	0	No	0	0	No	No	No
07-400-0070																
2006	8/10/05	1	Yes	0.20	7.0	0.30	0	0	0	0	No	0	40	No	No	No
	8/10/05	2	Yes	0.08	7.0	0.60	0	0	0.25	2.00	No	0	40	No	No	No
	9/20/05	3	Yes	0.04	7.0	0.20	0	0.20	1.50	2.00	No	0	60	SEWAGE	No	No

Outfall / Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
13-300-0135																
2006	7/22/05	1	Yes	1	6.0	0.40	0	0	0	3.00	No	0	30	BENZENE	No	No
	7/22/05	2	Yes	1	7.0	0.20	0	0	0	3.00	No	0	30	No	No	No
	8/23/05	3	Yes	SLOW	7.0	0	0	0	0	3.00	No	0	30	No	No	No
	8/23/05	4	Yes	SLOW	7.0	0	0	0	0	3.00	No	0	30	No	No	No
13-300-0140																
2006	7/26/05	1	Yes	19	6.0	0.30	0	0	0	0	No	0	0	No	No	No
	7/26/05	2	Yes	19	7.0	0.20	0	0	0	0	No	0	0	No	No	No
	8/24/05	3	Yes	19	7.0	0.30	0.20	0	1.50	1.00	Yes 74,000	50	50	No	SUDS	No
	8/25/05	4	Yes	19	7.0	0.20	0	0	0.25	0	No	0	0	No	No	No
13-300-0150																
2006	7/22/05	1	Yes	1	6.5	0.40	0	0	0.25	0	No	0	0	No	No	No
	7/22/05	2	Yes	1	6.5	0.20	0	0	0	0	No	0	0	No	No	No
	8/23/05	3	Yes	0.12	6.0	0	0	0	0	0	No	0	0	No	No	No
	8/23/05	4	Yes	0.16	7.0	0.20	0	0	0	0	No	0	10	No	No	No
13-300-0155																
2006	7/22/05	1	Yes	8	7.0	0.30	0	0.20	0	0.60	No	0	0	No	No	No
	7/22/05	2	Yes	8	7.0	0	0	0.20	0	0.80	No	0	0	No	No	No
	8/23/05	3	Yes	14	7.0	0.20	0	0	0	0	No	0	0	No	No	No
	8/23/05	4	Yes	14	7.0	0.20	0	0	0	0	No	0	0	No	No	No
13-300-0185																
2006	7/26/05	1	Yes	14	7.0	0.40	0	0	0	0.80	No	0	0	No	No	No
	7/26/05	2	Yes	14	7.0	0.20	0	0	0	0.80	No	0	0	No	No	No
	8/24/05	3	Yes	11	6.0	0.30	0	0	0	0	No	0	0	No	No	No
	8/24/05	4	Yes	10	6.0	0.30	0	0	0	0	No	0	0	No	No	No
13-300-0228																
2006	7/27/05	1	Yes	1	7.0	0.30	0	0.30	3	8.00	Yes 150,000	50	80	SEWAGE	No	No
	7/27/05	2	Yes	1	7.0	0.20	0	0	0	0.20	No	0	0	No	No	No
	8/29/05	3	Yes	0.96	7.0	0	0	0	0	0	No	0	0	No	No	No
	8/29/05	4	Yes	0.95	7.0	0	0	0	0	0	No	0	0	No	No	No

Outfall / Permit Year	Date	Visit #	Flow ?	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Fecal Sample (mpn/100ml)	Turbidity (ntu)	Color	Odor?	Surface Scum	Oil Sheen
79-400-0340																
2006	7/27/05	1	Yes	5	6.0	0.30	0.30	> 1.00	> 0.25	> 10.00	No	0	0	No	No	No
	7/27/05	2	Yes	5	5.0	0.20	0.30	> 10.00	> 3	> 10.00	No	0	0	No	No	No
	8/31/05	3	Yes	2	4.0	0.30	0.40	> 10.00	0.50	10.00	No	0	0	BENZENE	No	No
	8/31/05	4	Yes	2	4.0	0.30	0.40	10.00	0.25	10.00	No	0	0	BENZENE	No	No

Shaded rows represent samples which contained eleveated levels for at least 1 sampled parameter.

Elevated readings have been underlined.

Record Selection Criteria: SELECT * FROM qryAllData WHERE (((flow)=Yes)) and ((PermitYear)="2006")

Below is a listing of sample parameters and their elevated reading criteria:

pH	<= 6 or >8 su
Chlorine	>=0.3 ppm
Copper	>=0.1 ppm
Phenol	>=0.1 ppm
Detergents	>=0.25 ppm
Ammonia	>=1 ppm
Fecal Sample	>=200 mpn/100 ml

APPENDIX C

Summary Report for IBI Studies during permit year

INDEX OF BIOTIC INTEGRITY
FIRST CREEK

INTRODUCTION

This document represents data collected from First Creek in Knoxville, by the Tennessee Izaak Walton League for the City of Knoxville. First Creek is one of four streams to be surveyed for I.B.I. in July, 2006. In this document we will state our plan, describe the study area, explain methodology, and discuss results found.

TENNESSEE IZAAK WALTON LEAGUE, BACKGROUND

The Tennessee Izaak Walton League has been addressing general water quality concerns since 1977 and specific impacts of sewage, silt and trash debris on water for the past six years. In June 2000, we opened an office with a full-time professional staff located at 956 Volunteer Landing Marina, Knoxville Waterfront.

First Creek is one of the four urban streams we are studying in Knoxville, Tennessee. Our previous observations show that problems in First Creek include industrial disturbance, excessive impervious surface runoff and sewage overflow influence.

OBJECTIVES

1. Perform backpack electro-shocking, and macro-invertebrate study.
2. Perform a water quality test.
3. Score IBI and deliver write-up to the city of Knoxville.

STUDY AREA

First Creek is a 7739.2-acre drainage that flows through Knoxville and empties into the Tennessee River at the waterfront at mile 647.5 (Figure 1). This creek drains a significant portion of North Knoxville. First Creek begins due North of downtown Knoxville and flows southward to the Tennessee River. First Creek runs parallel to Broadway. This creek meanders through some residential areas and along roadways. This survey was conducted at approximately 6.8 miles up stream from the confluence with Fort Loudoun Lake. This site represents fish data collected on First Creek above its confluence with Whites Creek.

METHODS

The biotic condition of the stream was assessed by examining the fishes present and by examining the benthic macro invertebrates present in the upper First Creek drainage. One site was selected for conducting a biological assessment (Figure 2). Site selection was based upon topography, drainage area, access, and adjacent impacts to the stream.

Fisheries

The Index of Biotic Integrity (IBI) developed by Karr (1981) is used to examine fish communities. Tools used to conduct the Baker Creek IBI included a backpack shocker and two twenty-foot seines. The seines were placed 100 meters apart up stream and down

stream. Three passes were conducted using the backpack shocker to stun the fish to allow them to be collected. Each fish collected was then identified to species and then released. The sample area was measured to determine catch per unit effort; an average of fish per square feet yielded the score.

Figure 1. The First Creek Watershed Knoxville, Tennessee.

The data were analyzed by the IBI method that uses 12 metrics to assess biotic integrity. The 12 metrics include 6 that describe species richness and composition, 3 that relate to trophic composition, and 3 that measure fish abundance and condition. Scores of 1, 3, or 5 are possible for each metric. The six metrics used to describe species richness and compositions are good indicators of stream degradation. Metrics one through four assess species richness. Metrics five and six are used to determine the presence of tolerant or intolerant fish. Three metrics address the trophic composition of the stream by identifying percentage of fishes that forage on selected levels. Metrics seven through nine assess the energy base within the food wed of the community. They help identify shifts towards more generalized foraging that typically increase in degraded streams. Metrics ten through twelve-measure fish abundance and condition. These metrics are most useful at the low end of the biological integrity scale. The sum of the 12 metric scores result in an overall score that ranges from 12 to 60 (very poor to excellent).

Benthic Macro invertebrates

A qualitative, family level EPT survey was used to examine the benthic macroinvertebrate populations of mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Tricoptera). A thorough search for benthic macro-invertebrates was conducted in riffle, leaf packs, wood, rocks, root wads, submersed or emergent vegetation, and pool substrate. All of the organisms were collected and identified to family level. The EPT score is a sum of the total number of families of EPT organisms represented in a sample. Scores of 0-5 are considered poor, 7-11 fair, and >13 good.

Water Quality

Tests were conducted using an In-Situ Water Quality Sampler. The parameters tested were turbidity, dissolved oxygen, pH, temperature, conductivity, ORP, barometer and flow rate.

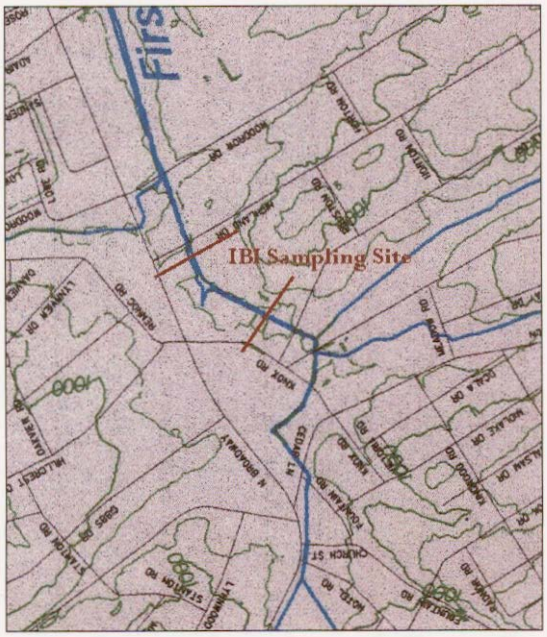


Figure 2. First Creek IBI site depicted, Knoxville, Tennessee.

RESULTS

Fish

Fish sampling on June 27, 2006 yielded an IBI score of **32** that equates to poor. Average depth: .14 meters; Average width: 3.8 meters.

Benthic

Macro-invertebrate sampling at First Creek yielded and EPT score of **1** that equates to poor.

Water Quality

Water tests on June 27, 2006 yielded the following results:

Dissolved Oxygen= 11.56 mg (DO)/L	Flow rate= .45 meters sec.
Turbidity= 10.6 NTU's;	ORP= 85
Temp= 72.16 F	pH= 8.14
Conductivity= 532.1 mS	Barometer= 28.97

DISCUSSION

First Creek is listed in the draft of the 2002, 303d for the state of Tennessee because of Pathogens, Siltation, Nutrients and other habitat alterations", pg. 50. The Index of Biotic Integrity (I.B.I.) for First Creek received an overall score of poor. This score, amongst other variables, reflects a low number of intolerant species, a high number of tolerant species, and a high number of diseased fish. The absence of intolerant fish is likely connected to stream channel alteration, siltation and pathogens. The presence of disease is likely a result of pathogens in the water. Water quality of First Creek showed to have adequate pH, and temperature. The Benthic Macro-invertebrates received a score of poor. Only one group within the EPT distinction, the Order Caddisfly (Tricoptera), was found on-site. Fish abundance, benthic macro-invertebrates, and water quality all come together to give us a better understanding of First Creek, 2006.

CONCLUSION

This document represents data collected from First Creek in Knoxville by the Tennessee Izaak Walton League for the City of Knoxville, Engineering Department. First Creek has a good chance to make a come back with better buffer areas and with some creative engineering to reduce flood events and, or provide bankfull fish habitat. We look forward to further study of this creek.

Index of Biotic Integrity
First Creek June 27, 2006
Ecoregion: Central Appalachian Ridges and Valleys

Metric Description	Scoring Criteria			Observed	Score
	1	3	5		
Total number of native fish species	<10	(10-19)	>19	9	1
Number of darter species	<2	2	>2	1	1
Number of sunfish species, less *Micropterus*	<2	2	>2	1	1
Number of sucker species	<2	2	>2	1	1
Number of intolerant species	<2	2	>2	1	1
Percent of individuals as tolerant species	>33%	17%-33%	<17%	98.9%	1
Percent of individuals as omnivores and stoneroller species	>40%	21%-40%	<21%	19.02%	5
Percent of individuals as specialized insectivores	<19%	19%-36%	>36%	80.97%	5
Percent of individuals as piscivores	<2%	2%-4%	>4%	1.63%	1
Catch rate (average number of fish per 300 sq. ft. sampling unit)	<22	22-43.8	>43.8	184	5
Percent of individuals as hybrids	>1%	TR-1%	0%	0%	5
Percent of individuals with diseases, tumors, fin damage, and other anomalies	>5%	2%-5%	<2%	1.08%	5
IBI					32
IBI Classification					VERY POOR

IBI Range: 0 = No fish; 12-22 Very poor; 28-34 = Poor; 40-44 = Fair, 48-52 = Good; 59-60 = Excellent

E.P.T. Families Present **Score: 1 (Poor)**

E: none
P: none
T: Philpotamidae

Comments: Reasonable bug diversity at this location

INDEX OF BIOTIC INTEGRITY
WILLIAMS CREEK

INTRODUCTION

This document represents data collected from Williams Creek in Knoxville, by the Tennessee Izaak Walton League for the City of Knoxville. Williams Creek is one of four streams surveyed for I.B.I. in July, 2006. In this document we will state our objective, describe the study area, explain methodology, and discuss results found.

TENNESSEE IZAAK WALTON LEAGUE, BACKGROUND

The Tennessee Izaak Walton League has been addressing general water quality concerns since 1977 and specific impacts of sewage, silt and trash debris on water for the past six years. In June 2000, we opened an office with a full-time professional staff located at 956 Volunteer Landing Marina, Knoxville Waterfront.
Williams Creek is one of the four urban streams we are studying in Knoxville, Tennessee. Our previous observations show that problems in Williams Creek include industrial disturbance, excessive impervious surface runoff and sewage overflow influence.

OBJECTIVES

1. Perform backpack electro-shocking, and macro-invertebrate study.
2. Perform a water quality test.
3. Score IBI and deliver write-up to the city of Knoxville.

STUDY AREA

Williams Creek is a 1,641.22 acre (664.2 hectare) drainage area that flows south 2.8 miles through East Knoxville and empties into the Tennessee River at two miles up stream of the waterfront development in downtown Knoxville. The upper half of the watershed is impacted by typical urban runoff, including a section of Interstate 40 and the heavily traveled, four lanes of Magnolia Avenue. The upper half is developed but flows through a magnificent high story riparian zone with large trees atypical of an urban stream. This section suffers from poorly maintained sewage laterals and large amounts of trash and debris. The lower half flows through a newly developed golf course, past the Vulcan materials plant and Knoxville Utilities Board before its confluence with the Tennessee River. This section contains a well-established riparian zone adjacent to the Vulcan Materials Plant. Williams Creek is listed in the draft of the 2002, 303d for the state of Tennessee because of both habitat alteration and urban runoff/ storm sewers.

METHODS

The biotic condition of the stream was assessed by examining the fishes present and by examining the benthic macro invertebrates present in the upper Williams Creek drainage. One site was selected for conducting a biological assessment. Site selection was based upon topography, drainage area, access, and adjacent impacts to the stream.

Fisheries

The Index of Biotic Integrity (IBI) developed by Karr (1981) is used to examine fish communities. Tools used to conduct the Baker Creek IBI included a backpack shocker and two twenty-foot seines. The seines were placed 100 meters apart up stream and down stream. Three passes were conducted using the backpack shocker to stun the fish to allow them to be collected. Each fish collected was then identified to species and then released. The sample area was measured to determine catch per unit effort; an average of fish per square feet yielded the score.

Figure 1. The Williams Creek Watershed Knoxville, Tennessee.

The data were analyzed by the IBI method that uses 12 metrics to assess biotic integrity. The 12 metrics include 6 that describe species richness and composition, 3 that relate to trophic composition, and 3 that measure fish abundance and condition. Scores of 1, 3, or 5 are possible for each metric. The six metrics used to describe species richness and compositions are good indicators of stream degradation. Metrics one through four assess species richness. Metrics five and six are used to determine the presence of tolerant or intolerant fish. Three metrics address the trophic composition of the stream by identifying percentage of fishes that forage on selected levels. Metrics seven through nine assess the energy base within the food wed of the community. They help identify shifts towards more generalized foraging that typically increase in degraded streams. Metrics ten through twelve-measure fish abundance and condition. These metrics are most useful at the low end of the biological integrity scale. The sum of the 12 metric scores result in an overall score that ranges from 12 to 60 (very poor to excellent).

Benthic Macro invertebrates

A qualitative, family level EPT survey was used to examine the benthic macroinvertebrate populations of mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddis flies (Tricoptera). A thorough search for benthic macro-invertebrates was conducted in riffle, leaf packs, wood, rocks, root wads, submersed or emergent vegetation, and pool substrate. All of the organisms were collected and identified to family level. The EPT score is a sum of the total number of families of EPT organisms represented in a sample. Scores of 0-5 are considered poor, 7-11 fair, and >13 good.

Water Quality

Tests were conducted using an In-Situ Water Quality Sampler. The parameters tested were turbidity, dissolved oxygen, pH, temperature, conductivity, ORP, barometer and flow rate.

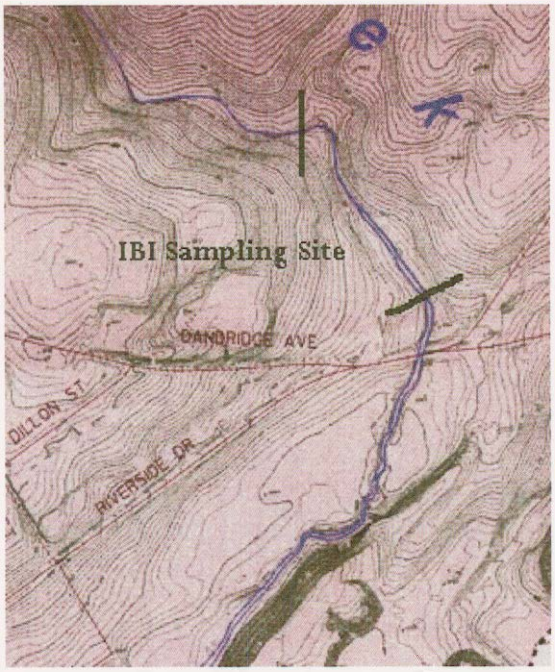


Figure2. Williams Creek IBI site depicted, Knoxville Tennessee.

RESULTS

Fish

Fish sampling on June 28, 2006 yielded an IBI score of **28** that equates to very poor. Average depth: .10 meters; Average width: 4.4 meters.

Benthic

Macro-invertebrate sampling at Williams Creek yielded and EPT score of **2** that equates to poor.

Water Quality

Water tests on June 28, 2006 yielded the following results:

Dissolved Oxygen= 8.92 mg (DO)/L	Flow rate= .14 meters a sec.
Turbidity= 1.9 NTU's;	ORP= 219
Temp= 69.2 F	pH= 8.72
Conductivity= 441.2 mS	Barometer= 29.22

DISCUSSION

Williams Creek is listed in the draft of the 2002, 303d for the state of Tennessee because of Pathogens and other habitat alterations", pg. 51. The Index of Biotic Integrity (I.B.I.) for Williams Creek received an overall score of very poor. This score, amongst other variables, reflects a low number of intolerant species, a high number of tolerant species, and a significant number of diseased fish. The absence of intolerant fish is likely connected to stream channel alteration, siltation and pathogens. The presence of disease is likely a result of pathogens in the water. Water quality of Williams Creek showed to have adequate pH, and temperature. The Benthic Macro-invertebrates received a score of poor. Only one group within the EPT distinction, the Order Caddis fly (Tricoptera), was found on-site. Fish abundance, benthic macro-invertebrates, and water quality all come together to give us a better understanding of Williams Creek, 2006.

CONCLUSION

This document represents data collected from Williams Creek in Knoxville by the Tennessee Izaak Walton League for the City of Knoxville, Engineering Department. Williams Creek has a good chance to make a come back with better buffer areas, more community awareness and some creative engineering to reduce flood events and, or provide better fish habitat. KUB has performed several upgrades to their sewage system along this creek since focus began back in 2002. It will be interesting to track the amount of Ecoli and other pathogens as they abate and cross-reference those numbers with the amount of diseased tumors found in fish—hope to see a linear regression. We look forward to further study of this creek.

Index of Biotic Integrity

Williams Creek June 28, 2006
Ecoregion: Central Appalachian Ridges and Valleys

Metric Description	Scoring Criteria			Observed	Score
	1	3	5		
Total number of native fish species	<10	(10-19)	>19	4	1
Number of darter species	<2	2	>2	0	1
Number of sunfish species, less *Micropterus*	<2	2	>2	0	1
Number of sucker species	<2	2	>2	0	1
Number of intolerant species	<2	2	>2	0	1
Percent of individuals as tolerant species	>33%	17%-33%	<17%	100%	1
Percent of individuals as omnivores and stoneroller species	>40%	21%-40%	<21%	15.30%	5
Percent of individuals as specialized insectivores	<19%	19%-36%	>36%	84.69%	5
Percent of individuals as piscivores	<2%	2%-4%	>4%	0%	1
Catch rate (average number of fish per 300 sq. ft. sampling unit)	<22	22-43.8	>43.8	281	5
Percent of individuals as hybrids	>1%	TR-1%	0%	0%	5
Percent of individuals with diseases, tumors, fin damage, and other anomalies	>5%	2%-5%	<2%	11.74%	1
IBI					28
IBI Classification					VERY POOR

IBI Range: 0 = No fish; 12-22 Very poor; 28-34 = Poor; 40-44 = Fair, 48-52 = Good; 59-60 = Excellent

E.P.T. Families Present **Score: 2 (Poor)**

E: none
P: none
T: Hydropsychidae, Helicopsychidae

Comments: Reasonable bug diversity at this location

INDEX OF BIOTIC INTEGRITY
BAKER CREEK

INTRODUCTION

This document represents data collected from Baker Creek in Knoxville, by the Tennessee Izaak Walton League for the City of Knoxville. Baker Creek is one of four streams surveyed for I.B.I .in July, 2006. In this document we will state our objective, describe the study area, explain methodology, and discuss results found.

TENNESSEE IZAAK WALTON LEAGUE, BACKGROUND

The Tennessee Izaak Walton League has been addressing general water quality concerns since 1977 and specific impacts of sewage, silt and trash debris on water. In June 2000, we opened an office with a full-time professional staff located at 956 Volunteer Landing Marina, Knoxville Waterfront.

Baker Creek is one of the four urban streams we are studying in Knoxville, Tennessee. Our previous observations show that problems in Baker Creek include industrial disturbance, excessive impervious surface runoff and sewage overflow influence.

OBJECTIVES

1. Perform backpack electro-shocking, and macro-invertebrate study.
2. Perform a water quality test.
3. Score IBI and deliver write-up to the city of Knoxville.

STUDY AREA

Baker Creek is a 1673.49-acre drainage area that flows through South Knoxville and empties into the Tennessee River at two miles up stream of the waterfront development in downtown Knoxville (Figure 1). Baker Creek is listed in the draft of the 2002, 303d, (pg.51) for the state of Tennessee because of both "Other Habitat Alterations and Pathogens."

METHODS

The biotic condition of the stream was assessed by examining the fishes present and by examining the benthic macro invertebrates present in the upper Baker Creek drainage. One site was selected for conducting a biological assessment. Site selection was based upon topography, drainage area, access, and adjacent impacts to the stream.

Fisheries

The Index of Biotic Integrity (IBI) developed by Karr (1981) is used to examine fish communities. Tools used to conduct the Baker Creek IBI included a backpack shocker and two twenty-foot seines. The seines were placed 100 meters apart up stream and down stream. Three passes were conducted using the backpack shocker to stun the fish to allow them to be collected. Each fish collected was then identified to species and then

released. The sample area was measured to determine catch per unit effort; an average of fish per square feet yielded the score.

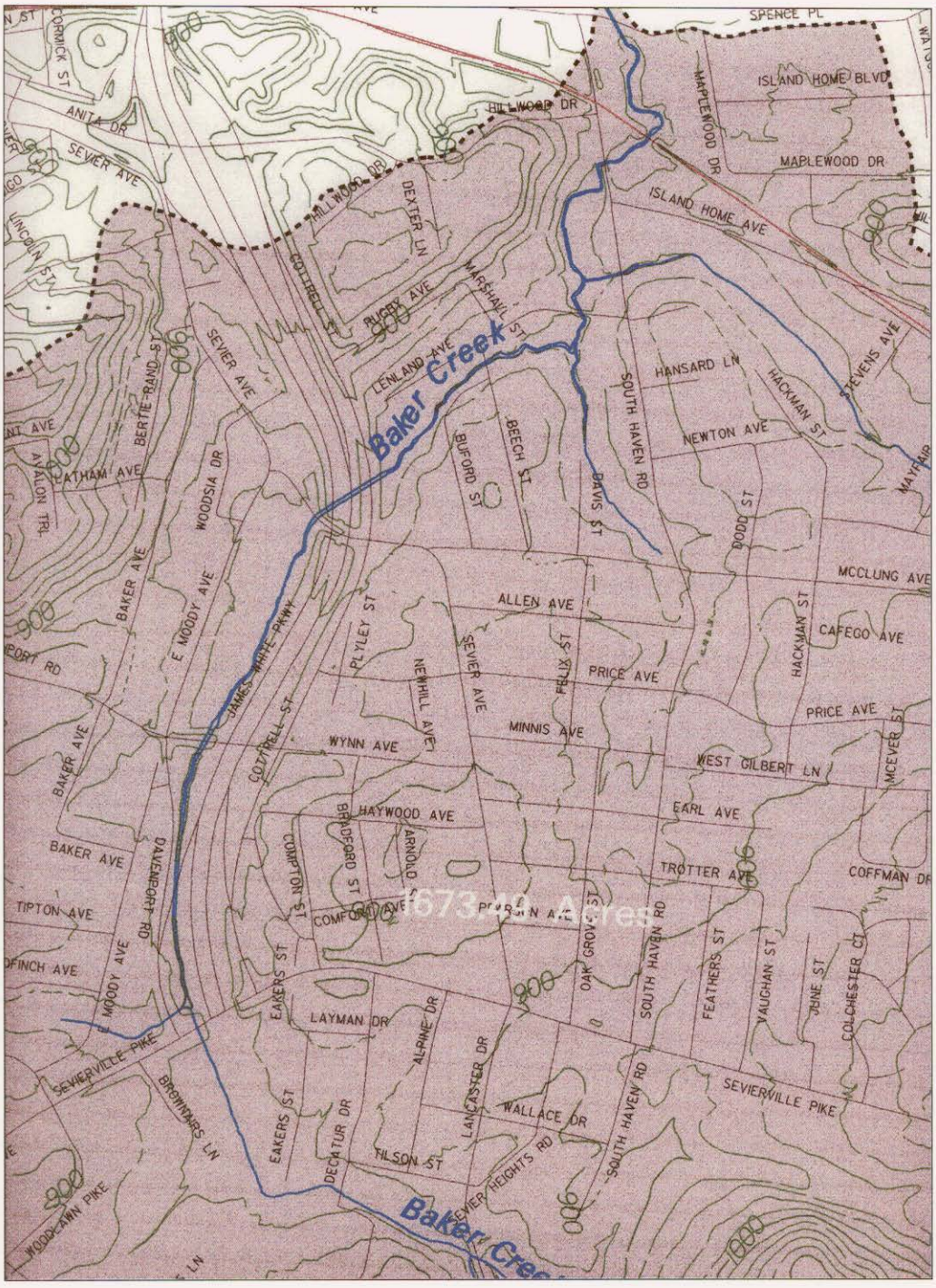


Figure 1. The Baker Creek Watershed Knoxville, Tennessee

The data were analyzed by the IBI method that uses 12 metrics to assess biotic integrity. The 12 metrics include 6 that describe species richness and composition, 3 that relate to trophic composition, and 3 that measure fish abundance and condition. Scores of 1, 3, or 5 are possible for each metric. The six metrics used to describe species richness and compositions are good indicators of stream degradation. Metrics one through four assess species richness. Metrics five and six are used to determine the presence of tolerant or intolerant fish. Three metrics address the trophic composition of the stream by identifying percentage of fishes that forage on selected levels. Metrics seven through nine assess the energy base within the food wed of the community. They help identify shifts towards more generalized foraging that typically increase in degraded streams. Metrics ten through twelve-measure fish abundance and condition. These metrics are most useful at the low end of the biological integrity scale. The sum of the 12 metric scores result in an overall score that ranges from 12 to 60 (very poor to excellent).

Benthic Macro invertebrates

A qualitative, family level EPT survey was used to examine the benthic macroinvertebrate populations of mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddis flies (Tricoptera). A thorough search for benthic macro-invertebrates was conducted in riffle, leaf packs, wood, rocks, root wads, submersed or emergent vegetation, and pool substrate. All of the organisms were collected and identified to family level. The EPT score is a sum of the total number of families of EPT organisms represented in a sample. Scores of 0-5 are considered poor, 7-11 fair, and >13 good.

Water Quality

Tests were conducted using an In-Situ Water Quality Sampler. The parameters tested were turbidity, dissolved oxygen, pH, temperature, conductivity, ORP, flow rate and barometer.

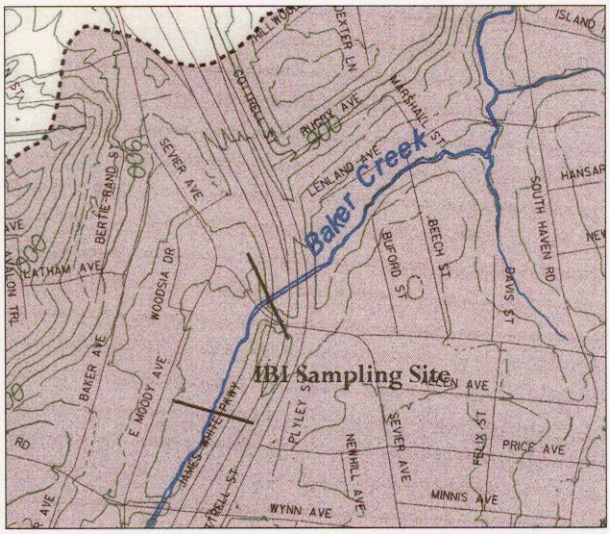


Figure 2. Baker Creek IBI site depicted, Knoxville Tennessee.

RESULTS

Fish

Fish sampling on June 29, 2006 yielded an IBI score of **26** that equates to poor. Average depth: .13 meters; Average width: 2.66 meters.

Benthic

Macro-invertebrate sampling at Baker Creek yielded and EPT score of **3** that equates to poor.

Water Quality

Water tests on June 29, 2006 yielded the following results:

Dissolved Oxygen= 9.09 mg (DO)/L	Flow Rate=.14 meters sec.
Turbidity= 6.2 NTU's;	ORP= 232
Temp= 68.7 F	pH= 5.81
Conductivity= 405.2 mS	Barometer= 29.21

DISCUSSION

Baker Creek is listed in the draft of the 2002, 303d for the state of Tennessee because of Pathogens and other habitat alterations", pg. 51. The Index of Biotic Integrity (I.B.I.) for Baker Creek received an overall score of poor. This score, amongst other variables, reflects the low number of intolerant species a high number of tolerant species and fish disease anomalies present. The absence of intolerant fish is likely connected to stream channel alteration, siltation and pathogens. The presence of disease is likely a result of pathogens in the water. Water quality of Baker Creek showed to have adequate pH, and temperature. The Benthic Macro-invertebrates received a score of poor. Only one group within the EPT distinction, the Order Caddis fly (Tricoptera), was found on-site. Fish abundance, benthic macro-invertebrates, and water quality all come together to give us a better understanding of Baker Creek, 2006.

CONCLUSION

This document represents data collected from Baker Creek in Knoxville by the Tennessee Izaak Walton League for the City of Knoxville, Engineering Department. Baker Creek has a good chance to make a come back with better buffer areas, more community awareness and some creative engineering to reduce flood events and, or provide better fish habitat. We look forward to further study of this creek.

Index of Biotic Integrity

Baker Creek June 29, 2006
Ecoregion: Central Appalachian Ridges and Valleys

Metric Description	Scoring Criteria			Observed	Score
	1	3	5		
Total number of native fish species	<10	(10-19)	>19	8	1
Number of darter species	<2	2	>2	1	1
Number of sunfish species, less *Micropterus*	<2	2	>2	1	1
Number of sucker species	<2	2	>2	1	1
Number of intolerant species	<2	2	>2	1	1
Percent of individuals as tolerant species	>33%	17%-33%	<17%	98.4%	1
Percent of individuals as omnivores and stoneroller species	>40%	21%-40%	<21%	43.2%	1
Percent of individuals as specialized insectivores	<19%	19%-36%	>36%	56.8%	5
Percent of individuals as piscivores	<2%	2%-4%	>4%	0%	1
Catch rate (average number of fish per 300 sq. ft. sampling unit)	<22	22-43.8	>43.8	125	5
Percent of individuals as hybrids	>1%	TR-1%	0%	0%	5
Percent of individuals with diseases, tumors, fin damage, and other anomalies	>5%	2%-5%	<2%	3.2 %	3
IBI					26
IBI Classification					VERY POOR

IBI Range: 0 = No fish; 12-22 Very poor; 28-34 = Poor; 40-44 = Fair, 48-52 = Good; 59-60 = Excellent

E.P.T. Families Present **Score: 3 (Poor)**

E: none
P: none
T: Hydropsychidae, Molannidae, Philpotamidae

Comments: Reasonable bug diversity at this location

INDEX OF BIOTIC INTEGRITY
GOOSE CREEK

INTRODUCTION

This document represents data collected from Goose Creek in Knoxville, by the Tennessee Izaak Walton League for the City of Knoxville. Goose Creek is one of four streams to be surveyed for I.B.I. during the 2006. In this document we will state our plan, describe the study area, explain methodology, and discuss results found.

TENNESSEE IZAAK WALTON LEAGUE, BACKGROUND

The Tennessee Izaak Walton League has been addressing general water quality concerns since 1977 and specific impacts of sewage, silt and trash debris on water for the past six years. In June 2000, we opened an office with a full-time professional staff located at 956 Volunteer Landing Marina, Knoxville Waterfront.
Goose Creek is one of the four urban streams we are studying in Knoxville, Tennessee. Our previous observations show that problems in Goose Creek include industrial disturbance, excessive impervious surface runoff and sewage overflow influence.

OBJECTIVES

1. Perform backpack electro-shocking, and macro-invertebrate study.
2. Perform a water quality test.
3. Score IBI and deliver write-up to the city of Knoxville.

STUDY AREA

Goose Creek is a 2382.8-acre drainage that flows through South Knoxville and empties into the Tennessee River at mile 646.8 (Figure 1). This creek drains a significant portion of South Knoxville. Goose Creek begins due East of downtown Knoxville and flows westward to the Tennessee River. Goose Creek runs parallel and south of Chapman highway. This creek meanders through many residential areas and along roadways. The Goose Creek watershed is also home to a superfund site—David Witherspoon. This survey was conducted at approximately 1.1 miles up stream from the confluence with Fort Loudoun Lake.

METHODS

The biotic condition of the stream was assessed by examining the fishes present and by examining the benthic macro invertebrates present in the upper Goose Creek drainage. One site was selected for conducting a biological assessment (Figure 2). Site selection was based upon topography, drainage area, access, and adjacent impacts to the stream.

Fisheries

The Index of Biotic Integrity (IBI) developed by Karr (1981) is used to examine fish communities. Tools used to conduct the Baker Creek IBI included a backpack shocker and two twenty-foot seines. The seines were placed 100 meters apart up stream and down

stream. Three passes were conducted using the backpack shocker to stun the fish to allow them to be collected. Each fish collected was then identified to species and then released. The sample area was measured to determine catch per unit effort; an average of fish per square feet yielded the score.

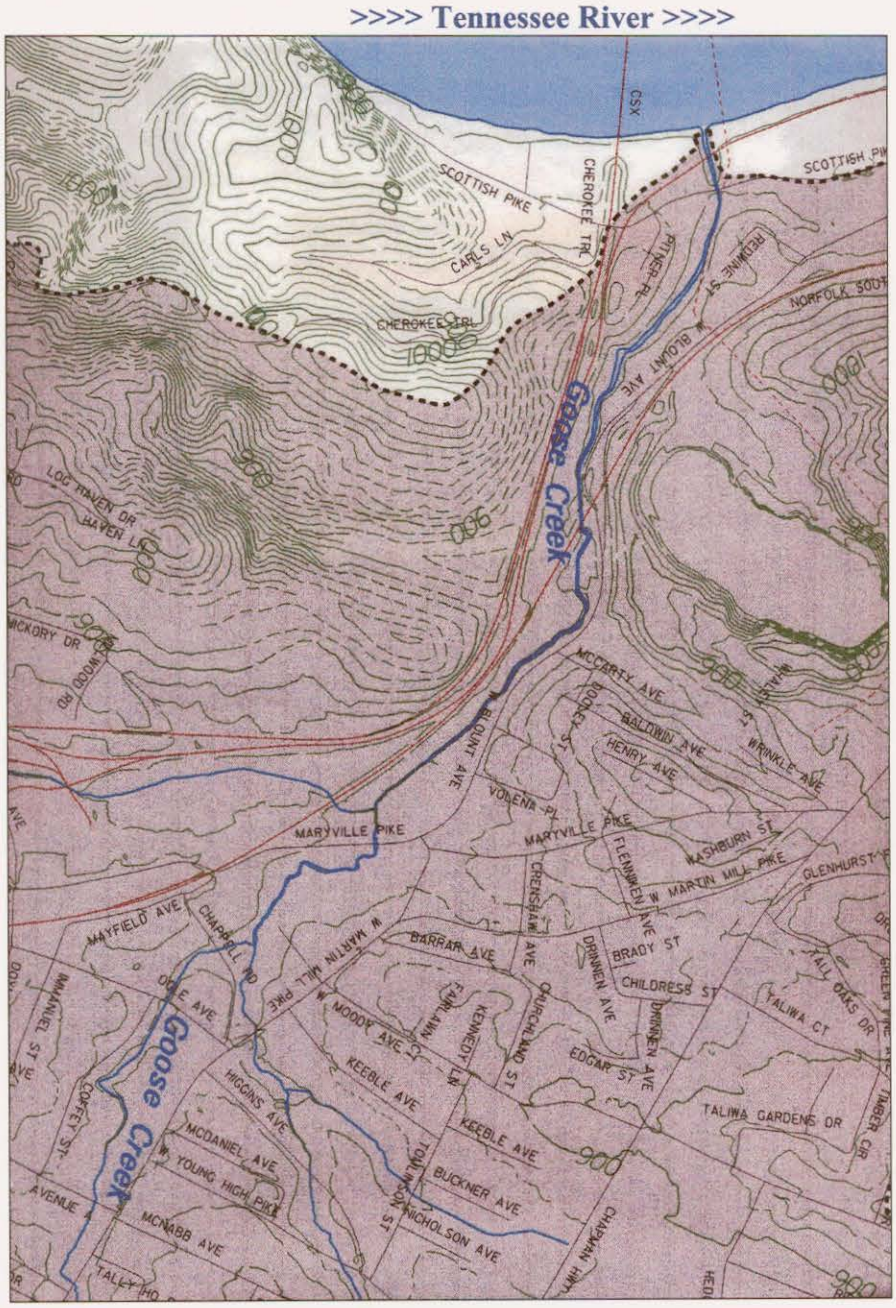


Figure 1. The Goose Creek Watershed Knoxville, Tennessee.

The data were analyzed by the IBI method that uses 12 metrics to assess biotic integrity. The 12 metrics include 6 that describe species richness and composition, 3 that relate to

trophic composition, and 3 that measure fish abundance and condition. Scores of 1, 3, or 5 are possible for each metric. The six metrics used to describe species richness and compositions are good indicators of stream degradation. Metrics one through four assess species richness. Metrics five and six are used to determine the presence of tolerant or intolerant fish. Three metrics address the trophic composition of the stream by identifying percentage of fishes that forage on selected levels. Metrics seven through nine assess the energy base within the food wed of the community. They help identify shifts towards more generalized foraging that typically increase in degraded streams. Metrics ten through twelve-measure fish abundance and condition. These metrics are most useful at the low end of the biological integrity scale. The sum of the 12 metric scores result in an overall score that ranges from 12 to 60 (very poor to excellent).

Benthic Macro invertebrates

A qualitative, family level EPT survey was used to examine the benthic macroinvertebrate populations of mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Tricoptera). A thorough search for benthic macro-invertebrates was conducted in riffle, leaf packs, wood, rocks, root wads, submersed or emergent vegetation, and pool substrate. All of the organisms were collected and identified to family level. The EPT score is a sum of the total number of families of EPT organisms represented in a sample. Scores of 0-5 are considered poor, 7-11 fair, and >13 good.

Water Quality

Tests were conducted using an In-Situ Water Quality Sampler. The parameters tested were turbidity, dissolved oxygen, pH, temperature, ORP, barometer, conductivity and flow rate.

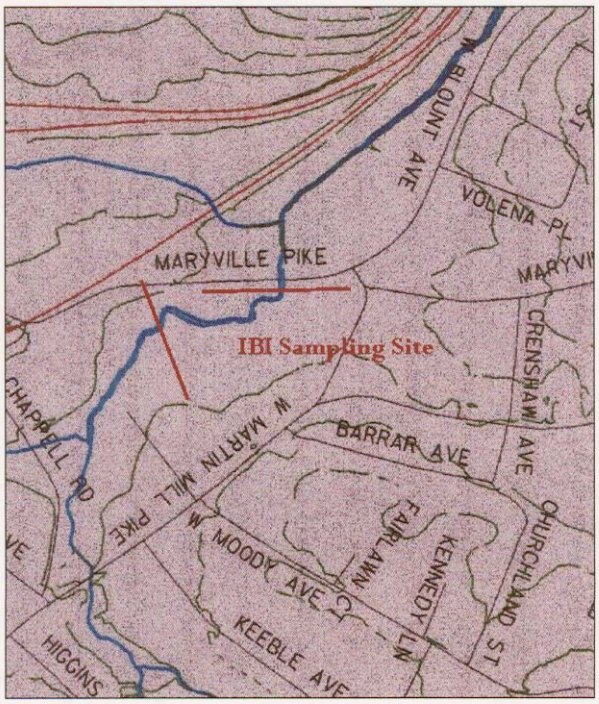


Figure 2. Goose Creek IBI site depicted, Knoxville, Tennessee.

RESULTS

Fish

Fish sampling on June 30, 2006 yielded an IBI score of **32** that equates to very poor. Average depth: .10 meters; Average width: 2.95 meters.

Benthic

Macro-invertebrate sampling at Goose Creek yielded and EPT score of **1** that equates to poor.

Water Quality

Water tests on June 30, 2006 yielded the following results:

Dissolved Oxygen= 10.07 mg (DO)/L	Flow Rate=.07 meters sec.
Turbidity= 14.7 NTU's;	ORP= 242
Temp= 65.9 F	pH= 7.64
Conductivity= 440.7 mS	Barometer= 29.25

DISCUSSION

Goose Creek is listed in the draft of the 2002, 303d for the state of Tennessee because of Pathogens, Siltation, other habitat alterations, and PCBs", pg. 51. The Index of Biotic Integrity (I.B.I.) for Goose Creek received an overall score of very poor. This score, amongst other variables, reflects a low number of intolerant species, a high number of tolerant species and a relatively low catch rate. The absence of intolerant fish is likely connected to stream channel alteration, siltation and pathogens. Water quality of Goose Creek showed to have adequate pH, and temperature. The Benthic Macro-invertebrates received a score of poor. Only one group within the EPT distinction, the Order Caddisfly (Tricoptera), was found on-site. Fish abundance, benthic macro-invertebrates, and water quality all come together to give us a better understanding of Goose Creek, 2006.

CONCLUSION

This document represents data collected from Goose Creek in Knoxville by the Tennessee Izaak Walton League for the City of Knoxville, Engineering Department. Goose Creek has a good chance to make a come back with better buffer areas and with some creative engineering to reduce flood events and, or provide bankfull fish habitat. We look forward to further study of this creek.

Index of Biotic Integrity

Goose Creek June 30, 2006
Ecoregion: Central Appalachian Ridges and Valleys

Metric Description	Scoring Criteria			Observed	Score
	1	3	5		
Total number of native fish species	<10	(10-19)	>19	5	1
Number of darter species	<2	2	>2	0	1
Number of sunfish species, less *Micropterus*	<2	2	>2	1	1
Number of sucker species	<2	2	>2	0	1
Number of intolerant species	<2	2	>2	1	1
Percent of individuals as tolerant species	>33%	17%-33%	<17%	96.2%	1
Percent of individuals as omnivores and stoneroller species	>40%	21%-40%	<21%	.94%	5
Percent of individuals as specialized insectivores	<19%	19%-36%	>36%	99%	5
Percent of individuals as piscivores	<2%	2%-4%	>4%	0%	1
Catch rate (average number of fish per 300 sq. ft. sampling unit)	<22	22-43.8	>43.8	106	5
Percent of individuals as hybrids	>1%	TR-1%	0%	0%	5
Percent of individuals with diseases, tumors, fin damage, and other anomalies	>5%	2%-5%	<2%	1.8%	5
IBI					32
IBI Classification					POOR

IBI Range: 0 = No fish; 12-22 Very poor; 28-34 = Poor; 40-44 = Fair, 48-52 = Good; 59-60 = Excellent

E.P.T. Families Present **Score: 1 (Poor)**

E: none
P: none
T: Hydropsychidae,

Comments: Reasonable bug diversity at this location

APPENDIX D

Solid Waste Transfer Station SWPPP

City of Knoxville

Solid Waste Transfer Facility
1033 Elm Street

Draft

Stormwater Pollution Prevention Plan

August 2006

TABLE OF CONTENTS

APPENDIX

STORMWATER POLLUTION PREVENTION PLAN FOR MUNICIPAL TRANSFER STATIONS

I. SITE DESCRIPTION AND POLLUTION PREVENTION TEAM

Facility Name: City of Knoxville Solid Waste Transfer Facility

Facility Address: 1033 Elm Street, Knoxville TN 37917

A. POLLUTION PREVENTION TEAM

This is the member roster and responsibilities list for the pollution prevention team. This list will be updated as necessary.

Leader: Tommy White Title: Waste Facility Manager
Office Phone: 215-6007 Cell Phone: 659-8231
Responsibilities: Coordinate all stages of Plan development, inspections and implementation; coordinate employee training program; keep all records and ensure reports are submitted; oversee sampling program

Member: Mike Glovier Title: HHW Facility Manager
Office Phone: 215-6708 Cell Phone: _____
Responsibilities: Implementation of the preventive maintenance program; oversee good housekeeping activities; spill response coordinator

Member: David Brace Title: Deputy Director Public Service Div.
Office Phone: 215-2060 Cell Phone: _____
Responsibilities: _____

Member: David Hagerman, P.E. Title: Stormwater/NPDES Permit Coordinator
Office Phone: 865-215-3251 Cell Phone: 865-705-9866 Fax: 865-215-2631
Responsibilities: Conduct / Assist with inspections and training program; conduct sampling

II. STORMWATER POLLUTION PREVENTION PLAN

A. SITE MAP

B. FACILITY AREAS DEFINED

The storm drain system from this facility discharges stormwater into Second Creek. Throughout this document, the specific areas of the facility will be referenced according to the corresponding number on the map. A brief description of the areas is listed below.

Area 1: Loading dock where compacted refuse is loaded into trailers for transport offsite as well as storage area for used tires and used appliances.

Area 2: De-watering area for debris collected by the street sweeping and vacuuming equipment.

Area 3: Majority of open lot for the facility. Area contains entrance/driveway, truck scales, attendant's shack, and #2 diesel fuel tank/refueling area.

Area 4: Access road to the compactor "pit"; the area contains the compactor where most refuse is disposed prior to offsite disposal. Area 4 stormwater drains to the detention pond prior to leaving the site.

Area 5: Household Hazardous Waste Collection Center where small volumes of hazardous materials are collected and stored prior to recycling or offsite disposal. Area includes used oil/automobile fluid disposal container.

C. FACILITY WIDE BEST MANAGEMENT PRACTICES

INVENTORY OF EXPOSED MATERIALS: Changes daily depending on the waste products delivered. May include, but not be limited to, lawn mowers, ovens, refrigerators, freezers, tires, used auto parts, pallets and other wood refuse, and other items for disposal.

SUMMARY OF POTENTIAL POLLUTANT SOURCES: A wide range of trash, debris, liquids, powders, or other wastes could be spilled anywhere on the site.

INSPECTIONS

- The following forms are included in the appendix.
  - The weekly Site Inspection Form will be filled out weekly.
  - The List of Significant Spills and Leaks will be filled out each time a significant spill occurs.
- All forms will be initialed by the inspector(s) and kept onsite for at least five years with all spills and maintenance needs noted.
- Each area of the site will be inspected daily and the following items will be checked.
  - Spills
  - Discharges
  - Stored trash or material exposed to rain

- Required Maintenance (leaks, damaged equipment, damaged grates, etc.)
- Sweeping/Cleaning
- Other specifics required for each area.

MEASURES AND CONTROLS

- Wastewater (regardless of the source) and other non-stormwater discharges must **never** be discharged into the storm drain catch basins unless specifically exempted by the Stormwater & Street Ordinance.
- No vehicles will be washed or cleaned anywhere onsite other than in area 1 and area 2, where the wastewater will enter the sanitary sewer.
- The entire lot will be swept as needed or at least weekly as a minimum.
  - Debris from the lot will be properly disposed with the other waste products.
  - Any garbage and debris that cannot be removed mechanically will be picked up and swept up by hand and properly disposed.
- After the lot has been swept and scraped with the bobcat and high lifts and the large debris is removed, street cleaning sweeping vacuum trucks will routinely vacuum the entire lot.
- Water hoses will be rolled up and stored when not in use.
- Leaking hoses will be repaired or properly disposed and replaced.
- Water spigots with leaky valves will be repaired promptly.
- No waste will be intentionally dumped on the lot, but will be dumped into the appropriate waste disposal area.
- All waste products delivered to the transfer station will be promptly removed and properly disposed.

SPILLS AND LEAKS

- If a material spilled presents an immediate threat to health or the environment, the Knoxville Fire Department will be notified to contain.
- If the spill is non-hazardous, it will be cleaned by the Service Department and properly disposed, including all containment and cleaning materials.
- Spill containment and clean up materials will be located conveniently at the household hazardous waste storage building where all employees have access to them.
- Containment material including but not limited to booms, absorbent pads, and absorbent granules will be used to contain the spill.
- Spills will be prevented from entering the storm drain system by using containment, drain blockers, or any other necessary means.
- The source of the spill will be identified and the discharge will be stopped.
- The site supervisor will be notified of the spill.
- If the spill is hazardous, the City will contact a hazardous material remediation contractor to contain, clean, and dispose the material.
- **No spill will ever be cleaned up by washing the spill, in part or wholly, into the storm drain system, or the catch basin inserts.**

EMPLOYEE TRAINING

- All facility employees will be trained in accordance with the specifics of this document.
- Newly hired employees and existing City employees transferring to work at this facility will be properly trained in stormwater pollution prevention from the site and the proper practices and procedures before beginning work on the site.
- Existing employees will be re-trained annually in this document and the procedures to be used to prevent stormwater pollution from the site.
- All personnel who work at the transfer station will be trained in appropriate spill response for the materials transported, stored, and/or used in their area.
- Pollution prevention team members will meet together at least annually for the purpose of discussing the Plan, the Site Compliance Inspection, and Preventive Maintenance Procedures.

D. AREA 1.

INVENTORY OF EXPOSED MATERIALS: Changes daily depending on the waste products delivered. May include, but not be limited to, lawn mowers, ovens, refrigerators, freezers, tires, used auto parts, and other items for disposal. Items will be removed from the site daily and disposed properly. Future plans include a covered structure to prevent exposure for the used appliances and auto parts.

SUMMARY OF POTENTIAL POLLUTANT SOURCES: Gasoline and oil; ammonia, refrigerants, and other liquids associated with household appliances; and grease, anti-freeze, and other automotive fluids.

MEASURES AND CONTROLS

- Trench drains in this area carry wastes and other runoff into the sanitary sewer. Oil absorbent booms are used in the trench to control hydrocarbon discharges into the sanitary sewer.
- Hydrocarbon booms in these drains will be inspected weekly for maintenance. They will be replaced when they turn dark gray.
- The area will be inspected daily for leaks and spills.
- A curb installed between the compactors and the trench drain will prevent hydraulic oil leaks from entering the trench drain.
- Trash and debris will be cleared from trench grate prior to washing surfaces daily.
- Grates will be a fine mesh to keep larger particles from causing sanitary blockages.
- An asphalt berm at the outside edge of the grate will prevent liquid from overflowing the edge of the grate onto the asphalt
- Products with oils, greases, etc. such as used auto parts, old lawn mowers, etc. will be stored under cover and protected from rainfall. They will be stored in an area where any leaking fluids will be contained and prevented from entering the sewer system.
- An oil/water separator may be added as part of a future capital project.

E. AREA 2.

INVENTORY OF EXPOSED MATERIALS: Refuse and debris collected from street sweeping and vacuuming.

SUMMARY OF POTENTIAL POLLUTANT SOURCES: Waste water and debris errantly spilled outside of the de-watering pit.

MEASURES AND CONTROLS

- This area contains a sanitary sewer drain in the drainage pit, and the street sweeping debris is de-watered in the pit. Extra precaution will be taken to insure waste materials will be discharged entirely to the pit.
- Any debris that spills outside the drainage pit will be cleaned immediately and placed into the pit until it is de-watered.
- De-watered debris will be taken from the drainage pit up and properly disposed into transfer trailers before the lot is cleaned daily.
- The base and walls of the existing de-watering pit will be maintained.
- Maintenance and improvements to the de-watering pit will be performed as needed and at least once per week as a minimum.
- A future capital project may include the addition of a cover to the de-watering pit.

F. AREA 3:

INVENTORY OF EXPOSED MATERIALS: Pallets and other wood refuse.

SUMMARY OF POTENTIAL POLLUTANT SOURCES: #2 diesel fuel leaking from the tank or spilled during refueling and any product falling from vehicles that are improperly or overly loaded.

MEASURES AND CONTROLS

- Woody debris and pallets, will not be dumped or stored outdoors until completion of a capital project to construct a containment wall for the material.
- The diesel tank needs secondary containment composed of a concrete slab with sides deep enough to contain the entire volume of the tank to prevent any leaks or spills from the tank from entering the storm drain catch basins.
- The tank also needs a rigid cover to prevent rainfall from filling and overflowing the secondary containment.
- Hydrocarbon absorbents will be placed under the equipment during fueling to collect the inevitable drips and spills associated with the operation.
- **All of the catch basins collecting stormwater from the transfer station will be retrofitted with inserts to treat the stormwater for hydrocarbons.**
- The inserts will be very sturdy with a metal, or at the minimum fiberglass, framework to provide a rigid structure
- Suntree Technologies, Inc. Grate Inlet Skimmer Box with a metal frame and fiberglass structure or equivalent will be used.

INSPECTIONS

- Inserts will be inspected weekly.
- The hydrocarbon absorbents will be changed as needed. When the absorbents turn gray to dark gray, they will be changed and replaced with clean new absorbents.
- The used absorbent booms will be properly disposed by the household hazardous waste center.
- The fiberglass structure will be removed monthly (or more often if needed) and cleaned and cleared before being reinstalled into the catch basin.
- Debris removed from the insert will be disposed in the "pit" in area 4 along with the other solid waste debris.
- The catch basins have been delineated by a numbering system as indicated on the site map.
- Records will be kept on the site for at least five years. The records will include:
  - Catch basin number
  - Date and time of inspection
  - Name and title of inspector

G. AREA 4:

INVENTORY OF EXPOSED MATERIAL: Nothing is intentionally stored outdoors in this area. Miscellaneous products may spill off the vehicles bringing them in for disposal. Such products will be removed daily during lot cleaning.

SUMMARY OF POTENTIAL POLLUTANT SOURCES: Dust suppression water from leaking hoses and overspray collecting spilled debris.

MEASURES AND CONTROLS

- The detention pond will also be inspected, and garbage will be picked up from the pond and properly disposed during the lot cleaning.
- Water is used to control dust on the pad under the structure covering the compactor pit.
- At no time will the water be allowed to flow west out from under the structure covering the compactor pit and pad.
- **All of the catch basins collecting stormwater from the transfer station will be retrofitted with inserts to treat the stormwater for hydrocarbons.**
- The inserts will be very sturdy with a metal, or at the minimum fiberglass, framework to provide a rigid structure
- Suntree Technologies, Inc. Grate Inlet Skimmer Box with a metal frame and fiberglass structure or equivalent will be used.

INSPECTIONS

- Inserts will be inspected weekly.

- The hydrocarbon absorbents will be changed as needed. When the absorbents turn gray to dark gray, they will be changed and replaced with clean new absorbents.
- The used absorbent booms will be properly disposed by the household hazardous waste center.
- The fiberglass structure will be removed monthly (or more often if needed) and cleaned and cleared before being reinstalled into the catch basin.
- Debris removed from the insert will be disposed in the "pit" in area 4 along with the other solid waste debris.
- The catch basins have been delineated by a numbering system as indicated on the site map.
- Records will be kept on the site for at least five years.
- Records will be kept on the site for at least five years. The records will include:
  - Catch basin number
  - Date and time of inspection
  - Name and title of inspector

H. AREA 5:

INVENTORY OF EXPOSED MATERIAL: Nothing will be stored outdoors in this area. Any products not under cover, including leaks or spills, will be collected immediately and placed under the shelter.

SUMMARY OF POTENTIAL POLLUTANT SOURCES: Paints, stains, solvents, volatiles, detergents, acidic and caustic substances, as well as other household hazardous wastes, and used automobile fluids.

MEASURES AND CONTROLS

- Spills are immediately cleaned up with an absorbent. (See Spill Prevention and Response Procedures)
- Spigots or funnels are used to minimize drips or leaks when transferring fluids.
- No drums (empty or full, open or closed) or used pallets are stored outdoors or uncovered
- Areas of truck loading and unloading are swept at least once per day, and more often if necessary to prevent the build-up of refuse in these areas.
- Areas around recycling bins are swept at least once per day, and more often if necessary to prevent the build-up of refuse in these areas.

I. MONITORING PROGRAM

DRY WEATHER SCREENING PROGRAM

- Three outfalls are located on the property in the following locations:
  1. Marked as CB 1 on the site map.
  2. The two drains from Area 4 that outlet into the detention pond
- Each of the three outfalls will be monitored for flow during dry weather at least four times each year.

- The second visit will occur from 4 to 24 hours after the first: the third visit will occur approximately 30 days after the second: the fourth visit will occur from 4 to 24 hours after the third.
- In the event of flow, the flow will be sampled and tested for the following:
  1. Turbidity
  2. Color
  3. pH
  4. Chlorine
  5. Copper
  6. Ammonia
  7. Phenols
  8. Detergents
- City Stormwater personnel will perform the inspections and maintain the records for dry weather screening.

WET WEATHER SAMPLING

- Runoff from storm events will be sampled once each year.

- The sample will be tested for the following parameters:

PARAMETER	UNITS
Oil and Grease	mg/L
Chemical Oxygen Demand	mg/L
Total Suspended Solids	mg/L
Total Phosphorous	mg/L
Total Kjeldahl Nitrogen	mg/L
Nitrate plus Nitrite	mg/L
Fecal Coliform	mg/L
Total dissolved solids	mg/L
Biochemical oxygen demand	mg/L
pH	
Total Kjeldahl nitrogen	mg/L
Dissolved Phosphorous	mg/L
Total ammonia & organic nitrogen	mg/L
Volatile Organic Compounds	mg/L

- City Stormwater personnel will collect the sample and maintain records of lab testing.

Table 1. Weekly Site Inspection Form Date of Inspection _____ Inspector_____.

AREA (1-5)	INSPECT	CHECK FOR:	PROBLEMS		If yes, describe	Spills > 5 gal, add to Table 2	
			Y	N		Y	N
1-5	Drainage Structures (catchbasins/ outfalls)	Absorbent boom color, sediment, etc.					
1	Used tires	Contained within their area					
1	Large Appliances Pile	Exposed to weather, exposed grease or oil					
2	De-watering pit	Spillage and careful dumping practices					
3	Above Ground Diesel Storage Tank	Berms, spills, leaks					
3	Wood Pallet Piles	Leaking material, or falling off trailer					
5	Household Hazardous Waste Center	All waste stored inside or under cover					
5	Spent fuels or motor oils	Spills or leaks around the container					
	Other _____						
	Other _____						

Update the pollution prevention team if necessary. Updated? Y N

Review the SWPPP. Are there any other areas which need to be updated? Y N

If yes, attach notes to this inspection form and update the team.

Table 2. List of Significant (> 5 gallons) Spills and Leaks

Date	Spill	Leak	Location (as indicated on site map)	Description				Response Procedures	Measures Taken To Prevent Reoccurrence
(MM/DD/YY)	(check one)			Type of Material	Quantity	Source, if known	Reason		

Date	Spill	Leak	Location (as indicated on site map)	Description				Response Procedures	Measures Taken To Prevent Reoccurrence
(MM/DD/YY)	(check one)			Type of Material	Quantity	Source, if known	Reason		

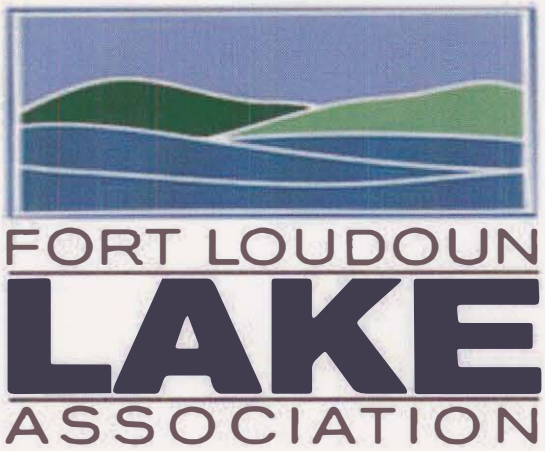
Date	Spill	Leak	Location (as indicated on site map)	Description				Response Procedures	Measures Taken To Prevent Reoccurrence
(MM/DD/YY)	(check one)			Type of Material	Quantity	Source, if known	Reason		

Please Copy Blank Form As Needed

APPENDIX E

Stream Restoration/Debris Removal Contract Report
Tennessee Izaak Walton League

Weir Removal Program – Grant #4



Work Conducted by:
Scott Wilson, Doug White and Mark Campen
December 1, 2006

Fort Loudoun Lake Association
956 Volunteer Landing Lane Box 12
Knoxville, TN 37915
865-523-3800

Weir Survey and Removal

Abstract:

The Weir survey and removal program has been very successful to date. The program entailed a ground survey of urban creeks throughout Knoxville where-in weirs were located, documented, and assessed as to whether they were necessary for removal. Project plans were then composed and the weirs removed.

Weirs Removed:

Weir #1
Williams Creek
N 35^0 58.945'
W 083^0 53.263'

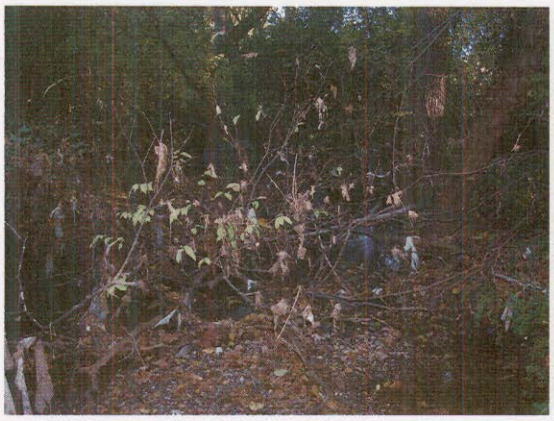
This weir was removed on October 13, 2006. Workers waded into the creek with a chainsaw, mattocks, and rakes. The City of Knoxville Public Works informed us of this weir. It consisted a large portion of debris being caught on a guide wire. The subsequent blockage was causing serious stream bank scouring and under cutting the streambed. The weir was removed and excessive litter bagged and removed from the site.

Weir #2
Williams Creek
N 35^0 58.877'
W 083^0 53.253'

This weir was found downstream after we weir #1 was removed. It consisted of a 14" diameter tree that had fallen and begun to collect debris. The stream flow had been altered into the opposite stream bank and scouring had begun. The large tree was bucked up and removed, as well as the built up sediment and debris.

Weir #3
Williams Creek
N 35^0 58.901'
W 083^0 53.254'

This weir was found in the just upstream from #2. It consisted to two immature trees falling across the creek. Their branches were collecting a lot of debris and trash and one tree was causing an alteration of the stream. Removal of this weir required a lot of chainsaw work to in order to get all the material cut up and out of the stream. We also removed a bag of excess litter from the area.




Weir #4
Williams Creek
N 35° 58.914'
W 083° 53.258'

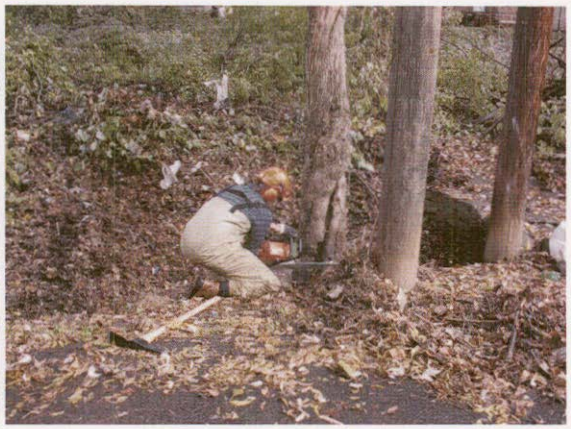
The following weir was in the same location as the previous three. It consisted of a small tree that had fallen and begun to build up debris. There was already undercutting of the streambed and increased siltation down stream. We were able to remove this one before it could cause more serious degradation to the creek. It was removed on November 6, 2006 using the same technique and tools as the previous weirs

.


Weir #5
Williams Creek
N 35° 58.804'
W 083° 53.416'

Williams Creek could not flow naturally without the proper flow of its' tributaries. The following weir was located just off of Cavalier Ave. in one of those tributaries. Trash and debris was collecting in front of a large culvert. There was also a dying tree, and large fallen limbs that was collecting a large amount. On November 7, 2006 workers waded in with chainsaw and other tools. First the fallen limbs were cut up and removed. Then trash

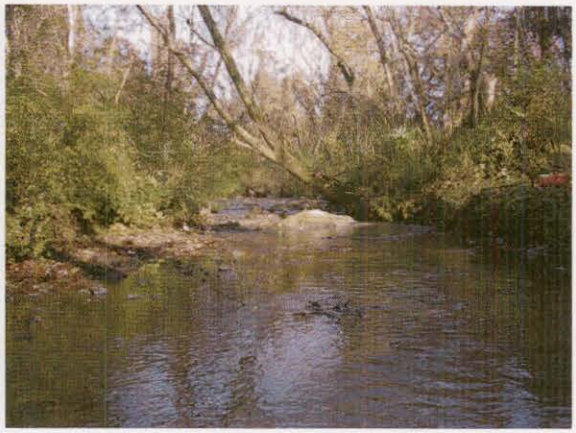
and debris removed. We discovered that a lot of debris had built up inside the culvert. Using a mattock all of the obstruction was pulled out. Last, the dying tree was cut and removed.



Weir #6
Williams Creek
N 35^0 58.634'
W 083^0 53.252'

The following weirs were located just off of Biddle Rd. They were removed on November 10, 2006. The first weir consisted of several fallen trees that were tangled with vines and other vegetation. A lot of trash and debris had collected in the trees. The flow of the creek had been redirected to the east bank and caused severe erosion and change in depth.

The trash and debris was collected and removed. The trees were cut away and placed above the highest water levels.

Weir #7
Williams Creek
N 35^0 58.627'
W 083^0 53.253'

The next weir seemed small in appearance, but was very difficult to remove. Approximately 60% of this creek was being blocked. Most of the wood had been there for a while and been covered by about one foot of sedimentation. There was an abundance of carpet scraps that had been dumped at this site. The carpet had wrapped around much of the wood and had also been buried by sediment.
The wood and carpet that was exposed was cut and removed. The carpet that was buried in the creek bed was removed using a mattock. Using a mattock and a timber jack the wood that remained buried by the creek bed was pried up and removed.



Weir #8
Williams Creek
N35^0 58.619'
W83^0 53.254'

This was the largest weir taken out on this contract, and proved to be the most difficult. It consisted of a large (25" plus diameter) sycamore that had fallen across Williams Creek. A good portion was submerged and blocking half of the stream. The obstruction was collecting a lot of trash, causing a great deal of sedimentation at the base. It was also altering the flow of the stream into the east stream bank and it was beginning to cause scouring. Removal took an entire 8-hour day on November 28, 2006, using a chain saw, a hand wench, miscellaneous hand tools and brute force.


Weir #9
Baker Creek
N35^0 57.200'
W83^0 53.360'

This weir was located on Baker Creek, downstream from Mary James Park. It consisted of a tree that had fallen across the stream and had collected other large limbs in recent

rain events. It had collected a large portion of trash and debris and the immediate stream bank was beginning to show signs of scouring. The weir was removed on December 1, 2006. Two men performed the work using a chainsaw, mattocks and a rake to clear the obstruction.


Weir #10
Baker Creek
N35^0 57.057'
W83^0 53708'

The final weir was found on Baker Creek, ¼ of a mile upstream from the Sevier Ave. fire station. It was located where two immature trees growing in the stream bank had been undercut and fallen into the creek. They had trapped a lot of debris and altered the flow into the opposite bank (and root structure of a large tree). The trees were cut up on December 1, 2006 and the debris removed from the creek. A large (6'+) submerged section of tree was discovered and wedged into the opposite stream bank, providing some armoring and protecting the root structure of the tree.


Conclusion:

As Urban runoff has increased within watersheds in the Knoxville area, stream bank scouring and stream widening has increased the frequency of weirs in surrounding urban creeks. Said weirs are a problem in that they can create additional stream bank scouring/erosion, trash and debris buildup, urban flooding, stream-bed sedimentation, Oxygen depletion, biota passage obstruction, mosquito and other pest breeding, and can be a human safety issue causing underpinning and drowning if a person is caught in the stream during a high water event. The removal of these obstructions can help further degradation to the creek, but visually and biologically.

APPENDIX F

Table of Commercial and Industrial Facility Inspections
For SPAP Compliance

Commerical and Industrial Facilities Inspected During 2005-2006

Permit Number	Project Name	Address	Street Name	Inspection Dat	Inspector	Water Quality Device
00-001	Wal-Mart Supercenter	10900	Parkside Dr	01/24/2006	Jeffrey Askew	Stormceptor
01-002	640 Business Park	2567	Prime Way #101	10/21/2006	J. Shubzda	catch basin inserts
01-004	Frito-Lay Distr. Cnt.	4744	South Middlebrook Pk.	04/12/2006	J. Shubzda	Suntree grate inlet skimmer box
01-007	Trinity Chapel	309	Deaderick Ave.	07/07/2005	J. Shubzda	grass swale
01-010	Pilot Food Mart	405	Lovell Rd	07/06/2005	J. Shubzda	Fossil Filter Flo Guard
02-002	Lee Specialtee LLC	322	Tillery Rd	07/22/2005	J. Shubzda	Pre-cast septic box
02-005	The Car Spa	435	E. Emory Rd	07/22/2005	J. Shubzda	Baysaver
02-009	FedEx Ground Package	3700	Middlebrook Pk	04/19/2006	Jeffery Askew	Crystal Stream 1056
02-015	Cedar Bluff 24 Hour Towing, Inc.	623	Simmons Rd	07/19/2005	J. Shubzda	O/W sep Never built
03-002	Ft. Sanders Park West Med. Cnt.	9352	Park West Blvd	01/05/2006	Jeffery Askew	Crystal Stream-Oil and grit seperator
03-006	Liquidy Split, formally Cosmic Clean Car V	8525	Walbrook Dr	07/19/2005	J. Shubzda	Suntree grate inlet skimmer box
03-014	Ridgeway Service Center	5410	Western Avenue	07/22/2005	J. Shubzda	grass swale functioning
03-016	Century Park	10127	Sherrill Blvd.	07/19/2005	J. Shubzda	Only half of the site is completed
04-001	Blue Skies Car Wash	321	Gallaher View Rd.	07/19/2005	J. Shubzda	Catch Basin Inserts
04-004	Pilot Food Mart	100	Merchant Drive	07/22/2005	J. Shubzda	
04-006	Hooter's	5005	Central Avenue Pike	07/22/2005	J. Shubzda	2 catch b Never installed
04-011	Connor Seafood	10915	Turkey Drive	07/06/2005	J. Shubzda	Catch Basin Inserts
04-012	Ruby Tuesday Restaurant	508	East Emory Road	04/25/2006	Jeffery Askew	Crystal Stream
04-016	Essen Motor Company	8837	Kingston Pike	05/16/2006	J. Shubzda	AquaShield Catch Basin Insert
04-023	JD Byrider Motors	8413	Kingston Pike	05/16/2006	J. Shubzda	Aquasheild Catch Basin Inserts
04-024	Five Points Re-Development	2332	Martin Luther King, Jr.	06/09/2006	J. Shubzda	Catch Basin Inserts
04-027	Ingles Markets Gas Express #399	430	East Emory Road	03/01/2006	J. Shubzda	1 Stormceptor Oil/Water Separator
04-028	Zaxby's Restaurant	607	East Emory Road	03/01/2006	J. Shubzda	4 Suntree Never Installed
05-002	West Side Motor Company	8835	Kingston Pike	05/16/2006	J. Shubzda	Grass Swale
05-007	Krystal	8901	Kingston Pike	05/16/2006	J. Shubzda	2 Suntree Catch Basin Inserts

APPENDIX G

NPDES Permit Program Inventory Map

(Attached separately)

The entire inventory map is not reproduced as part of the online version of the Year 10 Annual Report. The entire map is approximately 66 inches by 32 inches (covering an area of approximately 33 miles by 16 miles) at a scale of 1-inch equals one-half mile.

To view the entire map, please contact the Stormwater Engineering Division at (865) 215-2148.