Metro Nashville/Davidson County
Annual MS4 Report
Permit TNS068047

December 2017

Reporting Period:

July 1, 2016 - June 30, 2017

METRO WATER SERVICES STORMWATER

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1.0 Introduction

The Metropolitan Government of Nashville Davidson County (Metro) was issued the third cycle of the Municipal Separate Storm Sewer System (MS4) permit effective February 1, 2012. Under this permit, the reporting period for each permit year coincides with Metro's Fiscal Year (FY) (July 1st through June 30th). The reporting period for this report will be referred to as Fiscal Year 2017 (FY17), which represents the period between July 1, 2016 through June 30, 2017.

Each year, there are numerous individuals within different Metro Departments that work toward achieving overall MS4 permit compliance. As a measure to ensure permit compliance within the various facets of Metro government, the National Pollutant Discharge Elimination System Section (NPDES) was created to oversee all MS4 permit compliance activities. The NPDES Office, which is a section within the Metro Water Services (MWS) Stormwater Division, is responsible for performing specific MS4 permit requirements such as public education activities, illicit discharge investigations, runoff/discharge sampling, construction site inspections, field screening inspections, industrial inspections, etc. In addition, the NPDES Office is responsible for coordinating with various other Metro Departments to ensure permit compliance measures are being followed on a Metro-wide basis.

The following table is a list of certain individuals that have contributed directly to specific permit compliance activities/information during FY17. Any inquiries regarding information represented in this report should be directed to the MWS Stormwater NPDES Office (Attn: Josh Hayes) at 1607 County Hospital Rd, Nashville, Tennessee, 37218, Phone: 615-880-2420, Email: Josh.Hayes@Nashville.gov.

Table 1 - Contact List

Name	Agency	Position/Responsibility
Scott Potter	Metro Water Services	Director
Tom Palko	Metro Water Services	Assistant Director, Stormwater Division
Sonia Allman	Metro Water Services	Manager of Strategic Communications
Julie Berbiglia	Metro Water Services	Public Education Specialist
Jennifer Harrman	Metro Water Services	New Media Specialist
Ricky Swift	Metro Water Services	Program Manager, Stormwater Maintenance Section
Casey Cooper	Metro Water Services	Project Manager, Stormwater Maintenance Section
Hal Balthrop	Metro Water Services	Assistant Director, Development Services Division
Jennifer Knauf	Metro Water Services	Engineer, Development Services Division
Steve Mishu	Metro Water Services	Engineer, Development Services Division
Courtney Larson	Metro Water Services	Engineer, Development Services Division
Kimberly Hayes	Metro Water Services	Engineer, Development Services Division, Single Family
Jennifer Hill	Metro Water Services	Administration Service Manager, Stormwater
Michael Hunt	Metro Water Services	Program Manager, Stormwater NPDES Section
Bonnye Holt	Metro Water Services	Office Support Specialist, Stormwater NPDES Section
Howard Jackson	Metro Water Services	Office Support Specialist, Stormwater NPDES Permit Group
Dale Binder	Metro Water Services	Construction Inspection Manager, Stormwater NPDES Section
Shawn Herman	Metro Water Services	Construction Site Inspector, Stormwater NPDES Section
Katherine O'Hara	Metro Water Services	Construction Site Inspector, Stormwater NPDES Section
Denice Johns	Metro Water Services	Construction Site Inspector, Stormwater NPDES Section
Donald Erves	Metro Water Services	Construction Site Inspector, Stormwater NPDES Section
Ken Tranter	Metro Water Services	Construction Site Inspector, Stormwater NPDES Section
Leigh Nelson	Metro Water Services	Construction Site Inspector, Stormwater NPDES Section
Rebecca Dohn	Metro Water Services	Special Projects Manager, Stormwater NPDES Section
Josh Hayes	Metro Water Services	Permit Group Manager, Stormwater NPDES Section
Mary Bruce	Metro Water Services	Watershed Group Manager, Stormwater NPDES Section
Jane Wilson	Metro Water Services	Permit Group Inspector, Stormwater NPDES Section
Kalee Perry	Metro Water Services	Permit Group Inspector, Stormwater NPDES Section
Liz Stienstraw	Metro Water Services	Permit Group Inspector, Stormwater NPDES Section
Beth Wilson	Metro Water Services	Permit Group Inspector, Stormwater NPDES Section
Veronica Logue	Metro Water Services	Watershed Group Inspector, Stormwater NPDES Section
Stephanie Petty	Metro Water Services	Watershed Group Inspector, Stormwater NPDES Section
Sharon Smith	Department of Public Works	Solid Waste Division
Donna Ryman	Department of Public Works	Solid Waste Division
Clayton Hand	Department of Public Works	Engineer, Solid Waste Division
Phillip Jones	Department of Public Works	Director of the Street Services Division
Ernie Kurgan	Department of Public Works	Street Services Division
Will Robinson	Department of Public Works	Street Services Division
Wade Hill/Jon Michael	Codes Department	Chief Plans Reviewer
Anita McCaig	Metro Planning Department	Planner
Christopher Michie	Metro Health Department	Septic System Oversight
Steve Crosier	Metro Health Department	Restaurant Inspection
Greg Ballard	Metro Water Services	Program Manager, Overflow Abatement
Matt Lott	Metro Water Services	Program Manager, System Services Overflow Response
Al Corlew	Metro Parks Department	Parks and Recreation Planning Division
Tim Netsch	Metro Parks Department	Assistant Director
Scott Harris	Mayor's Office of Emergency Management	Spill Response Coordinator
Ted Taylor	Metro Water Services	Laboratory Superintendent
Andy Welch	Metro Water Services	Program Manager, Pre-treatment/FOG
Anna Kuoppamaki	Metro Water Services	GIS Analyst, Stormwater Master Planning Section

Note: There are many other personnel that contribute to the overall MS4 compliance program not listed on this table.

The following list is a description of commonly used acronyms throughout the document:

303(d)	State's List of Impaired Waterways (Below Water Quality Criteria for Use Classifications)
BMP	Best Management Practice
CCTV	Closed Circuit Televising
CSS	Combined Sewer System
CWN	Clean Water Nashville Program
DRIP	**D**avidson County Water **R**esources **I**mprovement Quantification **P**latform
EMC	Event Mean Concentration
EPA	Environmental Protection Agency
EPSC	Erosion Prevention and Sediment Control
FY17	Fiscal Year 2017
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System software
GP	Grading Permit
LA	Load Allocations for Streams with Approved TMDLs
LID	Low Impact Development
MEP	Maximum Extent Practicable
MDPW	Metro Department of Public Works
Metro	Metro Nashville Davidson County Government
MNPR	Metro Nashville Parks and Recreation
MNPS	Metro Nashville Public Schools
MS4	Municipal Separate Storm Sewer System
MWS	Metro Water Services
NOV	Notice of Violation
NON	Notice of Noncompliance
NPDES	National Pollutant Discharge Elimination System Section within MWS Stormwater
O&M	Operations and Maintenance
OEM	Mayor's Office of Emergency Management
PIE	Public Information/Education Plan
RMCP	Ready Mix Concrete Plant
RMP	Runoff Management Plan
SCM	Stormwater Control Measure (Post-Construction Stormwater Treatment)
SOP	Standard Operating Procedure
SSD	System Services Division
SSS	Sanitary Sewer System
SWMC	Stormwater Management Committee
SWMM	Stormwater Management Manual
SWMP	Stormwater Management Plan
SWO	Stop Work Order
TAB	Tennessee Association of Broadcaster's Public Education Program
TDEC	Tennessee Department of Environment and Conservation
TMDL	Total Maximum Daily Load of Pollutants Allowed within Streams
TMSP	Tennessee Multi-Sector Permit for Industrial Stormwater Discharges
TDF	Tennessee Department of Agriculture-Division of Forestry
TMI	Tennessee Macroinvertebrate Index
TSS	Total Suspended Solids
WLA	Waste Load Allocation

1.1 Objective of the Program

The objective of the Stormwater Management Program is to implement specific pollution prevention programs designed to improve the quality of Metro's water resources to the Maximum Extent Practicable (MEP), particularly as it relates to improving the quality of discharges from Metro's MS4. This leads to an overall goal of maintaining MS4 permit compliance, while simultaneously achieving water quality improvements in every Metro stream reach, including those listed on the Tennessee Department of Environment and Conservation's (TDEC's) 303(d) list of impaired streams. It is Metro's long-term goal to reduce pollutant loadings from the MS4 as much as possible so as to remove a majority of the streams from the 303(d) list that are indicated as being impaired by MS4 runoff. As Metro maintains compliance with the current MS4 permit requirements, it is important to evaluate the success of the major pollution prevention programs that have been implemented in the first 3 permit cycles. Over the first 3 permit cycles, Metro has made great strides to improve stormwater runoff from construction sites, industrial sites, commercial sites, residential sites, and Metro roadways/properties. Overall, the implementation of these control programs has worked to significantly reduce and minimize pollutants from entering the MS4 drainage system and the receiving streams. With the upcoming/pending issuance of the 4th iteration of Metro's MS4 permit, Metro believes some changes can be made to improve the efficiency of pollution prevention programs. Attachment B includes Metro Nashville's official request/application for a reissued Phase I MS4 permit submitted with the previous annual report. Also included in Attachment B, is an additional coordination letter submitted to TDEC DWR detailing proposed changes to the Stormwater Management Program, which NPDES plans to implement during the current transition period between permits.

1.2 Major Stormwater Pollution Findings

Each year there are fewer and fewer major discoveries of pollution to the MS4 drainage system. This can be largely attributed to the long-term implementation of core pollution prevention programs described further in this document. As Metro's MS4 program further matures, a renewed focus has been shifted to further addressing the long-term inspection and maintenance of post-construction Stormwater Control Measures (SCMs). Moving forward, some of the more notable findings will likely include improperly maintained SCMs. The paragraphs below describe some of the more notable findings impacting water quality of the MS4 and Metro streams during FY17.

1.2.1 Private Sanitary Sewer Failure

NPDES received a report from TDEC about a possible private sanitary sewer overflow from a gas station located in the Bellevue area. Upon investigating, NPDES found a broken clean-out cap and an overflowing sanitary sewer line in which raw sewage was draining down the hill to a floodplain area for a small stream. NPDES issued the commercial property a Notice of Non-compliance requiring them to repair the sanitary sewer line and remediate the exposed raw sewage on the ground. Due to a lack of response, NPDES issued a formal Notice of Violation (NOV) with an accompanied $200 administrative penalty. NPDES performed a follow-up inspection after the enforcement proceedings and noted that the repairs were made to the sanitary sewer line and the exposed sanitary waste material had been properly remediated.

Photographs of the Private Sanitary Sewer Failure

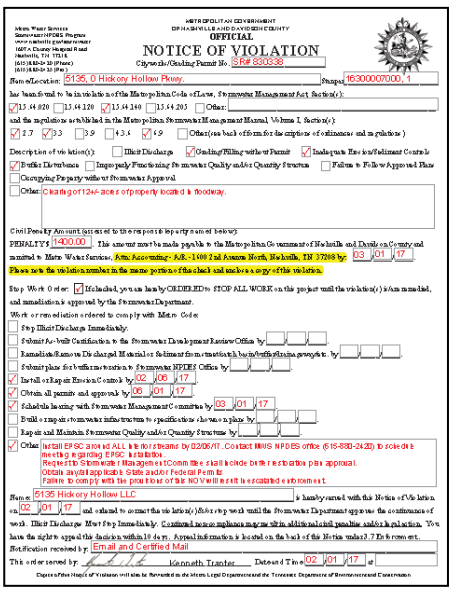
1.2.2 Large Polymer Spill into the MS4

NPDES was notified by the Office of Emergency Management (OEM) in the evening hours of July 20, 2016 that a potentially hazardous substance spilled onto Metro's roadway and drained into the area storm drains. Upon responding, the NPDES inspector found that a large quantity of dry polymer spilled onto the roadway during a rain event and, as a result, the polymer product drained into two MS4 drains, which over time transitioned into a gelatinous form within the street gutter, inlets, and pipes. NPDES coordinated with maintenance crews to quickly vacuum up the polymer gel product and properly dispose of it. NPDES also monitored the nearby receiving stream and, fortunately, no impacts were noted.

Photographs of the Polymer Spill onto the MS4

1.2.3 Construction Violation

During normal routine inspection routes, an NPDES inspector observed a large area of approximately 12 plus acres of recently graded/cleared land within the floodway/floodplain of Mill Creek. Upon closer inspection, it was determined that the site did not have appropriate permit coverage from Metro or TDEC for the grading activity and proper erosion and sediment control measures were not in place. The NPDES Office issued a Notice of Violation (NOV) and Stop Work Order (SWO) to the site with an assessed administrative penalty of $1,400. As a result of the enforcement, the site halted all grading and clearing, immediately installed temporary erosion and sediment control measures, and started discussions with staff on restoring the floodway/floodplain vegetation. A site restoration plan was eventually developed and approved by the Stormwater Management Committee (SWMC), which is currently being implemented.



METROPOLITAN GOVERNMENT
OF NASHVILLE AND DAVIDSON COUNTY

OFFICIAL

NOTICE OF VIOLATION

City-wide/Grading Permit No. GRP 830338

Name/Location: 5135, 0 Hickory Hollow Pkwy. Parcel 163000070001, 1

has been found to be in violation of the Metropolitan Code of Laws, Stormwater Management Act, Section(s):

☑ 13.44.020 ☐ 13.44.120 ☑ 13.44.140 ☐ 13.44.205 ☐ Other:

and the regulations established in the Metropolitan Stormwater Management Manual, Volume 1, Section(s):

☑ 2.7 ☑ 3.3 ☐ 3.9 ☐ 4.3.4 ☑ 4.9 ☐ Other (see back of this notice for descriptions of ordinances and regulations)

Description of violation(s): ☐ Illicit Discharge ☑ Grading/Filling without Permit ☑ Inadequate Erosion/Sediment Controls

☑ Buffer Disturbance ☐ Improperly Functioning Stormwater Quality and/or Quantity Structure ☐ Failure to Follow Approved Plans

☐ Occupying Property without Stormwater Approval

☐ Other: Clearing of 12+/- acres of property located in floodway.

Civil Penalty Assessed to the responsible party named below:

PENALTY: $ 1400.00 This amount must be made payable to the Metropolitan Government of Nashville and Davidson County and mailed to Metro Water Services, Attn: Accounting - A/R - 1400 2nd Avenue North, Nashville, TN 37208 by: 03 / 01 / 17

Please note the violation number in the memo portion of the check and enclose a copy of this violation.

Stop Work Order: ☑ Included, you are hereby ORDERED to STOP ALL WORK on the project until the violation(s) is/are remedied, and remediation is approved by the Stormwater Department.

Work or remediation ordered to comply with Metro Code:

☐ Stop Illicit Discharge Immediately.

☐ Submit As-built Certification to the Stormwater Development Review Office by ___/___/___.

☐ Remediate/Remove Discharged Material or Sediment from material basin/wetlands/stream properties by ___/___/___.

☐ Submit plans for verification to Stormwater NPDES Office by ___/___/___.

☑ Install or Repair Erosion Controls by 02 / 06 / 17

☑ Obtain all permits and approvals by 06 / 01 / 17

☑ Schedule hearing with Stormwater Management Committee by 03 / 01 / 17

☐ Build or repair stormwater infrastructure to specifications shown on plans by ___/___/___.

☐ Repair and Maintain Stormwater Quality and/or Quantity Structures by ___/___/___.

☑ Other: Install EPSC around ALL inlets/streams by 02/06/17. Contact MWS NPDES office (615-880-2420) to schedule meeting regarding EPSC installation.
Neglect to Stormwater Management Committee shall include but is not limited to penalties.
Obtain any/all applicable State and/or Federal Permits.
Failure to comply with the provisions of this NOV will result in escalated enforcement.

Name: 5135 Hickory Hollow LLC is hereby served with this Notice of Violation on 02 / 01 / 17 and ordered to correct the violation(s) described herein until the Stormwater Department approves the continuance of work. Illicit Discharge Must Stop Immediately. Continued non-compliance may result in additional civil penalties and/or legal action. You have the right to appeal this decision within 10 days. Appeal information is located on the back of this Notice under 7.7 Enforcement.

Notification received by: Email and Certified Mail

This order served by: Kenneth Tranter Date and Time: 02 / 01 / 17 at ___

Copies of this Notice of Violation will also be forwarded to the Metro Legal Department and the Tennessee Department of Environment and Conservation.

Grading Permit Violation Pictures and Resulting Enforcement

1.2.4 Illicit Cross-Connection from Mobile Trailer Gray Water Tanks to Stormwater

NPDES received a complaint from an area citizen about numerous mobile trailers and recreation vehicles staged at a local civic event draining their waste tanks into a storm drain. Upon investigating, NPDES discovered numerous mobile travel trailers with hoses draining waste from their gray water tanks directly into storm drains that tie into the MS4. The gray water consisted of waste from the sinks within the travel trailers, which could contain oils, detergents, etc. An NOV was issued immediately requiring the discharges from the numerous travel trailers to the MS4 be eliminated. As a result of enforcement, swift action was taken to remove the discharge and ensure that this situation does not occur in the future.

Discharge of Gray water from the Travel Trailer

1.3 Major Stormwater Management Program Accomplishments and Highlights

1.3.1 MWS Stormwater Division

The MWS Stormwater Division has continued to facilitate major accomplishments in the development of the overall Stormwater Management Program. Particular accomplishments performed in recent years are listed below:

SWMP Implementation:

In FY17, NPDES continued to implement Metro's MS4 Storm Water Management Plan (SWMP) that was developed during previous permit reporting periods. The SWMP, as required by the current MS4 permit, is a formal document that provides a comprehensive narrative description of Metro's overall Stormwater Management Program. The SWMP describes Metro's methods of achieving each MS4 permit-required activity. The SWMP is an internal program document that is reviewed routinely to determine if improvements or changes need to be made. During FY17, the SWMP was reviewed and no major updates were performed. Please note that technically Metro's permit cycle ended in the middle of FY17 (1/31/17) and is currently administratively extended until such time as the permit is reissued by TDEC DWR. The previous year's annual report included Metro Nashville's application request for reissuance of the MS4 Permit, which detailed proposed modifications to some of the programs such as industrial inspections, dry weather field screening, and wet weather monitoring. In addition, as the permit neared its expiration date, NPDES submitted a follow-up letter to TDEC on proposed program modifications during the aforementioned transition period between permits. Based on follow-up verbal communications with TDEC, NPDES has started to incorporate

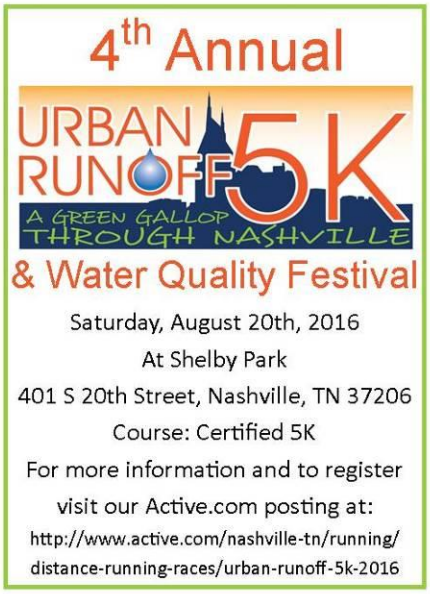
the MS4 program modifications during the transition period, which included a portion of FY17 (i.e. this reporting period).

Public Education:
In FY17, MWS' Stormwater Division increased involvement on public education activities by implementing various actions detailed in the Public Involvement/Education (PIE) plan. Despite the MS4 permit expiring on January 31, 2017, NPDES expanded public education actions and events as opportunities arose. NPDES will continue to build upon the successes of the public education programs and will always look for new outreach opportunities during this transition period between permits. While all details regarding the public education program are provided in the summary section of this document, the below paragraphs highlight specific public education activities that were conducted during FY17:

- Post-Construction Stormwater Control Measure Inspection and Maintenance Training
  During this reporting period, NPDES continued to coordinate with the Tennessee Stormwater Management Training Program to assist in implementing the state-wide post-construction SCM Inspection and Maintenance Training/Certification Program. The class is designed to provide a foundational knowledge and background for professionals that wish to be certified to perform inspection and maintenance functions of various types of SCMs (i.e. detention ponds, water quality units, bioretention basins, and pervious pavement). By the end of FY17, 93 individuals have been trained and certified to inspect and maintain SCMs.

Field Demonstration Portion of the First SCM Certification Class

- Urban Runoff 5K
  During FY17, MWS continued the partnership with TDEC, the Tennessee Department of Agriculture, and the Tennessee Stormwater Association (TNSA) to host the 4th Annual Urban Runoff 5K. The event was a family-oriented run/walk through Nashville that highlighted several stormwater-friendly, green infrastructure projects in and around Nashville's Shelby Park. The actual route took runners/walkers through a forested wetland area, riparian buffer area, and past the Nature Center building, which has a green roof, rain chains, and a rain garden. Public education signage was present throughout the route that explained the benefits of trees and other green features on reducing impacts to stormwater runoff. In addition to the actual race, several local organizations and government agencies hosted exhibitor booths as part of the Water Quality Festival that occurred during and after the race. Over 250 runners, volunteers and other "walk-ons" attended the 5K and Water Quality Festival.

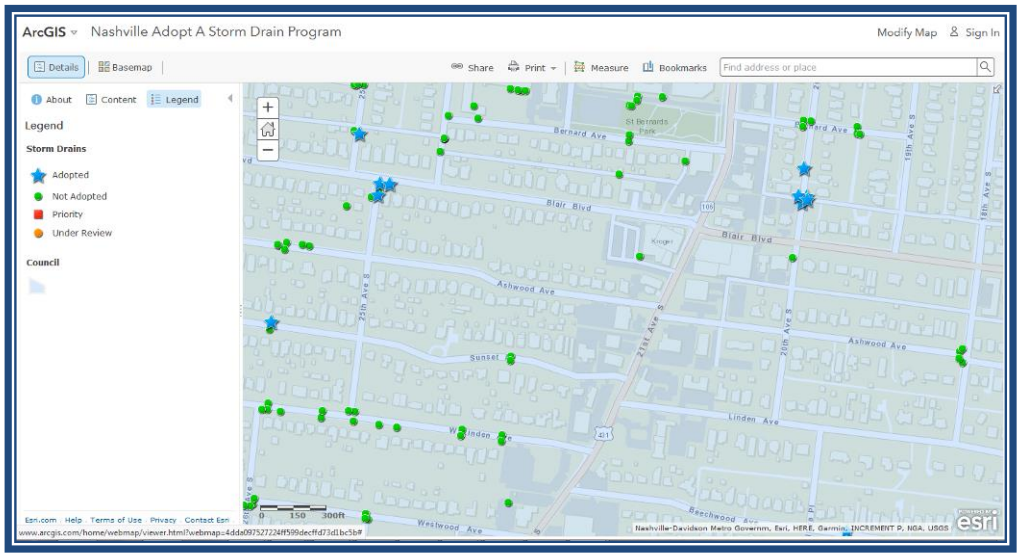


Advertisement and photos form the 4th Annual Urban Runoff 5K

- Social Media Post
  At the beginning of FY17, the MWS Strategic Communications Office hired an employee, dedicated to improving and expanding MWS' social media platform. This new employee has been tasked with continually updating Facebook and Twitter posts messages, many of which involve stormwater educational messages. Social media posts are important, as the new generation get most of their news from the various social media platforms. A benefit to using social media to distribute public education messages is that actual audience sizes can be calculated in terms of views. In FY17, MWS posted a total of 37 separate stormwater educational messages to social media that reached a total audience size of 29,710 individual views.

Example Social Media Posts with Stormwater Messages in FY17

- Nashville Clean Water Project - Adopt a Storm Drain Program
  During the reporting period for FY17, NPDES developed a cooperative relationship with the Nashville Clean Water Project (Water City USA) to start a volunteer "Adopt A Drain" program that encourages residents and businesses to monitor their designated storm drains and proactively remove trash and debris on a routine basis to prevent the material from washing down in the pipes and the receiving streams. The program, which is housed and operated by the Nashville Clean Water Project, utilizes the latest ArcGIS Online software to allow citizens to pick which mapped storm drains they wish to adopt and provide online reporting on the condition of the storm drain. NPDES worked closely with the Nashville Clean Water Project to provide mapped locations of storm drains and assist with ArcGIS software. During the first year, over 350 storm drains have been adopted and, as a result, citizens are much more engaged and mindful of general stormwater runoff impacts.



Nashville Clean Water Project (Water City USA) – Adopt A Storm Drain Program

Floodplain Buyout Properties

Over the years, the MWS Stormwater floodplain buyout program has worked to restore floodplain storage and riparian habitat in various watersheds within the county. The MWS Stormwater Division has been participating in the Federal Emergency Management Agency (FEMA) home buyout program for more than 19 years. Since MWS began participating in the home buyout program, Metro has purchased over 354 floodplain properties (over 180 acres) in which structures and other impervious surfaces such as driveways have been removed from the floodplain. For the restored floodplain parcels, Metro has ceased mowing areas directly adjacent to streams, allowing riparian buffers to naturally reestablish. MWS Stormwater has also coordinated the plantings of hundreds of native trees and shrubs within many of these floodplain properties. Many of the buyout sites are adjoining parcels within the same floodplain, resulting in the restoration of large continuous tracks of riparian floodplain. Some of these floodplain properties also provide recreational value to local neighborhoods as they are now managed and protected by the Metro's Parks Department.

Example Screen Capture of Floodplain Buyout Properties along Whites Creek

Stormwater LID Manual

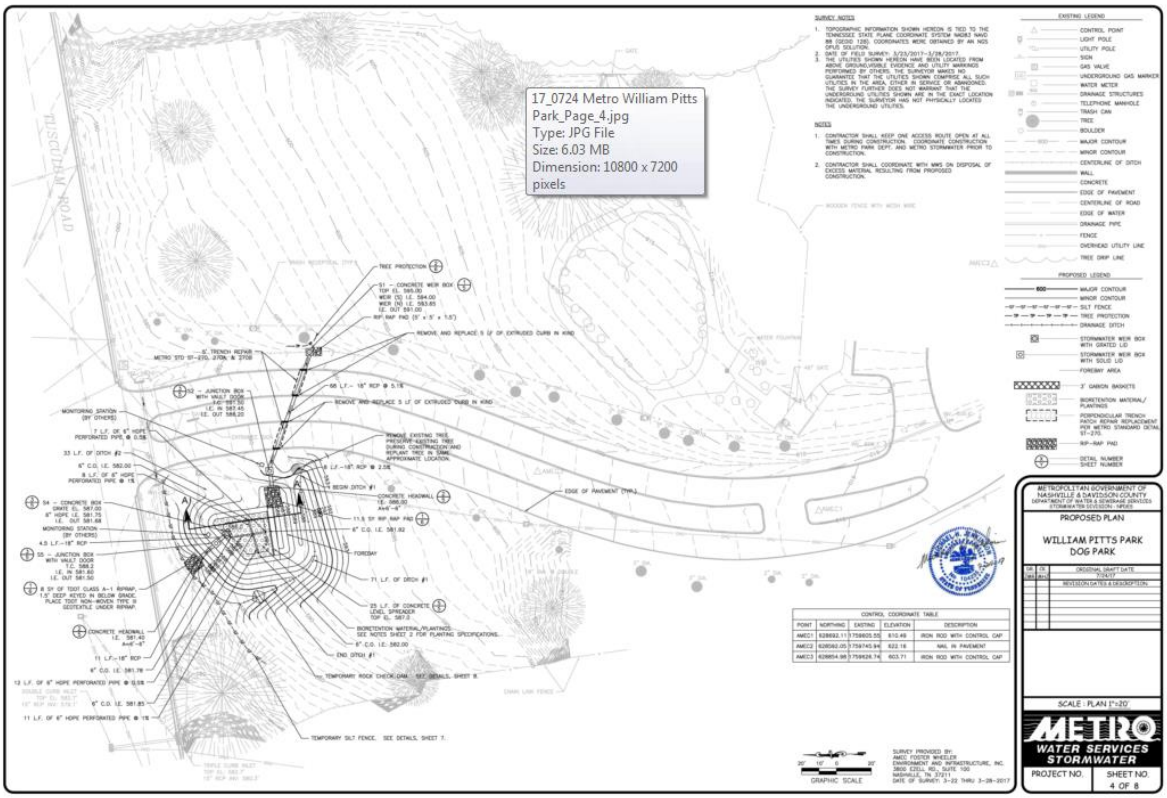
The Low Impact Development Manual became the requirement for post construction water quality compliance path on February 1, 2016, as required by the runoff reduction requirement in Section 3.2.5 of Metro's MS4 Permit. MWS also developed a waiver process to allow projects with certain site limitations such as high water tables, shallow bedrock, etc. to use the previously allowed standard treatment practices to treat at a rate of 80% TSS removal efficiency. At the time of June 30, 2017, MWS had granted waivers to 44 sites.

Volume 5 and photos of some of the LID treatment practices promoted by Metro

Watershed Improvement Fund

During FY17, NPDES began work on the first project to be funded by the Watershed Improvement Fund (WIF), which is a dedicated amount of money collected from the Stormwater user fee that will only be used to perform proactive projects to improve the quality of stormwater runoff in critical watersheds. The projects implemented with WIF funds will include structural and non-structural controls, which may include some retrofits of previously developed properties.

The first WIF project was identified and initiated in FY17. Through monitoring, NPDES determined that there were elevated levels of bacteria flowing off one of Metro's community dog parks during storm events. Metro's Pitts Dog Park, located at 299 Tusculum Road, was found to have unique circumstances where all the runoff for the park routes directly to a confined ditch into the MS4 and, shortly thereafter, into the headwaters of Sorghum Branch. The elevated levels of bacteria represent a specific concern as Sorghum Branch is listed on the 303(d) list of impaired waterways for exceeding the pathogen levels recommended for recreational streams. In order to develop a project to minimize bacteria runoff from the dog park, NPDES hired a contractor to design a bioretention structure to retain/infiltrate/treat stormwater runoff from the dog park. NPDES coordinated with Metro Parks on finalizing the design as to not hinder operation of the park. The design was finalized in FY17 and NPDES is hopeful that construction on the structure will commence in the dormant season of FY18. Once installed, NPDES will monitor the influent and effluent to determine the success in retaining/infiltrating/treating stormwater runoff from the park to minimize bacteria and nutrient runoff.



Bioretention Design to Retain/Treat Stormwater Runoff form Pitts Park

1.3.2 Other Metro Department Activities:

In addition to MWS Stormwater Division Activities, many other Metro Departments perform critical roles in promoting improved stormwater quality runoff throughout Metro.

Metro Parks and Recreation Department

Metro Nashville Parks and Recreation Department (MNPR) has been a key player in improving Stormwater runoff and riparian habitat on Metro properties. Below are some of the major MNPR activities that have served to improve the quality of stormwater runoff:

Dog Waste Pick-up On MNPR Property – During the reporting year, approximately 588,000 dog waste bags were distributed at MNPR properties. Based on the amount of dog waste bags distributed, it is estimated that approximately 176,400 pounds (88.2 tons) of dog waste were collected for proper disposal.

Other MNPR Projects – The following MNPR projects during FY17 have also helped to protect and improve aquatic habitat throughout Davidson County:

- Shelby Park Stream Restoration - The Metropolitan Board of Parks and Recreation continued coordination with the Tennessee Stream Mitigation Program to restore the stream channel through Shelby Park Golf Course, which is currently piped or runs in a concrete-lined channel. The design and permitting phase neared completion in FY17 and it is hopeful that construction will begin on this project in FY18. Once constructed, this project will restore several thousand linear feet of natural stream conditions.

- Metro Southeastern Park Property – During the previous fiscal year, MNPR acquired several hundred acres of property in the southeastern portion of the county. This property, which is mostly old farm land, is rich with water resources as several tributaries to Hurricane Creek and Collins Creek are present throughout the parcels of land. NPDES began coordinating with MNPR on some potential stream/wetland enhancement projects on the property. During FY17, the Tennessee Stream Mitigation Program met, on behalf of MNPR, with representatives from the U.S. Army Corps of Engineers and TDEC permitting staff to discuss the possible, stream mitigation projects at the site. Future coordination/planning is expected to continue into FY18 on potential stream mitigations projects at this site.

- Environmental Education Programs - Metro Parks Nature Centers have a direct and valuable positive impact on water quality and conservation through its environmental education programs, interpretive exhibits, green facilities, and watershed protection. Of the approximately 30,000 individuals who participate in nature center programs throughout any given year, as many as 10,000 receive education and information directly related to water resources. Several thousand more were exposed to water resources education through educational exhibits at the four Metro Parks nature centers. Each of these nature centers also feature amenities that conserve water resources and provide passive education opportunities to visitors. These include green roofs, water chains, rain barrels, teaching ponds, stream bank restoration areas, pervious paving materials, rain gardens and cisterns.

- Parks Land Conservation - The majority of the Parks and Recreation Department's 14,000 plus acres and over 60 miles of greenway corridor have continued to be maintained in a natural condition, providing vitally important protection to our watersheds, including many critical headwater streams. Each year MNPR plants many trees on a variety of parks properties. During FY17, MNPR planted approximately 1,190 trees.

- Metro Parks Land Acquisition – Metro Parks continued to acquire land through FY17, which will be conserved and protected. During FY17, Metro Parks acquired 9.4 acres.

Planning Department

Nashville's Planning Department focuses on sustainable development as described in the Community Character Manual, which encourages sustainable development and preservation in Nashville/Davidson County's fourteen community plans that guide future land use and infrastructure decisions. A foundational principle of the Community Character Manual is the commitment to create

sustainable communities through sustainable development. Key strategies include actions to address each property's unique location and geographic features, while avoiding sensitive environmental features. This benefits the community by protecting water quality, as well as reducing the impact of development on surrounding infrastructure and the community through the use of best practices in stormwater and wastewater management. In addition, the Community Character Manual includes objectives of the EPA and Metro Nashville's Stormwater Management Program, such as incorporating green infrastructure, protecting steep slopes and headwater areas, minimizing and/or recovering floodplain loss, and retaining or re-creating natural stream buffers. The Community Character Manual also includes a section of general principles for Healthy & Complete Communities which highlights the importance of minimizing the impact of development on the natural environment, especially air and water quality, and of integrating green space in developments for preservation, recreation, and healthy lifestyles.

In 2015, the Planning Department completed the city's update to Nashville's General Plan, which was created with city-wide community involvement and input. The process is referred to as NashvilleNext and is the vision and priorities for Nashville/Davidson County for the next 25 years. NashvilleNext includes a Growth & Preservation Concept Map that encourages additional development along the city's corridors and in mixed use centers, while preserving rural areas and areas of sensitive natural features.

One of the four foundations of the plan is a healthy environment. In addition, one of the seven principles in NashvilleNext is to champion the environment. NashvilleNext discusses the importance of how we as a city:

- Build a community founded on land and water conservation, preservation of sensitive environmental conditions, and sustainable development practices.
- Promote efficient transportation and well-designed neighborhoods to achieve healthy living, preserve the natural environment, and encourage resiliency and safety in the face of natural and manmade disasters.
- Sustain the ecological function, resource value, and character of sensitive environmental and rural lands.
- Bring nature into the city through parks, greenways, a healthy urban forest, and clean streams, creeks and rivers.
- Leave future generations an environment that is healthier than today's.

On a day-to-day basis, having quality natural areas betters the quality of life for people, plants, and animals. Nashville's current and projected population growth could degrade the current quality of life and jeopardize Nashville's natural and built environment. In addition to the pressure of sheer growth, demographic changes such as the growth of Baby Boomers and Millennials seeking more compact, walkable communities; the increase of single-person households will also drive new locations and forms of development in our communities. A renewed emphasis on public outreach, education, and personal responsibility will activate new stewardship to conserve energy, eliminate and reduce waste, preserve land, build high performance buildings, and create a culture of sustainability. Meanwhile, public policies, incentives, and private decision-making must provide a clear direction on what to preserve and how to build and grow our city in a more sustainable fashion than we do today. This will enable us to secure the best Nashville for current and future generations.

NashvilleNext contains seven plan elements. Nashville/Davidson County's natural resources area discussed in three elements—Natural Resources & Hazard Adaptation; Health, Livability & the Built Environment; and Land Use, Transportation & Infrastructure. Each element discusses goals, policies and actions that guide Nashville's future. Relevant Element goals, policies and actions include to:

- Conserve natural resources in order to mitigate floods and other natural hazards, ensure clean air and water, raise food locally, provide outdoor recreation, and preserve Nashville's culture and character.

- Invest in and increase Nashville's natural environment for beauty, biodiversity, recreation, food production, resiliency, and response to climate change through mitigation and adaptation strategies.
- Preserve Nashville's existing tree canopy, including urban trees, street trees and larger tracts of forested lands.
- Enjoy (all communities) equally high levels of environmental protection, equitable access to nature, and opportunities to improve their health and quality of life.
- Conserve and efficiently use land, energy, water, and resources while reducing waste and pollution.
- Establish a wide-ranging green education campaign that focuses on the "why" and "how" for water conservation, energy efficiency and reductions, recycling and waste reduction, natural resources preservation, and outdoor activity.
- Ensure all communities have access to parks, green areas, cultural amenities, and recreation opportunities that support mental and physical well-being.
- Optimize sewer, water, stormwater and other infrastructure within Nashville's centers and corridors to prepare for or coordinate with redevelopment. Use green infrastructure to reduce the need for upgrades and to improve streetscapes.
- Reduce the impact of construction on surrounding infrastructure and community through use of best practices in stormwater management, wastewater management, and reducing heat island effect and light pollution.
- Expand programs and institute more complete regulations to protect Nashville's sensitive environmental resources.

During FY17, the Planning Department worked to strengthen and clarify the Conservation Policy guidance found in the Community Character Manual. These changes include discussing Conservation Policy in each transect category (rural, suburban, urban, center, district) and highlighting the role of preserving natural features while balancing preservation and development. For example, one would expect more overall countryside green spaces and natural features preservation in rural areas. The role in the urban downtown and center areas reverses to expect more built environment with green spaces being provided via green roofs, plazas, planting strips, and street trees, while utilizing low impact development techniques in construction and rehab.

The Planning Department also continues its collaboration with Metro Parks and Greenways and the Land Trust for Tennessee by identifying properties that would be good additions to Nashville's open space network. This includes properties that are important to preserve for headwater areas, for wildlife habitat, and for water management in flood-prone areas.

On a daily basis, the Planning Department meets with property owners and development professionals to discuss property ideas and projects. Planning staff discuss the importance of preserving sensitive environmental features and working within the natural features of each site and regarding them as community amenities, including features such as waterways, wet weather conveyances, drainage patterns, steep slopes, woodlands, riparian habitat, and mature trees. Where appropriate, Planning staff direct property owners and development professionals to continue those discussions with Metro Water Services and the Stormwater Division for additional guidance and ideas.

<u>MWS Engineering Division</u>

The MWS Engineering Division and the Clean Water Nashville (CWN) program overseeing the sanitary sewer systems have worked diligently to minimize the volume of unintentional discharges of sanitary sewer overflow material to the MS4 and community waterways. MWS has dramatically increased its involvement on projects to reduce overflows from both the Combined Sewer System (CSS) and the Separate Sewer System (SSS). Table 3 lists some of the major projects undertaken by the MWS OAP that have been completed for which serve to greatly reduce discharges of sanitary

waste to stormwater drainage and streams. Table 4 provides a list of future projects that are planned to be completed in future reporting years.

MWS System Services Division

The Metro Water Services System Services Division (SSD) and its contractors continued to inspect and clean sewers to assess conditions and prevent potential overflows. In FY17 SSD and contractors inspected with Closed Circuit TV (CCTV) approximately 696,611 linear feet and cleaned approximately 286,198 linear feet of Metro sewer line. SSD has been using new acoustic technology to make rapid assessments of potential blockages of sewer line segments. The tool called Sewer Line – Rapid Assessment Tool (SL-RAT) assists SSD in assessing more sewers to prevent blockages and resulting overflows. In FY17, approximately 680,506 linear feet of sanitary sewer line were assessed using the SL-RAT technology.

During FY17, SSD continuously reviewed information from CCTV sewer inspection reports that indicated sewer problems with grease or roots. In some instances letters were sent out to notify customers of roots or grease in their private service lines or main lines and recommend corrective actions to prevent private sewer overflows. The estimated/reported MWS sewer overflows for FY17 are depicted in Table 7H.5 within Section 3 of this report.

Table 3 – MWS Engineering Projects to Reduce Sanitary Overflows

Type of Projects	# of Projects	Miles of Sanitary Lines	Money Spent	Watersheds Where Work was Performed
Cowan - Riverside Rehabilitation - Area 3 (West Trinity Lane): Design of this project, which will reduce I/I by rehabilitation of the collection system, began in November 2014 and was completed in April 2015. Construction began in October 2015 and was completed in November 2017.		5.8 miles	$4,024,917	Cumberland River, Pages Branch
28th Avenue Rehabilitation - Area 1 (Clifton Ave.): The design of this project to reduce I/I issues in the collection system began in February 2015 and was completed in December 2015. Construction began in May 2016 and was completed in May 2017.		5.43	$2,956,823	Cumberland River
Smith Springs Rehabilitation - Area 1 (Priest Lake Meadows): Design began in February 2015 for this project to reduce I/I related issues in the collection system. Design was completed in October 2015. Construction began in February 2016 and completed in March 2017.		5.37	$4,052,502	Hamilton Creek (West & Middle forks), Percy Priest Reservoir
Davidson - Brook Hollow Sewer Improvements: Design was initiated in April 2014 on this project to provide additional capacity to eliminate overflows caused by hydraulic restrictions in the collection system and rehabilitation of some portions of the collection system. Design was completed in June 2015, and construction began in October 2015. The project was completed in August 2016.		0.43 miles	$1,123,452	Ewin Branch, Richland Creek
Sewer Rehabilitation Projects in FY17	**3**	**16.6 miles**	**$11,034,242**	
Sewer Line Replacements	**1**	**0.43**	**$1,123,452**	
Total Completed Projects in FY 2017	**4**	**17.03**	**$12,157,694**	

Table 4 – Future MWS Engineering Projects to Reduce Sanitary Overflows

Type of Projects	Estimated Budget	Watersheds Where Work is Planned
Ewing Creek - Brick Church Equalization Facility: Design was initiated in August 2015 for this project, which will provide 10.6 MG of storage for wet weather events to reduce SSO events. Design was completed in October 2016, with construction starting in May 2017. Completion of construction is anticipated in FY 2019.	$10,140,000	Ewing Creek, Whites Creek
West Park WWPS and Equalization Basin: Design was initiated in May 2012 for this project, which will provide 21 MG of additional storage capacity at this site to reduce SSO events. The design was completed for this project in December 2014. Construction began in April 2015 and is anticipated to be completed in FY 2018.	$14,770,000	Richland Creek, Cumberland River
Davidson Branch WWPS and Equalization Facility: Design of this facility, which will provide a new WWPS for reliability and 6 MG of storage for wet weather flows to reduce SSO events, began in May 2015 and is essentially complete. Construction is dependent upon easement acquisition, which is anticipated to occur in FY 2018.	est. $23.4M	Davidson Branch, Cumberland River
Gibson Creek Equalization Facility: Design of this facility, which will provide 10 MG of storage capacity for wet weather flows to reduce SSO events, began in August 2016. Design is anticipated to be completed in FY 2018 and construction is anticipated to begin in FY 2018 pending final property acquisition and permitting.	est. $16.5M	Gibson Creek, Cumberland River
Annual Rehabilitation 2014 - Whites Creek Trunk Sewer: Design of this project, which will reduce I/I by rehabilitation of the trunk sewer along Whites Creek, began in October 2014 and was completed in May 2015. Construction began in January 2016 and is anticipated to be completed in FY 2018.	$11,324,000	Whites Creek, Cumberland River
Brick Church Pike Pipe: Design was initiated in July 2013 for this project, which will provide approximately 10,000 LF in parallel trunk sewer to increase conveyance to reduce overflows into Ewing Creek. Design was completed in April 2016, and construction began in August 2016. Completion of construction is anticipated in FY 2018.	$5,451,000	North Fork of Ewing Creek, Ewing Creek
Central Wastewater Treatment Plant - Capacity Improvements and CSO Reduction: The design - build process for improvements to the CWWTP for Optimization, Automation, and other improvements began with the selection of two teams for Planning and Design and engagement of a Construction Manager at Risk. Design began in June 2017 and will continue through several years, with various construction packages delivered to the CMAR for construction services.	Est. $267M	Cumberland River
Cowan - Riverside Rehabilitation - Area 4 (Pages Branch): Design of this project, which will reduce I/I by rehabilitation of the collection system, began in January 2015 and was completed in August 2015, at which time the previously reported Cowan - Riverside Area 5 (Youngs Lane) project was merged into a single construction project. Construction of the combined project began in August 2016 and is anticipated to be completed in FY 2018.	$6,936,000	Cumberland River, Pages Branch
Langford Farms - Madison Heights Rehabilitation: Design of this rehabilitation project to reduce I/I issues in the collection system was begun in February 2016 and completed in August 2016. Construction began in February 2017 and is anticipated to be completed in FY 2018.	$2,132,000	Old Hickory Lake, Cumberland River
Annual Rehabilitation 2017 - Dry Creek: Design began in May 2017 for this project, which will reduce I/I related issues in the collection system. Completion of design is anticipated to occur in FY 2018.	Unknown	Dry Creek, Cumberland River
Annual Rehabilitation 2017 - Shepherd Hills: Design began in May 2017 for this project, which will reduce I/I related issues in the collection system. Completion of design is anticipated to occur in FY 2018.	Unknown	Dry Creek, Cumberland River
Shelby Park Rehabilitation - Area 5 - Cooper Lane: Design began in June 2016 on this project, which will reduce I/I related issues in the collection system. Design was completed in December 2016. Construction is anticipated to begin in FY 2018.	$4,989,930	Cooper Creek, Cumberland River
Shelby Park Rehabilitation - Area 6 - Shelby Trunk: Design began in February 2017 on this project, which will reduce I/I related issues in the trunk sewer located in the Shelby Park basin. Design is anticipated to be completed in FY 2018.	Unknown	Cooper Creek, Cumberland River
Smith Springs Rehabilitation - Area 3 - Harbor Town: Design began in June 2017 for this project, which will reduce I/I related issues in the collection system. Design is anticipated to be completed in FY 2018.	Unknown	Hamilton Creek (East Fork), Percy Priest Reservoir
Loves Branch Rehabilitation: Design began in October 2016 for this project, which will reduce I/I related issues in the collection system. Design was completed in June 2017. Construction is anticipated to begin in FY 2018.	Unknown	Loves Branch, Cumberland River

Table 4 – Future MWS Engineering Projects to Reduce Sanitary Overflows Continued

Type of Projects	Estimated Budget	Watersheds Where Work is Planned
Hidden Acres Rehabilitation: Design began in October 2016 for this project, which will reduce I/I related issues in the collection system. Design was completed in June 2017. Construction is anticipated to begin in FY 2018.	Unknown	Cumberland River
Vandiver Rehabilitation: Design began in December 2016 for this project, which will reduce I/I related issues in the collection system. Design is anticipated to be completed in FY2018.	Unknown	Cumberland River
Smith Springs Rehabilitation - Area 2 (Castlegate): Design began in February 2016 for this project, which will reduce I/I related issues in the collection system. Design was completed in July 2016, and construction began in January 2017. Construction is anticipated to be completed in FY 2018	$6,175,000	Hamilton Creek (East Fork), Percy Priest Reservoir
Gibson Creek Rehabilitation - Area 1 (Dupont Avenue): Design of this project, which will address I/I issues in the collection system, began in July 2015 and was completed in February 2016. Construction began in September 2016 and is anticipated to be completed in FY 2018.	$5,013,000	North Fork Gibson Creek, Cumberland River
Hurricane Creek Pipe Improvements: Design of this project, to increase capacity and eliminate I/I issues within the existing trunk sewer, began in April 2016 and is anticipated to be completed in FY 2018. Construction is anticipated to begin in FY 2019 dependent upon easement acquisitions.	est. $11M	Hurricane Creek, Percy Priest Reservoir
Annual Rehabilitation 2016 - South Hurricane Creek Rehabilitation: Design began in March 2016 on this project, which will address I/I related issues in the southern portion of the Hurricane Creek basin. Design was completed in December 2017. Construction began in May 2017 and is anticipated to be completed in FY 2018.	$2,350,000	Holloway Branch, Hurricane Creek, Percy Priest Reservoir

2.0 MS4 Program Annual Report Form Required By TDEC

Tennessee Department of Environment and Conservation
Division of Water Pollution Control
Enforcement and Compliance Section
L&C Annex, 6th Floor, 401 Church Street
Nashville, TN 37243
TNS068047
Municipal Separate Storm Sewer System (MS4) Annual Report

1. MS4 Information

Nashville/Davidson County Municipal Separate Storm Sewer System (No. TNS068047)
Name of MS4

Michael Hunt/Josh Hayes
Name of Contact Person

615-880-2420
Telephone (including area code)

1607 County Hospital Rd
Mailing Address

Nashville	TN	37218
City	**State**	**ZIP code**

What is the current population of your MS4? *Approximately 600,000+*

What is the reporting period for this annual report? *The reporting period for this Annual report is from 07/01/16 to 06/30/17, which is the 6th reporting period under the current permit. This Annual Report coincides with Metro's Fiscal Year 2017 (FY17) activities. This annual report actually covers several months of MS4 permit compliance activities that took place after the permit's expiration date. Through communications with TDEC, Metro will continue to conduct MS4 Permit activities, as detailed in application materials and subsequent coordination sent to TDEC, included in Attachment B of this document.*

2. Protection of State or Federally Listed Species

A. Do any of the MS4 discharges or discharge-related activities likely jeopardize state or federally listed species ☐ Yes **X** No

B. Please attach the determination of the effect of the MS4 discharges on state or federally listed species per subpart *Endangered Species Assessment included in Attachment A.*

3. Water Quality Priorities

A. Does your MS4 discharge to waters listed as impaired on your state 303(d) list? **X** Yes ☐ No

B. If yes, identify each impaired water, the impairment(s), whether a TMDL has been approved by EPA for each, and whether the TMDL identifies your MS4 as a source of the impairment. (See below Checklist). *At the time of the preparation of this report, the proposed 2016 list of impaired streams has still not been approved by the EPA, therefore, the below list still represents the 2014 list.*

Impaired Water	Impairment	Approved TMDL	MS4 Assigned to WLA
East Fork Hamilton Creek (TN05130203-539-1000)	Habitat Alteration, Siltation	Yes X No	Yes X No
West Fork Hamilton Creek (TN05130203-539-1000)	Habitat Alteration, Siltation	Yes X No	Yes X No
Suggs Creek (TN05130203-232-1000)	Siltation	Yes X No	Yes X No
McCrory Creek (TN05130203-001-0150)	Alteration in stream-side or littoral veg. cover, Nitrite+Nitrate	X Yes No	X Yes No
McCrory Creek (TN05130203-001-0100)	*E. coli*, Alteration in stream-side or littoral veg. cover, Nitrite+Nitrate, Siltation	X Yes No	X Yes No
Unnamed Trib. to Stoners Creek (TN05130203-035-0400)	Siltation	X Yes No	X Yes No
Stoners Creek (TN05130203-035-1000)	*E. coli*, Siltation	X Yes No	X Yes No
Stones River (TN05130203001-1000)	Low DO, Odor, Sulfides, Flow Alteration	Yes X No	Yes X No
Scotts Creek (TN051302 03-035-0100)	Total Phosphorus, Nitrate+Nitrite, Siltation	X Yes No	Yes X No
Dry Fork Creek (TN05130203-035-0300)	Siltation	X Yes No	Yes X No
West Branch Hurricane Creek (TN05130203-036-0200)	Nutrients, Siltation	X Yes No	X Yes No
Hurricane Creek (TN05130203-036-0100)	*E. coli*, Siltation, Nutrients,	X Yes No	X Yes No
Mill Creek (TN05130202-007-5000)	Siltation, Total Phosphorus, Low DO, *E. coli*	X Yes No	X Yes No
Pavillion Branch (TN05130202007-1500)	*E. coli*	X Yes No	X Yes No
Holt Creek (TN05130202-007-1100)	*E. coli*, Nitrate+Nitrite, Total Phosphorus	Yes X No	Yes X No
Owl Creek (TN05130202-007-0900)	Alteration in stream-side or littoral veg. cover, Siltation, Total Phosphorus	Yes X No	Yes X No
Indian Creek (TN05130202-007-0800)	*E. coli*, Total Phosphorus	Yes X No	Yes X No
Collins Creek (TN05130202-007-0600)	Alteration in stream-side or littoral veg. cover, Siltation	Yes X No	Yes X No

Impaired Water	Impairment	Approved TMDL	MS4 Assigned to WLA
Whittemore Branch (TN05130202-007-1200)	*E. coli*, Habitat Alteration	Yes X No	Yes X No
Mill Creek (TN05130202-007-3000)	Siltation, Total Phosphorus, Low DO	Yes X No	Yes X No
Sorghum Branch (TN05130202-007-1300)	Habitat Alteration, Siltation, *E. coli*	Yes X No	Yes X No
Cathy Jo (TN05130202-007-1490)	Nitrate+Nitrite, Total Phosphorus, Other Anthropogenic substrate alterations, Siltation	Yes X No	Yes X No
Shasta Branch (TN05130202-007-1410)	*E. coli*	X Yes No	X Yes No
Sevenmile Creek (TN05130202-007-1450)	*E. coli*, Total Phosphorus, Nitrite+Nitrate	X Yes No	X Yes No
Sevenmile Creek (TN05130202-007-1400)	*E. coli*, Other Anthropogenic Habitat Alteration, Total Phosphorus, Nitrite+Nitrate, Low DO	X Yes No	X Yes No
Finley Branch (TN05130202-007-0300)	*E. coli*, Other Anthropogenic Habitat Alteration, Total Phosphorus	X Yes No	X Yes No
Mill Creek (TN05130202-007-2000)	Siltation, Total Phosphorus, Low DO	Yes X No	Yes X No
Sims Branch (TN05130202-007-0150)	Other Anthropogenic Habitat Alteration, Low DO, Propylene Glycol	Yes X No	Yes X No
Sims Branch (TN05130202-007-0100)	*E. coli*, Other Anthropogenic Habitat Alteration, Total Phosphorus, Low DO	X Yes No	X Yes No
Mill Creek (TN05130202-007-1000)	*E. coli*, Siltation, Total Phosphorus, Low DO	X Yes No	X Yes No
Manskers Creek (TN05130202-220-2000)	*E. coli*, Siltation, Low DO	X Yes No	X Yes No
Walkers Creek (TN05130202-220-0200)	*E. coli*	X Yes No	X Yes No

Impaired Water	Impairment	Approved TMDL	MS4 Assigned to WLA
Lumsley Fork (TN05130202-220-0100)	*E. coli*	X Yes No	X Yes No
Manskers Creek (TN05130202-220-1000)	*E. coli*, Siltation	X Yes No	X Yes No
Unnamed Trib. to Walkers Creek (TN05130202-220-1000)	Flow Alteration	Yes X No	Yes X No
West Fork Browns Creek (TN05130202-023-0300)	*E. coli*, Total Phosphorus, Nitrite+Nitrate	X Yes No	X Yes No
Middle Fork Browns Creek (TN05130202-023-0200)	*E. coli*, Other Anthropogenic Habitat Alterations, Total Phosphorus, Nitrite+Nitrate	X Yes No	X Yes No
East Fork Browns Creek (TN05130202-023-0100)	*E. coli*, Other Anthropogenic Habitat Alterations, Total Phosphorus, Nitrite+Nitrate, Oil & Grease	X Yes No	X Yes No
Browns Creek (TN05130202-023-2000)	*E. coli*, Other Anthropogenic Habitat Alterations, Total Phosphorus, Nitrite+Nitrate, Oil & Grease	X Yes No	X Yes No
Browns Creek (TN05130202-023-1000)	*E. coli*, Other Anthropogenic Habitat Alterations, Total Phosphorus, Nitrite+Nitrate, Oil & Grease	X Yes No	X Yes No
Richland Creek (TN05130202-314-3000)	Other Anthropogenic Habitat Alterations, Total Phosphorus, Nitrite+Nitrate, *E. Coli*	X Yes No	X Yes No
Vaughns Gap Branch (TN05130202-314-0750)	*E. coli*, Other Anthropogenic Habitat Alterations	X Yes No	X Yes No
Vaughns Gap Branch (TN05130202-314-0700)	*E. coli*, Other Anthropogenic Habitat Alterations	X Yes No	X Yes No
Jocelyn Hollow Branch (TN05130202-314-0800)	*E. coli*, Total Phosphorus, Nitrite+Nitrate	X Yes No	X Yes No
Richland Creek (TN05130202-314-2000)	Other Anthropogenic Habitat Alterations, Total Phosphorus, Nitrite+Nitrate, *E. Coli*	X Yes No	X Yes No

Impaired Water	Impairment	Approved TMDL	MS4 Assigned to WLA
Sugartree Creek (TN05130202-314-0400)	*E. coli*, Other Anthropogenic Habitat Alterations, Total Phosphorus, Nitrite+Nitrate, Low DO	X Yes No	X Yes No
Bosley Springs Branch (TN05130202-314-0300)	*E. coli*, Other Anthropogenic Habitat Alterations, Total Phosphorus, Nitrite+Nitrate	X Yes No	X Yes No
Richland Creek (TN05130202-314-1000)	Other Anthropogenic Habitat Alterations, Total Phosphorus, Nitrite+Nitrate, *E. coli*	X Yes No	X Yes No
Cooper Creek (TN05130202-209-1000)	*E. coli*, Other Anthropogenic Habitat Alterations	X Yes No	X Yes No
Ewing Creek (TN05130202-010-0900)	*E. coli*, Other Anthropogenic Habitat Alterations	Yes X No	Yes X No
Drakes Branch (TN05130202-010-0200)	*E. coli*, siltation	X Yes No	X Yes No
Whites Creek (TN05130202-101-2000)	*E. coli*, Alteration in stream-side or littoral vegetative cover, Siltation	X Yes No	X Yes No
Whites Creek (TN05130202-010-1000)	Nutrients	X Yes No	X Yes No
Gibson Creek (TN05130202-212-1000)	Other Anthropogenic Habitat Alterations, Flow Alteration	Yes X No	Yes X No
Neelys Branch (TN05130202-212-0100)	*E. coli*	X Yes No	X Yes No
Dry Creek (TN05130202-027-2000)	Other Anthropogenic Habitat Alterations	Yes X No	Yes X No
Dry Creek (TN05130202-027-1000)	*E. coli*	X Yes No	X Yes No
Loves Branch (TN05130202-211-1000)	Other Anthropogenic Habitat Alterations	Yes X No	Yes X No
Pages Branch (TN05130202-202-1000)	*E. coli*	X Yes No	X Yes No
Davidson Branch (TN05130202-001T-0700)	*E. coli*	Yes X No	Yes X No

Impaired Water	Impairment	Approved TMDL	MS4 Assigned to WLA
Unnamed Trib. to Cheatham Reservoir (TN05130202-001T-0700)	Iron, TDS	Yes X No	Yes X No
Cheatham Reservoir (TN05130202-001-3000)	*E. coli*	Yes X No	Yes X No
Overall Creek (TN05130202-001T-0900)	Siltation, Flow Alteration	Yes X No	Yes X No
Otter Creek (TN05130204-021-0100)	Total Phosphorus, Alteration in stream-side or littoral vegetative cover, Siltation, Flow Alteration	X Yes No	X Yes No
Little Harpeth River (TN05130204-021-1000)	Alteration in stream-side or littoral vegetative cover, Siltation, *E. coli*	X Yes No	X Yes No
Harpeth River (TN05130204-009-2000)	Total Phosphorus, Low DO	X Yes No	X Yes No
Trace Creek (TN05130204-009-0900)	Physical Substrate Habitat Alteration, Siltation	X Yes No	X Yes No
Flat Creek (TN05130204-009-0400)	Alteration in stream-side or littoral vegetative cover, Siltation	X Yes No	X Yes No
Unnamed Trib. to South Harpeth (TN05130204-010-0200)	Flow Alteration	Yes X No	Yes X No
Unnamed Trib. to South Harpeth (TN05130204-010-0300)	Alteration in stream-side or littoral vegetative cover	X Yes No	X Yes No
Harpeth River (TN05130204-009-3000)	Total Phosphorus, Low DO	X Yes No	X Yes No
Beech Creek (TN05130204-009-1100)	Alteration in stream-side or littoral vegetative cover, Siltation	X Yes No	X Yes No

C. What specific sources of these pollutants of concern are you targeting?

Pathogens (pet waste, sanitary sewer leaks), siltation (construction sites), oil & grease (industries/commercial sites), and nutrients (pet waste, sanitary sewer leaks, fertilizer application)

D. Do you have discharges to any Exceptional TN Waters (ETWs) or Outstanding National Resource Waters (ONRWs)?

X Yes ☐ No

A large portion of Metro drains to Mill Creek, which is listed as an ETW due to the presence of the federally endangered Nashville Crayfish (Orconectes shoupi). A portion of the Harpeth River in Davidson County is listed as a State Scenic Riverway.

E. Are you implementing additional specific provisions to ensure the continued integrity of ETWs or ONRWS located within your jurisdiction? X Yes ☐ No ☐ N/A

Specific public education activities have been implemented for certain residential areas that drain to the Harpeth River and commercial/industrial areas that drain to Mill Creek. Nutrient and pathogen reduction education has been and will be focused on that area. The Stormwater Maintenance Sections and the MWS Sanitary Sewer Division have been trained on limiting in-creek excavation work within the Mill Creek watershed. Metro also implements a robust construction oversight program to prevent excess sediment from draining to these high valued waterways.

4. Public Education and Public Participation

A. Is your public education program targeting specific pollutants and sources of those pollutants? X Yes ☐ No

B. If yes, what are the specific causes, sources and/or pollutants addressed by your public education program?

Pathogens (pet waste), siltation (construction sites), nutrients (residential lawn maintenance & pet waste), and oil & grease (commercial/industrial facilities).

C. Note specific successful outcome(s) (NOT tasks, events, publications) fully or partially attributable to your public education program during this reporting period.

During the reporting period of FY17, NPDES performed many activities to increase public education and awareness for many diverse stormwater issues, all of which are detailed in Section 4 of this document. In particular, NPDES increased their social media presence in order educate the new generation of customers about stormwater issues and pollution. Three main social media sources (Facebook, Twitter, and Instagram) were utilized to reach local citizens. Over the year a total of 37 posts were uploaded to social media that addressed stormwater pollution topics with an estimated 29,710 views. Typical content of the posts focused on drawing the connection of storm drains to our local water resources to encourage the general public to work towards reducing pollution. Various types of visual media were used to depict the kinds of pollutants that can end up in our streams and how Metro residents can do their part to reduce it. Pollutants that were specifically targeted included lawn chemicals, cigarette butts, lawn wastes, pet waste, and general trash. In addition to an increased social media presence, Metro also continued to achieve specific public education outcomes by sending out email or mail-out notices to various audience groups (i.e. development community, specific neighborhoods, etc.), which reached over 4,483 recipients. The various notices included information about Metro's new stormwater regulations as well as the proper use of chemicals (fertilizers, pesticides, etc.), proper management of yard wastes such as grass clippings, leaves, and brush, and the proper management of pet waste. During the reporting period for FY17, NPDES also developed cooperative relationship with the Nashville Clean Water Project (Water City USA) to start a volunteer "Adopt A Drain" program that encourages residents/businesses to monitor their designated storm drains and proactively remove trash and debris from storm drains on a routine basis to prevent the material from washing down into the storm drainage system and/or to receiving streams. During the first year, over 350 storm drains had been adopted and, as a result, citizens were becoming much more engaged and mindful of general stormwater runoff impacts.

D. Do you have an advisory committee or other body comprised of the public and other stakeholders that provides regular input on your stormwater program? X Yes ☐ No

Metro has a Stormwater Management Committee (SWMC) that reviews cases where development/redevelopment activities are unable to meet specific provisions of the stormwater regulations and hears appeals of violation decisions by the Director's office. The members of the committee are appointed by the Mayor's office. The SWMC monthly meetings are televised on Metro's Local Channel 3 which provides visibility of Metro stormwater matters as well as public education.

E. Provide a summary of all public meetings required by the permit.

Metro has various agencies that perform projects involving public meetings. For example, the MWS Stormwater Remedial Maintenance Section holds meetings for certain large-scale maintenance projects on an as-needed basis. The Metro General Services Department holds various public meetings for large Metro Development activities. In addition, the Metro Planning Department provides numerous opportunities designed to receive feedback from the general public or other stakeholders on a routine basis. Over the past few years, the Planning Department has created several "Resource Teams" that are made up of various stakeholders from the private and public sector involved in advising the Planning Department on future development activities, much of which involves sustainable stormwater practices. Information on the resource teams and other community outreach activities can be found at the following website:

http://www.nashville.gov/Government/NashvilleNext/Resource-Teams.aspx

MWS Stormwater also specifically facilitates monthly meetings with the Stormwater Management Committee for sites appealing specific stormwater regulations. These meetings are available for the public to attend and comment, and are advertised on the internet and at the property in question with a standard public notification sign. During the reporting period, Metro Stormwater facilitated 13 separate SWMC meetings. More information about the SWMC process is available at the following website:

http://www.nashville.gov/Water-Services/Developers/Stormwater-Review/Variance-Appeal-Information/Meeting-Dates-Deadlines.aspx

5. Codes and Ordinances Review and Update

A. Is a completed copy of the EPA Water Quality Scorecard submitted with this report? *A copy of the scorecard was submitted in the FY12 annual report*. ☐ Yes X No

B. Include status of implementation of code, ordinance and/or policy revisions associated with permanent Stormwater management.

MWS Stormwater has already developed a new volume of the Stormwater Management Manual (SWMM) (Volume 5) dedicated to promoting/incentivizing the use of Low Impact Development (LID) techniques for post development stormwater management. A few years ago, Metro promoted/incentivized use of runoff reduction practices, but still allowed development sites to utilize standard stormwater quality treatment practices of 80% total suspended solids (TSS) removal. In February of 2016, however, Metro revised the SWMM to require all development activities to pursue runoff reduction practices for stormwater quality treatment, unless certain site constraints were demonstrated to be present (i.e. high ground water table, clay soils, karst areas, brown fields, etc.). MWS Stomwater has developed a waiver process for sites that are requesting to revert to the standard water quality treatment practices.

6. Construction

A. Do you have an ordinance or adopted policies stipulating:

Erosion and sediment control requirements?	X Yes	☐ No
Other construction waste control requirements?	X Yes	☐ No
Requirement to submit construction plans for review?	X Yes	☐ No
MS4 enforcement authority?	X Yes	☐ No
Have you developed written procedures for site plan review and approval?	X Yes	☐ No
Do the written procedures for site plan review and approval include an evaluation of plan completeness and overall BMP effectiveness?	X Yes	☐ No

Have you developed written procedures for managing public input on projects?	☐ Yes X No
Metro Nashville manages public input in a variety of different ways throughout various departments. There are no written procedures for managing the public. Please refer to the above section on public engagement on stormwater development projects.	(See Notes)
Have you developed written procedures for site inspection and enforcement?	X Yes ☐ No
Have all MS4 Inspectors maintained certification under the Tennessee Fundamentals of Erosion Prevention and Sediment Control, Level 1?	X Yes ☐ No
Have all MS4 site plan reviewers maintained certification under the Tennessee Fundamentals of Erosion Prevention and Sediment Control, Level 2?	X Yes ☐ No

B. How many active construction sites disturbing at least one acre were there in your jurisdiction this reporting period?

Refer to attached Table 6B.1. In FY17, there were 262 grading permits issued, while 203 grading permit sites were completed (signed-off). Not all of the Grading Permits were for sites over an acre (requiring a TDEC General Construction Stormwater Permit). All sites that grade over an acre are required to also obtain a grading permit and must have coverage under the State's General Construction Stormwater Permit prior to receiving a Metro Grading Permit. As of July of 2017, there were 671 active grading permits as Metro requires permits for grading over 10,000 square feet.

C. How many of these active sites did you inspect this reporting period?

NPDES Section performed 6,787 construction related inspections in FY17. The inspections were performed on Grading Permit sites under construction and complaint inspections of construction activity without permits. In addition, MWS Stormwater also provides oversight and guidance to small residential construction activities usually with total disturbed area of less than 10,000 square feet (not requiring a standard grading permit). Refer to the attached Table 6C.1 for small construction project oversight numbers.

D. On average, how many times each, or with what frequency, were these sites inspected (e.g., weekly, monthly, etc.)? Monthly

NPDES inspects all active construction sites at least once per month.

E. Do you prioritize certain construction sites for more frequent inspections? X Yes ☐ No

If Yes, based on what criteria?

*All **active** permit sites are prioritized to receive inspections at least once per month. This meets and exceeds the permit requirement to perform monthly inspections of 303(d) listed siltation-impaired streams.*

7. Illicit Discharge Elimination

A. Have you completed a map of all known outfalls and receiving waters of your storm sewer system?	X Yes ☐ No
B. Have you completed a map of all known storm drain pipes of storm sewer system?	X Yes ☐ No

C. How many outfalls have you identified in your system?

Metro has undergone several iterations of mapping updates of Stormwater infrastructure into the Geographic Information System (GIS). During previous reporting periods, MWS Stormwater's contractor completed a project to re-delineate the outfall layer (grid by grid) with the focus of verifying "actual" MS4 permitted outfalls. While the focus was mapping MS4-permitted outfalls, NPDES also had the contractor create the following two outfall layers: 1)Sub-MS4 Outfalls – Outfalls within the MS4 system upstream of the discharge point to Waters of the State, but usually where two large systems combine; and 2) Private Outfalls – Point at which Stormwater from private properties drain to either Waters of the State or MS4. Currently there are 11,859 MS4-permitted Outfalls, 323 Sub-MS4 Outfalls, and 2,380 Private Outfalls mapped within Metro's GIS database. Please note that in determining the point at which MS4 outfalls drain to Waters of the State, NPDES had to assume the streams layer in GIS was an accurate representation of actual streams, even though the coverage is more of an estimate and has not been field-verified.

D. How many of these outfalls have been screened for dry weather discharges?

In FY17, there were 337 separate Stormwater infrastructure points screened for potential illicit discharges. All in all, there were a total of 366 ¼ mile grids completed, where an infrastructure point was screened or no MS4 infrastructure existed prior to the permit term ending on January 31, 2017. A total of 2,047 ¼ mile grids were screened for illicit discharges, water leaks, and/or sanitary sewer leaks during the 3rd MS4 permit term. Metro's MS4 permit only requires one outfall located within a ¼ mile industrial/commercial-zoned grid to be screened for potential illicit discharges.

As a result of expending substantial resource to accomplish this permit requirement and finding relatively few sources of pollution, NPDES recommended changing the MS4 Permit prescribed field screening process for the future permit. NPDES submitted a recommended change to focus field screening activities on commercial/industrial business housekeeping procedures to identify potential stormwater runoff issues instead of focusing solely on outfalls in search of illicit discharges, etc. While TDEC has not provided a written response, NPDES has received verbal feedback from TDEC that they did not have any issues with our proposed changes (Refer to Attachment B for Proposed Changes to MS4 Compliance Programs). After the MS4 Permit expiration date, NPDES began testing the new Field Screening Program and screened 88 separate grids during the remaining months of FY17, which involved the screening of 219 businesses for housekeeping practices on areas such as dumpster pads as well as parking lot maintenance.

E. How many of these have been screened more than once?

None are required to be screened twice per our new permit, however, if a non-stormwater/"illicit" flow is suspected, NPDES initiates an IDDE investigation that is documented within the Cityworks database until the illicit discharge is eliminated.

F. What is your frequency for screening outfalls for illicit discharges?

All 2,047 ¼ mile commercial and industrial-zoned grids were screened by the end of Year 5 of the MS4 permit (January 31, 2017).

G. Do you have an ordinance that effectively prohibits illicit discharges? X Yes ☐ No

H. During this reporting period, how many illicit discharges/illegal connections have you discovered (or been reported to you)?

During FY17 field screening activities, there were no confirmed illicit discharges and/or water and sewer leaks found. All illicit discharges found during FY17 originated from reports from citizens of other Metro departments. In FY17, there were 11 confirmed illicit discharges in which NPDES issued a Notice of Violation to the property owner to eliminate the discharge. In addition to the confirmed illicit discharges, NPDES initiated 107 separate water quality investigations during FY17, most of which, originated from citizen complaints. Refer to Table 7H.1 for a complete listing of the 107 IDDE investigations initiated during FY17. There were also 39 spill response investigations and 16 MWS sanitary sewer discharge investigations initiated by NPDES during the reporting period. Refer to Tables 7H.2 and 7H.3 respectively. The Metro Health Department also responds to failing septic systems and issues notices and/or citations requiring failing septic systems to be abated. During the reporting period, the Health Department issued 24 notifications to property owners for failing septic systems. (Refer to Table 7H.4)

I. Of those illicit discharges/illegal connections that have been discovered or reported, how many have been eliminated?

All illicit connections found during the reporting period were rectified swiftly and eliminated.

J. Do you have the authority to recover cost for addressing illicit discharges? ☐ Yes X No

We have language in our Code, but have never pursued the option. *(Not Currently)*

8. Stormwater Management for Municipal Operations

A. Have Stormwater pollution prevention plans (or an equivalent plan) been developed for Municipal operations:

NPDES developed a comprehensive Stormwater Management Plan (SWMP) in 2012, which was submitted in a previous annual report. The SWMP included site-specific Runoff Management Plans (RMPs) for key municipal Operations and Maintenance (O&M) facilities, which are plans equivalent to SWPPPs. Since the time the original SWMP and associated RMPs were developed, NPDES has developed additional RMPs for newly identified O&M facilities. Below is a list of current Metro operated O&M sites in which a SWPPP or RMP has been developed:

1. *Central Wastewater Treatment Plant*
2. *Dry Creek Wastewater Treatment Plant*
3. *Metro Fairgrounds Property*
4. *MWS Stormwater Maintenance Facility (County Hospital Road)*
5. *Metro Transit Authority (Nestor Street) Bus Maintenance Shop*
6. *Metro Nashville Public Schools Bus Maintenance Shop*
7. *Shelby Park Golf Course Maintenance Shop*
8. *Ted Rhodes Golf Course Maintenance Shop*
9. *Two Rivers Golf Course Maintenance Shop*
10. *Harpeth Hills Golf Course Maintenance Shop*
11. *Percy Warner Golf Course Maintenance Shop*
12. *McCabe Golf Course Maintenance Shop*
13. *Cedar Hill Park Maintenance Shop*
14. *Warner Park Golf Course*
15. *Public Works Maintenance Facility (5th Street)*
16. *Public Works West Maintenance Facility (Charlotte Avenue)*

All municipal parks, ball fields and other recreational facilities X Yes ☐ No

RMPs were developed for O&M facilities such as golf course and park maintenance facilities. RMPs were not developed for every ball field location.

All municipal turf grass/landscape management activities (*See Note Above*) X Yes ☐ No

All municipal vehicle fueling, operation and maintenance activities X Yes ☐ No

As per the MS4 Permit, RMPs were created for Municipal O&M facilities, some of which include fueling stations. Some fueling sites are stand-alone with no other maintenance operations present and RMPs were not necessary (although spill kits are at those locations).

All municipal maintenance yards All O&M facilities located within the MS4. X Yes ☐ No

All municipal waste handling and disposal areas X Yes ☐ No

SWPPPs were created for the Central Wastewater Treatment Plant and the Dry Creek Wastewater Treatment Plant as they retain a Tennessee Multi-Sector Permit for Industrial Stormwater runoff. Metro Nashville does not operate any waste transfer facilities or transfer stations, as it contracts those services out to private companies.

B. Are Stormwater inspections conducted at these facilities? X Yes ☐ No

Each O&M facility where the RMPs were implemented requires on-site personnel to perform weekly grounds inspections. NPDES personnel will also perform random audit inspections in the future to ensure each individual site is being maintained as designated in the RMP.

If Yes, at what frequency are inspections conducted? *See above answer*

C. Have standard operating procedures or BMPs been developed for all MS4 field activities? (e.g., road repairs, catch basin cleaning, landscape management, etc.) X Yes ☐ No

SOPs have been developed for most of the major O&M field activities. MWS posted all of the RMPs, individual water quality SOPs, and a general MS4 educational video to an internal Metro intranet web page for each O&M Department to train their own field staff.

D. Do you have a prioritization system for storm sewer system and permanent BMP inspections? X Yes ☐ No

In the first year of the permit, NPDES submitted a BMP Maintenance Verification Plan to TDEC that outlined a multipronged strategy to ensure permanent Stormwater Control Measures (SCMs) are being properly maintained. The strategy varies according to which set of Metro's regulations the SCMs were constructed under. The plan includes some inspections by NPDES personnel as well as requiring owner/operators to perform their own inspections/maintenance annually. Since the original SCM maintenance verification plan was submitted to TDEC, NPDES has been reevaluating this process and has determined that a greater amount of attention should be devoted to ensuring the proper maintenance of these structures. NPDES found that there was very low participation in the owner self-inspection/reporting requirements for newly installed SCMs. In addition, NPDES discovered that some of the inspection and maintenance reports that were submitted had authenticity concerns.

During FY17, NPDES received authorization to hire additional employees that could be dedicated to SCM inspection and maintenance oversight, which will allow improvements to be made to the program. Toward the end of the Fiscal Year, NPDES advertised to hire 2 SCM inspectors and 1 clerical staffer to oversee SCM owner report submittals. The new employees were hired by the time this report was written and the new enhanced approach to SCM maintenance oversight has already begun. NPDES will include more information on the expanded SCM oversight program in next year's Annual Report.

E. On average, how frequently are catch basins and other inline treatment systems inspected?

Varies

F. On average, how frequently are catch basins and other inline treatment systems cleaned out/maintained?

Frequency of cleanings depends on conditions. The Stormwater Maintenance Section has developed a rain route list of common stormwater infrastructure sites that clog with debris, leaves, gravel, and sediment on a frequent basis. Maintenance crews visit and clean out these sites and perform maintenance prior to many large rain events. Depicted within Table 8F.1 is a summary of some of the major routine maintenance activities performed on MS4 Stormwater infrastructure during FY17. It is estimated that approximately 184,508 cubic yards of material was removed from the MS4 ditches and culverts, approximately 142,551 pounds of material was removed from 15,839 inlets, and approximately 191,486 square feet of erosion control matting was deployed during the FY17 reporting period. In addition to performing routine maintenance and cleaning of stormwater infrastructure, the Stormwater Maintenance Section also operates a preventative maintenance program by aggressively sweeping public "curb and gutter" streets. MWS Stormwater prioritizes certain streets for sweeping activities based on the accumulation of material on the street. Refer to Table 8F.2 for street sweeping collection numbers in FY17.

In addition to the routine maintenance activities such as inlet and pipe cleaning, MWS Stormwater also performs various large projects to correct neighborhood flooding issues. In previous reporting periods, NPDES coordinated with the MWS Stormwater Remedial Maintenance Division to complete a water quality evaluation form for each large flood control project. As a result, engineers are being asked to consider use of green infrastructure or other low impact design techniques. Based on the water quality evaluation sheets submitted, NPDES was able to estimate that the large flood control projects designed during FY17 would provide the following benefits to water quality.

- *Removal of approximately 1,282 cubic yards of accumulated sediment,*
- *Stabilization of approximately 386 linear feet of stream bank, and*
- *Planting of approximately 47 trees and shrubs.*
- *Removal of approximately 5,000 linear feet of concrete lined ditches*

Illicit discharge detection and elimination X Yes ☐ No

If *Yes*, identify the number of municipal employees trained

Throughout FY17, there were a total of 16 NPDES staff members that had the adequate training to respond to and enforce on illicit discharge investigations. NPDES utilized an illicit discharge rotation schedule with 4 people within the Permit Group. In addition to the primary on-call personnel, there were an additional 12 staff members within the office that could respond to complaints of illicit discharges. Note: NPDES has also worked with various O&M sections to properly identify and report illicit discharges. Note that staff levels fluctuate each year, but toward the end of FY17, NPDES advertised an additional 2 job openings that will increase the number of personnel able to respond to IDDE complaints.

Construction site stormwater runoff control X Yes ☐ No

If *Yes*, identify the number of municipal employees trained:

At the time this report was completed, there were 13 NPDES staff members that had adequate training (TDEC Level 1 EPSC Workshop) to respond to and inspect Stormwater runoff from construction activities. Seven of the employees are dedicated fulltime to inspecting development sites under construction. Note that staff levels fluctuate each year, but NPDES plans on increasing staff levels that can routinely inspect runoff controls from construction activities.

Permanent stormwater management in new development and redevelopment X Yes ☐ No

If *Yes*, identify the number of municipal employees trained

During FY17, there was an average of 6 engineers employed within the Stormwater Development and Review Section that have been through the TDEC Level II Design Principles for Erosion Prevention and Sediment Control for Construction Sites. Four of the engineers were fully dedicated to reviewing plans for grading permit sites.

Pollution prevention/good housekeeping for municipal operations X Yes ☐ No

If *Yes*, identify the number of municipal employees trained:

In the previous reporting period (FY16), NPDES coordinated with all Metro Departments to remind them of stormwater issues that may occur from normal maintenance activities. As mentioned above, NPDES coordinated a training workshop with all major Metro Departments in which 43 separate managers attended.

9. Permanent Stormwater Controls

A. Do you have an ordinance or other mechanism to require:

Site plan reviews of all new and re-development projects?	X Yes	☐ No
Maintenance of Stormwater management controls?	X Yes	☐ No
Retrofitting of existing BMPs with green infrastructure BMPs?		
MWS Stormwater has compiled a new volume to the Stormwater Management Manual (SWMM). Volume 5 (also referred to as the LID Manual) provides specifications for development or redevelopment sites to follow in installing "green" stormwater control measures. The requirements with this manual became mandatory in February 2016.	X Yes	☐ No

B What is the threshold for new/redevelopment Stormwater plan review? (e.g., all projects, projects disturbing greater than one acre, etc.)

Metro actually has more stringent requirements for development than TDEC's Construction General Permit. All sites grading more than 10,000 square feet must obtain a grading permit. In order to obtain a grading permit, engineered plans must be submitted to the Stormwater Development Review Section for review and approval per Metro's stormwater regulations. All developments increasing the impervious footprint are required to install permanent stormwater treatment measures for water quality and quantity per SWMM criteria.

C. Have you implemented and enforced performance standards for permanent Stormwater controls? X Yes ☐ No

D. Do these performance standards go beyond the requirements found in paragraph and require that pre-development hydrology be met for:

Flow volumes (New LID Manual deals with reductions in site runoff volumes)	X Yes	☐ No
Peak discharge rates	X Yes	☐ No
Discharge frequency	☐ Yes	X No
Flow duration	☐ Yes	X No

E. Please provide the URL/reference where all permanent Stormwater management standards can be found.

https://www.nashville.gov/Water-Services/Developers/Stormwater-Review/Stormwater-Management-Manual.aspx

F. How many development and redevelopment project plans were reviewed for this reporting period?

There were 3,636 plans submitted to the MWS Development Review Section during FY17. This number includes initial grading permit plans, re-submitted plans, as-built final submittals, etc. Refer to attached Table 9F.1 for the total number of plans reviewed by Stormwater Development Review staff in FY17.

G. How many development and redevelopment project plans were approved?

There were 1,419 plans approved during FY17. This number includes initial grading permit submittals, final as-built signoffs, etc. Refer to Table 9F.1 for a complete listing. A better reflection of actual new development projects approved for construction would be the number of grading permits issued. In FY17, there were 262 grading permits issued.

H. How many permanent Stormwater management practices/facilities were inspected?

There were approximately 291 inspections by NPDES staff and contractor staff during FY17. This is an estimate based on the number of properties inspected. Most properties have multiple SCMs, therefore when a property gets inspected, several SCM structures often get inspected.

I. How many were found to have inadequate maintenance?

The 291 NPDES inspections conducted in FY17 of SCMs accounted for approximately 118 separate properties as some properties contain numerous SCM structures. Of the 118 properties, there were a total of 21 properties that were flagged as containing one or more structures that require critical maintenance actions. In addition, there were 32 sites that contained one or more structures that exhibited signs of structural damage and/or needed immediate maintenance.

J. Of those, how many were notified and remedied within 30 days? (If window is different than 30 days, please specify)

While NPDES has numerous informal conversations with SCM owners about the maintenance status of their SCM(s), official Notices of Noncompliance (NONs) were submitted to SCM property owners when critical maintenance needs were observed. Performing the necessary maintenance on SCM takes time and not all of the SCMs in need of maintenance were remedied within 30 days. NPDES performs follow-up compliance inspections when a no response is received as a result of the NON.

K. How many enforcement actions were taken that address inadequate maintenance?

In FY17, 21 NONs were issued to property owners for SCM maintenance issues.

L. Do you use an electronic tool (e.g., GIS, database, spreadsheet) to track post-construction BMPs, inspections and maintenance?

The NPDES Section currently uses a Microsoft Access database to track inspections. The database can be linked into GIS. Metro is currently mapping all post-construction stormwater treatment structures as a feature within the GIS database. Once completed, NPDES will work with the Metro Planning Department to make the mapped structures available to the public on the Metro Public GIS Map Viewer program.

X Yes ☐ No

M. Do all municipal departments and/or staff (as relevant) have access to this tracking system?

☐ Yes X No

N. Has the MS4 developed a program to allow for incentive standards for redeveloped sites?

X Yes ☐ No

O. How many maintenance agreements has the MS4 approved during the reporting period?

Approximately 262, which is an assumed number based on the number of grading permits issued during FY17.

10. Industrial and High Risk Runoff

A. Has the MS4 developed and implemented a program to monitor and control pollutants in runoff from the following types of industrial and high risk facilities and activities:

Municipal landfills All municipally operated landfills in Metro were closed years ago. The Metro Department of Public Works, Division of Solid Waste oversees all closed landfills' associated groundwater monitoring.	X Yes	☐ No
Hazardous waste treatment, storage and disposal facilities	X Yes	☐ No
Industries subject to reporting requirements pursuant to SARA Title III section 313	X Yes	☐ No
Industrial facilities that the MS4 determines are contributing a substantial loading of pollutants to the municipal separate storm sewer system	X Yes	☐ No

B. Has the MS4 maintained a database of industrial and high risk facilities and activities in the City which includes the following types of industries:

- municipal landfills;
- hazardous waste treatment, storage and disposal facilities;
- industries subject to reporting requirements pursuant to SARA Title III, Section 313; and
- industrial and commercial facilities that the permittee determines are contributing a substantial loading of pollutants to the municipal separate storm sewer system.

During the first permit year, NPDES built a robust industrial inspection database that comprises the above categories of industrial properties. In addition to the above category of industrial sites (Metro is required to inspect), NPDES has also included within the database all of the industrial facilities with active Tennessee Multi-Sector Permits (TMSPs) for industrial Stormwater runoff, all facilities with active Ready Mix Concrete Permits (RMCPs), and all facilities with active individual NPDES permits to discharge process water. The database is a Microsoft Access database that is interactive with GIS. Please note that most TMSP or RMCP sites do not qualify as industrial facilities subject to SARA Title III, Section 313 reporting requirements and are not required to be inspected by Metro.

Those listed in 10 (A) above	X Yes	☐ No
Facilities covered by individual NPDES permits	X Yes	☐ No
Facilities covered under the TMSP	X Yes	☐ No
Facilities regulated by the pretreatment program; *NPDES has a Microsoft Excel spreadsheet list of Pre-treatment Program sites for reference purposes, but the sites are not entered into the Industrial Monitoring Microsoft Access database.*	X Yes	☐ No

C. Has the MS4 updated the database of industrial and high risk facilities and activities at least yearly? X Yes ☐ No

If yes, provide a listing of any additionally identified industrial and high-risk facilities and activities which discharge stormwater into the MS4:

Facility/Activity

Refer to the attached Table 10.C.1 for a listing of all the industrial facilities NPDES has inventoried into the database. As mentioned above, Metro also inventoried other industrial facilities such as TMSP and RMCP facilities, which are not required to be inspected within the three year period.

D. Has the MS4 developed and implemented procedures, including an inspector manual and checklist, for routine inspections of industrial and high-risk facilities and activities? X Yes ☐ No

NPDES has created a Standard Operating Procedure (SOP) for performing inspections of industrial facilities.

E. Is the MS4 performing these inspections at such a rate that all required industries will be inspected at least once every three years? X Yes ☐ No

As per the MS4 permit, NPDES is required to inspect all SARA Title III, Section 313 industrial facilities once every 3 years. NPDES completed all of the inspections of facilities designated as having the SARA Title III, Section 313 and Treatment, Storage and Disposal (TSD) facilities by the end of the permit term (January 31, 2017). Following completion of these inspections, NPDES sent a letter to TDEC that addressed the planned inspections of industrial facilities during the transition period before the new permit is reissued. A copy of this letter can be found in Attachment B of this document. The new inspection focus during the transition period between permits will be based on the types of industrial facilities that typically have the most exposed materials that can pose a risk to stormwater runoff.

F. Provide a listing of inspections performed during this reporting year:

During FY17 NPDES inspected 19 industrial facilities. Refer to Table 10.F.1 for a list of Industrial Facilities that were inspected during FY17.

11. Enforcement

A. Identify which of the following types of enforcement actions you used during the reporting period, indicate the number of actions, the minimum measure (e.g., construction, illicit discharge, permanent stormwater control) or note those for which you do not have authority: Please note that Stop Work Orders are included as part of the same Notice of Violation for construction sites.

Action	Construction	Permanent Stormwater Controls	Illicit Discharge	Authority?
Notice of violation	109	0	11	X Yes ☐ No
Administrative Penalties	$44,582.50	$0	$2,000	X Yes ☐ No
Stop Work Orders	39	#	#	X Yes ☐ No
Civil penalties	#	#	#	☐ Yes X No
Criminal actions	#	#	#	☐ Yes X No
Administrative orders	#	#	#	X Yes ☐ No
Other:		39 Notices of Non Compliance	10 Notices of Non Compliance	X Yes ☐ No

B. Do you use an electronic tool (e.g., GIS, data base, spreadsheet) to track the locations, inspection results, and enforcement actions in your jurisdiction? X Yes ☐ No

C. What are the 3 most common types of violations documented during this reporting period?

Failure to maintain erosion prevention and sediment control measures, illicit discharges from construction and non-construction sites, and grading without applying for or receiving a Metro Grading Permit.

12. Program Resources

A. What was your annual expenditure to implement the requirements of your MS4 NPDES permit and SWMP this past fiscal year?

In FY17, NPDES, which oversees various MS4 compliance activities, operated under a budget of $1.72 million. The overall MWS Stormwater Division's budget, which includes NPDES, Development Services Review engineers, Stormwater Planning and Stormwater Maintenance, was $14.4 million. Please note that various other Metro Departments, while not included in this budget analysis, perform activities that contribute to MS4 permit compliance.

B. What is next fiscal year budget for implementing the requirements of your MS4 NPDES permit and SWMP?

The FY18 budget includes $2.0 million dedicated to the Stormwater NPDES Section, while the overall Stormwater Department is operating under a budget of $34.62 million. Note: The increased budget relates to a stormwater user fee increase that became effective as of 7/1/17. Information on the Metro Stormwater User fee can be found at http://www.nashville.gov/Water-Services/Stormwater/Stormwater-Fee.aspx.

C. Do you have an independent financing mechanism for your Stormwater program? X Yes ☐ No

D. If so, what is it/are they (e.g., Stormwater fees), and what is the annual revenue derived from this mechanism?

Source: Stormwater User Fee; Estimated Amount $34.62 million

E. How many full-time employees does your municipality devote to the Stormwater program (specifically for implementing the Stormwater program vs. municipal employees with other primary responsibilities that dovetail with Stormwater issues)?

At the conclusion of the reporting period, there were 82 employees within the overall MWS Stormwater Division and 11 vacancies that have been budgeted for a total of 93 employees.

F. Do you share program implementation responsibilities with any other entities? ☐ Yes X No

Entity	Activity/Task/Responsibility	Your Oversight/Accountability Mechanism

13. Evaluating/Measuring Progress

A. What indicators do you use to evaluate the overall effectiveness of your Stormwater Management Program, how long have you been tracking them, and at what frequency? Note that these are not measurable goals for individual BMPs or tasks, but large-scale or long-term metrics for the overall program, such as in-stream macroinvertebrate community indices, measures of effective impervious cover in the watershed, indicators of in-stream hydrologic stability, etc?

Within the last few years, the NPDES Watershed Group has been performing detailed sampling for TMDL streams throughout Metro, some of which is proactive and not required per the MS4 permit. While long-term trends cannot be extrapolated at this time, the data collection has proven beneficial in identifying segments of streams where pollutants are elevated or within water quality standard criteria. Please refer to the attached Table 13A.1 (TMDL Sampling Data) for the complete quarterly sampling results for the FY17 reporting period. Please note that previous Annual Reports contain additional data for monitoring conducted during those reporting periods. NPDES performs various monitoring activities as prescribed by the MS4 Permit. The MS4 permit-required sampling (i.e. Wet Weather Monitoring, Ambient Sampling, and Benthic Sampling) was changed in the current iteration of the permit. The NPDES Watershed Section routinely analyzes the sampling data to determine if negative trends are observed within any of the sampled tributaries. When negative trends are found, NPDES performs source tracking investigations. Whenever identifiable sources are not found, NPDES initiates targeted public education campaigns in those watersheds. The MS4-Permit prescribed Ambient Sampling, Wet Weather Sampling, and Benthic Sampling data is summarized in Table 13A.3, Table 13A.4, and Table 13A.5 respectively. In addition, the Benthic Sampling data for other streams within Metro's jurisdiction that have approved TMDLs is summarized in Table 13A.6. NPDES's Watershed Group collected approximately 462 water quality samples and performed visual stream assessments on approximately 121,500 linear feet of 303(d)-listed streams within FY17.

*Over the years, NPDES has also looked at other non-analytical data to evaluate the program's effectiveness. Refer to Table 13A.2 (SWMP Quantifiable Statistics). Many of the functions such as IDDE efforts, public education, etc. NPDES performs do not easily translate into quantifiable loading reduction numbers. As an attempt to quantify pollutant loading reduction numbers from various sources, NPDES solicited proposals in FY17 to hire a contractor to develop a database that will track loading reductions of structural and non-structural controls implemented as part of Metro's SWMP. At the end of FY17, NPDES was able to execute a contract with Paradigm Environmental to develop the **D**avidson County Water **R**esources **I**mprovement Quantification **P**latform (DRIP), which will be web-based database that will track pollutant reduction efforts of current SWMP elements as well as potential benefits through program modifications. Also as part of the contract with Paradigm Environmental, a more meaningful pollutant loading calculation/estimation, as required by the MS4 permit, will be generated. At the time this report was compiled, the MS4 permit-required loading calculations were being finalized. As a first step, Paradigm reviewed all the NPDES wet weather sampling calculations to determine the most appropriate Event Mean Concentrations (EMCs) per land use to be used in both the pollutant loading calculation and the DRIP database. A copy of the Paradigm Environmental EMC Memo is included in Attachment C. The complete MS4 Loading Estimates will be submitted at a later date as a supplemental document to this annual report.*

In addition to pursuing development of a database that can actively track and analyze pollution reduction efforts of the SWMP, NPDES also conducted an internal review of many of the MS4 permit-prescribed programs to assess the effectiveness and efficiency. As a result of the review, NPDES detailed proposed revisions to some of the MS4 permit elements in the proposed application for reissuance of the MS4 permit and subsequent letter to TDEC, which is included in Attachment B.

B. Provide a summary of data (e.g., water quality information, performance data, modeling) collected in order to evaluate the performance of permanent Stormwater controls installed throughout the system. This evaluation may include a comparison of current and past permanent Stormwater control practices.

Please refer to the answer above and Section 3 of this document for a summary of various water quality data collected by NPDES during this reporting period. As mentioned above, a more comprehensive evaluation will be finalized as part of the development of the DRIP database. However, a preliminary assessment of one specific parameter over the last ten years (summarized in Table 13A.2), it becomes obvious to conclude that the overall number of water quality (IDDE) investigations and Stormwater-specific enforcements have been dramatically reduced and therefore so has the amount of pollutants into the MS4 and receiving streams. We believe this can be contributed to the robust IDDE program, public education and outreach and proactive monitoring/screening efforts.

C. What environmental quality trends have you documented over the duration of your Stormwater program? (If you have reports or summaries, you can either attach them electronically, or provide the URL to where they may be found on the Web.) *As mentioned above, NPDES has noticed fewer and fewer illicit discharge findings over the years that can be contributed to a robust IDDE program and increased public awareness. In addition, there have been fewer notices of violations issued for construction site infractions. Middle Tennessee contractors have become acutely aware of Metro's construction site requirements and enforcement program and, therefore, have increasingly complied with our regulations. It has also been noted that many of the concerns from citizens usually involve relatively minor issues as compared to concerns reported in the beginning of the NPDES program.*

14. Stormwater Management Program Update

A. Describe any changes to the MS4 program, per Section 3.5 of the permit, during the reporting period including but not limited to:

Changes adding (but not subtracting or replacing) components, controls or other requirements.

During FY17, NPDES submitted a request to change the dry weather field screening, industrial monitoring, and wet weather sampling elements of the MS4 permit for the transition period between permit expiration and reissuance. NPDES also requested these items to be adjusted in the reissued permit as well. NPDES analyzed work hours per each task verses the benefit to the program in hopes of developing the most efficient and effective program possible. A summary of the proposed changes can be found in Attachment B.

Changes to replace an ineffective or unfeasible BMP.

Refer to above answer

Information (e.g., additional acreage, outfalls, BMPs) on program area expansion based on annexation or newly urbanized areas.

Just prior to the issuance of this cycle of the MS4 permit, the former satellite city of Lakewood voted to dissolve and become part of Metro Nashville and Davidson County. Upon that transition becoming official, NPDES field screened the commercial areas for potential illicit discharge connections, inventoried/added all of the Stormwater infrastructure into the GIS database, and began performing maintenance services for the newly annexed area.

Changes to the program as required by the division.

No major changes occurred during FY17.

15. Certification

This report must be signed by a ranking elected official or by a duly authorized representative of that person. See signatory requirements in subpart 5.7 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."

Printed Name and Title	Signature	Date

3.0 Required MS4 Reporting Tables

List of Tables

Table 6B.1 – Grading Permit Projects Initiated/Completed within FY17

Year	Preconstruction Meetings	Grading Permits Issued	Permits Completed
Total FY03	257	198	102
Total FY04	305	270	159
Total FY05	284	271	220
Total FY06	296	252	196
Total FY07	251	239	188
Total FY08	222	165	205
Total FY09	148	109	238
Total FY10	146	121	117
Total FY11	130	135	131
Total FY12	152	142	153
Total FY13	167	138	133
Total FY14	249	318	159
Total FY15	292	276	259
Total FY16	268	254	217
Total FY17	297	262	203
Total	**3,464**	**3,150**	**2,680**

Table 6C.1 – Small Construction Site Oversight in FY17

New Infill Permits Issued	2,060
Follow up site visits for Infill Developments	2,677
NOVs Issued to Single Family Residential Development	33

Note: Midway through FY15, Metro passed new legislation establishing the new Infill Development Permits. Projects that create 800 to 15,000 square feet of additional net impervious area though new development, redevelopment, or rehabilitation of a residential structure in existing neighborhoods are required to obtain Infill Development Permits. As such, MWS Stormwater staff provides oversight to require stormwater controls to be installed to treat stormwater runoff during and after construction.

Table 7H.1 – Illicit Discharge Investigations Initiated during FY17

ID Number	Date/Time Initiated	Description	Dispatched To	Problem Address
749046	7/1/2016 10:19	SWWQ- Water Quality	Hayes, Josh	6700 Holt Road
749210	7/1/2016 13:54	SWWQ- Water Quality	Hayes, Josh	711 51st Ave North
753169	7/12/2016 14:06	SWWQ- Water Quality	Langford, Gillian	3501 Charlotte Ave
753786	7/13/2016 15:03	SWWQ- Water Quality	Langford, Gillian	802 Vantage Way Ct
753934	7/14/2016 7:37	SWWQ- Water Quality	Langford, Gillian	3108 Belmont Blvd
755084	7/15/2016 11:12	SWWQ- Water Quality	Wilson, Jane	4041 Hillsboro Circle
755928	7/19/2016 7:12	SWWQ- Water Quality	Wilson, Elizabeth	1801 Jefferson Street
757493	7/21/2016 13:04	SWWQ- Water Quality	Wilson, Elizabeth	301 Dover Glen Drive
757982	7/22/2016 10:59	SWWQ- Water Quality	Wilson, Elizabeth	2319 Winford Ave
758165	7/22/2016 14:09	SWWQ- Water Quality	Wilson, Elizabeth	112 19th Ave. South
758262	7/22/2016 16:21	SWWQ- Water Quality	Wilson, Elizabeth	3014 Brandau Road
759660	7/27/2016 11:23	SWWQ- Water Quality	Hayes, Josh	4317 Harding Pike
759665	7/27/2016 11:28	SWWQ- Water Quality	Hayes, Josh	3939 Hillsboro Circle
761034	7/29/2016 13:43	SWWQ- Water Quality	Hayes, Josh	4107 Addine Street
762367	8/2/2016 14:39	SWWQ- Water Quality	Wilson, Elizabeth	2310 12th Ave S
762767	8/3/2016 12:13	SWWQ- Water Quality	Langford, Gillian	2706 12th Ave S
763788	8/4/2016 14:47	SWWQ- Water Quality	Langford, Gillian	3401 West End Ave
764119	8/5/2016 11:31	SWWQ- Water Quality	Langford, Gillian	4487 Post Place
764701	8/8/2016 11:38	SWWQ- Water Quality	Langford, Gillian	1018 Mulberry Way
767541	8/12/2016 13:59	SWWQ- Water Quality	Wilson, Jane	649 Old Hickory Blvd
768568	8/16/2016 14:11	SWWQ- Water Quality	Wilson, Elizabeth	5125 Harding Pl
768578	8/16/2016 14:19	SWWQ- Water Quality	Wilson, Elizabeth	300 Orlando Street
769492	8/18/2016 8:36	SWWQ- Water Quality	Wilson, Jane	500 Wedgewood Avenue
769739	8/18/2016 11:14	SWWQ- Water Quality	Wilson, Jane	1920 Overhill Drive
771248	8/23/2016 8:00	SWWQ- Water Quality	Langford, Gillian	689 Davidson Street
771482	8/23/2016 11:31	SWWQ- Water Quality	Hayes, Josh	721 Gallatin Road
772493	8/25/2016 9:41	SWWQ- Water Quality	Langford, Gillian	3511 Dickerson Pike
773523	8/26/2016 13:38	SWWQ- Water Quality	Hayes, Josh	400 Trinity
773603	8/26/2016 15:31	SWWQ- Water Quality	Langford, Gillian	4500 Murphy Road
777901	9/8/2016 7:46	SWWQ- Water Quality	Langford, Gillian	701 Ewing Avenue
779170	9/12/2016 8:56	SWWQ- Water Quality	Langford, Gillian	1514 McGavock Pike
779535	9/12/2016 13:19	SWWQ- Water Quality	Wilson, Elizabeth	101 Coventry Woods Drive
779893	9/13/2016 11:03	SWWQ- Water Quality	Wilson, Elizabeth	1906 Beech Avenue
780563	9/14/2016 13:30	SWWQ- Water Quality	Wilson, Elizabeth	4100 Hillsboro Circle
782815	9/20/2016 11:03	SWWQ- Water Quality	Wilson, Elizabeth	129 Scenic View Rd
782976	9/20/2016 14:08	SWWQ- Water Quality	Langford, Gillian	174 Sheila Drive
785471	9/26/2016 14:03	SWWQ- Water Quality	Wilson, Elizabeth	6840 Charlotte Pike

Table 7H.1 – Illicit Discharge Investigations Initiated during FY17 (Continued)

ID Number	Date/Time Initiated	Description	Dispatched To	Problem Address
791840	10/11/2016 13:18	SWWQ- Water Quality	Wilson, Elizabeth	2919 Berry Hill
796843	10/24/2016 14:26	SWWQ- Water Quality	Wilson, Jane	1544 Hamden Drive
797128	10/25/2016 9:58	SWWQ- Water Quality	Wilson, Jane	2919 Dickerson Road
797410	10/25/2016 14:12	SWWQ- Water Quality	Wilson, Jane	3920 Stewarts Lane
797610	10/26/2016 7:37	SWWQ- Water Quality	Wilson, Jane	4850 Nolensville Road
797959	10/26/2016 13:08	SWWQ- Water Quality	Wilson, Elizabeth	3308 Lebanon Pike
801247	11/3/2016 12:05	SWWQ- Water Quality	Langford, Gillian	143 Gallatin Pike N
801811	11/4/2016 11:48	SWWQ- Water Quality	Langford, Gillian	3909 Clarksville Pike
803201	11/8/2016 13:44	SWWQ- Water Quality	Wilson, Elizabeth	2739 Old Elm Hill Pike
808141	11/22/2016 13:26	SWWQ- Water Quality	Langford, Gillian	Harbor Village Dr
809697	11/29/2016 13:38	SWWQ- Water Quality	Langford, Gillian	3812 Waterford Way
812932	12/7/2016 11:21	SWWQ- Water Quality	Wilson, Elizabeth	2722 Murfreesboro Road
814235	12/12/2016 8:35	SWWQ- Water Quality	Hayes, Josh	5801 Centennial
814537	12/12/2016 14:01	SWWQ- Water Quality	Langford, Gillian	25th Ave N And Patterson
815384	12/14/2016 13:26	SWWQ- Water Quality	Hayes, Josh	3465 Dickerson
815389	12/14/2016 13:33	SWWQ- Water Quality	Hayes, Josh	3759 Homeland
815923	12/16/2016 7:30	SWWQ- Water Quality	Hayes, Josh	7601 Highway 70s
825439	1/18/2017 11:15	SWWQ- Water Quality	Wilson, Jane	1554 Springfield Hwy
826552	1/20/2017 14:31	SWWQ- Water Quality	Wilson, Elizabeth	4900 Centennial Blvd
827918	1/25/2017 10:02	SWWQ- Water Quality	Langford, Gillian	1649 Glenridge Drive
829409	1/27/2017 14:28	SWWQ- Water Quality	Langford, Gillian	3931 Westmont Ave
831433	2/2/2017 12:15	SWWQ- Water Quality	Langford, Gillian	Sutton Hill Road
832352	2/6/2017 10:15	SWWQ- Water Quality	Langford, Gillian	2418 Gallatin Pike
832572	2/6/2017 13:34	SWWQ- Water Quality	Wilson, Elizabeth	332 Lellyett Ave
833084	2/8/2017 7:03	SWWQ- Water Quality	Hayes, Josh	719 Thompson Lane
833766	2/9/2017 11:28	SWWQ- Water Quality	Hayes, Josh	3005 Clay Lick
834935	2/13/2017 12:05	SWWQ- Water Quality	Hayes, Josh	Molloy & Almond
838520	2/23/2017 11:31	SWWQ- Water Quality	Langford, Gillian	505 Snyder Ave
839712	2/27/2017 14:01	SWWQ- Water Quality	Wilson, Elizabeth	612 Tuscarora Court
842019	3/6/2017 8:16	SWWQ- Water Quality	Wilson, Elizabeth	1329 Love Joy Ct.
842496	3/7/2017 7:38	SWWQ- Water Quality	NPDES	Peabody & 4th
847974	3/21/2017 14:04	SWWQ- Water Quality	Langford, Gillian	Warfield Drive
848398	3/22/2017 13:32	SWWQ- Water Quality	Langford, Gillian	21st Ave S
848572	3/23/2017 8:14	SWWQ- Water Quality	Langford, Gillian	4500 Murphy Road
849489	3/24/2017 13:51	SWWQ- Water Quality	Langford, Gillian	14965 Old Hickory Blvd
851193	3/29/2017 14:59	SWWQ- Water Quality	Hayes, Josh	8561 Biggs Road
852145	3/31/2017 13:42	SWWQ- Water Quality	Wilson, Elizabeth	3730 Amy Lynn Drive
852381	4/3/2017 8:58	SWWQ- Water Quality	Wilson, Elizabeth	277 White Bridge Pike
852466	4/3/2017 9:56	SWWQ- Water Quality	Wilson, Jane	500 Wedgewood Ave

Table 7H.1 – Illicit Discharge Investigations Initiated during FY17 (Continued)

ID Number	Date/Time Initiated	Description	Dispatched To	Problem Address
855693	4/11/2017 12:16	SWWQ- Water Quality	Wilson, Jane	232A Harding Place
857306	4/14/2017 14:11	SWWQ- Water Quality	Wilson, Jane	330 Harrison Street
859245	4/20/2017 13:56	SWWQ- Water Quality	Hayes, Josh	5913 Charlotte Pike
859556	4/21/2017 10:18	SWWQ- Water Quality	Hayes, Josh	4712 Lickton Pike
866742	5/10/2017 11:26	SWWQ- Water Quality	Wilson, Jane	7252 Hwy 70s
867386	5/11/2017 12:55	SWWQ- Water Quality	Wilson, Jane	4405 Scenic Drive
867984	5/12/2017 15:38	SWWQ- Water Quality	Wilson, Jane	907 Neuhoff Lane
867990	5/12/2017 15:53	SWWQ- Water Quality	Wilson, Jane	5178 Mt.View Road
868415	5/15/2017 13:14	SWWQ- Water Quality	Langford, Gillian	6700 Cabot Drive
869984	5/18/2017 12:51	SWWQ- Water Quality	Wilson, Jane	5252 Hickory Hollow Pkwy
871700	5/23/2017 14:05	SWWQ- Water Quality	Petty, Jacquelyn	Cherokee Road @ Valley Road
874611	6/1/2017 8:24	SWWQ- Water Quality	Wilson, Elizabeth	1315 Meridian ST
875941	6/5/2017 10:29	SWWQ- Water Quality	Hayes, Josh	5855 Charlotte Pike
876650	6/6/2017 13:16	SWWQ- Water Quality	Wilson, Elizabeth	3201 Elkins Avenue
877417	6/8/2017 8:34	SWWQ- Water Quality	Wilson, Jane	412 Kingview Court
880028	6/14/2017 13:53	SWWQ- Water Quality	Langford, Gillian	698 Mercer Road
881024	6/16/2017 12:29	SWWQ- Water Quality	Hayes, Josh	5209 Pennsylvania
882776	6/21/2017 12:32	SWWQ- Water Quality	Wilson, Jane	First Avenue
883890	6/26/2017 6:27	SWWQ- Water Quality	Hayes, Josh	2719 Old Lebanon Road
885546	6/28/2017 14:24	SWWQ- Water Quality	Hayes, Josh	1335 Murfreesboro
885705	6/29/2017 7:25	SWWQ- Water Quality	Wilson, Elizabeth	2209 Abbot Martin
885773	6/29/2017 8:58	SWWQ- Water Quality	Hayes, Josh	Brandua Road
885798	6/29/2017 9:13	SWWQ- Water Quality	Wilson, Elizabeth	714 Vosswood Drive
886621	6/30/2017 13:51	SWWQ- Water Quality	Hayes, Josh	1003 Bate Ave
886646	6/30/2017 14:21	SWWQ- Water Quality	Wilson, Jane	200 French Landing Drive

Note: While many of the investigations resulted in the detection and elimination of illicit discharges, there were many that resulted in no issues being found. Every investigation, regardless of the findings, was tracked within the Cityworks database.

Table 7H.2 – Spill Response Investigations Initiated by NPDES during FY17

ID Number	Date/Time Initiated	Description	Dispatched To	Problem Address
749207	7/1/2016 13:44	SWSPILL- Spill Response	Hayes, Josh	Old Hickory Boulevard & Highway 70s
755115	7/15/2016 11:52	SWSPILL- Spill Response	Wilson, Elizabeth	7th Ave S and Demonbreun Street
756463	7/20/2016 7:13	SWSPILL- Spill Response	Wilson, Elizabeth	I-24 East Bound
757148	7/21/2016 8:15	SWSPILL- Spill Response	O'Hara, Katherine	102 46th Ave N
761276	8/1/2016 8:27	SWSPILL- Spill Response	Langford, Gillian	222 5th Ave S
761306	8/1/2016 8:52	SWSPILL- Spill Response	Langford, Gillian	2011 Richard Jones Rd
761320	8/1/2016 9:03	SWSPILL- Spill Response	Langford, Gillian	3654 Bell Road
762327	8/2/2016 14:18	SWSPILL- Spill Response	Langford, Gillian	100 1st Ave S
764421	8/8/2016 6:45	SWSPILL- Spill Response	Binder, Dale	5701 Edmondson
769426	8/18/2016 6:54	SWSPILL- Spill Response	Binder, Dale	Ellington Pkwy Mm 136
774235	8/30/2016 6:58	SWSPILL- Spill Response	Binder, Dale	1900 Warner Street
774237	8/30/2016 7:04	SWSPILL- Spill Response	Binder, Dale	905 Douglas Street
776240	9/1/2016 15:24	SWSPILL- Spill Response	Wilson, Jane	7112 Forrest Oaks Drive
777392	9/7/2016 7:26	SWSPILL- Spill Response	Langford, Gillian	5010 Old Hickory Boulevard
779233	9/12/2016 9:34	SWSPILL- Spill Response	Binder, Dale	I65 SB At Mm 97
782079	9/19/2016 8:22	SWSPILL- Spill Response	Binder, Dale	130 W Trinity Lane
786070	9/27/2016 14:05	SWSPILL- Spill Response	Wilson, Jane	3626 Trousdale Drive
789955	10/6/2016 6:59	SWSPILL- Spill Response	Wilson, Jane	665 Fontana Drive
794892	10/19/2016 13:51	SWSPILL- Spill Response	Langford, Gillian	150 West Trinity Lane
795969	10/21/2016 11:04	SWSPILL- Spill Response	Wilson, Jane	Harding Place @ Antioch Pike
818004	12/27/2016 9:24	SWSPILL- Spill Response	Wilson, Jane	Natchez Trace & Blair Blvd
819900	1/3/2017 7:56	SWSPILL- Spill Response	Hayes, Josh	2215 Dunn Ave
822247	1/9/2017 12:57	SWSPILL- Spill Response	Wilson, Elizabeth	7281 Centennial Blvd
832170	2/4/2017 9:20	SWSPILL- Spill Response	Binder, Dale	3801 Old Hickory Blvd
835875	2/15/2017 14:30	SWSPILL- Spill Response	Hayes, Josh	4211 Charlotte
837745	2/22/2017 8:33	SWSPILL- Spill Response	Hayes, Josh	Robertson
841103	3/2/2017 12:27	SWSPILL- Spill Response	Hayes, Josh	Dominican
842009	3/6/2017 8:04	SWSPILL- Spill Response	Wilson, Elizabeth	600 51st Ave
842466	3/7/2017 5:50	SWSPILL- Spill Response	Binder, Dale	I24 East At Harding Exit Ramp
846338	3/16/2017 13:32	SWSPILL- Spill Response	Wilson, Jane	4864 Barclay Square Drive
846891	3/17/2017 14:06	SWSPILL- Spill Response	Wilson, Jane	3336 Valley Creek Lane
848101	3/22/2017 6:29	SWSPILL- Spill Response	Binder, Dale	2306 Brick Church Pike
849713	3/27/2017 8:40	SWSPILL- Spill Response	Wilson, Jane	344 White Bridge Pike
864927	5/5/2017 8:21	SWSPILL- Spill Response	Binder, Dale	2112 Charlotte Ave
865198	5/5/2017 11:49	SWSPILL- Spill Response	Wilson, Elizabeth	130 West Trinity
873142	5/26/2017 13:32	SWSPILL- Spill Response	Wilson, Jane	1741 Elm Hill Pike
878357	6/12/2017 7:22	SWSPILL- Spill Response	Binder, Dale	4232 Westcap Road
878371	6/12/2017 7:52	SWSPILL- Spill Response	Binder, Dale	6261 Hillsboro Pike
886639	6/30/2017 14:09	SWSPILL- Spill Response	Wilson, Jane	5203 Indiana Avenue

Table 7H.3 – MWS Sewer Discharge Investigations Initiated by NPDES during FY17

ID	Date Initiated	Description	Dispatched To	Problem Address
752366	7/11/2016 12:10	MWS SORP	Langford, Gillian	4611 Nolensville Pike
768195	8/15/2016 14:41	MWS SORP	Langford, Gillian	409 Neill Ave
790926	10/7/2016 14:58	MWS SORP	Langford, Gillian	710 Ledford Drive
790943	10/7/2016 15:16	MWS SORP	Langford, Gillian	5003 Gallatin Pike
794920	10/19/2016 14:23	MWS SORP	Langford, Gillian	1415 Murfreesboro pike
798022	10/26/2016 14:24	MWS SORP	Langford, Gillian	3251 Viking road
802337	11/7/2016 9:59	MWS SORP	Petty, Jacquelyn	4031 Andrew Jackson Pkwy
815340	12/14/2016 12:20	MWS SORP	Langford, Gillian	517 Brewer Drive
827582	1/24/2017 13:57	MWS SORP	Langford, Gillian	5921 Woodland Hills Drive
829956	1/30/2017 14:15	MWS SORP	Wilson, Elizabeth	202 Hurst Drive
833803	2/9/2017 12:17	MWS SORP	Langford, Gillian	1717 Heil Quaker
834493	2/10/2017 14:52	MWS SORP	Langford, Gillian	7301 Ole Nottingham Drive
862169	4/28/2017 7:47	MWS SORP	Hayes, Josh	Ed temple & Shrader Lane
866446	5/9/2017 13:48	MWS SORP	Langford, Gillian	132 Bonnabrook Dr.
866473	5/9/2017 14:05	MWS SORP	Langford, Gillian	721 Thompson Lane
886630	6/30/2017 14:01	MWS SORP	Wilson, Elizabeth	3021 Lealand Ln.

Table 7H.4 - Failing Septic System Investigations Performed by the Health Department in FY17

Map & Parcel	Date Received	Street Name	Date Investigated	Notice Issued
038-00-0 076.01	7/6/2016	6297 Old Hickory Blvd	7/6/2016	
173-00-0 044.00	7/14/2016	5564 Pettus Road	7/14/2016	
033-00-0 255.00	7/26/2016	1271 Lowes Lane	7/27/2016	
062-02-0 004.00	7/28/2016	2569 Pennington Road	7/29/2016	
057-00-0 015.00	8/4/2016	5440 Old Hickory Blvd	8/4/2016	
066-00-0 033.00	8/8/2016	8283 River Road	8/9/2016	
015-00-0 030.00	8/9/2016	7505 Wilkinson Road	8/10/2016	8/11/2016
031-00-0 027.00	8/12/2016	4758 Lickton Pike	8/16/2016	
028-00-0 039.00	8/15/2016	5305 Ridge Road	8/15/2016	8/16/2016
171-04-0 006.00	8/18/2016	5623 Clovermeade Drive	8/22/2016	
101-00-0 65.01	8/25/2016	7064 River Road	8/30/2016	
034-09-0 015.00	8/29/2016	1505 Monticello Ave	8/30/2016	8/31/2016
014-00-0 073.00	8/30/2016	7129 Douglas Road	9/1/2016	
127-11-0 001.00	9/13/2016	8167 Highway 70 S	9/14/2016	9/21/2016
029-00-0 135.01	9/22/2016	4091 Grays Point Road	9/23/2016	9/26/2016
012-00-0 030.00	10/18/2016	7948 Old Springfield Pike	10/18/2016	10/21/2016
022-00-0 133.00	10/27/2016	3005 Clay Lick Road	10/27/2016	11/3/2016
162-00-0 121.00	10/31/2016	5371 Blue Hole Road	11/1/2016	6/14/2017
047-00-0 030.00	11/15/2016	4955 Sulphur Creek Road	11/16/2016	
032-00-0 147.00	11/17/2016	4531 Jackson Road	11/17/2016	11/18/2016
015-00-0 040.00	11/30/2016	2672 Morgan Road	11/30/2016	
161-03-0 016.00	12/8/2016	5004 Brewer Court	12/13/2016	
075-05-0 036.00	12/14/2016	4545 Hills Lane	12/15/2016	
021-00-0 239.00	1/3/2017	6321 Clarksville Highway	1/3/2017	2/8/2017
008-00-0 026.00	1/3/2017	7981 Whites Creek Pike	1/3/2017	
024-00-0 013.00	1/6/2017	4826 Brick Church Pike	1/6/2017	
064-02-0 040.00	1/19/2017	202 Montchanin Terrace	1/19/2017	1/23/2017
007-00-0040.00	1/19/2017	1558 Springfield Hwy	1/20/2017	1/23/2017
057-00-0 129.00	1/23/2017	4626 Cato Road	1/24/2017	2/21/2017
021-00-0 239.00	2/7/2017	6321 Clarksville Highway	2/8/2017	2/8/2027
014-00-0072.00	2/8/2017	7135 Douglas Road	2/13/2017	
015-14-1 004.00	2/17/2017	3115 Union Hill Road	2/17/2017	2/24/2017
150-00-0 084.00	2/20/2017	6183 Mt. View Road	2/21/2017	
007-00-0 054.00	2/21/2017	1625 Springfield Hwy	2/21/2017	
023-00-0 077.00	3/10/2017	5287 Lickton Pike	3/14/2017	3/15/2017
150-00-0 136.00	3/6/2017	3490 Hamilton Church Road	3/13/2017	3/22/2017
182-00-0 13.02	3/13/2017	13820 Old Hickory Blvd	3/13/2017	3/28/2017
028-00-0 036.00	3/15/2017	5961 Higdon Road	3/16/2017	
087-00-0 032.00	3/13/2017	4211 Central Pike	3/16/2017	
039-00-0 272.00	3/21/2017	6968 Old Hickory Blvd	3/21/2017	
021-00-0 160.00	4/10/2017	5011 Rawlings Road	4/10/2017	5/11/2017
021-00-0 044.00	4/14/2017	4910 Rawlings Road	4/14/2017	
075-00-0 140.00	4/7/2017	4491 Chandler Road	4/12/2017	
015-00-0 308.00	4/19/2017	2990 Union Hill Road	4/20/2017	5/22/2017
042-09-0 035.00	4/20/2017	103 Arta Drive	4/21/2017	
015-14-1 001.00	4/24/2017	3051 Gary Road	4/24/2017	
076-00-0 050.00	4/18/2017	955 Old Lebanon Dirt Road	4/27/2017	5/24/2017
032-00-0 026.00	5/1/2017	4403 Jackson Road	5/1/2017	5/2/2017
133-04-0 008.00	4/21/2017	3214 Glencliff Road	5/15/2017	

Table 7H.4 - Failing Septic System Investigations Performed by the Health Department in FY17 (Continued)

Map & Parcel	Date Received	Street Name	Date Investigated	Notice Issued
127-00-0 100.00	5/12/2017	8525 Newsom Station Road	5/17/2017	
046-00-0 082.00	5/18/2017	4951 Bull Run Road	5/22/2017	
039-00-0 003.00	6/6/2017	6335 Old Hickory Boulevard	6/6/2017	6/15/2017
008-00-0 155.00	6/6/2017	3708 Baxter Road	6/6/2017	
030-00-0 047.00	6/13/2017	5027 Seymour Hollow Road	6/13/2017	
112-00-0 079.00	6/19/2017	4121 Gourley Road	6/19/2017	
049-00-0 190.00	6/14/2017	3805 Whites Creek Pike	6/20/2017	
022-00-0 108.00	6/19/2017	3011 Claylick Road	6/22/2017	6/23/2017
021-00-0 096.00	6/20/2017	6200 Marrowbone Lake Road	6/27/2017	7/10/2017
004-00-0 064.00	6/19/2017	8385 Riley Adcock Road	6/19/2017	

Table 7H.5 – MWS Estimated/Reported Sewage Overflows in FY17

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Total
Wet Weather Overflows - CSO Permitted	20	21	11	1	6	24	18	6	26	25	22	17	197
Wet Weather Overflows - Sewer (non-pumps)	10	2	0	0	0	7	10	4	7	16	3	3	62
Wet Weather Overflows - Pump Stations	13	1	0	0	0	11	6	0	1	28	0	4	64
Wet Weather Overflows SSO - TOTAL	23	3	0	0	0	18	16	4	8	44	3	7	126
Dry Weather Overflows - Sewer (non-pumps)	2	4	4	10	2	4	7	9	8	4	7	6	67
Dry Weather Overflows - Pump Stations	0	0	0	0	0	0	0	1	0	2	0	0	3
Dry Weather Overflows - TOTAL	2	4	4	10	2	4	7	10	8	6	7	6	70
# of Overflows that Reached Creeks - Sewer	31	23	11	5	7	29	33	16	35	37	23	21	271
# of Overflows that Reached Creeks - Pump Stations (All)	13	1	0	0	0	11	6	1	1	30	0	4	67
# of Overflow Response Staff per sewer event	2	2	2	2	2	2	2	2	2	2	2	2	2
# of Sewer Vac Trucks per sewer event	1	1	1	1	1	1	1	1	1	1	1	1	1

*Note: Most of the dry-weather overflows involve a small level of clean-up performed by Department personnel. Most of the overflows that reach creeks occur during wet weather conditions.

Table 8F.1 - MWS Stormwater Maintenance Work Order Numbers for FY17

Ditch Excavation & Repair	
Ditch Excavated/Repaired (linear feet)	56,700
Debris Removed (cubic yards)	5,117
Debris Removal (misc)	
Debris Removed (cubic yards)	184,508
Inlet Maintenance	
Inlets Cleaned	15,839
Inlets Repaired	3
Estimated Material Removed (cubic yards)	142,551
Walls & Headwalls	
Walls/Headwalls Built	378
Walls/Headwalls Repaired	29
Cross Drains	
Cross Drains Cleaned	439
Cross Drains Replaced	3
Erosion	
Matting Used (feet)	191,486

Note: (Some assumptions are used in the quantity estimates)
*All statistics are reported based on the actual finish date of the task(s), not the work order(s).
*All cubic yardage is computed from the loads reported for each truck size.
*Debris Removed' under Ditch Exc. & Repair is the total of all cubic yardage reported under work orders that had a *Redefine Ditch' task. 'Debris Removed' under Debris Removal (misc) is the total of cubic yardage reported under all other work orders not counted in the first Debris Removal figure.
*Inlets Repaired number includes those that were replaced with "bike-friendly" grates.

Table 8F.2 - MWS Stormwater Contracted Street Sweeping Collection Numbers for FY17

	July	August	September	October	November	December	January	February	March	April	May	June	Total
Debris Collected (tons)	363	333	504	556	640	676	507	597	453	436	431	411	5,907
Miles of Street Swept	1,086	1,027	1,809	1,507	1,378	1,514	1,632	2,319	2,181	1,902	2,485	2,542	21,380

Table 9F.1 - Development and Review Section Plan Review Numbers for FY17

	July	August	September	October	November	December	January	February	March	April	May	June	Total
Number of Plan Submittals	326	298	310	295	254	275	303	288	356	276	317	338	3,636
Number of Plan Approvals	130	105	131	120	95	111	144	117	132	99	123	112	1,419

Note: This spreadsheet represents all plan submittals, including grading permit plans, plat reviews/approvals, as-built drawings etc. As of February 1, 2016, (prior to this reporting period) all new development and redevelopment sites seeking grading permits are required to utilize LID practices (one inch capture).

Table 10C.1 - Industrial Sites Inventoried within Metro's Database

Site Name	Site Location	SARA Site	TMSP Site	RMCP Site	Date Inspected
LKG Pick Your Part Southeast llc.	2030 Lucas Lane	No	Yes	No	10/30/17
The Mulch Company	665 Vernon Ave	No	Yes	No	10/24/17
West Nashville Auto Recycling Inc.	5604 Centennial Bvld.	No	Yes	No	10/24/17
Waste Management C&D Recycle Center	3211 Franklin Limestone Rd	No	No	No	10/5/17
Mid TN Recycling	3533 Hermitage Industrial Drive	No	No	No	9/6/17
Southern Recycling (Metal Management Nashville, LLC)	1840 Linder Industrial Dr	No	Yes	No	7/27/17
Stratas Foods (Supreme Oil Central, Inc.)	185 Spence Ln	No	Yes	No	7/25/17
QRS River Hills Recycling Facility	630 Myatt Dr	No	Yes	No	6/9/17
IMI Ready Mix - Cowan Street	1433 Cowan Ct	No	No	Yes	6/6/17
North American Galvanizing Co.(Azz Galvanizing)	200 32nd Ave N	Yes	Yes	No	6/5/17
Siskin Steel	4040 Jordonia Station Road	No	Yes	No	5/31/17
Pine Bluff Materials (Hunter Marine)	6615 Robertson Ave.	No	No	No	5/2/17
Nashville Ready Mix - Cowan Ct.	1436 Cowan Ct	Yes	Yes	Yes	1/27/17
Nashville Ready Mix, Inc. Baptist World	1326 Baptist World Center Dr	No	Yes	Yes	1/27/17
Innophos, Inc.	4600 Centennial Bvld.	Yes	Yes	No	1/24/17
J B Weimar (Reladyne)	7281 Centennial Blvd	Yes	Yes	No	1/9/17
Nashville Chemical & Equipment Co Inc.	7001 Westbelt Dr	Yes	No	No	1/9/17
Nashville Ready Mix Of West Nashville	5853 River Rd	Yes	No	Yes	12/30/16
Smyrna Ready Mix. - Visco Drive	1020 Visco Dr	Yes	No	Yes	11/29/16
A. Schulman, Inc.	481 Allied Dr	Yes	Yes	No	11/9/16
Twb Antioch	6050 Dana Way	Yes	No	No	11/9/16
Whirlpool Corp	1714 Heil Quaker Bvld.	Yes	No	No	11/9/16
Five Star Foods (Cargil)	2621 Eugenia Ave	Yes	No	No	11/2/16
Superior Trim	511 Bridgeway Ave	Yes	No	No	10/26/16
Ergon Terminaling, Inc. - Nashville	1114 Visco Dr	Yes	Yes	No	8/25/16
Airgass USA LLC	7236 Centennial	Yes	No	No	7/22/16
Motiva Nashville Terminal	1717 61st Ave N	Yes	No	No	6/23/16
Reddy Ice-Nashville	7261 Centennial Bvld.	Yes	No	No	6/17/16
Purity Dairies	360 Murfreesboro Pike	Yes	Yes	No	6/3/16
Rogers Group, Inc. (Reostone Quarry)	6514 Robertson Avenue	No	Yes	No	5/11/16
Quickrete - Nashville	6614 Robertson Ave	No	Yes	No	4/27/16
IMI Ready Mix- Robertson Road	6616 Robertson Ave	No	No	Yes	4/7/16
Azko Nobel	20 Culvert Street	Yes	No	No	3/18/16
Land O'lakes Purina Feed lock.	3601 Trousdale Dr	Yes	No	No	3/18/16
AKZO Nobel Coatings Inc.	20 Culvert St	Yes	Yes	No	3/8/16
Onsite Environmental	1421 Baptist World Center Drive	Yes	Yes	No	2/19/16
Green Tree Processing (On-Site Environmental)	1501 Baptist World Center Dr	No	Yes	No	2/19/16
Springs Global Us-Nashville Plant	7200 Cockrill Bend Blvd	Yes	Yes	No	2/5/16
Harcros Chemicals Inc	1418 Poplar Ln	Yes	No	No	1/15/16
Hilltop Auto Salvage	2408 Dickerson Park	No	Yes	No	1/12/16
Hailey's Harbor, Inc.	3730 Amy Lynn Dr	No	Yes	No	11/5/15
Rogers Group (Whites Creek Asphalt Plant)	2827 Whites Creek Pike	No	Yes	No	9/30/15
PSC Metals, Inc.	710 S 1st St	No	Yes	No	8/21/15
Sherman-Dixie Concrete Industries, Inc.	3641 Central Pike	Yes	No	Yes	8/13/15
Smyrna Ready Mix Concrete, 2nd Ave	1136 2nd Ave N	Yes	No	Yes	4/1/15
Superior Solvents & Chemicals	518 Swinging Bridge Rd	Yes	No	No	1/5/15
Parman Energy	7101 Cockrill Bend Blvd.	No	No	No	11/24/14

Table 10C.1 - Industrial Sites Inventoried within Metro's Database (Continued)

Site Name	Site Location	SARA Site	TMSP Site	RMCP Site	Date Inspected
Nashville Wire Products	295 Driftwood St	Yes	No	No	7/18/14
Exxon Mobil Pipeline Corp Nashville	1741 Ed Temple Blvd	Yes	No	No	7/8/14
Lawson Ready Mix	5915 River Rd	Yes	No	Yes	6/19/14
Triumph (Vought) Aircraft Industries Inc	1432 Vultee Blvd	Yes	No	No	6/16/14
Carlex Nashville Glass Plant (Carlex)	7200 Centennial Bvld.	Yes	No	No	6/10/14
E. I. Dupont De Nemours & Co., Inc. -	1002 Industrial Dr	Yes	Yes	No	5/29/14
Fiberweb, Inc. (Polymer Group)	70 Old Hickory Blvd	Yes	Yes	No	5/29/14
Country Delite Farms Llc (Suiza)	1401 Church St	Yes	No	No	5/22/14
Marathon Petroleum Company Llc	5 Main St	Yes	Yes	No	5/16/14
Marathon Petroleum Company Llc	930 Youngs Ln	Yes	Yes	No	5/16/14
Marathon Petroleum Company, Llc -	2922 Hydes Ferry Rd	Yes	Yes	No	5/16/14
Perfection Molders	213 Connell St	Yes	No	No	5/8/14
U S Smokeless Tobacco Manufacturing Co	800 Harrison St	Yes	No	No	5/8/14
Hennessy Industries	1601 J P Hennessy Dr	Yes	No	No	5/2/14
Palm Commodities International, Inc Sales	1717 J P Hennessy Dr	Yes	No	No	4/30/14
Marathon Terminal (Blanchard Terminal)	1409 51st Ave N	Yes	Yes	No	4/29/14
Safety-Kleen Systems, Inc.	215 Whitsett Rd	Yes	Yes	No	4/23/14
CMC Rebar Nashville	851 Visco Dr	Yes	No	No	4/17/14
Quad Graphics Nashville	2947 Brick Church Pike	Yes	No	No	4/15/14
Warren Paint & Color Co	700 Wedgewood Ave	Yes	Yes	No	4/9/14
Cone Solvents Inc Nashville	1830 Linder Industrial Dr	Yes	No	No	4/1/14
Ashland Distribution (Nexeo Solutions)	2315 Clifton Ave	Yes	Yes	No	3/13/14
Bellar Auto Parts, Inc.	670 James Ave	No	Yes	No	2/18/14
Cumberland Terminals, Inc.	7260 Centennial Bvld.	Yes	Yes	No	2/12/14
Greer Stop Nut	481 Mcnally Dr	Yes	Yes	No	2/5/14
Peterbilt Motors Company	430 Myatt Dr	Yes	Yes	No	2/5/14
Polar Technology Llc (Hudson)	1360 Foster Ave	Yes	No	No	2/5/14
Shrum Auto Salvage	1050 Old Buck Hill Road	No	Yes	No	3/21/13
Dicaperl Minerals Corp. (Chemrock)	2601 Osage St	No	Yes	No	6/13/12
3m	400 Swinging Bridge Road	No	Yes	No	
AAA Industries Inc.	3141 Ambrose Ave	No	Yes	No	
Abernathy Truck Salvage, Inc.	865 W Trinity Ln	No	Yes	No	
ABF Freight System, Inc. - Nashville	890 Visco Dr	No	Yes	No	
Advanced Composites (Tn)	3050 Sidco Dr	No	Yes	No	
All Star Recycling	460a Craighead Street	No	No	No	
All State Auto Parts, Inc.	515 Nawakwa Trl	No	Yes	No	
Allied Systems Ltd - Nashville	741 Harding Pl	No	Yes	No	
Allied Waste	700 Murfreesboro Park	No	Yes	No	
American Airlines Fuel Storage Facility At	929 Airport Service Road	No	No	No	
American Appliance Products - Madison	1129 Myatt Blvd	No	Yes	No	
Associated Wholesale Grocers	500 S Cartwright St	No	Yes	No	
ATI Metal Working Products	1 Teledyne Place	No	Yes	No	
Automotive Components Holdings, Llc	7200 Centennial Blvd	No	No	No	
Besway Systems Inc	305 Williams Ave	No	Yes	No	
BFI Of Nashville	700 Murfreesboro Pike	No	Yes	No	
BNE Properties, Inc.	317 Arlington Ave	No	Yes	No	
Bridgestone Americas Tire Operations, Llc	1201 Bridgestone Parkway	No	No	No	
Central Pike Class Iv Landfill	3530 Central Park	No	Yes	No	
Cherokee Marine Terminal	520 Cowan St	No	Yes	No	

Table 10C.1 - Industrial Sites Inventoried within Metro's Database (Continued)

Site Name	Site Location	SARA Site	TMSP Site	RMCP Site	Date Inspected
Circle Delivery Service, Inc.	125 Caden Dr	No	Yes	No	
Clopay Advanced Printing	555 Harding Industrial Dr	No	Yes	No	
Clopay Plastics Products	463 Harding Industrial Dr	No	Yes	No	
Coca-Cola Bottling Co. of Nashville	407 Craighead Street	No	Yes	No	
CSX Intermodal, Inc - Nashville Terminal	3086 Sidco Dr	No	Yes	No	
Cummings Signs Arch. and Banking Div.	4560 Trousdale Dr	No	Yes	No	
D & R Motors & Recycling	616 Durrett Dr	No	Yes	No	
Dixie Wire	5901 California Avenue	No	Yes	No	
Dry Creek Wastewater Treatment Plant	1600 2nd Ave N	No	Yes	No	
Earthgrains Banking Co., Inc	2407 Franklin Pike	No	Yes	No	
Elite Septic Tank Service	450 Edenwold Road	No	No	No	
Embraer Aircraft Maintenance Services, Inc.	50 Airways Blvd	No	Yes	No	
Essex Plastics Midwest, LLC D.B.A.	1105 Visco Dr	No	Yes	No	
Fed Ex Ground - Nashville Knight Rd	3301 Knight Dr	No	Yes	No	
Federal Express – BNAA	1931 Air Lane Dr	No	Yes	No	
First Response, Inc.	1411 Dickerson Pike	No	Yes	No	
Firstexpress Inc.	1135 Freightliner Dr	No	Yes	No	
Flex Sol Packaging Corp.	1105 Visco Drive	No	Yes	No	
Four Lane Auto Salvage Inc.	400 W Trinity Ln	No	Yes	No	
FTEC, Inc. (Palfleet Truck)	1801 Lebanon Park	No	Yes	No	
GAF Materials Corp.	970 Fiber Glass Rd	No	Yes	No	
Grooms Engines	611 4th Ave S	No	Yes	No	
Hamilton Machine Co Inc	464 Woodycrest Ave	No	Yes	No	
Harpeth Valley Utility District	5910 River Road	No	No	No	
HMA Contractors Asphalt Plant #1	820 Ezell Pike	No	Yes	No	
Howard Baer, Inc.	1301 Foster Ave	No	Yes	No	
Ingram Materials Sand Yard	1030 Visco Dr	No	Yes	No	
John Bouchard & Sons Co	1024 Harrison St	No	Yes	No	
John C. Tune Airport	110 Tune Airport Dr	No	Yes	No	
John W. McDougall Co., Inc.	3731 Amy Lynn Dr	No	Yes	No	
Jones Brothers, LLC	129 Bush Rd	No	Yes	No	
Kohl & Madden Plant #1	404 Harding Ind Dr	No	Yes	No	
Lee Brick and Block	3201 Franklin Limestone Rd	No	Yes	No	
Lion Oil Company - Nashville	90 Van Buren St	No	Yes	No	
Lojac Danley Plant	3185 Franklin Limestone Rd	No	Yes	No	
Lojac Downtown Plant	500 Cowan St	No	Yes	No	
LoJac Hermitage Asphalt Plant	3552 Hermitage Industrial Dr	No	Yes	No	
LoJac Nashville River Road Plant	4404 River Rd	No	Yes	No	
Lone Star Industries, Inc. d/b/a Buzzi	1702 2nd Ave N	No	Yes	No	
M & W Transportation Co., Inc.	101 Terminal Ct	No	Yes	No	
Magellan Nashville I Terminal	1609 63rd Ave N	No	Yes	No	
Magellan Terminals Holdings LP	1441 51st Ave N	No	Yes	No	
Metro Nashville Airport Authority	1 Terminal Drive	No	No	No	
Metro Nashville District Energy System	90 Peabody St	No	Yes	No	
Metro Salvage, Inc.	1975 Springfield Hwy	No	Yes	No	
Mid-South Wire	1070 Visco Dr	No	Yes	No	
Milan Express Co., Inc. - Nashville	825 Visco Dr	No	Yes	No	
Music City Processing	1629 Elm Hill Pike	No	No	No	
N & S Inc.	361 Herron Dr	No	Yes	No	

Table 10C.1 - Industrial Sites Inventoried within Metro's Database (Continued)

Site Name	Site Location	SARA Site	TMSP Site	RMCP Site	Date Inspected
Nashville Central STP	1600 2nd Ave N	No	Yes	No	
Nashville Machine Company	530 Woodycrest Ave	No	Yes	No	
Nashville Machine Elevator Inc	510 Interstate Blvd S	No	Yes	No	
Nashville Recycling Co	10 Van Buren St	No	Yes	No	
Nashville VMF	707 Chestnut St	No	Yes	No	
Nashville Wilbert Burial Vault Co.	432 Woodycrest Ave	No	Yes	No	
Nashville Wire Products	1604 County Hospital Rd	No	Yes	No	
Neely's Bend Inc.	1327 Neelys Bend Rd	No	Yes	No	
Paulo Products Company	3206 Ambrose Ave	No	Yes	No	
Pepsi Bottling Group	715 Thompson Ln	No	Yes	No	
PlastiCycle	5801 Centennial Blvd	No	Yes	No	
Portland Express, Inc.	531 Woodycrest Ave	No	Yes	No	
Precision Fabrics Group, Inc	530 Myatt Drive	No	No	No	
Pull-A-Part, LLC	7114 Centennial Boulevard	No	Yes	No	
Quality Plating	71 Fesslers Ln	No	Yes	No	
Radiant Technologies	1845 Elm Hill Park	No	Yes	No	
River Cement Sales Co dba Buzzi Unicem	1818 Cement Plant Rd	No	Yes	No	
Rivergate Auto Parts, Inc.	1471 Gallatin Pike	No	Yes	No	
Rogers Manufacturing Company	110 Transit Avenue	No	Yes	No	
Rolling Frito-Lay Sales, LP - Nashville DC	130 Spence Ln	No	Yes	No	
Sadler Bros Trucking & Leasing Company,	436 Enos Reed Dr	No	Yes	No	
Schreiber Foods, Inc.	4350 Hurricane Creek Blvd	No	Yes	No	
Sequatchie Concrete Service, Inc.	306 Cowan St	No	Yes	No	
Servitech Industries, Inc.	550 Brick Church Park Dr	No	Yes	No	
Smitty's Auto Parts	1609 Bell Rd	No	Yes	No	
Smurfit-Stone Container -- Nashville	707 19th Ave N	No	Yes	No	
Smyrna Mix - Basswood Drive	711 Basswood Ave	No	No	Yes	
Smyrna Mix Concrete	6677 River Road Pike	No	No	Yes	
Smyrna Ready Mix	3040 Brandau Rd	No	No	Yes	
Southeastern Freight Lines, Inc.	4141 Murfreesboro Park	No	Yes	No	
Southland Brick and Block	686 Franklin Limestone Rd	No	Yes	No	
Star Transportation	1125 Foster Ave	No	Yes	No	
Steel Summit Tennessee	1718 J P Hennessy Dr	No	Yes	No	
Techno-Aide, Inc.	7117 Centennial Bvld.	No	Yes	No	
Tennessee Air National Guard	240 Knapp Blvd	No	Yes	No	
Tennessee Commercial Warehouse -	22 Stanley St	No	Yes	No	
Tennessee Imports Auto Salvage	326 Oriel Ave	No	Yes	No	
TRANSFLO Terminal Services, Inc.	426 Chestnut St	No	Yes	No	
TREW Industrial Wheels Inc.	310 Wilhagan Rd	No	Yes	No	
Truck Center, Inc.	518 Hagan St	No	Yes	No	
Truck Shine	332 Wilhagan Rd	No	Yes	No	
United Parcel Service - Nashville Massman	705 Massman Dr	No	Yes	No	
United Parcel Service - Nashville Whites	3205 Whites Creek Park	No	Yes	No	
United Parcel Service - TCI	7525 Hickory Hills Ct	No	Yes	No	
USF Holland, Inc.	500 Oakbluff Ln	No	Yes	No	
Vaughn Manufacturing Co	757 Douglas Ave	No	Yes	No	
VF Imagewear, Inc.	554 Hickory Hl	No	Yes	No	
Vietti Foods Company, Inc.	636 Southgate Ave	No	Yes	No	
Vintage Millworks Inc.	525 Merritt Ave	No	Yes	No	
Vulcan Quarry - Hermitage	5301 Old Hickory Blvd	No	No	No	

Table 10C.1 - Industrial Sites Inventoried within Metro's Database (Continued)

Site Name	Site Location	SARA Site	TMSP Site	RMCP Site	Date Inspected
Waste Management of Tennessee-	4651 Amy Lynn Dr	No	Yes	No	
Waste Management Truck Maintenance Facility/Garbage Transfer St	1428 Antioch Park	No	Yes	No	
Wikoff Color Corporation	214 Ommohundro Place	No	Yes	No	
River Hills MRF	2018 River Hills Drive	No	Yes	No	

Table 10F.1 - Industrial Sites Inspected during FY17

Site Name	Site Location	SARA Site	TMSP Site	RMCP Site	Date Inspected
Siskin Steel	4040 Jordonia Station Road	No	Yes	No	5/31/17
Pine Bluff Materials (Hunter Marine)	6615 Robertson Ave.	No	No	No	5/2/17
Nashville Ready Mix - Cowan Ct.	1436 Cowan Ct	Yes	Yes	Yes	1/27/17
Nashville Ready Mix, Inc. Baptist World	1326 Baptist World Center Dr	No	Yes	Yes	1/27/17
Innophos, Inc.	4600 Centennial Bvld.	Yes	Yes	No	1/24/17
J B Weimar (Reladyne)	7281 Centennial Blvd	Yes	Yes	No	1/9/17
Nashville Chemical & Equipment Co Inc	7001 Westbelt Dr	Yes	No	No	1/9/17
Nashville Ready Mix Of West Nashville	5853 River Rd	Yes	No	Yes	12/30/16
Smyrna Ready Mix - Visco Drive	1020 Visco Dr	Yes	No	Yes	11/29/16
A. Schulman, Inc.	481 Allied Dr	Yes	Yes	No	11/9/16
Twb Antioch	6050 Dana Way	Yes	No	No	11/9/16
Whirlpool Corp	1714 Heil Quaker Bvld.	Yes	No	No	11/9/16
Five Star Foods (Cargil)	2621 Eugenia Ave	Yes	No	No	11/2/16
Superior Trim	511 Bridgeway Ave	Yes	No	No	10/26/16
Ergon Terminaling, Inc. – Nashville	1114 Visco Dr	Yes	Yes	No	8/25/16
Airgass USA LLC	7236 Centennial	Yes	No	No	7/22/16

Table 13A.1 – TMDL Monitoring Data for FY17

Date	Time	Site Name	Samplers	DO	DO	Cond.	Temp.	pH	Flow	*E. coli*
			(initials)	%	mg/L	uS	Celcius		cfs	mpn
7/19/2016	9:23	Bosley Springs	VL EW	110.7	9.9	597	21.1	8.03	0.21	613.1
7/26/2016	9:45	Bosley Springs	MB	98.1	8.74	590	21	7.99	1.00	104.6
7/27/2016	10:20	Bosley Springs	VL SP	115.8	10.18	591	22	8.05	2.23	116.2
8/1/2016	9:57	Bosley Springs	VL GWL	99.1	8.72	588	21.4	7.92	3.55	224.7
8/16/2016	10:41	Bosley Springs	VL SP	103.9	8.8	610	23.4	8.05	1.19	158.5
10/4/2016	10:23	Bosley Springs	VL SP	128.2	11.94	460	18.8	8.04		162.4
10/5/2016	10:00	Bosley Springs	VL GWL	105.1	9.86	516	18.5	7.97		461.1
10/6/2016	10:15	Bosley Springs	MB	132.1	12.34	594	18.5	7.98		410.6
10/13/2016	9:55	Bosley Springs	MB SP	93.1	8.8	591	18	7.31		547.5
10/25/2016	10:30	Bosley Springs	MB	97.8	9.7	599	15.8	8.06		248.1
1/9/2017	10:04	Bosley Springs	MB	105.5	11.54	564	11.3	8.01		727
1/25/2017	9:25	Bosley Springs	VL	97.2	9.79	591	15	8.09		127.4
1/26/2017	9:20	Bosley Springs	MB	98.1	10.18	591	13.5	8.33		>2419.6
1/30/2017	9:17	Bosley Springs	VL SP	98.8	10.6	601	12.1	8.27		>2419.6
2/1/2017	10:10	Bosley Springs	VL SP	104	10.92	599	9.9	8.13		866.4
5/9/2017	9:25	Bosley Springs	VL SP	98	9.25	523	18	7.17		387.3
5/11/2017	10:16	Bosley Springs	VL SP	101.2	9.39	546	18.9	7.96		325.5
5/16/2017	10:10	Bosley Springs	VL SP	105	9.87	526	18.4	7.88		435.2
5/17/2017	10:13	Bosley Springs	SP	96.9	9.27	532	17.4	7.77		816.4
5/31/2017	10:25	Bosley Springs	VL SP	102.6	9.45	521	19.2	7.75		>2419.6
7/12/2016	10:00	Browns 1	VL SP	89.8	7.88	602	21.7	7.78	12.77	193.5
7/13/2016	8:39	Browns 1	VL SP	86	7.49	603	22	7.77	7.47	222.4
7/14/2016	9:53	Browns 1	VL SP	87.9	7.53	595	23	7.79	14.18	152.9
7/18/2016	10:26	Browns 1	VL EW	95.1	8.23	566	22.5	7.86	12.59	472.1
7/26/2016	9:22	Browns 1	VL SP	85.5	7.21	546	23.8	7.86	13.40	238.2
10/5/2016	10:47	Browns 1	MB SP	83.3	7.52	556	20.1	7.82		249.5
10/6/2016	9:59	Browns 1	VL SP	85.2	7.76	562	19.9	7.46		410.6
10/11/2016	9:54	Browns 1	VL SP	87.4	8.53	555	16.4	7.57		238.2
10/17/2016	9:54	Browns 1	MB SP	74.6	6.83	560	19.6	7.81		344.8
10/25/2016	9:44	Browns 1	VL SP	80.3	8.16	552	14.4	7.73		285.1
1/9/2017	9:51	Browns 1	VL SP	97.4	11.73	581	7.3	8.15		238.2
1/24/2017	9:53	Browns 1	VL SP	96.3	10.25	569	12.5	5.91		148.3
1/26/2017	8:34	Browns 1	VL SP	91.5	9.92	580	11.7	7.8		93.4
1/31/2017	9:31	Browns 1	VL SP	99.5	10.88	566	10.9	7.95		69.7
2/1/2017	11:04	Browns 1	VL SP	110.8	12.03	558	11.6	8.08		42
5/9/2017	11:32	Browns 1	VL SP	83.8	7.84	558	18.1	7.59		2419.6
5/10/2017	10:50	Browns 1	VL SP	84	7.75	558	18.7	7.66		1203.3
5/16/2017	11:40	Browns 1	VL SP	80.3	7.49	587	18.6	7.68		>2419.6
5/18/2017	8:04	Browns 1	VL SP	80.1	7.34	613	19.4	7.61		>2419.6
6/1/2017	10:23	Browns 1	VL SP	82.2	7.51	662	19.3	7.47		>2419.6
7/12/2016	10:28	Browns 2	VL SP	105.1	9.07	602	22	8.23	10.60	248.9
7/18/2016	10:54	Browns 2	VL EW	103	8.91	578	22.5	8.23	1.83	547.2
7/26/2016	9:48	Browns 2	VL SP	98.2	8.41	576	23	8.18	3.29	770.1
10/5/2016	10:30	Browns 2	MB SP	96.4	8.83	580	19.5	8.19		488.4
10/6/2016	9:59	Browns 2	VL SP	97.5	8.91	583	19.6	8.03		461.1
10/11/2016	10:00	Browns 2	VL SP	91.7	8.97	582	16.4	7.76		1732.9
10/17/2016	10:12	Browns 2	MB SP	89.7	8.16	565	19.8	8.21		770.1
10/25/2016	10:00	Browns 2	VL SP	93.4	9.3	560	14.7	7.81		228.2

Table 13A.1 – TMDL Monitoring Data for FY17 (Continued)

Date	Time	Site Name	Samplers	DO	DO	Cond.	Temp.	pH	Flow	*E. coli*
			(initials)	%	mg/L	uS	Celcius		cfs	mpn
1/9/2017	10:13	Browns 2	VL SP	103.9	12.31	569	7.9	8.43		48.8
1/25/2017	8:45	Browns 2	MB SP	93.8	9.94	568	12.7	8.23	31.21	261.3
1/26/2017	8:08	Browns 2	VL SP	96.5	10.5	576	11.5	8.2		325.5
1/31/2017	9:53	Browns 2	VL SP	105.9	11.42	561	12.1	8.27		193.5
2/1/2017	10:41	Browns 2	VL SP	111.8	11.97	554	12.2	8.39		56.3
5/9/2017	11:37	Browns 2	VL SP	90.6	8.44	543	19	7.89		261.3
5/10/2017	11:10	Browns 2	VL SP	107.1	9.75	547	19.4	7.97		275.5
5/16/2017	11:55	Browns 2	VL SP	104.1	9.54	566	19.3	8.14		228.2
5/18/2017	8:20	Browns 2	CL SP	106.3	9.57	593	20.5	7.82		290.9
6/1/2017	10:55	Browns 2	VL SP	101.5	9.47	628	19.5	8.05		167
7/13/2016	9:04	Browns 2	VL SP	91.5	8	1080	21.8	8.21	7.34	172.5
7/14/2016	10:15	Browns 2	VL SP	97.1	8.35	600	22.7	8.2	9.77	313.0
7/19/2016	8:33	Davidson Branch	MB SP	82.1	7.06	668	22.8	8	0.09	410.6
7/26/2016	7:55	Davidson Branch	MB	85	7.41	659	22	8.03	0.04	157.6
7/27/2016	8:31	Davidson Branch	VL SP	82	7.15	658	22	8.03	0.00	110.6
8/1/2016	8:34	Davidson Branch	MB SP	80.8	6.94	672	22.8	7.98	0.10	248.9
8/16/2016	8:41	Davidson Branch	VL SP	78.1	6.68	716	23.2	7.87	0.13	248.9
10/4/2016	8:34	Davidson Branch	VL SP	74.8	7.16	852	17.6	7.67		129.6
10/5/2016	8:30	Davidson Branch	VL GWL	69	6.46	658	18.2	7.52		71.7
10/6/2016	8:36	Davidson Branch	MB	73.1	6.98	753	17.5	7.82		1553.1
10/13/2016	8:33	Davidson Branch	MB SP	74.3	7.01	765	18.1	7.69		36.4
10/25/2016	8:56	Davidson Branch	MB	76.6	7.77	760	14.6	7.79		135.4
1/9/2017	8:33	Davidson Branch	MB	101.6	12.81	587	5.5	8.22		39.3
1/25/2017	7:45	Davidson Branch	MB SP	92.5	10.13	555	11.2	8.21	2.03	74.9
1/26/2017	7:35	Davidson Branch	MB	95.6	10.74	547	10.2	8.2		71.2
1/30/2017	7:59	Davidson Branch	VL SP	100.4	98.8	583	7.6	8.22		46.5
2/1/2017	7:28	Davidson Branch	MB VL	92.9	10.82	586	8.6	8.21		60.9
5/9/2017	8:07	Davidson Branch	VL SP	89.2	8.56	560	16.9	7.95		66.3
5/11/2017	8:26	Davidson Branch	VL SP	89.2	8.38	571	18.4	8.03		71.7
5/16/2017	8:51	Davidson Branch	VL SP	93.3	9.01	585	17.01	7.98		75.9
5/17/2017	8:51	Davidson Branch	VL	92.5	8.62	579	18.6	7.62		74.3
5/31/2017	8:05	Davidson Branch	VL SP	88.3	8.37	583	17.8	8.01		83
7/12/2016	10:40	East Fork Browns	VL SP	108.6	9.33	661	22.2	8.25	2.35	116.9
7/13/2016	9:25	East Fork Browns	VL SP	108.3	9.47	666	22	8.25	1.92	141.4
7/14/2016	10:27	East Fork Browns	VL SP	136	11.57	659	23	8.28	1.44	119.8
7/18/2016	11:02	East Fork Browns	VL EW	102.5	8.86	639	22.3	8.25	1.75	116.0
7/26/2016	9:59	East Fork Browns	VL SP	116.5	9.68	650	23.9	8.31	1.36	191.8
10/5/2016	10:20	East Fork Browns	MB SP	108.5	9.89	667	19.9	8.23		238.2
10/6/2016	10:26	East Fork Browns	VL SP	112.2	10.03	668	20.7	8.08		235.9
10/11/2016	10:08	East Fork Browns	VL SP	122.6	11.89	684	16.6	8.25		>2419.6
10/17/2016	10:22	East Fork Browns	MB SP	122	10.89	678	20.5	8.4		517.2
10/25/2016	10:09	East Fork Browns	VL SP	112.7	11.42	682	14.5	7.86		222.4
1/9/2017	10:20	East Fork Browns	VL SP	107.5	12.74	756	7.9	8.45		275.5
1/24/2017	9:21	East Fork Browns	VL SP	100.7	10.77	636	12.2	5.34		344.8
1/26/2017	7:48	East Fork Browns	VL SP	101.5	11.17	647	11	8.25		275.5
1/31/2017	10:02	East Fork Browns	VL SP	120.9	13.7	632	11.7	8.48		307.6
2/1/2017	10:30	East Fork Browns	VL SP	125.7	13.75	625	11.2	8.55		275.5
5/9/2017	11:37	East Fork Browns	VL SP	114.7	10.39	623	19.9	8.28		344.8
5/10/2017	11:29	East Fork Browns	VL SP	117	10.61	632	19.9	8.25		224.7
5/16/2017	12:05	East Fork Browns	VL SP	117.6	10.68	650	20.2	8.24		866.4
5/18/2017	8:31	East Fork Browns	VL SP	113.1	10.29	658	20.1	8.28		435.2
6/1/2017	11:05	East Fork Browns	VL SP	116.7	10.68	714	19.6	8.2		344.8

Table 13A.1 – TMDL Monitoring Data for FY17 (Continued)

Date	Time	Site Name	Samplers (initials)	DO %	DO mg/L	Cond. uS	Temp. Celcius	pH	Flow cfs	*E. coli* mpn
7/14/2016	9:09	Hurricane Branch	VL SP	85.2	6.92	594	25.5	7.84	3.33	186.0
7/18/2016	9:36	Hurricane Branch	VL EW	93.3	7.83	571	24	7.83	3.85	115.3
7/26/2016	8:33	Hurricane Branch	VL SP	76.9	6.33	590	25.2	7.7	1.59	410.6
10/5/2016	9:20	Hurricane Branch	MB SP	82.6	7.61	576	18.9	7.64		155.3
10/6/2016	9:05	Hurricane Branch	VL SP	79.31	7.42	580	18.4	7.4		172.3
10/11/2016	9:09	Hurricane Branch	VL SP	76.8	7.67	601	15.3	7.36		224.7
10/17/2016	9:06	Hurricane Branch	MB SP	69.2	6.43	577	18.8	7.82		36.4
10/25/2016	8:40	Hurricane Branch	VL SP	75.8	8	602	12.4	8.31		60.2
1/9/2017	8:44	Hurricane Branch	VL SP	92.8	11.51	583	6.5	8.2		76.7
1/24/2017	8:10	Hurricane Branch	VL SP	92.1	9.62	556	13.1	7.75		290.9
1/26/2017	9:21	Hurricane Branch	VL SP	100.3	11.04	574	11	7.7		131.4
1/31/2017	8:16	Hurricane Branch	VL SP	109.3	12.52	578	9.1	8.02		145
2/1/2017	9:45	Hurricane Branch	VL SP	110.7	12.6	567	9.3	8.13		115.3
5/9/2017	10:51	Hurricane Branch	VL SP	101.4	9.46	546	18.7	7.9		40.2
5/10/2017	9:53	Hurricane Branch	VL SP	97.5	9.03	542	18.9	7.74		88.4
5/16/2017	11:00	Hurricane Branch	VL SP	100	9.1	552	19.4	7.73		82.3
6/1/2017	9:01	Hurricane Branch	VL SP	90.5	8.34	582	19.3	7.6		78
6/8/2017	1:155	Hurricane Branch	VL SP	91.4	8.39	587	19.8	7.62		1
7/19/2016	9:47	Jocelyn Hollow Branch	MB SP	92.2	7.63	581	24.9	8.2	0.34	290.9
7/27/2016	9:48	Jocelyn Hollow Branch	VL SP	93.2	7.9	581	23.6	8.12	0.04	148.3
8/1/2016	9:42	Jocelyn Hollow Branch	MB SP	84.9	7.14	613	24.1	8.1	0.27	488.4
8/16/2016	10:07	Jocelyn Hollow Branch	VL SP	65.2	5.37	670	24.8	7.89	0.51	1299.7
10/4/2016	9:42	Jocelyn Hollow Branch	VL SP	70.2	6.7	525	17.4	7.62		579.4
10/5/2016	9:35	Jocelyn Hollow Branch	VL GWL	61.6	5.45	661	18.3	7.25		344.1
10/6/2016	9:45	Jocelyn Hollow Branch	MB	45.4	4.29	658	17.9	7.54		1413.6
10/13/2016	9:26	Jocelyn Hollow Branch	MB SP	39.1	3.73	696	17.3	7.79		1413.6
10/25/2016	10:00	Jocelyn Hollow Branch	MB	37.6	3.91	743	13.4	7.7		613.1
1/9/2017	9:30	Jocelyn Hollow Branch	MB	103.9	13.26	536	5	7.71		185
1/25/2017	8:35	Jocelyn Hollow Branch	VL	99.3	10.96	496	11	7.69		101.2
1/26/2017	8:45	Jocelyn Hollow Branch	MB	103.2	11.77	500	9.5	8.43		107.6
1/30/2017	8:47	Jocelyn Hollow Branch	VL SP	103.9	12.6	522	6.9	8.3		152.3
2/1/2017	6:40	Jocelyn Hollow Branch	MB VL	95.3	11.21	530	8	7.82		123.6
5/9/2017	8:25	Jocelyn Hollow Branch	VL SP	96.3	9.35	502	16.7	8.13		235.9
5/11/2017	8:41	Jocelyn Hollow Branch	VL SP	94.5	8.88	520	18.3	7.92		387.3
5/16/2017	9:08	Jocelyn Hollow Branch	VL SP	92.9	8.76	496	17.3	7.95		613.1
5/17/2017	9:10	Jocelyn Hollow Branch	VL	97.9	9.08	520	18.9	7.79		270
5/31/2017	8:57	Jocelyn Hollow Branch	VL SP	96.5	9.17	532	17.7	7.96		1413.6
7/26/2016	9:15	Jocelyn Hollow Branch	MB	80.5	6.83	571	23.5	8.01	0.35	191.8
10/25/2016	10:29	Middle Fork Browns	VL SP	80.5	8.42	475	13.1	7.85		435.2
2/1/2017	10:55	Middle Fork Browns	VL SP	106.8	12.1	545	9.9	8.2		517.2
7/12/2016	11:13	Middle Fork Browns	VL SP	93.7	8.02	771	22.9	8.23	0.97	517.2
7/13/2016	9:45	Middle Fork Browns	VL SP	83.5	7.12	596	23.2	8.19	0.77	509.9
7/14/2016	10:49	Middle Fork Browns	VL SP	105.9	8.8	594	24.3	8.2	0.65	816.4
7/18/2016	11:25	Middle Fork Browns	VL EW	85	7.09	561	24.3	8.21	0.70	488.4
7/26/2016	10:18	Middle Fork Browns	VL SP	89.4	7.47	584	24.5	8.21	0.51	517.2
10/5/2016	10:15	Middle Fork Browns	MB SP	79.7	7.31	473	19.5	7.93		517.2
10/6/2016	10:40	Middle Fork Browns	VL SP	86.6	7.93	467	20	7.88		866.4
10/11/2016	10:35	Middle Fork Browns	VL SP	80.7	8.05	457	15.7	7.97		280.9
10/17/2016	10:35	Middle Fork Browns	MB SP	80.3	7.26	455	20.2	8.04		228.2

Table 13A.1 – TMDL Monitoring Data for FY17 (Continued)

Date	Time	Site Name	Samplers	DO	DO	Cond.	Temp.	pH	Flow	*E. coli*
			(initials)	%	mg/L	uS	Celcius		cfs	mpn
1/9/2017	10:35	Middle Fork Browns	VL SP	100.9	12.59	558	5.8	8.48		344.8
1/24/2017	9:00	Middle Fork Browns	VL SP	96.4	10.52	543	11.3	8.16		920.8
1/26/2017	7:32	Middle Fork Browns	VL SP	98.7	11.06	550	10	8.07		435.2
1/31/2017	10:24	Middle Fork Browns	VL SP	107.7	11.98	541	10.5	8.35		172.2
5/9/2017	12:22	Middle Fork Browns	VL SP	86.8	8.2	500	18.4	7.81		325.5
5/10/2017	11:38	Middle Fork Browns	VL SP	88.8	8.34	511	18.8	8.19		410.6
5/16/2017	12:20	Middle Fork Browns	VL SP	96.6	9.01	518	18.5	7.94		218.7
5/18/2017	8:48	Middle Fork Browns	VL SP	94.5	8.7	532	19.1	8		260.3
6/1/2017	11:20	Middle Fork Browns	VL SP	93.4	8.63	511	19	8.01		517.2
8/17/2016	10:14	Murphy	MB VL SP	83.9	7.4	646	21.4	8.19		488.4
7/19/2016	8:41	Richland 1	VL EW	104.6	8.63	585	24.8	7.9	5.23	61.2
7/26/2016	11:01	Richland 1	VL SP	113.2	9.09	562	26.8	8.21	6.40	116.0
7/27/2016	11:00	Richland 1	VL SP	124.8	10.12	575	26	8.14	10.60	82.0
8/1/2016	9:16	Richland 1	VL GWL	93.1	7.83	586	23.9	7.98	6.38	80.8
8/16/2016	11:21	Richland 1	VL SP	118.7	9.55	597	26.7	8.06	8.43	1413.6
10/4/2016	11:05	Richland 1	VL SP	144.5	13.19	477	19.7	8.02		88.4
10/5/2016	10:35	Richland 1	VL GWL	110	10.09	611	19.5	7.86		86.2
10/6/2016	10:40	Richland 1	MB	121.6	11.1	611	19.7	8.03		74.4
10/13/2016	10:12	Richland 1	MB SP	88.1	8.31	604	18.1	7.88		95.9
10/25/2016	8:12	Richland 1	MB	78.9	8.15	588	13.7	7.78		75.9
1/9/2017	10:40	Richland 1	MB	124.2	15.45	609	5.9	8.02		38.4
1/25/2017	8:12	Richland 1	MB SP	93.7	10.21	574	11.5	8.24	54.27	88.6
1/26/2017	10:04	Richland 1	VL SP	102.4	11.16	659	11.4	8.19		65
1/30/2017	9:48	Richland 1	VL SP	125	14.77	596	8.1	8.4		90.6
2/1/2017	9:26	Richland 1	VL SP	125.9	14.27	589	9.7	7.97		48.7
5/9/2017	9:58	Richland 1	VL SP	104.2	9.79	562	18.3	8.15		261.3
5/11/2017	10:54	Richland 1	VL SP	114.2	10.18	556	20.9	8.25		435.2
5/16/2017	8:30	Richland 1	VL SP	97.2	9.21	573	17.9	8.01		648.8
5/17/2017	8:27	Richland 1	VL SP	91.2	8.46	585	18.9	8.03		214.2
6/1/2017	7:45	Richland 1	VL SP	95.7	8.79	582	19.3	7.6		435.2
7/19/2016	9:09	Richland 2	VL EW	73.9	5.94	579	25.2	7.8	5.30	120.1
7/26/2016	10:08	Richland 2	MB	74.6	6.27	561	24.2	7.86	6.60	40.5
7/27/2016	10:20	Richland 2	VL SP	88.4	7.12	582	24.6	7.97	6.10	84.2
8/1/2016	9:41	Richland 2	VL GWL	82.8	6.9	584	24.3	7.92	7.00	218.7
8/16/2016	11:04	Richland 2	VL SP	87.2	6.89	599	26.2	7.82	4.20	396.8
10/4/2016	10:42	Richland 2	VL SP	94.8	8.7	477	19.1	7.58		478.6
10/5/2016	10:15	Richland 2	VL GWL	92.2	8.1	601	19.1	7.48		547.5
10/6/2016	10:55	Richland 2	MB	85.2	7.8	605	19.5	7.67		260.3
10/13/2016	10:49	Richland 2	MB SP	78.1	7.38	592	18.1	7.77		121.1
10/25/2016	8:31	Richland 2	MB	68.7	6.93	601	14.5	7.31		222.4
1/9/2017	10:25	Richland 2	MB	106.6	13.11	615	6.1	8.27		76.7
1/25/2017	9:35	Richland 2	VL	94.3	10	583	12.2	7.28		129.6
1/26/2017	9:40	Richland 2	MB	103.4	11.28	579	11.4	8.27		88.2
1/30/2017	9:30	Richland 2	VL SP	106.6	12.99	549	6.9	8.57		248.1
2/1/2017	9:48	Richland 2	VL SP	101.3	11.38	582	9.9	8.13		62.4
5/9/2017	9:41	Richland 2	VL SP	86.6	8.18	554	17.8	8.2		206.4
5/11/2017	10:33	Richland 2	VL SP	82.4	7.45	544	20	8.15		224.7
5/16/2017	10:22	Richland 2	VL SP	86.4	8.07	561	18.6	8.15		686.7
5/17/2017	10:19	Richland 2	SP	80	7.44	622	18.7	7.98		1011.2
5/31/2017	10:52	Richland 2	VL SP	80.4	7.32	544	19.8	7.57		866.4
7/19/2016	9:12	Richland 3	MB SP	87.5	7.19	624	25.6	8.3	0.06	325.5

Table 13A.1 – TMDL Monitoring Data for FY17 (Continued)

Date	Time	Site Name	Samplers	DO	DO	Cond.	Temp.	pH	Flow	*E. coli*
			(initials)	%	mg/L	uS	Celcius		cfs	mpn
7/26/2016	8:42	Richland 3	MB	83.3	7.04	610	23.9	8.02	0.15	1119.9
7/27/2016	9:16	Richland 3	VL SP	77.4	7.56	568	24.2	7.56	0.00	1413.6
8/1/2016	9:14	Richland 3	MB SP	88.1	7.35	631	24.2	8.19	0.30	816.4
8/16/2016	9:31	Richland 3	VL SP	90.8	7.2	710	26.1	7.25	0.00	22.8
10/4/2016	9:09	Richland 3	VL SP	68.9	6.51	566	17.9	7.22		38.8
10/5/2016	9:12	Richland 3	VL GWL	80.9	7.45	631	19.1	7.03		36.4
10/6/2016	9:15	Richland 3	MB	69.5	6.58	824	17.7	7.48		64.0
10/13/2016	9:05	Richland 3	MB SP	55.8	5.33	595	17.5	7.47		123.4
10/25/2016	9:27	Richland 3	MB	59.3	6.12	489	13.8	7.35		488.4
1/9/2017	9:06	Richland 3	MB	101.3	13.22	647	4.1	8.2		86.3
1/25/2017	8:10	Richland 3	VL	105.7	11.75	561	10.5	7.42		328.2
1/26/2017	8:15	Richland 3	MB	111.3	13	563	8.4	8.65		1732.9
1/30/2017	8:27	Richland 3	VL SP	114.4	14.47	579	5.3	8.47		387.3
2/1/2017	7:02	Richland 3	MB VL	89.3	10.67	597	7.6	8.13		686.7
5/9/2017	8:53	Richland 3	VL SP	109.5	10.54	546	17.1	8.33		290.9
5/11/2017	9:04	Richland 3	VL SP	104.1	9.44	543	19.7	8.25		410.6
5/16/2017	9:35	Richland 3	VL SP	120.4	11.34	558	18.2	8.28		1732.9
5/17/2017	9:37	Richland 3	VL	129.6	11.75	568	20.1	8.05		2419.6
5/31/2017	8:32	Richland 3	VL SP	108.1	10.27	559	17.8	8.13		980.4
7/26/2016	9:32	Sugartree	MB	59.3	5.15	640	21.9	7.3		435.2
7/27/2016	10:05	Sugartree	VL SP	67.9	5.84	642	22.5	7.36	0.00	285.1
8/1/2016	10:15	Sugartree	VL GWL	68.2	5.95	651	22	7.41	0.00	524.7
8/16/2016	10:23	Sugartree	VL SP	72.9	5.85	661	24.2	7.43	0.22	866.4
8/17/2016	9:52	Sugartree	MB VL SP	64	5.36	626	22.6	7.34	0.57	166.4
10/4/2016	10:01	Sugartree	VL SP	57.8	5.26	498	19.1	7.29		103.9
10/5/2016	9:48	Sugartree	VL GWL	65.7	6.1	691	18.4	7.2		218.7
10/6/2016	10:04	Sugartree	MB	31.9	0	636	18.9	7.05		435.2
10/13/2016	9:40	Sugartree	MB SP	37.6	2.93	516	20.7	7.19		248.9
10/25/2016	10:15	Sugartree	MB	21.6	2.05	562	17.9	7.02		209.8
1/9/2017	9:45	Sugartree	MB		10.75	617	9.4	7.67		81.3
1/25/2017	8:49	Sugartree	VL	89.1	9.68	597	11.5	7.03		166.4
1/26/2017	9:00	Sugartree	MB	86.6	9.45	586	11.5	7.82		51.2
1/30/2017	9:01	Sugartree	VL SP	82.5	9.12	586	10.6	7.64		44.1
2/1/2017	10:24	Sugartree	VL SP	101.9	10.91	570	12.2	9.11		52
5/9/2017	9:15	Sugartree	VL SP	70.5	6.75	576	17.4	7.77		1046.2
5/11/2017	9:35	Sugartree	VL SP	67.4	6.22	555	18.3	7.42		185
5/16/2017	10:00	Sugartree	VL SP	70	6.71	583	17.5	7.48		159.7
5/17/2017	10:02	Sugartree	SP	50.2	4.82	543	17.1	7.39		135.4
5/31/2017	10:37	Sugartree	VL SP	61.8	5.77	579	18.3	7.14		185
8/17/2016	10:29	Unnamed trib to Richland	MB VL SP	104.3	8.88	757	23.1	8.11	0.23	19.7
7/19/2016	9:32	Vaughns Gap 1	MB SP	75.6	6.48	631	23.2	8.14	2.36	325.5
7/26/2016	9:00	Vaughns Gap 1	MB	84.3	7.3	618	22.4	8.07	1.32	90.8
7/27/2016	9:31	Vaughns Gap 1	VL SP	106.1	9.2	616	22.2	8.1	0.74	127.4
8/1/2016	9:30	Vaughns Gap 1	MB SP	86.5	7.45	648	22.6	8.15	1.31	261.3
8/16/2016	9:53	Vaughns Gap 1	VL SP	86	7.26	566	23.7	8.07	0.76	272.3
10/4/2016	9:24	Vaughns Gap 1	VL SP	98	9.41	532	17.2	7.81		167.0
10/5/2016	9:25	Vaughns Gap 1	VL GWL	67.9	6.33	677	18.2	7.44		260.3
10/6/2016	9:27	Vaughns Gap 1	MB	70.8		691	17.9	8		123.6
10/13/2016	9:17	Vaughns Gap 1	MB SP	77.2	7.41	682	17.2	8.09		125.9

Table 13A.1 – TMDL Monitoring Data for FY17 (Continued)

Date	Time	Site Name	Samplers	DO	DO	Cond.	Temp.	pH	Flow	*E. coli*
			(initials)	%	mg/L	uS	Celcius		cfs	mpn
10/25/2016	9:46	Vaughns Gap 1	MB	85.2	8.81	664	13.8	8.03		101.7
1/9/2017	9:20	Vaughns Gap 1	MB	100.3	12.12	625	17.1	8.08		66.3
1/25/2017	8:26	Vaughns Gap 1	VL	88.5	9.33	581	12.7	8.07		117.8
1/26/2017	8:35	Vaughns Gap 1	MB	98.3	10.75	584	11.3	8.18		95.9
1/30/2017	8:38	Vaughns Gap 1	VL SP	91.3	10.39	526	8.9	8.12		121.1
2/1/2017	6:50	Vaughns Gap 1	MB VL	82.1	9.21	625	10	8.07		90.8
5/9/2017	8:38	Vaughns Gap 1	VL SP	84.6	8.21	552	16.7	7.86		201.4
5/11/2017	9:17	Vaughns Gap 1	VL SP	84.3	7.86	558	18.4	7.93		116.9
5/16/2017	9:28	Vaughns Gap 1	VL SP	84.1	8.07	590	17	7.94		61.3
5/17/2017	9:22	Vaughns Gap 1	VL	82.2	7.63	589	18.6	7.73		224.7
5/31/2017	8:48	Vaughns Gap 1	VL SP	78.5	7.54	590	17.3	7.79		111.2
7/19/2016	8:55	Vaughns Gap 2	MB SP	95.9	8.01	669	24.3	8.16	0.49	1732.9
7/26/2016	8:20	Vaughns Gap 2	MB	96.7	8.26	637	23.1	8.08	0.45	163.1
7/27/2016	8:55	Vaughns Gap 2	VL SP	97.5	8.32	847	23.2	8.03	0.50	129.6
8/1/2016	8:56	Vaughns Gap 2	MB SP	103.1	8.73	672	23.5	8.14	0.54	178.5
8/16/2016	9:07	Vaughns Gap 2	VL SP	99.1	8.38	632	23.6	8.03	0.21	73.8
10/4/2016	8:51	Vaughns Gap 2	VL SP	132.3	12.69	595	17.4	7.95		190.4
10/5/2016	9:00	Vaughns Gap 2	VL GWL	102	9.57	716	18.3	7.78		166.4
10/6/2016	9:00	Vaughns Gap 2	MB	101.3	9.63	738	17.7	8.08		261.3
10/13/2016	8:50	Vaughns Gap 2	MB SP	89	8.53	584	17.3	7.88		155.3
10/25/2016	9:12	Vaughns Gap 2	MB	94.8	9.74	673	14	7		161.6
1/9/2017	8:53	Vaughns Gap 2	MB	111.6	13.72	659	6.4	8.1		83.9
1/25/2017	7:42	Vaughns Gap 2	VL	103.3	11.46	586	12	7.71		107.1
1/26/2017	7:55	Vaughns Gap 2	MB	103.5	11.54	598	10.5	8.24		70.3
1/30/2017	8:17	Vaughns Gap 2	VL SP	111.5	13.1	647	8.2	8.24		31.7
2/1/2017	7:10	Vaughns Gap 2	MB VL	95.1	10.97	646	9	8.06		21.1
5/9/2017	9:00	Vaughns Gap 2	VL SP	96.9	9.34	544	17	7.99		137.6
5/11/2017	8:53	Vaughns Gap 2	VL SP	95.8	8.87	683	19	7.92		920.8
5/16/2017	9:48	Vaughns Gap 2	VL SP	99	9.34	721	18.2	7.97		866.4
5/17/2017	9:50	Vaughns Gap 2	SP	98.2	9.13	659	18.5	8.02		145.5
5/31/2017	8:15	Vaugns Gap 2	VL SP	93.8	8.98	560	17.4	7.82		93.3
10/25/2016	10:34	West Fork Browns	VL SP	89.9	8.95	533	15.5	7.73		344.1
1/26/2017	7:40	West Fork Browns	VL SP	84.3	8.93	529	12.2	7.85		27.2
2/1/2017	10:45	West Fork Browns	VL SP	112.2	11.62	497	13.7	8.18		4.1
7/12/2016	11:26	West Fork Browns	VL SP	97.2	8.65	982	20.6	7.78	2.12	165.8
7/13/2016	9:59	West Fork Browns	VL SP	91.1	8.23	526	20.1	7.79	2.14	410.6
7/14/2016	11:01	West Fork Browns	VL SP	116.5	10.49	630	20.4	7.78	2.21	191.8
7/18/2016	11:38	West Fork Browns	VL EW	95	8.73	512	19.5	7.74	1.80	193.5
7/26/2016	10:28	West Fork Browns	VL SP	89.9	8	520	20.7	7.83	1.66	206.4
10/5/2016	10:10	West Fork Browns	MB SP	95.2	8.74	526	19.4	7.82		222.4
10/6/2016	10:45	West Fork Browns	VL SP	94.6	8.73	403	19.2	7.85		410.6
10/11/2016	10:30	West Fork Browns	VL SP	93.4	8.95	522	17.2	7.94		344.8
10/17/2016	10:39	West Fork Browns	MB SP	92.3	8.48	525	19.5	8		275.5
1/9/2017	10:40	West Fork Browns	VL SP	93.2	10.42	520	10.4	8.05		31.3
1/24/2017	9:04	West Fork Browns	VL SP	96.4	10.19	520	12.8	8.16		83.9
1/31/2017	10:31	West Fork Browns	VL SP	107.5	11.15	500	13.6	8.02		1
5/9/2017	12:17	West Fork Browns	VL SP	93	8.77	498	18.1	7.91		184.2
5/10/2017	11:33	West Fork Browns	VL SP	98.2	9.31	497	17.9	7.81		240
5/16/2017	12:17	West Fork Browns	VL SP	100.7	9.78	501	7.76	17.8		77.1
5/18/2017	8:45	West Fork Browns	VL SP	99.6	9.42	536	18.2	7.8		98.5
6/1/2017	11:15	West Fork Browns	VL SP	91.1	8.6	509	17.8	7.48		114.5

Table 13A.2 - SWMP Quantifiable Statistics

Categories	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17
Recycled Oil (tons)	17.82	20.27	26.88	35.38	36.4	35.32	36.52	28.15	33	23.31	18.85	32.73
Recycled Glass (tons)	1,107.05	1,116.52	1,607.48	2,110.05	1,866.14	2,207.29	2,160.19	2,199.85	2,136.16	1,654.97	2,264.46	2,339.31
Total Brush Collection (tons)	30,498.85	30,269.40	27,785.25	30,972.21	29,456.10	38,634.89	32,795.37	28,486.59	27,178.37	21,014.68	26,742.01	31,893.67
Total Waste Collected (tons)	150,972.54	152,430.24	153,266.01	149,474.79	151,425.06	151,501.17	148,297.40	151,131.01	153,795.70	155,738.78	163,340.77	162,884.18
# of Water Quality Complaints (non-construction) Investigations Initiated in Database	287	156	135	133	139	138	122	131	114	99	100	107
# of Construction Stormwater-Related Inspections	5,721	6,552	6,327	6,160	5,079	5,457	5,843	5,170	6,064	6,082	6,684	6,787
# of Grading Permits Issued	252	239	165	109	121	135	142	138	318	276	254	262
# of Engineered Plans Submitted to Stormwater Development and Review	1,427	1,505	1,970	1,600	1,367	1,319	1,525	1,791	1,813	2,572	3,034	3,636
# of Construction Plans Approved or Declared No Permit Needed by Stormwater Development and Review	507	619	871	687	506	559	1,174	1,411	1,360	1,998	1,450	1,419
# of Stormwater Enforcements (NOVs and SWOs)	283	190	342	188	123	148	94	96	168	128	116	159

Table 13A.3 – Ambient Monitoring Data for the FY17 Reporting Period

Date	Site Name	Time	Samplers (initials)	DO	DO	Cond.	Temp.	pH	Flow	*E. coli*	BOD5	COD	NH3	TKN	NO3+NO2	Diss. P	Total P	Lead	Zinc	Cr	Cu	Nickel	O and G	TSS	TDS
				%	mg/L	uS	C		ft3/sec	mpn	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	mg/L	mg/L
1/25/2017	Davidson	7:45	MB SP	92.5	10.13	555	11.2	8.21	2.030	74.9	3	<20	0.9568	ND	<0.1	0.1806	0.2585	<0.001	<0.001	<0.001	<0.001	<0.001	<5	8	346
1/25/2017	Richland 1	8:12	MB SP	93.7	10.21	574	11.5	8.24	54.240	88.6	2	<20	<0.4	0.714	2.6882	0.1903	0.23	<0.001	<0.001	<0.001	<0.001	<0.001	<5	1	351
1/25/2017	Browns 2	8:45	MB SP	93.8	9.94	568	12.7	8.23	31.205	261.3	2	<20	<0.4	ND	2.9669	0.2194	0.167	<0.001	<0.001	<0.001	<0.001	<0.001	<5	5	348
1/25/2017	Trip blank										<2	<20	<0.4	ND	<0.1	<0.15	<0.15	<0.001	<0.001	<0.001	<0.001	<0.001	<5	<1	<1
4/10/2017	Richland 1	8:14	VL SP	84.3	8.45	560	15	7.88	13.338	93.3	7	<20	<0.4	0.251	0.932	0.16	0.1669	<0.001	<0.001	<0.001	<0.001	<0.001	<5	<1	351
4/10/2017	Davidson	8:48	VL SP	87.8	9.04	596	14	8.01	0.099	95.9	6	<20	<0.4	0.3868	0.1928	0.19	0.2134	<0.001	<0.001	<0.001	<0.001	<0.001	<5	<1	404
4/10/2017	Browns 2	9:41	VL SP	114.5	11.59	548	15.4	8.38	4.099	93.3	5	<20	<0.4	0.2517	1.3085	0.26	0.2657	<0.001	0.006	<0.001	<0.001	<0.001	<5	<1	367
4/10/2017	Field Blank										5	<20	<0.4	ND				<0.001	<0.001	<0.001	<0.001	<0.001	<5	<1	<1
6/8/2017	Browns 2	1:18	VL SP	95.7	8.66	555	19.8	7.96	7.298	344.8	<2	<20	<0.4	ND	1.8614	0.2986	0.344	<0.001	0.006	<0.001	<0.001	<0.001	<5	<1	350
6/8/2017	Davidson	1:50	VL SP	94.1	8.45	568	20.2	8.09	0.162	285.1	<2	<20	<0.4	ND	0.3746	0.3277	0.4179	<0.001	0.005	<0.001	<0.001	<0.001	<5	9	364
6/8/2017	Richland 1	2:18	VL SP	116.5	10.15	526	22.1	8.21	29.477	260.3	<2	<20	<0.4	ND	1.456	0.2852	0.3095	<0.001	0.005	<0.001	<0.001	<0.001	<5	<1	324
6/28/2017	Richland 1	9:00	VL SP	91	8.2	552	19.9	8.05	25.808	84.5	<2	<20	<0.4	ND	1.4628	0.308	0.231	<0.001	0.005	<0.001	<0.001	<0.001	<5	<1	369
6/28/2017	Davidson	9:35	VL SP	85	7.8	551	19.1	8.01	0.688	52	<2	<20	<0.4	ND	0.4075	0.374	0.3	<0.001	0.003	<0.001	<0.001	<0.001	<5	3	374
6/28/2017	Browns 2	8:20	VL SP	94	8.6	523	18.7	7.76	7.368	344.8	<2	31	<0.4	0.521	2.092	0.521	0.319	<0.001	0.003	<0.001	<0.001	<0.001	<5	1	346
6/28/2017	Davidson Dup	9:35	VL SP	84	7.8	550	19.1	8.06		43.5	<2	<20	<0.4	ND	0.393	0.416	0.327	<0.001	0.006	<0.001	<0.001	<0.001	<5	5	377

Table 13A.4 – Wet Weather Monitoring for the FY17 Reporting Period

Date	Time	Site Name	Flow	*E. coli*	BOD 5	COD	NH3	TKN	$NO_3 + NO_2$	Total N	Diss. P	P	Pb	Zn	Cr	Cu	Ni	O and G	Sus. Solids	Diss. Solids
Unit			cfs	MPN	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	mg/L	mg/L
7/14/2016	14:04	Comm 1 HR	0.562	16640.0	12	119	0.300	0.913	0.386	<Null>	0.141	0.438	2.70	130.00	<2	14.90	<5		81.2	51
7/14/2016	13:04	Comm FF	0.351	12.1	90	469	0.164	4.800	2.810	7.610	0.326	0.935	5.97	306.00	3.74	41.50	6.27		59.6	531
11/28/2016	18:00	Ind 1 HR	0.004	1732.9	29	74	<0.1	0.649	0.350	0.999	0.275	0.443	1.86	55.80	<2	5.72	<5	3.40	31.0	63
11/28/2016	17:00	Ind FF	0.004	1986.3	34	76	<0.1	0.556	0.302	0.858	0.275	1.080	1.79	48.10	<2	5.55	<5	5.20	21.2	79
11/28/2016	19:15	Res 1Hr***	0.0001	6130.0	<5	<20	<0.1	2.230	<0.25	2.230	1.080	1.700	<1.5	14.10	<2	67.80	<5	2.20	<4	<20
11/28/2016	18:15	Res FF	0.010	1986.3	49	164	0.150	3.670	0.590	4.260	0.415	1.510	5.37	186.00	<2	8.45	<5	2.80	118.0	62
1/11/2017	7:25	Ind 1 HR	0.079	2419.6	10	27	<0.1	0.265	0.336	0.601	<0.02	0.174	<1.5	33.50	<2	<4	<5	5.10	6.8	46
1/11/2017	6:25	Ind FF	0.027	307.6	<5	22	<0.1	0.291	<0.25	0.291	0.052	0.244	<1.5	57.10	<2	<4	<5	16.10	18.4	67
1/17/2017	8:09	Res 1Hr	0.004	29090.0	<5	34	<0.1	1.070	0.847	1.917	0.768	1.260	<1.5	29.00	<2	<4	<5	9.90	23.6	63
1/17/2017	7:09	Res FF	0.0002	22470.0	<5	<20	<0.1	0.676	0.318	0.994	0.191	0.240	<1.5	160.00	<2	<4	<5	13.70	<4	<20

*** This sample was run at 1:10 dilution because there was not enough volume with the exception of Oil and Grease

Table 13A.5 – MS4 Permit Benthic Monitoring Data for the FY17 Reporting Period

Davidson 09/13/2016	Biometrics	SQSH SCORE	Habitat Score (Target ≥127)	Davidson 04/11/2017	Biometrics	SQSH SCORE	Habitat Score (Target ≥127)
TOTAL NO. OF ORGANISMS	171			TOTAL NO. OF ORGANISMS	161		
TOTAL NO. OF TAXA	24	4		TOTAL NO. OF TAXA	26	4	
EPT	7	4		EPT	6	2	
%EPT-CHEUM	15.79%	0		%EPT-CHEU	12.42%	0	
%OC	6.43%	6		%OC	36.02%	4	
NCBI	5.14	4		NCBI	5.78	4	
%CLINGERS	49.12%	4		%CLINGERS	20.62%	2	
%TNUTOL	23.39%	6		%TNUTOL	39.75%	4	
		28	**130**			**20**	**142**
Browns Creek 09/20/2016	**Biometrics**	**SQSH SCORE**	**Habitat Score (Target ≥127)**	**Browns Creek 05/15/2017**	**Biometrics**	**SQSH SCORE**	**Habitat Score (Target ≥127)**
TOTAL NO. OF ORGANISMS	184			TOTAL NO. OF ORGANISMS	198		
TOTAL NO. OF TAXA	22	4		TOTAL NO. OF TAXA	28	6	
EPT	7	4		EPT	7	4	
%EPT-CHEUM	33.70%	4		%EPT-CHEU	13.13%	0	
%OC	10.87%	6		%OC	14.65%	6	
NCBI	6.07	4		NCBI	6.39	4	
%CLINGERS	20.65%	2		%CLINGERS	18.18%	2	
%TNUTOL	56.52%	2		%TNUTOL	59.60%	2	
		26	**125**			**24**	**119**

Table 13A.5 – MS4 Permit Benthic Monitoring Data for the FY17 Reporting Period (Continued)

Richland Creek 09/21/2016	Biometrics	SQSH SCORE	Habitat Score (Target ≥127)	Richland Creek 05/08/2017	Biometrics	SQSH SCORE	Habitat Score (Target ≥127)
TOTAL NO. OF ORGANISMS	204			TOTAL NO. OF ORGANISMS	204		
TOTAL NO. OF TAXA	26	4		TOTAL NO. OF TAXA	22	4	
EPT	6	2		EPT	5	2	
%EPT-CHEUM	37.75%	4		%EPT-CHEU	15.69%	0	
%OC	12.25%	6		%OC	28.43%	4	
NCBI	4.85	6		NCBI	5.57	4	
%CLINGERS	50.98%	4		%CLINGERS	46.56%	4	
%TNUTOL	38.24%	4		%TNUTOL	33.82%	4	
		30	**161**			**22**	**169**

Richland Creek 09/21/2016 - Duplicate	Biometrics	SQSH SCORE	Habitat Score (Target ≥127)
TOTAL NO. OF ORGANISMS	239		
TOTAL NO. OF TAXA	22	4	
EPT	6	2	
%EPT-CHEUM	35.15%	4	
%OC	8.79%	6	
NCBI	5.18	4	
%CLINGERS	46.03%	4	
%TNUTOL	52.30%	4	
		28	**165**

Table 13A.6 – Benthic Monitoring Data for TMDL Streams during FY17 Reporting Period

Trib to Stoners 08/07/2016	Biometrics	SQSH SCORE	Habitat Score (Target ≥127)
TOTAL NO. OF ORGANISMS	208		
TOTAL NO. OF TAXA	25	4	
EPT	4	2	
%EPT-CHEUM	25.00%	2	
%OC	20.19%	6	
NCBI	5.26	4	
%CLINGERS	67.79%	6	
%TNUTOL	55.77%	2	
		26	**116**
West Branch Hurricane 08/12/2016	**Biometrics**	**SQSH SCORE**	**Habitat Score (Target ≥111)**
TOTAL NO. OF ORGANISMS	238		
TOTAL NO. OF TAXA	19	2	
EPT	5	4	
%EPT-CHEUM	52.94%	6	
%OC	10.50%	6	
NCBI	3.79	6	
%CLINGERS	57.14%	6	
%TNUTOL	25.21%	6	
		36	**92**

Table 13A.7 – Post-Construction SCM Sampling Performed during MS4 Permit Term

SCM Type	Influent/ Effluent	Location	Rainfall (inches)	Date	TSS (mg/l)	O&G (mg/l)	TKN (mg/l)	Ammonia as N (mg/l)	Nitrate/ Nitrite (mg/l)	Total Phosphorus (mg/l)	Dissolved Phosphorus (mg/l)	Total Coliform (MPN)	Total *E. coli* (MPN)
Bioretention (1)	Effluent	1607 County Hospital Road	[5]0.08	3/19/2015	No Discharge to Underdrain								
Bioretention (2)	Influent	TSU	[5]3.19	4/28/2014	ND	ND	0.903	ND	ND	0.039	0.03	NS	NS
Bioretention (2)	Effluent	TSU	[5]3.19	4/28/2014	ND	ND	17.1	ND	0.556	0.228	0.167	NS	NS
Bioretention (3)	Influent	1607 County Hospital Road Cell 1	[2] 0.8 (FF)	11/18/2015	170	3.81	2.06	1.99	0.275	3.34	1.17	>2419.6	>2419.6
Bioretention (3)	Effluent	1607 County Hospital Road Cell 1	[2] 0.8 (FF)	11/18/2015	No Discharge to Underdrain								
Bioretention (4)	Influent	1607 County Hospital Road Cell 2	[2] 0.8 (FF)	11/18/2015	30.8	172	1.2	ND	0.277	0.715	0.288	>2419.6	>2419.6
Bioretention (4)	Effluent	1607 County Hospital Road Cell 2	[2] 0.8 (FF)	11/18/2015	ND	5.95	0.754	ND	0.329	0.346	0.264	>2419.6	>2419.6
Bioretention (5)	Effluent	1607 County Hospital Road	[5]0.24	2/29/2016	No Discharge to Underdrain								
Bioretention (6)	Effluent	1607 County Hospital Road	[2] 0.9	8/19/2016	No Discharge to Underdrain								
Dry Pond (1)	Influent	TSU	[5]1.61	5/14/2014	10.4	ND	ND	ND	ND	0.027	0.043	NS	NS
Dry Pond (1)	Effluent	TSU	[5]1.61	5/14/2014	9.6	1.5	ND	0.122	ND	0.311	0.043	NS	NS
Dry Pond (2)	Influent	1608 County Hospital Road	[1,3] 1.73	10/27/2015	ND	4.1	ND	ND	ND	0.057	0.053	>2419.6	48.0
Dry Pond (2)	Effluent	1608 County Hospital Road	[1,3] 1.73	10/27/2015	ND	ND	ND	ND	ND	0.105	0.098	>2419.6	517.2
Dry Pond (3)	Influent	1608 County Hospital Road	[2] 0.8 (FF)	11/18/2015	ND	3.7	ND	ND	0.313	ND	0.043	>2419.6	71.7
Dry Pond (3)	Effluent	1608 County Hospital Road	[2] 0.8 (FF)	11/18/2015	ND	3.7	ND	ND	0.33	0.077	0.0602	>2419.6	41.1
Dry Pond (4)	Influent	1607 County Hospital Road	[5] 0.39	1/11/2017	No flow through Inlet Structure								
Dry Pond (4)	Effluent	1607 County Hospital Road	[5] 0.39	1/11/2017	No Discharge through Outlet Structure								
Dry Pond (5)	Influent	1608 County Hospital Road	[5] 0.39	1/11/2017	No flow through Inlet Structure								
Dry Pond (5)	Effluent	1608 County Hospital Road	[5] 0.39	1/11/2017	No Discharge through Outlet Structure								
Green Roof (1)	Effluent	1900 Davidson Road	[2] 1.0	9/17/2016	NS	NS	1.23	ND	ND	0.121	0.069	NS	NS
Green Roof (2)	Effluent	1900 Davidson Road	[5] 1.12	11/28/2016	No Discharge to Rain Chain								
Green Roof (3)	Effluent	1900 Davidson Road	[2] 0.84	12/6/2016	ND	5.8	0.879	ND	ND	0.101	0.108	NS	NS
Green Roof (4)	Effluent	1900 Davidson Road	[5] 0.39	1/11/2017	No Discharge to Rain Chain								

Table 13A.7 – Post-Construction SCM Sampling Performed during MS4 Permit Term (Continued)

SCM Type	Influent/ Effluent	Location	Rainfall (inches)	Date	TSS (mg/l)	O&G (mg/l)	TKN (mg/l)	Ammonia as N (mg/l)	Nitrate/ Nitrite (mg/l)	Total Phosphorus (mg/l)	Dissolved Phosphorus (mg/l)	Total Coliform (MPN)	Total *E. coli* (MPN)
Pervious Pavement (2)	Effluent	1607 County Hospital Road	[5]0.08	3/18/2015	No Discharge to Biorentention Cell 1								
Pervious Pavement (3)	Effluent	1607 County Hospital Road	[2] 0.8 (FF)	11/18/2015	No Discharge to Biorentention Cell 1								
Pervious Pavement (4)	Effluent	1607 County Hospital Road	[5]0.24	2/29/2016	No Discharge to Biorentention Cell 1								
Pervious Pavement (5)	Effluent	1607 County Hospital Road	[2] 0.9	8/19/2016	No Discharge to Biorentention Cell 1								
Wet Pond (1)	Influent	25 Vantage Way (Nissan)	[5] 1.12	11/28/2016	37.2	21.7	1.15	0.119	0.654	0.82	0.457	NS	NS
Wet Pond (1)	Effluent	26 Vantage Way (Nissan)	[5] 1.12	11/28/2016	No discharge through outfall								
Wet Pond (2)	Influent	Nossi School of Art	[2] 0.84	12/6/2016	10.4	9	0.218	ND	ND	0.16	0.8	NS	NS
Wet Pond (2)	Effluent	Nossi School of Art	[2] 0.84	12/6/2016	10	7.8	0.312	ND	0.56	0.156	0.104	NS	NS
Wet Pond (3)	Influent	26 Vantage Way (Nissan)	[5] 0.39	1/11/2017	No Flow to Inlet Structure								
Wet Pond (3)	Effluent	26 Vantage Way (Nissan)	[5] 0.39	1/11/2017	No discharge through outfall								
Wet Pond (4)	Influent	Nossi School of Art	[5] 0.39	1/11/2017	No Flow to Inlet Structure								
Wet Pond (4)	Effluent	Nossi School of Art	[5] 0.39	1/11/2017	10	7.8	0.312	ND	0.56	0.156	0.104	NS	NS
WQ Unit (1)	Influent	1608 County Hospital Road (Threads)	[1,3] 1.73	10/27/2015	ND	ND	ND	ND	ND	0.067	0.064	>2419.6	46.4
WQ Unit (1)	Effluent	1608 County Hospital Road (Threads)	[1,3] 1.73	10/27/2015	ND	4.1	ND	ND	ND	0.057	0.053	>2419.6	48.0
WQ Unit (2)	Influent	1608 County Hospital Road (Threads)	[2,4] 0.8 (FF)	11/18/2015	7.2	4.37	ND	ND	0.306	0.088	0.043	>2419.6	63.7
WQ Unit (2)	Effluent	1608 County Hospital Road (Threads)	[2,4] 0.8 (FF)	11/18/2015	ND	3.7	ND	ND	0.313	ND	0.043	>2419.6	71.7
WQ Unit (3)	Influent	1608 County Hospital Road (Threads)	[5] 0.39	1/11/2017	No discharge to Bioretention								
WQ Unit (3)	Effluent	1608 County Hospital Road (Threads)	[5] 0.39	1/11/2017	No discharge through Outlet Structure								

[1] BNA Rain Gauge
[2] Portable Rain Gauge at Site
[3] After Annual Maintenance
[4] Bypassing
[5] Climate Data Website

ND = Non Detect
NS = Not Sampled

4.0 Supporting Program Data

The following is supplemental data that supports Metro Nashville's MS4 Permit Compliance:

MWS Internal Employee Newsletter Write-up on Adopt a Storm Drain Program

Adopt-A-Storm Drain program encourages clean drains

Have you ever thought much about a storm drain? Not a very exciting topic, for sure, but storm drains are more important than you might think. Storm drains collect rain water from our roadways and parking lots and ultimately convey that water to local streams and rivers where Metro and other communities ultimately withdraw and treat as a source of drinking water. So if you think about it, storm drains are one of the first lines of defense to pollution and other contaminants that could enter our precious watersheds. In addition to protecting our water supply, these storm drains are critically important to maintaining a safe environment for Nashville motorists. Trash and debris can clog storm drains and intensify roadway flooding conditions. While we have amazing stormwater maintenance crews that proactively clean storm drains around the city, the scope of this activity has become enormous. In Metro Nashville alone, we have approximately 60,000 public and private storm drains.

MWS Internal Employee Newsletter Write-up on Adopt a Storm Drain Program

So, in an attempt to improve our defenses to pollution and infrastructure clogging sources, MWS is embarking on a new collaborative effort with a local non-profit organization (Water City USA) to start a volunteer Storm Drain Adoption Program. The goal of the program will be to empower Nashville's citizens to take proactive actions in detecting and preventing stormwater pollution and infrastructure clogging issues. The Storm Drain Adoption Program will allow residents and businesses alike to utilize the latest technology (smart phones and tablets) to adopt storm drains in the area that they live or work. As citizens adopt these storm drains, they will take on specific responsibilities, such as performing routine inspections and cleanings of the grate covers and reporting major observations of pollution or infrastructure failures to the proper agencies. Of course, all of the volunteers will be guided on proper safety considerations in monitoring their storm drains. MWS and Water City USA intends to kick off the Storm Drain Adoption Program in November with the initial focus on two pilot areas located in the Belmont and 12th South neighborhoods. Focusing the initial storm drain adoptions to these pilot areas will allow MWS and Water City USA to further refine the program so the most effective Storm Drain Adoption Program can be extended out to the remainder of Metro Nashville.

Example Weekly Grounds Inspection Form by MDPW Staff at 5th Street Maintenance Facility

Weekly Grounds Inspection Form
(Form to be filled out and signed by each week.)
(Records shall be kept within Appendix C of this document for a period of no less than 3 years)

Date of Inspection: 7-19-16		Inspector Name (Printed)	Ernie Kuhlan
Time of Inspection: 8:00 Am		Inspector Name (Signature)	Ernie Kuhlan
Salt Storage/Brine Tanks:	☑ Ok	☐ Not OK	Notes:
Equipment Storage/ Maintenance Areas	☑ Ok	☐ Not OK	Notes:
Fueling/ Oil/Storage Areas:	☑ Ok	☐ Not OK	Notes:
Chemical Storage Areas (i.e. fertilizers, paints, pesticides, cleaners, etc.):	☑ Ok	☐ Not OK	Notes:
Dumpsters/Disposal Areas	☐ Ok	☑ Not OK	Notes: Debri around Dumpster

Notes on Follow-up Actions Performed:
Clean up around Dumpster

Various Stats Tracked for the Water Quality Improvement Project with the Cumberland River Compact

	Current Project			Past Project	Total of Both Projects
Data as of: 8/31/2017	3/1/15-Present (2/28/20)			3/1/09-3/1/15	3/12/09-Present (2/28/20)
Partnership Progress Summary Table	W-QIP			SEP	Total
	W-QIP	Current	%	SEP	Completed to date
SEP Goal Criteria	Goal	# Done	Done	Total	
Facilitate 50 rain gardens being built/yr for 5 years	250	150	60%	300	450
Facilitate planting of 12,500 trees 1/2" or greater	12,500	10671	85%	12,486	23,157
Educate 10,000 Davidson County residents about green infrastructure	12,500	32,687	261%	69,115	101,802
Recreation Opportunities on the River	12,500	8,838	71%		8,838
Facilitate the adoption of at least 25 stream segments	25	24	96%	16	40
Remove impermeable pavement (reporting square footage removed)	NA	3000		0	3000
start date =	3/1/2015				
end date =	2/28/2020				

MWS - CRC WQIP Status Update	Current Project			Past Project	Total of Both Projects
Data as of: 5/31/17	3/1/15-Present (2/28/20)			3/1/09-3/1/15	3/12/09-Present (2/28/20)
Partnership Progress Summary Table	W-QIP			SEP	Total
	W-QIP	Current	%	SEP	Completed to date
SEP Goal Criteria	Goal	# Done	Done	Total	
Facilitate 50 rain gardens being built/yr for 5 years	250	149	60%	300	449
Facilitate planting of 12,500 trees 1/2" or greater	12,500	10,671	85%	12,486	23,157
Educate 10,000 Davidson County residents about green infrastructure	12,500	32,353	259%	69,115	101,468
Recreation Opportuities on the River	12,500	6,800	54%		
Facilitate the adoption of at least 25 stream segments	25	22	88%	16	38
start date =	3/1/2015				
end date =	2/28/2020				

Example Summary Report from the TNSA "TAB" Public Education Program – Public Service Announcements (MWS contributing partner via TNSA)

Tennessee Stormwater Association
Tennessee Association of Broadcasters Public Education Program
Summary Report - May, 2017

Station (s)	City	Region	Units		Total
WUCT	Algood / Cookeville	Middle	82	$	369.60
WMPS	Bartlett	West	12	$	600.00
WBXE FM	Baxter / Cookeville	Middle	105	$	1,249.50
WMOD FM	Bolivar	West	45	$	281.25
WRKM	Carthage	Middle	28	$	220.50
WUCZ FM	Carthage	Middle	32	$	308.75
WDEF FM	Chattanooga	East	8	$	531.43
WDOD FM	Chattanooga	East	8	$	531.43
OTLW HD	Clarksville	Middle	34	$	510.00
WCVQ FM	Clarksville	Middle	32	$	960.00
WCVQ HD 2-SUNNY	Clarksville	Middle	28	$	420.00
WKFN	Clarksville	Middle	31	$	930.00
WRND FM	Clarksville	Middle	31	$	930.00
WVVR FM	Clarksville	Middle	39	$	1,170.00
WZZP FM	Clarksville	Middle	29	$	870.00
WYSH AM	Clinton	East	30	$	300.00
WCRV	Collierville / Memphis	West	3	$	66.00
WKOM FM	Columbia	Middle	31	$	255.75
WKRM	Columbia	Middle	31	$	240.25
WGSQ FM	Cookeville	Middle	7	$	315.00
WHUB	Cookeville	Middle	3	$	45.00
WKSW FM	Cookeville	Middle	2	$	50.00
WPTN AM / FM	Cookeville	Middle	2	$	28.00
WKBL	Covington	West	62	$	930.00
WKBQ FM	Covington	West	62	$	1,550.00
WAEW AM / FM	Crossville	Middle	6	$	90.00
WCSV	Crossville	Middle	6	$	90.00
WOWF FM	Crossville	Middle	6	$	240.00
WPBX	Crossville	Middle	6	$	180.00
WEKR	Fayetteville	Middle	20	$	200.00
WYTM FM	Fayetteville	Middle	20	$	200.00
WRLT FM	Franklin / Nashville	Middle	39	$	682.50
WMRO	Gallatin	Middle	7	$	49.00
WQZQ AM / FM	Goodlettsville / Nashville	Middle	16	$	400.00
WMYL FM	Halls Crossroads	East	30	$	750.00
WDXI	Jackson	West	20	$	120.00
WMXX	Jackson	West	20	$	120.00
WKPT AM / FM	Kingsport	East	10	$	100.00
WRZK FM	Kingsport	East	19	$	285.00
WTFM FM	Kingsport	East	13	$	715.00
WCYQ FM	Knoxville	East	3	$	105.00
WKHT FM	Knoxville	East	3	$	90.00
WNOX FM	Knoxville	East	3	$	75.00
WWST FM	Knoxville	East	3	$	120.00
WBUZ FM	LaVergne / Nashville	Middle	17	$	1,700.00
WBUZ FM-D3	LaVergne / Nashville	Middle	18	$	450.00
WANT FM	Lebanon	Middle	10	$	140.00
WZLT	Lexington TN	West	60	$	540.00
WLIV	Livingston	Middle	12	$	66.00
WLIV FM	Livingston	Middle	12	$	108.00

Example Summary Report from the TNSA Public Education Program MWS Contributes To (Continued)

WLQK FM	Livingston	Middle	92	$	972.40
WCMT	Martin	West	92	$	1,104.00
WCMT FM	Martin	West	124	$	1,488.00
WCDZ FM	Martin/Dresden	West	38	$	456.00
WHDM AM / FM	McKenzie	West	22	$	88.00
WAKI	McMinnville	Middle	7	$	35.00
WBMC	McMinnville	Middle	7	$	56.00
WOWC FM	McMinnville	Middle	6	$	72.00
WTRZ FM	McMinnville	Middle	6	$	60.00
IDIA AM	Memphis	West	8	$	80.00
IEGR FM	Memphis	West	8	$	80.00
IHAL FM	Memphis	West	8	$	80.00
IHRK FM	Memphis	West	8	$	80.00
IREC	Memphis	West	8	$	80.00
KJMS FM	Memphis	West	7	$	700.00
KWNW FM	Memphis	West	7	$	455.00
RJMS FM	Memphis	West	8	$	80.00
RWNW FM	Memphis	West	8	$	80.00
WDIA	Memphis	West	8	$	560.00
WEGR FM	Memphis	West	8	$	640.00
WHAL FM	Memphis	West	8	$	640.00
WHBQ AM	Memphis	West	12	$	600.00
WHRK FM	Memphis	West	5	$	500.00
WLOK	Memphis	West	6	$	270.00
WREC	Memphis	West	8	$	640.00
WKXD FM	Monterey	Middle	107	$	1,271.92
WCRK FM	Morristown	East	7	$	112.00
WMTN	Morristown	East	14	$	168.00
BSIX	Nashville	Middle	2	$	150.00
WCJK FM	Nashville	Middle	1	$	100.00
WCRT	Nashville	Middle	3	$	39.00
WECV FM	Nashville	Middle	3	$	57.00
WGFX FM	Nashville	Middle	12	$	900.00
WJXA FM	Nashville	Middle	12	$	1,800.00
WKDF FM	Nashville	Middle	12	$	1,800.00
WLAC	Nashville	Middle	2	$	150.00
WNRQ FM	Nashville	Middle	2	$	150.00
WQQK FM	Nashville	Middle	10	$	200.00
WRVW FM	Nashville	Middle	2	$	150.00
WSIX FM	Nashville	Middle	2	$	150.00
WSM AM	Nashville	Middle	13	$	260.00
WUBT FM	Nashville	Middle	2	$	150.00
WWTN FM	Nashville	Middle	27	$	540.00
WLIK	Newport	East	11	$	88.00
WAKQ FM	Paris	West	5	$	20.00
WLZK FM	Paris	West	22	$	88.00
WMUF FM	Paris	West	22	$	88.00
WRQR AM / FM	Paris	West	22	$	88.00
WTPR AM / FM	Paris	West	7	$	28.00
WBFG	Parkers Crossroads	West	60	$	600.00
WPRT FM	Peagram / Nashville	Middle	17	$	1,700.00
WPRT FM-D2	Peagram / Nashville	Middle	14	$	350.00
WKWX FM	Savannah	West	90	$	450.00
WORM	Savannah	West	20	$	120.00
WORM FM	Savannah/ Clifton	West	20	$	120.00

Example Summary Report from the TNSA Public Education Program MWS Contributes To (Continued)

WXOQ	Selmer/Bolivar	West	20	$	120.00
WUUQ FM	South Pittsburg / Chattanooga	East	8	$	531.43
WSMT	Sparta	Middle	6	$	120.00
WTZX	Sparta	Middle	6	$	24.00
WGOC	Tri-Cities	East	5	$	200.00
WJCW	Tri-Cities	East	4	$	160.00
WKOS	Tri-Cities	East	6	$	240.00
WQUT	Tri-Cities	East	5	$	200.00
WXSM	Tri-Cities	East	6	$	240.00
KYTN FM	Union City	West	58	$	870.00
WENK	Union City	West	7	$	70.00
WQAK FM	Union City	West	59	$	885.00
WWKF	Union City	West	8	$	80.00
TOTALS:			**2416**	**$**	**46,802.71**

TNSA Announcement of Metro Nashville being Awarded MS4 of the Year

MEDIA CONTACT
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FOR IMMEDIATE RELEASE

TENNESSEE STORMWATER ASSOCIATION

Announcing the 2016 Tennessee Stormwater Association "Exceptional Quality" Awards Winners

Pikeville, TN, October 24, 2016 – The Tennessee Stormwater Association (TNSA) announces the 2016 "Exceptional Quality" Award Winners. TNSA recognizes individuals and stormwater professionals that have devoted time and energy into making TNSA a success and have accomplished great strides within the Tennessee stormwater arena.

Nominations were accepted by TNSA members and voted on by their peers for three specific awards.

Person of the Year: An individual who displays Exceptional dedication and commitment to TNSA.

MS4 Member of the Year: An MS4 that displays Exceptional stewardship of Water Quality in Tennessee and provides Exceptional education and assistance to other MS4s.

TNSA Lifetime Achievement Award: TNSA's highest honor reserved for outstanding, longtime stormwater professionals. These individuals' long-term contributions have made a noticeable impact on stormwater management efforts in the State of Tennessee.

Awards were announced at the Tennessee Stormwater Association's Annual Conference on October 18, 2016.

Person of the year was awarded to Ashlie Farmer with the City of Clarksville, TN. Ashlie Farmer was nominated because of the time and dedication she had for TNSA the past year. Specifically, she spent many hours assisting TNSA with educating state legislators about stormwater and spoke on behalf of TNSA at one of the State House committee meetings.

MS4 (Municipal Separate Storm Sewer System) of the year was awarded to Metro Government of Nashville & Davidson County. They were nominated for MS4 member of the year for their efforts, partnership and contributions with the Urban Runoff 5K. Metro Nashville has lead the way in the State with the development of the LID (Low Impact Development) manual, hosted training opportunities, as well as great public outreach events like the Urban Runoff 5k that has been widely successful. With the tremendous growth seen in Nashville this year they are doing a fabulous job implementing green practices.

The TNSA Lifetime Achievement Award was awarded to Jennifer Watson with the City of Gallatin, TN. Jennifer Watson brings a smile with her everywhere she goes and has always maintained a positive attitude. Her knowledge and enthusiasm is something we all should aspire to. Jennifer also makes it a point to help out in any way she can with new MS4's and coordinators. She is the single best example of a loving what you do and setting an example for others. Jennifer is also the dedicated writer and organizer for the quarterly TNSA Times Newsletter.

Please help us recognize and congratulate the 2016 TNSA award winners. All of these folks work tirelessly to help keep the Tennessee waterways clean for years to come!

MWS PIO Public Education Program Activities during FY17

Metro Water Services Programs & Activities

Report Dates: From 7/1/2016 to 6/30/2017

574 Programs **13498 Students** **1833 Adults**

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MWS PIO Public Education Program Activities during FY17 (Continued)

ActivityType: Classroom Activity 233 Programs/Activities

TOTAL Teacher Led Activity	233 Programs/Activities	5553 Students	Adults
The Journey of Your Water Video	**233 Programs/Activities**	**5553 Students**	**Adults**
8/19/2016	Glendale Elementary	3	68	4th grade
8/22/2016	Robert E. Lillard Elem. @ Kings Lane	4	96	4th grade
8/25/2016	Granbery Elementary	3	75	4th grade
8/30/2016	Granbery Elementary	3	75	4th grade
9/1/2016	Old Center Elem.	3	66	4th grade
9/20/2016	Gateway Elementary	3	75	4th grade
9/21/2016	Pennington Elem.	3	75	4th grade
9/23/2016	Westmeade Elem.	4	100	4th grade
9/27/2016	Caldwell Elementary Enhanced Option	3	75	4th grade
9/28/2016	Chadwell Elementary	3	75	4th grade
10/11/2016	Lakeview Elem. Design Center	2	50	4thg rade
10/18/2016	Carter-Lawrence Elementary Magnet	3	75	4th grade
10/31/2016	Kelley, A.Z. Elementary	7	175	4th grade
11/1/2016	Dupont Elementary	4	100	4th grade
11/7/2016	Smithson-Craighead Academy	3	53	4th grade
11/8/2016	David Lipscomb Elementary School	3	75	3rd grade
11/10/2016	Moss, J.E. Elementary	7	175	4th grade
11/15/2016	Jackson, Andrew Elementary	2	50	4th grade
11/16/2016	Jackson, Andrew Elementary	2	50	4th grade
11/29/2016	Una Elem.	3	75	4th grade
11/30/2016	Una Elem.	3	75	4th grade
12/2/2016	Cotton, Hattie Elementary	3	75	4th grade
12/5/2016	Rosebank Elem.	3	75	4th grade
12/6/2016	Shayne Elem.	4	100	4th grade
12/7/2016	Shayne Elem.	3	75	4th grade
12/8/2016	Harpeth Valley Elementary	6	150	4th grade
12/9/2016	McGavock Elem.	2	50	4th grade
12/12/2016	Una Elem.	3	75	4th grade
12/13/2016	Dodson Elementary	4	100	4th grade
12/14/2016	Lockeland Elem. Design Center	3	75	4th grade

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MWS PIO Public Education Program Activities during FY17 (Continued)

12/15/2016	Tulip Grove Elem.	4	100	4th grade
1/17/2017	Fall-Hamilton Elementary Enhanced Option	3	60	4th grade
1/18/2017	Amqui Elementary	3	60	4th grade
1/19/2017	Amqui Elementary	3	60	4th grade
1/23/2017	Whitsitt Elem.	3	60	4th grade
1/24/2017	Neely's Bend Elem.	4	88	4th grade
1/25/2017	Buena Vista Elementary Enhanced Option	5	98	3rd and 4th grade
1/26/2017	Gower Elementary	5	125	4th grade
1/30/2017	Bellshire Elementary Design Center	5	125	4th grade
1/30/2017	Robert Churchwell Museum Magnet	5	125	4th grade
2/1/2017	Eakin Elementary	2	50	4th grade
2/3/2017	Eakin Elementary	4	100	4th grade
2/13/2017	Green, Julia Elementary	4	84	3rd grade
2/15/2017	Charlotte Park Elementary	4	100	4th grade
2/21/2017	Haywood Elementary	6	150	4th grade
3/3/2017	Warner Elem. Enhanced Option	4	57	4th grade
3/6/2017	Cole Elementary	2	50	4th grade
3/7/2017	Cole Elementary	2	50	4th grade
3/8/2017	Crieve Hall Elementary	3	75	4th grade
3/9/2017	Akiva School	1	8	2nd grade
3/13/2017	Stratton Elem.	5	125	4th grade
3/14/2017	Cole Elementary	2	50	4th grade
3/15/2017	Cole Elementary	2	50	4th grade
3/28/2017	Mt. View Elem.	3	75	4th grade
3/29/2017	Mt. View Elem.	3	75	4th grade
3/31/2017	Tom Joy Elem.	4	100	4th grade
4/3/2017	Donelson Christian Academy	3	60	4th grade
4/6/2017	Glencliff Elementary	2	43	4th grade
4/6/2017	Ruby Major Elem. Eric Lavender explained meters	1	25	erd grade
4/12/2017	Glencliff Elementary	2	47	4th grade
4/13/2017	Cumberland Elementary	5	125	4th grade
4/17/2017	Tusculum Elem.	4	100	4th grade

MWS PIO Public Education Program Activities during FY17 (Continued)

4/18/2017	Tusculum Elem.	2	50	4th grade
5/1/2017	Maxwell Elementary School	5	125	4th grade
5/4/2017	Waverly-Belmont Elementary School	3	75	4th grade
5/5/2017	Kirkpatrick Elem. Enhanced Option	3	75	4th grade
5/11/2017	Hickman Elementary	4	100	4th grade
5/15/2017	Glenview Elementary	6	120	4th grade

MWS PIO Public Education Program Activities during FY17 (Continued)

ActivityType: Classroom Program 276 Programs/Activities

TOTAL Classroom Program	276 Programs/Activities	7041 Students	Adults
Career Fair	**5 Programs/Activities**	**351 Students**	**Adults**
4/13/2017	East Literature Magnet Carlton Boleyjack-water operator careers	1 251	7th and 8th grade
5/17/2017	Lakeview Elem. Design Center MWS careers, career game	4 100	4th grade
Enviroscape	**29 Programs/Activities**	**669 Students**	**Adults**
7/14/2016	Special Group Owls Hill summer camp	1 25	elementary
7/21/2016	Special Group Owls Hill summer camp	1 25	elementary
7/28/2016	Special Group Owls Hill summer camp	1 25	elementary
10/4/2016	Franklin Road Academy	4 100	7th grade
10/11/2016	Jere Baxter Middle School after school program	1 15	middle school
10/12/2016	Margaret Allen Middle aftger school program	1 15	middle school
10/12/2016	Neely's Bend Middle	4 100	8th grade
10/17/2016	Donelson Middle after school program	1 15	middle school
10/21/2016	Hume Fogg High Magnet	4 100	9th grade
10/24/2016	John Early Middle Paideia Magnet after school program	1 15	middle school
10/25/2016	West End Middle	3 71	5th grade
10/26/2016	Apollo Middle after school program	1 15	middle school
11/17/2016	East Literature Magnet	3 73	5th grade
6/15/2017	Special Group Owls Hill Summer Camp	1 25	elementary
6/22/2017	Special Group Owl's Hill summer camp	1 25	elementary
6/29/2017	Special Group special group	1 25	elementary
The Water Cycle & Me	**230 Programs/Activities**	**5751 Students**	**Adults**
8/19/2016	Glendale Elementary	3 68	4th grade
8/22/2016	Robert E. Lillard Elem. @ Kings Lane	4 96	4th grade

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MWS PIO Public Education Program Activities during FY17 (Continued)

8/25/2016	Granbery Elementary	3	75	4th grade
8/30/2016	Granbery Elementary	3	75	4th grade
9/1/2016	Old Center Elem.	3	66	4th grade
9/20/2016	Gateway Elementary	3	75	4th grade
9/21/2016	Pennington Elem.	3	75	4th grade
9/23/2016	Westmeade Elem.	4	100	4th grade
9/27/2016	Caldwell Elementary Enhanced Option	3	75	4th grade
9/28/2016	Chadwell Elementary	3	75	4th grade
10/11/2016	Lakeview Elem. Design Center	2	50	4th grade
10/18/2016	Carter-Lawrence Elementary Magnet	3	75	4th grade
10/31/2016	Kelley, A.Z. Elementary	3	175	4th grade
11/1/2016	Dupont Elementary	3	100	4th grade
11/7/2016	Smithson-Craighead Academy	3	53	4th grade
11/8/2016	David Lipscomb Elementary School	4	100	3rd grade
11/10/2016	Moss, J.E. Elementary	6	175	4th grade
11/15/2016	Jackson, Andrew Elementary	2	50	4th grade
11/16/2016	Jackson, Andrew Elementary	2	50	4th grade
11/29/2016	Una Elem.	3	75	4th grade
11/30/2016	Una Elem.	3	75	4th grade
12/2/2016	Cotton, Hattie Elementary	3	75	4th grade
12/5/2016	Rosebank Elem.	3	75	4th grade
12/6/2016	Shayne Elem.	4	100	4th grade
12/7/2016	Shayne Elem.	3	75	4th grade
12/8/2016	Harpeth Valley Elementary	3	150	4th grade
12/9/2016	McGavock Elem.	2	42	4th grade
12/12/2016	Una Elem.	3	75	4th grade
12/13/2016	Dodson Elementary	4	100	4th grade
12/14/2016	Lockeland Elem. Design Center	3	75	4th grade
12/15/2016	Tulip Grove Elem.	4	100	4th grade
1/17/2017	Fall-Hamilton Elementary Enhanced Option	3	60	4th grade
1/18/2017	Amqui Elementary	3	60	4th grade
1/19/2017	Amqui Elementary	3	60	4th grade
1/23/2017	Whitsitt Elem.	3	60	4th grade

MWS PIO Public Education Program Activities during FY17 (Continued)

1/24/2017	Neely's Bend Elem.	4	88	4th grade
1/25/2017	Buena Vista Elementary Enhanced Option	5	98	3rd and 4th grade
1/26/2017	Gower Elementary	5	125	4th grade
1/30/2017	Bellshire Elementary Design Center	5	125	4th grade
1/30/2017	Robert Churchwell Museum Magnet	5	125	4th grade
2/1/2017	Eakin Elementary	2	50	4th grade
2/2/2017	Eakin Elementary	3	75	4th grade
2/3/2017	Sylvan Park Elem. Paideia Design Ctr.	4	100	4th grade
2/13/2017	Green, Julia Elementary	2	84	3rd grade
2/15/2017	Charlotte Park Elementary	4	100	4th grade
2/21/2017	Haywood Elementary	6	150	4th grade
3/3/2017	Warner Elem. Enhanced Option	4	57	4th grade
3/6/2017	Cole Elementary	1	50	4th grade
3/7/2017	Cole Elementary	2	50	4th grade
3/8/2017	Crieve Hall Elementary	3	75	4th grade
3/9/2017	Akiva School	1	8	2nd grade
3/13/2017	Stratton Elem.	5	125	4th grade
3/14/2017	Cole Elementary	2	50	4th grade
3/15/2017	Cole Elementary	2	50	4th grade
3/28/2017	Mt. View Elem.	3	75	4th grade
3/29/2017	Mt. View Elem.	3	75	4th grade
3/31/2017	Tom Joy Elem.	4	100	4th grade
4/3/2017	Donelson Christian Academy	3	60	4th grade
4/6/2017	Glencliff Elementary	2	43	4th grade
4/7/2017	Donelson Middle	3	75	5th grade
4/12/2017	Glencliff Elementary	2	47	4th grade
4/13/2017	Cumberland Elementary	5	125	4th grade
4/17/2017	Tusculum Elem.	4	100	4th grade
4/18/2017	Tusculum Elem.	2	50	4th grade
5/1/2017	Maxwell Elementary School	5	125	4th grade
5/4/2017	Waverly-Belmont Elementary School	3	56	4th grade
5/5/2017	Kirkpatrick Elem. Enhanced Option	3	75	4th grade
5/11/2017	Hickman Elementary	4	100	4th grade

MWS PIO Public Education Program Activities during FY17 (Continued)

5/15/2017	Glenview Elementary	6	120	4th grade
5/24/2017	Waverly-Belmont MNPS Facility	3	75	4th grade
Water Fun & Games	**1 Programs/Activities**		**30 Students**	**Adults**
6/27/2017	Library: Watkins Park Branch	1	30	6-9 years old
Water Presentation	**11 Programs/Activities**		**240 Students**	**Adults**
9/16/2016	David Lipscomb Middle School	5	100	5th grade
3/8/2017	Overton High for Overton HS Engineering Academy, presentation of Stormwater engineering projects at Titan's stadi	5	125	high school students
5/16/2017	Harpeth Hall preparation for their water projects	1	15	6th grade

MWS PIO Public Education Program Activities during FY17 (Continued)

ActivityType: Community Outreach Ev **8 Programs/Activities**

TOTAL Booth	**2 Programs/Activities**	**100 Students**	**### Adults**	
Booth/Table	**2 Programs/Activities**	**100 Students**	**#### Adults**	
5/20/2017	Special Event Urban Garden Festival - backflow and pollution prevention for gardeners	1		1300
6/24/2017	Special Event Long Hunter State park reading trail event, scoop the poop booth/activity	1	100	100
TOTAL Event	**1 Programs/Activities**	**Students**	**Adults**	
Splash Mascot Appearance	**1 Programs/Activities**	**Students**	**Adults**	
4/20/2017	Special Event Ascend Amphitheatre appearance with Socket	1		
TOTAL Provide Water	**5 Programs/Activities**	**Students**	**Adults**	
Water Fountain	**4 Programs/Activities**	**Students**	**Adults**	
7/4/2016	Hot Chicken Festival	1		
7/27/2016	Special Event For MAC Head Start Team Building Event	1		
9/7/2016	State Fair	1		
9/10/2016	Wine on the River	1		
Water Truck	**1 Programs/Activities**	**Students**	**Adults**	
9/10/2016	Dragon Boat & River Festival	1		

MWS PIO Public Education Program Activities during FY17 (Continued)

ActivityType: Community Presentation 7 Programs/Activities

TOTAL Presentation		**3 Programs/Activities**		**Students**	**110 Adults**
Special Presentation		**3 Programs/Activities**		**Students**	**110 Adults**
9/26/2016	Special Group Belmont Univ class for science teachers - using Enviroscape to engage students	1			20
2/22/2017	Community 12th Avenue South-Phase I Water Main & Stormwater project community meeting	1			50
4/5/2017	Special Group Veronica Logue presention on Using Biosassessments to Track Changes in Stream Conditions for AWRA ev	1			40
TOTAL Program		**3 Programs/Activities**	**22 Students**		**90 Adults**
Wise Watering		**3 Programs/Activities**	**22 Students**		**90 Adults**
3/2/2017	Master Gardeners water pollution prevention & backflow prevention	1			50
3/16/2017	Master Gardeners water pollution prevention & backflow prevention	1			40
6/22/2017	Jr. Master Gardeners backflow and pollution prevention for gardeners	1	22	middle school	
TOTAL Workshop		**1 Programs/Activities**		**Students**	**170 Adults**
TDEC Level One Erosion Control Workshop		**1 Programs/Activities**		**Students**	**170 Adults**
2/28/2017	TDEC Topic: MWS Grading Permit Process	1			170

MWS PIO Public Education Program Activities during FY17 (Continued)

ActivityType: Tour **50 Programs/Activities**

TOTAL Tour	**1 Programs/Activities**		**Students**	**2 Adults**	
Special Tour	**1 Programs/Activities**		**Students**	**2 Adults**	
6/1/2017	Special Group Tour of Laboratory for City of Memphis staff	1			2
TOTAL Tour: Biosolids	**3 Programs/Activities**		**126 Students**	**Adults**	
Biosolids Facility Tour: Students	**3 Programs/Activities**		**126 Students**	**Adults**	
9/26/2016	Vanderbilt School of Science & Math (High Schoo	1	100	9th grade	
10/14/2016	Whites Creek High active job shadow program	1	3	seniors	
11/3/2016	Goodpasture Christian School	1	23	seniors	
TOTAL Tour: MWS Facilities	**4 Programs/Activities**		**Students**	**14 Adults**	
Facilities Tour	**4 Programs/Activities**		**Students**	**14 Adults**	
7/22/2016	Special Group CSC staff	1			10
9/9/2016	Special Group Metro IT tour	1			
2/28/2017	Special Group tour for Amanda Deaton-Moyer	1			1
3/3/2017	Special Group Mayor's office tour	1			3
TOTAL Tour: WTP	**20 Programs/Activities**		**320 Students**	**15 Adults**	
K.R. Harrington Tour: Students	**19 Programs/Activities**		**320 Students**	**Adults**	
9/26/2016	Vanderbilt School of Science & Math (High Schoo	1	30	9th grade	
10/6/2016	Goodpasture Christian School Environmental science class	1	23	seniors	
10/7/2016	Akiva School	1	3	middle school	
10/15/2016	Girl Scout Event Scouts WOW program	1	8	3rd grade	
10/19/2016	Girl Scout Event scouts WOW program	1	11	3rd grade	
10/19/2016	Neely's Bend Middle	4	100	8th grade	
10/27/2016	Home School Group	1	8	elementary/middle	
11/14/2016	Whites Creek High Active job shadowing program	1	3	seniors	
2/22/2017	GirlScouts Wonders of Water (WOW) program	1	11	4th grade	

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MWS PIO Public Education Program Activities during FY17 (Continued)

4/5/2017	Overton High Part of Overton HS Engineering Academy activities	1	5	11th grade
5/9/2017	Overton High	3	75	8th grade
6/2/2017	Special Group Stormwater interns	1	17	14-16 years old
6/20/2017	Special Group MWS interns, Metro HR Interns	1	15	high school
6/21/2017	Special Group Schrader lane church summer camp	1	11	middle school
Ohohundro Tour: Adults	**1 Programs/Activities**		**Students**	**15 Adults**
3/15/2017	Fleming Training Center - TDEC Tour given by Carlton Boleyjack	1		15
TOTAL Tour: WWTP	**22 Programs/Activities**		**336 Students**	**32 Adults**
White's Creek Tour: Adults	**4 Programs/Activities**		**20 Students**	**32 Adults**
8/23/2016	Special Group Lexington, KY group - AWWA WPC follow up, to see our faility tours	1		4
11/18/2016	Aquinas	1	20	
4/15/2017	Belmont University microbiology class	1		13
4/18/2017	Belmont University microbiology class	1		15
Whites Creek Tour: Students	**18 Programs/Activities**		**316 Students**	**Adults**
9/14/2016	Whites Creek High Active Job Shadow program	1	5	seniors
9/19/2016	Goodpasture Christian School Environmental Science class	1	23	juniors/seniors
9/26/2016	Vanderbilt School of Science & Math (High Schoo	1	30	9th grade
10/13/2016	Stratford High	1	23	10th grade
10/24/2016	Harpeth Hall	2	52	10th grade
10/26/2016	Ensworth School	1	11	11th & 12th grade
10/28/2016	Franklin Road Academy	1	10	6th grade
2/22/2017	Montgomery Bell Academy	1	15	12th grade
2/23/2017	Montgomery Bell Academy	2	26	12th grade
4/5/2017	Overton High Part of Overton Engineering Academy activities.	1	5	11th grade
4/21/2017	Harpeth Hall	1	8	12th grade
5/10/2017	Overton High	3	75	8th grade

MWS PIO Public Education Program Activities during FY17 (Continued)

6/26/2017	Special Group MWS and Metro HR Interns	1	15	middle school
6/28/2017	Special Group MWS summer interns and stormwater interns	1	18	middle and high school

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NPDES Public Education Events/Presentations during FY17

Date	Event	Education Type	Audience Number	Audience	Target Audience/Pollutant	Staff Lead	Event Notes
6/29/2017	Fairgrounds Strom Drain Marking	Drain Stenciling/Marking	50	NOW interns and fairgrounds goers	General Stormwater Pollution	Petty (Stephanie)	Stormwater interns placed storm drain markers on about 50 storm drains in and around the fair grounds.
6/19/2017	Mail-Out-Lawn Debris and Brush	Mail-out	1	Resident at 222 Neelys Bend Road	Leaves/Brush/Trash Dumping	Wilson (Beth)	Sent resident at 222 Neelys Bend Road a lawn debris letter and residential stormwater brochure after a complaint about brush in the ditch.
6/8/2017	CMA Festival Booth	Educational Booth	10000	CMA Festival Attendants	General Stormwater Pollution	Wilson (Beth)	Assisted public works with a litter prevention booth at CMA fest. Handed out pocket ash trays to prevent people from putting their cigarette butts into the streets and storm drains.
5/28/2017	Targeted SM Post - weather	Social Media Post	1862	Facebook/Twitter	Fertilizer/Pesticides	Harrman	All those showers are bringing May flowers. Get the skinny on lawn chemicals to keep them and your community happy. http://bit.ly/2msBN4O
5/26/2017	SM Campaign Post- AAS	Social Media Post	1984	Facebook/Twitter	Leaves/Brush/Trash Dumping	Harrman	Nice work from volunteers @ Westminster Presbyterian. Thanks for helping keep Sugartree Creek clean. #AdoptAStream http://bit.ly/MWSVolunteer pic.twitter.com/HXjp206yLz
5/24/2017	Targeted SM Post - weather	Social Media Post	1440	Facebook/Twitter	Leaves/Brush/Trash Dumping	Harrman	Rainy #WednesdayWisdom analogy - hair is to a shower drain as litter is to storm drain. http://bit.ly/2kryFWJ Remember #OnlyRainInTheDrain pic.twitter.com/gO4WXjhICo
5/22/2017	Brush Letter Mail-out	Mail-out	1	Resident at 507 Glengarry Drive	Leaves/Brush/Trash Dumping	Hayes	Requested by Stormwater Maintenance to email a brush dumping letter to 507 Glengarry Drive.
5/16/2017	SM Comment	Social Media Post	325	Twitter	Leaves/Brush/Trash Dumping	Harrman	You can check out proper brush placement on the website too. Remember the ditch is no place for brush unless you're looking to build a dam. https://twitter.com/SocketUnplug/status/864481922822656000 …
5/6/2017	Targeted SM Post - weather	Social Media Post	238	Twitter	Pet Waste	Harrman	We know it's raining, but that means it is even more important to #scoopthepoop to keep it out of our waterways. http://bit.ly/2nMV85A
4/22/2017	Target SM Post - Earth Day	Social Media Post	237	Twitter	General Stormwater Pollution	Harrman	The @NashEarthFest may have been cancelled, but it's still #EarthDay. Help keep our planet happy and healthy. http://bit.ly/PreventingPollution …

NPDES Public Education Events/Presentations during FY17 (Continued)

Date	Event	Education Type	Audience Number	Audience	Target Audience/Pollutant	Staff Lead	Event Notes
4/21/2017	Regular SM Editorial Calendar	Social Media Post	279	Facebook,	Maintenance Activities	Harrman	We installed storm drain labels and bioretention signs over at the Metropolitan Government of Nashville and Davidson County's Richard Fulton Campus. Learn more about why what we're up to is so important to protect our creeks and streams: http://bit.ly/Pre
4/21/2017	Party for the Planet	Educational Booth	150	Students and Parents Attending Party for the Planet	General Stormwater Pollution	Wilson (Beth)	Booth at Nashville Zoo's Party for the Planet event. Played stormwater stretch and spoke with various students and adults about stormwater pollution.
4/20/2017	Regular SM Editorial Calendar	Social Media Post	129	Twitter	General Stormwater Pollution	Harrman	We have plenty of streams available for adoption in our #AdoptAStream program. Perfect for #NationalVolunteerMonth. http://bit.ly/MWSVolunteer pic.twitter.com/Cp5fYEWP8W
4/20/2017	Door hanger drop	Brochure/Door Hanger Distribution	20	residents of subdivision	Oil and Grease	Walshe-Langford	During an inspection Dale Binder noticed grease that had been dumped in a storm drain and was draining out of a headwall. GWL visited subdivision and handed out door hangers to 20 houses surrounding the storm drain that was affected.
4/18/2017	TDEC SCM Training and Certification	Presentation	15	Landscapers of other MS4 personnel	Construction/Development Education	Hayes	Spoke to attendees about Nashville's scm oversite.
4/16/2017	SM Campaign Post - AAS/Spring Clean	Social Media Post	2520	Facebook, Twitter, Instagram	General Stormwater Pollution	Harrman	Mayor Megan Barry's citywide spring clean is next Saturday, April 22nd. Have you signed up to volunteer yet? Browse the many opportunities across the county through Hands On Nashville and help keep our communities and waterways clean for everyone to enjoy
4/14/2017	Regular SM Editorial Calendar	Social Media Post	178	Twitter	General Stormwater Pollution	Harrman	Our volunteer opportunities are good for the soul and Nashville's waterways. http://bit.ly/MWSVolunteer #NationalVolunteerMonth #AdoptAStream pic.twitter.com/8wof87NdFu
4/7/2017	AWRA Panel	Presentation	125	Attendees of AWRA	General Stormwater Pollution	Hunt	The topic of our discussion will be: Planning for Growth and Aquatic Resources in Tennessee The panel will be 90 minutes in duration and will begin promptly at 10:30AM, Friday morning, April 7, 2017 in the plenary meeting room of the conference center

NPDES Public Education Events/Presentations during FY17 (Continued)

Date	Event	Education Type	Audience Number	Audience	Target Audience/Pollutant	Staff Lead	Event Notes
4/7/2017	AWRA Presentation	Presentation	50	AWRA attendees	Maintenance Activities	Mullen	Using Bioassessments to Track Changes in Stream Conditions in Response to Stream Restoration Projects
4/3/2017	Regular SM Editorial Calendar	Social Media Post	738	Twitter/Facebook	Leaves/Brush/Trash Dumping	Harrman	Debris that blocks flow can lead to yard and #streetflooding. Keep your #drainageditch and channels clear. http://bit.ly/Leafcollect pic.twitter.com/veY1M5MFOs
3/31/2017	Grandview Drive Door Hangers	Brochure/Door Hanger Distribution	3	Residents on Grandview Drive	General Stormwater Pollution	Wilson (Beth)	White milky substance in creek, but was gone. Neighbor thought it could have been paint. Door hangers were distributed.
3/27/2017	Email notice	Mail-out	689	Grading permit related - Development Community	Construction/Development Education	Binder	Sent out email notice to contact list of upcoming training classes: EPSC Level 1, Recertification, EPSC Level 2, and SCM inspection and maintenance.
3/23/2017	Regular SM Editorial Calendar	Social Media Post	128	Twitter users	Pet Waste	Harrman	Look's like somebody forgot to #scoopthepoop 💩and Bean is not too happy about it. #NationalPuppyDay http://bit.ly/2nMV85A pic.twitter.com/RmLCKM8ndh
3/23/2017	Regular SM Editorial Calendar	Social Media Post	130	Twitter users	Pet Waste	Harrman	Poop scoop #fail near @ShelbyBottoms. Let's remember to scoop it AND trash it. http://bit.ly/2nMV85A #NationalPuppyDay pic.twitter.com/QSJV9rl7He
3/20/2017	Regular SM Editorial Calendar	Social Media Post	1109	Facebook users, Twitter Users	Fertilizer/Pesticides	Harrman	Hello Spring! Here are a few tips to keep your yard beautiful and environmentally friendly this season. Happy gardening, Nashville. bit.ly/2msBN4O
3/17/2017	Oil Spill from Vehicle Maintenance	Brochure/Door Hanger Distribution	9	Residents in Neighborhood	Oil and Grease	Wilson (Jane)	
3/16/2017	SM Event Post - Master Gardener Class	Social Media Post	435	Facebook users	Fertilizer/Pesticides	Harrman	We had a great group of Master Gardeners of Davidson County this morning who were eager to learn about preventing pollution and proper use of lawn chemicals. In their words, when it comes to lawn chemicals, "use them the right way, don't over saturate, an
3/16/2017	SM Event Post - Master Gardeners Class	Social Media Post	200	Twitter users	Fertilizer/Pesticides	Harrman	When it comes to #lawnchemicals, follow the directions, don't over-saturate, and don't use when it's going to rain. #ReadTheLabel @mgofdc pic.twitter.com/cc7baBDCeo

NPDES Public Education Events/Presentations during FY17 (Continued)

Date	Event	Education Type	Audience Number	Audience	Target Audience/Pollutant	Staff Lead	Event Notes
3/16/2017	SM Event Post - Master Gardeners Class	Social Media Post	526	Twitter Users	Fertilizer/Pesticides	Harrman	Teaching @mgofdc today that organic doesn't mean good for the environment. Always #ReadTheLabel on lawn chemicals. http://bit.ly/2msBN4O pic.twitter.com/LV4mutCRJz
3/7/2017	Regular SM Editorial Calendar	Social Media Post	206	Twitter users	General Stormwater Pollution	Harrman	18% of #litter ends up in our creeks and streams. High winds/rain today will help it get there; you can help it not: http://bit.ly/2k4ZFe5 pic.twitter.com/wXc12RNedC
3/2/2017	SM Event Post - Master Gardeners Class	Social Media Post	2,641	Facebook users	Fertilizer/Pesticides	Harrman	Had A great evening with Master Gardeners of Davidson County class learning about water pollution and backflow prevention. Learn about these topics at water.Nashville.gov and click on community education
3/2/2017	SM Event Post - Lawn and Garden	Social Media Post	1114	Facebook, Twitter users	General Stormwater Pollution	Harrman	Come play the stormwater stretch with Beth @Lawngardenshow Our version of #Twister teaches you how to prevent pollution. #OnlyRainInTheDrain pic.twitter.com/nBIQYud1oQ
3/2/2017	Lawn and Garden Show	Educational Booth	100	Attendees of the Lawn and Garden Show	General Stormwater Pollution	Wilson (Beth)	Hosted a booth in the kids area playing stormwater stretch on 3/2/2017-3/3/2017. Left the scoop the poo and clean water begins at home banners up for the weekend.
2/28/2017	TDEC Level I Certification	Presentation	150	Prospective Level 1 EPSC Professionals	Construction/Development Education	Binder	Dale Binder presented Metro's grading permit information to prospective EPSC professionals.
2/27/2017	Tuscarora Court Door Hangers	Brochure/Door Hanger Distribution	7	Residents on Tuscarora Court	General Stormwater Pollution	Wilson (Beth)	Complaint that a car was leaking oil near a storm drain. Marked the storm drain and distributed 7 door hangers to the nearby residents.
2/25/2017	Council District 32 Meeting	Public/Group Meeting	10	Members of Council District 32	General Stormwater Pollution	Hunt	I spoke to the group regarding general NPDES Office operations/duties/responsibilities and provided specific information relating to our ongoing 5135 Hickory Hollow “clearing without a permit” incident enforcement case.
2/24/2017	Target SM Post - Weather	Social Media Post	102	Twitter	General Stormwater Pollution	Harrman	Strong winds expected with storms tonight. Help prevent creek/river pollution - secure trash cans, #PickUpLitter http://bit.ly/2k4ZFe5
2/15/2017	Regular SM Editorial Calendar	Social Media Post	186	Twitter	General Stormwater Pollution	Harrman	Great tips from @groundwaterfdn. If you want to organize a stream clean-up, we can help: http://bit.ly/MWSVolunteer https://twitter.com/groundwaterfdn/status/831911199868600320 …

NPDES Public Education Events/Presentations during FY17 (Continued)

Date	Event	Education Type	Audience Number	Audience	Target Audience/Pollutant	Staff Lead	Event Notes
2/13/2017	Regular SM Editorial Calendar	Social Media Post	2853	Twitter	General Stormwater Pollution	Harrman	Thanks @Gnash00 for helping Splash keep our creeks and streams clean. Remember, only rain in the drain. http://bit.ly/2kE1u1W
2/5/2017	Regular SM Editorial Calendar	Social Media Post	196	Twitter	Pet Waste	Harrman	It's not just being a good neighbor. It's keeping harmful bacteria like E.coli out of the river. #ScoopThePoop http://bit.ly/2jHIjrK
1/3/2017	SM Campaign Post - Adopt A Drain	Social Media Post	88	Twitter	General Stormwater Pollution	Harrman	Adopting a storm drain is easy! Just click, fill out the form and submit your adoption. #NashAdoptADrain http://bit.ly/NashAdoptADrain
12/30/2016	Regular SM Editorial Calendar	Social Media Post	115	Twitter	Construction/Development Education	Harrman	Looking back on a productive year... 30 stormwater capital projects were completed.
12/28/2016	SM Campaign Post - Adopt A Drain	Social Media Post	1066	Twitter, Facebook	General Stormwater Pollution	Harrman	When debris clogs storm drains, water stays on the street and can cause flooding. http://bit.ly/NashAdoptADrain #NashAdoptADrain pic.twitter.com/W0qH8DwYVl
12/26/2016	Regular SM Editorial Calendar	Social Media Post	141	Twitter	Leaves/Brush/Trash Dumping	Harrman	There's only one kind of butt we want in our streams. Clean a stream, adopt a drain, #Volunteer. http://bit.ly/MWSVolunteer
12/21/2016	Lawn Debris Post Cards	Mail-out	2184	Hot Area 2, East Fork Hamilton, Brook Drive, Brook Hollow Church Area, Elm Hill and Heney	Leaves/Brush/Trash Dumping	Wilson (Beth)	Post card sent out to Hot area 2, complaint areas, and also areas identified by the watershed group for problems with high nutrients and lawn debris dumping.
12/21/2016	Scoop the Poop Post Card	Mail-out	196	Shasta and Finley neighborhoods	Pet Waste	Wilson (Beth)	Sent out post cards to Shasta and Finley neighborhoods based on Watershed sampling results that discovered high bacteria and *E. coli*.
12/15/2016	Email notice	Mail-out	700	Grading permit related - Development Community	Construction/Development Education	Binder	Sent out email notice to contact list notifying them of recent chronic epsc issues that have been observed lately. Email was considered to be a public notice and warning.
12/9/2016	Regular SM Editorial Calendar	Social Media Post	159	Twitter	Maintenance Activities	Harrman	Your eyes on storm drains helps us maintain a healthy, working stormwater system. Report your concerns. http://bit.ly/2gVdhru
12/5/2016	Targeted SM Post - Weather	Social Media Post	521	Facebook/Twitter Users	General Stormwater Pollution	Harrman	Rain = stormwater runoff, which can carry pollutants from the street to our streams. More on how to prevent pollution: bit.ly/2cLgTfW

NPDES Public Education Events/Presentations during FY17 (Continued)

Date	Event	Education Type	Audience Number	Audience	Target Audience/Pollutant	Staff Lead	Event Notes
11/2/2016	Regular SM Editorial Calendar	Social Media Post	21	Instagram Followers/Users	General Stormwater Pollution	Harrman	Yikes!! This storm drain is in bad shape! DYK that all that mud and debris clogging #stormdrains can cause localized #flooding? Fall especially means leaves that are blocking water flow into drains can result in flooded streets during heavy rains. And all
10/21/2016	Plan Reviewers/Grading Permit Inspectors Lunch & Learn/Meet & Greet Meeting	Metro Employee MS4 Compliance	25	Plan Reviewers/Grading Permit Inspectors	Construction/Development Education	Hunt	Gathered to talk about LID, Grading Permits, introduce the employees to each other, and the stormwater ordinance. A handout of the new GP inspector map was provided by Dale.
10/19/2016	TNSA Annual Conference	Presentation	80	TNSA Membership and Conference Attendees	MS4 Permit Compliance	Dohn	Rebecca Dohn presented to the TNSA conference about Nashville's approach to LID.
10/19/2016	TNSA Annual Conference	Presentation	80	TNSA Membership and Conference Attendees	MS4 Permit Compliance	Hayes	Josh Hayes and Michael Hunt presented a history of the Nashville MS4 Program and the results of the internal evaluation and proposed permit language moving forward.
10/13/2016	NPDES Program Overview	Presentation	40	MWS Process Owners Group	MS4 Permit Compliance	Hunt	I spoke to MWS Process Owners group this morning re “NPDES Program Overview”. About 40 in attendance.
10/7/2016	Nashville's Oktoberfest	Citywide Event	1000	Attendants at Oktoberfest	Pet Waste	Wilson (Beth)	Co-hosted a booth with Public Works to distribute pocket ash trays and pet waste bags. Had information about picking up pet waste and about cigarette butt pollution available.
9/16/2016	Stratford STEM Magnet School Science and Engineering Day	Educational Booth	100	8th and 9th grade students at Stratford Stem Magnet School	General Stormwater Pollution	Wilson (Beth)	8th and 9th grade students learned about stormwater by playing Stormwater Stretch. Discussed what storm drains are, where the water goes, and what they can do at home to help prevent stormwater pollution.
9/10/2016	Dragon Boat Festival	Citywide Event	250	Attendees at the Dragon Boat Festival	General Stormwater Pollution	Wilson (Beth)	Educational booth at Dragon Boat Festival. Talked to attendants about stormwater pollution and how help keep streams clean at home. Gave away free educational cups with the promise to help keep our storm drains clean.

NPDES Public Education Events/Presentations during FY17 (Continued)

Date	Event	Education Type	Audience Number	Audience	Target Audience/Pollutant	Staff Lead	Event Notes
9/1/2016	Storm Drain Markings On Forrest Oaks Drive	Drain Stenciling/Marking	6	Residents on Forrest Oaks Drive	General Stormwater Pollution	Wilson (Jane)	Complaint of neighbor changing oil and pouring into storm drain at 7112 Forrest Oaks Drive. Marked 5 storm drains and left 1 door hanger in the neighborhood.
8/20/2016	Urban Runoff 5K and Water Quality Festival	Citywide Event	250	5K and Water Quality Festival Audience	General Stormwater Pollution	Wilson (Beth)	MWS co-hosted the race and water quality festival with TDEC and TNSA. There were 245 registered runners and about 30 volunteers. The event highlighted various stormwater features in Shelby Park and raised awareness about stormwater pollution.
8/13/2016	Tomato Arts Festival	Citywide Event	1000	Attendees of the Tomato Arts Festival	General Stormwater Pollution	Wilson (Beth)	Co-Hosted a booth at Tomato Arts Festival with Public Works. Passed out pocket ash trays and flyers for the Nashville Urban Runoff 5K.
8/8/2016	Storm Drain Marking	Drain Stenciling/Marking	10	Residents of Mulberry Way	Leaves/Brush/Trash Dumping	Walshe-Langford	Resident called to complain that a neighbor was dumping trash in the storm drains on their street repeatedly. Placed 10 storm drain markers on nearby storm drains.
7/18/2016	Battle of the Badges Blood Drive	Mascot Attendance	50	General public		Petty (Stephanie)	
7/10/2016	Nashville Sounds Boosters Birthday	Mascot Attendance	1500	Nashville Sounds Game Attendees	General Stormwater Pollution	Petty (Stephanie)	Splash participated in Booster's tenth birthday party.
7/10/2016	CRC WaterFest	Citywide Event	500	Attendees of CRC WaterFest	General Stormwater Pollution	Wilson (Beth)	Family friendly water festival hosted by Cumberland River Compact. Focused on kid friendly activities using stormwater stretch to teach kids about stormwater pollution and the importance they play at home.
Total Estimated Audience Reached			49,991				

Metro Department of Public Works Waste Collection During FY17

	July	August	September	October	November	December	January	February	March	April	May	June	Total
Recycling													
Curbside Recycling/In-house Recycling/Recycling Dumpsters													
Mixed Recyclables	1,125.16	1,041.06	1,071.28	1,001.04	938.47	1,184.55	1,271.18	955.65	964.68	1,166.74	1,046.56	1,070.09	12,836.46
Monthly Totals	**1,125.16**	**1,041.06**	**1,071.28**	**1,001.04**	**938.47**	**1,184.55**	**1,271.18**	**955.65**	**964.68**	**1,166.74**	**1,046.56**	**1,070.09**	**12,836.46**
Household Hazardous Waste Facility													
Oil	1.56	3.12	2.74	2.9	2.1	2.12	1.64	3.58	2.61	3.54	1.98	4.84	32.73
Anti-Freeze	1.08	2.14	0.58	2	0.8	0.96	0.88	0.3	0.96	0.94	1.16	1.66	13.46
Electronics	3.6	35.24	20.82	10.39	15	7.56	24.66	15.04	14.77	3.5	25.01	20.7	196.29
Batteries	0	0	0	0	0	0	0	0	0	0	0	0	-
Tanks	0	0	0	0	0	0	0	0	0	0	0	0	-
Clean Harbors	0	0	2.49	18.42		3.22		1.6	0.96	1.43	13.89	6.23	48.24
Monthly Totals	**6.24**	**40.5**	**26.63**	**33.71**	**17.9**	**13.86**	**27.18**	**20.52**	**19.3**	**9.41**	**42.04**	**33.43**	**290.72**
Drop Off Recycling Centers & Convenience Centers													
Carpet/Carpet Pad	10.22	8.03	10.22	10.22	5.84	8.03	3.65	8.76	7.30	5.84	1.46	5.84	85.41
Mixed Recyclables	16.38	19.86	20.69	19.77	22.53	25.24	19.61	18.97	21.29	16.68	20.06	18.76	239.84
Aluminum & Tin	-	-	-	-	-	-	-	-	-	-	-	-	-
Glass	185.21	191.20	185.46	178.17	197.27	192.61	224.07	172.59	197.33	183.69	216.63	215.08	2,339.31
Mixed Paper	173.88	217.81	206.25	177.98	235.02	211.90	175.45	167.31	174.94	155.79	168.17	184.95	2,249.45
OCC	196.81	220.46	184.02	194.03	180.60	226.66	241.05	187.57	213.96	233.07	241.19	262.00	2,581.42
Plastic	39.52	45.18	40.51	41.28	39.45	45.96	47.27	44.15	41.08	43.37	50.18	50.09	528.04
Plastic Bottles & Metal Cans	29.31	28.57	28.13	24.65	31.14	33.00	35.27	24.82	27.65	31.80	30.17	32.58	357.09
Scrap Metal	62.16	58.61	61.53	54.66	45.48	26.63	39.68	25.64	51.94	47.71	56.97	65.65	596.66
Tires	138.43	702.65	796.38	676.55	722.98	552.56	606.24	764.46	765.37	1,031.41	429.90	1,603.33	8,790.26
Monthly Totals	**851.92**	**1,492.37**	**1,533.19**	**1,377.31**	**1,480.31**	**1,322.59**	**1,392.29**	**1,414.27**	**1,500.86**	**1,749.36**	**1,214.73**	**2,438.28**	**17,767.48**
Waste Collection													
Total Metro Public Works Trash Collection	4,163.68	4,242.43	3,847.65	3,738.32	3,915.62	4,276.78	3,914.53	3,355.47	4,227.55	3,927.96	4,434.12	4,125.25	48,169.36
Total Convenience Center Trash	1,738.43	1,685.09	1,536.90	1,588.03	1,539.95	1,513.35	1,425.65	1,402.22	1,613.07	1,809.77	1,801.17	1,716.62	19,370.25
Contracted Residential	8,262.40	8,143.64	7,889.53	6,756.92	7,679.11	8,607.17	7,796.38	6,685.21	8,485.87	7,788.63	8,617.06	8,632.65	95,344.57
Monthly Totals	**14,164.51**	**14,071.16**	**13,274.08**	**12,083.27**	**13,134.68**	**14,397.30**	**13,136.56**	**11,442.90**	**14,326.49**	**13,526.36**	**14,852.35**	**14,474.52**	**162,884.18**
Brush Collection													
Unground -- Grapple Hook	3,129.33	4,676.82	2,137.25	2,218.38	2,356.51	1,041.53	2,581.10	1,260.08	2,350.15	2,178.78	2,310.13	2,748.87	28,988.93
Unground -- Metro Citizens	-	-	-	-	-	-	199.40	128.58	238.23	376.72	376.20	323.26	1,642.39
Unground -- Parks	-	-	-	-	-	-	28.95	65.54	107.34	78.11	65.14	54.54	399.62
Ground -- Board of Education	90.37	62.47	30.06	62.00	14.23	16.82	61.32	23.20	38.11	40.06	38.23	19.76	496.63
Ground -- Library	-	-	-	-	-	-	0.41	-	0.74	-	0.25	0.39	1.79
Ground--Sheriff	-	-	-	-	-	-	-	-	-	0.03	-	2.29	2.32
Leaves	9.14	18.79	14.85	79.19	190.35	49.67							361.99
Monthly Totals	**3,228.84**	**4,758.08**	**2,182.16**	**2,359.57**	**2,561.09**	**1,108.02**	**2,871.18**	**1,477.40**	**2,734.57**	**2,673.70**	**2,789.95**	**3,149.11**	**31,893.67**

Metro Department of Public Works Hazardous Spills Responses During FY17

ID	Date	Origin	Notified	Location	Situation	Departed	Agencies	Report By
1796	05/30/2017	Kurgan	9:00	Davidson and Shelby	Hydraulic oil spill	10:00	PW	Allen
1797	05/30/2017	OEM	18:13	Battery and Dustin	Oil and gas spill on roadway	19:33	FD/PW	Gann
1794	05/25/2017	Jackson	9:00	111 Whitsitt	Hydraulic oil spill in apartment complex	10:40	PW	Greene
1788	04/25/2017	Elliott	11:51	Lebanon and Spence	2 gallons motor oil spill on road	2:45	PW	Gann
1783	04/07/2017	Madden	10:28	Wedgewood and 12th	5 gallons oil spill on road	11:03	PW	Escue
1781	03/30/2017	Escue	14:20	800 McCall	Hydraulic oil spill	15:30	PW	Escue
1774	01/26/2017	OEM	12:02	1009 9th Avenue North	2 gallons of gas leaking from vehicle	12:40	FD/PW	Greene
1769	12/22/2016	Kurgan	12:10	Neil and Mansfield	Hydraulic oil spill 25-30 gallons	15:00	PW	Gann
1768	11/30/2016	Kurgan	11:44	5th and Main	5 gallons hydraulic oil spill	13:20	PW	Hatcher
1763	11/15/2016	OEM	9:23	Lebanon and Fesslers	Unknown amount of slick spill on road	10:05	PD/PW	Hatcher
1760	10/27/2016	OEM	11:53	Rosa Parks and Dominican	Oil spill of approximately 15 gallons	13:00	PW/PD/FD	Escue
1759	10/27/2016	McKay	7:00	Rock Street	Oil spill	8:30	PW	Hatcher
1758	10/26/2016	OEM	18:20	Trinity and Dickerson	Oil spill	20:15	PW	Allen
1757	10/26/2016	Mangrum	15:25	New York and 55th	20 gallons hydraulic oil on road	16:45	Pw	Hatcher
1753	10/13/2016	Elliott	15:10	5007 Whispering Hills	5 gallons antifreeze spill	16:39	PW	Gann
1744	09/21/2016	Kurgan	12:00	1441 Lebanon	Hydraulic spill	13:00	PW/SW	Allen
1743	09/21/2016	OEM	10:30	1300 Harrison	Oil spill	12:00	PD/PW	Allen
1740	09/19/2016	Kurgan	14:29	716 Stanvid	Hydraulic oil spill	14:52	PW/WD	Hathcer
1738	09/06/2016	Kurgan	15:21	Omohundro Place	Hydraulic oil spill on lot	17:45	PW	Gann
1736	08/31/2016	Kurgan	11:11	6535 Premier	12 gallon antifreeze spill	13:00	PW	Hatcher
1734	08/25/2016	OEM	1:15	2837 Clifton	Blood clean up	3:23	PW/FD/PD	Hatcher
1733	08/17/2016	Kurgan	9:20	4337 Sneed	20 gallons hydraulic spill	12:00	PW	Hatcher
1729	08/04/2016	East Center	13:45	916 Russell	Hydraulic oil spill	16:00	PW	Allen
1722	07/20/2016	Kurgan	13:29	Riverhills Recycle Center	5 gallons Hydraulic spill	14:12	PW	Gann
1720	06/21/2016	OEM	9:01	Old Hickory and Lebanon	40 gallons of oil in parking lot	11:40	FD/PW	Escue

Metro Department of Public Works Deicing Activities During FY17

	July	August	September	October	November	December	January	February	March	April	May	June	Total
Amount of salt/brine applied to Roadways (tons)	0	0	0	0	0	0	886.02	0	0	0	0	0	886.02

ATTACHMENT A – Protected Species Report

Metro Nashville Municipal Separate Storm Sewer System Permit
Federal or State-Protected Species Impact assessment

(Reporting Period 07/01/16– 06/30/17)

Reviewed and Updated:
November, 2017

Introduction:
As per the Municipal Separate Storm Sewer System (MS4) permit, Metro Nashville is required to perform an annual assessment of potential Stormwater impacts to federal and state-protected aquatic species known to exist within Metro Nashville Davidson County (Metro). In order to perform the assessment, the Metro Water Services (MWS) Stormwater NPDES Section downloaded a list of aquatic species located within Davidson County. In order to assess potential impacts to rare species, the list of rare aquatic species was analyzed and broken into specific habitat categories. Table 1 details the list of rare aquatic species that have been known to occur within Davidson County. According to the Tennessee Department of Conservation (TDEC) Natural Heritage Program (NHP), Rare Species Inventory Program there are 20 rare or protected aquatic species that have known to occur or have historically occurred within Davidson County.

Only five of the 22 rare aquatic species have a federal protection status, all of which are listed as "Endangered", while 17 of the rare aquatic species have been listed by the state of Tennessee with one of the following legal protection status:

- "D" Deemed in Need of Management,
- "E" Endangered, and,
- "T" Threatened

Typical Habitat Requirements:
While the 22 species may require specific habitat conditions, the general type of aquatic habitat can be broken into three main categories:

- Large River/Lake – The Cumberland River is the only large river system within Davidson County. The Cumberland River has portions of two impoundments (Cheatham Lake and Old Hickory Lake) within Davidson County. Due to the dilution factor, Nashville's Stormwater runoff would have negligible effects of the water quality/habitat of the Cumberland River.
- Small Streams to Small/Medium Rivers – This particular habitat represents all of the smaller headwater streams, creeks and small rivers that drain into the Cumberland River. The small streams/rivers are more susceptible to impacts from Stormwater runoff from the MS4.
- Ponds/Wetlands/Springs – This particular habitat describes floodplain wetlands, farm ponds and springheads located throughout the county, which would have the potential of being impacted by MS4 runoff.

Table 1 – List of Rare Aquatic Species for Davidson County Tennessee – FY17

General Aquatic Resource	Type	Scientific Name	Common Name	Global Rank	Fed. Status	St. Status	Habitat	State Rank
Small Headwater Streams to Small/Medium Rivers	Invertebrate Animal	*Sphalloplana buchanani*	A Cave Obligate Planarian	G1G2	No Status	Rare, Not State Listed	Aquatic cave obligate; northern Central Basin; Davidson County; taxonomy poorly understood.	S1
	Vertebrate Animal	*Ambystoma barbouri*	Streamside Salamander	G4	No Status	D	Seasonally ephemeral karst streams; middle Tennessee.	S2
	Vertebrate Animal	*Cryptobranchus alleganiensis*	Hellbender	G3G4	No Status	D	Rocky, clear creeks and rivers with large shelter rocks.	S3
	Vertebrate Animal	*Etheostoma luteovinctum*	Redband Darter	G4	No Status	D	Limestone streams; Nashville Basin & portions of Highland Rim.	S4
	Vertebrate Animal	*Etheostoma microlepidum*	Smallscale Darter	G2G3	No Status	D	Small rivers, in deep, strongly flowing riffles with gravel, boulder, and coarse rubble substrates; Cumberland River drainage.	S2
	Vertebrate Animal	*Percina phoxocephala*	Slenderhead Darter	G5	No Status	D	Small-large rivers with moderate gradient in shoal areas with moderate-swift currents; portions of Tenn. & Cumb. river watersheds.	S3
	Invertebrate Animal	*Orconectes shoupi*	Nashville Crayfish	G1G2	LE	E	1st-order & larger streams, generally with bedrock bottom, under slab rock; endemic to Mill Creek watershed; Davidson & William. cos.	S1S2
	Invertebrate Animal	*Epioblasma florentina walkeri*	Tan Riffleshell	G1T1	LE	E	Found in river headwaters, in riffles and shoals in sand and gravel substrates; Tennessee & Cumberland river systems.	S1
	Invertebrate Animal	*Simpsonaias ambigua*	Salamander Mussel	G3	No Status	Rare, Not State Listed	In sand or silt under large, flat stones in areas of swift current; occurred historically in E Fk Stones R; 2005 obs in lower Duck R.	S1
	Invertebrate Animal	*Lithasia duttoniana*	Helmet Rocksnail	G2Q	No Status	Rare, Not State Listed	Rocky substrates in riffle systems; bedrock in flowing water below main section of riffles; Duck River (TN River system).	S2
Large Riverine Systems/Lakes	Vertebrate Animal	*Haliaeetus leucocephalus*	Bald Eagle	G5	No Status	D	Areas close to large bodies of water; roosts in sheltered sites in winter; communal roost sites common.	S3
	Vertebrate Animal	*Acipenser fulvescens*	Lake Sturgeon	G3G4	No Status	E	Bottoms of large, clean rivers and lakes.	S1
	Vertebrate Animal	*Carpiodes velifer*	Highfin Carpsucker	G4G5	No Status	D	Large rivers, mostly in Tennessee River drainage.	S2S3
	Vertebrate Animal	*Cycleptus elongatus*	Blue Sucker	G3G4	No Status	T	Swift waters over firm substrates in big rivers.	S2
	Vertebrate Animal	*Macrochelys temminckii*	Alligator Snapping Turtle	G3G4	No Status	D	Slow moving, deep water of rivers, sloughs, oxbows, swamps, and lakes; middle and west Tennessee; obscure.	S2S3
	Invertebrate Animal	*Epioblasma brevidens*	Cumberlandian Combshell	G1	LE	E	Large creeks to large rivers, in coarse sand or mixtures of gravel, cobble, or rocks; Tennessee & Cumberland river systems.	S1
	Invertebrate Animal	*Lampsilis abrupta*	Pink Mucket	G2	LE	E	Generally a large river species, preferring sand-gravel or rocky substrates with mod-strong currents; Tennessee & Cumberland river systems.	S2
	Invertebrate Animal	*Plethobasus cooperianus*	Orangefoot Pimpleback	G1	LE	E	Large rivers in sand-gravel-cobble substrates in riffles and shoals in deep flowing water; Cumberland & Tennessee river systems.	S1
Ponds/Wetlands/Springs	Vascular Plant	*Ranunculus aquatilis var. diffusus*	White Water-buttercup	G5T5	No Status	E	Ponds And Streams	S1

Potential Impacts from MS4 Runoff:
Rare species that inhabit smaller streams and rivers, ponds, wetlands, and springs would be the most vulnerable to potential impacts from MS4 runoff. Impacts from MS4 runoff includes:

- Increased sediment loads smothering natural stream substrate;
- Increased nutrient runoff that cause sporadic algal blooms and accompanying reductions in available oxygen;
- Increased levels of toxic chemicals such as pesticides, oils, etc.;
- General loss of habitat from development activities.

Metro Nashville's Measures to Prevent Impacts to Aquatic Rare Species:
Metro Nashville's MS4 program deploys a simple technique to protect against impacts to rare aquatic species: "*Protect all of Nashville's Aquatic Habitat*". In order to protect Nashville's aquatic habitat, a three-prong approach is in place:

1. Control Future Development –
    a) Establish local regulations that prevent future development from destroying aquatic habitat.
    b) Monitor runoff during construction to prevent the destruction of aquatic habitat
    c) Enforce on developments that violate local construction regulations that could lead to the further destruction of aquatic resources.
2. Control the quality of Stormwater runoff from existing properties
    a) Establish local regulations that prevent the discharging of pollutants to waterways
    b) Monitor existing properties to ensure pollutants are not being discharged to the waterways.
    c) Enforce on properties/individuals that violate local water pollution laws that could potentially impact aquatic habitat.
3. Monitor the overall water quality and health of Nashville's streams
    a) Analytical sampling of certain water quality parameters
    b) Rotating biological surveys of Davidson County streams.

Controlling Future Development
Metro Nashville has established strict regulations protecting aquatic resources from impacts associated with development activities. All development or redevelopment activities that are over 10,000 square feet in overall footprint or involve more than 100 cubic yards of fill are required to obtain grading permits from the Metro Water Services (MWS) Stormwater Division. In order to obtain a grading permit from MWS, engineered plans have to be developed that illustrate how Stormwater runoff will be managed during and after development. Strict erosion and sediment control measures are required at all grading permit properties during construction. In order to ensure that erosion and sediment controls are maintained throughout construction, NPDES has six inspectors that inspect grading permit site construction control measures.

Metro Nashville also requires protection from impacts to aquatic resources after the construction phase of projects by requiring grading permit properties to install permanent Stormwater treatment measures that are designed to treat/address both the volume and quality of runoff from the property.

In addition to requiring development or redevelopment activities to obtain permits and treat Stormwater runoff, Metro Nashville was also one of the first municipalities in the state to establish no-disturb buffers along streams and other water resources within Metro Nashville, Davidson County. Development activities that demonstrate a hardship requiring some impacts to the no-disturb riparian buffer (i.e. for a bridge crossing, etc.) are required to go through a strict variance appeal process. Variance requests for stream crossing or other direct impacts to water resources are not granted unless any necessary TDEC Aquatic Resource Alteration Permits

(ARAPs) or Section 404 permits from the U.S. Army Corps of Engineers (USACOE) are obtained, which cannot be issued if protected species are impacted.

Controlling the Quality of Stormwater Runoff from Existing Properties

Metro Nashville has the following specific ordinance in place that prevents the discharge of pollutants to storm drains or community waters:

15.64.205 - Non-Stormwater discharges.

A. Definitions.

"Community waters" means any and all rivers, streams, creeks, branches, lakes, reservoirs, ponds, drainage systems, springs, wetland, wells and other bodies of surface or subsurface water, natural or artificial, lying within or forming a part of the boundaries of the Metropolitan Government of Nashville and Davidson County.

"Contaminant" means any physical, chemical, biological or radiological substance or matter.

"Director" means the Director of the Metropolitan Government of Nashville and Davidson County's Department of Water and Sewerage Services, or his designee.

"Discharge" means any substance disposed, deposited, spilled, poured, injected, seeped, dumped, leaked, or placed by any means, intentionally or unintentionally, into community waters, the waters of the state, or any area draining directly or indirectly into the municipal Stormwater system of the metropolitan government.

"Metropolitan government" means the Metropolitan Government of Nashville and Davidson County.

"Municipal separate storm sewer system of the metropolitan government" means a conveyance, or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, and storm drains) designed or used for collecting or conveying Stormwater; provided, however, that sanitary and combined sewers are not included in the definition of the municipal separate storm sewer system.

"Non-Stormwater discharge" means any discharge to the municipal separate storm sewer system except as permitted by subsection C of this section.

"Waters of the state" means any water, surface or underground, lying within or forming a part of the boundaries of the Metropolitan Government of Nashville and Davidson County, over which the Tennessee Department of Environment and Conservation exercises primary control with respect to Stormwater permits.

B. Except as hereinafter provided, all non-Stormwater discharges into community waters, into the waters of the state, or into the municipal separate storm sewer system of the metropolitan government are prohibited and are declared to be unlawful.

C. Unless the director has identified them as a source of contaminants to community waters, the waters of the state, or the municipal separate storm sewer system of the metropolitan government, the following discharges are permitted:

1. Stormwater as defined in TCA Section 68-221-1102(5);
2. Water line flushing;

3. Landscape irrigation;
4. Diverted stream flows;
5. Rising ground waters;
6. Uncontaminated groundwater infiltration (as defined at 40 CFR 35.2005(20)) to separate storm sewers;
7. Uncontaminated pumped groundwater;
8. Discharges from potable water sources;
9. Foundation drains;
10. Air conditioning condensate;
11. Irrigation water;
12. Springs;
13. Water from crawl space pumps;
14. Footing drains;
15. Lawn watering;
16. Individual residential car washing;
17. Flows from riparian habitats and wetlands;
18. Dechlorinated swimming pool discharges;
19. Street wash waters resulting from normal street cleaning operations;
20. Discharges or flows from emergency firefighting activities.

D. The director, with the approval of the mayor, shall have authority to implement this section by appropriate regulations. Such regulations may include but are not limited to provisions for inspection of points of origin of known or suspected non-permitted discharges by appropriate personnel of the metropolitan government.

E. Discharges pursuant to a valid and effective NPDES permit issued by the State of Tennessee are not prohibited by this section.

F. The provisions of this section, including subsection C of this section, shall not apply to sanitary or combined sewers, which are governed by Chapter 15.40 of the Metropolitan Code of Laws.

G. Violation of this section shall subject the violator to a civil penalty of not less than fifty dollars nor more than five thousand dollars per day for each day of violation. Each day of violation may constitute a separate violation.

NPDES issues enforcement notices and administrative penalties to existing facilities found to be in violation of the above non-Stormwater discharge code.

In addition to controlling polluted runoff from construction activity, NPDES implements various other pollution prevention programs:

- Industrial Inspection/Monitoring Program
- Proactive Field Screening/Illicit Discharge Detection Elimination Program
- Pollution Reporting Hotline
- Sewer Leak Detection Program (Using Thermography Technology)
- Post-Construction Stormwater Treatment BMP inspection/maintenance verification program
- Public Involvement/Education

<u>Monitoring the Overall Water Quality and Health of Nashville's Streams</u>

NPDES performs intense monitoring of Metro Nashville, Davidson County streams. In previous years, Dr. Steve Winesett of the NPDES Division retained a permit/certification from the USFWS/TWRA to perform surveys within the Mill Creek watershed (home to the endangered Nashville Crayfish). Since his departure, Veronica Mullen (NPDES) has been processing the paperwork with TWRA and the USFWS to receive the same permit/certification. The following programs involve field assessments of streams:

- Ambient Sampling - Seasonal water quality samples are taken and analyzed for potential pollutants. Various streams are sampled each year on a rotating basis.
- TMDL Monitoring – Quarterly flow weighted samples are collected and analyzed for bacterial and TSS of various/rotating stream segments in which TMDLs have been developed.
- Visual Stream Assessments – All State-listed 303(d) stream segments with MS4 outfalls are visually inspected on a 5 year cycle.
- Benthic Surveys – Seasonal benthic surveys are performed on various streams each year. The benthic sampling coincides with the same stream rotation schedule as the ambient sampling.

If abnormalities are found in any of the above monitoring results, individual investigations are initiated to find and eliminate potential sources of pollution.

Conclusion:
Metro Nashville's MS4 program has taken substantial steps to protect aquatic resources within Metro Nashville, Davidson County. By virtue of protecting the Nashville's water resources, critical habitat required for aquatic species has also been preserved/ protected. During this permit year, there have not been any known discharges form the MS4 that have caused the destruction of a rare species or their critical habitat.

ATTACHMENT B – Application for New 4th Cycle MS4 Permit and Follow-up Coordination with TDEC

Metro Nashville 4th Cycle MS4 Permit – Application

1. Introduction:

Metropolitan Nashville and Davidson County (Metro) hereby formally applies for reissuance of the Phase 1 Municipal Separate Storm Sewer System (MS4) permit. As the primary Metro office responsible for overseeing Metro's MS4 permit compliance measures, Metro Water Services Stormwater NPDES Section (NPDES) requests pre-application meetings to be initiated between the Tennessee Department of Environment and Conservation (TDEC) and Metro for negotiation of specific terms and provisions within our reissued MS4 NPDES permit.

Metro's first Phase 1 MS4 permit was issued on July 1, 1996, which required the implementation of various programs to manage the municipal stormwater runoff of approximately 492 square miles. Prior to applying for the 4th cycle of this MS4 permit, our office took the opportunity to perform an internal evaluation of several key components of the MS4 program. This evaluation was important as it is imperative to identify which pollution prevention programs/MS4 permit requirements have proven the most effective verses those that have been primarily unproductive in reducing respective pollutant loads. Ultimately, Metro's goal is to further refine our MS4 program to reduce stormwater pollutants to the Maximum Extent Practicable (MEP) and improve the overall quality of Metro's waterways. In order to accomplish the MEP reduction in pollutant runoff, Metro must operate the most efficient and effective programs possible. With that said, if some of the pollution prevention programs prescribed by the MS4 permit are considered ineffective and/or inefficient, Metro will request the necessary changes in the new/reissued permit.

The internal review of the MS4 program revealed that most of the key aspects of the Stormwater Management Program (SWMP) and associated MS4 permit requirements have been very successful and should continue without modification. There were some areas, however, that were identified that should be modified to improve effectiveness and efficiency. The following paragraphs describe the overall findings of the internal analysis and the proposed changes to the Metro SWMP and MS4 Permit that will further improve the program efficiency and effectiveness.

2. SWMP/MS4 Permit Efficiency/Effectiveness Evaluation:

Overall, Metro's MS4 permit requirements (SWMP activities) were analyzed to determine if they were either efficient in producing a reduction of pollutant loadings to and from the MS4 or effective in producing monitoring data useful in making management decisions or assessing the overall quality of the streams within Metro.

The evaluation was completed on both the specific "*MS4 Permit Program Elements*" (structural and non-structural pollution prevention controls) and specific "*MS4 Permit Specific Monitoring Requirements"*. The cursory review involved a review of internal tracking databases and obtaining feedback from veteran staff members. Each Program/Monitoring Element was ranked based on the following 2 criteria categories:

- Estimated Staff Resource Dedication Per Year
- Pollution Abated/Prevented or Quality Data Collected

A. MS4 Permit Program Elements:

In reviewing the MS4 permit program elements as prescribed in the MS4 Permit, the following major categories and sub-categories were delineated and analyzed individually:

I. Public Education and Outreach
II. Public Involvement
III. Illicit Discharge Detection and Elimination
    a. MS4 Mapping/Updating
    b. Dry Weather Field Screening
    c. Complaint Response
IV. Construction Site Stormwater Runoff Control
V. Permanent Stormwater Management in New Development and Redevelopment
    a. Performance Standards – Regulations
    b. SCM Maintenance
VI. Pollution Prevention/Good Housekeeping for Municipal Operations
    a. Municipal Operations
    b. Street Sweeping
    c. Monitor and Control Industrial, Commercial, and High Risk Runoff

A summary of the evaluation findings is presented on the following page in Table 1. Based on this review, a majority of the major program elements were found to have been highly successful over the previous 3 permit cycles. There were 4 major program elements, however, that were found to require moderate to high levels of staff resources, while only producing low to moderate stormwater program benefits. Two of the program elements were found to require improvements to Metro's internal SWMP (public education/involvement and Stormwater Control Measure (SCM) maintenance), while not requiring changes to the actual MS4 permit language. There were two other program elements (dry weather field screening and industrial monitoring), however, that were found to require changes to both the Metro SWMP and future MS4 permit language.

Industrial Monitoring:
The industrial monitoring requirement within the MS4 permit states that Metro is to monitor and control runoff from the following types of properties:

- Municipal landfills
- Hazardous waste treatment, storage, and disposal facilities
- Industries subject to reporting requirements pursuant to SARA Title III, Section 313
- Industrial and commercial facilities Metro determines are contributing a substantial loading of pollutants.

In the previous 20 years of inspecting industrial facilities, Metro has found the requirement to inspect the aforementioned categories has resulted in relatively few findings of industrial processes or contaminants exposed to stormwater runoff. In general, many of the above categories of industrial facilities include those that have received "No Exposure" certification and are not subject to applying for and receiving coverage under the Tennessee Multi-Sector Permit (TMSP) for industrial stormwater runoff. The majority of pollution issues eliminated from industrial facilities through the past 3 MS4 permit terms have resulted from complaint investigations of sites with TMSP coverage or Ready Mix Concrete Permit (RMCP) coverage and were not discovered from the routine industrial inspection process prescribed within the MS4 Permit. Proposed changes to the industrial monitoring section are detailed in Section 3.

Table 1 – Effectiveness/Efficiency Evaluation of MS4 Program Elements

Major Permit Requirement Tasks	Estimated Staff Resource Dedication Per Year	Pollution Abated/Prevented or Quality Data Collected	Recommended Improvements to SWMP	MS4 Permit Language Change Required to Implement SWMP Change
Element 1 & 2 - Public Involvement/ Education	**Moderate**	**Moderate**	Recommend improvements to overall approach to Public Involvement/Education, which includes a dedication of additional resources and more-effective targeted campaigns toward pollutant types, demographics, and geographic locations within watersheds.	No
Element 3 - IDDE (MS4 Mapping/Updating)	**High**	**High**	No changes proposed to Nashville's SWMP	No
Element 3 - IDDE (Field Screening)	**High**	**Very Low**	Recommend major changes that result in screening business sites in lieu of outfalls. (*Refer to Section 3)	Yes
Element 3 - IDDE (Complaint Response)	**Moderate**	**High**	No changes proposed to Nashville's SWMP	No
Element 4 - Construction Stormwater Oversight	**High**	**High**	No changes proposed to Nashville's SWMP	No
Element 5 - Administering Post-Construction Regulations and Oversight (Regulations Revisions)	**High**	**High**	No changes proposed to Nashville's SWMP	No
Element 5 - Administering Post-Construction Regulations and Oversight (SCM Maintenance)	**Moderate**	**Moderate**	Due to the vast numbers of SCM structures in place, recommend major changes to the SWMP to allocate the necessary resources to inspecting/following up.	No
Element 6 - Pollution Prevention/Good Housekeeping for Municipal Operations (Industrial Oversight/Monitoring)	**Moderate**	**Moderate**	Recommend minor changes to SWMP to focus inspections on high-risk commercial and industrial sites (eliminate focus on SARA Title 3, Sec. 313) (*Refer to Section 3)	Yes
Element 6 - Pollution Prevention/Good Housekeeping for Municipal Operations (Municipal Site Management and Street Sweeping)	**High**	**High**	No changes proposed to Nashville's SWMP	No

Dry Weather Field Screening:
The dry weather field screening MS4 permit requirement directs Metro to perform dry-weather inspections and monitoring of MS4 outfalls within every ¼ mile grid that contains commercial and/or industrial zoned properties. During this most recent permit cycle, there were 2,407 - ¼ mile grids within Davidson County that contained commercial and/or industrial zoned properties. Screening this number of grids required a large expenditure of Metro resources. Despite the significant amount of resources devoted to performing field screening, there were very few major finds of pollution during the 3rd permit cycle. It is estimated that Metro spent approximately 3,009 hours (as shown in Table 2 below) performing dry weather field screening each permit cycle. It has been concluded that this permit requirement should be dramatically changed to produce a much more efficient field screening program. Proposed changes to the field screening program are detailed in Section 3.

Table 2 – Analysis of Dry Weather Field Screening Resource Requirements

Field Screening						
Average Hours per Day	**Average Grids per Day**	**Hours per Grid (Including data entry, etc.)**	**Total Grids**	**Total Staff Hours Per 5 Year Permit Cycle**	**Total Staff Hours Per Year**	**Work Days Per Year Dedicated to Field Screening**
8	10	1.25	2,407	3,009	602	75

B. MS4 Permit Monitoring Requirements

The MS4 monitoring program as implemented within the SWMP has largely been driven by specific MS4 Permit Requirements as prescribed in the original 40 CFR Part 122.6 and more recent TDEC TMDL/303(d)-related sampling activities. For purpose of evaluating the effectiveness of these monitoring programs, the following major monitoring requirements were evaluated:

I. Wet Weather Land-Use Outfall Sampling
II. MS4 Permit Ambient Sampling
III. TMDL Monitoring (Geo-Mean Sampling)
IV. Post Construction SCM Wet Weather Sampling
V. Visual Stream Assessments

Based on the analysis, most of the Metro MS4 monitoring programs were found to be highly beneficial in producing valuable data that could be used to track down sources of pollution, assess overall water quality of Davidson County streams, or assess the effectiveness of specific elements within the SWMP. However, there were some necessary changes identified that require modifications to the Metro SWMP and MS4 permit language. In particular, there were two specific monitoring components that were identified as needing complete modifications, as they have been found to require a high level of resources, while producing insignificant data. These two monitoring components, which are specific requirements of the MS4 Permit, include the *wet weather land-use outfall sampling* and the *post construction SCM wet weather sampling*. A summary of the overall analysis is provided in Table 3.

Table 3 – Effectiveness/Efficiency Evaluation of MS4 Monitoring Requirements

Major Permit Requirement Tasks	Estimated Staff Resource Dedication Per Year	Pollution Abated/Prevented or Quality Data Collected	Recommended Improvements to SWMP	MS4 Permit Language Change Required to Implement SWMP Change
Wet Weather Land-Use Outfall Sampling	**High**	**Low**	Recommend replacing this sampling program with a more-effective sampling program that produces valuable data that could be used to pinpoint pollution, make stormwater management decisions and/or assess stream water quality conditions.	**Yes**
MS4 Permit Ambient Sampling (MS4 Mapping/Updating)	**Moderate**	**Moderate**	Recommend replacing this sampling program with a more-effective sampling program that produces valuable data that could be used to pinpoint pollution, make stormwater management decisions and/or assess stream water quality conditions.	**Yes**
TMDL Monitoring (Geo-Mean Sampling)	**Moderate**	**High**	No changes proposed to Nashville's SWMP	No
Post Construction SCM Wet Weather Sampling	**Moderate**	**Low**	Recommend replacing this sampling program with a more-effective sampling program that allows Metro to analyze potential retrofit opportunities with pre- and post-runoff sampling.	**Yes**
Visual Stream Assessments	**High**	**Moderate**	Recommend clarifying a more-efficient process for performing visual stream assessments on sections that have been previously assessed.	**Yes**

Wet Weather Land-Use Outfall Sampling

The wet weather land-use outfall sampling program has been required in all three cycles of the MS4 permit. As per the MS4 permit, Metro is required to collect 3 sample events for 5 homogeneous land uses each year. This requirement involves an inordinate amount of resources, while the data itself has proven of very little value to the Stormwater program. Metro estimates that it takes approximately 1,800 hours of staff resources each permit cycle to sample or attempt to sample homogeneous land use outfalls. (See Table 4)

Table 4 – Analysis of Wet Weather Land Use Sampling Resource Requirements

MS4 Permit Wet Weather Land Use Characterization Sampling						
Required Samples Per Year	**Estimated Staff Hours Per Each Sample (Includes prepping samples, drive time, sampling time, transport time, data entry time, weather monitoring etc.)**	**Estimated Number of Events Per Year Staff Attempts Sampling (Rain stops, runoff does not result, etc.)**	**Staff Hours Per Each False Alarm (Includes time of several employees)**	**Total Staff Hours Per 5 year Permit Cycle**	**Total Staff Hours per year**	**Work Days Per Year Dedicated to Wet Weather Land Use Sampling**
15	16	10	12	1,800	360	45

Post Construction SCM Wet Weather Sampling

The 3rd cycle of the MS4 Permit required Metro to collect 5 wet weather "grab" sample events for each of the following types of post-construction SCM: dry detention pond; wet pond; bioretention basin; pervious pavement; green roof; and proprietary underground water quality unit. This sampling requirement necessitates a great deal of resource dedication from Metro staff, however, similar to the land use wet weather sampling, the data has proven to be of little to the Metro NPDES program. Metro estimates that it requires approximately 640 hours to perform this MS4 permit requirement each permit cycle.

MS4 Permit Post-Construction Stormwater Control Measure Wet Weather Sampling						
Required Samples Per Year	**Estimated Staff Hours Per Each Sample (Includes prepping samples, drive time, sampling time, transport time, data logging time, weather monitoring etc.)**	**Estimated Number of Events Per Year Staff Attempts Sampling (Rain stops, runoff does not result, etc.)**	**Staff Hours Per Each False Alarm (Includes time of several employees)**	**Total Staff Hours Per 5 year Permit Cycle**	**Total Staff Hours per year**	**Work Days Per Year Dedicated to SCM Wet Weather Sampling**
6	8	10	8	640	128	16

3. Proposed Changes to MS4 Permit Language for Nashville's 4th Cycle:

As a result of the effectiveness/efficiency analysis on current SWMP elements and MS4 permit requirements, Metro has concluded that specific changes are necessary to create a more efficient and effective MS4 program. While some of the proposed changes will only require changing internal Metro NPDES programs and operating procedures, other changes have been identified that will require existing MS4 permit requirements to be adjusted moving forward. The following paragraphs describe the proposed specific changes to the existing Phase 1 MS4 permit.

A. Dry Weather Screening *(Existing MS4 Permit Section 3.2.3.3 – Page 11)*:

As mentioned in Section 2, the effort to perform dry weather screening of outfalls within commercial and industrial-zoned ¼ mile grids has proven to be a very ineffective and inefficient use or resources. This permit requirement dates back to the original 40 CFR, Part 122, which was intended for the original Phase 1 MS4 Permit applications. Most of the major issues this program element was intended for (i.e. cross connections, illicit discharges, etc.) have been discovered in previous permit cycles. The current outfall-based screening program is a "tunnel vision" approach that looks only at the outfall at a point in time and, as a result, misses many non-point sources of pollution such leaking/messy dumpsters, spilled oil and grease, etc., that could be addressed to prevent future contaminants from discharging to the MS4 during rain events. Metro would like to propose, in-lieu of the existing permit requirement, the following program element to be implemented.

1. Metro create "*Pollution Hot Zone*" polygons of commercial and industrial areas within the county that have been documented to have recurring issues of illicit discharges, complaints, ongoing instances of poor housekeeping, and/or low water quality conditions of receiving waters.

2. Metro create ¼ mile grid system to cover each "*Pollution Hot Zone*" and GIS-based database to track inspections/screenings of each ¼ mile grid.

3. Metro perform property-based screenings (i.e. commercial/industrial business parking lots, dumpsters, etc.) of at least 3 properties within each ¼ mile grid once per every 18 months (i.e. All "*Pollution Hot Zone*" ¼ mile grids will be screened twice per 5 year permit cycle).

4. Metro document all findings within the GIS-based database and follow-up with issues in the field with proper enforcement and/or public education efforts, so that pollutant exposure issues found during the screening process are addressed.

5. If dry weather discharges are observed during the property screening process, the appropriate field tests will be conducted to determine if the discharge is a prohibited non-stormwater discharge.

B. Industrial/High Risk Commercial monitoring (*Existing MS4 Permit Section 3.2.6.7 – Page 23*)

Metro has found the requirement to inspect municipal landfills, hazardous waste treatment, storage and disposal facilities, and SARA Title III, Section 313 facilities to be an ineffective prioritization system. This MS4 permit requirement dates back to the original 40 CFR Part 122, which was intended for the initial Phase 1 MS4 permit applications. Since this time, Tennessee has implemented an effective TMSP program that requires most facilities, with exposed industrial processes to obtain permit coverage. In lieu of focusing inspections on facilities described in the original 40 CFR, Metro proposes to adapt with the changing regulations and focus inspections on industrial facilities that have the greatest potential for exposure of industrial process to stormwater runoff. As such, metro proposes to change this program element to the following criteria:

1. Metro to create/maintain a GIS-based database of active industrial facilities that have received a TMSP for industrial stormwater runoff and facilities that have received a RMCP for stormwater runoff and discharges of treated process water. Additionally, Metro would inventory high-risk commercial facilities that fall outside of the industrial permitting mechanisms, such as landscaping companies, etc.

2. Within the first 6 months, Metro should perform an aerial photography review of industrially zoned properties within Metro to identify potential stormwater exposure sites that do not have proper TMSP or RMCP coverage. Based on the aerial photography survey, Metro would perform field inspections on sites identified with potential exposure issues. Metro will provide TDEC with a list of facilities that were identified to have exposed industrial processes, but lack TMSP or RMCP coverage.

3. Metro would create a priority inspection list of industrial facility types for which past complaints have shown them to be most likely to have stormwater runoff issues (i.e. salvage lots, ready mix concrete plants, fleet maintenance, high-risk commercial sites, etc.) and submit the industrial priority inspection list to TDEC within the first 6 months

4. Metro would proceed with inspecting all priority inspection sites within a 3 year period. At the conclusion of the 3rd year, Metro will perform an additional review of the TDEC permit database to determine if any new industrial sites need to be added to the Metro priority inspection list. Metro would report any updates to the priority inspection list within the Year 4 Annual Report.

5. In years 4 and 5 of the permit, Metro would inspect any new facilities added to the priority inspection list and would re-inspect those facilities in which issues were found during the original inspection to determine if the appropriate corrective actions were completed

C. Stormwater Monitoring Program (*Existing MS4 Permit Section 3.3 – Page 24*)

As described in Section 2, Metro has identified two existing MS4 permit monitoring requirements that have proven somewhat ineffective in producing valuable data and two existing monitoring requirements that have produced data of limited value and have caused an inefficient allocation of staff resources. Rather than proposing specific changes to those sections, Metro wishes to proceed on the same course as the newly issued Phase II MS4 permit, which allows the permittee to submit an alternative customized monitoring plan to TDEC within the first 6 months of permit reissuance. Metro requests that there be specific language that allows deviation from the original Phase 1 MS4 permit application (40 CFR Part 122), which specifically required wet weather land use outfall sampling.

Metro's customized monitoring plan will be designed to accomplish the following goals:

- Source tracking and pinpointing chronic sources of pollution to Davidson County's waterways;
- Evaluating specific SWMP pollution prevention programs and/or structures to determine effectiveness in reducing pollutant loadings to the MS4 and receiving waterbodies; and
- Assessing water quality conditions of Davidson County waterways to determine if they are meeting the water quality criteria for their designated uses – particularly as it relates to TMDL and/or 303(d) list related considerations.

Metro would initiate the monitoring program once TDEC confirms approval of the customized monitoring plan and would report all results in subsequent annual reports.

MEGAN BARRY
MAYOR

METROPOLITAN GOVERNMENT OF NASHVILLE AND DAVIDSON COUNTY

DEPARTMENT OF WATER AND SEWERAGE SERVICES
STORMWATER DIVISION
NPDES OFFICE
1607 COUNTY HOSPITAL ROAD
Nashville, Tennessee 37218

January 31, 2017

Re: Nashville Phase 1 MS4 Permit Reissuance – TNS068047

Vojin Janjic | Manager, Water-Based Systems
Division of Water Resources
William R. Snodgrass Tennessee Tower, 11th Floor
312 Rosa L. Parks Ave, Nashville, TN 37243

Dear Mr. Janjic,

We are writing you to request specific clarification on the permit reissuance process for the Metropolitan Government of Nashville, Davidson County (Metro) Municipal Separate Storm Sewer System, which expires as of today, January 31, 2017. As we approach this reissuance process and period between expired permit and reissued permit, it is our intentions to propose the following path going forward to ensure MS4 Permit compliance is maintained throughout the transition period and to ensure coordination occurs between the Division and key Metro staff to incorporate changes to specific terms and conditions of the MS4 permit.

Transition Period:
As you are aware, most of the specific requirements of the MS4 permit are ongoing and do not have certain deadlines by which to be completed. Among these, include programs such as administering stormwater management regulations requirements for post-construction stormwater controls, overseeing a vigorous inspection and oversight program for construction activities, performing public education/public involvement activities, ensuring municipal maintenance operations are not impacting stormwater runoff, and implementation of various Illicit Discharged Detection and Elimination (IDDE) programs. Metro proposes to continue these ongoing programs as prescribed in the existing active permit until the new permit becomes effective.

If d assistance or an accommodation, please contact Metro Water Services, -862-4862, 1600 Second Avenue North, Nashville, Tennessee 37208.

There are some MS4 permit requirements, however, that list specific target dates or timeframes for the activities to be completed per Metro's active permit. Specific requirements within the MS4 permit that have declared deadlines are listed below:

- ***Dry Weather Outfall Screening***
  - *Screen one outfall within every ¼ mile commercial/industrial grid once per permit term.*
- ***Industrial Inspection/Monitoring Program***
  - *Inspect industrial high risk sites as identified by the MS4 permit (i.e. SARA Title 3, TSD sites, etc.) once every 3 years.*
- ***Post Construction Stormwater Control Measure (SCM) Inspection and Maintenance Oversight Program***
  - *Implement permittee-defined program by the end of year 5.*
- ***Various MS4 Permit-Prescribed Monitoring Activities.***
  - *Sampling programs (i.e. wet weather, ambient, visual stream assessments, etc.) prescribed in the permit to be completed on a 5 year permit term.*

It is our understanding through conversations with TDEC staff, that it may be late 2017 or possibly even next year, before our MS4 permit is reissued. With that said, we would like to propose the following compliance activities to be performed in the transition period.

- ***Dry Weather Outfall Screening***
  - *Test our newly proposed field screening protocol (i.e. screen 3 business/industrial sites for site management/housekeeping procedures in each ¼ commercial/industrial-zoned grid.) Transition period goal would be to screen at least 50 grids each year prior to the new permit being issued.*
- ***Industrial Inspection/Monitoring Program***
  - *Re-inspect only industrial sites in which issues were noted during the original inspections and/or those involved with compliant investigations. Identify and perform inspections on industrial facilities (not required to be inspected by the original MS4 permit (i.e. auto salvage lots, ready-mix facilities, etc. not identified as SARA Title 3 or TSD facilities)). A list of industrial facilities to be inspected would be sent to the TDEC Nashville Field Office. Goal would be to inspect 10 industrial facilities each year.*
- ***Post Construction Stormwater Control Measure (SCM) Inspection and Maintenance Oversight Program***
  - *Continue to respond to citizen complaints of SCM structures not being maintained properly. In addition, would inspect and enforce (if necessary) on at least 50 SCM structures per year. Currently and during the transition period, Metro will continue to build its SCM Inspection & Maintenance oversight process.*
- ***Various MS4 Permit-Prescribed Monitoring Activities.***
  - *Discontinue the following sampling activities until the new MS4 permit is issued:*
    - *Wet Weather Homogenous Land Use Sampling*
    - *Wet Weather SCM Discharge Grab Sampling*
    - *Wet Weather Industrial Sampling (1 TMSP/RMCP site per year).*

- *Continue routine ambient monitoring/sampling programs (ambient chemical/bacteriological sampling and visual stream assessments) as well as any site-specific sampling as required in the course of routine investigations. The MWS Stormwater NPDES Watershed Group would coordinate with TDEC Nashville Field Office staff on monitoring schedules (which watersheds they will be monitoring during the transition period).*

New Permit Coordination

As stated above, Metro is requesting coordination on developing specific terms and conditions of the reissued MS4 permit in an ongoing effort to improve our permit compliance activities. In particular there are several program activities that Metro is interested in modifying to make more efficient and effective. Some of these proposed changes would involve changes to MS4 permit requirements as well, if implemented. Specific changes Metro are requesting to individually listed permit requirements were included in Metro's most recent Annual Report submittal (see attachment). Metro is requesting specific meetings to be arranged between appropriate TDEC permit writer staff and MWS Stormwater NPDES personnel so that these proposed changes can be explored and discussed.

Sincerely,

Michael Hunt
Metro Water Services, Stormwater, NPDES
Program Manager

Encl. - Nashville Phase 1 MS4 Permit Application Section of MS4 Annual Report

CC:

April Grippo – TDEC Nashville Field Office
Jennifer Dodd – TDEC Central Office
John Leffew – TDEC Nashville Field Office

ATTACHMENT C – MS4 Pollutant Loading EMC Calculation Memo

To: Metro Water Services Stormwater – NPDES Program
From: Paradigm Environmental
Date: December 8, 2017
Re: Statistical Analysis of MWS Wet-weather Outfall Monitoring Data

This memorandum presents a statistical analysis of the wet-weather outfall monitoring data collected by Metro Nashville Water Services (MWS) under its Municipal Separate Storm System permit (MS4 Permit). The primary goal of this memorandum is to address MS4 Permit requirements to provide event mean concentrations (EMCs) by land use and pollutant and create estimates of Seasonal Pollutant Loading (SPLs) (Permit Section 3.2.2). Furthermore, the outputs from this analysis will support development of a database-backed web platform to facilitate the continuous tracking of MS4 program control measures and their effectiveness over time. The SPL estimates will be presented in a separate memo.

This memorandum is organized into the following sections:

- Background information (**Section 1**)
- Overview of wet-weather pollutant monitoring data collected by MWS from 2012-2017 (**Section 2**)
- Description of applied statistical methods (**Section 3**)
- Summary statistics of pollutant concentrations by land use (**Section 4**)
- Additional statistical analysis including statistical significance testing of first-flush concentrations and comparison to national water quality databases (**Section 5**)
- Appendices containing boxplots by land use for each pollutant (Appendix A), summary statistics for each pollutant (Appendix B), and EMC medians for first-flush and one hour later samples (Appendix C)

1 BACKGROUND

The Metropolitan Government of Nashville and Davidson County (Nashville) is served by a large MS4 system. MWS, which manages the MS4 Permit, strives to reduce pollution delivered through the MS4 system by implementing both structural control measures and non-structural programs. Over the years, MWS has implemented various programs aimed at reducing pollution to local receiving waters including a stringent grading permit for new or redevelopment, public guidance documents and videos on stormwater pollution, illicit discharge detection and elimination programs, and many other efforts. Under the current MS4 permit, MWS must evaluate the effectiveness of these programs through the calculation of SPL estimates from MS4 jurisdictional areas. Specifically, Section 3.3.1 of the current MS4 permit requirement states as follows:

> *"The permittee should provide the seasonal pollutant load (SPL) and the event mean concentration (EMC) for all parameters listed in Table 2, except pH, for each wet weather site. The permittee should document the method used to calculate SPL and EMC. The SPL and EMC should be included in the Annual Report for the fifth year of the permit."*

The results of this memo address the MS4 Permit requirement to calculate EMCs. A separate / follow-up memo will leverage the EMCs to generate SPL estimates. The EMCs are based on MWS wet-weather outfall monitoring data, as described in the next section.

2 DATA ASSESSMENT

MWS conducted wet-weather outfall monitoring as a requirement of Section 3.3.1 of the current MS4 Permit. Samples were collected at five different sites between April 2012 and January 2017 with each site representing a single homogeneous land use. **Table 2-1** summarizes the five wet-weather MS4 outfall monitoring locations, including a physical description of the site, dominant land use, latitude, longitude, and downstream receiving waterbody. The five land uses sampled are commercial, industrial, open space, residential, and transportation. These categories align with the general land use categories covered for both the Nationwide Urban Runoff Program (NURP) and National Stormwater Quality Database (NSQD) studies (USEPA 1983, Pitt et al. 2004). Comparisons to these datasets are provided in Section 5.3.

Table 2-1. Summary of Wet-Weather Outfall Monitoring sites (TDEC 2012)

Land Use	Description of Location	Latitude	Longitude	Watershed
Residential	Culverted street drain near the address of 841 Russleo Drive	-86.8776	36.13855	Cumberland River
Commercial	Behind the Bellemeade Kroger Shopping Plaza	-86.8503	36.1245	Richland Creek
Industrial	Intersection of Cockrill Bend Blvd and West Belt Drive	-86.877	36.17096	Richland Creek
Open Space	Entrance road to the trail head parking area of Bells Bend Park located off Old Hickory Blvd.	-86.9258	36.15617	Cumberland River
Transportation	On the north side of Ashland City Highway near the address of 4882 Ashland City Highway	-86.907	36.21046	Sulphur Creek

Figure 2-1 displays the locations of the five wet-weather outfall monitoring sites in relation to local watersheds. The wet-weather sampling sites were chosen to capture five distinct, homogeneous land uses. The sampling sites are also located in drainage areas large enough to sustain flow during a storm event of at least 0.1 inches of rainfall and greater than 72 hours since the last 0.1" rainfall (TDEC 2012). All five sites are located west of downtown Nashville.

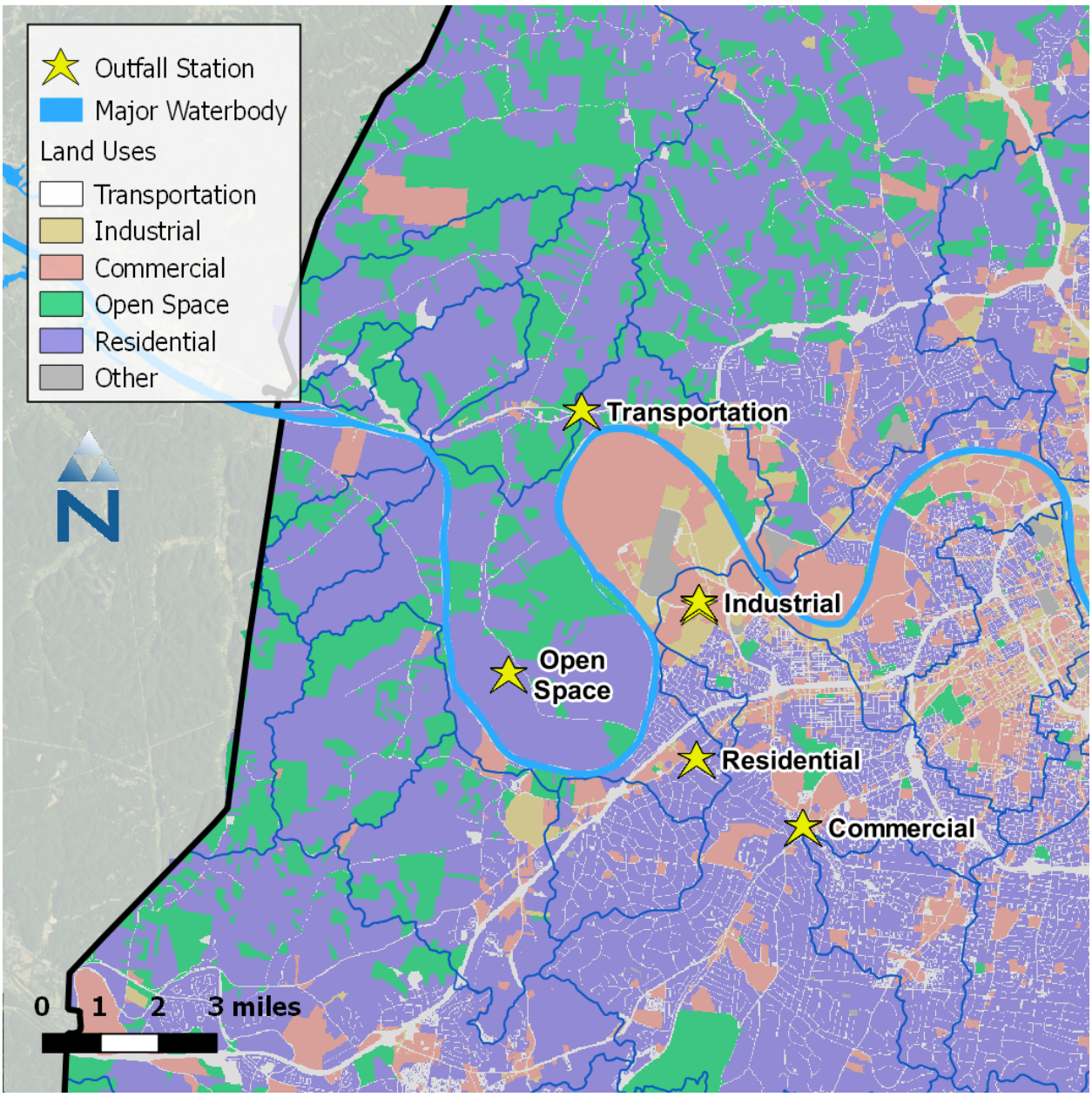

Figure 2-1. Location of wet-weather outfall monitoring sites and surrounding land uses.

The MS4 permit requires sampling at each site for at least three storm events per year, each during a different season (TDEC 2012). A summary of the outfall monitoring dataset, specifically sample counts and detection limits by pollutant, is presented in **Tale 2-2**. The MS4 permit requires that two measurements be taken for each storm event characterizing the *first-flush* (FF) and *one-hour* (1-HR) runoff concentrations. The *first-flush* sample was reported to be taken during the initial 30 minutes of runoff, or soon after as realistically feasible. The post first-flush, or *one-hour,* sample was intended to represent the remaining duration of the storm. Three sample events were to be collected per permit year at each of the five locations. If samples were not collected due to difficulties encountered, then the missing samples were to be collected during subsequent years with changes noted in the annual reports submitted to TDEC.

It is noted that not all samples were available in pairs for *first-flush* and *one-hour* measurements. For example, the industrial, residential, and commercial land use sites had more *first-flush* samples than *one-hour* samples. Samples for the open space and transportation land uses were always available in *first-flush* and *one-hour* pairs.

Table 2-2. Summary of pollutant detection limits in the EMC dataset (2012-2017)

Pollutant Name	# of Lower Detection Limits Reported	# of First-Flush Samples	# of One-Hour Samples
Biological Oxygen Demand [1]	5	64	60
Chemical Oxygen Demand	1	61	58
E. coli [1]	2	64	60
Total Suspended Solids	3	64	60
Total Dissolved Solids	1	64	60
Oil & Grease	2	63	59
Total Chromium	1	64	60
Total Copper	1	64	60
Total Lead	1	64	60
Total Nickel	1	64	60
Total Zinc	1	64	60
Total Ammonia [1]	5	64	60
Nitrate + Nitrite	1	64	60
Total Kjeldahl Nitrogen	1	64	60
Total Nitrogen	10	64	59
Total Phosphorous	1	64	60
Dissolved Phosphorous	1	64	60

1 – The laboratory also reported one upper detection limit

3 STATISTICAL METHODS

A Regression on Order Statistics (ROS) analysis was used to evaluate the outfall data. ROS is a semi-parametric method that is commonly used to estimate summary statistics (mean, median, percentiles, etc.) on data that contain censored (non-detect) values. The advantage of ROS is that summary statistics can be computed without "substitution" of detection limits (e.g., replacing the non-detect value with half the detection limit), which is subject to error and bias.

The ROS method performs a regression on the data and assumes lognormal quantiles. A regression line is created that then predicts unknown observations (those that have been "censored" and are above or below the detection limit). The mean is estimated using the intercept and the standard deviation using the slope of the line. Subsequently, unknown values below the detection limit (censored values) can be extrapolated using the estimated parameters. Observations for all the censored values are then known, and the summary statistics can be estimated.

The ROS method is especially useful in analyzing water quality data because of the following characteristics (Huston 2009):

- The ROS method works well for small datasets, and almost any sample size is sufficient
- For water quality data, ROS can handle datasets with multiple detection limits
- There is no limit on the percentage of censoring that can occur (though results should be interpreted carefully for high percentages of non-detects)
- The ROS method is resistant to non-normality in the data, and even with skewed data, meaningful inferences can be developed
- It is robust and uses as much sample data as possible
- ROS provides better estimates of median values for log-normally distributed datasets

Environmental data are generally skewed, following non-normal distributions. A robust method like ROS is less biased than other methods (e.g., Kaplan-Meier, MLE-Lognormal) which assume data follow a normal distribution. While these other methods consistently produce similar estimates of the mean, using ROS results in a better prediction of median values. Studies have shown the bias introduced by ROS as relatively small (Huston 2009).

ROS statistics for MWS outfall monitoring data were generated in the open-source R software environment using the *Non-detects and Data Analysis* (NADA) library. This library was designed specifically for handling environmental datasets complicated by non-detect values. The NADA library was developed by Lopaka (Rob) Lee of the United States Geological Survey (USGS) and Dennis Helsel (Helsel 2012).

4 RESULTS: SUMMARY STATISTICS

The ROS method described in **Section 0** was used to generate summary statistics for each combination of land use and pollutant. Data were analyzed in individual groups for FF and 1-HR samples, as well as a group analyzing all combinded samples (ALL). The results were analyzed both graphically, using boxplots, and through tabular generation of summary statistics. Both boxplots and summary statistics were generated using the NADA package in R. The boxplot outputs can also be viewed online at this web viewer.

For efficiency, the statistical results for four primary pollutants are presented in the main body of this memo while other pollutants are presented in appendices. Example boxplots and summary statistics for four pollutants are presented in this section:

- **Figure 4-1** and **Table 4-1** present sample boxplots and summary statistics for *E. coli*, respectively. *E. coli* concentrations appear to be highest in the residential land use area, with few non-detects.
- **Figure 4-2** and **Table 4-2** present sample boxplots and summary statistics for Dissolved Phosphorus, respectively. Dissolved phosphorus appears to be highest in Open Space and Residential areas, but has the greatest difference in first flush and one-hour samples at the Open Space land use sample site.
- **Figure 4-3** and **Table 4-3** present sample boxplots and summary statistics for Total Copper, respectively. As with other metals, total copper concentrations are highest in Commercial and Transportation land uses, and first flush samples consistently yield higher copper concentrations than samples taken one hour later across all land uses.
- **Figure 4.4** and **Table 4.4** present sample boxplots and summary statistics for Total Suspended Solids, respectively. TSS concentrations are highest in Open Space, Residential and Transportation land uses, and (similarly to copper and other metals), the first flush samples yield higher TSS concentrations than samples taken one hour later across all land uses.

Appendix A presents boxplots for all 17 parameters comparing the spread of data between FF, 1-HR and ALL samples across the five land uses. **Appendix B** presents the ROS calculated summary statistics for all 17 parameters that were used in developing the boxplots in **Appendix A**.

Additional analysis of first flush patterns is presented in the next section.

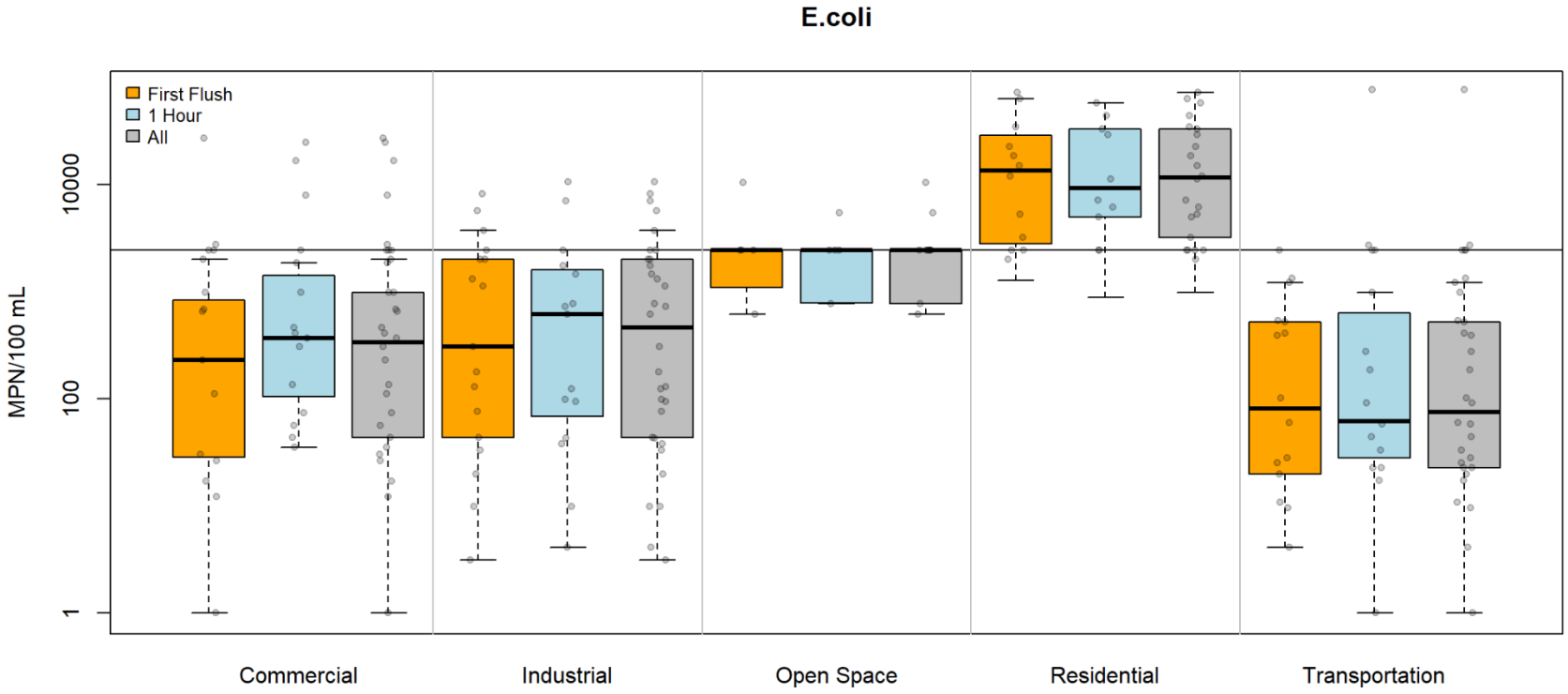

Figure 4-1. *E. coli* sample distributions for first flush, one hour later, and all samples across five land uses.

Note: the horizontal line in all box plots show the highest detection limit reported for that pollutant

Table 4-1. Statistics for *E. coli* across five land uses and three sample types

E. *coli* (MPN/100 mL)															
Land Use	**Commercial**			**Industrial**			**Open Space**			**Residential**			**Transportation**		
Type	**FF**	**1-HR**	**ALL**	**FF**	**1-HR**	**ALL**	**FF**	**1-HR**	**ALL**	**FF**	**1-HR**	**ALL**	**FF**	**1-HR**	**ALL**
n	15	15	30	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	87%	93%	90%	100%	100%	100%	80%	80%	80%	92%	90%	91%	93%	93%	93%
Mean	2,307	3,622	2,973	1,595	1,710	1,649	3,393	2,371	2,892	21,022	19,618	20,403	332	5,596	2,959
Standard Deviation	6,829	7,383	7,016	2,315	3,027	2,628	4,015	1,912	3,008	24,133	19,924	21,793	445	19,776	14,003
Coefficient of Variation	3.0	2.0	2.4	1.5	1.8	1.6	1.2	0.81	1.0	1.2	1.0	1.1	1.3	3.5	4.7
lower 95th CI	8.8	41	14	8.5	8.1	7.2	707	773	663	1,667	1,575	1,627	7.7	12	6.6
upper 95th CI	9,971	19,091	21,134	6,152	8,071	7,539	8,828	4,852	8,194	67,365	51,451	62,747	1,255	25,007	2,585
25th percentile	28	105	46	44	68	43	1,084	785	890	2,990	5,245	3,623	21	28	23
Median	**228**	**365**	**337**	**308**	**613**	**460**	**2,419**	**2,420**	**2,419**	**13,435**	**9,215**	**11,565**	**80**	**62**	**75**
75th percentile	833	1,415	980	1,986	1,596	1,986	2,420	2,420	2,420	25,473	31,888	31,888	493	628	493
IQR	805	1,311	934	1,943	1,528	1,943	1,336	1,635	1,530	22,483	26,643	28,265	472	600	469
Minimum	1.0	35	1.0	3.1	4.1	3.1	613	770	613	1,986	2,420	1,986	4.1	1.0	1.0
Maximum	26,820	24,810	26,820	8,160	10,500	10,500	10,430	5,460	10,430	72,700	57,940	72,700	2,420	77,010	77,010

Note: median is **bolded** because it is the primary central tendency measure that will be used for pollutant loading estimates.

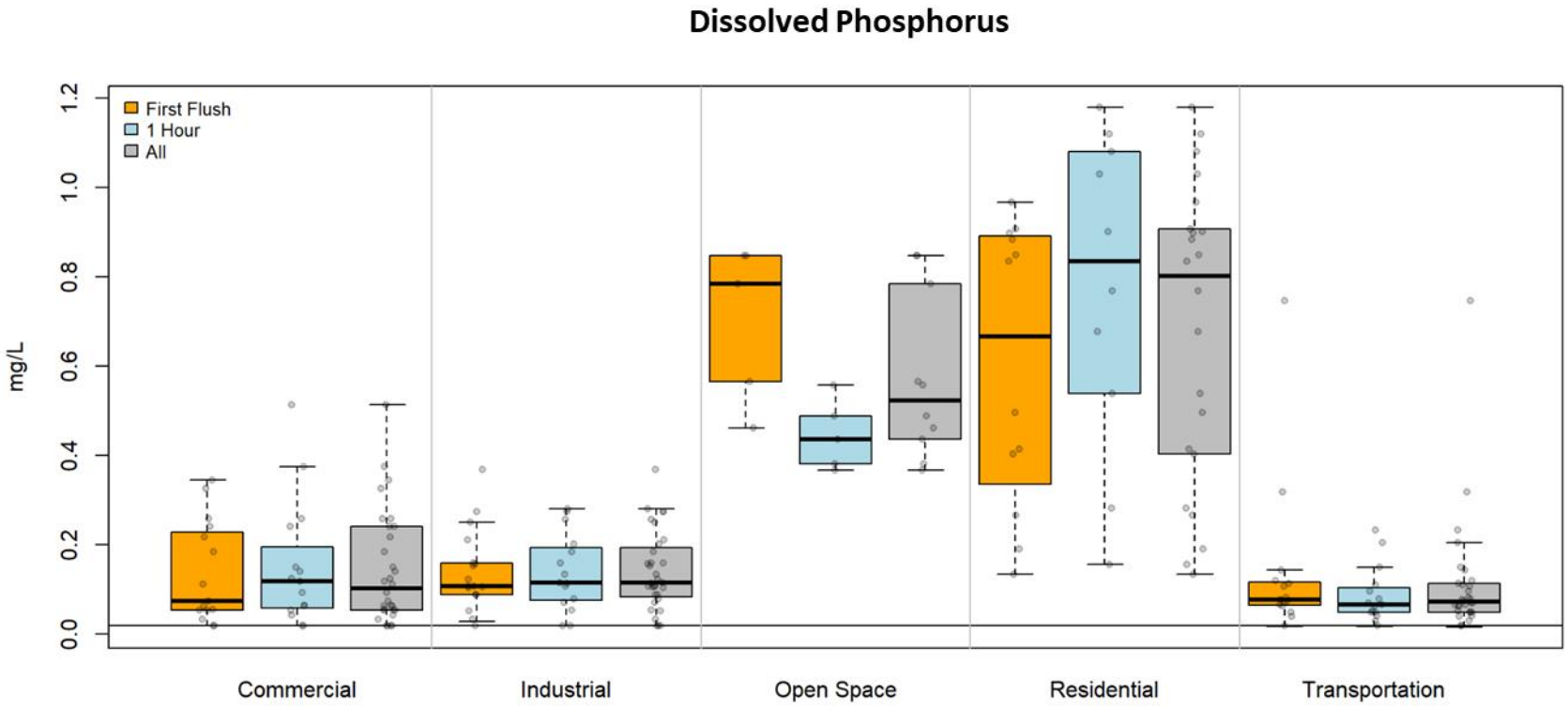

Figure 4-2. Dissolved Phosphorus sample distributions for first flush, one hour later, and all samples across five land uses.

Note: the horizontal line in all box plots show the highest detection limit reported for that pollutant.

Table 4.2. Statistics for Dissolved Phosphorus across five land uses and three sample types

Dissolved Phosphorus (mg/L)															
Land Use	Commercial			Industrial			Open Space			Residential			Transportation		
Type	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL
n	15	15	30	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	100%	100%	100%	94%	93%	94%	100%	100%	100%	100%	100%	100%	93%	93%	93%
Mean	0.14	0.15	0.14	0.14	0.14	0.14	0.70	0.45	0.57	0.60	0.77	0.68	0.14	0.09	0.11
Standard Deviation	0.11	0.14	0.13	0.09	0.09	0.09	0.18	0.08	0.19	0.32	0.36	0.34	0.18	0.06	0.14
Coefficient of Variation	0.83	0.93	0.87	0.63	0.62	0.62	0.25	0.18	0.32	0.52	0.46	0.50	1.3	0.71	1.2
lower 95th CI	0.02	0.02	0.02	0.03	0.02	0.03	0.48	0.37	0.37	0.17	0.21	0.16	0.03	0.03	0.03
upper 95th CI	0.33	0.42	0.36	0.29	0.28	0.28	0.85	0.54	0.85	0.93	1.2	1.1	0.45	0.21	0.28
25th percentile	0.05	0.06	0.05	0.09	0.08	0.09	0.57	0.38	0.44	0.37	0.57	0.41	0.07	0.05	0.05
Median	**0.07**	**0.12**	**0.10**	**0.11**	**0.12**	**0.12**	**0.78**	**0.44**	**0.52**	**0.67**	**0.83**	**0.80**	**0.08**	**0.07**	**0.07**
75th percentile	0.23	0.20	0.24	0.16	0.19	0.19	0.85	0.49	0.73	0.89	1.1	0.91	0.12	0.10	0.11
IQR	0.18	0.14	0.18	0.07	0.12	0.10	0.28	0.11	0.29	0.52	0.49	0.50	0.05	0.05	0.06
Minimum	0.02	0.02	0.02	0.02	0.02	0.02	0.46	0.37	0.37	0.14	0.16	0.14	0.02	0.02	0.02
Maximum	0.35	0.51	0.51	0.37	0.28	0.37	0.85	0.56	0.85	0.97	1.2	1.2	0.75	0.23	0.75

Note: median is **bolded** because it is the primary central tendency measure that will be used for pollutant loading estimates.

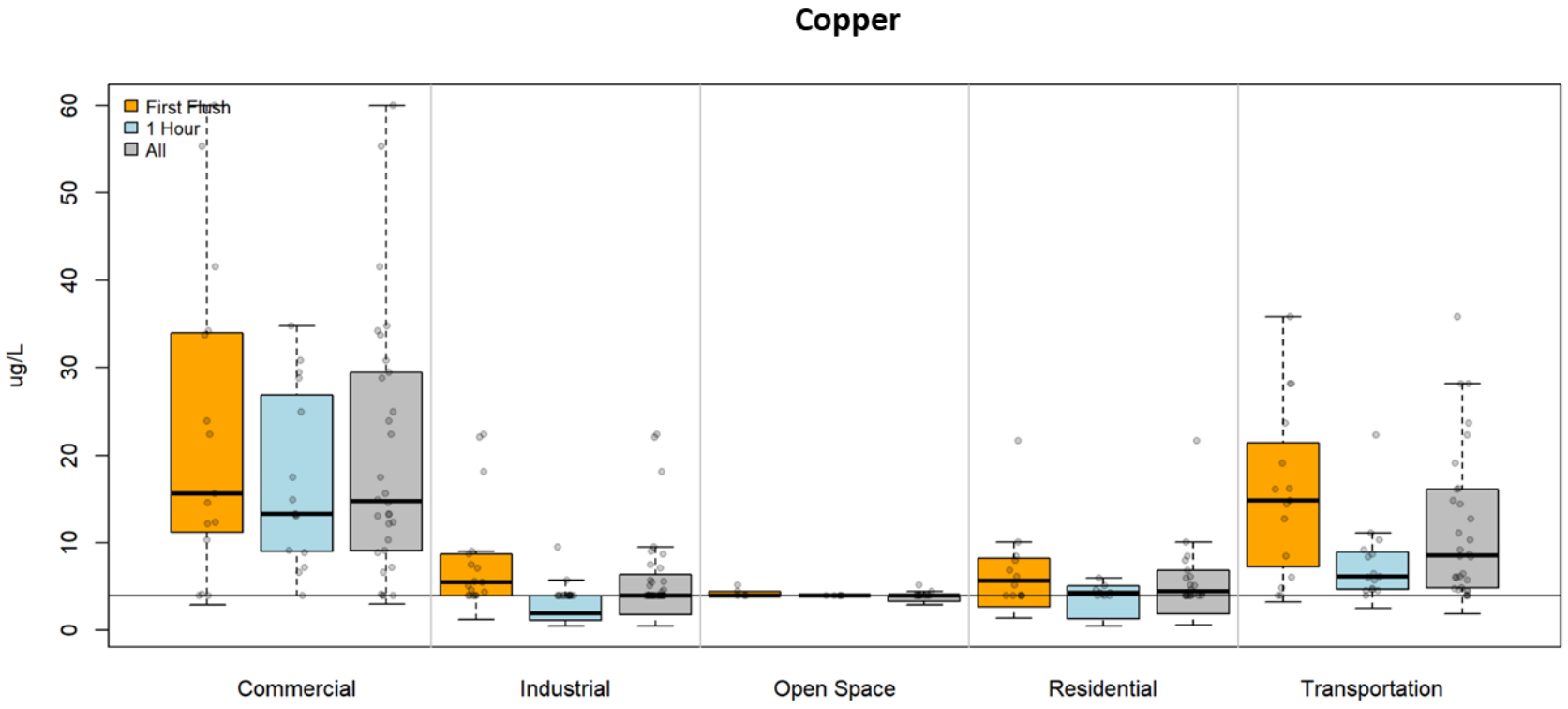

Figure 4.3. Total copper sample distributions for first flush, one hour later, and all samples across five land uses.

Note: the horizontal line in all box plots show the highest detection limit reported for that pollutant.

Table 4.3. Statistics for total copper across five land uses and three sample types

Copper (Cu) (ug/L)															
Land Use	Commercial			Industrial			Open Space			Residential			Transportation		
Type	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL
n	15	15	30	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	87%	93%	90%	76%	33%	56%	80%	40%	60%	67%	70%	68%	87%	93%	90%
Mean	23	17	20	7.8	2.8	5.5	4.2	4.0	3.9	6.6	9.9	8.0	16	7.7	12
Standard Deviation	18	10	15	6.7	2.4	5.7	0.73	0.00	0.66	5.5	20	14	9.8	4.7	8.7
Coefficient of Variation	0.79	0.59	0.73	0.86	0.86	1.0	0.18	0.00	0.17	0.84	2.1	1.8	0.62	0.61	0.75
lower 95th CI	3.8	5.8	4.0	1.6	0.65	0.85	3.4	4.0	3.1	1.7	0.69	0.89	4.0	3.9	2.6
upper 95th CI	57	32	49	22	6.9	20	5.1	4.0	4.9	15	40	21	30	14	28
25th percentile	11	9.0	9.4	4.0	1.2	1.9	4.0	4.0	3.4	2.8	2.0	2.0	7.3	4.7	5.1
Median	**16**	**13**	**15**	**5.5**	**2.0**	**4.0**	**4.0**	**4.0**	**4.0**	**5.6**	**4.3**	**4.5**	**15**	**6.1**	**8.6**
75th percentile	34	27	29	8.7	4.0	6.1	4.5	4.0	4.0	8.1	5.0	6.7	21	8.9	16
IQR	23	18	20	4.7	2.8	4.2	0.47	0.00	0.60	5.3	3.0	4.7	14	4.3	11
Minimum	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Maximum	60	35	60	22	9.5	22	5.2	4.0	5.2	22	68	68	36	22	36

Note: median is **bolded** because it is the primary central tendency measure that will be used for pollutant loading estimates.

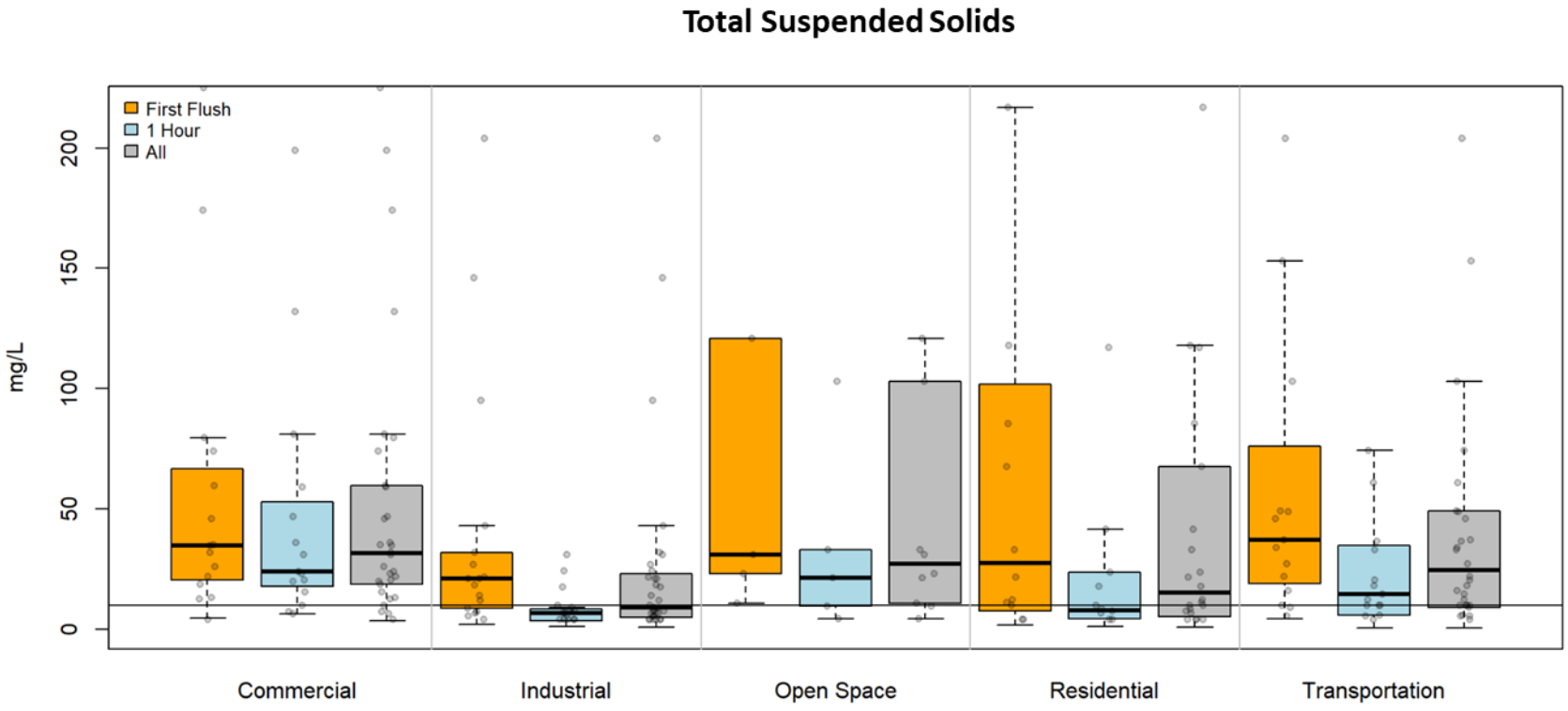

Figure 4-4. Total suspended solids (TSS) sample distributions for first flush, one hour later, and all samples across five land uses.

Note: the horizontal line in all box plots show the highest detection limit reported for that pollutant.

Table 4-4. Statistics for Total Suspended Solids across five land uses and three sample types.

Total Suspended Solids (TSS) (mg/L)															
Land Use	**Commercial**			**Industrial**			**Open Space**			**Residential**			**Transportation**		
Type	**FF**	**1-HR**	**ALL**	**FF**	**1-HR**	**ALL**	**FF**	**1-HR**	**ALL**	**FF**	**1-HR**	**ALL**	**FF**	**1-HR**	**ALL**
n	15	15	30	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	93%	93%	93%	88%	67%	78%	100%	100%	100%	75%	70%	73%	93%	80%	87%
Mean	57	47	52	40	9.0	25	120	34	77	74	23	51	737	286	512
Standard Deviation	63	54	58	56	8.7	44	171	40	126	98	35	79	2,646	1,025	1,985
Coefficient of Variation	1.1	1.1	1.1	1.4	0.97	1.7	1.4	1.2	1.6	1.3	1.5	1.6	3.6	3.6	3.9
lower 95th CI	10	6.7	6.3	2.9	1.7	1.5	13	5.5	6.8	2.5	1.6	1.5	5.2	1.0	2.1
upper 95th CI	189	152	188	158	26	118	357	89	283	258	83	212	3,233	1,249	2,286
25th percentile	20	18	19	8.8	3.5	5.3	23	9.8	13	9.4	5.1	5.7	19	5.8	9.3
Median	**35**	**24**	**32**	**21**	**6.7**	**9.0**	**31**	**21**	**27**	**27**	**8.0**	**15**	**37**	**15**	**25**
75th percentile	67	53	59	32	8.6	22	121	33	86	94	22	61	76	35	49
IQR	46	35	40	23	5.1	17	98	23	72	84	17	55	57	29	40
Minimum	4.0	6.5	4.0	4.0	4.0	4.0	11	4.4	4.4	4.0	4.0	4.0	5.6	4.0	4.0
Maximum	225	199	225	204	31	204	416	103	416	309	117	309	10,300	3,990	10,300

Note: median is **bolded** because it is the primary central tendency measure that will be used for pollutant loading estimates.

5 ADDITIONAL STATISTICAL ANALYSIS

5.1 Comparison of Mean & Median Values

Based on a review of the summary statistics presented in **Section 0** and **Appendix A**, a comparison of the mean and median pollutant concentration was developed by land use to evaluate the use of these two statistics as an EMC value for generating SPL estimates. **Table 5-1** presents the mean and median values for all samples combined by pollutant and land use. All values were calculated using the ROS method described in **Section 3**. Both the mean and median were considered for application as the pollutant EMC because they provide estimates of the central tendency of the data. For water quality data, which are inherently lognormally distributed (Helsel 2012), the median provides a better estimate of the central tendency of the population. An evaluation of MWS data suggests the wet weather outfall data are indeed log-normally distributed. Therefore, the median will be the primary central tendency measure that will be used for future pollutant loading estimates. **Appendix C** contains tables that present the mean and median values isolated for the first-flush and one-hour samples.

Table 5-1. Summary of mean and median wet-weather concentrations for all samples by land use and pollutant (*first-flush & one-hour, combined*)

Pollutant	Statistic	Land Use				
		Commercial	Industrial	Open Space	Residential	Transpor-tation
E. coli (MPN/100ml)	*Mean*	2,973	1,649	2,892	20,403	2,959
	Median	337	460	2,419	11,565	75
Biological Oxygen Demand (mg/L)	*Mean*	21	8.5	3.7	25	6.4
	Median	10	6.1	2.4	6.0	4.0
Chemical Oxygen Demand (mg/L)	*Mean*	130	40	51	74	109
	Median	80	27	48	41	52
Total Ammonia (mg/L)	*Mean*	0.34	0.14	0.09	0.12	0.24
	Median	0.27	0.09	0.08	0.08	0.17
Total Kjeldahl Nitrogen (mg/L)	*Mean*	1.8	0.68	0.91	1.5	1.1
	Median	0.93	0.58	0.66	0.94	0.65
Nitrate + Nitrite (mg/L)	*Mean*	0.56	0.32	0.47	0.39	0.38
	Median	0.36	0.28	0.29	0.27	0.28
Total Nitrogen (mg/L)	*Mean*	2.3	0.93	1.2	1.8	1.5
	Median	1.3	0.72	0.87	1.2	0.96
Dissolved Phosphorus (mg/L)	*Mean*	0.14	0.14	0.57	0.68	0.11
	Median	0.10	0.12	0.52	0.80	0.07
Total Phosphorus (mg/L)	*Mean*	0.42	0.51	0.99	1.1	0.52
	Median	0.34	0.23	0.95	1.1	0.26
Lead (µg/L)	*Mean*	4.6	2.0	1.7	1.8	3.3
	Median	3.1	1.7	1.5	1.1	1.8
Nickel (µg/L)	*Mean*	4.2	3.9	5.2		3.3
	Median	3.9	3.8	5.2		1.2
Zinc (µg/L)	*Mean*	177	61	65	117	73
	Median	116	43	16	92	40
Chromium (µg/L)	*Mean*	2.6	1.2	3.3	1.9	3.4
	Median	2.3	0.79	2.8	1.7	2.3
Copper (µg/L)	*Mean*	20	5.5	3.9	8.0	12
	Median	15	4.0	4.0	4.5	8.6
Oil & Grease (mg/L)	*Mean*	4.3	2.1	4.6	2.0	10
	Median	2.8	1.1	3.4	0.44	2.2
Total Suspended Solids (mg/L)	*Mean*	52	25	77	51	512
	Median	32	9.0	27	15	25
Total Dissolved Solids (mg/L)	*Mean*	421	82	196	117	443
	Median	92	62	195	98	91

5.2 Significance Testing of First Flush Effects

Once EMC values were generated, significance tests were performed to highlight first-flush effects exhibited by pollutants. For those pollutants with a significant first-flush effect, the SPL estimates will use distinct "bins" for first-flush loading, while other pollutants will use a single EMC (All) for the entire runoff volume. As shown in **Table 5-2**, a Generalized Wilcoxon test was performed on each pollutant and land use to determine if there was a significant difference between the first-flush and one-hour samples. If first-flush and 1-hr samples are deemed significantly different, then distinct FF and 1-HR median values (see **Appendix C**) will be used for SPL estimates. If there is no significant difference between FF and 1-HR samples, then the median for ALL samples will be used (see Table 5-1 or Appendix C).

The results show that the land uses with highest imperviousness, Transportation and Industrial, most commonly exhibited significantly higher first-flush concentrations. Also, among pollutants, the metals commonly exhibited significantly higher first-flush concentrations, including zinc in residential areas. *E. coli* exhibited no significant differences in first flush concentrations for any land use.

The Generalized Wilcoxon test is non-parametric, meaning it can accommodate datasets that have multiple detection limits. The algorithm involves making all possible comparisons between observations from different groups (first-flush vs. one-hour by land use and parameter). Samples were ranked as greater than, less than, or equal to all other samples. Performing this test in R compares FF and 1-HR values resulting in a p-value rather than the creation of confidence intervals. Significance was determined based on the p-value in each comparison: p-value less than 0.05 was considered significant.

Table 5-2. Summary of statistically significant differences between *first-flush* and *one-hour* concentrations

Pollutant	FF and 1-HR Significantly Different?				
	Commercial	Industrial	Open Space	Residential	Transpor-tation
E. coli	--	--	--	--	--
Biological Oxygen Demand	--	Yes	--	--	Yes
Chemical Oxygen Demand	--	Yes	--	--	Yes
Total Ammonia	--	--	--	Yes	--
Total Kjeldahl Nitrogen	--	Yes	--	--	Yes
Nitrate + Nitrite	--	--	--	--	Yes
Total Nitrogen	--	--	--	--	Yes
Dissolved Phosphorous	--	--	Yes	--	--
Total Phosphorous	--	Yes	Yes	--	Yes
Total Lead	--	Yes	--	--	Yes
Total Nickel	--	--	--	--	--
Total Zinc	--	Yes	--	Yes	Yes
Total Chromium	--	--	--	--	--
Total Copper	--	Yes	--	--	Yes
Oil & Grease	--	--	--	--	--
Total Suspended Solids	--	Yes	--	--	--
Total Dissolved Solids	--	--	--	--	Yes

5.3 Comparison to NURP and NSQD

As a component of the EMC analysis, MWS requested that Nashville concentrations be compared to other available datasets. Two datasets were selected for comparisons, as follows:

- National Urban Runoff Program (NURP): between 1979 and 1983, the United States Environmental Protection Agency conducted the NURP to characterize urban runoff in different geographies and land use settings (USEPA 1983). The study included collected flow-weighted samples from 28 sites across the United States resulting in a comprehensive dataset quantifying urban runoff concentrations in the United States. The study consisted of field monitoring at sites throughout the country to represent regional climatology, land use types, slopes and soil conditions. NURP EMCs were based on flow-weighted composite samples.
- National Stormwater Quality Database (NSQD): in the early 2000s, a similar research study sponsored by USEPA was conducted through the University of Alabama in conjunction with the Center for Watershed Protection. This study, the National Stormwater Quality Database (NSQD), harvested long-term datasets collected from over 200 municipalities through their NPDES MS4 permits (Pitt et al. 2004).

Median concentrations for each MWS-monitored pollutant and land use were compared to benchmark values reported by the NURP and NSQD programs. Comparisons were evaluated as the percent difference between the median MWS wet-weather outfall concentrations (ALL samples) and NURP- and NSQD-reported values. Comparison are presented in the following tables:

- **Table 5-3** presents the NURP-reported EMCs versus median concentrations in MWS outfall samples, as well as the percent difference between these values.
- **Table 5-4** presents the median NSQD EMCs versus median concentrations in MWS outfall samples, as well as the percent difference between these values.

While statistical significance was not analyzed for these comparisons because it would have required raw data not available from NURP and NSQD, highlights of the analysis include:

- Metals concentrations in runoff from Nashville are generally lower than reported by NURP and NSQD (as shown by positive percent differences across most land uses);
- In residential runoff, *E. coli* concentrations in Nashville were generally higher than reported by NSQD (as shown by negative percent differences across most land uses); and
- Phosphorous concentrations in Nashville runoff are higher than reported by NURP and NSQD across several land uses.

Table 5-3. Comparison of Median Nashville-area Concentrations (from Table 5-1) to NURP EMCs (USEPA 1983)

NURP versus MWS Outfall Monitoring Data Comparison (ALL samples)															
Land Use	**Commercial**			**Industrial**			**Open Space**			**Residential**			**Transportation**		
Pollutant	**NURP EMC**	**MWS Median**	**% Diff.**	**NURP EMC**	**MWS Median**	**% Diff.**	**NURP EMC**	**MWS Median**	**% Diff.**	**NURP EMC**	**MWS Median**	**% Diff.**	**NURP EMC**	**MWS Median**	**% Diff.**
E. Coli (MPN/100 mL)	--	337		--	460		--	2,419		--	11,565		--	75	
Biological Oxygen Demand (mg/L)	9.30	10	-9%	--	6.1		--	2.4		10	6.0	67%	--	4.0	
Chemical Oxygen Demand (mg/L)	57	80	-29%	--	27		40	48	-17%	73	41	78%	--	52	
Total Ammonia (mg/L)	--	0.27		--	0.09		--	0.08		--	0.08		--	0.17	
Total Kjeldahl Nitrogen (mg/L)	1.2	0.93	26%	--	0.58		0.97	0.66	45%	1.9	0.94	103%	--	0.65	
Nitrite + Nitrate (mg/L)	0.57	0.36	58%	--	0.28		0.54	0.29	87%	0.74	0.27	171%	--	0.28	
Total Nitrogen [1] (mg/L)	--	1.3		--	0.72		--	0.87		--	1.2		--	0.96	
Dissolved Phosphorus (mg/L)	0.08	0.10	-22%	--	0.12		0.03	0.52	-95%	0.14	0.80	-82%	--	0.07	
Total Phosphorus (mg/L)	0.20	0.34	-41%	--	0.23		0.12	0.95	-87%	0.38	1.1	-65%	--	0.26	
Total Lead (ug/L)	104	3.1	3271%	--	1.7		30	1.5	1900%	144	1.1	12866%	--	1.8	
Total Nickel (ug/l)	--	3.9		--	3.8		--	5.2		--			--	5.0	
Total Zinc (ug/L)	226	116	95%	--	43		195	16	1142%	135	92	46%	--	40	
Total Chromium (ug/L)	--	2.27		--	0.79		--	2.8		--	1.7		--	2.3	

NURP versus MWS Outfall Monitoring Data Comparison (ALL samples)															
Land Use	**Commercial**			**Industrial**			**Open Space**			**Residential**			**Transportation**		
Pollutant	**NURP EMC**	**MWS Median**	**% Diff.**	**NURP EMC**	**MWS Median**	**% Diff.**	**NURP EMC**	**MWS Median**	**% Diff.**	**NURP EMC**	**MWS Median**	**% Diff.**	**NURP EMC**	**MWS Median**	**% Diff.**
Total Copper (ug/L)	29	15	97%	--	4.0		--	4.0		33	4.5	637%	--	8.60	
Oil and Grease (mg/L)	--	2.8		--	1.1		--	3.4		--	0.44		--	2.2	
Total Suspended Solids (mg/L)	69	32	119%	--	9.0		70	27	158%	101	15	569%	--	25	
Total Dissolved Solids (mg/L)	--	92		--	62		--	195		--	98		--	91	

-- No EMC data reported by NURP for this parameter
1 – Total nitrogen was not explicitly reported by NURP. It was calculated as the sum of Total Kjeldahl Nitrogen, Nitrate, and Nitrite.

Table 5-4. Comparison of Median Nashville-area Concentrations (from Table 5-1) to median EMCs from NSQD (Pitt et al. 2004)

NSQD versus MWS Outfall Monitoring Data Comparison (ALL samples)															
Land Use	**Commercial**			**Industrial**			**Open Space**			**Residential**			**Transportation**		
Pollutant	**NSQD Median**	**MWS Median**	**% Diff.**	**NSQD Median**	**MWS Median**	**% Diff.**	**NSQD Median**	**MWS Median**	**% Diff.**	**NSQD Median**	**MWS Median**	**% Diff.**	**NSQD Median**	**MWS Median**	**% Diff.**
E. Coli (MPN/100 mL)	--	337	--	--	460	--	--	2,419	--	700	11,565	-94%	1,900	75	2433%
Biological Oxygen Demand (mg/L)	11	10	7%	9.0	6.07	48%	5.4	2.4	121%	9.0	6.0	50%	8.00	4.0	100%
Chemical Oxygen Demand (mg/L)	60	80	-25%	60	27	122%	42.1	48	-12%	55	41	34%	100	51.50	94%
Total Ammonia (mg/L)	0.50	0.27	86%	0.50	0.09	458%	0.18	0.08	138%	0.32	0.08	278%	1.1	0.17	547%
Total Kjeldahl Nitrogen (mg/L)	1.6	0.93	71%	1.4	0.58	140%	0.74	0.66	11%	1.4	0.94	50%	2.0	0.65	206%
Nitrite + Nitrate (mg/L)	0.60	0.36	66%	0.73	0.28	164%	0.59	0.29	103%	0.60	0.27	121%	0.28	0.28	1%
Total Nitrogen [1] (mg/L)	2.2	1.3	72%	2.1	0.72	197%	1.3	0.87	53%	2.0	1.2	73%	2.3	0.96	138%
Dissolved Phosphorus (mg/L)	0.11	0.10	7%	0.11	0.12	-4%	0.13	0.52	-75%	0.17	0.80	-79%	0.20	0.07	176%
Total Phosphorus (mg/L)	0.22	0.34	-36%	0.26	0.23	15%	0.31	0.95	-67%	0.30	1.1	-73%	0.25	0.26	-4%
Total Lead (ug/L)	18	3.1	483%	25	1.67	1397%	10	1.5	567%	12	1.1	980%	25	1.8	1259%
Total Nickel (ug/l)	7.0	3.9	40%	16	3.80	220%	--	5.2	--	5.4	--	8%	9.0	5.0	80%
Total Zinc (ug/L)	150	116	29%	210	43	384%	40	16	155%	73	92	-21%	200	40.35	396%
Total Chromium (ug/L)	6.0	2.27	164%	14	0.79	1679%	5.4	2.8	91%	4.6	1.7	174%	8.3	2.3	263%

NSQD versus MWS Outfall Monitoring Data Comparison (ALL samples)															
Land Use	**Commercial**			**Industrial**			**Open Space**			**Residential**			**Transportation**		
Pollutant	**NSQD Median**	**MWS Median**	**% Diff.**	**NSQD Median**	**MWS Median**	**% Diff.**	**NSQD Median**	**MWS Median**	**% Diff.**	**NSQD Median**	**MWS Median**	**% Diff.**	**NSQD Median**	**MWS Median**	**% Diff.**
Total Copper (ug/L)	17	15	15%	22	4.00	450%	10	4.0	150%	12	4.5	168%	35	8.60	304%
Oil and Grease (mg/L)	4.7	2.8	71%	5.0	1.13	343%	1.3	3.4	-62%	3.9	0.44	789%	8.0	2.2	264%
Total Suspended Solids (mg/L)	42	32	33%	78	8.95	772%	48.5	27	79%	49	15	225%	99	24.65	302%
Total Dissolved Solids (mg/L)	74	92	-20%	92	62	48%	125	195	-36%	72	98	-27%	78	91.00	-15%

-- No EMC data reported by NSQD for this parameter
1 – Total nitrogen was not explicitly reported in NSQD. It was calculated here as the sum of Total Kjeldahl Nitrogen, Nitrate, and Nitrite.

6 CONCLUSIONS

This memo presents a statistical analysis of pollutant concentrations in wet weather runoff from five (5) representative land uses in the Nashville area. MWS has generated an impressive, foundational dataset that required significant effort by field and laboratory staff. The ROS statistical methods employed here are robust and defensible. The median concentrations by land use for first-flush, one-hour and all samples will be used in a subsequent memo to calculate SPLs as required by the MS4 Permit. Furthermore, the outputs from this analysis will support development of database-backed web platform to facilitate the continuous tracking of MS4 program control measures and their effectiveness over time. Beyond those near-term efforts, the summary statistics presented here could be used for a variety of additional applications in the future including public outreach, illicit discharge detection and other investigative programs that would benefit from statistical benchmarks of elevated pollutant levels.

7 REFERENCES

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APPENDIX A: BOX PLOT COMPARISON BY PARAMETER

This appendix lists the summary boxplots for all 17 parameters measured by MWS during wet weather outfall monitoring. These censored boxplots are based on Regression on Order Statistics, as described in Section 3. The web viewer of boxplots is located here: http://rpubs.com/ksemrod/WQ_Nashville. No boxplot was produced for Nickel because there were not enough observed data points to generate a plot using NADA in R.

Figures

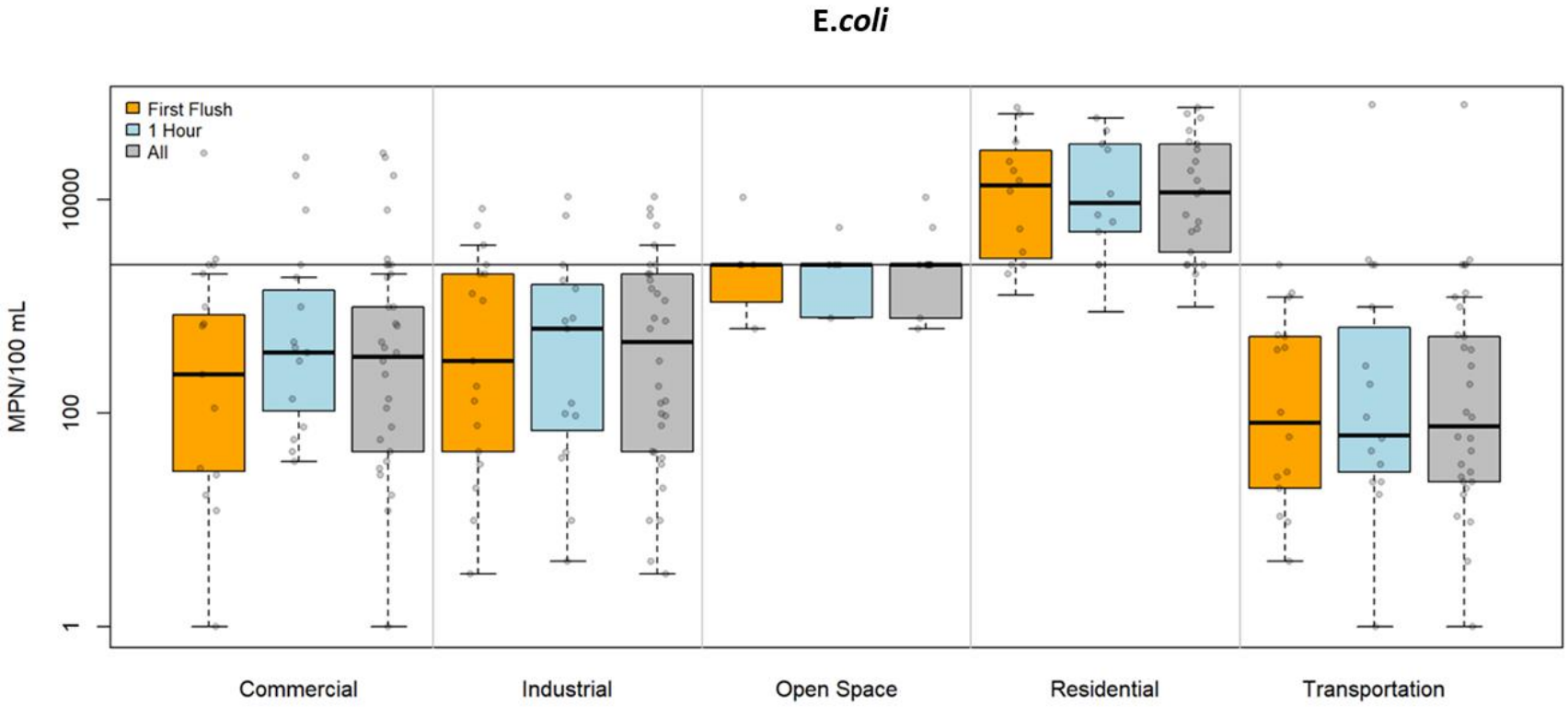

Figure A-1. *E. coli* sample distributions for first flush, one hour later, and all samples across five land uses.

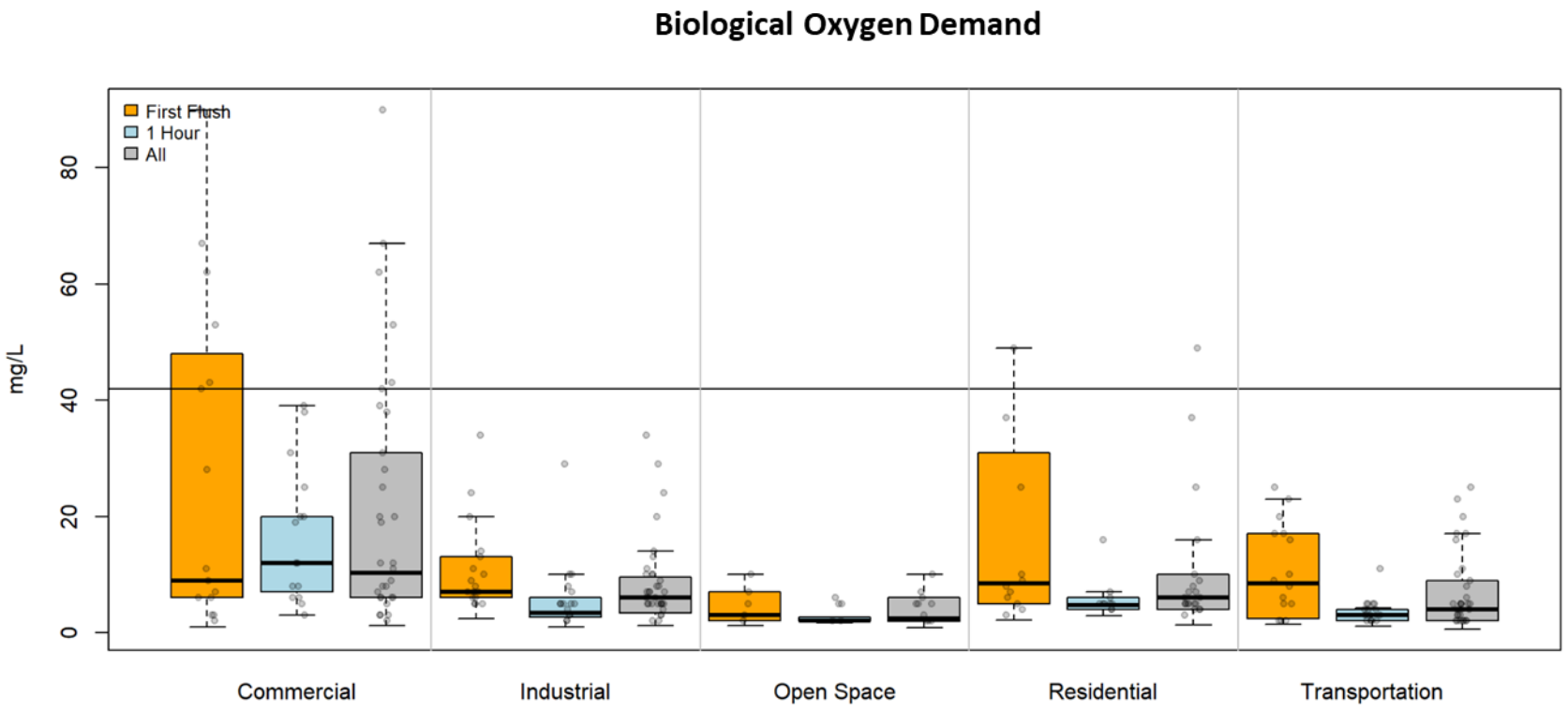

Figure A-2. BOD5 sample distributions for first flush, one hour later, and all samples across five land uses.

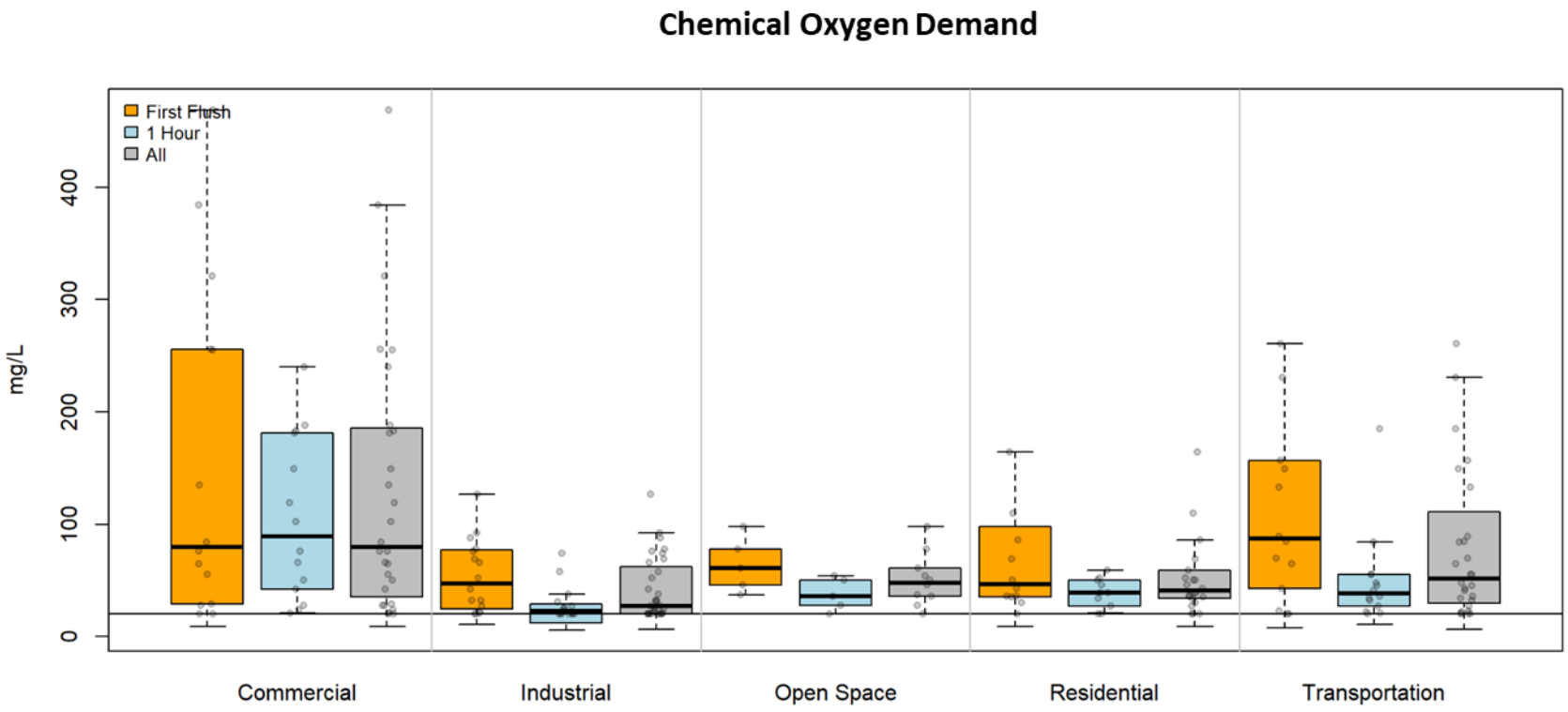

Figure A-3. Chemical Oxygen Demand sample distributions for first flush, one hour later, and all samples across five land uses.

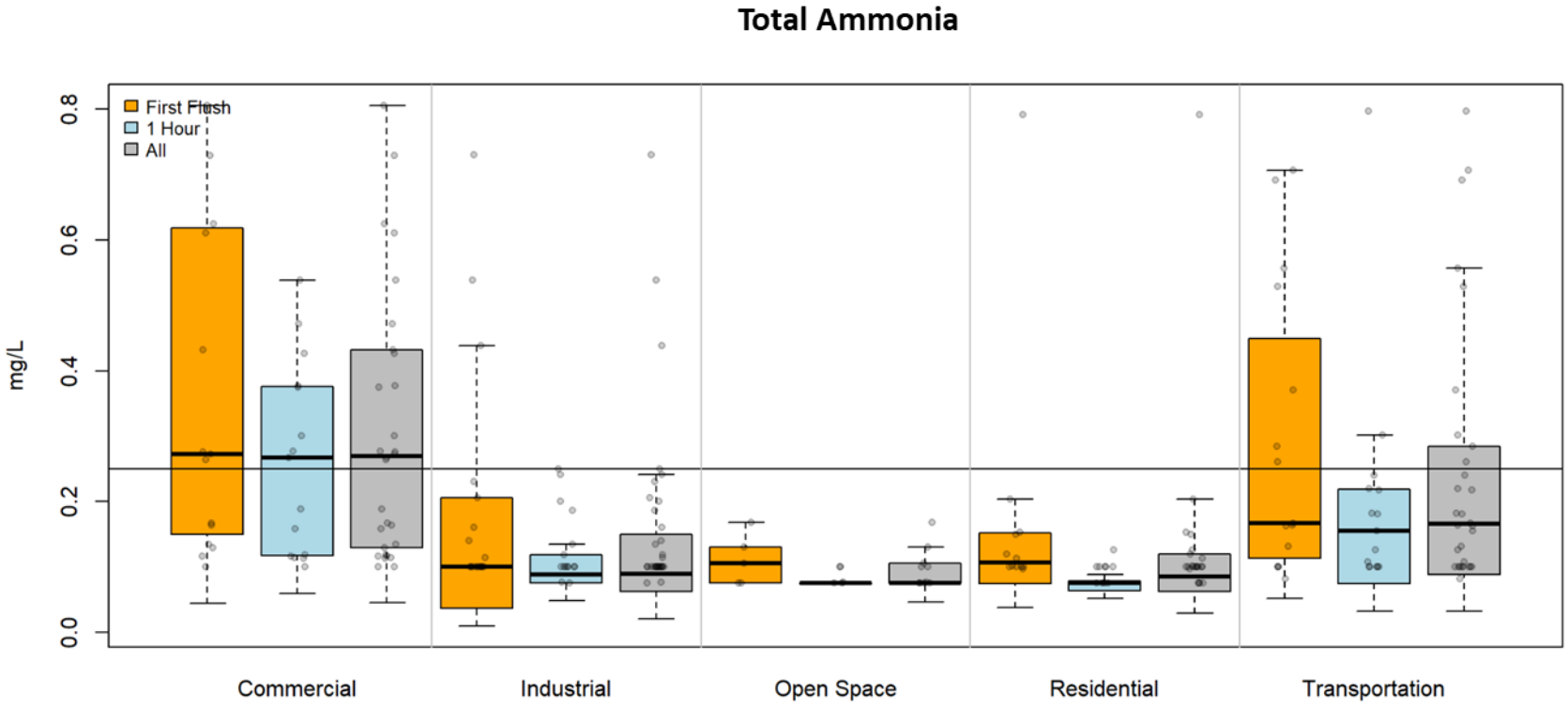

Figure A-4. Total Ammonia (NH3) sample distributions for first flush, one hour later, and all samples across five land uses.

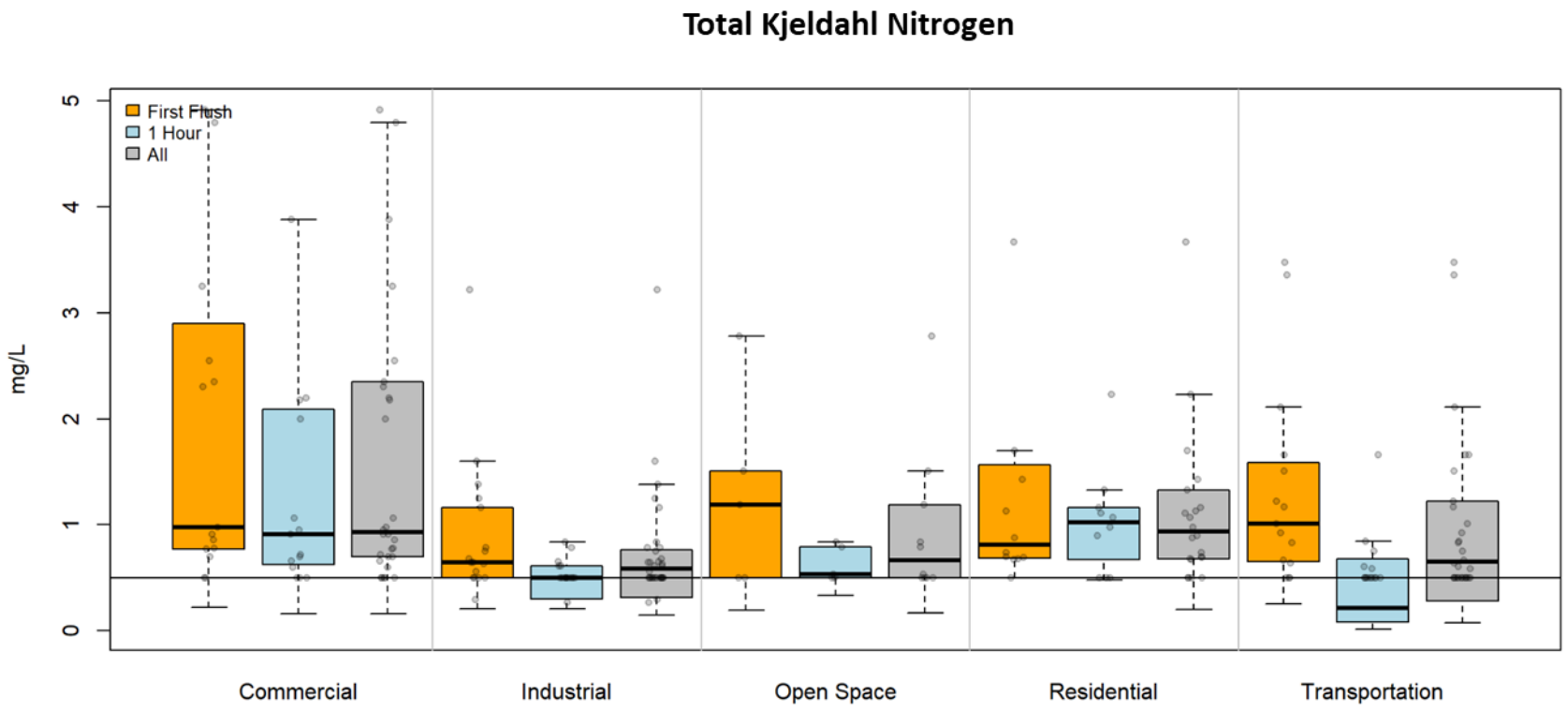

Figure A-5. Total Kjeldahl Nitrogen (TKN) sample distributions for first flush, one hour later, and all samples across five land uses.

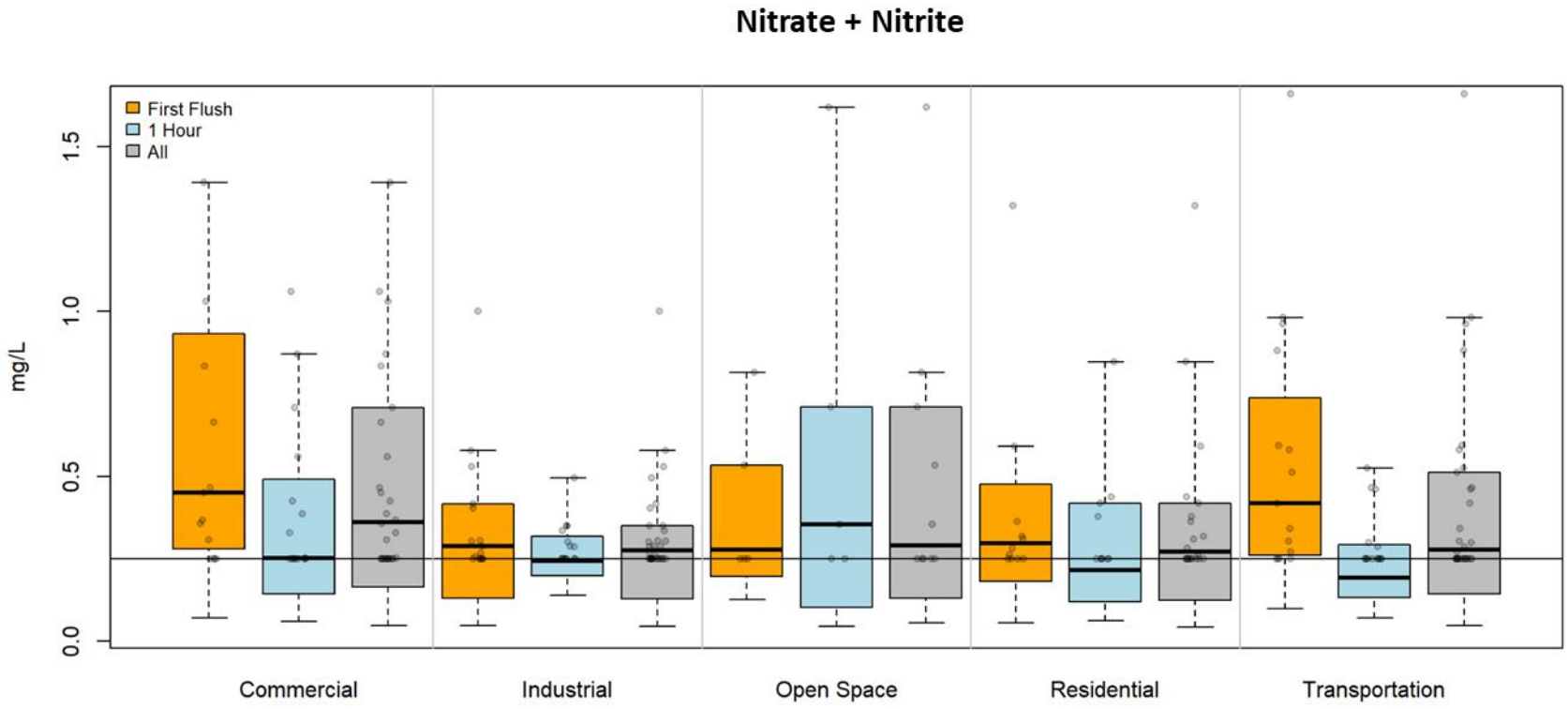

Figure A-6. Nitrate + Nitrite (NO3 + NO2) sample distributions for first flush, one hour later, and all samples across five land uses.

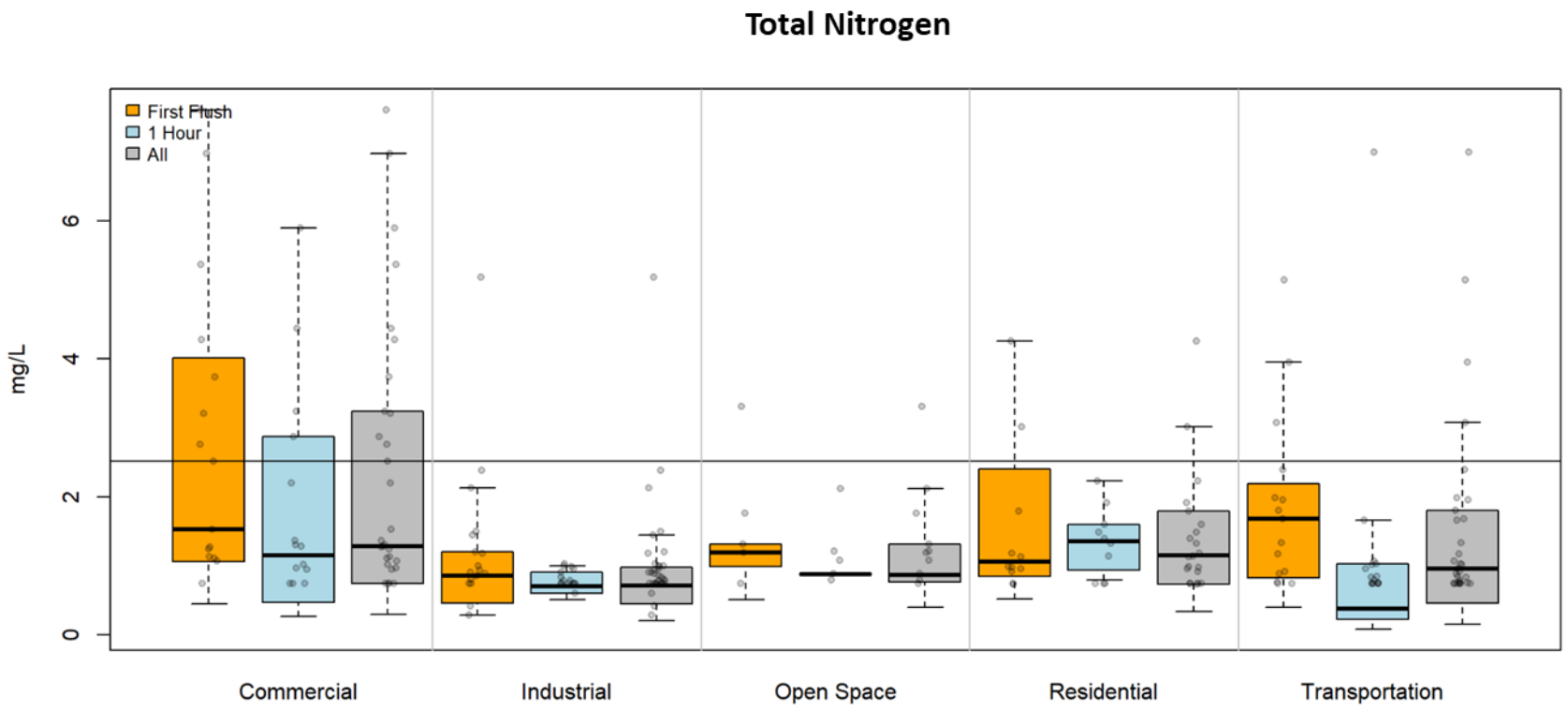

Figure A-7. Total Nitrogen (TN) sample distributions for first flush, one hour later, and all samples across five land uses.

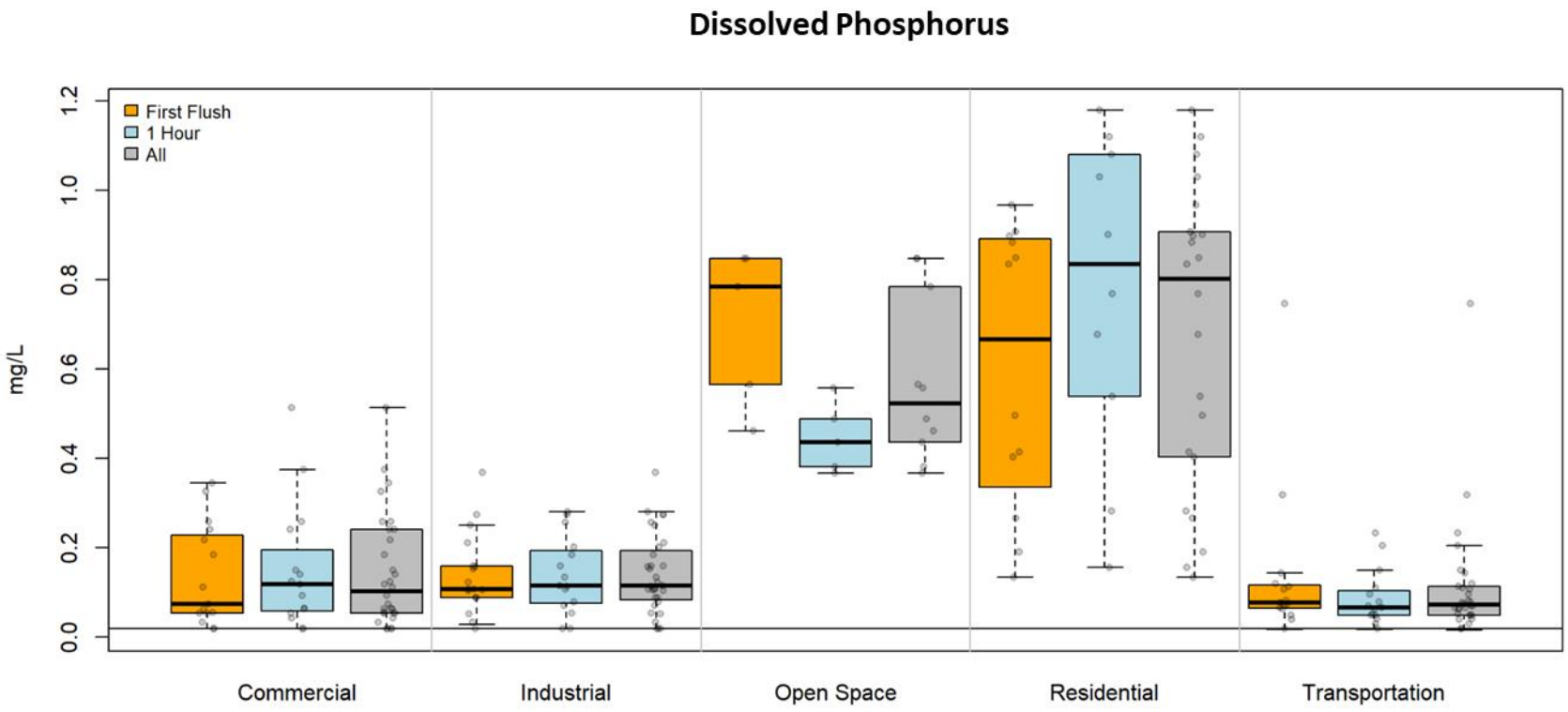

Figure A-8. Dissolved phosphorus sample distributions for first flush, one hour later, and all samples across five land uses.

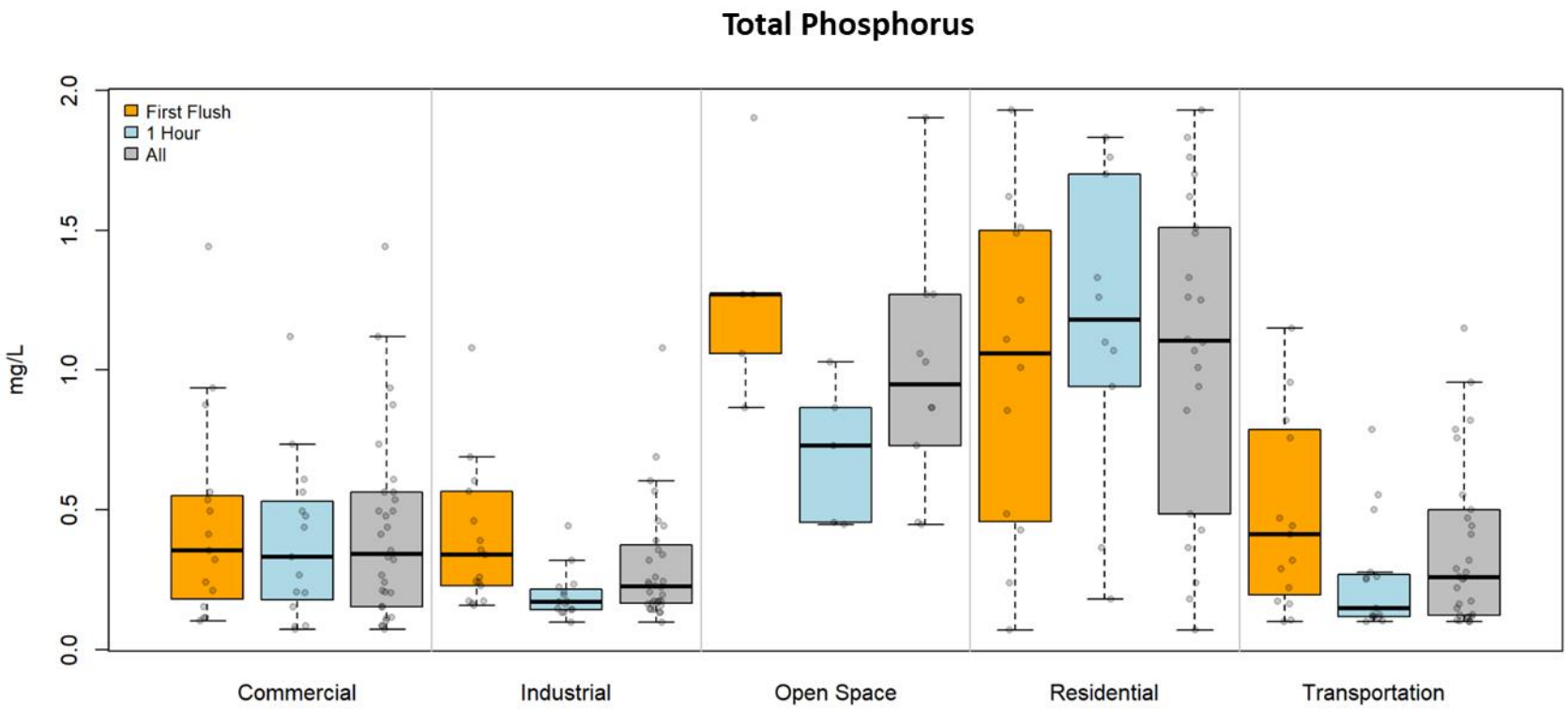

Figure A-9. Total Phosphorous (TP) sample distributions for first flush, one hour later, and all samples across five land uses.

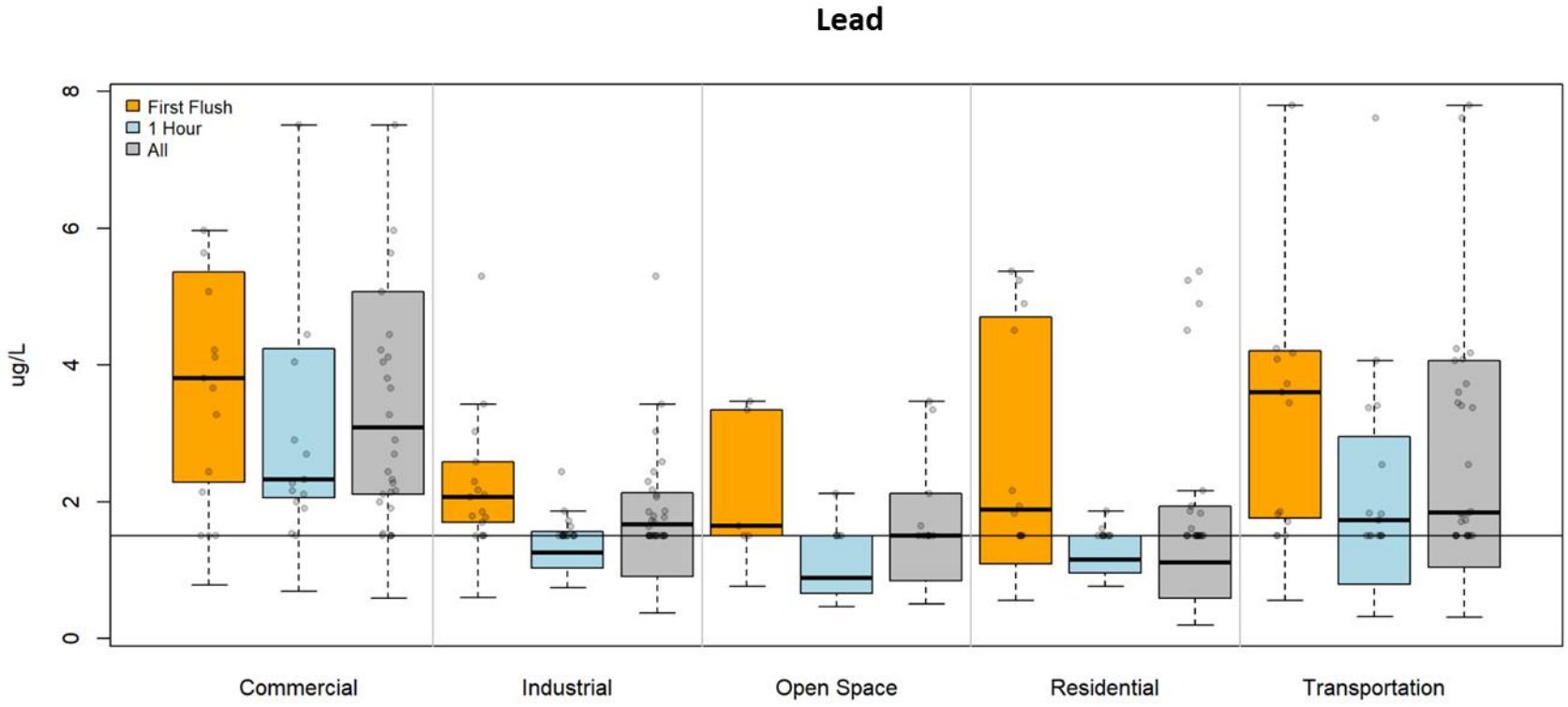

Figure A-10. Lead (Pb) sample distributions for first flush, one hour later, and all samples across five land uses.

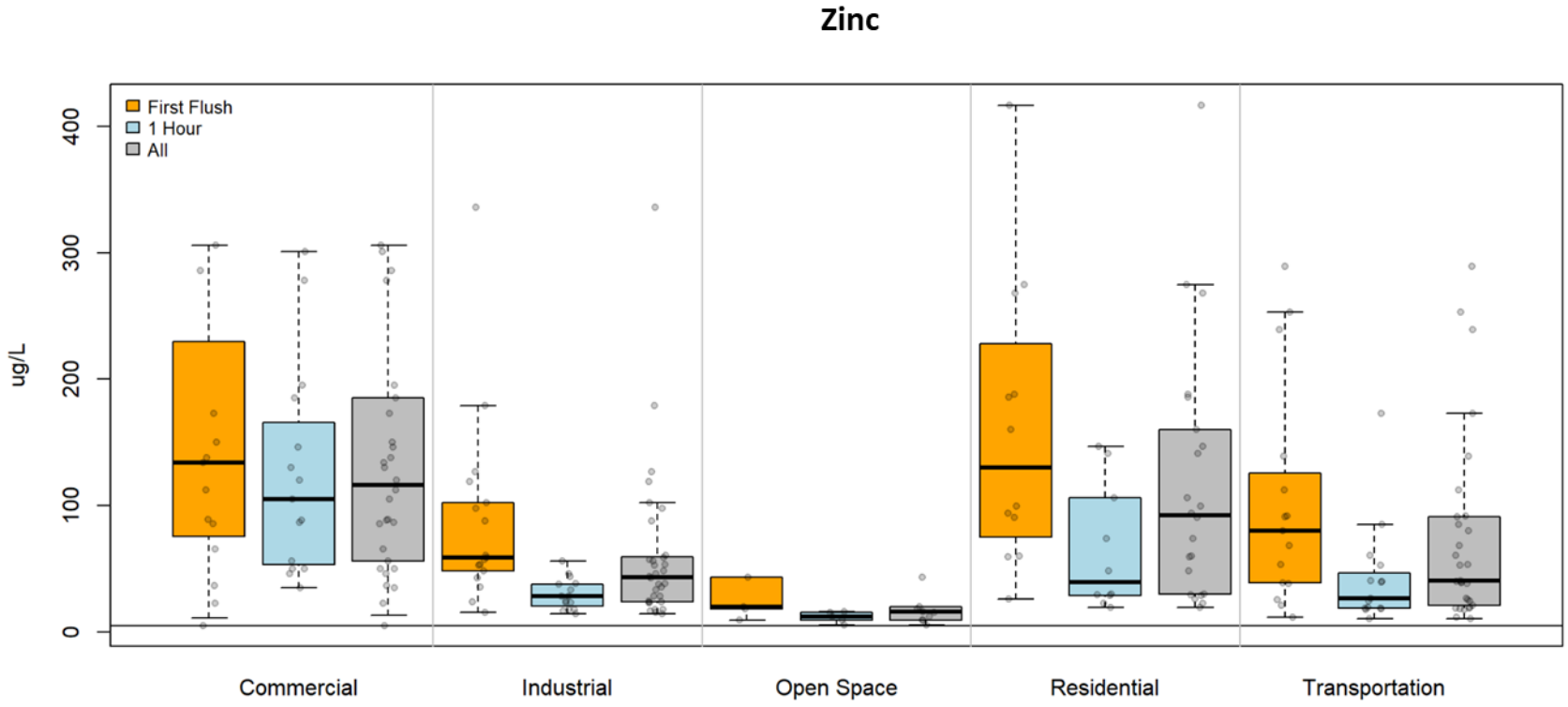

Figure A-11. Zinc (Zn) sample distributions for first flush, one hour later, and all samples across five land uses.

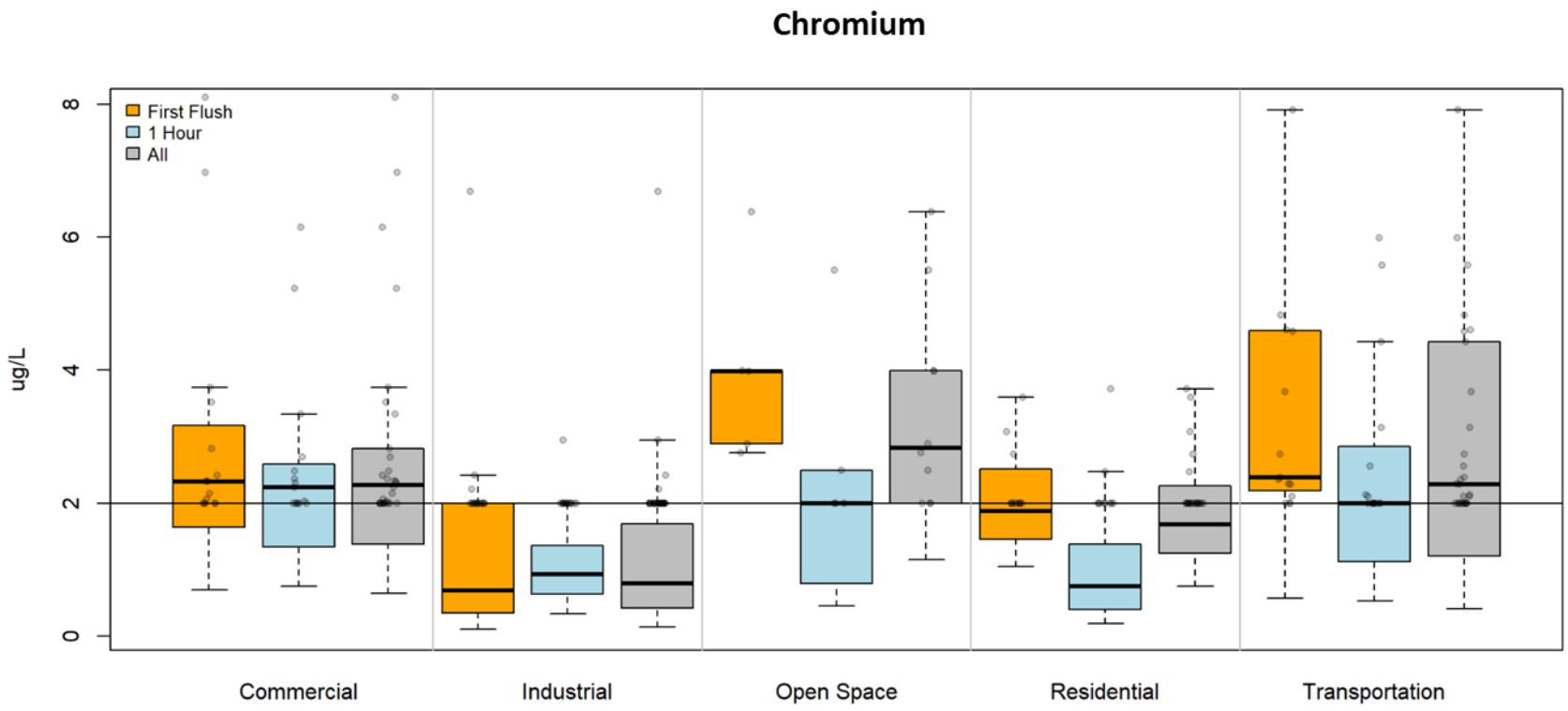

Figure A-12. Chromium (Cr) sample distributions for first flush, one hour later, and all samples across five land uses.

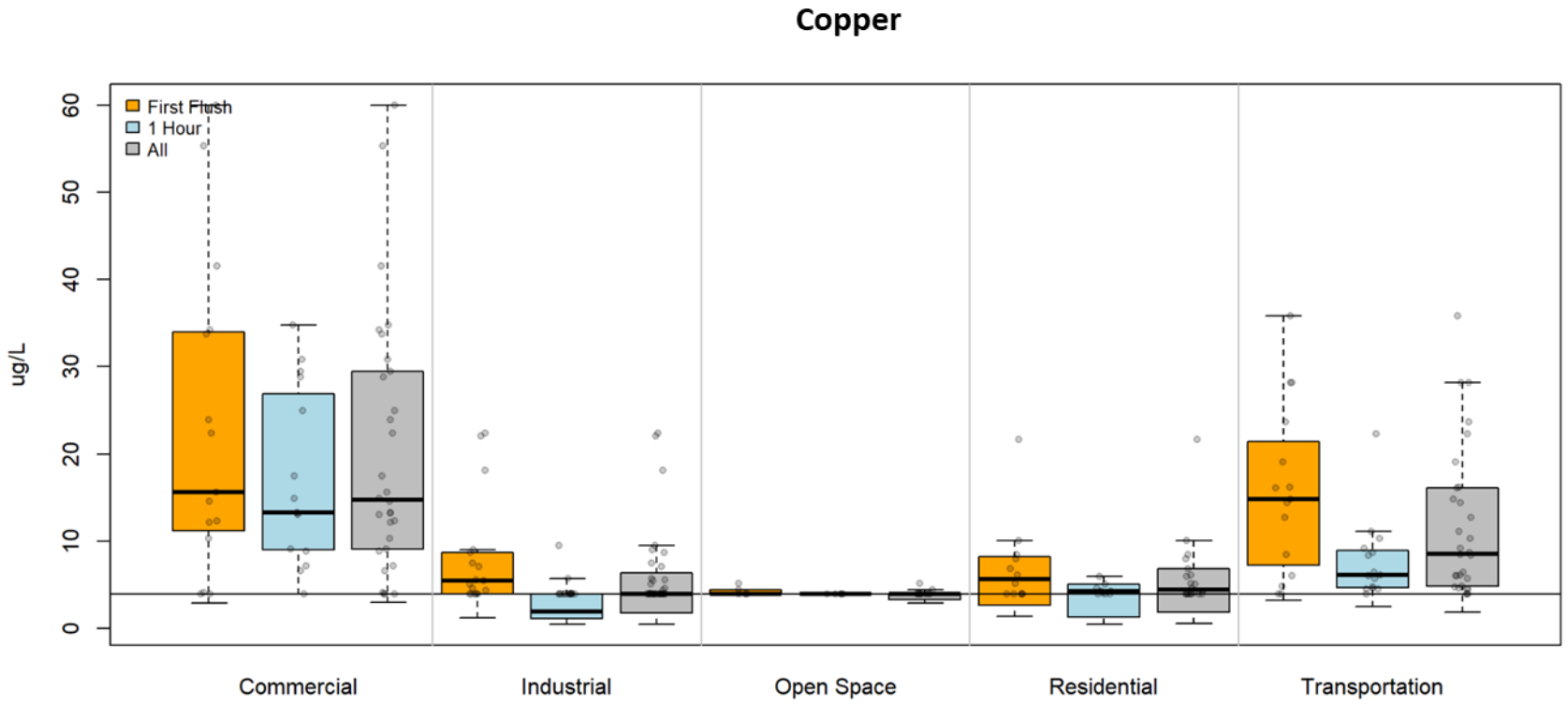

Figure A-13. Copper (Cu) sample distributions for first flush, one hour later, and all samples across five land uses.

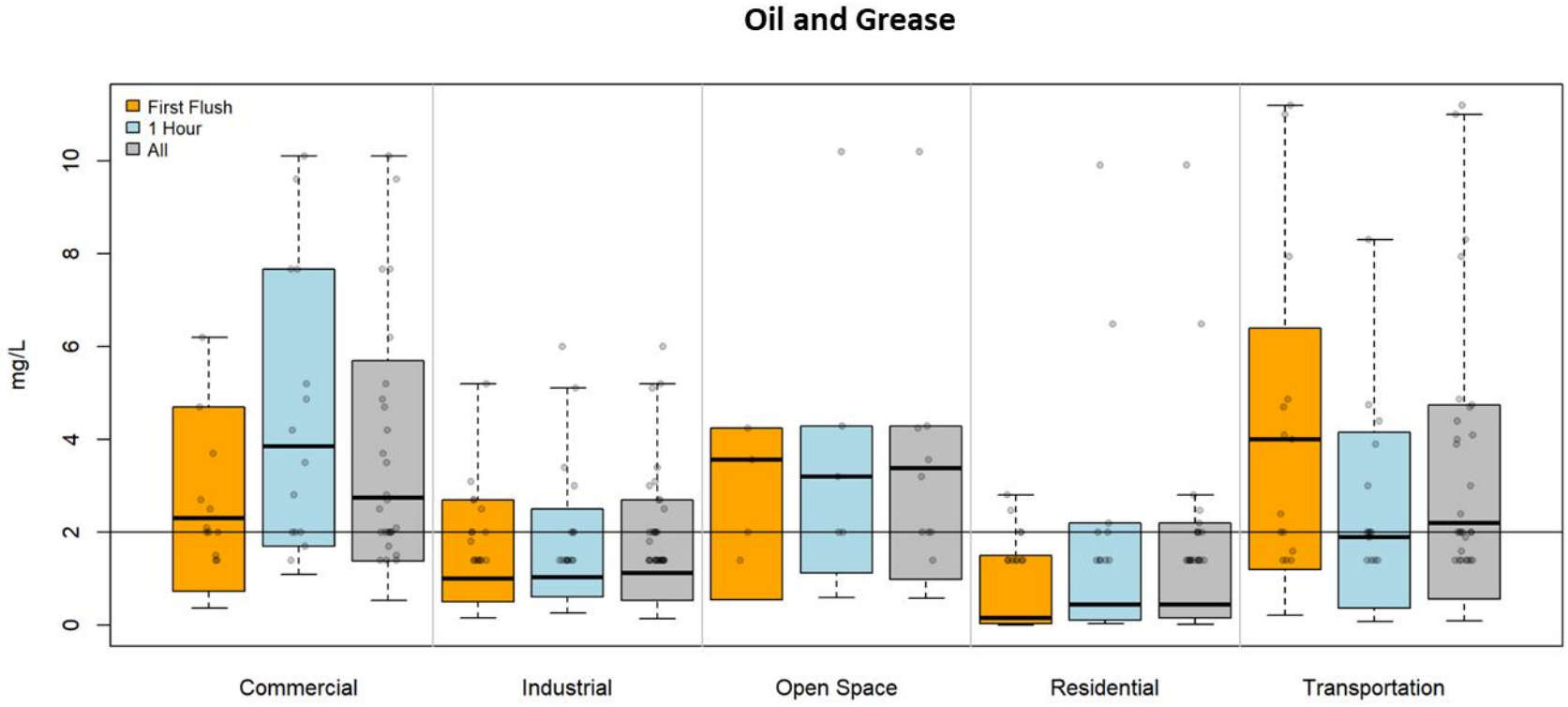

Figure A-14. Oil and grease sample distributions for first flush, one hour later, and all samples across five land uses.

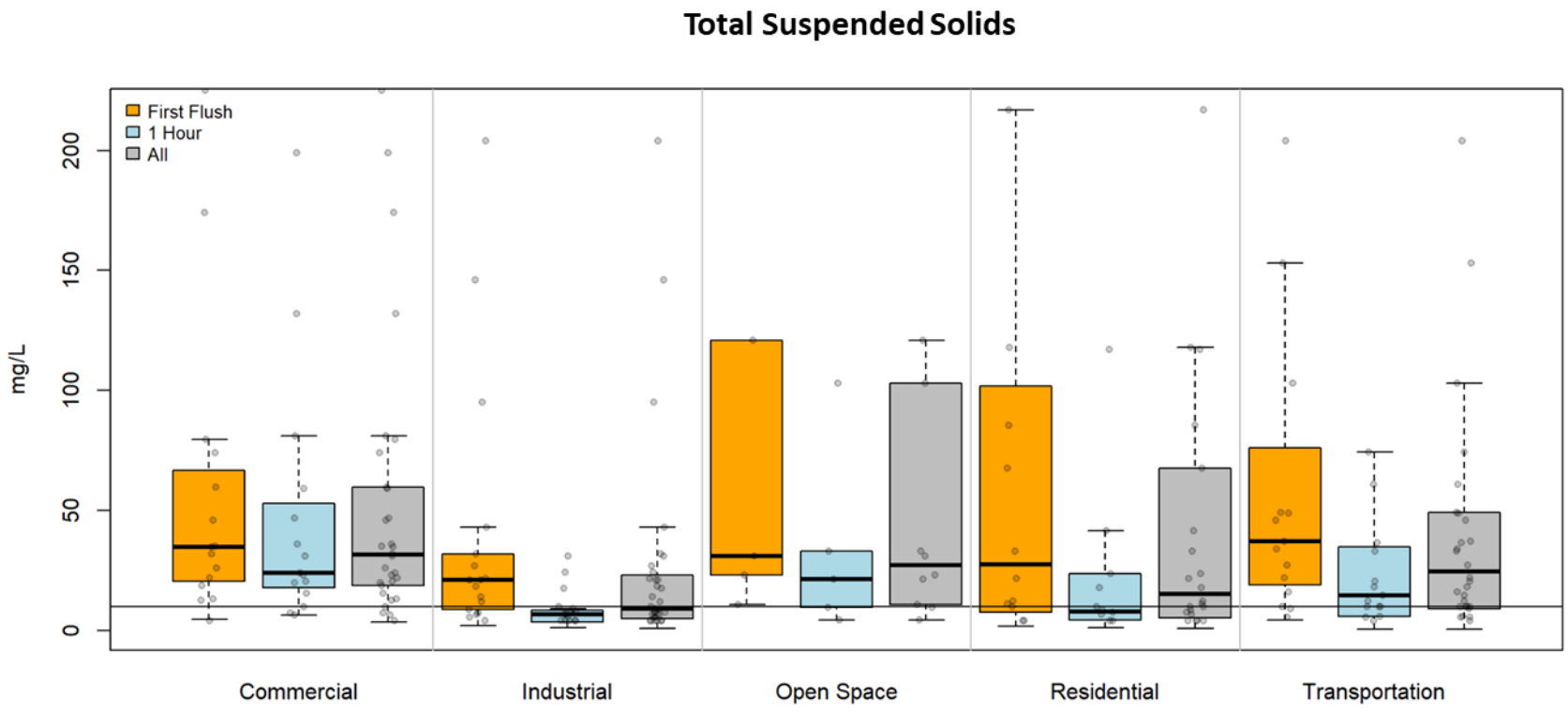

Figure A-15. Total Suspended Solids (TSS) sample distributions for first flush, one hour later, and all samples across five land uses.

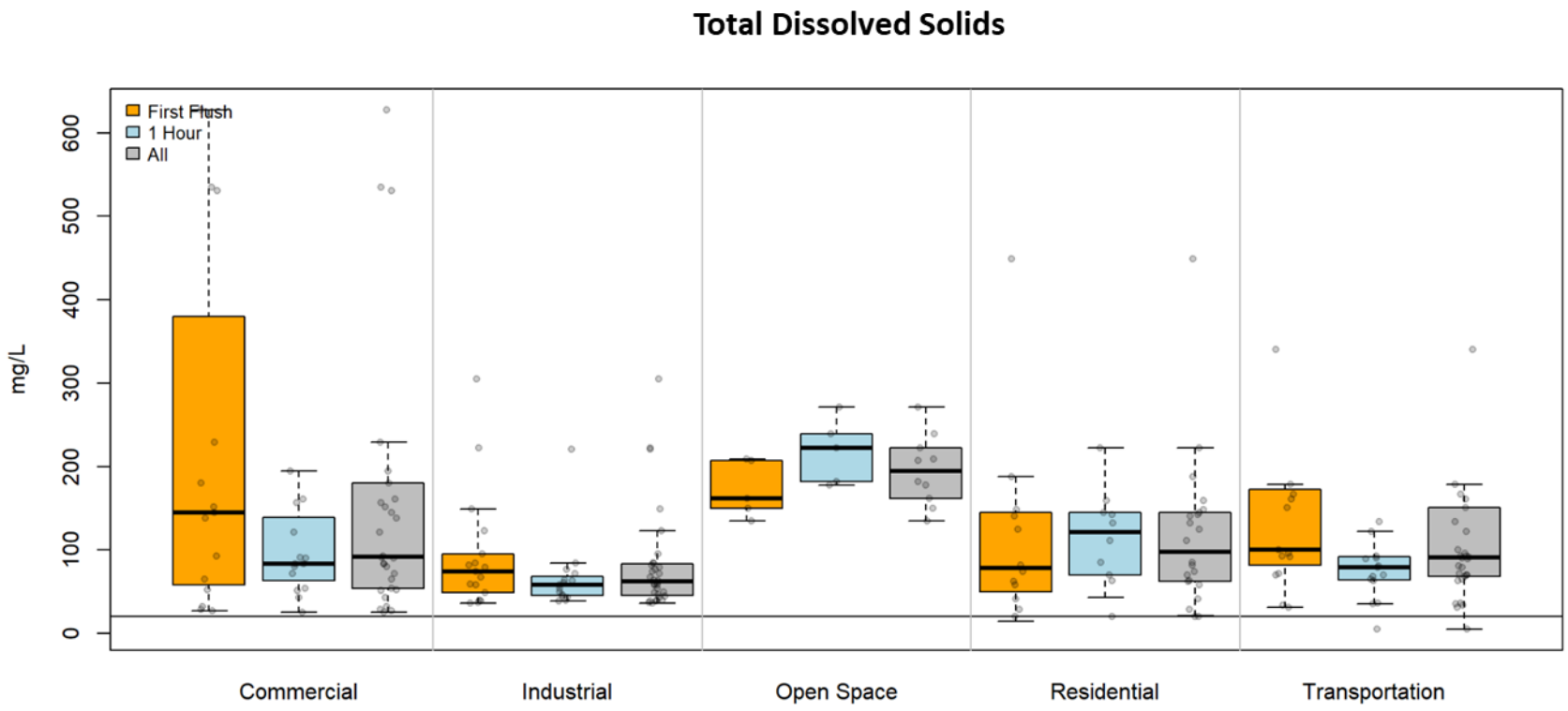

Figure A-16. Total Dissolved Solids (TDS) sample distributions for first flush, one hour later, and all samples across five land uses.

APPENDIX B: SUMMARY STATISTICS BY PARAMETER

This appendix details the summary statistics for all 17 parameters measured by MWS during wet-weather outfall monitoring. The statistics are based on Regression on Order Statistics, as described in Section 3.

Tables

Table B-1. Statistics for *E. coli* across five land uses and three sample types

E. *coli* (MPN/100 mL)															
Land Use	**Commercial**			**Industrial**			**Open Space**			**Residential**			**Transportation**		
Type	**FF**	**1-HR**	**ALL**	**FF**	**1-HR**	**ALL**	**FF**	**1-HR**	**ALL**	**FF**	**1-HR**	**ALL**	**FF**	**1-HR**	**ALL**
n	15	15	30	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	87%	93%	90%	100%	100%	100%	80%	80%	80%	92%	90%	91%	93%	93%	93%
Mean	2,307	3,622	2,973	1,595	1,710	1,649	3,393	2,371	2,892	21,022	19,618	20,403	332	5,596	2,959
Standard Deviation	6,829	7,383	7,016	2,315	3,027	2,628	4,015	1,912	3,008	24,133	19,924	21,793	445	19,776	14,003
Coefficient of Variation	3.0	2.0	2.4	1.5	1.8	1.6	1.2	0.81	1.0	1.2	1.0	1.1	1.3	3.5	4.7
lower 95th CI	8.8	41	14	8.5	8.1	7.2	707	773	663	1,667	1,575	1,627	7.7	12	6.6
upper 95th CI	9,971	19,091	21,134	6,152	8,071	7,539	8,828	4,852	8,194	67,365	51,451	62,747	1,255	25,007	2,585
25th percentile	28	105	46	44	68	43	1,084	785	890	2,990	5,245	3,623	21	28	23
Median	228	365	337	308	613	460	2,419	2,420	2,419	13,435	9,215	11,565	80	62	75
75th percentile	833	1,415	980	1,986	1,596	1,986	2,420	2,420	2,420	25,473	31,888	31,888	493	628	493
IQR	805	1,311	934	1,943	1,528	1,943	1,336	1,635	1,530	22,483	26,643	28,265	472	600	469
Minimum	1.0	35	1.0	3.1	4.1	3.1	613	770	613	1,986	2,420	1,986	4.1	1.0	1.0
Maximum	26,820	24,810	26,820	8,160	10,500	10,500	10,430	5,460	10,430	72,700	57,940	72,700	2,420	77,010	77,010

Table B-2. Statistics for Biological Oxygen Demand across five land uses and three sample types

Biological Oxygen Demand (BOD) (mg/L)															
Land Use	Commercial			Industrial			Open Space			Residential			Transportation		
Type	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL
n	15	15	30	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	87%	87%	87%	88%	67%	78%	60%	60%	60%	92%	70%	82%	73%	67%	70%
Mean	26	16	21	11	5.8	8.5	4.7	2.9	3.7	42	5.8	25	9.9	3.4	6.4
Standard Deviation	29	12	23	8.2	6.9	7.9	3.7	1.8	3.0	95	3.8	72	7.4	2.3	6.4
Coefficient of Variation	1.1	0.77	1.1	0.75	1.2	0.92	0.79	0.62	0.81	2.3	0.66	2.8	0.74	0.69	0.99
lower 95th CI	2.4	3.1	2.8	4.5	1.4	1.8	1.4	1.8	0.97	2.7	3.2	2.2	1.8	1.5	0.93
upper 95th CI	74	38	65	26	16	26	9.4	5.3	8.7	180	12	48	21	6.3	19
25th percentile	6.0	7.0	6.0	6.0	2.7	3.4	2.1	2.0	2.0	5.5	4.0	4.0	3.0	2.0	2.0
Median	9.0	12	10	7.0	3.4	6.1	3.0	2.0	2.5	8.5	4.7	6.0	8.5	3.0	4.0
75th percentile	48	20	30	13	6.0	9.3	7.0	2.6	5.3	28	5.8	9.8	17	4.0	9.0
IQR	42	13	24	7.0	3.3	5.8	4.9	0.61	3.3	23	1.8	5.8	14	2.0	7.0
Minimum	2.0	3.0	2.0	5.0	2.0	2.0	2.0	2.0	2.0	3.0	4.0	3.0	2.0	2.0	2.0
Maximum	90	39	90	34	29	34	10	6.0	10	341	16	341	25	11	25

Table B-3. Statistics for Chemical Oxygen Demand across five land uses and three sample types

Chemical Oxygen Demand (COD) (mg/L)															
Land Use	Commercial			Industrial			Open Space			Residential			Transportation		
Type	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL
n	14	14	28	16	15	31	5	5	10	12	10	22	14	14	28
Percent Detected	86%	100%	93%	94%	60%	77%	100%	100%	100%	92%	80%	86%	93%	93%	93%
Mean	156	105	130	53	26	40	64	38	51	104	39	74	169	50	109
Standard Deviation	152	72	120	33	19	30	25	14	24	155	13	118	259	43	192
Coefficient of Variation	0.98	0.69	0.92	0.62	0.75	0.75	0.38	0.38	0.46	1.5	0.32	1.6	1.5	0.86	1.8
lower 95th CI	13	23	16	18	7.2	9.1	39	22	24	20	23	12	16	17	13
upper 95th CI	414	206	362	101	63	90	94	53	89	350	56	161	530	119	251
25th percentile	36	44	39	26	12	20	46	28	36	36	29	34	49	28	31
Median	80	89	80	47	23	27	61	36	48	47	39	41	87	39	52
75th percentile	256	173	184	77	29	62	78	50	59	92	49	57	155	53	100
IQR	220	129	146	51	17	42	32	22	23	56	20	23	107	25	69
Minimum	20	21	20	20	20	20	37	20	20	20	20	20	20	20	20
Maximum	469	240	469	127	74	127	98	54	98	578	59	578	1,030	185	1,030

Table B-4. Statistics for Total Ammonia across five land uses and three sample types

Total Ammonia (NH3) (mg/L)															
Land Use	Commercial			Industrial			Open Space			Residential			Transportation		
Type	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL
n	15	15	30	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	93%	93%	93%	53%	47%	50%	100%	40%	70%	67%	40%	55%	80%	67%	73%
Mean	0.43	0.26	0.34	0.17	0.10	0.14	0.11	0.07	0.09	0.16	0.08	0.12	0.29	0.19	0.24
Standard Deviation	0.41	0.15	0.32	0.21	0.05	0.15	0.04	0.00	0.04	0.20	0.02	0.16	0.23	0.19	0.21
Coefficient of Variation	0.97	0.58	0.93	1.2	0.50	1.1	0.36	0.02	0.40	1.2	0.27	1.3	0.79	1.0	0.88
lower 95th CI	0.09	0.10	0.08	0.01	0.06	0.03	0.08	0.07	0.05	0.05	0.05	0.03	0.07	0.04	0.05
upper 95th CI	1.1	0.49	0.77	0.58	0.21	0.48	0.16	0.08	0.15	0.47	0.11	0.20	0.70	0.45	0.70
25th percentile	0.15	0.12	0.13	0.04	0.08	0.06	0.08	0.07	0.08	0.08	0.07	0.06	0.11	0.07	0.09
Median	0.27	0.27	0.27	0.10	0.09	0.09	0.11	0.08	0.08	0.11	0.08	0.08	0.17	0.16	0.17
75th percentile	0.62	0.38	0.43	0.21	0.11	0.15	0.13	0.08	0.10	0.15	0.08	0.12	0.45	0.22	0.28
IQR	0.47	0.26	0.30	0.17	0.04	0.08	0.06	0.00	0.02	0.07	0.01	0.05	0.34	0.14	0.19
Minimum	0.10	0.10	0.10	0.10	0.08	0.08	0.08	0.08	0.08	0.10	0.08	0.08	0.08	0.10	0.08
Maximum	1.6	0.54	1.6	0.73	0.25	0.73	0.17	0.10	0.17	0.79	0.13	0.79	0.71	0.80	0.80

Table B-5. Statistics for Total Kjeldahl Nitrogen across five land uses and three sample types

Total Kjeldahl Nitrogen (TKN) (mg/L)															
Land Use	Commercial			Industrial			Open Space			Residential			Transportation		
Type	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL
n	15	15	30	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	87%	80%	83%	82%	60%	72%	80%	80%	80%	100%	70%	86%	80%	47%	63%
Mean	2.2	1.5	1.8	0.88	0.47	0.68	1.2	0.60	0.91	1.9	1.1	1.5	1.3	0.83	1.1
Standard Deviation	2.0	1.5	1.8	0.72	0.20	0.58	1.0	0.21	0.78	2.6	0.49	2.0	1.0	1.7	1.4
Coefficient of Variation	0.91	1.0	0.97	0.83	0.42	0.85	0.82	0.35	0.86	1.4	0.47	1.4	0.76	2.1	1.3
lower 95th CI	0.29	0.21	0.25	0.26	0.24	0.20	0.25	0.37	0.20	0.59	0.53	0.27	0.32	0.02	0.12
upper 95th CI	5.5	4.4	5.3	1.9	0.80	1.5	2.5	0.83	2.2	6.4	1.8	3.6	3.4	3.2	3.4
25th percentile	0.77	0.63	0.70	0.50	0.30	0.32	0.50	0.50	0.50	0.69	0.73	0.68	0.65	0.08	0.29
Median	0.98	0.91	0.93	0.64	0.50	0.58	1.2	0.54	0.66	0.81	1.0	0.94	1.0	0.21	0.65
75th percentile	2.9	2.1	2.3	1.2	0.61	0.76	1.5	0.79	1.1	1.5	1.2	1.3	1.6	0.68	1.2
IQR	2.1	1.5	1.6	0.66	0.31	0.44	1.0	0.29	0.60	0.81	0.42	0.61	0.93	0.60	0.92
Minimum	0.50	0.50	0.50	0.29	0.27	0.27	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Maximum	6.7	5.7	6.7	3.2	0.84	3.2	2.8	0.84	2.8	9.7	2.2	9.7	3.5	6.7	6.7

Table B-6. Statistics for Nitrate + Nitrite across five land uses and three sample types

Nitrate + Nitrite (NO3 NO2) (mg/L)															
Land Use	Commercial			Industrial			Open Space			Residential			Transportation		
Type	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL
n	15	15	30	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	80%	60%	70%	65%	47%	56%	40%	60%	50%	75%	50%	64%	80%	40%	60%
Mean	0.75	0.37	0.56	0.41	0.26	0.32	0.39	0.57	0.47	0.47	0.29	0.39	0.54	0.24	0.38
Standard Deviation	0.78	0.30	0.61	0.47	0.09	0.36	0.28	0.64	0.48	0.52	0.24	0.42	0.42	0.14	0.35
Coefficient of Variation	1.0	0.82	1.1	1.2	0.35	1.1	0.73	1.1	1.0	1.1	0.81	1.1	0.78	0.61	0.92
lower 95th CI	0.10	0.08	0.07	0.06	0.15	0.07	0.14	0.06	0.07	0.07	0.08	0.06	0.12	0.08	0.07
upper 95th CI	2.3	0.93	1.7	1.2	0.39	0.77	0.76	1.4	1.3	1.5	0.66	1.3	1.2	0.48	0.97
25th percentile	0.28	0.14	0.17	0.13	0.20	0.13	0.20	0.10	0.14	0.22	0.13	0.13	0.26	0.13	0.15
Median	0.45	0.25	0.36	0.29	0.24	0.28	0.28	0.36	0.29	0.30	0.22	0.27	0.42	0.19	0.28
75th percentile	0.93	0.49	0.70	0.42	0.32	0.35	0.53	0.71	0.67	0.42	0.41	0.41	0.74	0.29	0.50
IQR	0.65	0.35	0.53	0.29	0.12	0.22	0.34	0.61	0.52	0.20	0.28	0.28	0.48	0.16	0.35
Minimum	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Maximum	2.8	1.1	2.8	2.0	0.50	2.0	0.81	1.6	1.6	1.7	0.85	1.7	1.7	0.52	1.7

Table B-7. Statistics for Total Nitrogen across five land uses and three sample types

Total Nitrogen (Total N) (mg/L)															
Land Use	Commercial			Industrial			Open Space			Residential			Transportation		
Type	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL
n	15	14	29	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	73%	64%	69%	71%	47%	59%	60%	60%	60%	92%	60%	77%	80%	47%	63%
Mean	2.8	1.8	2.3	1.2	0.75	0.93	1.5	1.1	1.2	2.3	1.4	1.8	1.9	1.0	1.5
Standard Deviation	2.4	1.7	2.1	1.2	0.17	0.92	1.1	0.57	0.87	3.1	0.46	2.3	1.3	1.7	1.6
Coefficient of Variation	0.84	0.95	0.90	1.0	0.22	0.98	0.74	0.51	0.71	1.3	0.33	1.3	0.72	1.7	1.1
lower 95th CI	0.61	0.37	0.47	0.29	0.55	0.28	0.61	0.81	0.52	0.64	0.86	0.46	0.50	0.13	0.25
upper 95th CI	7.2	5.0	6.5	2.9	1.0	2.2	2.9	1.9	2.8	7.5	2.1	4.2	4.3	3.3	4.6
25th percentile	1.1	0.51	0.75	0.47	0.62	0.47	0.99	0.87	0.77	0.90	0.98	0.74	0.83	0.23	0.47
Median	1.5	1.2	1.3	0.86	0.70	0.72	1.2	0.87	0.87	1.1	1.4	1.2	1.7	0.38	0.96
75th percentile	4.0	2.7	3.2	1.2	0.89	0.97	1.3	0.89	1.3	2.1	1.6	1.7	2.2	1.0	1.8
IQR	3.0	2.2	2.5	0.74	0.28	0.50	0.32	0.02	0.51	1.2	0.60	1.0	1.4	0.80	1.3
Minimum	0.75	0.75	0.75	0.29	0.60	0.29	0.75	0.79	0.75	0.74	0.75	0.74	0.75	0.75	0.75
Maximum	7.6	5.9	7.6	5.2	1.0	5.2	3.3	2.1	3.3	11	2.2	11	5.1	7.0	7.0

Table B-8. Statistics for Dissolved Phosphorus across five land uses and three sample types

Dissolved Phosphorus (Dissolved P) (mg/L)															
Land Use	Commercial			Industrial			Open Space			Residential			Transportation		
Type	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL
n	15	15	30	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	100%	100%	100%	94%	93%	94%	100%	100%	100%	100%	100%	100%	93%	93%	93%
Mean	0.14	0.15	0.14	0.14	0.14	0.14	0.70	0.45	0.57	0.60	0.77	0.68	0.14	0.09	0.11
Standard Deviation	0.11	0.14	0.13	0.09	0.09	0.09	0.18	0.08	0.19	0.32	0.36	0.34	0.18	0.06	0.14
Coefficient of Variation	0.83	0.93	0.87	0.63	0.62	0.62	0.25	0.18	0.32	0.52	0.46	0.50	1.3	0.71	1.2
lower 95th CI	0.02	0.02	0.02	0.03	0.02	0.03	0.48	0.37	0.37	0.17	0.21	0.16	0.03	0.03	0.03
upper 95th CI	0.33	0.42	0.36	0.29	0.28	0.28	0.85	0.54	0.85	0.93	1.2	1.1	0.45	0.21	0.28
25th percentile	0.05	0.06	0.05	0.09	0.08	0.09	0.57	0.38	0.44	0.37	0.57	0.41	0.07	0.05	0.05
Median	0.07	0.12	0.10	0.11	0.12	0.12	0.78	0.44	0.52	0.67	0.83	0.80	0.08	0.07	0.07
75th percentile	0.23	0.20	0.24	0.16	0.19	0.19	0.85	0.49	0.73	0.89	1.1	0.91	0.12	0.10	0.11
IQR	0.18	0.14	0.18	0.07	0.12	0.10	0.28	0.11	0.29	0.52	0.49	0.50	0.05	0.05	0.06
Minimum	0.02	0.02	0.02	0.02	0.02	0.02	0.46	0.37	0.37	0.14	0.16	0.14	0.02	0.02	0.02
Maximum	0.35	0.51	0.51	0.37	0.28	0.37	0.85	0.56	0.85	0.97	1.2	1.2	0.75	0.23	0.75

Table B-9. Statistics for Total Phosphorus across five land uses and three sample types

Total Phosphorus (TP) (mg/L)															
Land Use	Commercial			Industrial			Open Space			Residential			Transportation		
Type	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL
n	15	15	30	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mean	0.46	0.39	0.42	0.79	0.20	0.51	1.3	0.71	0.99	1.0	1.2	1.1	0.79	0.26	0.52
Standard Deviation	0.38	0.29	0.33	1.7	0.09	1.3	0.39	0.25	0.43	0.59	0.56	0.57	1.3	0.20	0.96
Coefficient of Variation	0.82	0.74	0.78	2.2	0.44	2.5	0.31	0.36	0.44	0.59	0.48	0.53	1.7	0.79	1.9
lower 95th CI	0.11	0.08	0.08	0.17	0.12	0.13	0.90	0.45	0.45	0.16	0.27	0.19	0.11	0.10	0.10
upper 95th CI	1.1	0.85	1.0	2.3	0.36	0.87	1.8	1.0	1.6	1.8	1.8	1.8	2.4	0.62	1.1
25th percentile	0.18	0.18	0.17	0.23	0.14	0.17	1.1	0.46	0.76	0.47	0.97	0.58	0.20	0.12	0.12
Median	0.35	0.33	0.34	0.34	0.17	0.23	1.3	0.73	0.95	1.1	1.2	1.1	0.41	0.15	0.26
75th percentile	0.55	0.53	0.56	0.57	0.22	0.37	1.3	0.87	1.2	1.5	1.6	1.5	0.79	0.27	0.49
IQR	0.37	0.35	0.39	0.34	0.07	0.20	0.21	0.41	0.45	1.0	0.64	0.93	0.59	0.15	0.37
Minimum	0.10	0.07	0.07	0.16	0.10	0.10	0.87	0.45	0.45	0.07	0.18	0.07	0.10	0.10	0.10
Maximum	1.4	1.1	1.4	7.3	0.44	7.3	1.9	1.0	1.9	1.9	1.8	1.9	5.4	0.79	5.4

Table B-10. Statistics for Lead across five land uses and three sample types

Lead (Pb) (ug/L)															
Land Use	Commercial			Industrial			Open Space			Residential			Transportation		
Type	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL
n	15	15	30	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	80%	93%	87%	82%	47%	66%	80%	40%	60%	58%	30%	45%	87%	53%	70%
Mean	5.2	4.0	4.6	2.7	1.4	2.0	2.1	1.1	1.7	2.6	1.2	1.8	4.6	2.1	3.4
Standard Deviation	5.2	3.5	4.4	2.7	0.45	2.1	1.2	0.68	1.0	1.9	0.35	1.7	4.6	1.9	3.7
Coefficient of Variation	1.0	0.87	0.97	0.99	0.33	1.1	0.56	0.60	0.63	0.73	0.29	0.95	1.0	0.91	1.1
lower 95th CI	1.0	1.3	0.86	0.74	0.81	0.52	0.91	0.50	0.59	0.68	0.81	0.29	0.73	0.42	0.49
upper 95th CI	16	11	13	6.7	2.0	4.3	3.4	2.0	3.4	5.3	1.8	5.2	14	5.1	10
25th percentile	2.3	2.1	2.1	1.7	1.0	0.92	1.5	0.66	0.88	1.1	0.98	0.60	1.8	0.79	1.1
Median	3.8	2.3	3.1	2.1	1.3	1.7	1.7	0.88	1.5	1.9	1.2	1.1	3.6	1.7	1.8
75th percentile	5.4	4.2	4.9	2.6	1.6	2.1	3.3	1.5	2.0	4.6	1.5	1.9	4.2	3.0	4.0
IQR	3.1	2.2	2.8	0.9	0.5	1.2	1.8	0.8	1.1	3.5	0.5	1.3	2.5	2.2	2.9
Minimum	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Maximum	20	12	20	12	2.4	12	3.5	2.1	3.5	5.4	1.9	5.4	17	7.6	17

Table B-11. Statistics for Nickel across five land uses and three sample types

Nickel (Ni) (ug/L)															
Land Use	Commercial			Industrial			Open Space			Residential			Transportation		
Type	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL
n	15		30	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	33%		20%	12%		6%	20%		10%				33%	13%	23%
Mean	5.1		4.2	4.3		3.9	5.2		5.2				4.7	4.6	3.3
Standard Deviation	1.6		1.6	0.78		0.82	0.00		0.00				7.4	1.1	5.6
Coefficient of Variation	0.31		0.38	0.18		0.21	0.00		0.00				1.6	0.24	1.7
lower 95th CI	3.4		2.3	3.3		2.8	5.2		5.2				0.20	3.2	0.14
upper 95th CI	7.5		6.5	5.7		5.3	5.2		5.2				16	6.5	11
25th percentile	4.2		3.0	3.8		3.3	5.2		5.2				0.61	3.8	0.47
Median	4.8		3.9	4.2		3.8	5.2		5.2				1.6	4.4	1.2
75th percentile	5.8		4.9	4.7		4.4	5.2		5.2				5.2	5.1	3.2
IQR	1.6		1.8	0.97		1.1	0.00		0.00				4.6	1.3	2.7
Minimum	4.7		3.0	5.0		5.0	5.0		5.0				5.0	5.0	5.0
Maximum	9.5		9.5	6.0		6.0	5.2		5.2				28	6.9	28

Note: Cells that are blank indicate that there were not enough detected values to calculate statistics in NADA.

Table B-12. Statistics for Zinc across five land uses and three sample types

Zinc (Zn) (ug/L)															
Land Use	Commercial			Industrial			Open Space			Residential			Transportation		
Type	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL
n	15	15	30	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	93%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mean	230	125	177	88	30	61	119	12	65	160	65	117	103	43	73
Standard Deviation	326	83	240	76	12	63	217	4.5	155	114	50	101	89	41	75
Coefficient of Variation	1.4	0.67	1.4	0.87	0.41	1.0	1.8	0.38	2.4	0.71	0.77	0.87	0.86	0.96	1.02
lower 95th CI	19	43	28	22	16	16	11	6.1	7.0	44	21	23	18	15	14
upper 95th CI	766	285	433	210	49	150	413	16	298	339	144	275	264	111	247
25th percentile	76	53	59	48	20	24	18	9.2	9.9	83	29	35	39	19	22
Median	134	105	116	59	28	43	20	12	16	130	39	92	80	26	40
75th percentile	230	166	182	102	38	59	43	15	20	208	98	157	126	47	90
IQR	154	112	123	54	18	35	25	6.0	9.7	125	69	122	87	28	68
Minimum	5.0	35	5.0	15	15	15	9.0	5.4	5.4	26	19	19	11	10	10
Maximum	1,300	301	1,300	336	56	336	506	16	506	417	147	417	289	173	289

Table B-13. Statistics for Chromium across five land uses and three sample types

Chromium (Cr) (ug/L)															
Land Use	Commercial			Industrial			Open Space			Residential			Transportation		
Type	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL
n	15	15	30	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	73%	67%	70%	29%	20%	25%	100%	60%	80%	25%	20%	23%	80%	60%	70%
Mean	2.8	2.4	2.6	1.3	1.1	1.2	4.0	2.3	3.3	2.0	1.2	1.9	4.5	2.4	3.4
Standard Deviation	2.1	1.5	1.8	1.6	0.72	1.3	1.5	2.0	1.7	0.77	1.1	0.83	5.9	1.7	4.4
Coefficient of Variation	0.75	0.63	0.69	1.3	0.64	1.1	0.36	0.89	0.52	0.38	0.97	0.45	1.3	0.72	1.3
lower 95th CI	0.85	0.89	0.85	0.15	0.40	0.21	2.8	0.52	1.3	1.2	0.23	0.89	0.74	0.66	0.61
upper 95th CI	7.3	5.5	6.6	3.3	2.3	2.7	5.9	4.9	6.0	3.3	3.2	3.6	13	5.7	7.1
25th percentile	1.6	1.3	1.4	0.34	0.63	0.44	2.9	0.79	2.1	1.5	0.43	1.3	2.2	1.1	1.2
Median	2.3	2.2	2.3	0.69	0.93	0.79	4.0	2.0	2.8	1.9	0.75	1.7	2.4	2.0	2.3
75th percentile	3.2	2.6	2.8	2.0	1.4	1.5	4.0	2.5	4.0	2.4	1.3	2.2	4.6	2.9	4.2
IQR	1.5	1.2	1.4	1.7	0.73	1.1	1.1	1.7	1.9	0.91	0.87	0.97	2.4	1.7	3.0
Minimum	2.0	2.0	2.0	2.0	2.0	2.0	2.8	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Maximum	8.1	6.2	8.1	6.7	3.0	6.7	6.4	5.5	6.4	3.6	3.7	3.7	25	6.0	25

Table B-14. Statistics for Copper across five land uses and three sample types

Copper (Cu) (ug/L)															
Land Use	Commercial			Industrial			Open Space			Residential			Transportation		
Type	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL
n	15	15	30	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	87%	93%	90%	76%	33%	56%	80%	40%	60%	67%	70%	68%	87%	93%	90%
Mean	23	17	20	7.8	2.8	5.5	4.2	4.0	3.9	6.6	9.9	8.0	16	7.7	12
Standard Deviation	18	10	15	6.7	2.4	5.7	0.73	0.00	0.66	5.5	20	14	9.8	4.7	8.7
Coefficient of Variation	0.79	0.59	0.73	0.86	0.86	1.0	0.18	0.00	0.17	0.84	2.1	1.8	0.62	0.61	0.75
lower 95th CI	3.8	5.8	4.0	1.6	0.65	0.85	3.4	4.0	3.1	1.7	0.69	0.89	4.0	3.9	2.6
upper 95th CI	57	32	49	22	6.9	20	5.1	4.0	4.9	15	40	21	30	14	28
25th percentile	11	9.0	9.4	4.0	1.2	1.9	4.0	4.0	3.4	2.8	2.0	2.0	7.3	4.7	5.1
Median	16	13	15	5.5	2.0	4.0	4.0	4.0	4.0	5.6	4.3	4.5	15	6.1	8.6
75th percentile	34	27	29	8.7	4.0	6.1	4.5	4.0	4.0	8.1	5.0	6.7	21	8.9	16
IQR	23	18	20	4.7	2.8	4.2	0.47	0.00	0.60	5.3	3.0	4.7	14	4.3	11
Minimum	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Maximum	60	35	60	22	9.5	22	5.2	4.0	5.2	22	68	68	36	22	36

Table B-15. Statistics for Oil and Grease across five land uses and three sample types

Oil and Grease (mg/L)															
Land Use	Commercial			Industrial			Open Space			Residential			Transportation		
Type	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL
n	14	14	28	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	64%	71%	68%	47%	33%	41%	60%	60%	60%	25%	30%	27%	73%	53%	63%
Mean	4.0	4.5	4.3	2.4	1.8	2.1	5.1	3.9	4.6	1.7	2.1	2.0	13	6.8	10
Standard Deviation	4.8	3.1	4.0	3.8	1.8	3.0	6.7	3.8	5.1	3.9	3.4	3.6	36	18	28
Coefficient of Variation	1.2	0.69	0.93	1.6	0.96	1.4	1.3	0.99	1.1	2.3	1.6	1.8	2.7	2.7	2.8
lower 95th CI	0.39	1.1	0.63	0.25	0.35	0.24	0.55	0.70	0.76	0.01	0.07	0.05	0.36	0.13	0.17
upper 95th CI	14	9.8	13	7.4	5.4	5.6	14	9.0	14	7.7	8.4	9.7	50	27	44
25th percentile	0.83	1.8	1.4	0.50	0.61	0.53	0.55	1.1	1.1	0.03	0.14	0.16	1.2	0.37	0.59
Median	2.3	3.9	2.8	1.0	1.0	1.1	3.6	3.2	3.4	0.16	0.44	0.44	4.0	1.9	2.2
75th percentile	4.5	7.1	5.5	2.7	2.5	2.7	4.3	4.3	4.3	1.0	1.9	1.9	6.4	4.2	4.7
IQR	3.6	5.3	4.0	2.2	1.9	2.2	3.7	3.2	3.2	0.98	1.7	1.8	5.2	3.8	4.1
Minimum	1.4	1.4	1.4	1.4	1.4	1.4	1.4	2.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Maximum	15	10	15	16	6.0	16	17	10	17	14	9.9	14	142	72	142

Table B-16. Statistics for TSS across five land uses and three sample types

TSS (Total Suspended Solids) (mg/L)															
Land Use	Commercial			Industrial			Open Space			Residential			Transportation		
Type	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL
n	15	15	30	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	93%	93%	93%	88%	67%	78%	100%	100%	100%	75%	70%	73%	93%	80%	87%
Mean	57	47	52	40	9.0	25	120	34	77	74	23	51	737	286	512
Standard Deviation	63	54	58	56	8.7	44	171	40	126	98	35	79	2,646	1,025	1,985
Coefficient of Variation	1.1	1.1	1.1	1.4	0.97	1.7	1.4	1.2	1.6	1.3	1.5	1.6	3.6	3.6	3.9
lower 95th CI	10	6.7	6.3	2.9	1.7	1.5	13	5.5	6.8	2.5	1.6	1.5	5.2	1.0	2.1
upper 95th CI	189	152	188	158	26	118	357	89	283	258	83	212	3,233	1,249	2,286
25th percentile	20	18	19	8.8	3.5	5.3	23	9.8	13	9.4	5.1	5.7	19	5.8	9.3
Median	35	24	32	21	6.7	9.0	31	21	27	27	8.0	15	37	15	25
75th percentile	67	53	59	32	8.6	22	121	33	86	94	22	61	76	35	49
IQR	46	35	40	23	5.1	17	98	23	72	84	17	55	57	29	40
Minimum	4.0	6.5	4.0	4.0	4.0	4.0	11	4.4	4.4	4.0	4.0	4.0	5.6	4.0	4.0
Maximum	225	199	225	204	31	204	416	103	416	309	117	309	10,300	3,990	10,300

Table B-17. Statistics for TDS across five land uses and three sample types

TDS (Total Dissolved Solids) (mg/L)															
Land Use	Commercial			Industrial			Open Space			Residential			Transportation		
Type	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL	FF	1-HR	ALL
n	15	15	30	17	15	32	5	5	10	12	10	22	15	15	30
Percent Detected	100%	100%	100%	100%	100%	100%	100%	100%	100%	92%	90%	91%	100%	100%	100%
Mean	657	184	421	94	68	82	173	218	196	118	117	117	640	245	443
Standard Deviation	1,771	356	1,278	72	45	61	34	39	42	117	54	92	1,781	666	1,336
Coefficient of Variation	2.7	1.9	3.0	0.77	0.66	0.75	0.20	0.18	0.22	0.99	0.46	0.79	2.8	2.7	3.0
lower 95th CI	28	38	28	37	40	38	138	179	142	22	52	27	33	26	32
upper 95th CI	2,546	575	1,086	239	125	221	209	265	257	305	194	220	2,806	889	1,908
25th percentile	59	63	57	49	46	46	150	182	166	54	74	62	82	64	69
Median	145	83	92	74	58	62	162	222	195	78	122	98	100	79	91
75th percentile	380	139	175	95	68	83	207	239	219	143	144	144	173	92	147
IQR	322	76	119	46	23	37	57	57	53	89	71	82	91	28	78
Minimum	27	25	25	36	39	36	135	178	135	20	20	20	31	5.0	5.0
Maximum	7,020	1,460	7,020	305	221	305	209	271	271	449	222	449	7,020	2,650	7,020

APPENDIX C: EMC MEANS AND MEDIANS FOR FIRST FLUSH AND 1-HR SAMPLES

This appendix lists the mean and median EMC values for all 17 parameters measured by MWS during wet-weather outfall monitoring. These EMCs are based on Regression on Order Statistics, as described in Section 3.

Tables

Table C-1. Summary of mean and median EMC for *first-flush* samples by land use and pollutant.

Pollutant	Statistic	Land Use				
		Commercial	Industrial	Open Space	Residential	Transportation
E. coli (MPN/100ml)	*Mean*	2,307	1,595	3,393	21,022	332
	Median	228	308	2,419	13,435	80
Biological Oxygen Demand (mg/L)	*Mean*	26	11	4.7	42	9.9
	Median	9.0	7.0	3.0	8.5	8.5
Chemical Oxygen Demand (mg/L)	*Mean*	156	53	64	104	169
	Median	80	47	61	47	87
Total Ammonia (mg/L)	*Mean*	0.43	0.17	0.11	0.16	0.29
	Median	0.27	0.10	0.11	0.11	0.17
Total Kjeldahl Nitrogen (mg/L)	*Mean*	2.2	0.88	1.2	1.9	1.3
	Median	0.98	0.64	1.2	0.81	1.0
Nitrate + Nitrite (mg/L)	*Mean*	0.75	0.41	0.39	0.47	0.54
	Median	0.45	0.29	0.28	0.30	0.42
Total Nitrogen (mg/L)	*Mean*	2.8	1.2	1.5	2.3	1.9
	Median	1.5	0.86	1.2	1.1	1.7
Dissolved Phosphorus (mg/L)	*Mean*	0.14	0.14	0.70	0.60	0.14
	Median	0.07	0.11	0.78	0.67	0.08
Total Phosphorus (mg/L)	*Mean*	0.46	0.79	1.3	1.0	0.79
	Median	0.35	0.34	1.3	1.1	0.41
Lead (µg/L)	*Mean*	5.2	2.7	2.1	2.6	4.6
	Median	3.8	2.1	1.7	1.9	3.6
Nickel (µg/L)	*Mean*	5.1	4.3	5.2		4.7
	Median	4.8	4.2	5.2		1.6
Zinc (µg/L)	*Mean*	230	88	119	160	103
	Median	134	59	20	130	80
Chromium (µg/L)	*Mean*	2.8	1.3	4.0	2.0	4.5
	Median	2.3	0.69	4.0	1.9	2.4
Copper (µg/L)	*Mean*	23	7.8	4.2	6.6	16
	Median	16	5.5	4.0	5.6	15
Oil & Grease (mg/L)	*Mean*	4.0	2.4	5.1	1.7	13
	Median	2.3	1.0	3.6	0.16	4.0
Total Suspended Solids (mg/L)	*Mean*	57	40	120	74	737
	Median	35	21	31	27	37
Total Dissolved Solids (mg/L)	*Mean*	657	94	173	118	640
	Median	145	74	162	78	100

Table C-2. Summary of mean and median EMC for *one-hour* samples by land use and pollutant

Pollutant	Statistic	Land Use				
		Commercial	Industrial	Open Space	Residential	Transportation
E. coli (MPN/100ml)	*Mean*	3,622	1,710	2,371	19,618	5,596
	Median	365	613	2,420	9,215	62
Biological Oxygen Demand (mg/L)	*Mean*	16	5.8	2.9	5.8	3.4
	Median	12	3.4	2.0	4.7	3.0
Chemical Oxygen Demand (mg/L)	*Mean*	105	26	38	39	50
	Median	89	23	36	39	39
Total Ammonia (mg/L)	*Mean*	0.26	0.10	0.07	0.08	0.19
	Median	0.27	0.09	0.08	0.08	0.16
Total Kjeldahl Nitrogen (mg/L)	*Mean*	1.5	0.47	0.60	1.1	0.83
	Median	0.91	0.50	0.54	1.0	0.21
Nitrate + Nitrite (mg/L)	*Mean*	0.37	0.26	0.57	0.29	0.24
	Median	0.25	0.24	0.36	0.22	0.19
Total Nitrogen (mg/L)	*Mean*	1.8	0.75	1.1	1.4	1.0
	Median	1.2	0.70	0.87	1.4	0.38
Dissolved Phosphorus (mg/L)	*Mean*	0.15	0.14	0.45	0.77	0.09
	Median	0.12	0.12	0.44	0.83	0.07
Total Phosphorus (mg/L)	*Mean*	0.39	0.20	0.71	1.2	0.26
	Median	0.33	0.17	0.73	1.2	0.15
Lead (µg/L)	*Mean*	4.0	1.4	1.1	1.2	2.1
	Median	2.3	1.3	0.88	1.2	1.7
Nickel (µg/L)	*Mean*					4.6
	Median					4.4
Zinc (µg/L)	*Mean*	125	30	12	65	43
	Median	105	28	12	39	26
Chromium (µg/L)	*Mean*	2.4	1.1	2.2	1.2	2.4
	Median	2.2	0.93	2.0	0.75	2.0
Copper (µg/L)	*Mean*	17	2.8	4.0	9.9	7.7
	Median	13	2.0	4.0	4.3	6.1
Oil & Grease (mg/L)	*Mean*	4.5	1.8	3.9	2.1	6.8
	Median	3.9	1.0	3.2	0.44	1.9
Total Suspended Solids (mg/L)	*Mean*	47	8.9	34	23	286
	Median	24	6.7	21	8.0	15
Total Dissolved Solids (mg/L)	*Mean*	184	68	218	117	245
	Median	83	58	222	122	79