

THE CITY OF KNOXVILLE TENNESSEE

NPDES Permit Annual Report



National Pollutant Discharge Elimination System
Stormwater Discharge Permit TNS068055
July 1, 2017 - June 30, 2018





December 26, 2018

Ms. Valerie McFall
Tennessee Department of Environmental and Conservation
Division of Water Resources
Knoxville Environmental Field Office
3711 Middlebrook Pike
Knoxville, TN 37921

**RE: City of Knoxville, NPDES MS4 Permit # TNS068055
2017 – 2018 Annual Report**

Dear Ms. McFall:

The City of Knoxville is pleased to submit the fourteenth annual report for the NPDES permit issued July 1, 2004. This annual report summarizes the NPDES activities during the twelve-month period of July 1, 2017 through June 30, 2018. The annual report was coordinated and prepared by the Engineering Department in conformance with the reporting requirements in the City's NPDES Permit Part VI.

If you have any questions or wish to discuss any of the NPDES Permit programs, please contact me by email at dhagerman@knoxvilletn.gov or by phone at (865) 215-3251.

Sincerely,



David Hagerman, P.E., Stormwater Management

CC: Mr. Vojin Janjic



December 26, 2018

Mr. Vojin Janjic
Tennessee Department of Environmental and Conservation
Division of Water Resources
William R. Snodgrass Tennessee Tower, 2nd Floor
312 Rosa L. Parks Ave.
Nashville, TN 37243

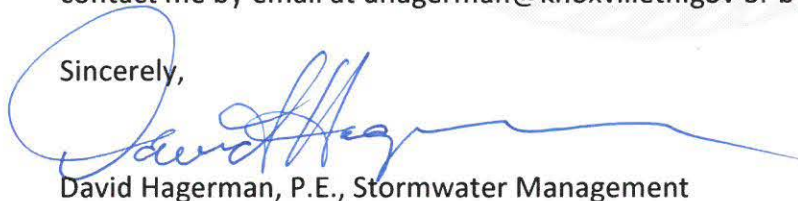
**RE: City of Knoxville, NPDES MS4 Permit # TNS068055
2017 – 2018 Annual Report**

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David Hagerman, P.E., Stormwater Management

CC: Ms. McFall

Phase I Medium Municipal Separate Storm Drain System (MS4) Annual



Tennessee Department of
Environment and Conservation
Division of Water Resources
William R. Snodgrass Tennessee
Tower,
312 Rosa L. Parks Avenue, 2nd Floor, Nashville,
Tennessee 37243, 615-532-0109 (TDEC)

Phase I Medium Municipal Separate Storm Drain System (MS4) Annual Report

1. MS4 Information

Name of MS4:City of Knoxville		MS4 Permit Number:TNS068055	
Contact Person: David Hagerman, P.E.		Email Address: dhagerman@knoxvilletn.gov	
Telephone: (865) 215-3251		MS4 Program Web Address: www.knoxvilletn.gov	
Mailing Address: P.O. Box 1631, 400 Main Street, Suite 317			
City: Knoxville		State: Tennessee	ZIP code: 37901

Additional Contacts:

James R. Hagerman, P.E., Director (865) 215-2148 jhagerman@knoxvilletn.gov
Engineering Department
P.O. Box 1631, Suite 480, 400 Main Street, Knoxville, TN 37901

Chad Weth, Director (865) 215-2060 cweth@knoxvilletn.gov
Public Service Department
P.O. Box 1631, Suite 467, 400 Main Street, Knoxville, TN 37901

What is the current population of your MS4? **From 2010 Census: 178,874;**
Census.gov estimated 2017 population: 187,347

What is the reporting period for this annual report? **July 1, 2017 to June 30, 2018**

Phase I Medium Municipal Separate Storm Drain System (MS4) Annual

2. Discharges to Water Bodies with Unavailable Parameters or Exceptional Tennessee Waters

- A. Does your MS4 discharge into waters with unavailable parameters (previously referred to as impaired) for pathogens, nutrients, siltation or other parameters related to stormwater runoff from urbanized areas as listed on TN's most current 303(d) list and/or according to the on-line state GIS mapping tool (tdeconline.tn.gov/dwr/)? If yes, attach a list. ☒ Yes ☐ No

See attached Table 2A.

- B. Are there established and approved TMDLs (<http://www.tn.gov/environment/article/wr-ws-tennessees-total-maximum-daily-load-tmdl-program>) with waste load allocations for MS4 discharges in your jurisdiction? If yes, attach a list. ☒ Yes ☐ No

Since the current permit was issued, the following TMDLs have been approved:

- **Fecal Coliform in First, Second, Third, and Goose Creek (Fort Loudoun Lake Watershed - HUC 06010201), and;**
- **Fecal Coliform in Baker, Fourth, and Williams Creek (Fort Loudoun Lake Watershed HUC 06010201).**

- C. Does your MS4 discharge to any Exceptional TN Waters (ETWs - http://environmentonline.tn.gov:8080/pls/enf_reports/f?p=9034:34304:4880790061142)? If yes, attach a list. ☐ Yes ☒ No

- D. Are you implementing a specific Stormwater Management Plan (SWMP) to control pollutant discharges to waterbodies with unavailable parameters or ETWs? If yes, describe the specific practices: ☒ Yes ☐ No

The City of Knoxville continues to implement and comply with the SWMP issued in the 2004 NPDES permit (TNS068055). The specific task elements of the SWMP are listed in the tables on pages 3-7.

Phase I Medium Municipal Separate Storm Drain System (MS4) Annual

SCHEDULE FOR MAINTENANCE AND IMPLEMENTATION OF SWMP ELEMENTS AND PROGRAMS

PROGRAM OF STRUCTURAL AND SOURCE CONTROLS FOR REDUCING
POLLUTANTS TO THE MUNICIPAL SEPARATE STORM SEWER SYSTEM

122.26 (d)(2)(iv)(A)

The Residential and Commercial Program (RC)

Code	Activity	Schedule
RC-1	<u><i>Maintenance Activities for Structural Controls</i></u>	
	-Continue existing maintenance programs from Part 2 application, pp.5-5 thru 5-8.	Ongoing
	-Develop improved stream restoration and channel maintenance program.	12 Months
	-Implement improved stream restoration and channel maintenance program.	24 Months
	-Require Standard Maintenance Agreement for on-site facilities.	Ongoing
	-Continue to coordinate with other agencies/organizations to develop, install, and maintain structural controls that prevent floating pollution (litter/oils/foam/etc) from entering the TN River	Ongoing
	-Require routine / major maintenance of BMP facilities.	Ongoing
RC-2	<u><i>Planning for New Development</i></u>	
	-Review original Stormwater & Streets Ordinance to evaluate possible improvements to existing water quality and quantity requirements for new development.	Immediately
	-Require "No Dumping" message cast into all curb irons and solid stormwater catch basin covers installed on new developments.	Immediately
	-Plan and site location for regional BMP facilities for area of new development.	Ongoing
	-Continue to review, update, and maintain guidance criteria for BMP's on City web page (http://www.ci.knoxville.tn.us/engineering/)	Ongoing
RC-3	<u><i>Maintenance for Public Streets, Roads, and Highways</i></u>	
	-Continue street maintenance activities outlined in Part 2 application, p.5-8	Ongoing
	-Evaluate current deicing program and study alternatives and improvements.	Ongoing
RC-4	<u><i>Evaluation of Flood Management Projects</i></u>	
	-Continue to evaluate regional BMP facilities for water quality retrofits.	Ongoing
	-Maintain existing GIS inventory of on-site BMP facilities, including newly constructed facilities.	Ongoing
RC-5	<u><i>Monitoring of Solid Waste Facilities</i></u>	
	-See City's management program for industrial areas.	See Code IN-3
RC-6	<u><i>Management of Pesticides, Herbicides, and Fertilizer</i></u>	
	- Evaluate possible improvements to existing public education program as part of illicit connection and improper disposal program. Educate City staff, public, etc.	12 Months
	- Reevaluate effect of fertilizers as part of the City's ongoing monitoring program.	60 Months
RC-7	<u><i>Annual Reporting</i></u>	
	- Annual reporting to TDEC concerning the progress of this program.	Within 6 months after the end of each year.

Phase I Medium Municipal Separate Storm Drain System (MS4) Annual

SCHEDULE FOR MAINTENANCE AND IMPLEMENTATION OF SWMP ELEMENTS AND PROGRAMS

PROGRAM TO DETECT AND REMOVE ILLICIT AND
IMPROPER DISCHARGES TO THE MUNICIPAL STORM SEWER SYSTEM
122.26 (d)(2)(iv)(B)

The Illicit Discharges and Improper Disposal Program (ILL)

Code	Activity	Schedule
ILL-1	<u>Ordinances</u> -Evaluate the prohibitions and exemptions of non-stormwater discharges in the original Stormwater & Streets Ordinance. Maintain authority for \$5000 penalty. -Implement any new revisions to the Stormwater & Streets Ordinance.	
		Immediately
		6 Months
ILL-2	<u>Field Screening</u> -Perform follow-up analysis at all high risk screening sites. -Investigate 150 field sites four times per year . (Including the repeat high parameter sites above.)	
		Ongoing
		Ongoing
ILL-3	<u>Investigation of Storm Drain System</u> - Implement procedures for mapping, field surveys and upstream source identification. -Evaluate and update enforcement procedures, policies, monitoring and inspections. - Inspect stormdrain system and update features on GIS.	
		Ongoing
		Ongoing
ILL-4	<u>Spill Response Program</u> - Coordinate with Knoxville Emergency Response Team (KERT) and Tennessee Department of Environment and Conservation (TDEC).	
		Ongoing
ILL-5	<u>Reporting of Illicit Discharges and Public Education Program</u> - Continue to maintain and monitor the "Water Quality Hotline" for public reporting. - Maintain public education program.	
		Ongoing
		Ongoing
ILL-6	<u>Used Oil & Toxic Materials Program</u> - Continue coordination of recycling program (managed by Solid Waste Division (SWD)). - Maintain and Operate household hazardous waste facility (managed by SWD).	
		Ongoing
		Ongoing
ILL-7	<u>Annual Reporting</u> - Annual reporting to TDEC concerning the progress of this program.	
		Within 6 months after the end of each year.

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**SCHEDULE FOR MAINTENANCE AND
IMPLEMENTATION OF SWMP
ELEMENTS AND PROGRAMS**

**PROGRAM TO MONITOR AND CONTROL RUNOFF FROM
TSD AND INDUSTRIAL FACILITIES SUBJECT TO SARA III, SECTION 313
122.26(d)(2)(iv)(C)**

The Industrial and Related Facilities Program (IN)

Code	Activity	Schedule
IN-1	<u>Ordinances</u> - Evaluate possible revisions to the prohibitions and exemptions of non-stormwater discharges in the existing Stormwater & Streets Ordinance - Implement any new revisions to the Stormwater & Streets Ordinance.	
		Immediately
		6 Months
IN-2	<u>Inspection Element</u> - Develop inspection program for non-permitted commercial facilities (i.e. restaurants, services stations, grocery stores, car lots, etc.) - Collect and analyze NOI's from Industrial Permit applicants. - Identify potential industrial discharges through Illicit Connection and Improper Disposal Program. (Both SW and non-SW discharges) - Review and update inspection program as part of Pollution Prevention Plans for Municipal Industrial Facilities. Conduct annual inspections at municipal industrial facilities.	
		12 Months
		Ongoing
		Ongoing
	12 Months	
IN-3	<u>Monitoring Element</u> - Collect monitoring data from industrial stormwater dischargers and/or from TDEC. Assess impacts to storm sewer system. - Develop an ongoing monitoring program at non-permitted commercial facilities using guidelines pursuant to 40 CFR 122.26(d)(2)(iv)(c)(2). Identify industrial pollutants & sources as applicable. - Implement the ongoing monitoring program at non-permitted commercial facilities and analyze the results from ongoing commercial monitoring program. -Maintain adequate legal authority to require monitoring and reports from TSDs and Industrial facilities subject to SARA Title III, Section 313. Request monitoring reports as necessary. -Evaluate and update the monitoring program for Municipal Industrial Facilities (MIFs) in each annual report. - Manage and conduct monitoring program at Municipal Industrial Facilities.	
		Ongoing
		12 Months
		Begin after 12 Months
		Ongoing
	Annually	
		12 Months
IN-4	<u>Annual Reporting</u> - Annual reporting to TDEC concerning the progress of this program.	
		Within 6 months after the end of each year

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**SCHEDULE FOR MAINTENANCE AND
IMPLEMENTATION OF SWMP
ELEMENTS AND PROGRAMS**

**PROGRAM TO IMPLEMENT AND MAINTAIN BMP PLANS TO
REDUCE CONSTRUCTION SITE RUNOFF TO THE MUNICIPAL STORM SEWER
122.26(d)(2)(iv)(D)**

The Construction Site Runoff Program (CS)

Code	Activity	Schedule
<u>Site Planning</u>		
CS-1	<ul style="list-style-type: none">- Review and update the original Stormwater & Streets Ordinance which requires construction sites greater than 10,000 sq.ft. to submit Erosion & Sediment (E&S) control plans.- Require site plans submittals per the City of Knoxville BMP manual.- Review & update minimum criteria for plan review and inspection checklist.- Continue Preconstruction Assistance Meetings with developer/contractors.	Immediately
		Immediately
		Immediately
		Immediately
<u>BMP Requirements</u>		
CS-2	<ul style="list-style-type: none">- Require Construction BMP's from the City of Knoxville BMP manual or equivalent.- Evaluate additional BMP requirements and design modifications. Maintain the updated BMP requirements on the City's web page.- Continue to require construction site "good housekeeping" practices.	Immediately
		2nd half of each year
		Immediately
<u>Inspection / Enforcement</u>		
CS-3	<ul style="list-style-type: none">- Continue expanded inspections to include smaller construction sites (single family); where feasible.- Implement routine site inspections on commercial and subdivision developments (e.g. rough grading, E&S control installation, final grading, and final stabilization.- Continue to require post-construction Development Certifications from licensed professional Engineers, and/or the appropriate design professional before bond release to insure the stormwater facilities were built as planned.- Maintain enforcement procedures, policies, and follow-up monitoring/inspections.	Ongoing
		Ongoing
		Ongoing
<u>Training Programs</u>		
CS-4	<ul style="list-style-type: none">- Co-sponsor E & S Control Practice Seminars for all participants.- Continue to provide training for City plan review staff and inspectors.	Annually
		Annually
<u>Annual Reporting</u>		
CS-5	<ul style="list-style-type: none">- Annual reporting to TDEC concerning the progress of this program.	Within 6 months after the end of each year

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SCHEDULE FOR MAINTENANCE AND IMPLEMENTATION OF SWMP ELEMENTS AND PROGRAMS

PROGRAM TO COLLECT QUANTITATIVE DATA TO DETERMINE
THE IMPACTS OF URBAN STORMWATER ON THE NATURAL ENVIRONMENT
122.26(d)(2)(iii)(A)

The Comprehensive Monitoring Program (MN)

Code	Activity	Schedule
MN-1	<u>Seasonal Storm Event Monitoring</u> - Maintain the Standard Operating Procedures (SOP) for the seasonal sampling program. - Maintain at least five (5) automatic monitoring stations at locations approved by TDEC. - Collect and analyze a minimum of twenty (20) flow weighted composite samples as listed below in accordance with 40 CFR 136 for all parameters except pH, which will be determined in the field at the time of sample collection. Parameters include: BOD5, COD5, suspended residue, dissolved residue, nitrate + nitrite N, ammonia, total kjeldahl N, total organic N, total phosphate, lead, zinc, and ph (field). - Collect and analyze five (5) wet weather bacteria samples (fecal coliform and <i>E.coli</i>). - Collect and analyze five (5) full-suite grab samples of: oil & grease, the pollutants listed in Tables II & III of 40 CFR Part 122 Appendix D (Volatiles, Pesticides, Acids, Base/Neutrals, Toxic Metals, Cyanide, and Total Phenols).	
		Annually
		Ongoing
		Minimum of one per quarter per station annually.
		One sample/year/station
MN-2	<u>Dry Weather Screening & Industrial/Commercial Site Monitoring</u> - Dry weather screening as described in ILL-2. - Implement Commercial/Industrial Monitoring Programs as described in IN-3.	Annually
		Varies
MN-3	<u>Ambient & Biological Monitoring</u> - Continue Ambient sampling program at the five designated monitoring stations. All routine parameters shall be tested once per quarter per station. - Maintain the Biological Monitoring program that supplements the program administered by TVA. This program focuses on habitat assessments, bioassessments, etc.	Quarterly
		Ongoing
MN-4	<u>Training Programs</u> - Maintain the Training Program for Staff and/or Volunteers.	
		Ongoing
MN-5	<u>Annual Reporting</u> - Annual reporting to TDEC concerning the progress of this program.	Within 6 months after the end of each year

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3. Public Education/Outreach and Involvement/Participation

A. Have you developed a Public Information and Education plan (PIE)? ☒ Yes ☐ No

B. Is your public education program targeting specific pollutants and sources, such as Hot Spots? If yes, describe the specific pollutants and/or sources targeted by your public education program: _

☒ Yes ☐ No

- The Special Pollution Abatement Permit (SPAP) program targets specific pollutants not covered by first flush requirements, such as floatable debris and oil/grease.
- The Tennessee Stormwater Association's (TNSA) Tennessee Association of American Broadcasters (TAB) program runs various public service announcements on local radio stations that each target a specific pollutant.
- Signs have been installed throughout the City that are designed to educate the public on the water quality concerns, specifically fecal coliform and E. coli bacteria, that can result from feeding wild birds or pet waste.
- Education programs for pesticides, herbicides, and fertilizer use have been implemented in conjunction with City public education programs for collection and recycling of household hazardous waste (HHW).
- The 311 call center is advertised to increase the public's 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, like illicit dumping or industrial discharges.

C. Do you have a webpage dedicated to your stormwater program? If yes, provide a link/URL:

☒ Yes ☐ No

[http://knoxvilletn.gov/government/city_departments_offices/engineering/stormwater engineering division](http://knoxvilletn.gov/government/city_departments_offices/engineering/stormwater_engineering_division)

D. Summarize how you advertise and publicize your public education, outreach, involvement and participation opportunities:

- The City advertises the 311 call center through stormwater pollution prevention educational handouts such as magnets, brochures, presentations, business cards, and routine correspondence with residents.
- The City advertises volunteer opportunities on the stormwater website and on a shared website with other agencies.
- The City developed and maintains both the BMP Manual, which clearly explains requirements for stormwater pollution prevention and erosion control, and the Land Development Manual (LDM), created to assist developers with meeting all design and construction requirements. Both are updated on an as needed basis and are available through the stormwater programs website.

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- **The City has a standard that requires a "No Dumping" message to be cast in all new curb irons, solid stormwater manhole/junction box covers, and manhole lids for stormwater treatment devices.**

E. Summarize the public education, outreach, involvement and participation activities you completed during this reporting period:

- **The City operated an educational stormwater booth at the annual Neighborhood Conference. The purpose of the booth is to educate the public on issues concerning stormwater quality.**
- **The City has administered the Adopt-A-Stream (AAS) program for 14 years and has provided the supervision and training in addition to gloves, trash bags, pitchforks, wheelbarrows, waders, and other tools to the volunteers for these activities.**
- **Signs were installed at both Fountain City Lake and Lake Ottosee in Chilhowee Park to educate the public on the negative effects on water quality that can result in feeding wild birds.**
- **The City continues to participate with the TNSA TAB program to provide public service announcements on local radio stations that focus on urban water quality.**

F. Summarize any specific successful outcome(s) (e.g., citizen involvement, pollutant reduction, water quality improvement, etc.) fully or partially attributable to your public education and participation program during this reporting period:

- **The Citizens near Edgewood Park were encouraged to become involved in improving their park. This resulted in an overwhelming response for restoring the culverted spring back to an open creek in the park.**
- **The City installed signage at both Fountain City Lake and Lake Ottosee in Chilhowee Park to educate the public on the results of feeding bread, cat food, and grain to ducks. The public responded with a notable drop in abusive feeding practices.**

4. Illicit Discharge Detection and Elimination, CFR 122.26 (d)(2)(iv)(B)

A. Have you developed and do you continue to update a storm drain system map that shows the location of system outfalls where the municipal storm drain system discharges into waters of the state? ☒ Yes ☐ No

See attached NPDES Permit Program Inventory Map.

B. If yes, does the map include inputs into the storm drain collection system, such as the inlets, catch basins, drop structures or other defined contributing points to the drainage area of that outfall, and general direction of stormwater flow? ☒ Yes ☐ No

The detailed inventory, along with LIDAR data and break points is maintained and managed by the Knoxville Geographic Information System (KGIS), which is funded by the City of Knoxville in partnership with Knox County and the Knoxville Utilities Board. The individual structures are mapped but not visible on the printed map due to scale.

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- C. How many outfalls have you identified in your storm drain system? **1,349**
- D. Do you have an ordinance, or other regulatory mechanism, that prohibits non-stormwater discharges into your storm sewer system? ☒ Yes ☐ No
- E. Have you implemented a plan to detect, identify and eliminate non-stormwater discharges, including illegal disposal, throughout the storm sewer system? If yes, provide a summary:
☒ Yes ☐ No

The City of Knoxville has implemented an Illicit Discharge and Improper Disposal Program as a part of the overall Stormwater Management Plan (SWMP). The program has been designed to detect and remove illicit and improper discharges to the Municipal Storm Drain System (MS4) as required by 40 CFR 122.26(d)(2)(iv)(B). The program includes the following sections:

- **The Stormwater and Street Ordinance (effective June 20, 1997)**
Specifically prohibits non-stormwater discharges and authorizes penalties up to \$5000 per day, and provides water quality regulations for new development.
- **Field Screening**
Since 1996, the Dry Weather Screening Program has been used to evaluate both randomly selected outfalls and high-risk outfalls. At least 150 outfalls are screened annually. Screening consists of four (4) site visits per outfall over a 30-day period. If flow is present the water is tested for indicator pollutants using a field test kit. A summary table of the results of outfalls that had flow at the time of screening is included as Table 4E. A map showing the location of all screened outfalls is included as the NPDES Permit Program Inventory Map. Multiple sanitary and potable water illicit discharges were located, investigated, and eliminated.
- **Investigation of the Storm Drain Mapping System**
The procedure for mapping, field surveys, and upstream source identification were developed and included in the Part 2 Application in Section 5.3.5. The City continues to utilize and continually update the procedure to maintain the effectiveness of the Illicit Discharge and Improper Disposal Program.
- **Spill Response Program**
The City coordinates with the Knoxville Emergency Management Agency (KEMA), Knoxville Fire Department (KFD) Hazmat, 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.
- **Reporting of Illicit Discharges**
The City actively encourages citizens to report water quality concerns to the 311 call center. The publicity of the hotline handled through a permanent 311 call center has already provided a consistent and convenient resource for concerned citizens. The City includes the 311 number in stormwater pollution prevention educational handouts such as magnets, brochures, presentations, business cards, no dumping signage, and routine correspondence with residents. In addition to 311 giving citizens the opportunity to report

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illicit discharges, the City also leads several educational programs, such as, the River Rescue, Adopt-A-Stream, an educational booth at the Neighborhood Conference, and routine training of Public Service, Engineering, and Fleet City departments.

• **Used Oil and Toxic Materials Program**

The City's operates multiple recycling centers as well as the permanent Household Hazardous Waste Facility, which serves to divert reusable products, collect and reuse or solidify latex paint, collect car batteries and fluids, divert selected acids and bases to wastewater treatment, bulk flammable materials, and pack miscellaneous materials for safe shipment and disposal.

F. How many illicit discharge related complaints were received this reporting period?

114 illicit discharge complaints were received and categorized as the following: 23 as erosion control, 3 as commercial washing, 8 as an illicit connection, 23 as illicit dumping, 15 as an accidental spill, 9 as an industrial discharge, 10 as a sign of sewage, and 10 as a miscellaneous illicit discharge.

G. How many illicit discharge investigations were performed this reporting period? 275

H. Of those investigations performed, how many resulted in valid illicit discharges that were addressed and/or eliminated? 45

5. Construction Site Stormwater Runoff Pollutant Control, CFR 122.26 (D)(2)(IV)(D)

A. Do you have an ordinance or other regulatory mechanism requiring:

Construction site operators to implement appropriate erosion prevention and sediment control BMPs consistent with those described in the TDEC EPSC Handbook? ☒ Yes ☐ No

Construction site operators to control wastes such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste? ☒ Yes ☐ No

Design storm and special conditions for unavailable parameters waters or exceptional Tennessee waters consistent with those of the current Tennessee Construction General Permit (TNR100000)? ☒ Yes ☐ No

B. Do you have specific procedures for construction site plan (including erosion prevention and sediment BMPs) review and approval? ☒ Yes ☐ No

C. Do you have sanctions to enforce compliance? ☒ Yes ☐ No

D. Do you hold pre-construction meetings with operators of priority construction activities and inspect priority construction sites at least monthly? ☒ Yes ☐ No

E. How many permits were issued for construction sites disturbing at least one acre or greater in your jurisdiction this reporting period? 18

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F. *How many permits were issued for construction sites disturbing less than one acre or greater in your jurisdiction this reporting period?* **1389**

G. *How many active priority and non-construction sites were inspected this reporting period?*
4102

H. *How many construction related complaints were received this reporting period?* **61**

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6. Permanent Stormwater Management of Source Controls, CFR 122.26 (d)(2)(iv)(a)

- A. Do you have a regulatory mechanism (e.g. ordinance) requiring permanent stormwater pollutant removal for development and redevelopment projects? If no, have you submitted an Implementation Plan to the Division? ☒ Yes ☐ No

The 1997 Stormwater and Street Ordinance, last updated January 2018 and the accompanying LDM.

- B. Does the ordinance or other regulatory mechanism require:

Site plan review and approval of new and re-development projects? ☒ Yes ☐ No

A process to ensure stormwater control measures (SCMs) are properly installed and maintained?

☒ Yes ☐ No

Permanent water quality riparian buffer zones? If yes, specify requirements: ☒ Yes ☐ No

The Stormwater and Street Ordinance requires a riparian buffer zone (RBZ) of 60 ft for drainage areas of greater than 1 mi². A RBZ of 30 ft is allowed for drainage areas that are less than 1 mi². The RBZ is measured from the top of the bank and extends perpendicularly for the length of the water body. If a plat is required, the natural streamside buffer zone must be shown. The Ordinance does not allow any actively eroding creek banks to remain after development is complete. 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. The RBZ must be preserved post development.

- C. What is the threshold for development and redevelopment project plans plan review (e.g., all projects, projects disturbing greater than one acre, etc.)?

All construction sites greater than 10,000 ft² must submit an Erosion and Sediment Control Plan (ESC) that has been stamped by a registered professional engineer.

- D. How many development and redevelopment project plans were reviewed for this reporting period? **1478**

- E. How many development and redevelopment project plans were issued permits? **1407**

- F. How many permanent stormwater related complaints were received this reporting period? **671**

- G. How many enforcement actions were taken to address improper installation or maintenance?

279 Notices of Violation (NOVs) were issued. Verbal notifications are a routine part of our inspection process and are not included in this total.

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- H. Do you have a system to inventory and track the status of all public and private SCMs installed on development and redevelopment projects? ☒ Yes ☐ No

Both public and private SCMs that were installed before 1997 are mapped using the KGIS database. Private SCMs that are installed after 1997 are mapped using the KGIS database, recorded using permanent maintenance agreements and/or covenants, and tracked using the SPAP program (used for Hot Spots only) and the Accela database. All Public SCMs installed after 1997 are mapped using KGIS and tracked using the Accela database.

- I. Does your program include an off-site stormwater mitigation or payment into public stormwater fund? If yes, specify. ☐ Yes ☒ No

J.

The City has proposed to create and implement a stormwater mitigation bank in the new permit term as a way to support development where volume control, RBZs, and/or other requirements cannot be met onsite.

7. Stormwater Management for Municipal Operations, CFR 122.26(d)(2)(iv)(C)

- A. As applicable, have annual visual inspections been performed at least once a year on each of the municipal industrial facilities (MIFs) listed below:

Solid Waste Management Facility (SWMF) on Elm Street?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
The Fleet Truck and Heavy Equipment garage on Loraine Street?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
The Fleet and Police Garage at Prosser Road?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
The Knoxville Area Transit (KAT) bus station on Magnolia Avenue?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
The KAT Transfer Station on Church Street?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

- B. Do you have a training program for employees responsible for municipal operations at facilities within the jurisdiction that handle, generate and/or store materials which constitute a potential pollutant of concern for MS4s? ☒ Yes ☐ No

If yes, are new applicable employees trained within six months, and existing applicable employees trained and/or retrained within the permit term? ☒ Yes ☐ No

Phase I Medium Municipal Separate Storm Drain System (MS4) Annual

8. Reviewing and Updating Stormwater Management Programs

- A. *Describe any revisions to your program implemented during this reporting period including but not limited to: Modifications or replacement of an ineffective activity/control measure.*

The 2004 NPDES Permit required a "Water Quality Hotline" to be maintained for public reporting. Shortly after the new 2004 permit was issued, the City implemented a 311 Call Center for all types of calls. Hotline calls were advertised and answered separately but that created an inefficient use of resources and possible confusion for the public. During this report year, the City phased out the promotion of the separate 865 215 4147 phone number altogether on brochures, business cards, signs, websites, PSAs, vehicles, etc. The hotline number is now forwarded directly to the live operators at 311 and all promotions are for the 311 call center directly.

In an effort to increase efficiency of both reporting and review, the City has attempted to adopt a modified version of TDEC's Phase II standardized annual report format. Some sections have been added or edited to accurately reflect the tasks and programs that are different from the Phase II permit. This new format will serve a basis for the new format expected in the highly anticipated new NPDES permit.

Changes to the program as required by the division to satisfy permit requirements. **None**

Information (e.g. additional acreage, outfalls, BMPs) on newly annexed areas and any resulting updates to your program. **Four previously unknown outfalls were identified and added to the current inventory.**

- B. *In preparation for this annual report, have you performed an overall assessment of your stormwater management program effectiveness? If yes, summarize the assessment results, and any modifications and improvements scheduled to be implemented in the next reporting period.*
☒ Yes ☐ No

The City of Knoxville proposed many changes in both the 2008 and the 2016 reapplication for permit TNS068055 to modify the current SWMP. One significant proposed change is to reduce the amount of chemical monitoring (not including bacteriological) and focus on biological assessments in order to determine fishable and swimmable conditions in the waterways. The biological assessments (e.g. RBPIIs & IBIs) are part of the current permit but were waived as part of the QLP process. The City believes the biological assessments are a greater measure of program effectiveness than the chemical monitoring. In retrospect, the intent of the chemical monitoring appears to have been a one-time project for the original permit application back in 1990-1993 rather than an ongoing program. The City of Knoxville plans to implement these changes during the 2018/2019 reporting year or when the new permit is approved.

Phase I Medium Municipal Separate Storm Drain System (MS4) Annual

9. Enforcement Response Plan

- A. Have you implemented an enforcement response plan that includes progressive enforcement actions to address non-compliance, and allows the maximum penalties specified in TCA 68-221-1106? If no, explain. ☒ Yes ☐ No

The written Enforcement Response plan was developed by the City and reviewed by TDEC as part of the Tennessee Qualifying Local Program (QLP) approval process and can be found in the Land Development Manual as Policy 14.

- B. As applicable, identify which of the following types of enforcement actions (or their equivalent) were used during this reporting period; indicate the number of actions, the minimum measure (e.g., construction, illicit discharge, permanent stormwater management), and note those for which you do not have authority:

Action	Construction	Permanent Stormwater	Illicit Discharge	In Your ERP?			
NOVs	# 246	#	# 33	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No
Administrative Penalties	# 29	#	#	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No
Stop Work Orders	# 5	#	#	<input checked="" type="checkbox"/>	Yes	<input type="checkbox"/>	No

- C. Do you track instances of non-compliance and related enforcement documentation?
☒ Yes ☐ No
- D. What were the most common types of non-compliance instances documented during this reporting period?

Erosion prevention and sediment control at new construction sites were the most common type of violation.

10. Monitoring, Recordkeeping and reporting

- A. Summarize any analytical monitoring activities (e.g., planning, collection, evaluation of results) performed during this reporting period.

During the July 1, 2017 to June 30, 2018 monitoring period, a total average of 49.87 inches of rainfall was recorded. The City's five ISCO monitoring stations collected quarterly samples from rain events for a total of twenty wet weather composite samples to comply with Section V of the current NPDES permit. Analytical laboratory data summaries for each of the sampling locations are included as Table 10A.1.

The City collects wet weather grab samples from all treated outfalls once per year at all MIFs. In order to evaluate the effectiveness of the treatment units located at the Fleet Truck and Heavy Equipment garage and the SWMF, both pretreated and post treated grab samples are collected. Analytical laboratory data summaries for each of the sampling locations are included as Table 10A.2.

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The City conducts a quarterly ambient sampling program where at least twenty ambient samples are collected each year at a rate of one sample per quarter from the same locations as the five monitoring station locations. The samples are collected manually by a single grab procedure. Each ambient sample collected is analyzed for the bacteria and 13 routine parameters listed in MN-1. Analytical laboratory data summaries for each of the sampling locations are included as Table 10A.3.

The NPDES permit requires an estimate of the total urban runoff volume discharged by the City of Knoxville annually. The volume estimate is based on total average annual rainfall and the estimated imperviousness of different land uses. To estimate the imperviousness the City utilizes GIS to determine the approximate area of each land use within a watershed. The total average rainfall was determined by averaging the rainfall recorded during the year from the City's stormwater monitoring stations, rain gauge stations, and the National Weather Service data recorded at McGhee Tyson airport. The analysis for each watershed and the entire City is included as Table 10A.4.

- B. *Summarize any non-analytical monitoring activities (e.g., planning, collection, evaluation of results) performed during this reporting period.*

- **Hot Spots**

The City has identified many common discharges from facilities that are not required to be permitted under the TDEC multi-sector general stormwater permit or individual NPDES permit programs. Rather than spend limited resources attempting to duplicate the efforts of TDEC and Environmental Protection Agency (EPA) by monitoring existing permitted facilities, the City added the SPAP program for those specific land-uses that have proven to have the potential to discharge polluted runoff. Section 22.5-37 of the Stormwater and Street Ordinance requires a SPAP on new development and redevelopment of projects for certain land uses, targeting the pollutants of concern for each land use. This program is used to eliminate gaps in the existing State and Federal permit programs through a local inspection program for otherwise non-permitted facilities.

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

Stormwater Quality compliance inspections for non-SPAP sites are conducted in direct response to specific complaints from citizens or tips from 311 calls. The City decides on a case-by-case basis whether this group of inspections will use education or enforcement to correct any problems found. In some cases, an existing facility that is not "new development" or undergoing "redevelopment" may be required to apply for a SPAP to correct violations.

- TMDL Implementation

The City has identified homeless encampments as a signification source of trash and bacteria pollution. To determine the impacts on watersheds Engineering began investigating and monitoring an area containing a large concentrated group of individuals homesteading adjacent to existing stormwater infrastructure. In addition to trash and debris, extremely high bacteria levels were confirmed at outfalls downstream of the densely populated area. The City remediated the pollutant hazard using physical removal of trash, cleaning of the storm drains, lime application, and prevention of outdoor elimination by humans through placement of multiple porta potties at the site. In addition, a fence was erected around the site with one point of ingress and egress to allow for closing of the site in the evenings. The site is also manned by a security guard during daytime hours. The situation continues to be monitored to determine effectiveness and changes will be incorporated on an as needed basis.

- Municipal Industrial Facility Inspection Program

The City has developed an inspection and pollution prevention program for municipal industrial facilities. Currently only five MIFs are operated in the City. These facilities include:

- The Solid Waste Management Facility (SWMF) on Elm Street,
- The Fleet Truck and Heavy Equipment garage on Loraine Street,
- The Fleet and Police Garage at Prosser Road,
- The Knoxville Area Transit (KAT) bus station on Magnolia Avenue, and
- The KAT Transfer Station on Church Street.

Each facility is currently evaluated and inspected regularly by Stormwater staff and will continue to be inspected at least annually in the future. The KAT Station is the newest of the MIFs and was built using LEED standards including stormwater quality treatment devices for the runoff.

The inspection and monitoring program has been productive at all of the MIFs in the past. Structural and management BMPs have been installed to control pollution and improve the water quality of runoff from each facility. The SWMF has been retrofitted with structural controls to reduce the solids, sediment, hydrocarbons, and bacteria in the runoff from the paved areas. Additional water quality improvements have been constructed at the SWMF that include new grit/sediment sumps, floatables skimmers, grass swale, and low flow modifications to the detention pond.

- Industrial Facility Inspection Program

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 in the facilities' SWPPPs. Applicants must monitor in accordance with TDEC Rule 1200-4-10-.04. 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. The City maintains this information to 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 (e.g., reports on additional parameters), requirements for an expanded program for subsequent monitoring events is coordinated with TDEC and/or

the industrial discharger.

• **Permanent Maintenance Agreement Inspection Program**

Since 1997, permanent maintenance agreements and/or covenants have been required for all new stormwater detention facilities and special pollution abatement devices (e.g., oil/water separators and catch basin inserts). A covenant is defined in Section 22.5-34 of the Ordinance as a legal document entitled "Covenant for Permanent Maintenance of Stormwater Facilities," which replaced the original "agreement" referred to in the Part II application and Part IV of the permit. A covenant does not require the Mayor's signature or Council approval, and the end result for water quality protection and flood control is the same. Covenants are recorded in the office of the Knox County Register of Deeds.

The City retains the right to inspect the stormwater facilities to insure they are properly maintained; however, the responsibility for the maintenance of stormwater facilities remains 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 required.

C. *If applicable, are monitoring records for activities performed during this reporting period submitted with this report.* ☒ Yes ☐ No

11. **Fiscal Analysis**

The Fiscal Analysis for this annual report lists the permit year budget sources and amounts along with estimates for the following permit year. Due to complexity, all of the support activities such as purchasing, payroll, legal support, information systems, fleet management, and human resources are not reflected. The below table presents the primary sources of funding for the City's stormwater related activities.

Capital Funds	FY18 Actual	Total Available Funding FY19
Stormwater Engineering	\$ 1,388,777	\$1,516,233
Civil Engineering	\$12,424,969	\$25,919,482
 Operating Funds	 FY18 Actual	 FY19 Budget
Stormwater Engineering	\$2,911,495	\$2,772,540
PSD – Stormwater Related	\$3,494,004	\$3,500,000*
Household Hazardous Waste Facility and Recycling	\$2,334,372	\$2,000,250

* - Estimated amount of stormwater related activities which are paid out of PSD general fund account.

Phase I Medium Municipal Separate Storm Drain System (MS4) Annual

12. Certification

This report must be signed by a ranking elected official or by a duly authorized representative of that person. See signatory requirements in sub-part VII (K) of the permit.

"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 gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the 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."

Madeline Rogero

Printed Name and Title

Mayor

Madeline Rogero

Signature

12/19/18

Date

Annual reports must be submitted within 6 months after the end of the permit year to the appropriate Environmental Field Office (EFO), identified in the table below:

EFO	Street Address	City	Zip Code	Telephone
Chattanooga	1301 Riverfront Pkwy, Suite 206	Chattanooga	37402	(423) 634-5745
Columbia	1421 Hampshire Pike	Columbia	38401	(931) 380-3371
Cookeville	1221 South Willow Ave.	Cookeville	38506	(931) 520-6688
Jackson	1625 Hollywood Drive	Jackson	38305	(731) 512-1300
Johnson City	2305 Silverdale Road	Johnson City	37601	(423) 854-5400
Knoxville	3711 Middlebrook Pike	Knoxville	37921	(865) 594-6035
Memphis	8383 Wolf Lake Drive	Bartlett	38133	(901) 371-3000
Nashville	711 R S Gass Boulevard	Nashville	37216	(615) 687-7000

APPROVED AS TO FORM:

Charles W. Swanson
CHARLES W. SWANSON
LAW DIRECTOR

Table 2A

City of Knoxville Waters with Unavailable Parameters

Waterbody ID	Impacted Waterbody	County	Miles/Acres Impaired	Reason for Impairment/TMDL Priority	Pollutant Source
TN06010104 001_0100	LOVE CREEK	Knox	9.7 Miles	Nitrate+Nitrite L Loss of biological integrity L due to siltation L Other Anthropogenic Habitat Alterations L Escherichia coli H	Discharges from MS4 area
TN06010104 001_1400	SWANPOND CREEK	Knox	16.3 Miles	Loss of biological integrity L due to siltation L Alteration in stream-side or littoral vegetative cover L Escherichia coli NA	Channelization Discharges from MS4 Area
TN06010201 020_1000	FORT LOUDOUN RESERVOIR	Knox Loudon	14066 acres	PCBs NA	Contaminated Sediment
TN06010201 020_2000	FORT LOUDOUN RESERVOIR	Knox	534 acres	Mercury L PCBs NA	Atmospheric Deposition Contaminated Sediment
TN06010201 066_1000	STOCK CREEK	Knox	3.77 Miles	Escherichia coli NA	Pasture Grazing
TN06010201 066_2000	STOCK CREEK	Knox	1.98 Miles	Escherichia coli NA	Pasture Grazing
TN06010201 067_0100	EAST FORK THIRD CREEK	Knox	2.78 Miles	Loss of biological integrity due to siltation NA Other Anthropogenic Habitat Alterations NA Escherichia coli NA	Discharges from MS4 area Urbanized High Density Area Collection System Failure
TN06010201 067_1000	THIRD CREEK	Knox	17.86 Miles	Nitrate+Nitrite L Loss of biological integrity due to siltation NA Other Anthropogenic Habitat Alterations NA Escherichia coli NA	Discharges from MS4 area Urbanized High Density Area Collection System Failure
TN06010201 080_0100	WHITES CREEK	Knox	10.2 Miles	Other Anthropogenic Habitat Alterations NA Escherichia coli H	Discharges from MS4 area Streambank Modification
TN06010201 080_1000	FIRST CREEK	Knox	16.1 Miles	Nitrate+Nitrite L Loss of biological integrity due to siltation NA Other Anthropogenic Habitat Alterations NA Escherichia coli NA	Discharges from MS4 area Urbanized High Density Area Collection System Failure
TN06010201 097- 1000	SECOND CREEK	Knox	12.8 Miles	Other Anthropogenic Habitat Alterations NA Nitrate+Nitrite L Loss of biological integrity due to siltation NA Escherichia coli NA	Discharges from MS4 area Collection System Failure
TN06010201 1330_1000	SINKING CREEK	Knox	4.1 Miles	Escherichia coli H	Discharges from MS4 area

Table 2A

City of Knoxville Waters with Unavailable Parameters

Waterbody ID	Impacted Waterbody	County	Miles/Acres Impaired	CAUSE / TMDL Priority	Pollutant Source
TN06010201 340_1000	TURKEY CREEK	Knox	15.8 Miles	Loss of biological integrity due to siltation NA Escherichia coli H	Discharges from MS4 area
TN06010201 697_1000	FOURTH CREEK	Knox	14.9 Miles	Physical Substrate Habitat Alterations NA Escherichia coli NA	Discharges from MS4 area Channelization
TN06010201 719_1000	WILLIAMS CREEK	Knox	2.8 Miles	Nitrate+Nitrite L Other Anthropogenic Habitat Alterations NA Escherichia coli NA	Discharges from MS4 area Collection System Failure
TN06010201 721_1000	BAKER CREEK	Knox	3.3 Miles	Nitrate+Nitrite L Other Anthropogenic Habitat Alterations NA Escherichia coli NA	Discharges from MS4 area Collection System Failure
TN06010201 723_1000	GOOSE CREEK	Knox	4.9 Miles	Loss of biological integrity due to siltation NA Other Anthropogenic Habitat Alterations NA PCBs L Escherichia coli NA	Collection System Failure Discharges from MS4 area RCRA Hazardous Waste
TN06010207 011_0600	KNOB FORK	Knox	8.1 Miles	Nitrate+Nitrite L Loss of biological integrity due to siltation NA Habitat loss due to other anthropogenic substrate NA Alteration in stream-side or littoral vegetative cover NA Escherichia coli H	Discharges from MS4 area
TN06010207 011_0700	GRASSY CREEK	Knox	8.2 Miles	Loss of biological integrity due to siltation NA Escherichia coli H	Discharges from MS4 Area
TN06010207 011_1000	BEAVER CREEK	Knox	22.5 Miles	Total Phosphorus L Nitrate+Nitrite L Escherichia coli NA Low Dissolved Oxygen L Loss of biological integrity due to siltation NA Physical Substrate Habitat Alterations NA	Municipal Point Source Collection System Failure Pasture Grazing Discharges from MS4 Area
TN06010207 011_2000	BEAVER CREEK	Knox	13.7 Miles	Escherichia coli H Loss of biological integrity due to siltation NA Physical Substrate Habitat alterations NA	Pasture Grazing Discharges from MS4 Area Collection System Failure
TN06010207 011_3000	BEAVER CREEK	Knox	7.5 Miles	Escherichia coli H Loss of biological integrity due to siltation NA Physical Substrate Habitat alterations NA	Pasture Grazing Discharges from MS4 Area Collection System Failure

Notes:

MS4 - Municipal Separate Storm Drain System

L - Low Priority

M - Medium Priority

H - High Priority

NA - Not Applicable

Table 4E

Dry Weather Screening Outfalls with Flow July 1, 2017 through June 30, 2018														
Outfall Permit Year 17/18	Date	Visit #	Flow Yes/No	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Color	Odor Yes/No	Surface Scum Yes/No	Oil Sheen Yes/No
00-300-0240														
2018	12/13/17	1	No											
2018	12/13/17	2	No											
2018	3/5/18	3	Yes	0.25	7.0	0	0	0	0	0	Clear	No	No	No
2018	3/5/18	4	Yes	0.25	7.0	0	0	0	0	0	Clear	No	No	No
00-300-0285														
2018	12/14/17	1	No											
2018	12/14/17	2	No											
2018	4/2/18	3	Yes	2	7.0	0	0	0	0	0	Clear	No	No	No
2018	4/2/18	4	Yes	2	7.0	0	0	0	0	0	Clear	No	No	No
00-100-0300														
2018	12/14/17	1	Yes	0.30	6.0	0	0	0	0	0	Clear	No	No	No
2018	12/14/17	2	Yes	0.30	6.0	0	0	0	0	0	Clear	No	No	No
2018	1/25/18	3	Yes	0.50	6.0	0	0	0	0	0	Clear	No	No	No
2018	1/25/18	4	Yes	0.50	6.0	0	0	0	0	0	Clear	No	No	No
00-300-0385														
2018	12/15/17	1	No											
2018	12/15/17	2	No											
2018	4/2/18	3	Yes	1	7.0	0	0	0	0	0	Clear	No	No	No
2018	4/2/18	4	Yes	1	7.0	0	0	0	0	0	Clear	No	No	No
00-300-0412														
2018	12/15/17	1	Yes	3	6.0	0	0	0	0	0	Clear	No	No	No
2018	12/15/17	2	Yes	3	6.0	0	0	0	0	0	Clear	No	No	No
2018	4/2/18	3	No											
2018	4/2/18	4	No											
01-300-0144														
2018	11/30/17	1	No											
2018	11/30/17	2	No											
2018	2/20/18	3	Yes	pumping	n/a	n/a	n/a	n/a	n/a	n/a	Clear	No	No	No
2018	2/20/18	4	Yes	pumping	n/a	n/a	n/a	n/a	n/a	n/a	Clear	No	No	No
01-300-0149														
2018	11/28/17	1	Yes	5	7.0	0	0	0	0	0	Clear	No	No	No
2018	11/29/17	2	Yes	5	7.0	0	0	0	0	0	Clear	No	No	No
2018	1/5/18	3	No											
2018	1/5/18	4	No											
01-300-0150														
2018	11/28/17	1	No											
2018	11/29/17	2	No											
2018	1/5/18	3	Yes	5	7.0	0	0	0	0	0	Clear	No	No	No
2018	1/5/18	4	Yes	5	7.0	0	0	0	0	0	Clear	No	No	No
01-100-0775														
2018	11/27/17	1	No											
2018	11/27/17	2	No											
2018	2/20/18	3	Yes	5	7.0	0	0	0	0	0	Clear	No	No	No
2018	2/20/18	4	Yes	5	7.0	0	0	0	0	0	Clear	No	No	No
02-100-0103														
2018	8/28/17	1	Yes	0.30	7.0	0	0	0	0	0	Clear	No	No	No
2018	8/29/17	2	Yes	0.10	7.0	0	0	0	0	0	Clear	No	No	No
2018	3/5/18	3	Yes	1	7.0	0	0	0	0	0	Clear	No	No	No
2018	3/5/18	4	Yes	1	7.0	0	0	0	0	0	Clear	No	No	No
02-300-0148														
2018	11/13/17	1	No											
2018	11/13/17	2	No											
2018	2/20/18	3	Yes	1	6.0	0	0	0	0.25	0.10	Clear	No	No	No
2018	2/20/18	4	Yes	1	6.0	0	0	0	0.25	0.10	Clear	No	No	No
02-300-0164														
2018	11/14/17	1	Yes	3	6.0	0	0	0	0	0	Clear	No	No	No
2018	11/14/17	2	Yes	3	6.0	0	0	0	0	0	Clear	No	No	No
2018	1/2/18	3	Yes	3	6.0	0	0	0	0	0	Clear	No	No	No
2018	1/2/18	4	Yes	3	6.0	0	0	0	0	0	Clear	No	No	No
02-300-0245														
2018	11/15/17	1	Yes	3	7.0	0	0	0	0	0	Clear	No	No	No
2018	11/15/17	2	Yes	3	7.0	0	0	0	0	0	Clear	No	No	No
2018	3/5/18	3	No											
2018	3/5/18	4	No											
03-300-0035														
2018	8/2/17	1	No											
2018	8/2/17	2	No											
2018	4/20/18	3	Yes	1	7.0	0	0	0	0	0	Clear	No	No	No
2018	4/20/18	4	Yes	1	7.0	0	0	0	0	0	Clear	No	No	No
03-100-0090														
2018	8/2/17	1	No											
2018	8/2/17	2	No											
2018	4/20/18	3	Yes	0.50	7.0	0	0	0	0	0	Clear	No	No	No
2018	4/20/18	4	Yes	0.50	7.0	0	0	0	0	0	Clear	No	No	No

Table 4E

Dry Weather Screening Outfalls with Flow														
July 1, 2017 through June 30, 2018														
Outfall Permit Year 17/18	Date	Visit #	Flow Yes/No	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Color	Odor Yes/No	Surface Scum Yes/No	Oil Sheen Yes/No
03-100-0380														
2018	8/3/17	1	No											
2018	8/4/17	2	No											
2018	3/28/18	3	Yes	3	7.0	0	0	0	0	0	Clear	No	No	No
2018	3/28/18	4	Yes	3	7.0	0	0	0	0	0	Clear	No	No	No
03-300-0385														
2018	8/16/17	1	No											
2018	8/16/17	2	No											
2018	4/30/18	3	Yes	< 0.2	7.0	0	0	0	0.80	0.25	Clear	No	No	No
2018	4/30/18	4	Yes	< 0.2	7.5	0	0	0	1	0.10	Clear	No	No	No
03-300-0398														
2018	8/16/17	1	No											
2018	8/16/17	2	No	trickle <										
2018	4/30/18	3	Yes	0.10	8.0	0	0	0	0	0	Clear	No	No	No
2018	4/30/18	4	Yes	trickle <	8.0	0	0	0	0.25	0	Clear	No	No	No
03-300-0400														
2018	8/16/17	1	No											
2018	8/16/17	2	No											
2018	4/30/18	3	Yes	5	8.0	0.20	0	0	0.10	2.00	Clear	Yes	No	No
2018	5/1/18	4	Yes	5	8.0	0	0	0	0.10	0.87	Clear	Yes	No	No
03-200-0414														
2018	8/16/17	1	No											
2018	8/16/17	2	No											
2018	5/4/18	3	Yes	0.10	7.5	0	0	0	0	0	Clear	No	No	No
2018	5/4/18	4	Yes	0.20	7.5	0	0	0	0.25	2.00	Clear	No	No	No
03-300-0615														
2018	8/22/17	1	No											
2018	8/22/17	2	No											
2018	4/30/18	3	Yes	2	7.0	0	0	0	0	0	Clear	No	No	No
2018	4/30/18	4	Yes	2	7.0	0	0	0	0	0	Clear	No	No	No
03-200-0865														
2018	8/25/17	1	No											
2018	8/25/17	2	No											
2018	3/28/18	3	Yes	1	7.0	0	0	0	0	0	Clear	No	No	No
2018	3/28/18	4	Yes	1	7.0	0	0	0	0	0	Clear	No	No	No
05-200-0130														
2018	8/30/17	1	No											
2018	8/30/17	2	No											
2018	2/20/18	3	Yes	< 1 gpm	5.0	0	0	0	0	0	Clear	No	No	No
2018	2/20/18	4	Yes	< 1 gpm	5.0	0	0	0	0	0	Clear	No	No	No
05-500-0155														
2018	8/30/17	1	Yes	5	7.0	0	0	0	0	0	Clear	No	No	No
2018	8/30/17	2	Yes	5	7.0	0	0	0	0	0	Clear	No	No	No
2018	4/12/18	3	Yes	5	7.0	0	0	0	0	0	Clear	No	No	No
2018	4/12/18	4	Yes	5	7.0	0	0	0	0	0	Clear	No	No	No
05-100-0165														
2018	8/30/17	1	Yes	0.50	7.0	0	0	0	0	0	Clear	No	No	No
2018	8/30/17	2	Yes	0.50	7.0	0	0	0	0	0	Clear	No	No	No
2018	4/12/18	3	Yes	0.50	7.0	0	0	0	0	0	Clear	No	No	No
2018	4/12/18	4	Yes	0.50	7.0	0	0	0	0	0	Clear	No	No	No
06-400-0080														
2018	9/18/17	1	Yes	5	7.0	0	0	0	0	0	Clear	No	No	No
2018	9/18/17	2	Yes	5	7.0	0	0	0	0	0	Clear	No	No	No
2018	3/5/18	3	Yes	5	7.0	0	0	0	0	0	Clear	No	No	No
2018	3/5/18	4	Yes	5	7.0	0	0	0	0	0	Clear	No	No	No
06-100-0128														
2018	9/18/17	1	Yes	4	7.0	0	0	0	0	0	Clear	No	No	No
2018	9/18/17	2	Yes	4	7.0	0	0	0	0	0	Clear	No	No	No
2018	3/5/18	3	Yes	4	7.0	0	0	0	0	0	Clear	No	No	No
2018	3/5/18	4	Yes	4	7.0	0	0	0	0	0	Clear	No	No	No
06-100-0133														
2018	9/18/17	1	Yes	0.75	7.0	0	0	0	0	0	Clear	No	No	No
2018	9/18/17	2	Yes	0.75	7.0	0	0	0	0	0	Clear	No	No	No
2018	3/5/18	3	Yes	1	7.0	0	0	0	0	0	Clear	No	No	No
2018	3/5/18	4	Yes	1	7.0	0	0	0	0	0	Clear	No	No	No
07-100-0175														
2018	9/19/17	1	Yes	0.75	7.0	0	0	0	0	0	Clear	No	No	No
2018	9/19/17	2	Yes	3	7.0	0	0	0	0	0	Clear	No	No	No
2018	1/23/18	3	No											
2018	1/23/18	4	No											
08-500-0140														
2018	9/20/17	1	No											
2018	9/20/17	2	No											
2018	4/12/18	3	Yes	5		0	0	0	0	0	Clear	No	No	No
2018	4/12/18	4	Yes	5		0	0	0	0	0	Clear	No	No	No

Table 4E

Dry Weather Screening Outfalls with Flow														
July 1, 2017 through June 30, 2018														
Outfall Permit Year 17/18	Date	Visit #	Flow Yes/No	Flow Rate (gpm)	pH (su)	Chlorine (ppm)	Copper (ppm)	Phenol (ppm)	Detergents (ppm)	Ammonia (ppm)	Color	Odor Yes/No	Surface Scum Yes/No	Oil Sheen Yes/No
09-400-0005	9/21/17	1	No											
2018	9/22/17	2	No											
2018	2/20/18	3	Yes	2	7.0	0	0	0	0	0	Clear	No	No	No
2018	2/20/18	4	Yes	2	7.0	0	0	0	0	0	Clear	No	No	No
11-300-0611	9/26/17	1	No											
2018	9/27/17	2	No											
2018	3/28/18	3	Yes	3	6.0	0	0	0	0	0	Clear	No	No	No
2018	3/28/18	4	Yes	3	6.0	0	0	0	0	0	Clear	No	No	No
12-500-0575	9/28/17	1	No											
2018	9/28/17	2	No											
2018	3/4/18	3	Yes	10	7.5	0	0	0	0	0	Clear	No	No	No
2018	3/4/18	4	Yes	10	7.5	0	0	0	0	0	Clear	No	No	No
12-300-0714	9/28/17	1	No											
2018	9/28/17	2	No											
2018	3/4/18	3	Yes	2	8.0	0	0	0	0.25	0	Clear	No	No	No
2018	3/5/18	4	Yes	1	7.5	0	0	0	0.25	0.10	Clear	No	No	No
12-100-0748	9/28/17	1	No											
2018	9/28/17	2	No											
2018	3/4/18	3	Yes	0.30	7.5	0	0	0	0.25	0	Clear	No	No	No
2018	3/5/18	4	Yes	0.25	7.0	0	0	0	0.25	0.25	Clear	No	No	No
13-300-0135	10/4/17	1	Yes	backflow	n/a	n/a	n/a	n/a	n/a	n/a	Clear	No	No	No
2018	10/5/17	2	Yes	backflow	n/a	n/a	n/a	n/a	n/a	n/a	Clear	No	No	No
2018	1/5/18	3	No											
2018	1/5/18	4	No											
13-300-0350	10/6/17	1	No											
2018	10/6/17	2	No											
2018	2/20/18	3	Yes	2	6.8	< 0.2	0	0	< 0.25	0	Clear	No	No	No
2018	2/20/18	4	Yes	2	6.5	< 0.3	0	0	0	0	Clear	No	No	No
13-300-0355	10/6/17	1	No											
2018	10/6/17	2	No											
2018	2/20/18	3	Yes	2	7.8	< 0.2	0	0	0.25	0	Clear	No	No	No
2018	2/20/18	4	Yes	2	7.0	0.3	0	0	0	0	Clear	No	No	No
31-100-0500	10/13/17	1	Yes	10	7.0	0	0	0	0	0	Clear	No	No	No
2018	10/13/17	2	Yes	10	7.0	0	0	0	0	0	Clear	No	No	No
2018	4/13/18	3	Yes	10	7.0	0	0	0	0	0	Clear	No	No	No
2018	4/13/18	4	Yes	10	7.0	0	0	0	0	0	Clear	No	No	No
50-400-0085	10/18/17	1	Yes	10	7.0	0	0	0	0	0	Clear	No	No	No
2018	10/19/17	2	Yes	10	7.0	0	0	0	0	0	Clear	No	No	No
2018	1/24/18	3	No											
2018	1/24/18	4	No											
53-100-0045	10/20/17	1	Yes	1	7.0	0	0	0	0	0	Clear	No	No	No
2018	10/20/17	2	Yes	1	7.0	0	0	0	0	0	Clear	No	No	No
2018	1/3/18	3	Yes	1	7.0	0	0	0	0	0	Clear	No	No	No
2018	1/3/18	4	Yes	1	7.0	0	0	0	0	0	Clear	No	No	No
53-100-0075	10/20/17	1	No											
2018	10/20/17	2	No											
2018	12/29/17	3	Yes	0.50	7.0	0	0	0	0	0	Clear	No	No	No
2018	12/29/17	4	Yes	0.50	7.0	0	0	0	0	0	Clear	No	No	No
53-100-0085	10/20/17	1	Yes	0.50	7.0	0	0	0	0	0	Clear	No	No	No
2018	10/20/17	2	Yes	0.50	7.0	0	0	0	0	0	Clear	No	No	No
2018	12/29/17	3	Yes	0.50	7.0	0	0	0	0	0	Clear	No	No	No
2018	12/29/17	4	Yes	0.50	7.0	0	0	0	0	0	Clear	No	No	No
79-100-0380	11/13/17	1	No											
2018	11/13/17	2	No											
2018	4/20/18	3	Yes	0.10	7.5	0	0	0	0	0	Clear	No	No	No
2018	4/20/18	4	Yes	0.10	7.5	0	0	0	0	0	Clear	No	No	No
79-100-0400	11/13/17	1	No											
2018	11/13/17	2	No											
2018	4/12/18	3	Yes	0.50	7.5	0	0	0	0	0	Clear	No	No	No
2018	4/13/18	4	Yes	0.50	6.0	0	0	0	0	0	Clear	No	No	No

Notes:

gpm - gallons per minute

su - standard unit

ppm - parts per million

mpn - most probable number

ml - milliliter

Table 10A.1

Laboratory Analysis Summary - Seasonal Storm Sampling Program

July 1, 2017 through June 30, 2018

Site	Quarter	pH	Average Sampled Volume	Rainfall per Event	BOD	COD	Total Suspended Solids (TSS)	Total Dissolved Solids (TDS)	Nitrate + Nitrite Nitrogen	Ammonia Nitrogen	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate	E. Coli	Fecal Colif.
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	mpn/100mL	cfu/100 mL
KAT First Creek	Sum '17	7.0	730	0.36	ND	61	52	169	1.20	ND	0.25	0.25	ND	ND	ND	0.035	NS	NS
	Fall '17	7.0	173	1.03	ND	16	5	206	0.92	ND	0.32	0.32	ND	ND	0.11	ND	>2420	42,000
	Wtr '18	7.0	137	0.54	3.8	17	16	292	0.88	ND	ND	ND	ND	ND	ND	ND	NS	NS
	Spr '18	7.0	161	0.00	9.4	29	24	154	0.77	ND	0.81	0.81	ND	ND	ND	ND	NS	NS
Average:		7.0	300.3	0.48	6.6	31.0	24.3	205.3	0.94	ND	0.46	0.46	ND	ND	0.11	0.035	N/A	N/A
Love Creek	Sum '17	7.0	ND	0.34	10.5	32	14	282	1.11	ND	0.36	0.36	ND	ND	ND	ND	NS	NS
	Fall '17	7.0	ND	1.18	17.1	39	20	203	0.79	ND	0.28	0.28	ND	ND	ND	ND	NS	NS
	Wtr '18	7.0	442.0	0.31	ND	ND	3	315	0.82	ND	ND	ND	ND	ND	ND	ND	276	280
	Spr '18	7.0	228.0	0.46	12.2	28	5	210	0.90	ND	0.62	0.62	ND	ND	0.13	ND	NS	NS
Average:		7.0	335.0	0.57	13.3	33.3	10.6	252.5	0.91	ND	0.42	0.42	ND	ND	0.13	ND	N/A	N/A
Third Creek	Sum '17	7.0	32.0	0.36	3.4	13	22	243	1.50	ND	0.38	0.38	ND	ND	ND	ND	NS	NS
	Fall '17	7.0	105.0	0.93	10.2	68	106	163	0.86	ND	0.53	0.53	0.022	0.201	0.15	ND	NS	NS
	Wtr '18	7.0	58.0	0.15	4.7	28	26	530	1.20	ND	0.34	0.34	0.008	0.067	ND	ND	980	1364
	Spr '18	7.0	45.0	0.20	ND	15	8	211	1.14	ND	0.33	0.33	ND	ND	ND	ND	NS	NS
Average:		7.0	60.0	0.41	6.1	31.0	40.4	286.8	1.17	ND	0.40	0.40	0.015	0.134	0.15	ND	N/A	N/A
Walden Drive Fourth Creek	Sum '17	7.0	ND	ND	27.1	66	14	219	1.08	ND	0.33	0.33	ND	ND	ND	0.079	NS	NS
	Fall '17	7.0	ND	1.05	16.0	63	146	110	0.51	ND	0.38	0.38	0.010	0.115	ND	ND	NS	NS
	Wtr '18	7.0	39.0	0.28	9.7	40	56	463	1.06	ND	ND	ND	ND	0.053	ND	ND	816	1091
	Spr '18	7.0	211.0	0.00	15.8	46	175	106	0.51	ND	0.57	0.57	ND	0.140	0.14	ND	NS	NS
Average:		7.0	125.0	0.44	17.2	53.7	97.8	224.5	0.79	ND	0.42	0.42	0.010	0.103	0.14	ND	N/A	N/A
Williams Creek	Sum '17	7.0	20.0	0.29	16.1	32	22	259	1.57	ND	0.40	0.40	ND	ND	ND	ND	NS	NS
	Fall '17	7.0	52.0	0.98	4.4	41	114	229	1.13	ND	ND	ND	0.014	0.051	0.18	ND	NS	NS
	Wtr '18	7.0	16.0	0.14	10.4	90	237	141	0.91	ND	0.38	0.38	0.027	0.085	0.19	0.025	461	300
	Spr '18	7.0	24.0	0.44	9.8	69	22	234	0.78	ND	2.78	2.78	0.045	0.198	0.58	ND	NS	NS
Average:		7.0	28.0	0.46	10.2	58.2	98.8	215.8	1.10	ND	1.19	1.19	0.029	0.111	0.32	0.025	N/A	N/A
*National NURP Study Average					11.9	90.8	N/A	N/A	N/A	*****	2.35	3.31	0.18	0.176	0.16	N/A	N/A	N/A
*Characteristics of Urban Stormwater Range					1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	N/A	0.1 - 2.5	0.01 - 4.5	N/A	0.0 - 1.9	N/A	0.1 - 125	N/A	N/A	N/A

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

-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

-NS: Analyte not sampled for.

-N/A: Not applicable.

-ND: Analyte was not detected.

Table 10A.2

Laboratory Analysis Summary - Municipal Industrial Facility Wet Weather Program

July 1, 2017 through June 30, 2018

Point Source Sample Site	Period/Unit	Date	Type	pH	BOD	COD	Suspended Solids (TSS)	Dissolved Solids (TDS)	Nitrate + Nitrite Nitrogen	Ammonia Nitrogen	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate	Oil/ Grease	E. Coli	Fecal Colif.
Units					mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mpn/ 100mL	cfu/ 100mL
	ANNUAL																		
KAT A	Treated Outfall	12/05/17	G	7.0	30.7	521.00	8.7	108	0.482	ND	1.420	1.420	ND	0.129	0.444	0.336	ND	**	**
KAT B	Treated Outfall	12/05/17	G	7.0	ND	19.4	16.2	44	0.754	0.146	0.368	NS	ND	0.088	ND	ND	ND	**	**
Loraine Street Treatment Units	Pretreated	12/05/17	G	5.0	42.9	248.0	87.0	142	0.458	0.23	1.980	1.750	0.00915	0.199	0.308	0.0930	20.6	**	**
	East Suntree	12/05/17	G	6.0	21.9	693.0	22.2	143	0.201	0.615	1.430	0.815	ND	0.0896	0.231	0.0550	7.8	**	**
	West Baysaver																	**	**
Transfer Station	Pretreated	12/05/17	G	6.0	14.0	166.0	137.0	154	1.020	0.195	1.260	1.070	0.0617	0.373	0.298	0.0290	NS	921	2,800
	Treated	12/05/17	G	6.0	52	86	298	372	0.811	0.487	2.410	1.920	0.1430	0.564	0.657	0.3220	NS	1,733	2,300
Prosser Rd	Treated Outfall	12/05/17	G	7.0	12.4	109.0	10.2	75	0.510	0.549	1.160	0.611	ND	0.578	0.160	0.1000	ND	**	**
Average:				6.2	28.6	220.2	95.1	155	0.626	0.37	1.435	1.233	0.0713	0.315	0.331	0.1198	14.2	1327	2550
*National NURP Study Average					11.9	90.8	N/A	N/A	N/A	N/A	2.350	3.310	0.18	0.176	0.16	N/A	N/A	N/A	N/A
*Characteristics of Urban Stormwater Range					1 - 700	5 - 3,100	2 - 11,300	200 - 14,600	N/A	0.1 - 2.5	0.01 - 4.5	N/A	0.0 - 1.9	N/A	0.1 - 125	N/A	N/A	N/A	N/A

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

*** Microbiological testing not needed at these locations.

-NS: Analyte not sampled for.

-N/A: Not applicable.

-ND: Analyte was not detected.

Table 10A.3

Laboratory Analysis Summary - Seasonal Ambient Grab Sampling Program

July 1, 2017 through June 30, 2018

Site	Quarter	pH	BOD	COD	Total Suspended Solids (TSS)	Total Dissolved Solids (TDS)	Nitrate + Nitrite Nitrogen	Ammonia Nitrogen	Total Kjeldahl Nitrogen	Total Organic Nitrogen	Lead	Zinc	Total Phosphorus	Ortho Phosphate	E. Coli	Fecal Colif.
Units			mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mpn/100mL	cfu/100 mL
First Creek	Sum '17	7.0	ND	ND	6.6	237	1.97	ND	ND	ND	ND	ND	ND	0.094	866	700
	Fall '17	7.0	ND	ND	ND	239	1.23	ND	ND	ND	ND	ND	ND	ND	2420	1200
	Wtr '18	7.0	ND	ND	ND	280	1.48	ND	ND	ND	ND	ND	ND	ND	67	*
	Spr '18	7.0	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	155	191
Average:		7.0	ND	ND	6.6	252.0	1.56	ND	ND	ND	ND	ND	ND	0.094	877	697
Love Creek	Sum '17	7.0	ND	ND	2.5	282	2.14	ND	ND	ND	ND	ND	ND	ND	345	480
	Fall '17	7.0	ND	ND	ND	294	1.45	ND	ND	ND	ND	ND	ND	ND	135	120
	Wtr '18	7.0	ND	ND	ND	283	0.92	ND	ND	ND	ND	ND	ND	ND	20	*
	Spr '18	7.0	ND	ND	ND	223	1.310	ND	0.36	0.36	ND	ND	ND	ND	68	127
Average:		7.0	ND	ND	2.5	270.5	1.45	ND	0.36	0.36	ND	ND	ND	ND	142	242
Third Creek	Sum '17	7.0	ND	ND	3.8	256	1.91	ND	ND	ND	ND	ND	ND	0.031	548	500
	Fall '17	7.0	ND	ND	ND	208	1.50	ND	ND	ND	ND	ND	ND	ND	210	200
	Wtr '18	7.0	ND	ND	4.7	310	1.77	ND	0.964	0.964	ND	ND	ND	ND	91	*
	Spr '18	7.0	ND	64.2	ND	322	2.260	ND	0.38	0.376	ND	ND	ND	ND	517	360
Average:		7.0	ND	64.2	4.2	274.0	1.860	ND	0.67	0.670	ND	ND	ND	0.031	342	353
Fourth Creek	Sum '17	7.0	ND	ND	ND	260	1.49	ND	ND	ND	ND	ND	ND	0.043	>2419.6	3200
	Fall '17	7.0	ND	ND	ND	271	1.29	ND	ND	ND	ND	ND	ND	ND	435	540
	Wtr '18	7.0	ND	ND	ND	269	1.16	ND	ND	ND	ND	ND	ND	ND	99	*
	Spr '18	7.0	ND	ND	ND	256	1.180	ND	ND	ND	ND	ND	ND	ND	225	155
Average:		7.0	ND	ND	ND	264.0	1.280	ND	ND	ND	ND	ND	ND	0.043	253	1298
Williams Creek	Sum '17	7.0	ND	ND	ND	246	1.73	ND	ND	ND	ND	ND	ND	ND	194	164
	Fall '17	7.0	ND	ND	ND	273	1.57	ND	ND	ND	ND	ND	ND	ND	152	164
	Wtr '18	7.0	ND	ND	ND	269	1.51	ND	ND	ND	ND	ND	ND	ND	46	*
	Spr '18	7.0	ND	ND	ND	240	1.300	ND	ND	ND	ND	ND	ND	ND	127	155
Average:		7.0	ND	ND	ND	257.0	1.528	ND	ND	ND	ND	ND	ND	ND	130	161

* Knoxville Regional Labs not performing Fecal Coliform at time of sampling

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

-NS: Analyte not sampled for.

-N/A: Not applicable.

- ND: Analyte was not detected.

Table 10A.4

ESTIMATED RUNOFF FROM MAJOR WATERSHEDS WITHIN THE MS4

July 1, 2017 through June 30, 2018

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 17/18 (in./yr)	Total Runoff for 17/18 (Mgal/yr)
Baker Cr.	412	2	107	640	90	77	32	1	1	3	269	13	27	1,674	1,674	32	0.41	49.87	925
East Fork	313	0	10	475	302	78	73	31	195	235	584	33	180	2,509	2,509	53	0.57	49.87	1,946
First Cr.	724	0	300	3,152	544	501	110	157	127	556	1,412	51	116	7,750	7,750	44	0.50	49.87	5,238
Fourth Cr.	965	57	423	2,026	468	406	93	206	201	568	881	61	414	6,769	5,920	41	0.48	49.87	3,827
Goose Cr.	639	40	126	669	213	67	8	21	77	131	327	34	29	2,381	1,755	35	0.43	49.87	1,017
Grassy Cr.	2,230	176	561	610	215	24	0	14	31	95	211	39	95	4,301	433	17	0.29	49.87	168
Holston R.	2,362	69	371	1,222	417	45	5	2	219	33	805	32	50	5,632	2,455	28	0.37	49.87	1,234
Inman Br.	563	33	214	138	4	12	0	0	0	0	145	0	34	1,143	99	21	0.31	49.87	42
Knob Cr.	1,719	195	481	843	125	84	1	19	1	29	296	4	169	3,966	989	19	0.30	49.87	407
Knob Fork	1,659	26	398	675	182	56	5	93	6	124	257	19	252	3,752	823	22	0.33	49.87	365
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	49.87	3,040
Second Cr.	443	0	90	1,281	346	247	29	107	140	542	1,161	35	82	4,503	4,498	53	0.57	49.87	3,478
Sinking Cr.	1,614	146	459	1,266	284	90	17	33	31	267	881	12	347	5,447	2,434	33	0.41	49.87	1,368
Swanpond Cr.	3,892	303	833	604	121	36	4	79	240	232	457	65	285	7,151	499	19	0.30	49.87	205
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	49.87	2,392
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	49.87	5,092
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	49.87	3,649
Toll Cr.	535	69	154	222	42	26	1	0	37	4	93	42	4	1,229	767	22	0.32	49.87	335
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	49.87	873
Whites Cr.	2,733	154	782	1,298	575	59	31	11	49	126	608	51	578	7,055	1,634	23	0.34	49.87	746
Williams Cr.	358	11	47	561	46	96	125	17	10	61	276	3	30	1,641	1,605	37	0.45	49.87	978
Woods Cr.	1,220	106	281	371	0	26	0	2	140	43	261	1	157	2,608	143	23	0.33	49.87	65
Sink-East	1,226	0	0	728	9	17	0	17	3	27	0	0	0	2,027	91	12	0.24	49.87	30
Beaver Cr	21,174	0	0	21,230	1,292	845	4	259	283	712	0	160	0	45,959	162	16	0.28	49.87	61
Tuckahoe	4,293	0	0	1,829	18	14	0	8	2	1	0	4	0	6,169	229	8	0.22	49.87	67
Fr.Broad riv	8,954	0	0	2,744	73	40	24	24	497	117	0	166	0	12,639	551	11	0.24	49.87	178
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				37,726

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

where, P = total precipitation (inches/year) = 49.87 in./yr = 4.16 ft./yr

C = land use area weighted runoff coefficient = $0.15 \times \text{pervious\%} + 0.95 \times \text{impervious\%}$

A = drainage area (acres) = acres in watershed $\times (4.35E4 \text{ ft}^2/\text{acre}) = A_i \text{ ft}^2$

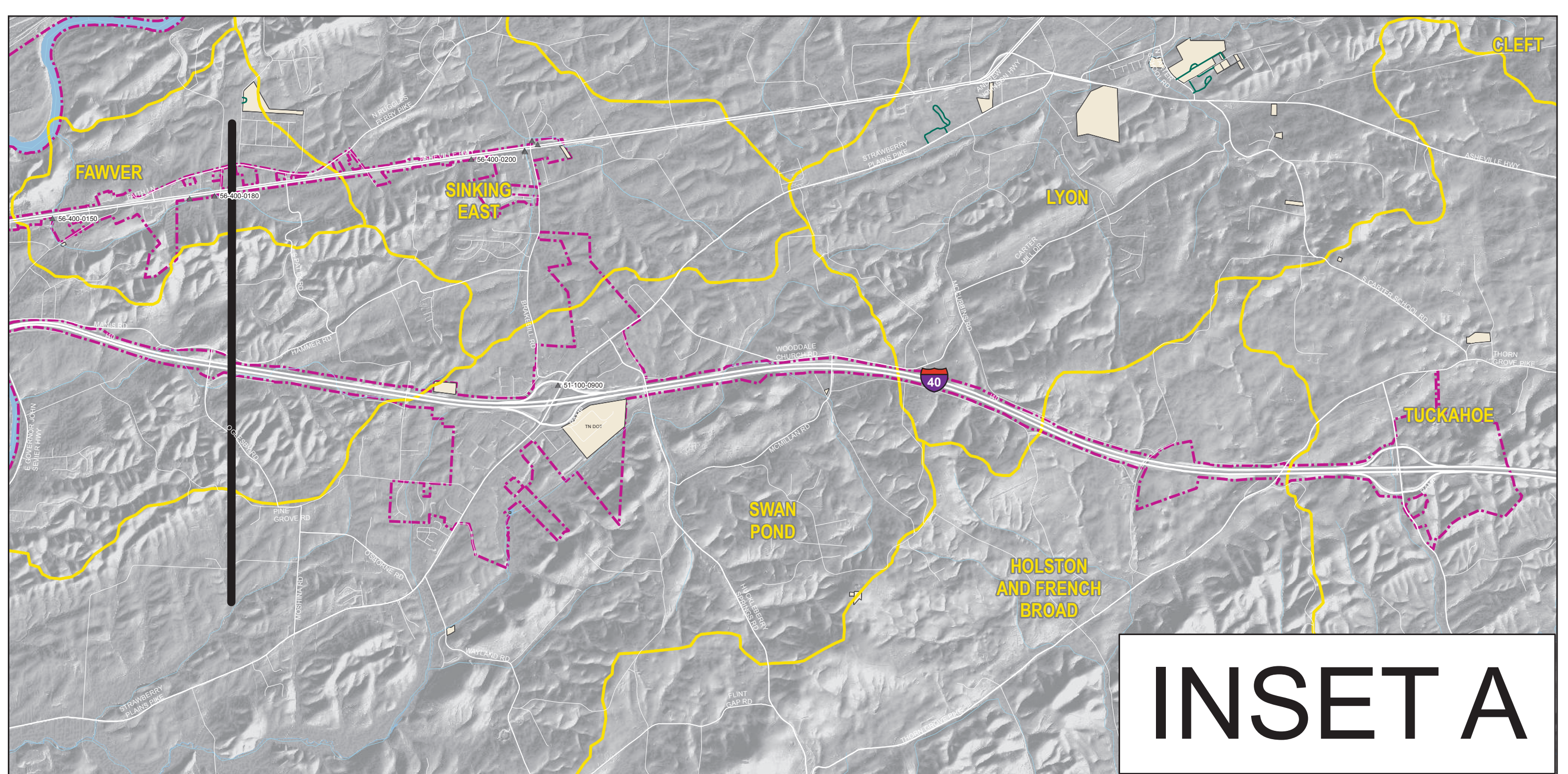
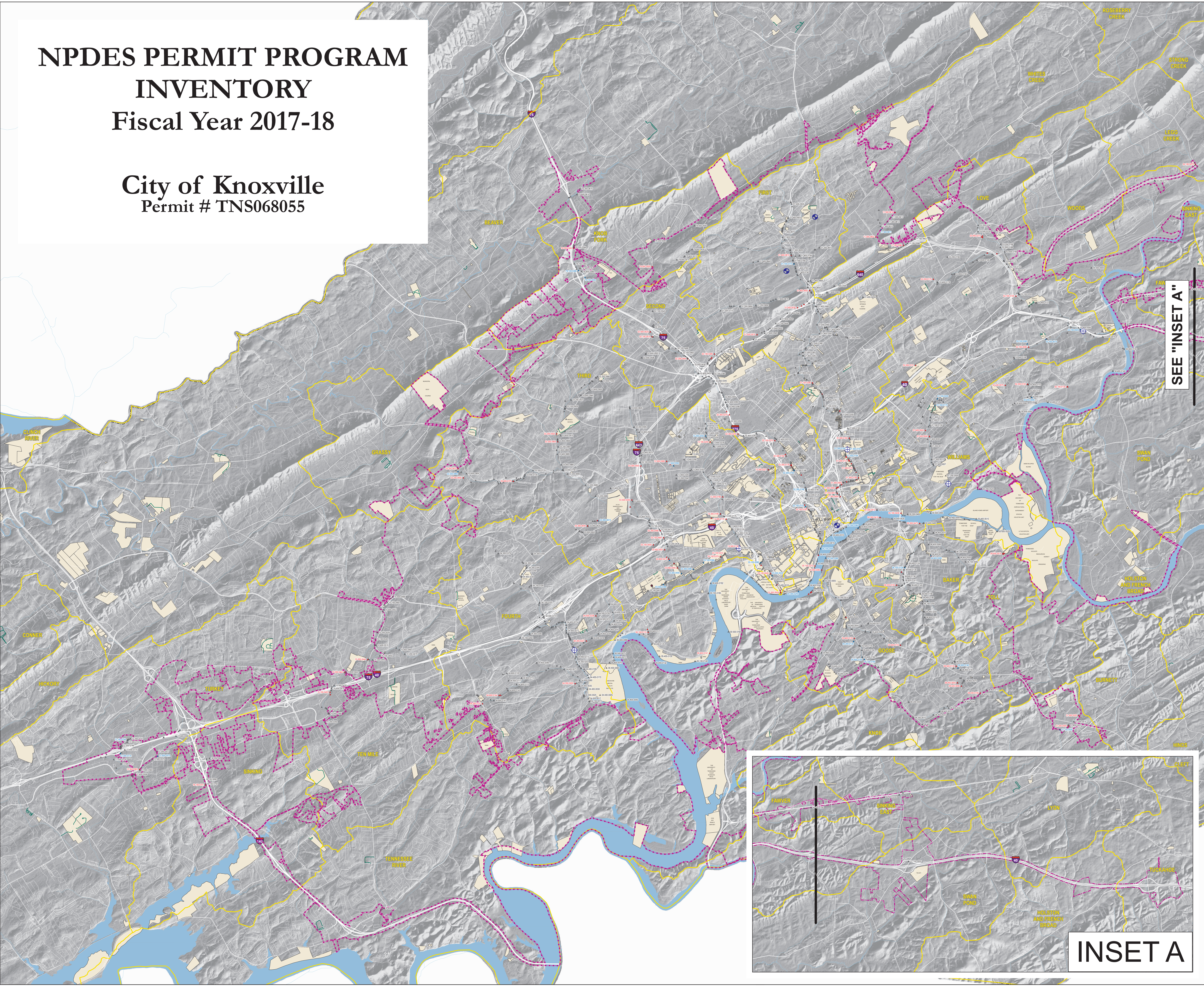
Q = total runoff rate = sum of each watershed's Q_i .

Total estimated runoff for 2017/2018 Reporting Period = 37,726 Mgal/yr

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 E). 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.

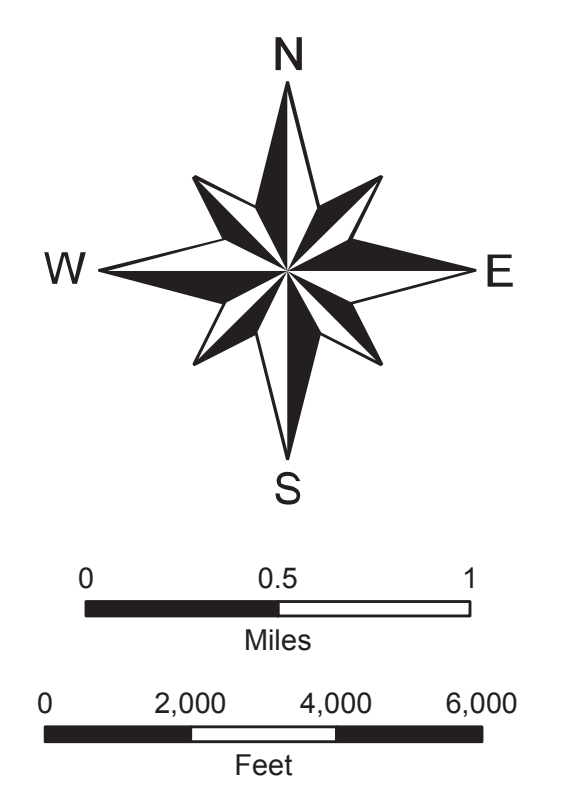
NPDES PERMIT PROGRAM INVENTORY Fiscal Year 2017-18

City of Knoxville
Permit # TNS068055



INSET A

- Monitoring Stations
- Sampling Station
 - Rain Gauge
- 2018 Outfall Status
- Dry
 - Wet
 - Not Sampled
- Knoxville Corporate Limits
- Watershed Basins
 - Public Lands
 - Waterbodies
 - Creeks & Streams
 - Knox County Boundary



Date Created: 9/26/2018
Created By: R. Taylor

MAP DATA TAKEN FROM
AERIAL SURVEY OF KNOXVILLE
AND KNOX COUNTY. THIS MAP IS
INTENDED TO MEET NATIONAL MAP
ACCURACY STANDARDS AT THE
COMPILED SCALE

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