

**National Pollutant Discharge  
Elimination System (NPDES)  
Municipal Separate Storm Sewer System (MS4)  
Permit MO-0130516  
Thirteenth Year Report  
May 2017 – April 2018**



**Submitted by**

**KC Water  
4800 East 63<sup>rd</sup> Street  
Kansas City, Missouri 64130**

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## ACRONYMS

APWA	American Public Works Association
BMPs	Best Management Practices
BOD	Biochemical oxygen demand
BRWA	Blue River Watershed Association
CERC	Columbia Environmental Research Center
City	City of Kansas City, Missouri
COD	Chemical oxygen demand
CP&D	City Planning & Development
EMC	Event-mean concentration
EOT	Education and Outreach Team
GIS	Geographic Information System
HHW	Household Hazardous Waste
KCW	KC Water
KCWL	Kansas City Wildlands
LDD	Land Development Division
MARC	Mid-America Regional Council
MDNR	Missouri Department of Natural Resources
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollution Discharge Elimination System
OEQ	The Office of Environmental Quality
P&R	Parks and Recreation Department
PHFs	Pesticides, herbicides, and fertilizers
PWD	Public Works Department
STREAM	Students Teaching River Education Around the Metro
SWMP	Stormwater Management Plan
SWPPP	Stormwater Pollution Prevention Plan
USACE	U.S. Army Corp of Engineers
USGS	U.S. Geological Survey
WRDA	Water Resources and Development Act

## **WRITTEN NOTICE OF COMPLIANCE**

Part IV.B of the Missouri State Operating permit MO-0130516 requires that the City of Kansas City, Missouri provide written notice of compliance or noncompliance with the schedule for permit implementation. The City has, so far, submitted thirteen reports covering the period from September 3, 2004 to April 30, 2017, to Missouri Department of Natural Resources. This current report covers the period of May 1, 2017 - April 30, 2018. It documents the status of implementing, to the maximum extent practicable, the components of the stormwater management programs that are established as permit conditions and addresses the progress of programs that were required to be implemented in this period. As detailed in the report, the City is in compliance with the schedule for all interim milestones and final deadlines as identified in the permit schedule (permit Part IV.A).

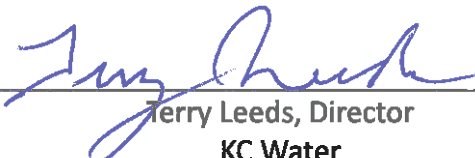
## AUTHORITY

As required in Part VI, Sections D and E of Missouri State Operating permit No. MO-0130516, all reports required by the permit and other information requested by the Director shall be signed by:

1. for a municipality, State, or other public agency: either a principal executive officer or ranking elected official.

## CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering 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 fines and imprisonment for knowing violations.

  
\_\_\_\_\_  
Terry Leeds, Director  
KC Water  
City of Kansas City, Missouri

12/26/18  
\_\_\_\_\_  
Date

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## INTRODUCTION

This report is submitted to the Missouri Department of Natural Resources (MDNR) by the City of Kansas City, Missouri (hereafter referred to as the City) pursuant to the conditions of the National Pollutant Discharge Elimination System (NPDES) Missouri State Operating permit MO-0130516 for discharges from its municipal separate storm sewer system (MS4). The five-year permit was issued on September 3, 2004 and expired on September 3, 2009. Prior to the expiration of the first permit term, the City submitted its renewal application in a timely manner and as such has continued to operate its separate storm sewer system under the expired permit conditions. This annual report provides an update on the permit activities conducted between May 1, 2017 and April 30, 2018.

This report consists of six sections.

1. **Stormwater Management Program Components.** Elements of the City's stormwater management program are summarized in this section. Objectives, program development, implementation status, and major achievements are discussed here.
2. **Public Education Program.** Public education is required in multiple stormwater management programs in the City's MS4 permit. This section discusses education activities, currently conducted or planned, pursuant to permit requirements.
3. **Watershed Monitoring Program.** Monitoring water quality is a critical component in evaluating the effectiveness of the MS4 permit implementation. This section presents a summary of ongoing monitoring efforts performed in accordance with Part VI of the permit.
4. **Other Permit Reporting Requirements.** The City's MS4 permit mandates reporting elements that allow for the evaluation of permit implementation but are not specifically included in any of the previous sections. These elements include proposed changes to permit conditions, enforcement actions, identification of water quality improvement or degradation, and a fiscal analysis.
5. **Future Implementation.** This section discusses the future direction of stormwater management in the City.
6. **Appendices.** This section includes detailed supporting documents that have been developed in compliance with the permit requirements and/or that are not required by the permit but show the City's efforts on stormwater pollution prevention and mitigation.



## SECTION 1. STORMWATER MANAGEMENT PROGRAM COMPONENTS

### 1.1 Address Post-Construction Discharge from Areas of New Development and Significant Redevelopment

**A. Permit Reference III.A-1a. (Status ongoing)**

**Water quality considerations for areas of new development and significant redevelopment**

The activities performed under this program included:

1. Revising the Kansas City Zoning and Development Code.  
 A code with sections dating back to 1926, the revised zoning and development code, was approved by Ordinance 081033 on May 21, 2009. No stormwater-related changes were made during the reporting period.
2. New area plans addressing stormwater and sustainability.  
 Table 1 provides the new area plans that the City Planning and Development department (CP&D) worked on directly and specifically address stormwater and environmental sustainability.

**Table 1. New area plans addressing stormwater and sustainability**

Area Plan	Completion/ Adoption Date	Low-Impact Development or Redevelopment, Stormwater-related Vision/Principle/Recommendation
Blue Ridge	2017 (adopted)	<p>Preserve open spaces. Create an interconnected system of open spaces that include opportunities for recreation, stormwater management and habitat restoration.</p> <p>Promote eco-green infrastructure. Implement eco-green and sustainable stormwater solutions in new development, capital improvements, and public facilities.</p> <p>Promote sustainable development. Integrate sustainable approaches to storm water management, ... in new development.</p>
Country Club/ Waldo	2018 (adopted)	<p>Create and promote a sustainable stormwater system</p> <p>Streetscape enhancements should include eco-green stormwater management elements, as well as landscaped open spaces.</p>

Longview	2017 (adopted)	Integrate eco-green elements and sustainable approaches to stormwater management...and sustainable land management <ul style="list-style-type: none"> <li>• Emphasize storm water management approaches which enhance environmental stewardship and natural resource preservation</li> <li>• Avoid development in stormwater “depressional” areas and floodplains</li> </ul>
Riverfront Industrial	2018 (adopted)	Manage stormwater as a valuable natural resource <ul style="list-style-type: none"> <li>• Streetscape enhancements should include eco-green stormwater management elements</li> <li>• Corridor should include eco-green stormwater management elements as well as landscaped open spaces</li> </ul>
Shoal Creek Valley	2017 (adopted)	Streetscape enhancements should include eco-green stormwater management elements  Corridor should include eco-green stormwater management elements as well as landscaped open spaces  Sustainable design techniques and materials such as eco-green roofs are encouraged to reduce the amount of storm water runoff, enhance the local environment and reduce energy costs

**Specific effort to address watershed development.** The Watershed Planning Group of KC Water (KCW) generated a model incorporating multiple indices (e.g., erosion hazard zones, flow characteristics) to delineate appropriate riparian buffer width for each individual segment of First Creek and Second Creek. The purpose is to address preservation of the riparian buffer zone in a more stream-focused, watershed-based approach for better planning and design for both floodplain and erosion-based threat. This is a pilot project that may be utilized as a component of comprehensive wet weather mapping throughout the City. Currently the model has been reviewed by the stakeholders and is being adjusted and refined.

**B. Permit Ref. III.A-1.a.i (Status Ongoing)**

**Procedures for addressing water quality issues as part of the permitting process**

The Land Development Division (LDD) of City Planning and Development (CP&D) continued to require developments’ adherence to the adopted American Public Works Association (APWA) standards and supplements. These standards and supplements include the *Manual of Best Management Practices for Stormwater Quality* and compliance with stream buffer regulations during the initial planning stages of new development and redevelopment, and during the construction of the projects. These standards require developments to mitigate their impacts for post-construction above predevelopment conditions

by including permanent water quality best management practices (BMPs), stream buffers, and maintenance instruments for all sites within the municipal separate storm sewer system (MS4). In addition, KCW also provides BMPs guidance during the plan review and approval process.

**C. Permit Ref. III.A-1.a.ii (Status ongoing)**

**A description of review standards and a description of the site development review process for internal and external educational purposes (Table 2)**

**Table 2. Task summary associated with addressing post-construction discharge from new development and significant redevelopment**

Permit Ref.	Task	Activities
		<i>The Review Process</i>
1a.	Incorporate water quality considerations for areas of new development and redevelopment	214 Reviews of development applications
	(1) in land use planning, subdivision approval, and site plan review and approval	136 Reviews of construction projects
	(2) in project review and approval for new development and significant redevelopment	29 BMP facilities installed
		28 BMPs easements reviewed
1a.i & ii	Improve procedures for incorporating water quality concerns as part of the permitting process	16 Covenants for maintenance reviewed
1a.ii.	Upgrade the site development review standards	
1a.ii.	Internal and external education on review standards and process	
1a.iii.	Set up minimum design criteria for structural BMPs	
1b.	Inspect and maintain post-construction BMPs	15 Public detention or retention basins inspected and maintained if necessary
		26 Stormwater BMPs permitted by City Planning Department inspected
		152 Private detention basins inspected
		28 Acres of Green Stormwater Infrastructure maintained

**D. Permit Ref. A-1.b. (Status ongoing)**  
**Operation and maintenance of post-construction BMPs**

**Regional BMPs.** A concept design for the detention basin in the East Fork Creek sub-basin of the Line Creek watershed was developed. The Engineering Group of KCW and the LDD of the CP&D are reevaluating the previous design and seeking more efficient options for site runoff source control.

**Public BMPs.** The Stormwater Maintenance group inspected and maintained the public detention basins at 6013 North Strathbury Road, 300 Chestnut Trafficway, 3913 North Kensington Road, Stillwell Avenue, and Gardner Avenue (now a retention basin). The City owns, and the City's Board of Police Commissioners maintains, multiple detention basins at several police department patrol stations, which include Central, Metro, South, East Patrol, and Shoal Creek stations.

In addition, KCW continues to maintain city-owned Green Stormwater Infrastructure, allowing them to function at an optimal level. Currently, KCW maintains a total of 28 acres of Green Stormwater Infrastructure footprint, which include, but are not limited to, rain gardens, bioretention cells, detention basins, and permeable pavements. Maintenance assistance also was provided by the Parks and Recreation and Public Works Departments.

**Private Water Quality BMPs.** The Detention Basin Credit program is maintained by KCW to encourage the use of detention basins. KCW conducted routine inspections for basins receiving the detention credit. See Table 2 for details.

## **1.2 Control Discharge from Roadways**

**A. Permit Ref. 111.A-2a. (Status ongoing)**  
**Store and cover deicing chemicals to minimize the discharge of deicing salts to the municipal separate storm sewer system (MS4)**

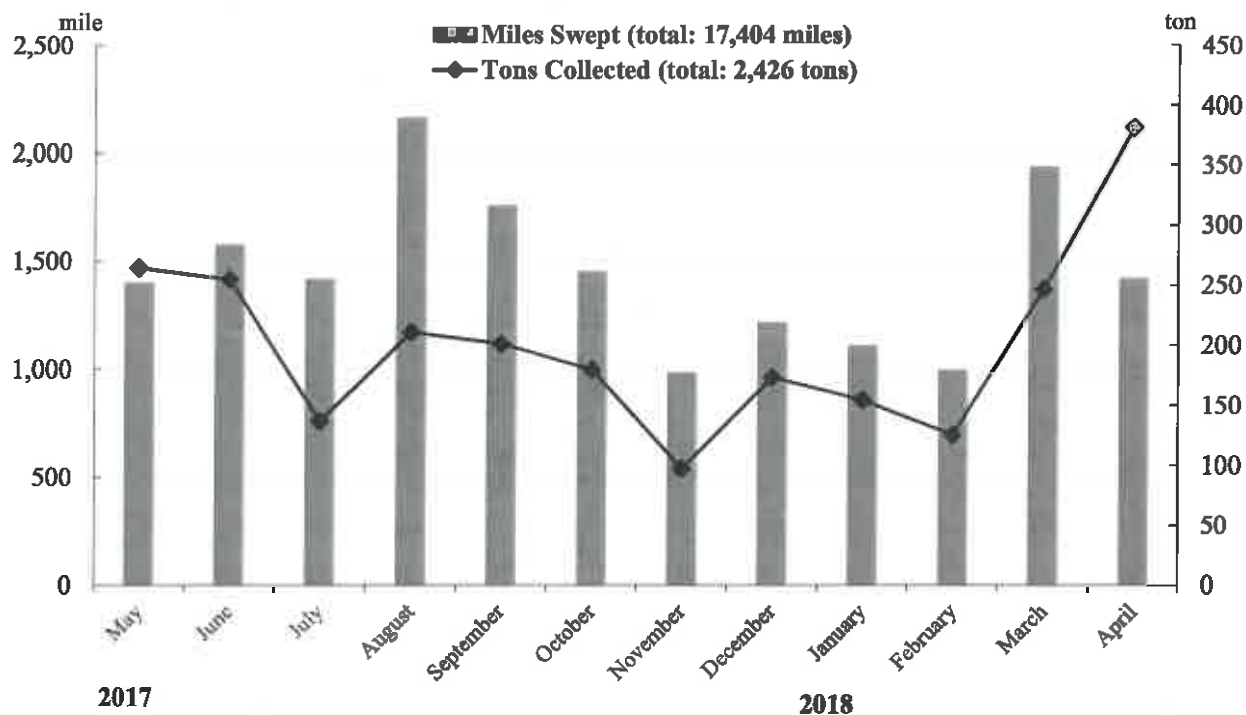
The City's Public Works Department (PWD) has deicing chemical and material storage facilities at each of its three districts and two outlying salt storage facilities. The facilities vary in size and their storage capacities range from 6,000 to 12,000 tons. Rock salt is stored in dome structures at three of the locations. The domes were constructed on asphalt slabs and consist of wooden and concrete structural materials, capable of containing deicing chemicals during periods of extended storage. The two additional salt storage facilities are COVERALL buildings with ten-foot high concrete walls constructed on an asphalt slab. Salt brine and calcium chloride solutions are also used as deicing agents for the public streets and both are stored in tanks. During the reporting period, the City used a total of 60,000 gallons of salt brine, 3,000 gallons of liquid calcium chloride, and 18,053 tons of salt to keep the City streets safe for cars and passengers.

**B. Permit ref. III.A.2b (Status ongoing)**

**Effectively maintain public streets while considering water quality and watershed goals and objectives**

**Street Sweeping Program.** The Stormwater Maintenance Division of the KCW operated the program. Figure 1 provides the performance measurements.

**Figure 1. Monthly record of street sweeping for FY 2017-18**



**Other Trafficway/Right-Of-Way Maintenance.** The City’s Parks & Recreation Department (P&R) maintains 12,000 acres of parkland in 220 parks, 40+ miles of interior roads, hundreds of parking lots, 135 miles of boulevards, parkways, and streets, and over 100 miles of trails and bikeways. Due to the isolation of much of the property in the park system, it is a prime target for illegal dumping activities. KCW continued working with law enforcement personnel, neighborhood and community groups, other City departments, the City’s Illegal Dumping Task Force and other stakeholders in a multifaceted effort to address the dumping problem.

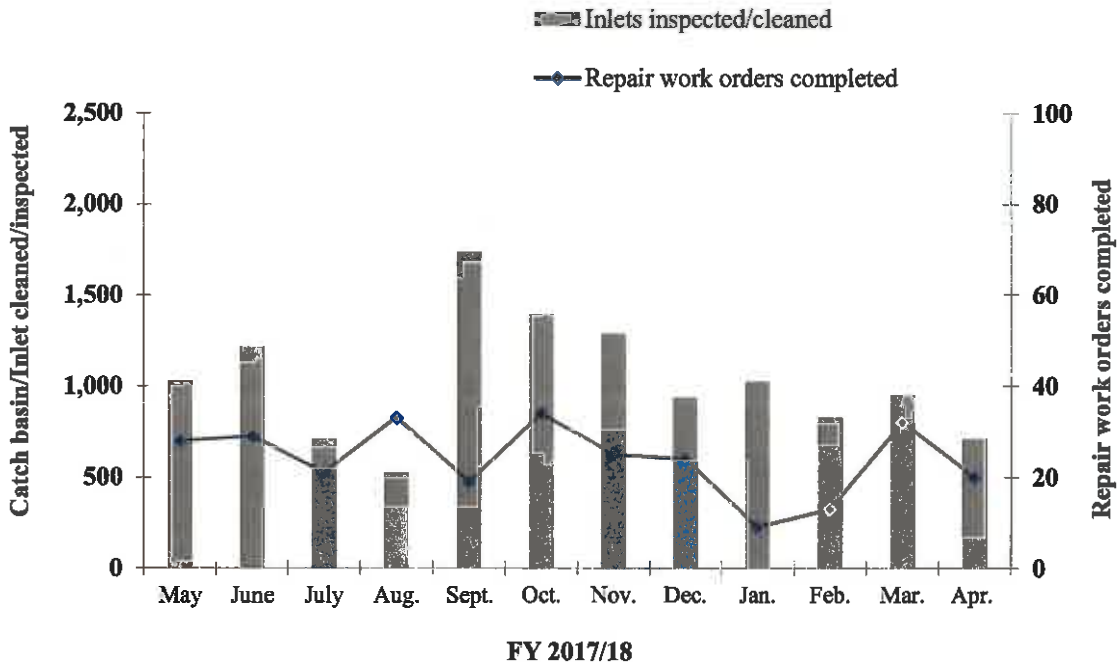
**The Leaf and Brush Program.** To prevent leaves and yard waste from getting into streets/catch basins, a total of 18,072 tons of yard waste were recovered at three drop-off centers. In addition, 4,084 tons of yard waste were collected during the seasonal curbside collections during this reporting period. Collected material is managed to create mulch and compost for reuse.

**C. Permit Ref. III.A.2c (Status Ongoing)**  
**Storm sewer maintenance**

Stormwater Maintenance Policy Implementation. The KCW Stormwater Maintenance Division defines maintenance activities as cleaning, repair, and replacement of structures, including stormwater inlets, ditches, streams, channels, fences for channels, and detention basins. Scheduled inspection of inlets are on a three-year frequency. Priority inlets are cleaned more frequently. Inlets are primarily cleaned by the use of vacuum trucks to remove debris that could otherwise find its way to streams.

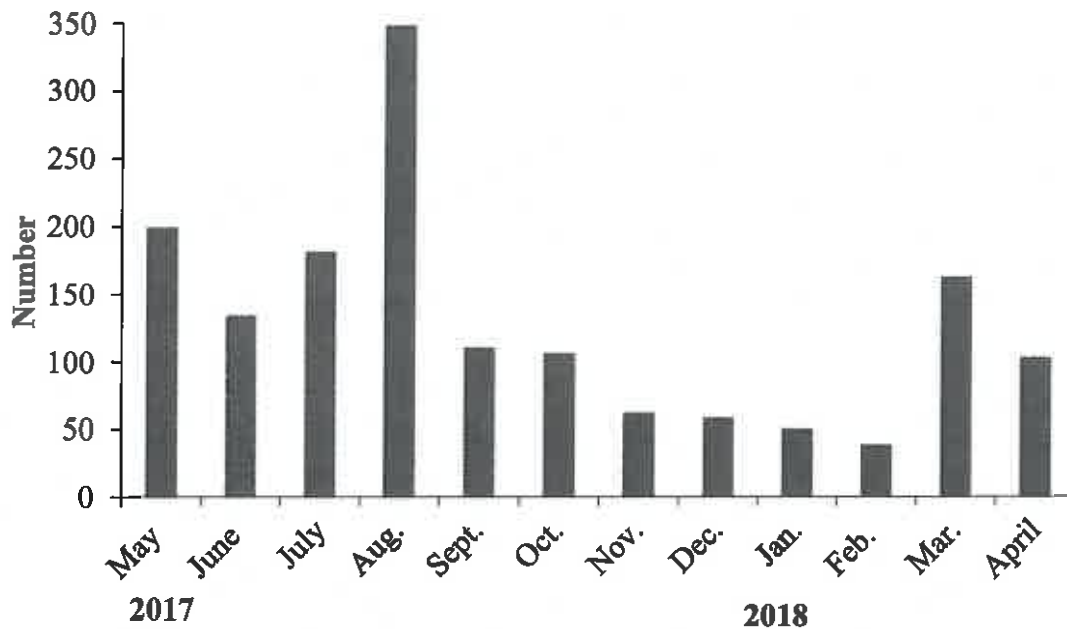
Stormwater Maintenance Group Accomplishments. As needed, Stormwater Maintenance inspected and cleaned 12,336 storm inlets, and completed 287 inlet-related repair work orders (Figure 2). This work is seasonally dependent. Additionally, the group repaired 26 storm manholes and completed 113 work orders related to storm sewer line. The group also strengthened its staffing resources and expertise to meet the maintenance demand related to the use of eco-green infrastructure as an alternative to conventional stormwater concrete infrastructure.

**Figure 2. Storm sewer structure maintenance for FY 2017-18**



Catch basin hotline. The City’s 3-1-1 Action Center serves as a central point of contact for City services, including catch basin or other stormwater concerns. During the reporting period, the City received 1,551 requests for service or maintenance of catch basins and other stormwater inlets (Figure 3).

**Figure 3. Requests for services on catch basins/inlets through the City’s Action Center**



### 1.3 Assess Impact of Flood Risk Management Projects on Water Quality Conditions

#### A. Permit Ref. III.A.-3b (Status Ongoing)

##### Evaluate existing flood risk management projects for water quality retrofitting

##### **Turkey Creek Flood Mitigation Project.**

**Phase 1:** The two-year project is currently scheduled to be completed by October 2018. The work of this phase will lower the channel bed at the farthest downstream end of the channel improvements and will construct the interceptor slot at this new low point for future construction work to extend the interceptor to the new point of collection. By lowering the channel, the area will benefit from all of the improvements made upstream that have been blocked by this downstream high spot. The lowered gradient will reduce backloading and high-energy scour.

**Phase 2:** The interceptor alignment initiated from Phase 1 will continue during this phase. The interceptor will run under railroad tracks and streets via pipe jacking and terminate at connection with 88” brick storm line. Also, there will be a secondary lateral. The interceptor system will incorporate reinforced box culverts, reinforced concrete pipes and associated inlets and structures. The system is expected to mitigate the impact from 15-year storms on the area.

**Dodson Flood Damage Reduction Project.** This project was authorized by Congress in the 1996 Water Resources and Development Act (WRDA). The Project Cooperation Agreement for construction of the project was signed in 2001. The final phase of construction is underway and will complete the 500-year

flood protection for the Dodson Industrial District. There were no water quality retrofit activities to report in this reporting period.

**Swope Park Industrial Park Levee/Floodwall.** The plan for this project has been developed by the U.S. Army Corps of Engineers (USACE) and was authorized in the 2007 WRDA. Construction began in 2011. Notice to proceed was issued for real estate acquisition to support the next construction package consisting of critical bank stabilization and initiating construction of the levee and east bridge approach. The construction bid was awarded in September 2016. The bank stabilization project was completed by the end of the reporting period with the final inspection held in March 2018. The bank stabilization project protects the stream bank and conveys energy downstream; this greatly reduces high energy scour and debris (trash and trees). The design plan for the flood levee system was nearly completed during the reporting period. Currently easement and land acquisition efforts are in progress. Construction is scheduled to begin in early 2019.

#### **The Kansas Citys' (Seven) Levees.**

A multi-jurisdictional team is working together to develop a plan for improvements to three levees: the Argentine Unit on the Kansas River; the Armourdale Unit on the Kansas River; and the Central Industrial District Unit on the Kansas and Missouri Rivers. The four project partners include the USACE; the Kaw Valley Drainage District; the City of Kansas City, Missouri, and the Unified Government of Kansas City, Kansas and Wyandotte County, Kansas. The project partners are working on a schedule and strategy to identify the local funds needed to match the federal investment in the project. The work is anticipated to include improvements or replacement of existing pump stations, as well as increasing levee heights to provide protection from the 500-year flood event.

#### **B. Permit Ref. III.A.3b (Status: Ongoing)** **Evaluate new flood control projects**

##### **Brush Creek Improvements**

**Upper Brush Creek.** A multi-jurisdictional team is working together on the Bi-State Reach. The project participants include Johnson County, Kansas; the City of Mission Hills, Kansas; the City of Kansas City, Missouri; the Mid-America Regional Council (MARC); and the USACE.

Work includes north-bank stabilization west (upstream) and east (downstream) of the State Line Road bridge. The work also includes habitat restoration feasibility in partnership with the USACE Section 1135 authority. The feasibility study is estimated to be completed by the end of 2018.

##### **Lower Brush Creek**

The City is working with the USACE under the Corps' Section 1135 Habitat Restoration authority. The USACE expects to complete a feasibility Study by early 2019. The City has authorized \$500,000 for the design of improvements to lower Brush Creek, beginning with an evaluation for modifications to the Elmwood Dam and Lake of the Enshriners on Brush Creek.

In addition, KCW has been engaged in the following initiatives that will influence water quality efforts to be included in current and future flood control projects.

- **Town Fork Creek Restoration.** Project staff worked with the USACE to complete a study that examined strategies to reduce, and in some cases eliminate, combined sewer overflows. The



initial study was completed in 2016. A new phase of the study is underway to better promote water quality BMPs, and to further incorporate habitat restoration throughout the watershed.

#### **Blue River**

Project staff worked with Blue River Rescue Organization, General Services, and Stormwater Maintenance crews throughout the year to remove illegal dumping and invasive plants from within the Blue River Corridor.

#### **Line Creek**

An ongoing study with the USACE continued to look at flood risk-reduction measures and water-quality improvements maximizing eco-green infrastructure approaches. FEMA awarded an FMA grant to Kansas City for the buyout of four frequently-flooded homes along the east fork of Line Creek. It is anticipated that the homes will come into City possession by mid-2018.

### **1.4 Control Pollutants in Runoff from Municipal Waste Management Facilities**

#### **A. Permit Ref. III.A.4 (Status Ongoing)**

##### **Conduct periodic inspections for the closed landfills**

The Office of Environmental Quality (OEQ) performs periodic walk-through inspections of the 87th Street site. Visual observations during the inspection include evaluations for:

- (1) cap integrity and vegetative cover
- (2) water ponding on the cap surface of the site
- (3) fill material exposure
- (4) active seepage present at this site

The inspection results are documented and further investigations will be undertaken, if warranted. The 87th Street site inspections were performed monthly during the reporting period with the ongoing construction of a pumpstation.

#### **B. Permit Ref. III.A.4 (Status Ongoing)**

##### **Site Construction Activities**

KCW completed the upgrades on the wastewater pumping station located at the 87th Street site in June 2017. The upgrade entailed excavations into the fill area. The Solid Waste Management Program of the MDNR approved a work plan submitted by SCS Engineers on behalf of KCW.

#### **C. Permit Ref. III.A.4 (Status Ongoing)**

##### **Establish and Implement a Landfill Maintenance Program**

All maintenance activities are geared toward maintaining the integrity of the 87<sup>th</sup> Street site cap and minimizing the infiltration of water into the interred waste. Maintenance program activities may include surface waste removal and cap maintenance.

### **Surface waste removal**

Annual removal of any waste materials that have been either illegally dumped onto the cap surface or were deposited by stormwater flowing from the adjacent stream onto the property.

These removed wastes will be documented and disposed of in an active, permitted landfill.

### **Cap maintenance**

Annual maintenance activities to the cap surface will consist of the repair of any areas of erosion, cap damage, subsidence, or depressions that directly affect the infiltration of water into the interred waste areas or runoff into adjacent stream.

All areas determined to be in need of repair will be recorded and documented through GPS coordinates, and will be visited the following year during the annual OEQ inspection to determine if the repairs were successful. Only clean fill material will be used for these maintenance activities.

## **1.5 Monitor and Control Pollutants from Industrial and High-Risk Runoff**

### **A. Permit Ref. III.A.5a (Status Ongoing)**

#### **Update the Inventory of Potentially Significant Dischargers**

At the end of this reporting period, the inventory of high-risk runoff facilities lists 203 facilities: 71 municipal-owned or -operated facilities and 132 non-municipal facilities. Appendix 1 provides a list of these facilities with their names, site addresses, and the watersheds where they are located.

### **B. Permit Ref III.A.5a-c**

#### **Implement the Inspection Program**

See Table 3 (below) for details on the progress of the inspections.

**Table 3. Industrial and high-risk runoff facility programs summary**

Permit Ref.	Task	Subtask	Status	Output	# of Activities (listed by categories)
5a.	Update the inventory of potentially significant dischargers	update the inventory	Completed	Appendix 1	<u>Inspections</u> 8 City-owned or operated facilities 36 Non-city-owned or operated facilities General inspection covering stormwater 348 City owned/operated sites <sup>a</sup>
		(1) update the list (2) conduct field verification or inspection	Completed	Appendix 2	
		Maintain a GIS database of high-risk runoff dischargers	update the GIS database	Ongoing	
5c.	Continue the inspection program	(1) inspect municipal facilities (2) inspect private facilities	Ongoing	Inspection records and follow up	<u>Monitoring</u> 2 Event 2 Sites <sup>b</sup> 15 Facilities implementing self-assessment 59 Facilities no-exposure certified
5d.	Implement the monitoring program	(1) conduct the monitoring (2) develop a self-assessment program for municipal facilities (3) implement a self-assessment program for municipal facilities	Ongoing	Monitoring results	59 Facilities no-exposure certified <u>Education</u> 5/16 City employees/private industry employees took the Stormwater Self-Assessment workshop and/or watched the educational DVD on stormwater pollution prevention 1 Funding (\$15K) awarded to not-for-profit organization (Bridging the Gap) for reaching out to selected commercial areas for stormwater education
			Completed and reported previously		
			Ongoing	Stormwater no exposure certificates Stormwater pollution prevention plans	
	Conduct outreach	target municipal and private facilities, as well as commercial areas	Ongoing	Training sessions+ individuals/facilities reached out	

<sup>a</sup> Some sites do not have outdoor operation

<sup>b</sup> Multiple sampling efforts were made during the reporting period and only successful efforts in providing sufficient samples were included

**C. Permit Ref. III.A.5d (Status Ongoing)**  
**Evaluate the Priority List of High-Risk Runoff Facilities**

See Appendix 2 for an updated priority list of high-risk runoff facilities.

**D. Permit Ref. IIIA.5d (Status Ongoing)**  
**Implement the Monitoring Plan for High-Risk Runoff Facilities**

The Stormwater Services of KCW has made the following progress:

- continues to collect monitoring data from the facilities that hold state permits and are on the priority list ([Appendix 2](#))
- continues to conduct monitoring at the selected industrial area, which is located south of Worlds of Fun (see table 4 for results)
- implements the Stormwater Self-Assessment Program at 15 participating facilities

**E. Permit Ref. III.A.5e (Status Ongoing)**  
**Alternative Certification**

KCW developed a No Exposure Certification as an alternative to monitoring for certain qualified facilities in 2007. During the reporting period, 67 facilities have the certification.

**F. Permit Ref. NA (Status Ongoing)**  
**Employee education and outreach**

KCW provided its employees and also employees from private industries with training on stormwater pollution-prevention practices. In addition, KCW funded a nonprofit organization to reach out to commercial businesses for stormwater BMPs. See Table 3 (page 11) for details.

**Table 4. Data summary of stormwater monitoring at the selected industrial area**

The ranges listed here were extracted from the ranges found for the stormwater runoff samples collected from representative residential, industrial, and commercial areas in the City from year 2005-2015 per Part VI. Monitoring and Reporting Requirements in the MS4 permit.

Parameter	Unit	Detection (total: 4)	Minimum	Maximum	Median	Range of stormwater runoff*	Number of exceedence
alkalinity	mg/L	4	49	132	126	32-177	0
biochemical oxygen demand	mg/L	4	18	59	38.5	3-21	3
chemical oxygen demand	mg/L	4	136	320	287.5	7-803	0
hardness	mg/L	4	108	190	170	27-580	0
ammonia	mg/L	2	<0.13	1.5	0.78	<0.13-4.72	0
oil & grease	mg/L	4	5.1	18.4	8.25	<1.4-24	0
phenols	mg/L	2	<0.002	0.045	0.018	<0.002-0.56	0
total suspended solids	mg/L	4	44	280	215	8-879	0
total dissolved solids	mg/L	4	400	740	620	22-4,940	0
total solids	mg/L	4	490	750	690	160-1,800	NA
Ag-Dissolved	mg/L	0	<0.000744	<0.000744	NA	<0.0007-0.0053	0
Al-Dissolved	mg/L	4	0.031	0.035	0.0325	NA	NA
Cd-Dissolved	mg/L	0	<0.00011	<0.00011	NA	<0.00011-0.078	0
Cr-Dissolved	mg/L	4	0.003	0.005	0.003	<0.00026-0.02	0
Cu-Dissolved	mg/L	4	0.011	0.037	0.0225	<0.00053-0.025	2
Ni-Dissolved	mg/L	4	0.002	0.008	0.0045	<0.0004-0.019	0
Pb-Dissolved	mg/L	3	<0.002	0.003	0.003	<0.00214-0.064	0
Zn-Dissolved	mg/L	4	0.026	0.126	0.0825	<0.00016-0.272	0
Ag	mg/L	0	<0.000744	<0.000744	NA	NA	NA
Al	mg/L	4	0.67	3.27	2.525	NA	NA
As	mg/L	4	0.010	0.014	0.011	NA	NA
Cd	mg/L	0	<0.00011	<0.00011	NA	<0.00011-0.136	0
Cr	mg/L	4	0.007	0.014	0.0105	<0.00026-0.110	0
Cu	mg/L	4	0.028	0.051	0.0465	0.00053-0.035	3
Fe	mg/L	4	0.813	4.200	2.990	NA	NA
Hg	mg/L	2	<0.00003	0.00004	0.00002	<0.000025-0.0002	0
Mg	mg/L	4	3.33	7.87	4.145	NA	NA
Mn	mg/L	4	0.105	0.231	0.15	NA	NA
Mo	mg/L	4	0.002	0.030	0.015	NA	NA
Ni	mg/L	4	0.005	0.011	0.0095	<0.0004-0.018	0
Pb	mg/L	4	0.007	0.023	0.0155	<0.00214-0.12	0
Zn	mg/L	4	0.183	0.379	0.267	0.01-0.473	0

## 1.6 Reduce the Discharge of Pesticides, Herbicides, and Fertilizers

### A. Permit Ref. III.A.6.a (Status Ongoing)

Continue the public education program to promote the proper use, handling, storage, and disposal of pesticides, herbicides, and fertilizers (PHFs)

Activities that occurred during this reporting period included the following.

Participating in the regional Water Quality Public Education Program.

KCW is a major sponsor for MARC's Water Quality public education program. The media campaign during the reporting period promoted native plants and rain gardens and provided instructions on proper lawn care. See Appendix 3, 2017 Regional Water Quality Public Education Program for more details.

Nature First program.

The City's partners in restoration and management of natural areas include Bridging the Gap, Kansas City Wildlands (KCWL), GreenWorks, Blue River Watershed Association, and MDNR, as well as numerous neighborhood associations, park support groups, and private corporations. This year's achievements included rotational burning of prairie and glade habitats in Swope Park and Jerry Smith Park. KCWL continued efforts to remove invasive honeysuckle in various locations and maintained a tool-lending shed for honeysuckle events led by community leaders on non-KCWL/Parks properties.

### B. Permit Ref.: III.A.6.b

Implement BMPs to reduce the contribution of pollutants associated with the application, storage, and disposal of PHFs on City-owned property and right-of-ways

Activities included the following.

City Environmental Management System Program and Employee Training. The City continues to implement the program and provide its employees with relevant training with 1,578 accumulated hours.

City Facility Environmental Inspections. The City conducted 354 environmental inspections for the sites (list managed by OEQ) that are either owned or operated by the City during this reporting period.

Conditionally Exempt Small Quantity Generator Waste Disposal Program. The program purpose is to dispose of unused or off-specification pesticides, herbicides, and fertilizers (PHFs) from the City's facilities. Heritage Environmental Services, which contracted with the City, visits facilities on a monthly basis to remove these materials, as needed. A total of 14,214 pounds of hazardous materials were shipped out from City facilities during the reporting period. The program is part of the City's overall Household Hazardous Waste (HHW) program and the City's BMP effort regarding PHFs management for the City's properties.

BMPs on the City Golf Courses. The City continues to use environmental BMPs and procedures for its five golf courses: Hodge Park, Shoal Creek, Swope Memorial, Minor Park, and Heart of America. The contracted management teams from Kemper Sports and Orion Management Solutions continue to reduce pesticide and fertilizer usage at the above courses by:

- maintaining a native buffer near water bodies and sensitive areas wherever possible
- allowing the outer rough areas at each course that were once mowed and irrigated course to return to their native habitats (approximately 15 to 20 acres)

In addition, Shoal Creek Golf Course is designated as a *Certified Audubon Sanctuary* through the International Audubon Cooperative Sanctuary Program for golf courses. This ecologically-based program promotes both responsible land management and conservation of natural resources.

**BMPs at the City's Parks.** P&R crews continue to maintain, improve, and protect thousands of acres of land that provide wildlife habitat and contribute to reducing stormwater runoff and water pollution throughout the City. These properties include:

- >6,500 acres protected as woodlands throughout the park system
- >150 acres in the reduced-mowing program
- >290 acres of natural areas on 36 sites, consisting of restored and remnant prairies, glades, butterfly gardens, bioswales, and rain gardens

In all these areas, taller grasses, deep-rooted native plants, and increased tree cover act to provide wildlife habitat, slow down and filter water runoff, and increase infiltration into the soils. Additionally, wetlands are protected near the Lake of the Woods in Swope Park.

**BMPs on the City's Lakes.** P&R continued to inspect and treat the City lakes following the same procedure, as necessary, the same as described in 2012 annual report.

**BMPs for Mosquito Control on Public Properties.** The Health Department purchases larvicide (a 90-day briquette) as chemical control each year for distribution on City-owned property. The Health Department does some larviciding on City-owned properties but this occurs only on a complaint basis.

**BMPs on Right-of-Ways.** P&R maintains over 40 miles of park roads, hundreds of parking lots, 2,008-acres of Right-of-Ways, and 135 miles of boulevards, parkways, and streets. The department does not use pesticides in these rights-of-ways except in the effort to save the healthiest Ash trees from the Emerald Ash Borer. Herbicides and fertilizers are used sparingly and only as needed on specific areas which require a higher level of maintenance.

## 1.7 Reduce Illicit Discharges, Spills, and Improper Disposal

### A. Permit Ref. III.A.7a (Status Completed)

#### **Develop a city ordinance to prohibit illicit discharges to MS4**

The City's ordinance for Stormwater Discharge Control Regulation was adopted in 2007. No substantive revisions were made to the ordinance during this reporting period.

**B. Permit Ref III.A.7a & d (Status Completed)**

**Implement a procedure for illicit discharge investigation and enforcement**

The procedure for illicit discharge investigation and enforcement was developed in 2006. During the reporting period, there were 16 incidents of illicit discharge or illegal connection and all were resolved.

**C. Permit Ref. III.A.7b & c (Status Ongoing)**

**Identify priority areas and continue field screening program**

During this reporting period, KCW screened 298 outfalls, primarily in the watersheds north of the Missouri River.

**D. Permit Ref. III.A.7d & f (Status Ongoing)**

**Prevent illicit discharge and improper disposal**

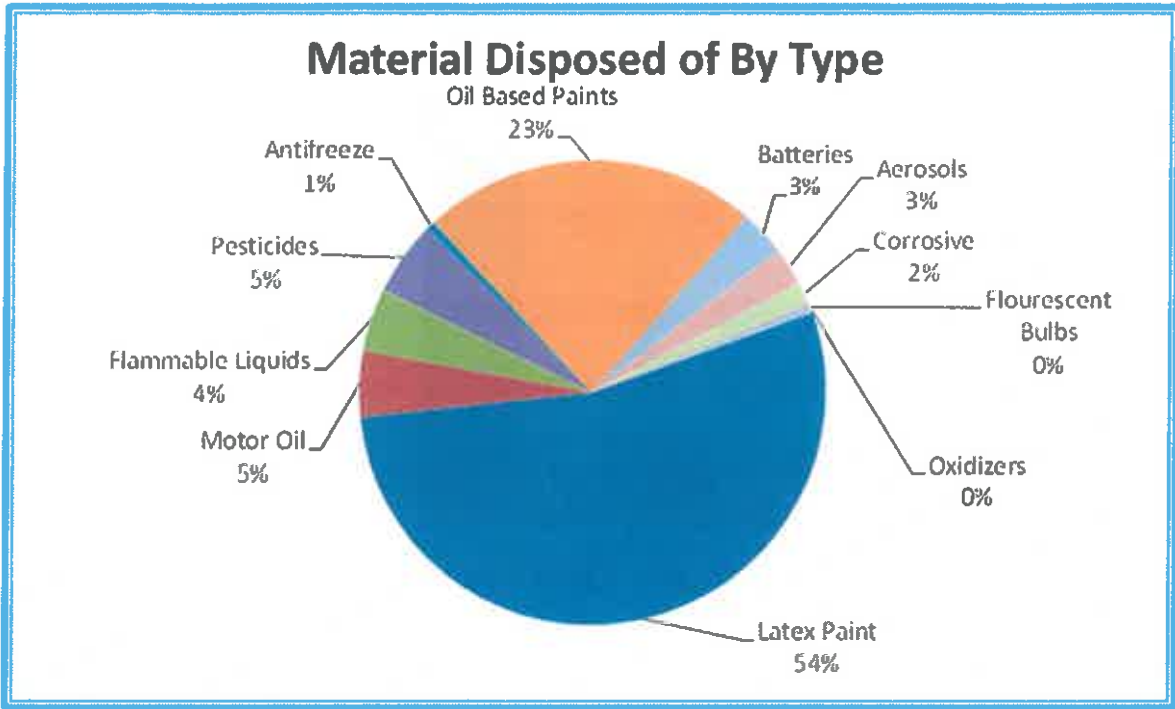
Table 5 provides a summary of several waste management programs that encourage proper disposal, as well as preventing and addressing illegal dumping. Figures 4 and 5 provide a couple of more details on the HHW program.

***Table 5. Comprehensive waste management program achievements***

Quantity	Program	Tons by Program
<b>KC Recycles (FY 2017/18)</b>		
723 tons	Community recycling drop-off centers	18,939
18,216 tons	Curbside recycling	
<b>Bulky Items Collection (FY 2017/18)</b>		
7,398 tons	Bulky items	7,398
<b>Leaves and Brush Collection (FY 2017/18)</b>		
18,072 tons	Drop-off site	22,144
4,072 tons	Curbside	
<b>Illegal Dumping Cleanup (FY 2017/18)</b>		
3,100 tons	Material collected	3,100
<b>Neighborhood Cleanup Assistance (FY 2017/18)</b>		
15,570 (171 tons)	Tires collected in neighborhoods and during special events, or received at drop-off centers	171 tons
<b>Household Hazardous Waste (January thru December 2017)</b>		
1,275,627 lbs.	HHW Facility	812.2 tons
348,720 lbs.	Mobile Outreach	
80,815 lbs.	Swap Shop.	



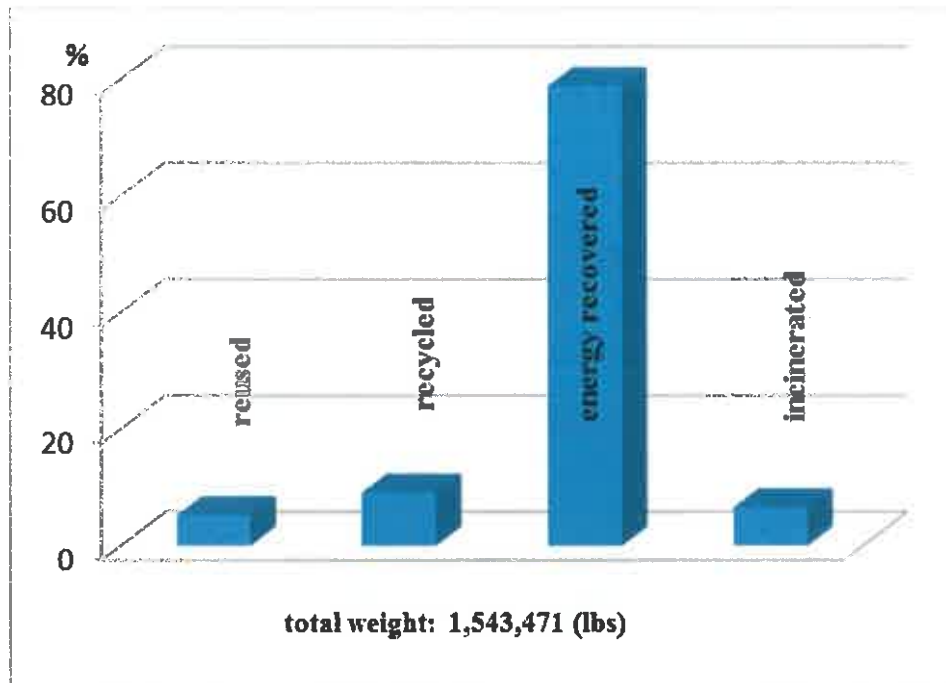
**Figure 4. Material by type disposed of by the HHW facility in calendar year 2017**  
(Provided by R. Fort, KCMO HHW Program Manager)



**Notes.**

Total weight of the materials disposed of (not collected) is 1,447,987 pounds.  
Total weight counts only the materials that were disposed of and shipped out.  
Percentages reflect the HHW numbers associated with Kansas City, Independence, Lee's Summit, and MARC participating communities.

**Figure 5. Distribution of material managed by HHW facility in 2017 (calendar year)**



**Note.**

Total weight of the materials includes additional interagency materials not associated with MARC communities.

**E. Permit Ref. III.A.7e (Status Ongoing)  
Spill Prevention, Containment, and Response**

The Fire Department responded to a total of 411 incidents for fluid cleanup (380) or hazardous materials (31) during the reporting period. Hazardous material-related incidents referred to here may not necessarily be about liquid spills (e.g., chemical odors emitted from structures). Also note the total number does not include incidents that may have fluids spilled but that were classified as a higher level of calls (i.e., emergency calls for injuries in vehicular accidents, etc.).

**F. Permit Ref. III.A.7 (Status Ongoing)  
The Sanitary Sewer Maintenance Program**

Wastewater Maintenance Division

177 miles sewers televised  
 567 miles sewers cleaned  
 1,558 feet public sewers repaired  
 4,277 feet private sewers repaired  
 229 manholes repaired  
 171 stoppages opened

Engineering Division (estimated)

34 miles sewers televised/cleaned  
 10 manholes rehabilitated  
 18 manholes installed  
 52 miles sewer line rehabilitated  
 359 sewer repair jobs

**Overflow Control Group (Smart Sewer Program)\***

217 miles      sewers televised  
 606              sewer segments installed  
 8.3 miles      new sewer main installed  
 284              new inlets installed  
 209 miles      sewers cleaned

\*Numbers shown are all for separate storm sewer components

**G. Permit Ref. NA**  
**GIS Mapping Effort**

The KCW’s GIS mapping group and Stormwater Compliance Group continue to maintain its GIS databases to assist in the program tracking repair/replacement and maintenance of storm sewer system assets, to support stormwater billing, and to support the illicit discharge screening process (Table 6). The groups update the database with the information supplied by field inspection crews, engineering as-built drawings from construction projects, and the latest orthophoto map product.

**Table 6. Stormwater features in the GIS database**

	Stormwater inlets	Paved ditch	Detention basin	Swale
City owned or has easement	45,751	181	16	81
Privately owned	9,359	24	307	3
Ownership to be determined	80	25	0	4
Abandoned	10	0	0	0
State owned (MODOT)	130	26	0	0
<b>TOTALS</b>	<b>55,330</b>	<b>252</b>	<b>323</b>	<b>88</b>

Data as of 7/6/2018.

## 1.8 Reduce Pollutants in Construction-Site Runoff

### A. Permit Ref. III.A.8a (Status Completed) Erosion and Sediment Control Ordinance Review and Update

No updates have been made since the last reporting period.

### B. Permit Ref. III.A.8b (Status Ongoing) Maintaining an Inventory of Active Construction Sites

#### Private development sites ( $\geq 1$ acre).

The City continued to use the KIVA system to track active private development construction sites. During this report period, there were 104 new site disturbance permits issued, 76 closed, and 201 active site disturbance permits.

#### City construction projects ( $\geq 1$ acre).

The KCW tracks projects ( $\geq 1$  acre) that are constructed by City departments under the City's general operating permit. There were 32 projects recorded as less than 90 percent complete during the reporting period.

### C. Permit Ref. III.A.8c (Status Ongoing) Inspection of Construction Sites

The City's inspections for sediment and erosion control-related issues are handled as follows.

#### Private construction projects.

The LDD in CP&D is responsible for inspection of site disturbance activities ( $\geq 1$  acre). During this report period, the LDD inspection staff documented a full year of biweekly compliance monitoring, and documentation was incorporated into the KIVA permit tracking system. Inspection comments in KIVA are available to the public through the KIVANET web site. LDD conducted 2,387 inspections of site disturbance activities on private development projects during this reporting period.

For  $< 1$  acre private projects, the Division of Inspections in CP&D conducted 7,393 erosion control inspections.

#### City construction projects.

These projects are regulated under the state's General Operating permit MO-R100006. KCW conducts monthly oversight inspections to ensure compliance with the sediment and erosion control requirements. The inspection review includes verification of an active, up-to-date Stormwater Pollution Prevention Plan (SWPPP) for each site, an updated site plan, weekly inspection reports, including items noted for correction and the noted correction, and the inspection log. A total of 291 inspections were conducted.

### D. Permit Ref. III.A.8d (Status Ongoing) Providing Inspector Training and Outreach to the Construction Industry

Table 7 summarizes the training provided to City employees.

**Table 7. A summary of education and outreach on erosion and sediment control**

<i>Employee Education</i>				
Training Providers	Content	Dates	# Attendees/ session	Work background of attendees
CP&D	KCMO Supplements to APWA Standards 2100, 2600, 5100, 5600, BMP Manual, erosion sediment control drawings, and the stream buffer ordinance	Biweekly training throughout the year	8-9	Plan Reviewers and LDD Inspectors
	Enforcement procedures	Spring 2018	8	field inspectors
	Erosion control	throughout the year	4	new hires
MARC	pervious pavement	Feb. to Mar. 2018	1	Environmental Compliance Officer
Clean & Green Sustainability Conference & Expo	All Things Erosion and Sediment Control and New Product Exposition			
Center for Watershed Protection (webcast)	BMP inspection methods			

**E. Permit Ref III.A.8e (Status Ongoing)**  
**Enforcement of the City’s Construction-Site Runoff Program**

The City inspection staff followed established protocols for escalated enforcement actions or steps. For private construction projects (≥ 1 acre) managed by the LDD, inspection results were placed in KIVA. Certified letters were sent to responsible parties stating deficiencies and performance requirements for compliance; letters included days allowed for resolution. Citations were issued when compliance issues were not resolved in a timely manner.

During the reporting period, the LDD inspection staff notified contractors of more than 2,000 deficiencies, indicating modifications necessary for compliance, providing orders to complete the work or defaulting on the developer’s bonds when necessary.

For projects < 1 acre, CP&D department’s Division of Investigations conducted 127 investigations, sent 45 notices of violation, and wrote 13 tickets with 2 stop-work orders issued.

## SECTION 2. STORMWATER PUBLIC EDUCATION & AWARENESS PROGRAM

Stormwater public education is a key element of many of the programs conducted by the City and is required under the MS4 permit. To facilitate its implementation and to underscore its significance, the City has extracted the public education requirements from individual programs throughout the permit and has consolidated them into this Stormwater Public Education and Awareness program. However, each stormwater management program required by the permit still addresses its own technical training (such as construction inspector training) but is able to use this program as a resource for its outreach and educational requirements and needs.

### Public Education and Outreach

See Table 8 for a summary of various public and outreach activities.

**Table 8. A summary of public education and outreach efforts**

Programs/ Partnerships	Achievement During the Report Period
<b>KC Green</b>	<p>The City's KC Green Education and Outreach Team (EOT) is made up of volunteers of various City departments. EOT celebrated Earth Day on April 22, 2018 by holding a pledge to recycle, handed out recycling information at several City departments, as well as gathering 43 employees to remove 1,960 lbs of trash and 18 tires from a neighborhood next to two City department headquarters.</p> <p>The EOT continued the KC Green Neighborhood Recognition Program in 2017. This program allows neighborhoods that are proactive in sustainability to receive recognition for their eco-green initiatives in several categories, including Water and Stormwater Management (e.g., rain barrel use, planting and maintaining rain gardens). Participating neighborhoods may get a rating of Platinum, Gold, Silver, or Not Eligible. Two neighborhoods, previously awarded a Silver designation, moved to Gold status designation. One additional neighborhood received Silver status.</p>
<b>Water Education for Kansas City (WE KC Program)</b>	<p>The program facilitated 19 litter pickups and 14 watershed educational events, reaching a total of 2,512 students and cleaning up over 17,500 lbs. of trash.</p>
<b>Water Quality Small Grant Program</b>	<ul style="list-style-type: none"> <li>• In 2016, KC Water launched the Water Quality Small Grant Program to support local nonprofits in projects and activities related to water quality protection, improvement, and education within the city limits of Kansas City, Missouri.</li> <li>• The following organizations received grants:                         <ol style="list-style-type: none"> <li>1. <u>Blue River Watershed Association (BRWA)</u>. Received funding to hold a series of "Saturday Community Camps" for youth and adults in the Seven Oaks neighborhood with education messages on water pollution and stewardship activities, including litter pickup.</li> <li>2. <u>Bridging the Gap</u>. Received funding to reach out to four retail districts to conduct litter pickups at four priority streams.</li> <li>3. <u>Friends of Kaw Point Park</u>. Funded to update and maintain the existing caches at 10 locations along local waterways and near</li> </ol> </li> </ul>

	<p>constructed BMPs, to set up additional 10 caches, and to teach 16 “From Runoff to Rivers” classes in local middle and high schools.</p> <ol style="list-style-type: none"> <li>4. <u>Healthy Rivers Partnership/ Little Blue River Watershed Coalition.</u> Funded for <i>Project Blue River Rescue</i> with 500 volunteers participation, collection and disposal of about 40 tons of trash and 800 used tires from 10 worksites, removal of invasive honey suckle from three areas, and planting of 500 trees on April 7, 2017.</li> <li>5. <u>Little Blue River Watershed Coalition.</u> Received funding for <i>Blue at the Zoo</i> with 10 educational booths and 143 attendees, and funding also for the <i>Missouri River Watershed Festival</i> with 14 educational booths and 240 students from four local schools.</li> <li>6. <u>Kansas City Art Institute.</u> Used funding for the Brush Creek Film Festival with participation of 25 filmmakers and over 100 people. The festival is a venue for the filmmakers to present their works on the water quality issues of the local stream.</li> <li>7. <u>StoneLion Puppet Theater.</u> Used funding for educational puppet shows at more than 18 local schools.</li> </ol>
<p><b>Stormwater: From KC to the Sea</b></p>	<p>Stormwater curriculum was taught to a total of 5,031 students (4<sup>th</sup> to 6<sup>th</sup> grades) from 18 schools in 9 different school districts.</p>
<p><b>Stormwater Plinko</b></p>	<p>Stormwater Plinko, an educational tool, was played at 10 outreach events, reaching about 1,160 people</p>
<p><b>First LEGO League Presentations</b></p>	<p>The 2017 LEGO League challenge was Hydro Dynamics, where students were challenged to develop LEGO solutions to real world water problems. Local schools that participated in this challenge requested KC Water to educate students on water issues facing Kansas City. KC Water taught 18 classes on water pollution, water access, wastewater, storm water, and chemical pollution in watersheds, reaching 250 LEGO League participants.</p>
<p><b>Additional Education Initiatives</b></p>	<ul style="list-style-type: none"> <li>• <b>Freddy the Fish.</b> KC Water used a modified version of Freddy the Fish to educate 1,757 K through 2<sup>nd</sup> grade students, spanning 22 schools and one community center.</li> <li>• <b>Trash Tally.</b> The program was developed to educate students on how litter gets to storm drains; what types of litter are commonly seen; and how everyone can help. The program was taught at eight schools, reaching 482 2<sup>nd</sup> and 3<sup>rd</sup> grade students.</li> <li>• <b>Macro Monitoring.</b> The class was designed to educate students on how human activities can affect the bottom dwellers in streams. The class was taught to 580 students in 6<sup>th</sup> to 12<sup>th</sup> grade from seven schools.</li> </ul>

<p><b>The Regional Water Quality Public Education Program (MARC)</b></p>	<ul style="list-style-type: none"> <li>• The KCW continues to be a leading stakeholder for this program.</li> <li>• The 2017 primary media campaign focused on the "one water" approach - whether it is flowing from your faucet or into the storm drain, all water matters.</li> <li>• In recognition of National Water Quality month (August), the program committee released four short animated videos, each raising awareness about specific behaviors that adversely affect water quality and encouraging residents to help keep the region's water clean. The animations were viewed a total of 18,781 times, and <a href="http://www.marc.org/water">www.marc.org/water</a> saw a 500 percent increase in visitors in 2017.</li> <li>• A series of webinars broadcast by the Center for Watershed Protection were hosted. Topics included stormwater runoff education, best management practices and eco-green infrastructure.</li> <li>• A total of \$27,184 in grants was awarded to seven local nonprofit and educational organizations for education and outreach events related to reducing stormwater runoff and improving water quality in area creeks and streams.</li> </ul>
<p><b>KC STEM Fest</b></p>	<ul style="list-style-type: none"> <li>• KCW participated in this event hosted by Science Pioneers on October 1, 2017. The event allows K through 12 teachers to learn about hands-on learning opportunities for their students.</li> <li>• KCW gave out information on the <i>KC to the Sea</i> curriculum and the <i>WE KC</i> water quality education program to over 450 area teachers.</li> </ul>



## SECTION 3. WATERSHED MONITORING PROGRAM

### A. Permit Ref. VI.A.1 (Status Completed)

#### Implement a representative stormwater discharge monitoring plan

The KCW's Laboratory continued to conduct the monitoring, which included field sampling, field measurements of basic water quality parameters, and laboratory testing for physicochemical and microbiological parameters. All field sampling/measurements, sample handling, laboratory analysis, and data validation, as well as a quality assurance and quality control plan, follow SOPs for the MS4 stormwater discharge monitoring program developed by the department's laboratory. Grab samples were collected using a stainless steel bucket or by filling the containers directly from the outfall. Of the 24 samples, 15 were each collected as a composite using ISCO Avalanche Portable Refrigerated Samplers for the first 3 hours of the discharge (12 aliquots taken with an interval of 15 minutes). Due to issues of instrument malfunction and vandalism at individual sampling sites, the remaining nine samples were collected manually, with each sample collected within one hour for the first three hours at each site. As a result, these manual samples generated three individual sets of data for each site per event, and a mean value of the three data for each parameter was calculated for each site for each event.

The KCW maintains records of the sampling events as follows.

#### Description of Sampling

- location and collection time
- sample collection
- field test results
- staff who collected samples (chain-of-custody forms)

#### Storm event data

- date and duration of the storm events sampled
- rainfall data
- duration between storm event sampled and the end of the previous measurable storm event
- estimate of the total volume of the discharge sampled

QA/QC review and clarification is contained in a single database containing field-test results and laboratory results.

Sampling events occurred from May 2017 through April 2018. Table 9 includes the number of storm events sampled at each site, as well as the ranges of rainfall at these sites. The precipitation for all sampling events ranged from 0.12 inch to more than one inch (Figure 6 below). Runoff from the sampled storm events at the sampling sites ranged from 8,700 to 160,100 cubic feet and was estimated based on the storm magnitude and the size and land use of the drainage areas.

Grab samples collected during the first two hours of the discharge were used for the field testing of temperature, dissolved oxygen, and pH, as well as the laboratory analysis of total phenols, oil and grease, fecal coliform, *E.coli*, total coliform, and turbidity. Both time-based composite samples and individual manual samples were used for the analysis of over 100 physicochemical parameters that include more than 60 semi-volatile organic compounds, 26 organochlorine compounds of pesticides and PCBs

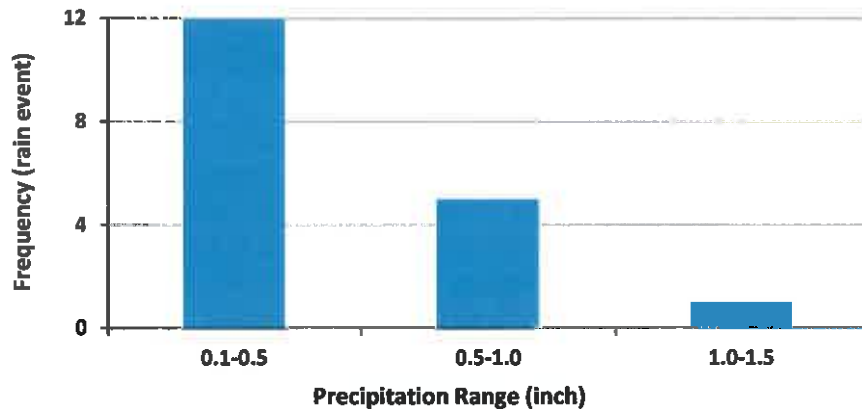
(polychlorinated biphenyl), 8 metals (dissolved and/or total), 6 nutrients, 4 common anions, in addition to 8 other conventional water quality parameters (e.g., oxygen-related or solid-related).

**Table 9. A summary of sampled storm event characteristics**

Site ID	Location (land use)	Storms Sampled (#)	Rainfall Range (inches) <sup>a</sup>	Range of Runoff (est. cubic feet) <sup>b</sup>
#801	SE 50th Terr. & Sterling (residential)	3	0.23-0.52	70,800-160,100
#802	SE Wyandotte & 135 <sup>th</sup> St. (industrial)	3	0.16-0.56	8,700-30,400
#803	NW 107 Terr. & Pomona (industrial)	3	0.12-0.52	87,800-22,400
#804	49 <sup>th</sup> St & N. Highland (residential)	3	0.29-0.44	15,300-23,200
#805	133 <sup>rd</sup> St. & Inverness (commercial)	3	0.25-1.23	14,000-68,800
#806	Barry Rd. & I-29 (commercial)	3	0.25-0.64	32,700-83,600

- a. Rainfall data is obtained either from rain gauges installed at individual sampling stations or from the closest rain gauge within the City's Flood Warning System.
- b. Runoff volume estimated based on rainfall, drainage area, and runoff coefficient (volume = rainfall x drainage area x runoff coefficient). Runoff coefficients (land-use dependent) are cited from *Civil Engineers Reference Manual*, 9<sup>th</sup> edition, pg. A-45.

**Figure 6. Precipitation range and distribution of sampled storm events frequency**



**B. Permit Ref. VIA.1 (Status Completed)**

**Summary of Storm Event Data**

Tables 10 and 11 present a summary of the data characterizing stormwater discharges for each land-use type. The range of event-mean concentration (EMC) is described, as well as average EMC according to the land-use category. For the purpose of this report, the concentration of a constituent in an individual grab or time-based composite sample is considered as an estimate of the EMC of this constituent in the runoff for a particular storm event tested. The land-use average EMC is the average of EMCs of a constituent in the runoff for all storm events sampled for a specific land-use category.

Table 12 presents the estimated loading results for the monitored storm events. The pollutant loading is defined as the mass of a constituent contained in stormwater runoff that is transported to the receiving water during a storm event. For the purpose of this reporting, it is estimated by multiplying the flow volume and the EMC of a parameter per event.

Below is an analysis of the monitoring results.

- Of the four pesticides that require monitoring under the permit (i.e.,  $\alpha$ -BHC, DDT, methoxychlor, and dieldrin), none was detected at any of the six designated sites
- Of more than 60 semi-volatile organic compounds analyzed, the following were detected in one or more samples
  - Di(2-ethylhexyl)phthalate (#802, a commercial site; #805, an industrial site)
  - Benzo(b)fluoranthene, Benzo(ghi)perylene, Fluoranthene, Phenanthrene, Pyrene (#802, #803, are both industrial sites)
  - Benzo(a)pyrene, Benzo(k)fluoranthene, Chrysene, indeno(1,2,3-cd)pyrene, Diethylphthalate (#803, an industrial site)
- Metals were detected in every sample
  - Chromium, copper, and zinc in both dissolved and total recoverable forms
  - Lead and nickel in both dissolved and total recoverable forms were also frequently detected across all three land uses
  - No detection of silver in dissolved form, or cadmium in either the dissolved form or total recoverable form
  - Mercury was infrequently detected

Table 10. Stormwater discharge summary characterization by land use category (continued on next page)

Constituent	Units	Residential		Commercial		Industrial		Result Count	Detect Count	MDL**
		EMC Range	Avg.*	EMC Range	Avg.*	EMC Range	Avg.*			
Ammonia	mg/L	ND	NA	ND-1.54	0.36	ND-10.70	0.315	18	5	0.13
Conductivity (Lab)	µS/cm	113-590	289	59-966	365	130-12,990	2,369	18	18	NA
Dissolved oxygen	mg/L	3.5-10.3	7.8	8.0-9.5	8.6	8.8-13.4	10.3	18	15	NA
pH	S.U.	7.1-8.3	7.6	7.3-8.6	7.9	6.8-8.6	7.9	18	18	NA
Total Alkalinity	mg/L	57-131	100	30-92	59	43-124	80	18	18	NA
Total Hardness	mg/L	76-196	140	50-142	105	78-212	134	18	18	NA
Chemical Oxygen Demand	mg/L	26-103	55	28-115	61	31-158	85	14	14	6.25
Biochemical Oxygen Demand (5-day)	mg/L	6-22	14	3-21	12	6-9	7	18	18	2
Turbidity (Lab)	NTU	14-100	41	6-77	27	27-220	138	18	18	0.011
Total Dissolved Solids	mg/L	180-340	268	140-520	272	170-4,533	986	18	18	1
Total Suspended Solids	mg/L	11-120	71	7-97	45	163-301	102	18	18	8
Volatile Suspended Solids	%	26-71	36	18-91	43	15-46	24	18	18	NA
Nitrate+Nitrite	mg/L	0.113-1.462	0.686	0.239-1.381	0.554	0.657-1.026	0.853	18	18	0.027
Nitrogen, total Kjeldahl	mg/L	0.9-3.6	1.7	0.1-2.1	1.2	0.5-2.0	1.4	18	18	0.283
Oil & Grease	mg/L	ND-2.4	1.0	ND-2.8	1.2	ND-2.7	1.7	18	7	1.4
Phenols	mg/L	ND-0.054	0.02	ND-0.051	0.02	ND-0.046	0.02	18	10	0.002
Phosphorus, total	mg/L	0.19-0.83	0.46	0.10-0.33	0.19	0.10-0.45	0.26	18	18	0.016
Phosphorus, dissolved	mg/L	0.10-0.37	0.22	0.10-0.15	0.11	0.09-0.46	0.19	18	18	0.016
Fecal Coliform	cfu/100 mL	457-55,600	19,930	504-24,196	9,444	644-25,900	9,250	18	18	NA
E. Coli	MPN/100 mL	1,246-101,700	31,612	323-24,196	7,894	97-19,863	6,815	18	18	1
Cadmium, dissolved	mg/L	ND	NA	ND	NA	ND	NA	18	0	0.00011

Constituent	Units	Residential		Commercial		Industrial		Result Count	Detect Count	MDL**
		EMC Range	Avg.*	EMC Range	Avg.*	EMC Range	Avg.*			
Chromium, dissolved	mg/L	0.002-0.005	0.0028	0.001-0.006	0.003	0.001-0.003	0.002	18	18	0.00026
Copper, dissolved	mg/L	0.003-0.005	0.004	0.003-0.023	0.010	0.002-0.007	0.004	18	18	0.00053
Lead, dissolved	mg/L	ND-0.003	0.002	ND-0.003	0.002	ND-0.003	0.002	18	9	0.00214
Nickel, dissolved	mg/L	ND-0.002	0.0009	ND-0.001	0.0003	ND-0.001	0.0007	18	9	0.0004
Silver, dissolved	mg/L	ND	NA	ND	NA	ND	NA	18	0	0.00074
Zinc, dissolved	mg/L	0.007-0.02	0.011	0.007-0.026	0.017	0.018-0.044	0.026	18	18	0.00016
Cadmium, total	mg/L	ND	NA	ND	NA	ND	NA	18	0	0.00011
Chromium, total	mg/L	0.002-0.007	0.0045	0.002-0.009	0.005	0.003-0.008	0.005	18	18	0.00026
Copper, total	mg/L	0.003-0.010	0.007	0.006-0.047	0.022	0.005-0.015	0.010	18	18	0.00053
Mercury, total	mg/L	ND-0.00003	0.00002	ND-0.00004	0.00002	ND-0.00004	0.00002	18	4	0.000025
Lead, total	mg/L	0.02-0.010	0.006	ND-0.007	0.004	0.002-0.007	0.005	18	17	0.00214
Nickel, total	mg/L	ND-0.005	0.003	0.001-0.003	0.002	0.001-0.013	0.005	18	17	0.0004
Silver, total	mg/L	ND	NA	ND	NA	ND	NA	18	0	0.00074
Zinc, total	mg/L	0.012-0.063	0.036	0.032-0.148	0.068	0.068-0.237	0.115	18	18	0.00016
<b>Semi volatile organic compounds (detected)</b>										
Benzo(a)pyrene	µg/L	ND	NA	ND	1.01	ND-5.5	NA	18	1	1.5
Benzo(b)fluoranthene	µg/L	ND	NA	ND	1.22	ND-4.98	NA	18	2	1.9
Benzo(ghi)perylene	µg/L	ND	NA	ND	1.09	ND-8.5	NA	18	2	1.2
Benzo(k)fluoranthene	µg/L	ND	NA	ND	1.20	ND-5.5	NA	18	1	1.9
Chrysene	µg/L	ND	NA	ND	NA	ND-11	NA	18	1	1.3
Di(2-ethylhexyl)phthalate	µg/L	ND	NA	ND-24.40	2.11	ND-2.64	0.54	18	3	0.84
Diethylphthalate	µg/L	ND	NA	ND	NA	ND-3.88	0.68	18	1	0.99

Constituent	Units	Residential		Commercial		Industrial		Result Count	Detect Count	MDL**
		EMC Range	Avg.*	EMC Range	Avg.*	EMC Range	Avg.*			
Fluoranthene	µg/L	ND	NA	ND	NA	ND-11	1.78	18	2	1.2
Indeno(1,2,3-cd)pyrene	µg/L	ND	NA	ND	NA	ND-5.27	1.05	18	1	1.6
Phenanthrene	µg/L	ND	NA	ND	NA	ND-4.2	0.87	18	2	1.2
Pyrene	µg/L	ND	NA	ND	NA	ND-7.3	1.04	18	2	1.2

\* average is calculated based on detected values and half of the detection limits for those under their detection limits

\*\* MDL (method detection limit)

\*\*\*ND: the concentration of a specific parameter is below its detection limit.

**Table 11. A summary of stormwater discharge characterization (selected pesticides & semi-volatile organic compounds)**

Constituent	Result Count	Detect Count	MDL* (µg/L)
<b>Pesticides</b>			
a-BHC	18	0	0.47
4,4'-DDE	18	0	0.62
4,4'-DDT	18	0	0.72
Methoxychlor	18	0	0.68
Dieldrin	18	0	0.62
<b>Semi-volatile organics</b>			
1,2,4-Trichlorobenzene	18	0	0.87
1,2-Dichlorobenzene	18	0	0.94
1,2-Diphenylhydrazine	18	0	0.8
1,3-Dichlorobenzene	18	0	0.58
1,4-Dichlorobenzene	18	0	0.58
2,4,5-Trichlorophenol	18	0	1.7
2,4,6-Trichlorophenol	18	0	1.8
2,4-Dichlorophenol	18	0	2.3
2,4-Dimethylphenol	18	0	1.8
2,4-Dinitrophenol	18	0	2.8
2,4-Dinitrotoluene	18	0	1.4
2,6-Dinitrotoluene	18	0	1.2
2-Chloronaphthalene	18	0	0.69
2-Chlorophenol	18	0	2.4
2-Methylnaphthalene	18	0	1.3
2-Methylphenol(o-Cresol)	18	0	1.6
2-Nitroaniline	18	0	2
2-Nitrophenol	18	0	1.9
4-Chloroaniline	18	0	2.5
4-Chlorophenyl phenyl ether	18	0	0.9
4-Methylphenol	18	0	1.3
4-Nitrophenol	18	0	0.96
Acenaphthene	18	0	0.82
Acenaphthylene	18	0	1.1
Anthracene	18	0	0.74
Benzo(a) anthracene	18	0	1.3
Benzidine	18	0	1.6
Benzo(a) pyrene	18	1	1.5
Benzo(b) fluoranthene	18	2	1.9
Benzo(ghi) perylene	18	2	1.2
Benzo(k) fluoranthene	18	1	1.9
Butyl benzyl phthalate	18	0	1.3
Carbazole	18	0	1.8
Chrysene	18	1	1.3
Di(2-ethylhexyl)phthalate	18	3	0.84
Di-n-butyl phthalate	18	0	1.1
Di-n-octyl phthalate	18	0	0.74
Dibenz(a,h)anthracene	18	0	1.7
Diethyl phthalate	18	1	0.99
Dimethyl phthalate	18	0	1.4
Fluorene	18	0	1.1
Fluoranthene	18	2	1.2
Hexachlorobenzene	18	0	0.91
Hexachlorobutadiene	18	0	0.7
Hexachlorocyclopentadiene	18	0	0.33
Hexachloroethane	18	0	0.77
Indeno(1,2,3-cd) pyrene	18	1	1.6
Isophorone	18	0	1.5
N-Nitrosodi-n-propylamine	18	0	1.4
Naphthalene	18	0	1
Nitrobenzene	18	0	1.4
Pentachlorophenol	18	0	3.4
Phenanthrene	18	2	1.2
Phenol	18	0	0.78
Pyrene	18	2	1.2
bis(2-Chloroethoxy)methane	18	0	1.3
bis(2-Chloroisopropyl)ether	18	0	1

\*MDL: method detection limit

**Table 12. Estimated pollutant loadings per outfall per rain event by land use category (conventional, inorganic, bacterial parameters)**

Constituent	Units	Residential		Commercial		Industrial	
		Range	Average	Range	Average	Range	Average
Ammonia	kg	0.03-0.30	0.14	0.03-3.0	0.58	0.03-1.92	0.42
Total Hardness	kg	33-854	324	20-336	133	39-234	130
Chemical Oxygen Demand	kg	25-113	65	11-136	85	17-165	91
Biochemical Oxygen Demand (5-day)	kg	4-50	23	1-38	17	2-19	8
Total Alkalinity	kg	25-571	223	18-128	65	31-134	74
Total Dissolved Solids	kg	78-1,360	586	55-481	306	106-2,875	713
Total Suspended Solids	kg	22-453	120	3-189	68	11-239	114
Volatile Suspended Solids	1E+04 kg	12-152	NA	24-47	35	6-49	24
Nitrite+ Nitrate	kg	0.06-6.14	1.99	0.13-0.90	0.47	0.15-2.73	0.90
Nitrogen, total Kjeldahl	kg	0.69-6.35	2.78	0.06-2.92	1.45	0.30-3.57	1.44
Oil & Grease	kg	0.3-10.5	2.7	0.3-2.6	1.2	0.3-5.5	1.9
Phenols	kg	0.0004-0.235	0.058	0.0004-0.1207	0.0345	0.0004-0.0671	0.017
Phosphorus, total dissolved	kg	134-1,858	782	40-391	224	39-447	247
Phosphorus, dissolved	kg	86-906	358	40-237	131	22-1,264	306
Fecal Coliform	1E+06 cfu	219-2,422,441	555,095	4,666--572,650	127,215	5,542-643,775	145,875
E. Coli	1E+06 MPN	5,961-4,430,976	1,013,443	6,291-572,650	124,726	357-224,420	84,104
Cadmium, dissolved	g	0.02-0.25	0.11	0.02-0.13	0.07	0.01-0.15	0.07
Chromium, dissolved	g	0.87-22.7	7.5	0.40-7.1	3.6	0.5-5.0	2.1
Copper, dissolved	g	1.3-22.7	8.0	2.0-21.4	9.5	1.2-11.0	4.3



Constituent	Units	Residential		Commercial		Industrial	
		Range	Average	Range	Average	Range	Average
Lead, dissolved	g	0.5-13.6	4.0	0.4-2.5	1.6	0.5-8.2	2.4
Nickel, dissolved	g	0.4-2.0	1.0	0.1-1.2	0.4	0.1-2.7	0.8
Silver, dissolved	g	0.2-1.7	0.8	0.1-0.9	0.5	0.1-1.0	0.5
Zinc, dissolved	g	3.5-49.9	20.6	4.4-33.1	18.6	5.9-57.2	29.5
Cadmium, total	g	0.02-0.25	0.11	0.02-0.13	0.07	0.01-0.15	0.07
Chromium, total	g	1.4-31.7	10.1	0.8-11.7	6.3	1.2-8.2	4.9
Copper, total	g	2.9-40.8	12.5	3.6-91.5	27.5	1.7-41.2	12.7
Mercury, total	g	0.006-0.06	0.03	0.005-0.08	0.02	0.003-0.075	0.02
Lead, total	g	2.39-45.3	12.3	0.4-13.6	4.8	1.0-110.0	5.0
Nickel, total	g	0.9-13.6	3.8	0.4-5.8	2.2	0.7-35.7	8.0
Silver, total	g	0.2-1.7	0.8	0.1-0.9	0.5	0.1-1.0	0.5
Zinc, total	g	14-227	67	15-288	91	21-187	116
<b>Semi volatile organic compounds and pesticides (detected)</b>							
Benzo(a)pyrene	g	0.32-3.40	1.56	0.30-1.78	0.91	0.18-3.49	1.43
Benzo(b)fluoranthene	g	0.41-4.31	1.97	0.38-2.25	1.15	0.23-3.16	1.72
Benzo(ghi) perylene	g	0.26-2.72	1.25	0.24-1.42	0.73	0.15-5.39	1.70
Benzo(k)fluoranthene	g	0.41-4.31	1.97	0.38-2.25	1.15	0.23-3.49	1.65
Chrysene	g	0.28-2.95	1.35	0.26-1.54	0.79	0.16-6.98	1.90
Di(2-ethylhexyl)phthalate	g	0.18-1.90	0.87	0.39-9.67	2.57	0.10-1.15	0.68
Diethylphthalate	g	0.21-2.24	1.03	0.20-1.17	0.60	0.12-9.64	2.01
Fluoranthene	g	0.26-2.72	1.25	0.24-1.42	0.73	0.15-6.96	2.09
Indeno(1,2,3-cd)pyrene	g	0.35-3.63	1.66	0.32-1.89	0.97	0.20-3.34	1.46
Phenanthrene	g	0.26-2.72	1.25	0.24-1.42	0.73	0.15-2.7	1.30
Pyrene	g	0.26-2.72	1.25	0.24-1.42	0.73	0.15-4.65	1.61

The calculation is based on the detected values and half of the detection limits for those under their detection limits.

**C. Permit Ref. VI.B (Status Completed)**  
**Implement an ambient monitoring action plan**

The following progress was made on this program during the reporting period.

**Completed field sampling and laboratory analysis**

The KCW completed two sampling events during the reporting period. The events occurred in November 2017 and April 2018. The streams evaluated include East Fork Shoal Creek, Line Creek, Round Grove Creek, North Brush Creek, Fishing River, Brush Creek, Hickman Mill Creek, Little Blue River, Searcy Creek, and Buckeye Creek. One stream outside of the City limit, Prairie Creek in Platte County Missouri, was also sampled for comparison.

Sampling activity at each site usually consisted of both field (in-stream) measurements and grab-sample collection. An YSI Pro DSS Sampling System was used in field measurement, which includes temperature, dissolved oxygen, pH, conductivity, and turbidity. Stream water samples were collected and handled in accordance with the *Kansas City, Missouri Integrated Water Quality Monitoring Program (2010)* and the *Quality Assurance Project Plan (2010)*. Samples were analyzed by the KCW laboratory. Sample analysis included general water quality parameters (e.g., ammonia, alkalinity), seven metals (total and dissolved forms), mercury, three bacteria indicators, more than 50 semi-volatile organic compounds and 26 organochlorine compounds.

**Data summary**

To evaluate the water quality of the sampled streams, Table 14 provides a statistical summary of physico-chemical and microbial data and a comparison made between the analytic results and the Missouri State Water Quality Criteria for Designated Uses. Since all the streams that are monitored in the program and that are within the City limits currently have the same use designation that includes livestock and wildlife watering, protection of aquatic life, and whole body contact recreation (B) (Both North Brush Creek and Little Blue River are also designated for secondary contact recreation), the most stringent criteria among the designated uses were used to simplify the comparison.

For physical and inorganic-chemical parameters, all of the results are within the criteria ranges. For microbial parameters, the values collected in this project are not sufficient to compare with the established criteria. For organic analyte (semi-volatile organic compounds and organochlorine compounds), nearly all of the results were below individual detection limits, except for one sample detected in trace amounts that was taken from Round Grove Creek in April 2018) with diethylphthalate (9.39 µg/L).

**Table 13. A summary of physicochemical data for the streams monitored in dry weather**

Parameter	Units	Method Detection Limit	Total number	Number of detection	Frequency of detection (%)	Minimum	Maximum	Median <sup>1</sup>	Criteria <sup>2</sup>
Air Temperature	°C	NA	18	35	100	3.8	16.5	9.95	
Water Temperature	°C	NA	21	36	100	4.8	14	8.2	32
Conductivity	ms/cm	NA	19	36	100	559	2065	750	
Dissolved Oxygen	mg/L	NA	21	36	100	5.31	14.75	12.72	5
pH	S.U.	NA	21	36	100	7.27	9.2	8.15	
Turbidity (field)	NTU	NA	21	36	100	0.1	449	4.8	
Turbidity (Lab)	NTU	0.01	21	21	100	0.85	24	3.3	
Alkalinity, total	mg/L	0	21	21	100	118	313	206	
Biochemical oxygen demand 5-day	mg/L	2	21	11	52	ND	7	1	
Cl	mg/L	0.014	21	21	100	21.5	231	76.9	
Chemical oxygen demand	mg/L	6.25	21	21	100	7	43	22	
<i>E. Coli.</i>	MPN/100ml	10	21	19	90	ND	1019	51	206 <sup>3</sup>   1134 <sup>3</sup>
Fecal Coliform	MPN/100ml	NA	21	16	76	ND	408	29	
Na	mg/L	0.0232	21	21	100	20	217	47.7	
Ammonia	mg/L	0.13	21	7	33	ND	0.5	0.065	1.3-29.5 <sup>4</sup>   0.5-5.5 <sup>5</sup>
Hardness, total	mg/L	NA	21	21	100	150	612	278	
Nitrite	mg/L	0.011	21	12	57	ND	0.126	0.027	
Nitrate	mg/L	0.016	21	15	71	ND	1.18	0.204	10 <sup>6</sup>
Total Kjeldahl Nitrogen	mg/L	0.283	21	17	81	ND	1.9	0.5	
Oil & Grease	mg/L	1.4	21	1	5	ND	6.45	NA	10
Phenols	mg/L	0.002	21	21	100	0.01	0.084	0.042	
Phosphorus, dissolved	mg/L	0.016	21	19	90	ND	0.16	0.1	
Phosphorus, total	mg/L	0.016	21	21	100	0.04	0.17	0.111	
Total dissolved solids	mg/L	1	21	21	100	210	1400	460	
Total solids	mg/L	1	21	21	100	250	1600	520	
Total suspended solids	mg/L	1	21	21	100	1	45	9	
Volatile suspended solids	%	NA	21	21	100	ND	75	28	
Ag-dissolved	mg/L	0.000744	21	0	0	ND	ND	NA	
Cd-dissolved	mg/L	0.00011	21	0	0	ND	ND	NA	
Cr-dissolved	mg/L	0.00026	21	21	100	0.002	0.005	0.003	
Cu-dissolved	mg/L	0.00053	21	21	100	0.002	0.005	0.002	0.012-0.042 <sup>7</sup>
Ni-dissolved	mg/L	0.0004	21	10	48	ND	0.001	0.0001	0.073-0.240 <sup>7</sup>
Pb-dissolved	mg/L	0.00214	21	19	90	ND	0.006	0.002	0.004-0.016 <sup>7</sup>
Zn-dissolved	mg/L	0.00016	21	21	100	0.003	0.01	0.004	0.166-0.545 <sup>7</sup>
Ag	mg/L	0.000744	21	0	0	ND	ND	NA	
Cd	mg/L	0.00011	21	0	0	ND	ND	NA	
Cr	mg/L	0.00026	21	21	100	0.002	0.007	0.003	
Cu	mg/L	0.00053	21	21	100	0.002	0.007	0.003	
Hg	mg/L	0.000025	21	0	0	ND	ND	NA	0.77
Ni	mg/L	0.0004	21	19	90	ND	0.006	0.001	
Pb	mg/L	0.00214	21	19	90	ND	0.006	0.003	
Zn	mg/L	0.00016	21	21	100	0.004	0.021	0.008	

<sup>1</sup> When calculating medians, one-half of the detection limit is used for those results below detection limits. For bacterium criteria, the geometric mean is calculated.

<sup>2</sup> Criteria listed here are cited from MDNR's criteria for protection of aquatic life unless annotated otherwise. For metals, chronic criteria are used unless annotated otherwise. A blank space is used if the criterion is not available or applicable to ambient stream samples.

<sup>3</sup> Criteria for whole body contact recreation-WBC(B) and secondary contact recreation, respectively

<sup>4</sup> Acute criteria for cool & warm-water fisheries for pH values between 7.2 and 9.0

<sup>5</sup> Chronic criteria for early life stages present for pH values between 7.6 and 9.0 and temperature between 4.8° C and 14° C

<sup>6</sup> Criteria for drinking water supply and groundwater

<sup>7</sup> Chronic criteria

**D. Permit Ref. VI.C.1 & 2**  
**Conduct Biological Assessment**

During the reporting period, the City maintained an existing collaborative agreement and also initiated a new one with the Columbia Environmental Research Center (CERC) of U.S. Geological Survey (USGS) for implementing the bio-assessment program. The CERC lab sorted, processed, analyzed the samples collected in 2016 and prepared a draft report with 2015 and 2016 sample data.

**Streams**

The streams covered in the assessment were:

**7 urban stream reaches**

1. East Fork Shoal Creek
2. Line Creek
3. Round Grove Creek
4. Brush Creek
5. Hickman Mills Creek (referred to as Hart Grove Creek in the tables and graphs)
6. Searcy Creek
7. Buckeye Creek

**3 control stream reaches; 2 within the City limits**

1. North Brush Creek, Fishing River (within the City limits)
2. Little Blue River (within the City limits)
3. Prairie Creek in Platte County (a control stream reach outside of the City limits)

**Laboratory work**

Laboratory processing, taxonomic identification, and enumeration of macroinvertebrates collected in spring and fall of 2016 were completed at the CERC laboratory. Operations were conducted according to the State's *Protocol Taxonomic Levels for Macroinvertebrate Identifications* (MDNR 2010). Appropriate quality control procedures were implemented.

**Data analysis**

A draft report on 2016 sample data and its comparison with previous years' data was prepared by the CERC during this reporting period. The report is currently being reviewed by KC Water.

## SECTION 4. OTHER PERMIT REPORTING REQUIREMENTS

### 4.1 Summary of Implementation Status

The Stormwater Management Plan (SWMP) is being implemented and the status of each program element has been described in each individual program section of this report. All the required components are proceeding in accordance with the City's permit requirements.

### 4.2 Proposed Changes

During the past fiscal year's permit implementation, no significant change of the SWMP has been identified or anticipated. If any major changes are anticipated or occur in the future, KCW will send written notification to MDNR's Water Pollution Control Program Permits section for approval, following the procedures as described in Part III.G. of the permit.

### 4.3 Program Effectiveness Evaluation Regarding Water Quality Improvement

The following presents an overall assessment of the City's Stormwater Management programs, based on major outcomes of the relevant programs.

**The City continues to enforce its new zoning and development code in its planning and development processes:**

- The code advances conservation principles by directing new development away from waterways and by preserving stream buffers.
- The enforcement of this code will generate a profound environmental impact in preventing future stream degradation.
- The City continues its effort to address preservation of riparian buffer zones in a more stream-focused, watershed-based approach for First Creek and Second Creek.

**Level of maintenance services for roadways and storm sewer systems remains the same.**

- The City continues to operate and maintain these public infrastructure systems in a manner that is required by the permit.
- The City continues to maintain and improve the ancillary functions, such as GIS mapping, to facilitate its maintenance services.
- The City continues to maintain Green Stormwater Infrastructure (rain gardens, bio-retention cells, etc.), allowing them to function at optimal level.

**Water quality protection is incorporated into flood damage reduction projects.**

Water quality protection is an important element in flood risk management projects. The City uses applicable eco-green infrastructure in designing and constructing new projects.

**Activities and programs are still aimed at promoting awareness of stormwater pollutants in industrial and commercial runoff.**

Education and outreach continues to play an important role in the City's overall efforts to address stormwater issues among the industrial and commercial communities.

**Pesticide usage has been kept at a minimum level.**

- The City's 221 parks are maintained free of insecticides.
- The City continues to maintain native prairies and wetlands.

**There continues to be a significant effort to reduce stormwater pollution.**

- A number of programs hosted or supported by various City departments serve to reduce nonpoint source pollutants.
- The nature of these programs ranges from City-wide to localized hot spots, and from routine maintenance to individually scheduled events.
- These programs address various pollutants, from daily household solid waste, hazardous waste, to sewage leaks and pharmaceutical products, which can all potentially end up in urban runoff or affect stormwater quality.

**Construction site runoff control has been recognized as an important practice.**

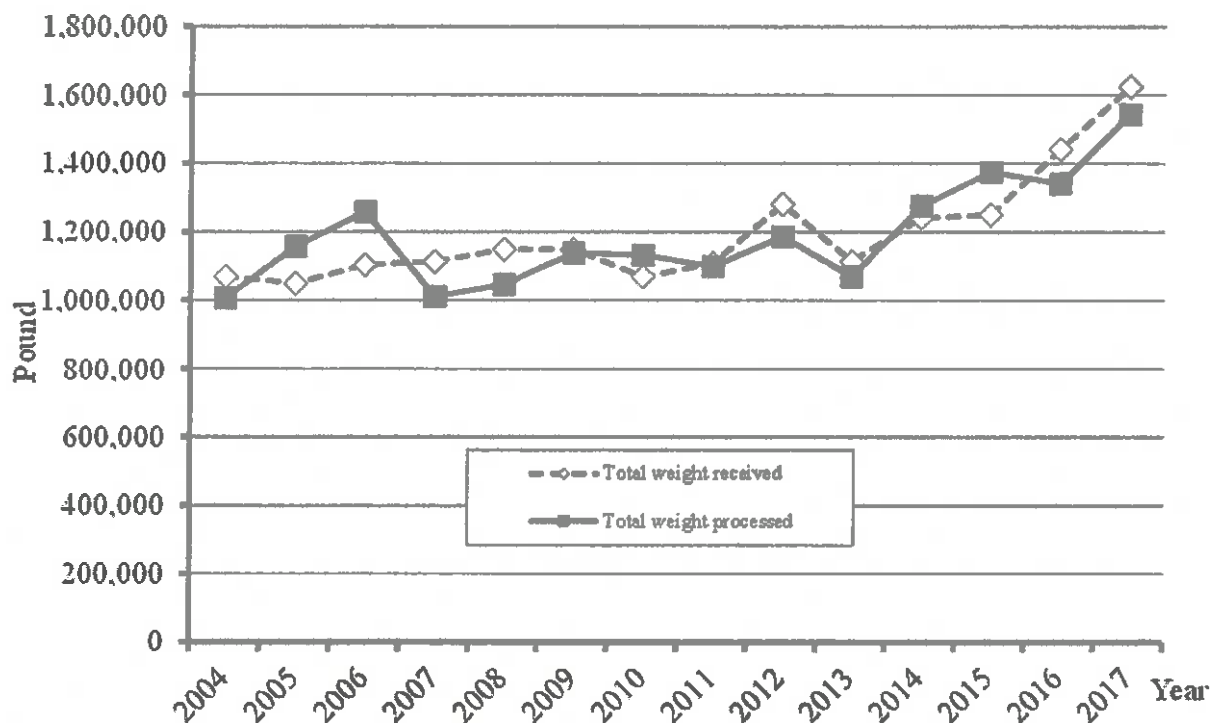
- The City continues to use standard procedures for land disturbance inspections and to provide a standard template of the SWPPP for construction or grading projects disturbing > 1 acres.
- The City continues to educate relevant staff on this subject.

**Public education and outreach efforts continue to grow.**

- The City continues to operate a number of programs (such as, *Stormwater: from KC to the Sea*; WE KC program), in which public education and outreach plays an important role.
- The City continues to develop new programs and projects to enhance the education messages. For example, the City continued a mini-grant program to fund projects that focus on stormwater and non-point source pollution education.
- The City continues to maintain partnership with different organizations on a number of programs for public educational purposes. Examples of the programs and their organizations include Community Recycling by Bridging the Gap and the Water Quality Education program by MARC.

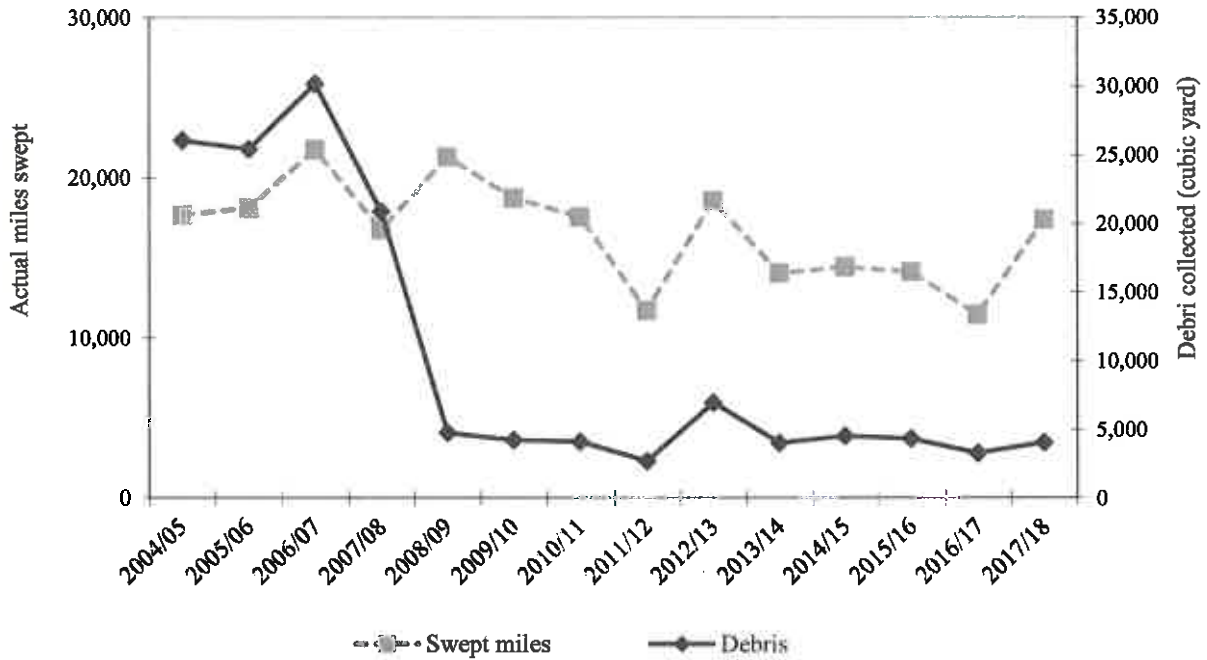
The above-mentioned major outcomes can further be measured by some indirect indicators. Figure 7 shows the annual quantity of materials that the regional HHW Collection program received and processed from 2004 to 2017. The program continues to divert HHW away from the landfills, streams, and storm sewers.

**Figure 7. Yearly comparison of regional HHW collection program (2004-2017)**



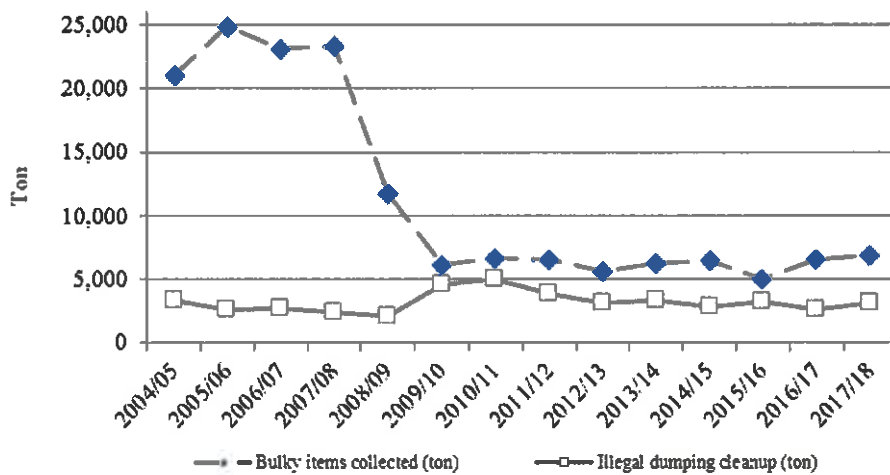
In addition to routine street sweeping performed by the KCW (Figure 8), the City's other departments/divisions utilize and enhance other existing programs or other methods to curb urban nonpoint source pollution to maintain a cleaner environment. Examples of these programs include but are not limited to, City-wide Curbside and Community Recycling; KC Recycles, HHW, and the Leaf and Brush Collection Program. Figures 8 and 9 illustrate some of the achievements made by the City from 2004 to 2017.

**Figure 8. Street Sweeping Program 2004-2018**



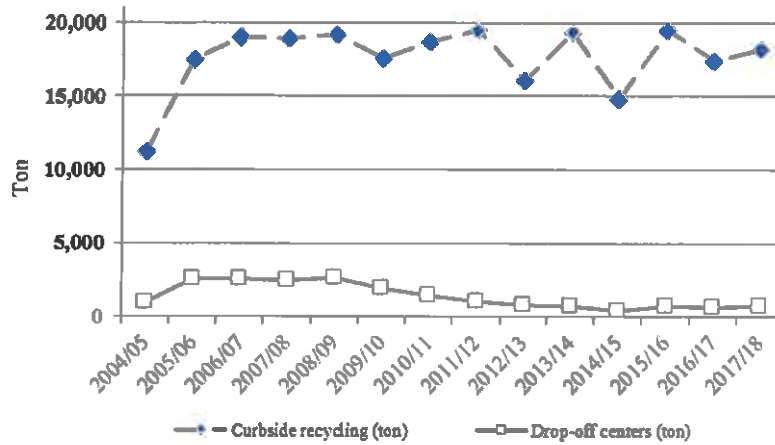
Note: Fig. 8. Prior to 2008, the program used to cover residential, arterial/boulevards, and downtown streets; and the debris collected was tracked by cubic yard. Since 2008, cleaning downtown streets has been supplemented with Kansas City Downtown Council’s cleanup efforts. Additionally, the program was shifted from Public Works to the Water Services Department in 2008, and actual waste weight is tracked by tonnage instead of by cubic yard used previously. A conversion factor of 1.67 was used to convert tonnage to cubic yards for data comparison.

**Figure 9. Bulky items collection and illegal dumping cleanup 2004-2018**





**Figure 10. 2004-2018 KC Recycle program**



#### 4.4. Data Summary

The monitoring results for representative stormwater discharges, ambient monitoring, and bio-assessment programs for receiving streams have been summarized in Section 3. Watershed Monitoring Program.

#### 4.5 Annual Expenditures

Table 14 provides a breakdown of the cost for the programs/activities that can be associated with stormwater management.

**Table 14. Overall budget for programs/activities supporting stormwater management effort in FY ‘17/18 and projection for FY ‘18/19**

Program/Service	Funding Source	FY 17/18 (Actual \$)	FY 18/19 (Adopted \$)
<i>Direct Cost (Activities conducted to ensure compliance with the Permit)</i>			
Permit administration – Stormwater Utility Division	Stormwater Fund	383,734 <sup>1</sup>	320,963 <sup>1</sup>
Ambient monitoring	Stormwater Fund	22,764	25,000
Biological monitoring	Stormwater Fund	92,433 <sup>2</sup>	61,831 <sup>2</sup>
Industrial monitoring	Stormwater Fund	2,480	2,500
BMPs in drainage improvement projects	PIAC Fund <sup>3</sup>	869,500	740,000
Stormwater discharge monitoring	Stormwater Fund	41,382	47,500
Stormwater public education	Stormwater Fund	116,283 <sup>2</sup>	120,000 <sup>2</sup>
<i>Indirect Cost (Activities conducted to help with stormwater pollution prevention effort)</i>			
Leaf & brush drop-off site operation and maintenance	General Fund	1,406,273	602,441
Leaf & brush collection (curbside)	Stormwater Fund	936,484	720,201
Bulky item collection	General Fund	1,435,347	1,427,679

<b>Indirect Cost (Activities conducted to help with stormwater pollution prevention effort) con't.</b>			
Catch Basin Replacement program	Stormwater Funds,	354,834 <sup>2</sup>	500,000 <sup>2</sup>
Stormwater Maintenance	Stormwater Fund	8,754,361	9,612,832
Deicing, snow/ice program	Motor Fuel Tax and General Fund	2,592,562	2,538,000
HHW program	Wastewater & Stormwater Fund	1,255,255	1,436,415
Illegal dumping abatement	General Fund	2,128,376	2,232,817
KC Recycles (Recycle First) program	General Fund	4,460,217	4,600,058
Land development inspection	Fee Supported	1,951,023	2,178,957
Neighborhood Cleanup Assistance program	General Fund	443,752	458,418
Property acquisition/demolition/clean-up for flood control	PIAC Fund <sup>2</sup>	134,106	1,742,943
HazMat Team (spill prevention and control )	Cigarette Tax	4,612,337	4,636,399
<b>TOTAL</b>		<b>\$31,993,504</b>	<b>\$34,004,955</b>

<sup>1</sup> The amount only covers staff within the Stormwater Utility Division and Industrial Waste Division (after September 2015) of KCW at the level of both management and administration of the programs directly related to the permit. These programs are: ambient monitoring, biological monitoring, development plan review for stormwater control and BMPs, high-risk runoff facility inspection/monitoring, illicit discharge investigation, land disturbance inspection for City projects, stormwater discharge monitoring, stormwater public education, permit renewal effort, along with the management of the permit in general. Fringe benefit (35%) is also included. The cost of City staff from other divisions and/or other departments supporting the above programs or managing other MS4 programs (e.g., illegal dumping investigation, landfill inspection/monitoring, Construction site runoff control at private development sites) is not included.

<sup>2</sup> The listed expenses only include new purchases and/or contract amounts. It does not cover either the cost of staff developing/managing/implementing/assisting this program and their associated training, or the additional cost of the existing City resources utilized (e.g., vehicles, computers, software programs including Arc/Map).

<sup>3</sup> Multi funds include PIAC funds (the sales tax through Public Improvements Advisory Committee), Energy & Water Approp to USACE, and Johnson County, Kansas – Stormwater (SMAC).

## 4.6 Activity Summaries; Inspection, Enforcement, and Public Education

Table 15 summarizes the enforcement, inspection, and public education activities that are relevant to stormwater issues.

**Table 15. Activity summary**

ENFORCEMENT ACTIONS						
Sediment and erosion control						
> 1 acre (Inspection): >2,000 site deficiencies						
≤ 1 acre (Complaint-driven investigation)						
45 Letters on site deficiency		13 Tickets written		2 Stop work orders		
203 Illegal dumping summons; 172 dispositions						
INSPECTIONS						
Public / private detention basin: 15/152			Private BMP: 26			
Catch basin/Inlet: 12,336			Outfall: 298			
Missouri River levee: 11.5 miles*1 to 5 times			Blue River levee: 3.5 miles*5 times			
Municipal facility: 8			Private facility: 36			
TV sanitary sewer line: 428 miles						
Active construction site (erosion & sediment control)						
City projects		Private development				
≥ 1 acre		≤ 1 acre	≤ 1 acre (Complaint-driven)		> 1 acre	
291		7,393	127 (investigation)		2,387	
PUBLIC EDUCATION AND OUTREACH						
City efforts: Programs/Activities						
WE KC		Stormwater Plinko		From KC to the Sea		
Litter pick-up events/watershed education events		Students	Events played at	Participants	Schools	Students
19/14		2,512	10	1,162	51	5,031
Water Quality Small Grant Program						
Organizations granted: 9			Grant amount: \$93,600			
Regional Effort: Lead Sponsoring Water Quality Public Education Program (2017)						
Brochures distributed		Storm drain markers		Grant issued		
4,054		450		7 projects/\$27,184		
Pet waste signage		Native seed packet		Pet waste bag dispenser		
100		90		200		

#### 4.7 Water Quality Degradation/Improvements

The trend analysis of bio-assessment data collected in the previous years was presented in the 2015 report. The objective of these evaluations is to capture the temporal trend of the quality of stormwater and receiving streams, as well as to assess the impact of the City's Stormwater Management Programs on water quality. The following activities (during fiscal year 2017/18 unless otherwise specified) are expected to have a positive impact on the City's surface water quality.

- Over one million pounds of HHW was collected, recycled, and properly disposed of in 2017.
- Over 700 tons of material was recovered by community drop-off recycling centers, over 18,000 tons of material was recovered by curbside collection.

- About 18,000 tons of leaf and brush was collected from the drop-off centers; 4,084 tons were collected from residential curbside collection.
- More than 2,387 sediment/erosion control inspections were conducted for private development that disturbed areas more than one acre.
- Over 17,000 miles of streets were swept and nearly 2,500 tons of waste was removed from streets;
- A total of 12,336 cleanings of storm inlets were completed.

As a result of these efforts, a significant amount of materials and waste did not get into the storm drainage system reducing pollution in our local waterways.

## SECTION 5. FUTURE IMPLEMENTATION

The City's first five-year permit term expired in 2009. KCW has continued to operate its storm sewer system per the requirements listed in the expired permit. While this report is being prepared, the City is working with MDNR for the permit renewal, with the goal to have the new permit in place by the end of 2018.

The following listing presents the City's vision for the near future regarding the permit activities for better managing stormwater, protecting natural resources, and ensuring full compliance with the permit conditions.

### ***Continue to evaluate and improve relevant policies***

- Enhance/update the existing policies and operating procedures, where applicable, by incorporating and promoting stormwater protection elements
- Establish strategic stormwater-related practices. For example, KCW is targeting both municipal-owned or -operated, as well as privately-owned or operated facilities for greater utilization of the *Stormwater Self-assessment* program
- Investigate funding opportunities available to address funding levels needed to provide a more robust overall stormwater management system

### ***Improve the existing services***

- Improve asset management as it relates to stormwater
- Improve the GIS mapping

### ***Enhance public education and outreach by better utilizing the dedicated water-quality outreach personnel and resources***

### ***Evaluate and improve the stormwater management programs***

- Evaluate the programs' progress against the predetermined goals and objectives
- Improve departmental maintenance capabilities for eco-green infrastructure

In summary, the City's objectives are not only to comply with the state and federal regulations but also to reduce stormwater pollution and improve stormwater runoff quality.

## SECTION 6. APPENDICES

### Appendix 1. Industrial & Other High-Risk Runoff Facilities Inventory Kansas City, MO 2017

	Non-Municipal Facilities	Activity Address	Watershed
1	A Luster Metal Finishing-Division of Brady Enterprises	1019 West 24th St.	Turkey Creek
2	A Zahner Company	1400 E 9 <sup>th</sup> St.	Blue River
3	ABF Terminal - 003 Kansas City	4209 Gardner Ave.	NEID*
4	Advantage Powersports (formerly Kawasaki)	6401 NW Barry Rd.	Line Creek
5	All Star Auto Parts	6101 E 32nd St.	Blue River
6	Allied Aviation Service Company	217 Bern St.	Todd Creek
7	Avenue Auto Wrecking	2500 Manchester Tfwy.	Blue River
8	AZZ Galvanizing	7700 E. 12 <sup>th</sup> St.	Blue River
9	Bartlett Grain Company, L.P.(KCT Elevator)	5801 Birmingham Rd.	Searcy Creek
10	Batliner Paper Stock Company	2501 E Front St.	Missouri River
11	Bayer Cropscience	8400 Hawthorn Rd.	NEID*
12	Blount International KCDC	10331 NW Transcon	N. Brush Creek
13	Blount-Kansas City	4840 E 12th St.	Turkey Creek
14	Boulevard Brewing Company	2501 Southwest Blvd.	Turkey Creek
15	Brenntag Mid- South Inc.	5200 Still Well Ave.	NEID*
16	C&H Auto and Truck Salvage	7604 E Truman Rd.	Blue River
17	Cargill Inc.- Biodiesel Plant	2309 E Front St	NEID*
18	Cargill Inc.- Soybean Processing Plant	2306 Rochester	NEID*
19	Cargill Inc./Choteau Elevator	4801 NE Birmingham Rd.	Buckeye Creek
20	Carter Waters Corporation	2440 W Pennway St.	Turkey Creek
21	Carter Waters Corporation	3750 N Skiles Rd.	Randolph Creek

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	Non-Municipal Facilities	Activity Address	Watershed
22	Catalent Pharma Solutions Inc. (formerly Quintiles Inc.)	10245 Hickman Mills Dr.	Hickman Mills Creek
23	Century Concrete, Inc. (formerly Fordyce Concrete Company Inc.-Randolph Facility)	3700 N. Skiles Rd..	Randolph Creek
24	Charles Paint Research Inc.	2401 E. 85th St.	Blue River
25	City Market	20 E 5 <sup>th</sup> St.	NEID*
26	Clay & Bailey	6401 E 40th St.	Blue River
27	Cook Brothers Insulation Inc.	1405 Saint Louis Ave.	CID**
28	Crunch Time Auto Salvage	7900 E 17th St.	Blue River
29	CTB Grain Systems (formerly Brock Grain & Feed)	7400 E 13th St.	Blue River
30	D&D Detail	3701 E 12th St.	Gooseneck Creek
31	Dayton Superior Corp. (Zea Corp.)	3101 Gardner Avenue	NEID*
32	Deffenbaugh Warehouse	6817 Stadium Dr.	Blue River
33	Don's Mobile Welding	7000 E US 40 Hwy.	Blue River
34	Double Check Company, Inc.	4000 Raytown Rd.	Round Grove Creek
35	Economy Auto Salvage	3139 Stadium Dr.	Blue River
36	Eharas Services and Solutions	4980 Stillwell Ave.	NEID*
37	Elite Trucking	900 N. Indiana	NEID*
38	Environmental Specialists, Incorporated	3001 E 83rd St.	Blue River
39	Environmental Specialists, Incorporated	7300 E 63rd St.	Blue River
40	EPRO Services	6817 Stadium Dr.	Blue River
41	Firestone (Caiver's Express)	1501 Main St	Gooseneck Creek
42	Fordyce Concrete Company Inc.-63rd St. Facility	5810 E, 63rd St.	Blue River
43	Fresh Del Monte Produce Inc.	6311 Deramus Ave.	NEID*

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	Non-Municipal Facilities	Activity Address	Watershed
44	Gateway Packaging Company	5910 Winner Rd.	Blue River
45	General Mills Operations Inc.	2917 Guinotte Ave.	NEID*
46	Gerdau Ameristeel	1301 N Chouteau Tfwy	NEID*
47	Hallmark Cards Inc.	2501 McGee	Turkey Creek
48	Hansen Mueller (KCS Elevator )	1031 N. Topping	NEID*
49	Harley-Davidson Motor Group Comp.	11401 N. Congress Ave.	Second Creek
50	Hawthorn Generating Facility (Kansas City Power & Light)	8700 Front St.	NEID*
51	HazMat Inc. (formerly Waste Express)	6300 Stadium Dr.	Blue River
52	Heritage Environmental Service	8525 NE 38th St.	Randolph Creek
53	Hiland Dairy (Roberts Dairy, Prairie Farms)	3805 South Emanuel Cleaver II Blvd.	Brush Creek
54	Hiles Plating Company	2028 Broadway	Turkey Creek
55	Import Auto Salvage	4120 Winchester Ave.	Blue River
56	Jackson Plating & Polishing, Inc.	2641 Jackson	Blue River
57	Jay Wolfe Acura	1029 W. 103rd St.	Indian Creek
58	Joe's Mobile Truck & Trailer Repair	3040 Manchester Trafficway	Blue River
59	Kansas City Ready Mix dba Talon (LaFarge North America Inc.)	3101 East 85th St.	Blue River
60	Kansas City Screw Products Inc.	2908 Truman Rd.	Blue River
61	Kauffman Stadium	1 Royal Way	Round Grove Creek
62	KC Southern Railway - Knoche Yard	3651 East Front St.	NEID*
63	KC Streetcar Authority Maintenance Facility (Singleton Yard)	3rd St. and Holmes	CID**
64	LabConco Corporation	8811 Prospect	Blue River
65	Langley Recycling, Inc.	3557 Stadium Dr.	Blue River



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	Non-Municipal Facilities	Activity Address	Watershed
66	Leeds Industrial Park	6817 Stadium Dr.	Blue River
67	Little Will's Auto Salvage	7910 E. 17th St.	Blue River
68	Lowe's Home Improvement	8601 N. Boardwalk Ave.	Second Creek
69	Lowe's Home Improvement	1700 W, 133rd St.	Camp Branch
70	Mallin Companies Inc. (Mallin Brothers Co.)	3211 Gardner Ave.	NEID*
71	Mark One Electric Company, Inc.	1001 Forest Ave., 921 Forest Ave.	Blue River
72	Marshall	13600 Madison Ave	Camp Branch
73	Martin Foundry Company	1510 Crystal Ave.	Blue River
74	Metals Protection Plating (MPP) Corporation	2800 East Truman Rd.	Blue River
75	MRI Global (Midwest Research Institute)	425 Volker Blvd.	Brush Creek
76	Mid America Car Inc. - Locomotive	1525 N. Monroe Ave.	NEID*
77	Midway Ford Truck Center Corporation	7601 Northeast 38th St.	Randolph Creek
78	Midwest Locomotive, Inc.	6817 Stadium Dr.	Blue River
79	Midwest Scrap management	8116 Wilson Rd.	Blue River
80	Miller Material Company	2405 East 85th St.	Blue River
81	MO Dept. of Transportation- District 4 General Services	9101 E 40th Ter.	Round Grove Creek
82	Missouri Dept. of Transportation-Motorist Assistance	3505 E 18th St.	Gooseneck Creek
83	Missouri Dept. of Transportation-Northmoor	5248 Waukomis Dr.	Line Creek
84	Missouri Dept. of Transportation-Skiles	3800 N Skiles Ave.	Randolph Creek
85	Missouri Dept. of Transportation-Mulberry	650 Mulberry St.	West Bottom
86	Missouri Plating Company	7001 East 13th St.	Blue River
87	Mizkan (Speaco Foods, Inc.)	2400 Nicholson Ave.	NEID*

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	Non-Municipal Facilities	Activity Address	Watershed
88	Mondi Bags USA, LLC (Graphic Packaging International, Inc., Stone Container Corp.)	3244 Gardner Ave.	NEID*
89	Monier Life Tile LLC	12600 East 98th St.	Little Blue River
90	Nitto Denko Automotive, Missouri, Inc. (formerly Permacel Kansas City Inc.)	8485 Prospect Ave.	Blue River
91	NKC Transportation	3811 Gardner Ave.	NEID*
92	Nostrum	1800 N Topping Ave	NEID*
93	Ortho Mattress, Inc.	6301 NW Barry Rd.	Line Creek
94	PathFinder Systems, Inc.	6301 Deramus Ave.	NEID*
95	Paulo Products Company	4827 Chelsea Ave.	Brush Creek
96	PBI Gordon Corporation	1217 W 12th St.	Turkey Creek
97	Penny's Concrete, Inc.- Parvin Road Plant.	8601 NE 38th St.	Randolph Creek
98	Performance Roof Systems Inc.(Derbigum)	4821 Chelsea Ave.	Brush Creek
99	Permacel Kansas City	3900 Empire Rd.	NEID*
100	Pick-n-Pull - KC (Self-Service Auto Parts Store)	8012 E Truman Road	Blue River
101	Pick-n-Pull (U-Pick-it)	7700 E Winner Rd.	Blue River
102	Plumbers & Gasfitters-Local 8	5950 Manchester Tfwy	Blue River
103	Porter's Auto Salvage	3231 Stadium Dr.	Blue River
104	Quality Finishing Industries Inc. (NEW)	6015 Manchester Tfwy	Blue River
105	Republic Services (Material Recovery & Transfer LLC)	4020 Winchester Ave.	Round Grove Creek
106	Research Medical Center	2316 East Meyer Blvd.	Town Fork Creek
107	Rotadyne Roll Group	2035 Washington St.	Turkey Creek
108	Southeast Sanitary Landfill L.L.C.	8301 Indiana Ave.	Blue River
109	Stericycle Environmental Solution (Philip Services Corporation)	716 Mulberry St.	CID***

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	Non-Municipal Facilities	Activity Address	Watershed
110	Stones & Bricks Inc.	6701 E. US 40 Hwy.	Blue River
111	Summit Machine Products Inc.	7101 E. 13th St.	Blue River
112	Superior Metal Treating & Equipment	2540 Indiana Ave	Blue River
113	T & E Service	4980 Stillwell Ave.	NEID*
114	Target	1201 W 136th St	Camp Branch
115	The Nutro Company	1315 N Chouteau Trafficway	NEID*
116	Thoroughbred Ford	8501 N. Boardwalk Ave.	Second Creek
117	Transmission Auto	8021 Prospect Ave.	Blue River
118	Truman Medical Center	2301 Holmes St.	Turkey Creek
119	Union Pacific Railroad	6400 Martin	NEID*
120	Univar USA Inc.- KC (formerly Vopak USA Inc.)	2000 Guinotte Ave.	NEID*
121	University of Missouri-Kansas City	5100 Rockhill Rd.	Brush Creek
122	US Plating & Surface Finishing	1341 Montgall Ave.	Blue River
123	USC Technologies	1300 NW Briarcliff PKWY	Line Creek
124	VA Medical Center	4801 Linwood Blvd.	Blue River
125	Vance Brother - Chelsea Facility (Koch Materials Company )	4915 Chelsea St.	Brush Creek
126	Vance Brothers Inc.	5201 Brighton	Blue River
127	Veolia Energy (Trigen-KC Grand Ave Station)	115 Grand Ave.	NEID*
128	W.R. Meadows of Kansas City	3111 E 17th St.	Turkey Creek
129	Walker Towel & Uniform	2601 Truman Rd.	Blue River
130	Walmart	1701 W, 133rd St.	Camp Branch
131	Walmart Supercenter	8551 N. Boardwalk Ave.	Second Creek
132	Yellow Transportation	3500 Booth St.	Blue River

**MUNICIPAL FACILITIES**

	<b>Municipal Facilities</b>	<b>Activity Address</b>	<b>Watershed</b>
1	KCMO American Royal Arena Complex	1800 Genessee	CID**
2	KCMO Animal Control Kennel	4400 Raytown Rd.	Round Grove Creek
3	KCMO Birmingham Wastewater Treatment Plant	10801 NE 28th St.	Birmingham Bottom
4	KCMO Blue River Golf Academy	7501 Blue River Rd.	Blue River
5	KCMO Blue River Secondary Wastewater Treatment Plant	7300 Hawthorne Rd.	NEID*
6	KCMO Blue River Wastewater Treatment Plant	7600 Front St.	NEID*
7	KCMO Buckeye Maintenance Facility	5001 Birmingham	Searcy Creek
8	KCMO Central Patrol	1200 E Linwood	Turkey Creek
9	KCMO City Tow Lot	7750 Front St.	Missouri River
10	KCMO Communication Center	1111 Locust St	Turkey Creek
11	KCMO Police Dept. - Crime Laboratory	6633 Troost Ave.	Town Fork Creek
12	KCMO Downtown Airport	250 Richards Rd.	Missouri River
13	KCMO Police Dept. - East Patrol (Old site)	5301 E 27th St.	Blue River
14	KCMO Police Dept. - East Patrol (New site)	2640 Prospect Ave.	Turkey Creek
15	KCMO Fire Dept. - MAST Headquarter	6750 Eastwood Tfwy	Blue River
16	KCMO Fire Marshall's Office	635 Woodland Ave.	Blue River
17	KCMO Fire Station 10	1505 E 9th St.	Blue River
18	KCMO Fire Station 14	8300 N Brighton Ave	East Fork Creek
19	KCMO Fire Station 18	3211 Indiana Ave.	Brush Creek
20	KCMO Fire Station 19	550 W 43rd St	Brush Creek
21	KCMO Fire Station 23	4777 Independence Ave.	Blue River
22	KCMO Fire Station 35	3200 Clever II	Brush Creek
23	KCMO Fire Station 36	9903 Holmes	Indian Creek
24	KCMO Fire Training Academy	5130 Deramus	NEID*
25	KCMO Fishing River WWTP	10600 NE 118th St.	Fishing River

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	Municipal Facilities	Activity Address	Watershed
26	KCMO Fleet Maintenance	1901 Brooklyn	Turkey Creek
27	KCMO Fleet Operations	5215 E. 27th St.	Blue River
28	KCMO Habitat Restore	4701 Deramus	Missouri River
29	KCMO Helicopter Unit	4601 Eastern	Round Grove Creek
30	KCMO Hodge Golf Course	7000 NE Barry Rd.	East Fork Creek
31	KCMO Holmes Annex	1525 Holmes	Turkey Creek
32	KCMO KCI Airport	125 Paris St.	Todd Creek
33	KCMO Kemper Arena	1800 Genessee	CID**
34	KCMO Lakeside Nature Center	4701 E Gregory Rd	Blue River
35	KCMO Leaf & Brush Drop off site	I-470 & Raytown Rd.	Little Blue River
36	KCMO Maintenance facility	1800 Prospect	Turkey Creek
37	KCMO Metro Patrol	7601 Prospect	Blue River
38	KCMO Minor Golf Course	11215 Holmes Rd	Blue River
39	KCMO Municipal Service Center	5300 Municipal Ave.	NEID*
40	KCMO North Patrol	1001 NW Barry Rd.	Line Creek
41	KCMO Nursery	5400 E. Gregory Ave.	Blue River
42	KCMO Pacaar Building & Lot	1301 NE Chouteau Tfwy	NEID*
43	KCMO Parks District 2	1520 West 9th St.	Turkey Creek
44	KCMO Parks District 3	6901 Elmwood Ave.	Blue River
45	KCMO Pistol Range	6900 Coal Mine Rd.	Blue River
46	KCMO Police Dept. Headquarters	1125 Locust St.	Turkey Creek
47	KCMO Police Dept.- South Patrol Station	9701 Marion Park Dr. (11109 Hickman Mills Dr.)	Hickman Mills Creek
48	KCMO Police Dept.-new Training Academy	6885 NE Pleasant Valley	Shoal Creek
49	KCMO Police Dept. - Gym	1801 White	Blue River
50	KCMO Police Training Academy-Agnes Annex	1328 Agnes	Blue River
51	KCMO Public Works District 1	2400 NE Russell Rd.	Rock Creek
52	KCMO Public Works District 2	5300 Municipal Ave.	NEID*
53	KCMO Public Works District 3	4725 Coal Mine Rd.	Blue River
54	KCMO Recycling Center	4703 Deramus Ave.	NEID*

City of Kansas City, Missouri Stormwater NPDES Permit No. 0130516  
Thirteenth-Year Report (May 1, 2017 – April 30, 2018)

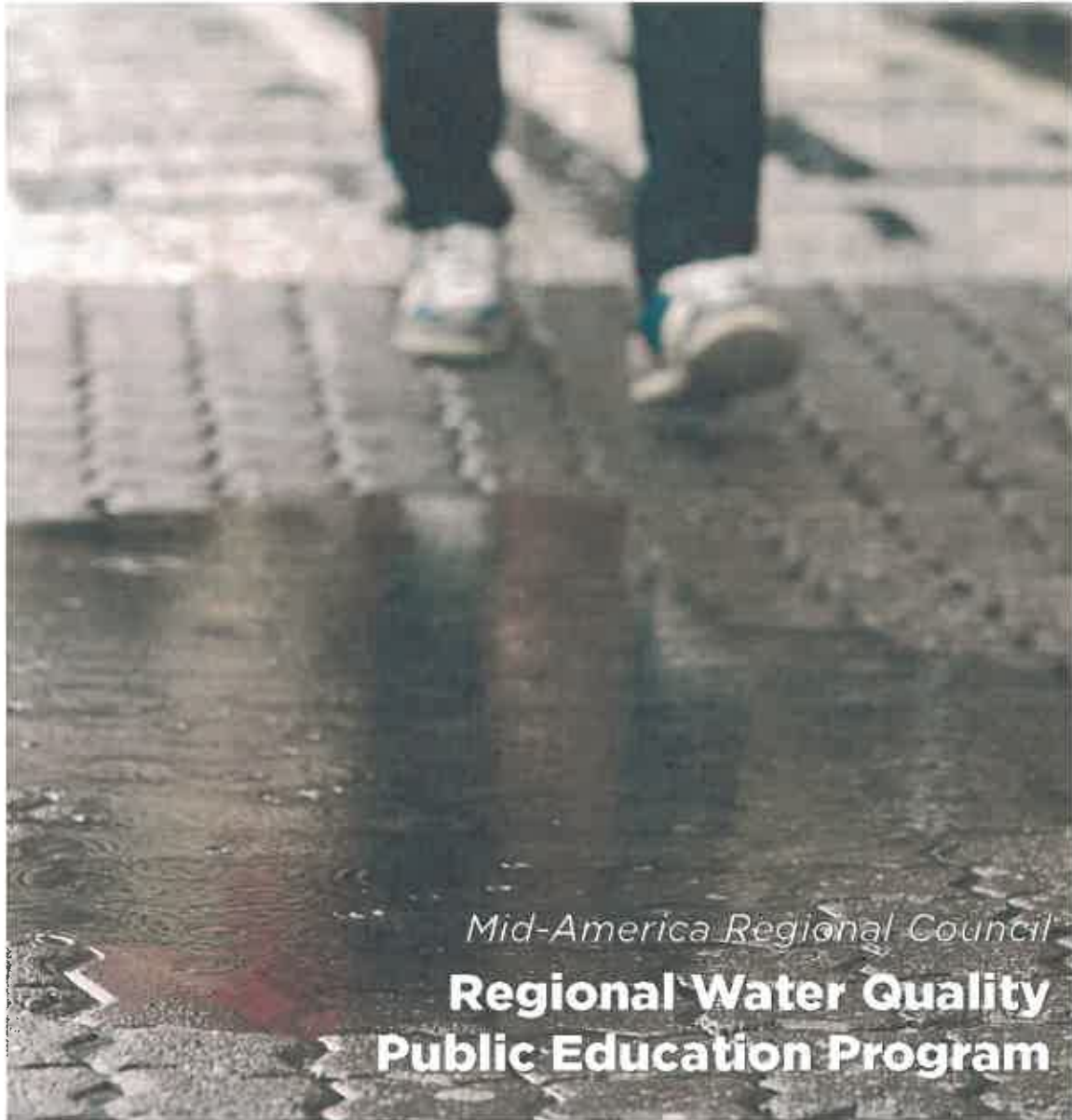
	Municipal Facilities	Activity Address	Watershed
55	KCMO Regional Household Hazardous Waste Facility	4707 Deramus Ave.	NEID*
56	KCMO Rocky Branch WWTP	500 NE 132nd St.	Rocky Branch
57	KCMO Ruskin Maintenance	11231 Bennington	Hickman Mills Creek
58	KCMO Salt storage Facility, District 1	11660 N. Main Street	First Creek
59	KCMO Services Station	1245 Prospect	Blue River
60	KCMO Shoal Creek Golf Course	8905 N Shoal Creek Parkway	Shoal Creek
61	KCMO Shoal Creek Patrol Division	6801 NE Pleasant Valley Rd.	Shoal Creek
62	KCMO Solid Waste Headquarters	1815 N. Chouteau	NEID*
63	KCMO Stanley Palmer Engineering Center	4721 Coal Mine Rd.	Blue River
64	KCMO Starlight Theater	4600 Starlight Rd.	Blue River
65	KCMO Swope Memorial Golf Course	6900 Swope Memorial Dr.	Blue River
66	KCMO Swope Park Off-Leash Area	East of Elmwood, Gregory Blvd.	Blue River
67	KCMO Todd Creek Wastewater Treatment Plant	7600 NW 144th St.	Todd Creek
68	KCMO Traffic Operations	5310 Municipal Ave.	NEID*
69	KCMO Water Treatment Plant	1 NW Briarcliff	Line Creek & Rock Creek
70	KCMO Westside Wastewater Treatment Plant	1849 Woodsweather Rd.	CID**
71	KCMO Zoo	6900 Zoo Dr.	Blue River

\*NEID: Northeast Industrial District; \*\*CID: Central Industrial District

### Appendix 2. 2017 Kansas City, MO Priority List of Industrial & Other High-Risk Runoff Facilities

ORGANIZATION	Activity Address	Watershed	MS4/CSO	State Permit	State Stormwater No Exposure Certification	Evaluated	Monitoring Data Received
AZZ Galvanizing Corporation (formerly North American Galvanizing Corp.)	7700 East 12th Street	Blue River	CSO	Not applicable	Not applicable	Yes	Yes (City's Self-assessment Program)
Bayer CropScience	8400 Hawthorn Road	NEID	CSO	MO-0002526	Not applicable	Yes	Not applicable
Century Concrete, Inc. -Skiles Facility (formerly Fordyce Concrete Company Inc. - Randolph Facility)	3700 North Skiles Road	Randolph Creek	MS4	MOG490266	Not applicable	Yes	Not applicable
Clay & Bailey	6401 East 40th Street	Blue River	MS4	MOR203297	Not applicable	Yes	Not applicable
HazMat Inc. (Amerex-Waste Express Inc.)	6300 Stadium Drive	Blue River	MS4	MO0117692	Not applicable	Yes	Yes
Heritage Environmental Service	8525 Northeast 38th Street	Randolph Creek	MS4	MO0125512	Not applicable	Yes	Yes
Penny's Concrete, Inc.-Parvin Road Plant	8601 E 38th St.	Randolph Creek	MS4	MOG490966	Not applicable	Yes	Yes
The industrial area south of Worlds of Fun		Randolph Creek	MS4	Not applicable		Monitored by the City	

**Appendix 3. MARC 2017 Annual Report for Regional Water Quality Public Education Program**



Clean Water. Healthy Life.

**2017**  
ANNUAL  
REPORT



CLEAN WATER. HEALTHY LIFE.

## Regional Water Quality Public Education Program Annual Report, January–December 2017

### COMMITTEE HISTORY

Since 2003, MARC has convened a committee of representatives from local governments and environmental organizations to develop a regional watershed public education program. The committee was formed in response to numerous requests from local governments to develop a cooperative approach to water quality public education and to meet federal NPDES Phase I/II regulatory requirements. The committee's efforts have provided a firm foundation for its goal of educating the general public about actions to reduce non-point source (NPS) pollution.

### PROGRAM DETAILS

The Regional Water Quality Public Education Program is a comprehensive approach to raising public awareness about watershed issues and water quality in the Kansas City region. The long-term water quality public education strategy capitalizes on momentum created by past water quality awareness topics and community initiatives such as the Kansas Healthy Yards and Communities program. The program's outreach campaign structure identifies several specific water quality issues to address throughout the year. However, the structure remains flexible by promoting additional messages as opportunities arise. Campaigns consist of varying levels of support and methods of outreach, as explained below.

### PROGRAM FOCUS

During the past 14 years, the program has addressed several top NPS pollution issues facing our region. The program's theme — "Clean Water. Healthy Life." — focuses on changing behaviors to improve water quality, community health and quality of life. Each year, the Regional Water Quality Education Committee (WQEC), with MARC staff support, develops an NPS pollution-focused message that supports the program's theme and determines the most effective means for disseminating the message. The committee's education and outreach activities vary each year but typically consist of a media campaign, a mini-grant program, training, and education and outreach materials. This year, the program also partnered to host the Kansas City Urban Stormwater Conference, held January 23–24, 2017.

### 2017 PROGRAM ACCOMPLISHMENTS

#### Media Campaigns

In 2017, the public outreach campaign focused on communicating a "one water" message to Greater Kansas City residents age 25–54, emphasizing the importance of both

indoor and outdoor water quality and conservation concerns. The goal was to educate people about actions they can take to help improve water quality and direct them to assets they can use to educate others.

MARC staff compiled a "fact sheet" as a web page, included original art sized for social media to accompany many of the facts, and contracted four entertaining animated videos — for dissemination through paid advertising and earned media which directed viewers to the Water Quality website. WQEC members and MARC partners were encouraged to share and



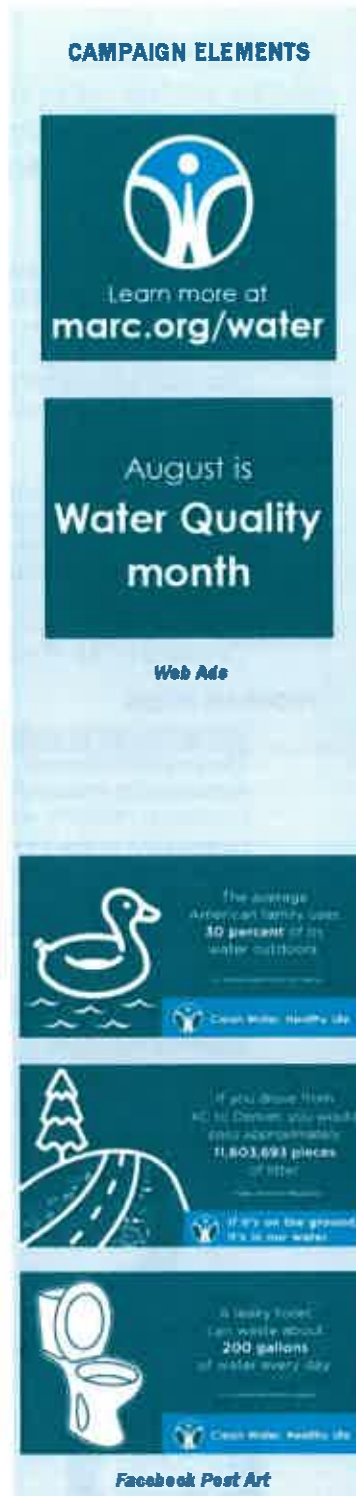
post the facts on their own social media channels, which led to a moderate amount of organic reach. The campaign focused on National Water Quality Month, which is recognized during the month of August. During this time, the campaign message was seen or heard more than two million times and the website saw 5,000 page views — up from 1,000 last year and 656 in 2015.

Medium	Number of Ad Placements	Estimated Gross Impressions
Online	N/A	795,393
Radio	224	849,600
Social Media	12	373,706
<b>Total</b>	<b>236</b>	<b>2,018,699</b>



Animation stills addressing household cleaner use, disposal of prescription medication, yard/pet waste and litter.

CLEAN WATER. HEALTHY LIFE.



Facebook Post Art

## GRANTEE PROJECTS



*Revolving Green Around the Blue*  
Blue River Watershed Association



*Big Muddy Cleanup*  
Healthy Rivers Partnership

## GRANT PROGRAMS

Each year, the committee offers funding opportunities to local nonprofit and educational organizations for education and outreach events related to reducing stormwater runoff and improving water quality in area creeks and streams. Proposals undergo a competitive selection process and are evaluated by a grant selection subcommittee. Grants were awarded to the following organizations:

### *Blue River Watershed Association (\$3,735)*

The Blue River Watershed Association and its partner organizations held "Revolving Green Around the Blue," a restoration event. This public event had multidimensional goals, including habitat restoration for a section of the Blue River in the Conservation Opportunities Area (COA), emphasizing stream quality, good forest management practices and watershed health; promoting awareness, understanding and appreciation for Missouri's natural resources; recruiting new outdoor users; and attracting and engaging new partners while strengthening existing partnerships.

### *Friends of the Kaw (\$5,000)*

Friends of the Kaw (FOK) managed and facilitated eight Kids About Water (KAW) projects at two high schools in the Kansas City, Kansas, Public School District, that included two community Best Management Practice (BMP) activities. FOK organized a Water Quality Speaker day for eight science classes, and hired high school interns who had participated in both the KAW Project and the Water Quality Speaker day. Interns learned to conduct water quality tests, taught adult volunteer mentors how to test water quality and organized a community BMP project. The endeavor provided students and adults in Wyandotte County with hands-on learning experiences about the impacts of stormwater pollution on water quality and public health in their community.

### *Heartland Conservation Alliance (\$5,000)*

Heartland Conservation Alliance produced a film trailer about the Blue River. The Blue River trailer will be used to leverage resources for a full-length documentary film that will feature oral histories and the ecological and cultural history of the river, functioning as an asset of the "Renew the Blue" campaign — an initiative to conserve and restore natural resources along the Blue River. The trailer will be featured on social media and used for promotion at community events, cultural and natural sites. The primary target audiences for the trailer are residents of communities neighboring the river, elected officials and decision makers in local governments, schools and businesses engaged in civic and community life, and staff at natural and cultural attractions along the river — as well as residents of the larger metropolitan area.

### *Healthy Rivers Partnership (\$5,000)*

Healthy Rivers Partnership gathered volunteers at La Benite Park on Oct. 7, 2017, for the Big Muddy Cleanup. Goals of the event included providing education to the public about non-point source pollution, and demonstrating best management practices through a river cleanup.

**Dotte Agency (\$2,000)**

In a Master of Architecture spring course through the University of Kansas' Dotte Agency, KU students researched the history and contemporary understanding of the ecosystems and associated cultural and societal impacts of the northeast Wyandotte County area, specifically the area that feeds into the Jersey Creek Greenway (JCG) — 1.8 miles of shared sidewalks and trails which are part of MARC's MetroGreen™ greenway plan. After years of neglect and decay, the 24-acre waterway/greenway between Fifth and 18th Streets has seen some recent activities and small installations that are changing the perception and nature of the landscape. The Dotte Agency has been actively engaged with community leadership in identifying what exists through documentation and identification of various physical and programmatic needs; developing interactive maps and activities that engage residents in visioning potential programmatic uses; developing grant support for walking clubs in the park; and the design, building and installation of five exercise elements in the JCG.

**StoneLion Puppet Theatre (\$5,000)**

This community outreach program provided a unique, two-day water festival at Theis Park next to Brush Creek, with free admission to the public. The festival focused on educating adults and children about how their actions effect the water system, and offered best management practices people can implement. This new event was an expansion of the successful annual Mother's Day for Mother Earth giant puppet show. StoneLion built upon the pre-show activities held last year, creating a new, five-hour event with two presentations over Memorial Day weekend called "Illuminated Waters." This reinforced the theme of the event, clean water, and provided concrete examples of behavioral change to the audience, while reaching more citizens. "Illuminated Waters" featured five different areas of interest with specific themes, such as reduction of pesticides or plastics that pollute our waterways.

**South Grand River Watershed Alliance (\$1,449)**

The South Grand River Watershed Alliance (SGRWA), in partnership with Family Center Farm and Home, the city of Harrisonville Public Works, the Missouri Department of Conservation, and Missouri Stream Teams will held its fifth annual "Know Your Watershed Festival" in the Family Center parking lot in Harrisonville, Missouri.

This project addressed two water-quality education goals: providing public education about the adverse impacts of stormwater runoff and water pollution, and inviting elected officials to the festival to be educated as well. The education included actions individuals, local governments and businesses can take to address these issues through presentations, demonstrations and printed information. This project will promoted policies and best management practices by inviting local city and county government officials to the festival.

**GRANTEE PROJECTS**



**Illuminated Waters  
Stone Lion Puppet Theatre**



## TRAININGS

### Webcasts

The committee hosted six webinars by the Center for Watershed Protection in 2017:

- “Stormwater Contaminants of Emerging Concern,” May 3, 2017.
- “Nutrient Trading,” May 24, 2017.
- “Making Urban Trees Count,” June 21, 2017.
- “Modeling for Water Quality,” Sept. 13, 2017.
- “Bringing Better Site Design into the 21st Century,” Oct. 25, 2017.
- “Stream Restoration: Where are we now?” Nov. 29, 2017.

### Stormwater Training

The MARC Water Quality Public Education Committee, in cooperation with Missouri Water Environment Association and Kansas Water Environment Association held the first Greater Kansas City Urban Stormwater Conference on Jan. 23–24, 2017. The conference convened national, regional and local stormwater professionals to discuss the growing issues around stormwater runoff in urban areas. There were 187 registered attendees.



Conference sponsors were Benesch, Black & Veatch, Burns & McDonnell, CDM Smith, and Phronesis. Conference session sponsors were Amec Foster Wheeler, GBA architects engineers, and Olsson Associates. The keynote speaker was Howard Neukrug, retired CEO of Philadelphia Water and principal of CASE Environmental, LLC. Session speakers included professionals in utilities, public works, planning, parks departments, engineering firms, regulatory entities and nonprofit organizations. Sessions included:

- Designing, constructing, monitoring, and maintaining **Green Infrastructure**
- **Stormwater Funding** options and plans.
- **Levee** design, study, accreditation and certification.
- **MS4** programs, audits, and inspection response.
- Regional **CSO** programs.
- **Civil Works** projects and flood mitigation programs.



## PRINTED MATERIALS

### Native Plants and Rain Gardens

- Continued to distribute “Build Your Own Rain Garden” brochure.
- Incorporated “10 Natives for the Kansas City Region” poster into revised “Know your Roots” brochure.
- Continued to distribute Rain gauges designed with native species landscapes as promotional giveaway items.
- Continued to distribute outdoor-rated, “Do Not Mow/Native Planting” signage for BMFs.
- Continued to distribute Black-eyed Susan (*Rudbeckia hirta*) seed packets with “Blue Thumb — Planting for Clean Water” message.

**Pet Waste**

Continued to distribute:

- “Pick Up After Your Pet” brochures.
- Outdoor-rated, “Pick Up After Your Pet” signage to local municipalities.
- Portable, refillable pet waste bag dispensers with “Pick Up After Your Pet” message as promotional giveaway item.

**Lawn Care**

- Continued to distribute “Build Your Own Rain Barrel”, “Redirect or Disconnect Your Downspout”, “Know Your Soil”, “Making and Using Compost” and “Use Lawn Chemicals Wisely” brochures.

**Brochure Translations**

- Continued to use existing supply of Spanish-language brochures.
- Created and distributed double-sided doorhangers (in English and Spanish) as a companion outreach tool for neighbors near stormdrain marker installations.

**General Stormwater Education**

- Continued to distribute stormdrain inlet markers for local municipalities.
- Continued to distribute “Keep Sediment Out of Our Water”, “Know Your Watershed”, “Protect Our Streams” and “Stormdrain Stewardship” brochures.
- Continued to make the committee’s Water Quality Education Program banner available for community events and functions.
- Continued to distribute automotive trash bags with the “Stop Littering” imprinted message.

Item	Quantity
Brochures	4,054
Storm drain markers	450
Portable/car litter bags	75
Pet waste public signage	100
Native planting public signage	90
Seed packets	130
Rain gauges	25
Pet waste bag dispensers	200
<b>Total</b>	<b>5,124</b>

STORMWATER AFFILIATE OFFICE

**PROMOTIONAL ITEMS**



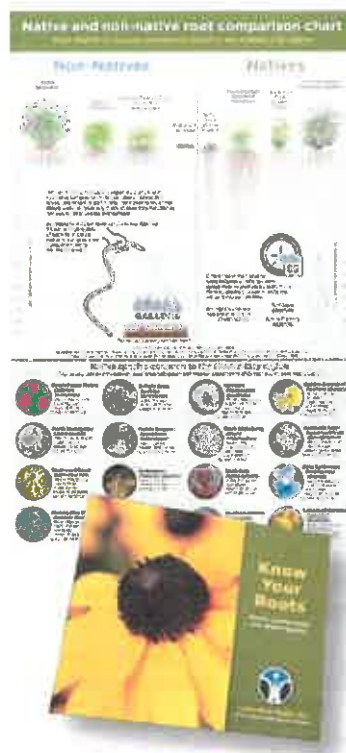
Native Plant Rain Gauge



Seed Packets



Imprinted Auto Trash Bag



Portable Pet Waste Bag Dispenser

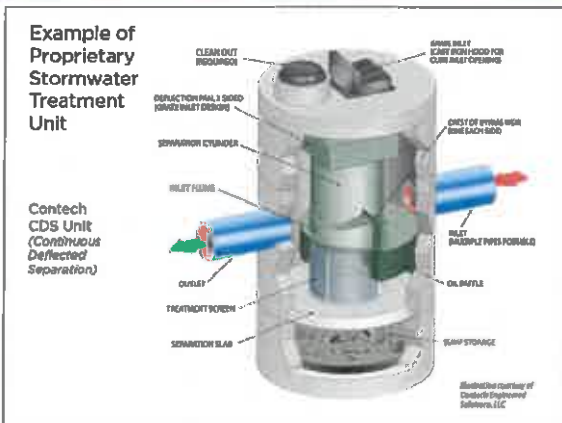
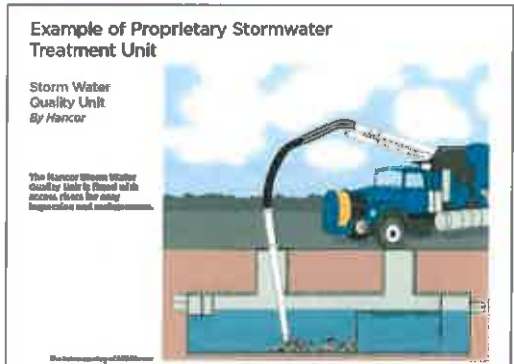
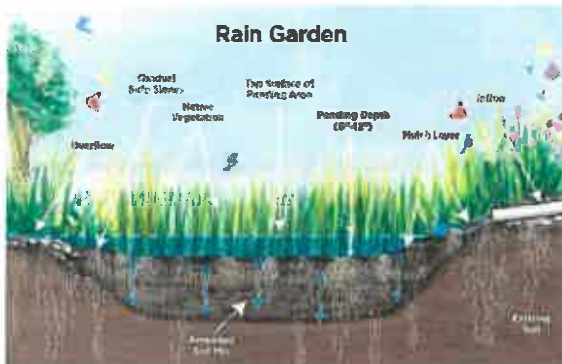
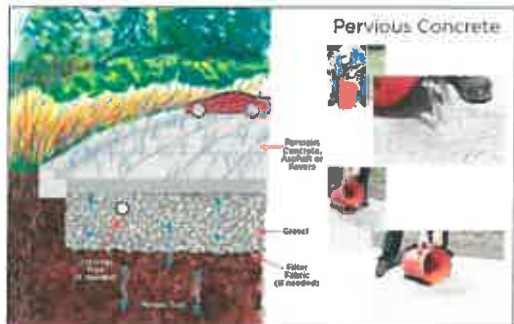
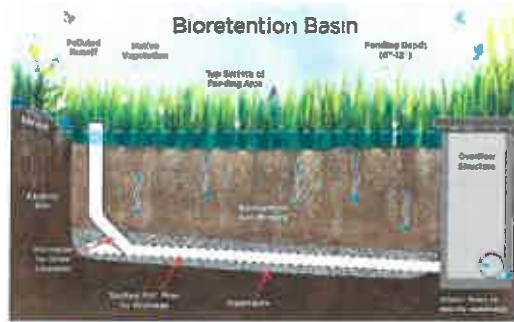
**ADDITIONAL WORK**

*Illustrations of Best Management Practices*

In late 2016, the education subcommittee requested illustrations of key BMPs for use in educational presentations to their citizens. MARC staff developed three illustrations based on plans from the APWA Manual of Best Management Practices for Stormwater Quality, and obtained images of various proprietary stormwater management treatment units from private industry vendors.

*Art Requests in 2017*

- Shared "Pick Up After Your Pet" brochure with the city of Allentown, Pennsylvania, and the city of Port St. Lucie, Florida.
- Shared "Keep Sediment out of Our Water" brochure with the city of Mt. Vernon, Washington.
- Shared "Know Where Water Flows" content and illustrations with AECOM's Environmental Services department for outreach and education.



## FUNDING

In January 2017, MARC submitted a program funding request to local governments for \$165,000. During the course of the year, 20 local governments supported the program. Participating governments are listed below.

## PARTICIPATING GOVERNMENTS

Clay County, Missouri	Lee's Summit, Missouri
Excelsior Springs, Missouri	North Kansas City, Missouri
Gladstone, Missouri	Overland Park, Kansas **
Independence, Missouri	Recliar, Missouri
Jackson County, Missouri	Platte County, Missouri
Johnson County, Kansas *	Raymore, Missouri
Kansas City, Missouri	Raytown, Missouri
Lake Lotawana, Missouri	Weatherby Lake, Missouri
Lake Waukomis, Missouri	Unified Government of Wyandotte County /
Liberty, Missouri	Kansas City, Kansas**
Lenexa, Kansas **	

*\*(Contributes for all Johnson County cities and unincorporated areas)*

*\*\* (Contributes additional funding above standard per capita rate)*

## WQEG COMMITTEE CO-CHAIRS

Lara Isch, Water Quality Educator  
KC Water Services,  
City of Kansas City, Missouri

Heather Schmidt, Water Quality Specialist  
Public Works and Infrastructure,  
Johnson County, Kansas

## MARC STAFF

Tom Jacobs, Director of Environmental Programs  
Alecia Kates, Water Quality Planner II  
Kym Bledsoe, Public Affairs Coordinator  
Nordia Epps, Public Affairs Coordinator  
Carmellya Anderson, Marketing Coordinator II,  
Government Training Institute  
Kitty Steffens, Environmental Planning Intern

## CONTACT

To learn more about the MARC Regional Water Quality Education Committee, contact Alecia Kates at [akates@marc.org](mailto:akates@marc.org) or 816-701-8233



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[www.marc.org/water](http://www.marc.org/water)