

**National Pollutant Discharge
Elimination System (NPDES)
Municipal Separate Storm Sewer System
(MS4) Permit MO-0130516
Twelfth Year Report
May 2016 – April 2017**



Submitted by
KC Water
4800 East 63rd 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	the City of Kansas City, Missouri
COD	Chemical oxygen demand
EMC	Event-mean concentration
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	MO 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
USGS	U.S. Geological Survey
WRDA	Water Resources and Development Act

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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



Date

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 twelve reports covering the period from September 3, 2004 to April 30, 2016, to Missouri Department of Natural Resources. This current report covers the period of May 1, 2016 - April 30, 2017. 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).

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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, 2016 and April 30, 2017.

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:

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

Table 1. *The new area plans addressing stormwater and sustainability*

Area plan	Completion/ adoption date	Low-impact development (or redevelopment), stormwater-related vision/principle/recommendation
Red Bridge Area	2017 (approved)	Integrate green elements and sustainable approaches to stormwater management, energy efficiency, alternative energy production, and sustainable building materials
West Bottoms Streetscape and Wayfinding	2016 (draft)	Leverage planned green infrastructure implementation by including additional district infrastructure and streetscape needs surrounding projects

Specific effort to address watershed development. The Watershed Planning Group of KC Water Department (KCW) is generating a model incorporating multiple indices (*e.g.* erosion hazard zones, flow characteristics) to delineate appropriate riparian buffer width for each individual segment of the 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. This a pilot project that may be utilized as a component of comprehensive wet weather mapping throughout the City.

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 the City Planning and Development Department continues to utilize the adopted American Public Works Association (APWA) standards and supplements, including the *Manual of Best Management Practices for Stormwater Quality* and compliance with stream buffer regulations during review and permitting of new development and redevelopment. 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 requirements. 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 below)

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

Permit Ref.	Task	Activities
1a.	Incorporate water quality considerations for areas of new development and redevelopment.	<i>The Review Process</i> 238 reviews of development applications
	(1) in land use planning, subdivision approval, and site plan review and approval	374 reviews of construction projects
	(2) in project review and approval for new development and significant redevelopment	47 BMP facilities installed
		59 pre-application development assistance sessions with development stakeholders
1a.i & ii	Improve procedures for incorporating water quality concerns as part of the permitting process	44 BMPs easements reviewed
1a.ii.	Upgrade the site development review standards	25 Covenants for Maintenance reviewed
1a.ii.	Internal and external education on review standards and process	
1a.iii.	Set up minimum design criteria for structural BMPs	
		15 public detention (or retention) basins inspected and maintained, as needed
1b.	Inspect and maintain post-construction BMPs	180 private detention basins inspected
		15.5 acres of green solution sites 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. While the City is working on funding for the construction, the Engineering Group of KCW and the LDD of the City Planning and Development Department 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 solution sites, allowing them to function at an optimal level. Currently, KCW maintains a total of 15.5 acres of green solutions footprint, which include, but are not limited to, rain gardens, bio-retention cells, detention basins, and permeable pavements.

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.

BMPs Evaluation. BMPs evaluation were conducted for development plans and BMPs easements, 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)

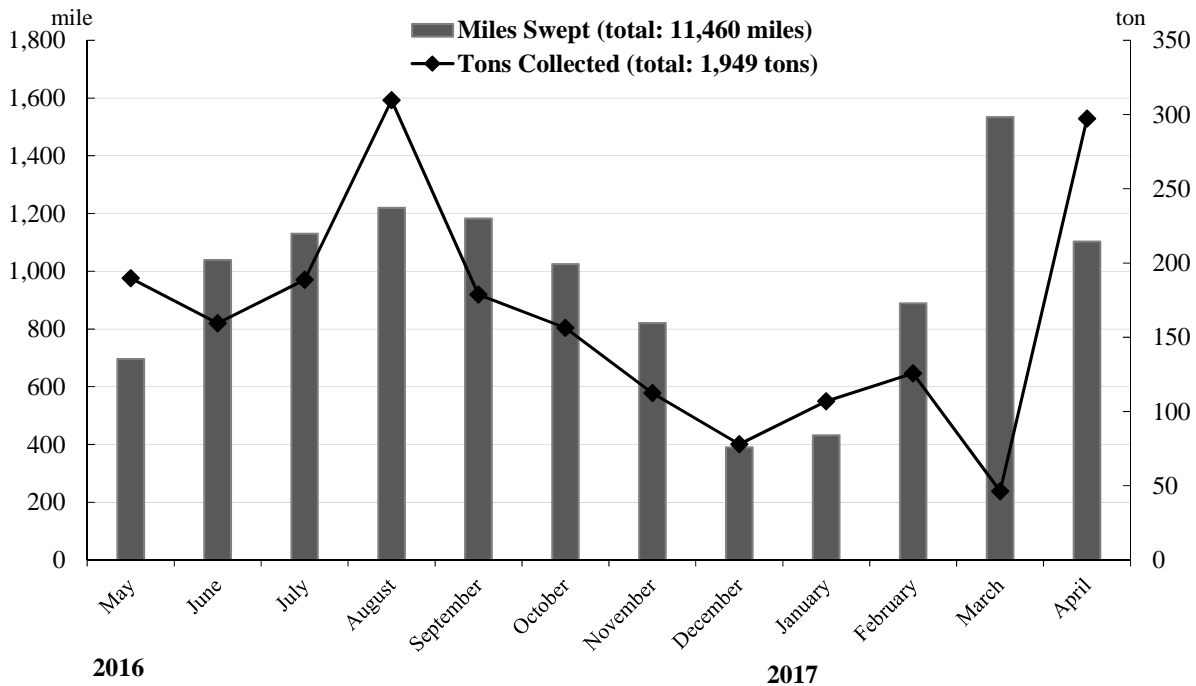
The City's Public Works Department (PWD) has deicing chemical and material storage facilities at each of its three districts and two outlying salt storage facilities. The facilities vary in size and their storage capacities range from 6 to 12 thousand tons. Rock salt is stored in dome structures at three 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 "Cover-All" 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 280,000 gallons of salt brine, 4,860 gallons of liquid calcium chloride, and 22,544 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 (below) provides the performance measurements.

Figure 1. Monthly record of street sweeping for FY 2016/17



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 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 13,000 tons of yard waste was recovered at three drop-off centers. In addition, 4,188 tons of yards waste was collected during the seasonal curbside collections during this reporting period. Collected material is used to create mulch and compost for reuse.

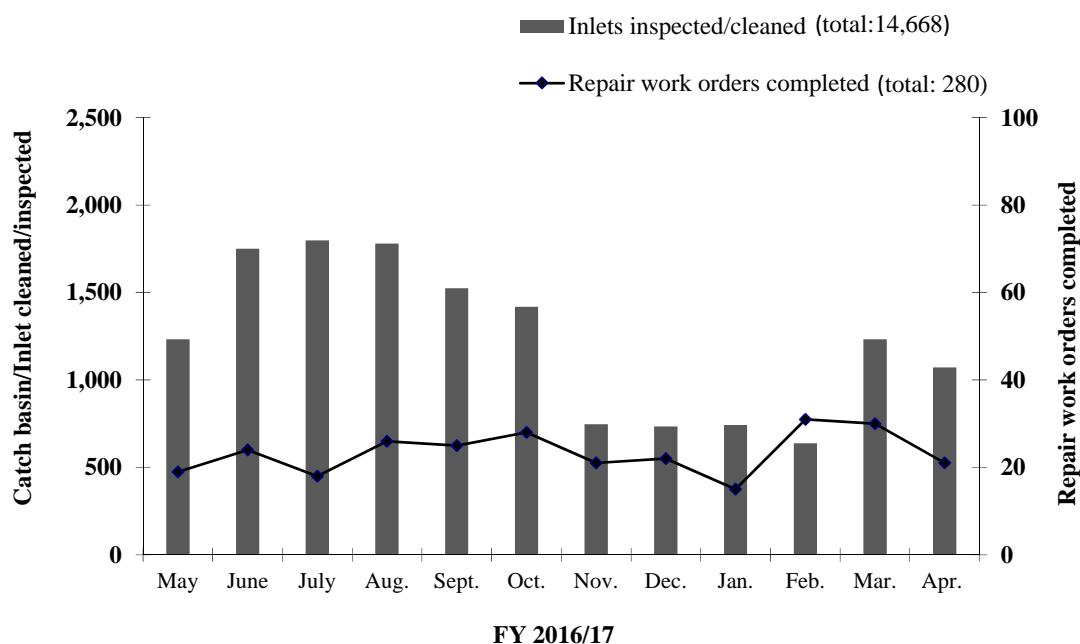
C. Permit Ref. III.A.2c (Status Ongoing)
Storm sewer maintenance

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. The group inspected and cleaned, as needed, 14,668 storm inlets, and completed 280 repair work orders (Figure 2). This work is seasonally dependent.

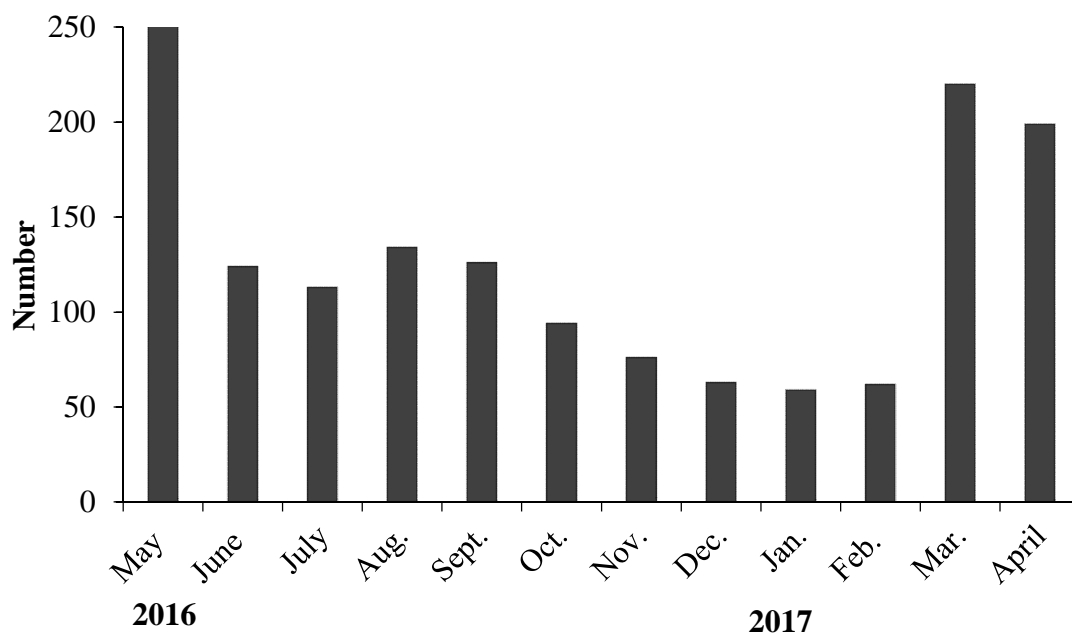
Additionally, the group strengthened its staffing resources and expertise to meet the maintenance demand related to the use of green infrastructure as an alternative to conventional stormwater concrete infrastructure.

Figure 2. Monthly record of storm sewer structure maintenance for FY 2016/17



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 1,610 requests for service or maintenance of catch basins and other stormwater inlets (Figure 3).

Figure 3. Record of requests for services on catch basins/inlets through the City's 3-1-1 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: Missouri Interceptor. The two-year project is scheduled to be completed by July 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.

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. While work is continuing, 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 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. Scheduled for completion in March 2018, the bank

stabilization project will protect the streambank and convey energy downstream. This will greatly reduce high energy scour and debris (trash and trees) transport further downstream.

The Kansas Citys' (Seven) Levees.

Phase 2 of the feasibility study began in 2007 for the Kaw Valley drainage district units of Armourdale, Kansas and the Central Industrial District in Kansas and Missouri. The feasibility study for Phase 2 was completed in 2014.

B. Permit Ref. III.A.3b (Status: Ongoing)

Evaluate new flood control projects

Brush Creek Improvements. A multipurpose watershed approach is being used to consider opportunities for further flood damage reduction, environmental ecosystem restoration, water quality improvement and compatible recreation along the entire Bi-State Brush Creek Watershed. The Bi-State Brush Creek Feasibility Study is being prepared by KCW and Johnson County, Kansas in conjunction with the Corps of Engineers and with facilitation assistance from Mid-America Regional Council (MARC).

Through the Brush Creek Coordinating Committee and in conjunction with the Bi-State Brush Creek Feasibility Study, four action teams have been formed.

1. Environmental (E-Team)
Creating an environmental model of the entire watershed to evaluate the effectiveness of solutions to justify federal funding and optimize water quality benefits
2. Project Team
Formulating solutions for the Bi-State reach, the Lower Brush Creek reach, and, in Johnson County, Kansas BMP education
3. Watershed Management Plan Team
Facilitate the EPA through its Urban Waters Initiative designation given to Kansas City, Missouri and 17 other communities – Drafting a Watershed Management Plan
4. Communications Team
Managing and disseminating information on the Brush Creek watershed and communicating ongoing projects and activities in the watershed. Also maintains the website www.brushcreekwatershed.com.

During this reporting period, the Bi-State Reach plan has been optimized and a Section 1135 Feasibility Report is planned to be completed by the end of 2017 so as to transition the project into the Corps' Continuing Authorities Program. The Bi-State Reach plan is an ecosystem restoration project that includes flood risk reduction measures.

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 Army Corps of Engineers to complete a study that examined strategies to reduce and in some cases eliminate combined sewer overflows; the study was completed in 2016. Additional study scoping is currently underway to

better promote water quality BMPs, and to further incorporate habitat restoration throughout the watershed.

- Blue River Maintenance. 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 Study: An ongoing study with the Army Corps of Engineers continued to look at flood risk reduction measures and water quality improvements maximizing 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 landfill; (3) fill material exposure; and (4) evaluate continued active seepage present at this landfill. The inspection results are documented and further investigations will be undertaken, if warranted. The 87th Street Landfill inspections were performed monthly during the reporting period with the ongoing construction of a pump station.

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

Site Construction Activities

KCW is nearing the completion of the upgrades on the wastewater pumping station located at the 87th Street site. The upgrade entails 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, prior to the beginning of the excavation activities. The excavation into the fill area has been backfilled. OEQ will continue to perform periodic monitoring of the exterior construction activities until the project has been completed.

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 87th 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 landfill 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 198 facilities: 73 municipal-owned or operated facilities and 125 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.A summary of industrial and high-risk runoff facility programs

Permit Ref.		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> 9 City-owned or operated facilities 30 Non-city-owned or operated facilities <u>General inspection covering stormwater</u> 340 City owned/operated sites ^a <u>Monitoring</u> 2 Event 2 Sites ^b 14 Facilities implementing self-assessment 67 Facilities no-exposure certified <u>Education</u> 21/ 17 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 a not-for-profit organization (Bridging the Gap) to reach out to selected commercial areas for stormwater education
5b.	Update and evaluate the priority list of high-risk runoff dischargers	(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	GIS layers/map	
5c.	Continue the inspection program	(1) Inspect municipal facilities (2) Inspect private facilities	Ongoing	Inspection records and follow up	
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 Completed and reported previously Ongoing	Monitoring results 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	

^a Some sites do not have outdoor operation

^b 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 the 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 (see Table 4 for results)
- Implements the Stormwater Self-Assessment Program at the 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)
Geographical Information System (GIS) Mapping

KCW continues to maintain its GIS database for the facilities in the Inventory and Priority list.

G. 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 for details.

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

Parameter	Unit	Detection (total: 4)	Minimum	Maximum	Range of stormwater runoff*	Number of exceedence
alkalinity	mg/L	4	64	304	NA	NA
biochemical oxygen demand	mg/L	4	9	92	3-21	3
chemical oxygen demand	mg/L	4	44	361	7-803	0
hardness	mg/L	4	114	454	27-580	0
ammonia	mg/L	4	0.44	2.4	ND-1.4	1
oil & grease	mg/L	3	ND	7.7	ND-22	0
phenols	mg/L	0	ND	ND	ND-0.08	0
total suspended solids	mg/L	4	60	71	8-879	0
total dissolved solids	mg/L	4	140	300	22-4,940	0
total solids	mg/L	4	260	860	NA	NA
Ag-Dissolved	mg/L	0	ND	ND	ND-0.0053	0
Al-Dissolved	mg/L	4	0.025	0.03	NA	NA
Cd-Dissolved	mg/L	1	ND	0.0010	ND-0.0017	0
Cr-Dissolved	mg/L	4	0.006	0.014	ND-0.020	0
Cu-Dissolved	mg/L	4	0.005	0.034	ND-0.025	1
Ni-Dissolved	mg/L	4	0.002	0.007	ND-0.019	0
Pb-Dissolved	mg/L	4	0.004	0.012	ND-0.064	0
Zn-Dissolved	mg/L	4	0.02	0.302	ND-0.272	1
Ag	mg/L	0	ND	ND	NA	NA
Al	mg/L	4	0.164	0.84	NA	NA
As	mg/L	4	0.017	0.042	NA	NA
Cd	mg/L	1	ND	0.001	ND-0.002	0
Cr	mg/L	4	0.008	0.013	ND-0.017	0
Cu	mg/L	4	0.006	0.048	ND-0.027	2
Fe	mg/L	4	0.228	1.14	NA	NA
Hg	mg/L	0	ND	ND	ND-0.0002	0
Mg	mg/L	4	2.2	22.4	NA	NA
Mn	mg/L	4	0.052	0.149	NA	NA
Mo	mg/L	3	ND	0.112	NA	NA
Ni	mg/L	4	0.003	0.009	ND-0.017	0
Pb	mg/L	4	0.009	0.013	ND-0.061	0
Zn	mg/L	4	0.03	0.393	0.01-0.448	0

* 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 to year 2008 per Part VI. Monitoring and Reporting Requirements in the MS4 permit.

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 main media campaign during the reporting period focused on the use of native plants to improve water quality through the "Blue Thumb" program. The 2016 native plant outreach campaigns featured "Native Trees and Shrubs" in the fall. See **Section 2. Public Education and Awareness Program** for more details.

Nature First program. The City's partners in restoration and management of natural areas include Bridging the Gap Kansas City, Kansas City Wildlands (KCWL), MDNR, 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's 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, as presented in the previous reports.

City Facility Environmental Inspections. The City conducted 340 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 is used to dispose unused or off-specification PHFs from the City's facilities. Heritage Environmental Services, which is contracted with the City, visits facilities on a monthly basis to remove these materials, as needed. A total of 25,926 pounds of hazardous materials was 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 that were once mowed and irrigated at each 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:

- More than 6,500 acres protected as woodlands throughout the park system
- More than 150 acres in the reduced mowing program
- More than 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. A new rain garden was completed at 48th and Topping, and in cooperation with community partners, native gardens were planted in Loose Park.

BMPs on the City's Lakes. P&R continued to inspect and treat, as necessary, the City lakes following the same procedure 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 and 135 miles of boulevards, parkways, and streets. Except in the effort to save the healthiest Ash trees from the Emerald Ash Borer, the department does not use pesticides in these rights-of-ways. 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, six incidents of illicit discharge or illegal connection were reported 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 210 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

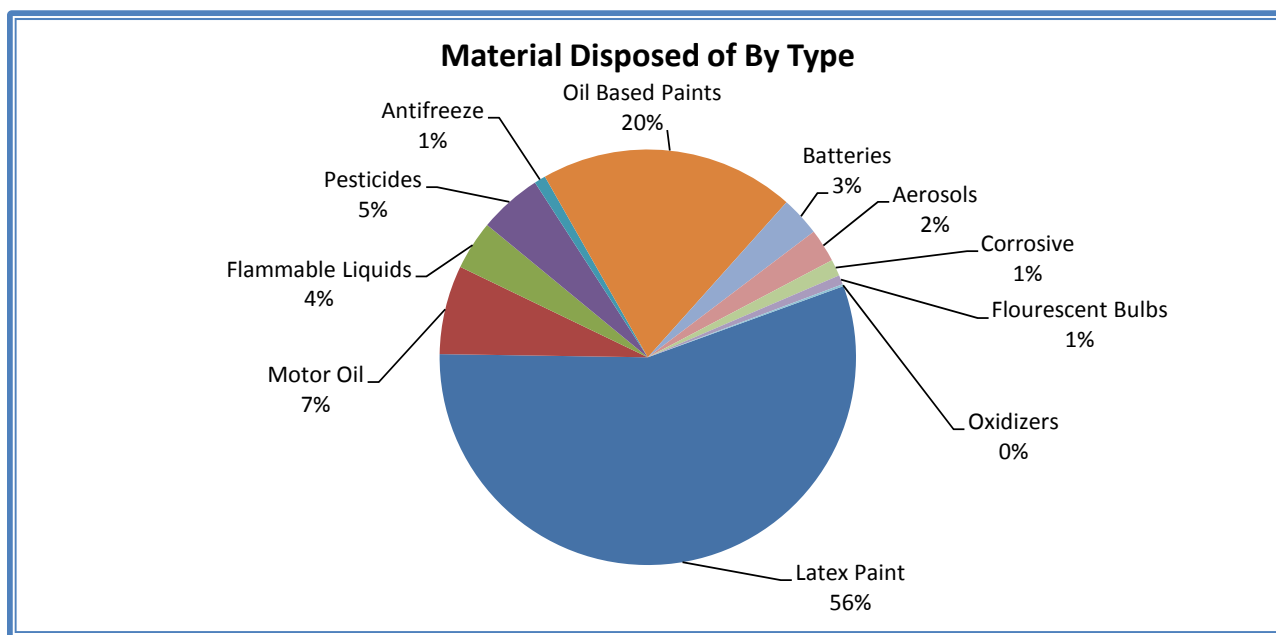
Table 5 (below) provides a summary of several waste management programs that encourage proper disposal, as well as preventing and addressing illegal dumping. In addition to this progress, the following program is of particular note.

Table 5. Achievements through comprehensive waste management programs

Table 3: Achievements on our comprehensive waste management programs		
Quantity		Total
KC Recycles (FY 2016/17)		
609 tons	Community recycling drop-off centers	18,021 tons
17,393 tons	Curbside recycling	
19 tons	Organics collection	
Bulky Items Collection (FY 2016/17)		
6,540 tons	Bulky items	6,559 tons
19 tons	White goods collection	
Leaves and Brush Collection (FY 2016/17)		
13,000 tons	Drop-off site	17,188 tons
4,188 tons	Curbside	
Illegal Dumping Cleanup (FY 2016/17)		
2,591 tons	Material collected	2,591 tons
Neighborhood Cleanup Assistance (FY 2016/17)		
175	Participating home associations	
195	Tires collected or received at drop-off centers	
333	Dumpsters placed	
Household Hazardous Waste (January thru December 2016)		
1,105,561 lbs.	HHW Facility	9,855 vehicles delivering
336,193 lbs.	Mobile Outreach	3,171 vehicles delivering
87,751 lbs.	Swap Shop	\$23,173 saved
		1,441,754 lbs ~721 tons

The HHW Management Program overseen by KCW, consists of three subprograms: drop-off, Swap Shop, and mobile collection events. During the reporting period, the HHW program serviced 91 communities from the 5 counties of the regional solid waste management district and hosted 14 mobile events (See Table 5, Figure 4, and Figure 5, for the scope of the HHW program achievements).

Figure 4. Material by type disposed of by the HHW facility in calendar year 2016
(Provided by R. Fort, KCMO HHW Program Manager)

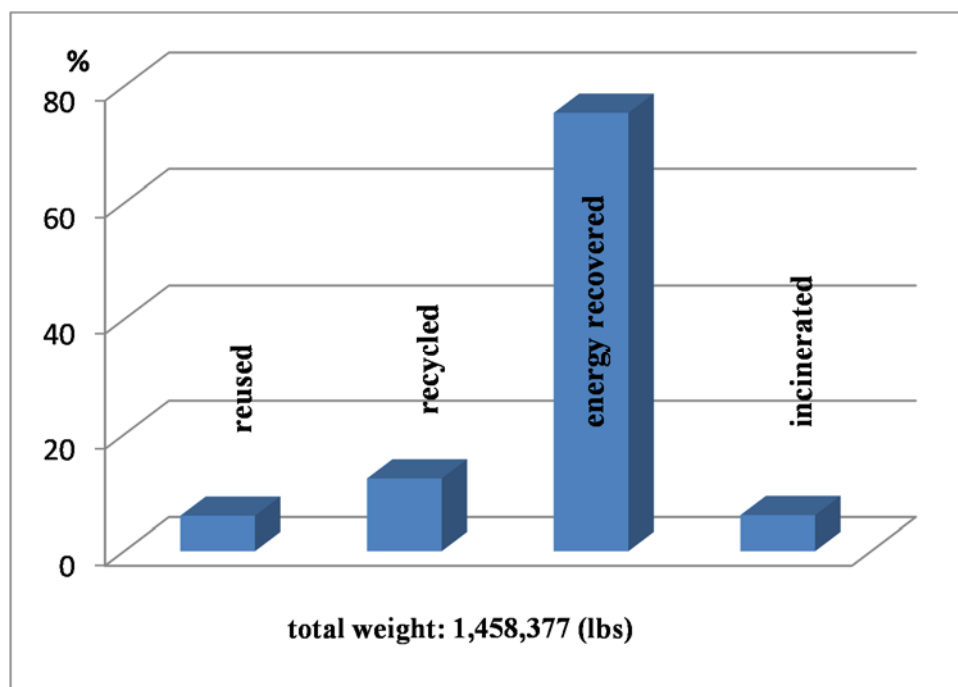


Notes.

Total weight of the materials disposed of (not collected) is 1,340,738 lbs

Total weight counts only the materials that were disposed of and shipped out

Figure 5. Distribution of material managed by HHW facility in 2016 (calendar year)



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

The Fire Department responded to a total of 398 incidents for fluid cleanup (370) or hazardous materials (28) 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

Because some of the projects for the engineering division span different fiscal years, project managers can only estimate their numbers, as reflected in Table 6.

Table 6. Sanitary sewers maintenance performance for FY 16/17

Engineering Division					
Sewers televised/cleaned		Manholes rehabilitated/installed		Sewer line rehabilitated	Sewer repair jobs
46 miles		24/10		29.2 miles	330
Wastewater Maintenance Division					
Sewers televised	Sewers cleaned	Public sewers repaired	Private sewers repaired	Manholes repaired	Stoppages opened
343 miles	592 miles	2,224 ft	4,820 ft	197	174

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 7). 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 7. Stormwater features in the GIS database

	Stormwater inlets	Paved ditch	Detention basin	Swale
City owned or has easement	45,572	177	14*	81
Privately owned	9,325	24	307	2
Ownership to be determined	78	25	0	4
Abandoned	9	0	0	0
State owned (MODOT)	124	26	0	0
TOTALS	55,108	252	321	87

Data as of 6/8/2017, and based on the 2016 Orthophoto

* The majority of this group was, in the previous year report, included in the Category of City owned or has easement due to a misassignment (or by default) of attributes in the GIS system.

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 (≥ 1 acre). The City continued to use the KIVA system to track active private development construction sites. During this report period, there were 98 new site disturbance permits issued, 60 closed, and 157 active site disturbance permits.

City construction projects (≥ 1 acre). The KCW tracks projects (≥ 1 acre) that are constructed by City departments under the City's general operating permit. There were 36 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 the City Planning and Development Department is responsible for inspection of site disturbance activities (≥ 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 2,139 inspections of site disturbance activities on private development projects during this reporting period.

For privately-funded construction projects (< 1 acre), the Division of Inspections in the City Planning & Development Department conducted 6,631 erosion control inspections.

City-funded 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 275 inspections were conducted.

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

Table 8 summarizes the training provided to City employees.

Table 8. A summary of education and outreach on erosion and sediment control

Employee Education				
Training Providers	Content	Dates	# Attendees per session	Work background of attendees
City Planning and Development	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	Fall 2016	1	Field inspectors
Stormwater One (online)	SWPPP Preparation and Inspection Certification	Summer 2016	1	Project manager
Online training (Forester University, Stormwater One, River Network) OCP workshop Mid-American Regional Council	Five different sessions 1. The Evolution of Stormwater Monitoring Strategies 2. Assessing Limitations of BMPs to Design Effective Sediment Containment Systems 3. Post-Construction BMP Workshop 4. Qualified Compliance Inspector of Stormwater (QCIS) Recertification (2016) 5. Green Streets: filtering & slowing stormwater, revitalizing neighborhoods & making streets safer	During the reporting period	1	Environmental Compliance Officer

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 and 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 2,200 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, the City Planning & Development Department's Division of Investigations conducted 20 investigations, sent 15 notices of violation, and wrote 6 tickets with no 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 the Table below.

Table 9. *A summary of public education and outreach efforts*

Programs/Partnerships	Achievement during the report period
KC Green	<ul style="list-style-type: none"> The City's KC Green Team partnered with Science City, EPA, and the Paseo Academy for the Environment expo. Over 150 youth and adults played Stormwater Plinko to learn about litter's effect on water quality and made environmentally themed buttons to show their commitment to protecting the earth and its resources. The KC Green Team hosted <i>Hard to Recycle Item</i> events on November 5, 2016 and April 22, 2017. The event allowed residents to get rid of items (such as, batteries, glass, electronics, etc.) that cannot be recycled curbside through the City's regular services to help prevent illegal dumping. Over 1,000 residents participated in the two events, disposing of nearly 75 tons of hard to recycle items.
Water Education for Kansas City (WE KC Program)	<ul style="list-style-type: none"> The program facilitated 8 litter pickups and 16 watershed educational events, reaching a total of 1,061 students.
Water Quality Small Grant Program	<ul style="list-style-type: none"> In 2016, Water Services launched the Program to support local non-profits in projects and activities related to water quality protection, improvement, and education within the city limits of Kansas City, Missouri. The following organizations received the grants: <ol style="list-style-type: none"> Blue River Watershed Association (BRWA); funding to teach the Teaching Rivers in an Urban Environment program in 10 middle schools Bridging the Gap; funding to outreach to businesses for stormwater education) Friends of Kaw Point Park; funding to set up a hydrocaching project in the City Healthy Rivers Partnership/ Little Blue River Watershed Coalition; funding for <i>Project Blue River Rescue</i> with 961 volunteers, about 50 tons of trash and 1,397 used tires collected and disposed of from 23 worksites, and 1,000 trees/shrubs

	<p>planted on April 1, 2017, <i>Big Muddy Clean-up</i> with 128 volunteers, 6 tons of trash, 29 tires and 2 tons of scrap metal collected on October 2, 2016 and <i>Art and Science on the River</i>)</p> <ol style="list-style-type: none"> 5. Little Blue River Watershed Coalition; funding for <i>Blue at the Zoo</i> with 10 educational booths and 250 attendees 6. <i>Missouri River Watershed Festival</i> with 24 educational booths and 360 students from six schools 7. StoneLion Puppet Theater; funding for 18 educational puppet shows and 5 carnival water festivals reaching out to a total of 5,475 students
Stormwater: From KC to the Sea	<ul style="list-style-type: none"> • Stormwater curriculum was taught to a total of 3,758 students (4th to 6th grades) from 45 schools in 9 different school districts. • The curriculum won an <i>Excellence in Communications Award</i> from the National Association of Flood and Stormwater Management Agencies in September 2016
Stormwater Plinko	<ul style="list-style-type: none"> • Stormwater Plinko, an educational tool, was played at 13 outreach events, reaching over 1,300 people
The Regional Water Quality Public Education Program (Mid-America Regional Council)	<ul style="list-style-type: none"> • The KCW continues to be a leading stakeholder for this program. • This 2016 primary media campaign focused on the use of native plants to improve water quality through the <i>Blue Thumb</i> program. The outreach campaign featured <i>Leisurely Landscaping</i> and <i>Native Trees and Shrubs</i>, it specifically targeted homeowners, local governments, contractors, and those interested in gardening, landscaping, and green living in the region. The campaign received 5,249,734 estimated gross impressions through online ads and social media. • The program hosted the Kansas City Urban Stormwater Conference in January 2017. The conference drew attendees from local governments, state agencies, and the consulting community. • For more details, go to http://www.marc.org/Environment/Water-Resources/pdfs/WQEC_Annual_Rpts/Water_Quality_Ed_Program_AnnualReport_2016-web.aspx
Teacher Resource Day	<ul style="list-style-type: none"> • KCW participated in this event hosted by Science Pioneers on Jan. 28, 2017. The event allows K-12 teachers to learn about hands-on learning opportunities for their students. • KCW gave out information on the <i>KC to the Sea</i> curriculum and the <i>WE KC</i> water quality education program.

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, 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. Composite samples were collected using ISCO Avalanche Portable Refrigerated Samplers for the first three hours of the discharge (12 aliquots taken every 15 minutes).

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 July 2016 through April 2017. Table 10 (below) 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 0.10 inch to more than 4 inches (Figure 6 below). Runoff from the sampled storm events at the sampling sites ranged from 16,300 to 812,400 cubic feet and was estimated based on the storm magnitude and the size and land use of the drainage areas.

Grab samples were collected during the first two hours of the discharge. These samples 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. Time-based composite 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 10. *A summary of sampled storm event characteristics*

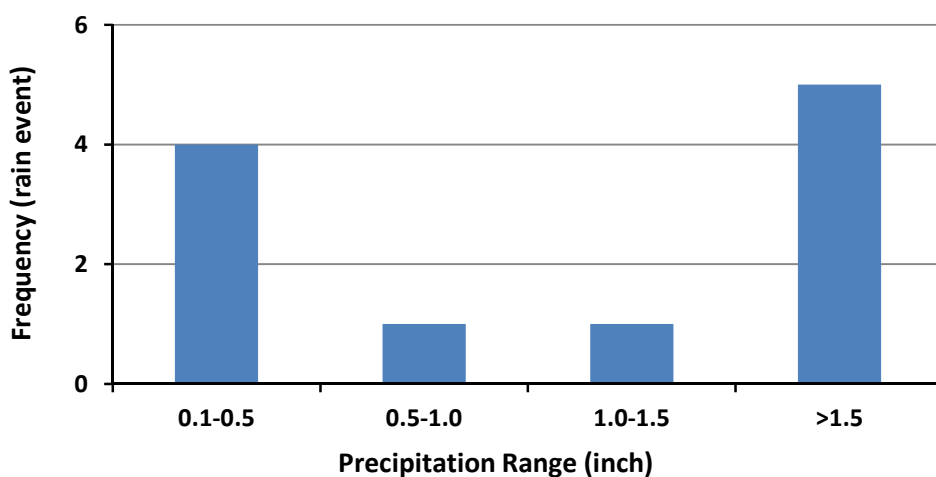
Site ID	Location	Storms Sampled (#)	Rainfall Range (inches) ^a	Range of Runoff (est. cubic feet) ^b
#801	SE 50th Terr. & Sterling	0	NA	NA
#802	SE Wyandotte & 135 th St.	2	0.30-1.66	16,300-90,100
#803	NW 107 Terr. & Pomona	4	0.10-4.35	18,700-812,400
#804	49 th St & N. Highland	1 ^c	0.75	39,500
#805	133 rd St. & Inverness	2	0.30-1.91	16,800-106,900
#806	Barry Rd. & I-29	2	1.40-1.64	183,000-214,300

a. Rainfall data obtained from rain gauges installed at individual sampling stations

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*, 9th edition, pg. A-45.

c. The requirement for three samplings at each site was only fulfilled at one of the six sites, outfall #803.

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



B. Permit Ref. VIA.1 (Status Completed)
Summary of Storm Event Data

Tables 11 and 12 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 13 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.*, α -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 was the only compound detected in one or more samples
 - Di(2-ethylhexyl)phthalate (#802, #804, #805)under each land use category
- Metals were detected in every sample
 - Chromium, copper and zinc in both dissolved and total recoverable forms
 - Lead in total recoverable form
 - Nickel in total recoverable form and lead and nickel in dissolved form 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 and silver in dissolved form were infrequently detected

Table 11. 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	NA	NA	ND-0.2	0.10	ND-1.1	0.34	11	5	0.13
Conductivity (Lab)	μS/cm	281	NA	68-494	202	95-2,002	803	11	11	NA
Dissolved oxygen	mg/L	8.9	NA	7.6-9.8	8.5	7.6-11.8	9.2	11	11	NA
pH	S.U.	7.7	NA	7.6-8.1	7.8	7.6-8.1	7.7	11	11	NA
Total Alkalinity	mg/L	73	NA	22-76	46	39-114	66	11	11	NA
Total Hardness	mg/L	216	NA	60-260	119	80-348	144	11	11	NA
Chemical Oxygen Demand	mg/L	138	NA	28-74	47	32-173	72	9	9	6.25
Biochemical Oxygen Demand (5-day)	mg/L	24	NA	4-11	8	4-9	7	8	8	2
Turbidity (Lab)	NTU	137	NA	5-55	27	11-169	50	11	11	0.011
Total Dissolved Solids	mg/L	200	NA	46-500	197	64-420	232	11	11	1
Total Suspended Solids	mg/L	120	NA	13-42	25	24-91	48	11	11	1
Volatile Suspended Solids	%	24	NA	17-48	34	15-47	32	11	11	NA
Nitrate+Nitrite	mg/L	0.605	NA	0.068-0.926	0.368	0.148-1.160	0.736	11	11	0.027
Nitrogen, total Kjeldahl	mg/L	4.1	NA	1.0-3.0	2.1	1.5-3.7	2.3	10	10	0.283
Oil & Grease	mg/L	1.7	NA	ND-4.0	1.93	ND-2.9	1.6	11	7	1.4
Phenols	mg/L	ND	NA	ND	NA	ND	NA	11	0	0.002
Phosphorus, total	mg/L	0.73	NA	0.10-0.25	0.18	0.12-0.61	0.39	11	11	0.016
Phosphorus, dissolved	mg/L	0.46	NA	0.10-0.18	0.13	0.10-0.29	0.20	11	11	0.016
Fecal Coliform	cfu/100 mL	4,884	NA	1,860-9,804	5,506	1,236-26,500	10,134	11	11	NA
E. Coli	MPN/100 mL	6,867	NA	1,580-6,488	4,379	1,850-15,531	7,366	11	11	1
Cadmium, dissolved	mg/L	ND	NA	ND	NA	ND	NA	11	0	0.00011
Chromium, dissolved	mg/L	0.002	NA	0.001-0.005	0.004	0.002-0.004	0.003	11	11	0.00026

Constituent	Units	Residential		Commercial		Industrial		Result Count	Detect Count	MDL**
		EMC Range	Avg.*	EMC Range	Avg.*	EMC Range	Avg.*			
Copper, dissolved	mg/L	0.004	NA	0.003-0.012	0.006	0.002-0.006	0.004	11	11	0.00053
Lead, dissolved	mg/L	ND	NA	ND-0.002	0.002	ND-0.004	0.002	11	6	0.00214
Nickel, dissolved	mg/L	0.002	NA	ND-0.001	0.0004	ND-0.002	0.0008	11	5	0.0004
Silver, dissolved	mg/L	ND	NA	ND***	NA	ND	NA	11	0	0.00074
Zinc, dissolved	mg/L	0.012	NA	0.010-0.029	0.016	0.014-0.061	0.032	11	11	0.00016
Cadmium, total	mg/L	ND	NA	ND	NA	ND	NA	11	0	0.00011
Chromium, total	mg/L	0.002	NA	0.001-0.005	0.004	0.002-0.004	0.003	11	11	0.00026
Copper, total	mg/L	0.004	NA	0.003-0.012	0.006	0.002-0.006	0.004	11	11	0.00053
Mercury, total	mg/L	0.0002	NA	ND-0.0002	0.0001	ND-0.0002	0.00004	11	3	0.000025
Lead, total	mg/L	0.01	NA	0.003-0.004	0.003	0.002-0.006	0.004	11	11	0.00214
Nickel, total	mg/L	0.006	NA	ND-0.002	0.0013	0.001-0.006	0.002	11	10	0.0004
Silver, total	mg/L	ND	NA	ND	NA	ND-0.001	0.0005	11	1	0.00074
Zinc, total	mg/L	0.062	NA	0.024-0.067	0.038	0.038-0.226	0.087	11	11	0.00016
Semi volatile organic compounds and pesticides (detected)										
Di(2-ethylhexyl)phthalate	µg/L	15.7	NA	ND-8.88	4.61	ND-2	0.74	11	4	0.84

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

Constituent	Result Count	Detect Count	MDL *
Pesticides			
a-BHC	11	0	0.47
4,4'-DDE	11	0	0.62
4,4'-DDT	11	0	0.72
Methoxychlor	11	0	0.68
Dieldrin	11	0	0.62
Semi-volatile organics			
1,2,4-Trichlorobenzene	11	0	0.87
1,2-Dichlorobenzene	11	0	0.94
1,2-Diphenylhydrazine	11	0	0.8
1,3-Dichlorobenzene	11	0	0.58
1,4-Dichlorobenzene	11	0	0.58
2,4,5-Trichlorophenol	11	0	1.7
2,4,6-Trichlorophenol	11	0	1.8
2,4-Dichlorophenol	11	0	2.3
2,4-Dimethylphenol	11	0	1.8
2,4-Dinitrophenol	11	0	2.8
2,4-Dinitrotoluene	11	0	1.4
2,6-Dinitrotoluene	11	0	1.2
2-Chloronaphthalene	11	0	0.69
2-Chlorophenol	11	0	2.4
2-Methylnaphthalene	11	0	1.3
2-Methylphenol(o-Cresol)	11	0	1.6
2-Nitroaniline	11	0	2
2-Nitrophenol	11	0	1.9
4-Chloroaniline	11	0	2.5
4-Chlorophenyl phenyl ether	11	0	0.9
4-Methylphenol	11	0	1.3
4-Nitrophenol	11	0	0.96
Acenaphthene	11	0	0.82
Acenaphthylene	11	0	1.1
Anthracene	11	0	0.74
Benzo(a) anthracene	11	0	1.3
Benzidine	11	0	1.6
Benzo(a) pyrene	11	0	1.5
Benzo(b) fluoranthene	11	0	1.9
Benzo(ghi) perylene	11	0	1.2
Benzo(k) fluoranthene	11	0	1.9
Butyl benzyl phthalate	11	0	1.3
Carbazole	11	0	1.8
Chrysene	11	0	1.3
Di(2-ethylhexyl)phthalate	11	4	0.84
Di-n-butyl phthalate	11	0	1.1
Di-n-octyl phthalate	11	0	0.74
Dibenz(a,h)anthracene	11	0	1.7
Diethyl phthalate	11	0	0.99
Dimethyl phthalate	11	0	1.4
Fluorene	11	0	1.1
Fluoranthene	11	0	1.2
Hexachlorobenzene	11	0	0.91
Hexachlorobutadiene	11	0	0.7
Hexachlorocyclopentadiene	11	0	0.33
Hexachloroethane	11	0	0.77
Indeno(1,2,3-cd) pyrene	11	0	1.6
Isophorone	11	0	1.5
N-Nitrosodi-n-propylamine	11	0	1.4
Naphthalene	11	0	1
Nitrobenzene	11	0	1.4
Pentachlorophenol	11	0	3.4
Phenanthrene	11	0	1.2
Phenol	11	0	0.78
Pyrene	11	0	1.2
bis(2-Chloroethoxy)methane	11	0	1.3
bis(2-Chloroisopropyl)ether	11	0	1

*MDL: method detection limit

Table 13. *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	0.07	NA	0.03-1.0	0.4	0.03-4.6	1.4
Total Hardness	kg	242	NA	124-364	273	73-1,886	616
Chemical Oxygen Demand	kg	154	NA	35-231	117	29-352	141
Biochemical Oxygen Demand (5-day)	kg	27	NA	5-26	14	4-44	15
Total Alkalinity	kg	82	NA	36-243	143	44-897	297
Total Dissolved Solids	kg	224	NA	139-789	439	157-2,300	833
Total Suspended Solids	kg	134	NA	10-255	106	14-1,265	349
Volatile Suspended Solids	1E+04 kg	27	NA	20-164	104	20-345	132
Nitrite+ Nitrate	kg	0.68	NA	0.21-1.56	0.84	0.34-13.29	3.5
Nitrogen, total Kjeldahl	kg	4.58	NA	1.09-15.54	7.17	1.00-85.10	21.9
Oil & Grease	kg	1.9	NA	1.9-11.9	5.0	0.9-46.0	10.2
Phenols	kg	0.001	NA	0.0005-0.0061	0.004	0.0005-0.0230	0.007
Phosphorus, total	kg	816	NA	95-1,517	669	281-3,190	1,413
Phosphorus, dissolved	kg	514	NA	62-1,092	494	115-2,530	972
Fecal Coliform	1E+06 cfu	54,615	NA	23,229-594,792	239,489	17,073-2,914,585	838,173

Constituent	Units	Residential		Commercial		Industrial	
		Range	Average	Range	Average	Range	Average
E. Coli	1E+06 MPN	76,790	NA	27,557-393,616	164,573	20,504-1,708,167	581,584
Cadmium, dissolved	g	0.06 NA	NA	0.03-0.33	0.2	0.03-1.3	0.4
Chromium, dissolved	g	2.2	NA	2.4-25.9	13.9	1.1-46.0	17.4
Copper, dissolved	g	4.5	NA	5.7-18.2	13.6	2.3-46.0	17.4
Lead, dissolved	g	1.2	NA	1.0-6.51	4.8	0.5-69.0	16.1
Nickel, dissolved	g	2.2	NA	0.5-1.2	0.8	0.5-4.6	1.8
Silver, dissolved	g	0.4	NA	0.2-2.3	1.4	0.2-8.6	2.5
Zinc, dissolved	g	13	NA	14-63	43	20-529	145
Cadmium, total	g	0.06	NA	0.03-0.33	0.2	0.03-1.30	0.4
Chromium, total	g	7.8	NA	2.9-42.5	19.9	1.6-92.0	31.4
Copper, total	g	12.3	NA	8.1-31.1	21.9	3.7-92.0	30.0
Mercury, total	g	0.22	NA	0.04-0.10	0.07	0.01-0.28	0.10
Lead, total	g	11.2	NA	1.4-24.3	12.6	1.6-92.0	22.6
Nickel, total	g	6.7	NA	0.6-12.1	4.7	1.1-46.0	11.3
Silver, total	g	0.4	NA	0.2-2.3	1.4	0.2-8.6	2.7
Zinc, total	g	69	NA	32-206	114	38-1,288	379
Semi volatile organic compounds and pesticides (detected)							
Phenol	g	0.44	NA	0.1-2.37	1.44	0.18-8.97	2.59
Di(2-ethylhexyl)phthalate	g	0.55	NA	0.24-3.00	1.83	0.23-11.38	3.3

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 January and April 2017, respectively. 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. All sampling sites are shown in Figure 7.

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 13 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 available 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, except the ammonia value of one sample (Brush Creek, taken on April 10, 2017). The ammonia value was 0.66 mg/L, exceeding the criterion 0.5 mg/L. 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), most of the results were below individual detection limits, except for the following samples detected in trace amounts: one sample (Searcy Creek, taken on January 18, 2017) with both DDT (0.520 µg/L) and Endrin Aldehyde (estimated at 0.400 µg/L) detected; one sample (Hickman Mills Creek, taken on 1/19/2017) with Endrin Aldehyde (estimated at 0.473 µg/L) detected; and one sample (Brush Creek, taken on 1/19/2017) with Di(2-ethylhexyl)phthalate (estimated at 2.14µg/L) detected (Table 14).

Table 14. A summary of physicochemical data for the streams monitored in dry weather

Parameter	Unit	Detection limit	Total number	Number of detection	Frequency of detection (%)	Minimum	Maximum	Median ¹	Criteria ²	
Air Temperature	°C	NA	22	22	100	5.2	23.6	11.1		
Water Temperature	°C	NA	22	22	100	0.4	19.7	7.9	32	
Conductivity	ms/cm	NA	22	22	100	0.562	2,519	1		
Dissolved Oxygen	mg/L	NA	22	22	100	6.2	16.5	12.5	5	
pH	S.U.	NA	22	22	100	7.6	9.1	8.6		
Turbidity (field)	NTU	NA	22	22	100	0.0	52236.8	3.3		
Turbidity (Lab)	NTU	0.01	22	22	100	2.1	354	6.75		
Alkalinity, total	mg/L	0	22	22	100	96	281	212.5		
Biochemical oxygen demand 5-day	mg/L	2	22	7	32	ND	38	1		
Cl	mg/L	0.014	21	21	100	19	526	122		
Chemical oxygen demand	mg/L	6.25	22	22	100	2	91	15		
<i>E. Coli.</i>	MPN/100mL	10	22	22	100	41	15,531	303	206 ³	1134 ³
Fecal coliform	CFU/100mL	NA	22	22	100	20	6,131	174		
Total coliform	MPN/100mL	10	22	22	100	759	24,196	4,325		
Na	mg/L	0.232	22	22	100	20	315	65		
Ammonia	mg/L	0.13	22	9	41	ND	0.66	0.70	1.3-17.0 ⁴	0.1-9.2 ⁵
Hardness, total	mg/L	NA	22	22	100	126	476	288		
Nitrite	mg/L	0.011	22	12	55	ND	0.13	0.0625		
Nitrate	mg/L	0.016	22	21	95	ND	1.96	0.481	10 ⁶	
Total Kjeldahl Nitrogen	mg/L	0.283	22	14	64	ND	3.3	0.65		
Oil & Grease	mg/L	1.4	22	2	9	ND	1.6	0.7	10	
Phenols	mg/L	0.002	22	0	0	ND	ND	0.001		
Phosphorus, dissolved	mg/L	0.016	22	21	95	ND	0.183	0.1		
Phosphorus, total	mg/L	0.016	22	22	100	0.016	0.63	0.1		
Total dissolved solids	mg/L	1	22	22	100	210	1000	475		
Total solids	mg/L	1	22	22	100	370	1600	625		
Total suspended solids	mg/L	1	22	22	100	2	380	8.5		
Volatile suspended solids	%	NA	22	22	100	1.6	86	42		
Ag-dissolved	mg/L	0.000744	22	0	0	ND	ND	0.00037	0.002-0.0156	
Cd-dissolved	mg/L	0.00011	22	0	0	ND	ND	0.00005	0.0002-0.00005	
Cr-dissolved	mg/L	0.00026	22	22	100	0.002	0.003	0.002		
Cu-dissolved	mg/L	0.00053	22	22	100	0.001	0.003	0.002	0.007-0.020	
Ni-dissolved	mg/L	0.0004	22	13	59	ND	0.002	0.001	0.041-0.113	
Pb-dissolved	mg/L	0.00214	22	12	55	ND	0.003	0.002	0.004-0.007	
Zn-dissolved	mg/L	0.00016	22	22	100	0.002	0.012	0.004	0.092-0.255	
Ag	mg/L	0.000744	22	0	0	ND	ND	0.00037		
Cd	mg/L	0.00011	22	0	0	ND	ND	0.00005		
Cr	mg/L	0.00026	22	22	100	0.002	0.029	0.003		
Cu	mg/L	0.00053	22	22	100	0.002	0.006	0.003		
Hg	mg/L	0.000025	22	0	0	ND	ND	0.000013	0.0024 ⁶	
Ni	mg/L	0.0004	22	20	91	ND	0.028	0.001		
Pb	mg/L	0.00214	22	16	73	ND	0.006	0.002		
Zn	mg/L	0.00016	22	22	100	0.004	0.043	0.006		
4,4 DDT	ug/L	0.72	22	1	5	ND	0.52	0.36		
Di(2-ethylhexyl)phthalate	ug/L	0.84	22	1	5	ND	2.14	0.42		
Endrin Aldehyde	ug/L	0.6	22	2	9	ND	0.473	0.300		

¹ 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.

² 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.

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

⁴ Acute criteria for cool & warm-water fisheries for pH values between 7.6 and 9.0

⁵ Chronic criteria for early life stages present for pH values between 7.6 and 9.0 and temperature between 4.8° C and 29.4° C

⁶ Criteria for drinking water supply and groundwater

⁷ Acute criteria

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

During the reporting period, one round of habitat assessment was conducted in July 2016 and one round of macro-invertebrate sampling was conducted in April 2017 with support from the Columbia Environmental Research Center (CERC) of U.S. Geological Survey (USGS). In addition, samples collected during previous sampling events were being analyzed by the CERC lab, and a data report for 2015 sample collection was prepared.

Streams

The streams selected for both habitat assessment and sampling were:

- seven urban stream reaches; East Fork Shoal Creek, Line Creek, Round Grove Creek, Brush Creek, Hickman Mills Creek (referred to as Hart Grove Creek in the tables and graphs), Searcy Creek, and Buckeye Creek
- three control stream reaches; North Brush Creek, Fishing River and Little Blue River within the City limit
- a control stream reach outside of the City limit; Prairie Creek in Platte County, Missouri.

Field work

Habitat assessment and macroinvertebrate collection were performed in accordance with relevant state standard operating procedures by the MDNR Air and Land Protection Division's Environmental Services Program (i.e., Semi-quantitative Macroinvertebrate Stream Bioassessment Project procedure [MDNR 2010]; Stream Habitat Assessment Project Procedure [MDNR 2010]).

Laboratory work

Laboratory processing, taxonomic identification, and enumeration of macroinvertebrates collected in spring 2015 were completed, and laboratory work of samples collected in spring 2016 was being done 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 report on 2015 sample data and its comparison with previous years' data was prepared during this reporting period (Table 15, below). A couple of major conclusions have been made. Based on the Missouri Stream Condition Index calculation, the 2015 data shows the same pattern noted in previous years, which is that fall samples tend to perform higher than expectations; spring samples tend to perform lower than expectations. This pattern may suggest that the streams are subjected to more severe stresses during winter and early spring months. Previous data indicates the ability of some of the streams to fully meet aquatic life expectations; however, the 2015 macroinvertebrate data shows that only the control site at North Brush Creek supports this presumption. The fluctuation of the other streams in their biotic conditions is not unexpected, given the impact associated with dynamic urban activities both along adjacent riparian corridor and within individual watersheds.

Table 15. Missouri Stream Condition Index scores for stream sites evaluated since 2007

Site	Spring 2007	Fall 2008	Spring 2009	Spring 2010	Fall 2011		Spring 2012		Spring 2013		Fall 2013		Spring 2014		Spring 2015	
					CO	All	CO	All	CO	All	CO	All	CO	All	CO	All
N Brush	18	16	14	18	20	18	16	16	16	16	14	18	16	16	16	16
Hart Grove	*	*	*	*	*	*	*	*	*	*	*	*	12	10	12	12
Little Blue	*	*	*	*	*	*	*	*	*	*	*	*	16	14	16	14
EF Shoal	18	16	12	14	*	*	14	12	8	12	14	16	14	14	16	12
Line	18	14	14	18	16	18	16	16	16	16	18	20	18	16	14	12
Searcy	*	*	*	*	*	*	*	*	*	*	*	*	10	10	12	12
Buckeye	*	*	*	*	*	*	*	*	*	*	*	*	10	10	12	12
Brush	*	*	*	*	*	*	*	*	*	*	*	*	10	8	10	10
Fishing	*	14	14	14	16	18	14	16	14	12	10	14	14	12	14	12
Prairie	*	*	*	*	18	20	16	14	14	14	16	18	16	14	16	12
Round Grove	6	12	10	10	12	14	14	12	12	12	14	16	12	12	12	12
First	*	14	10	12	16	18	16	10	12	10	12	12	*	*	*	*
Rock	8	12	10	10	10	14	10	12	12	12	8	10	*	*	*	*
U. Shoal	16	14	12	12	16	16	16	12	12	14	12	14	*	*	*	*

^aRanges in MSCI scores correspond with the following aquatic life impairment levels:

16-20 = Fully Supporting

10-14 = Partially-Supporting

4-8 = Non-Supporting

For years 2007-2010, only scores for single-habitat (CO=coarse substrate) are given. Both single-habitat and three-habitat (All=coarse, depositional non-flow, and rootmat) scores are based on site comparisons with reference data for streams with riffle-pool (RP) prevalence within the Central Plains Blackwater/Lamine drainage unit (CPBL). *= denotes samples not taken.

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, but the Stormwater Discharge Monitoring program, are proceeding in accordance with the City's permit requirements. The implementation of the monitoring program was compromised by two factors; unforeseen staffing issues and unanticipated equipment problems.

4.2 Proposed Changes

During the past fiscal year's permit implementation, no significant change of 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. in 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 solution sites (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 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 220 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:

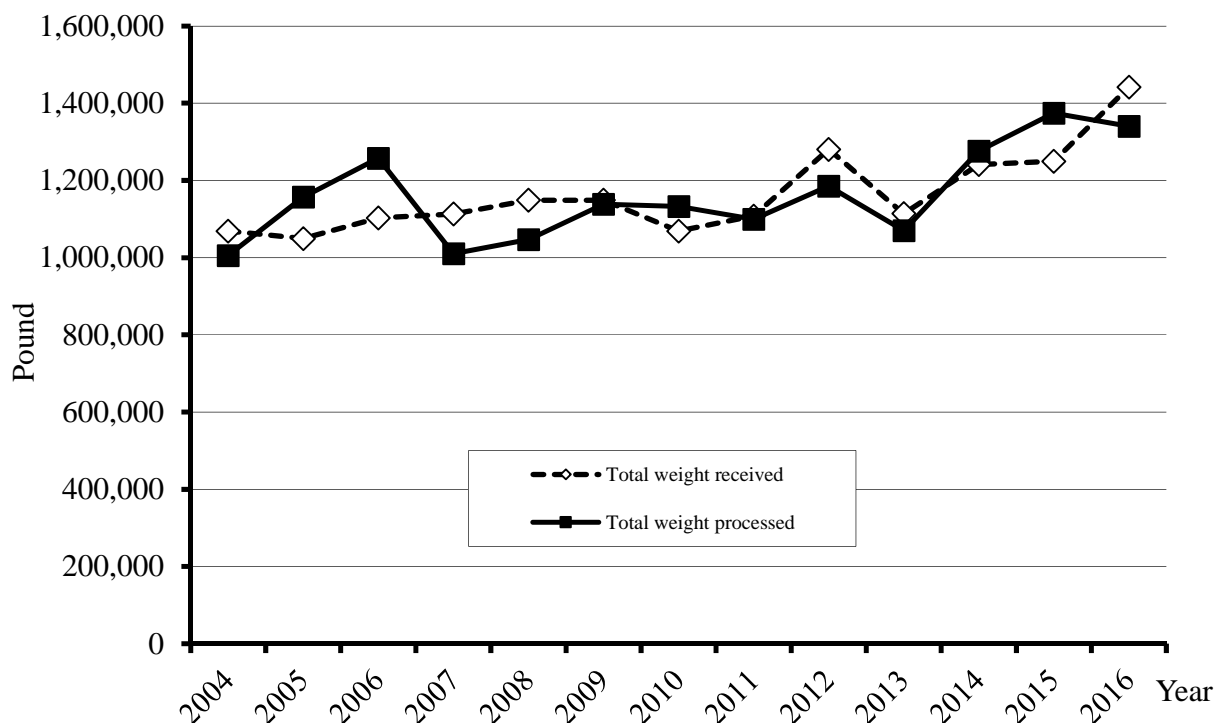
- The City continues to use standard procedures for land disturbance inspections and to provide a standard template of the Stormwater Pollution Prevention Plan for construction or grading projects disturbing one or more acres.
- The City continues to host training sessions to educate relevant staff on 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*; *KC Green's Hard to Recycle Items*), 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 started a mini-grant program to fund projects that focus on stormwater and non-point source pollution education.
- The City continues to maintain an extensive partnership with different organizations on a number of programs for public educational purposes. These programs and their organizations include Community Recycling by Bridging the Gap and the Water Quality Education program by MARC.

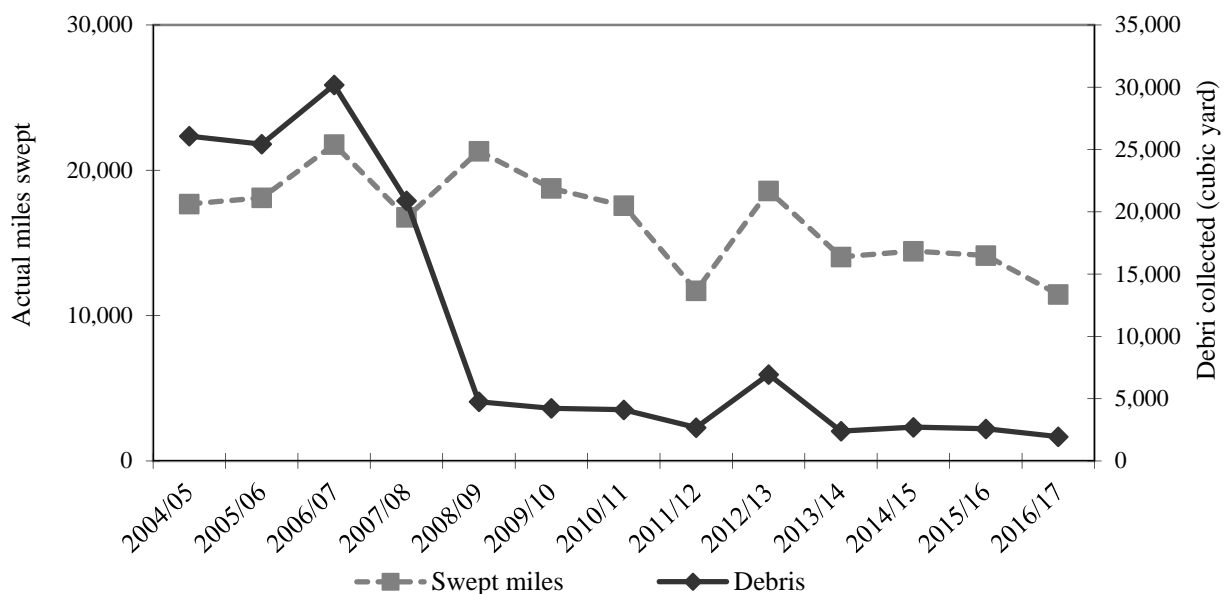
The above-mentioned major outcomes can further be measured by some indirect indicators. Figure 7 shows the annual quantity of materials that the regional HHW Collection Program received and processed from 2004 to 2016. The program continues to divert HHW away from the landfills, streams, and storm sewers.

Figure 7. Yearly comparison of regional HHW collection program (2004-2016)



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 Solid Waste Division, formerly with Public Works, and now with Neighborhood & Community Services Department from 2004 to 2016.

Figure 8. Street Sweeping Program 2004-2017



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 2004-2017

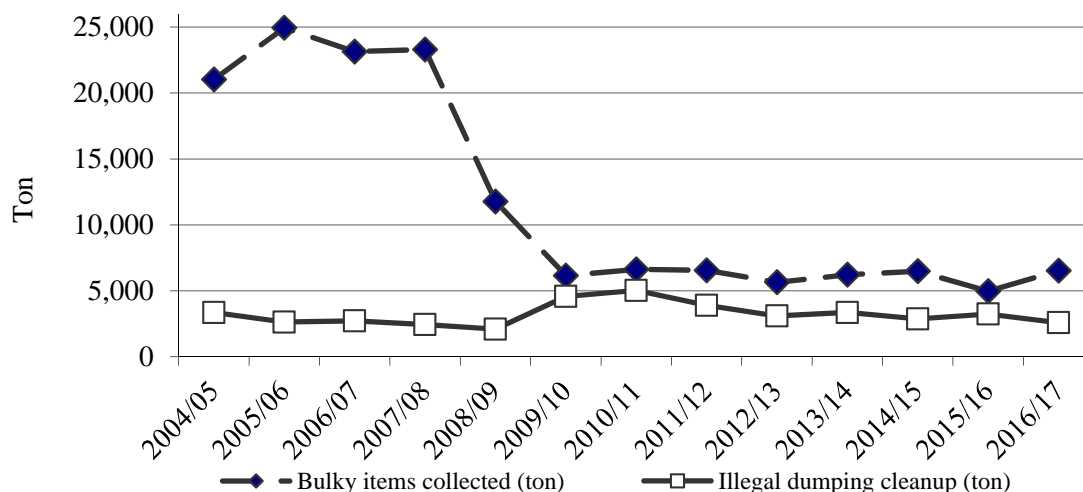
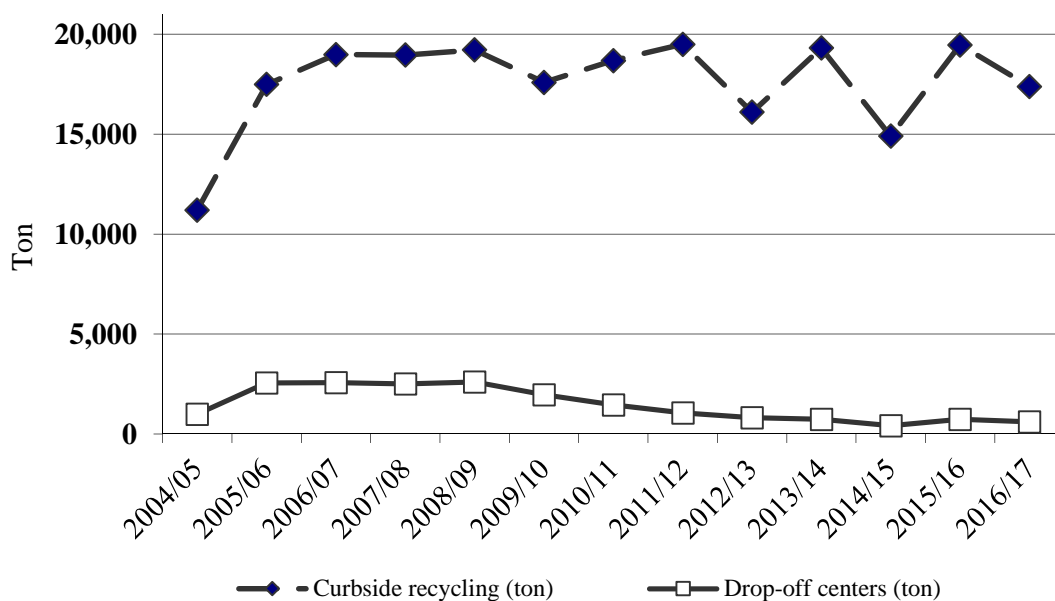


Figure 10. 2004-2017 KC Recycle program



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

4.6 Activity Summaries; Inspection, Enforcement, and Public Education

Table 17 summarizes the enforcement, inspection, and public education activities that are relevant to stormwater issues.

4.7 Water Quality Degradation/Improvements

The trend analysis of bio-assessment data collected in the previous years was presented in the previous 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 2016/17 unless otherwise specified) are expected to have a positive impact on the City's surface water quality.

- Over one million pounds of household hazardous waste was collected, recycled, and properly disposed of in 2016.
- Over 600 tons of material was recovered by community drop-off recycling centers, over 17,000 tons of material was recovered by curbside.
- About 13,000 tons of leaf and brush was collected from the drop-off centers; 4,188 tons were collected from residential curbside.
- More than 2,139 sediment/erosion control inspections were conducted for private development that disturbed areas more than one acre;
- Over 11,000 miles of streets were swept and nearly 2,000 tons of litter was removed from streets;
- A total of 14,668 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.

Table 16. Overall budget for programs/activities supporting stormwater management effort in FY '16/17 and projection for FY '17/18

Program/Service	Funding Source	FY 16/17 (Actual \$)	FY 17/18 (Adopted \$)
Direct Cost (Activities conducted to ensure compliance with the Permit)			
Permit administration – Stormwater Utility Division	Stormwater Fund	\$332,650 ¹	\$339,303 ¹
MS4 assistance	Stormwater Fund	0	0
Ambient monitoring	Stormwater Fund	31,440	30,000
Biological monitoring	Stormwater Fund	91,904 ²	100,000 ²
Industrial monitoring	Stormwater Fund	2,612	5,000
BMPs in Flood Damage Reduction Projects	Multi Funds ³	⁴	⁴
BMPs in drainage improvement projects	PIAC Fund ³	⁴	⁴
Landfill monitoring and control measures	General Fund	37,842	0
Stormwater discharge monitoring	Stormwater Fund	95,652	75,000
Stormwater public education	Stormwater Fund	142,500 ²	90,000 ²
Indirect Cost (Activities conducted to help with stormwater pollution prevention effort)			
Leaf & brush drop-off site operation and maintenance	General Fund	616,619	0
Leaf & brush collection (curbside)	Stormwater Fund	600,165	725,000
Bulky item collection	General Fund	1,403,803	1,633,377
Catch Basin Replacement program	Stormwater Funds,	76,148 ²	500,000 ²
Stormwater Maintenance	Stormwater Fund	8,958,790	9,441,241
Deicing, snow/ice program	Motor Fuel Tax and General Fund	2,359,524	2,749,891
Household hazardous waste program	Wastewater & Stormwater Fund	1,315,475	1,384,153
Illegal dumping abatement	General Fund	2,295,571	2,195,190
KC Recycles (Recycle First) program	General Fund	4,263,254	4,963,548
Land development inspection	Fee Supported	4,455,665	4,691,762
Flood risk management features maintenance	Stormwater Fund	⁴	⁴
Neighborhood Cleanup Assistance program	General Fund	369,810	424,388
Property acquisition/demolition/clean-up for flood control	PIAC Fund ²	⁴	⁴
Special Sewer Connection & Septic Tank Disconnection program	Wastewater Fund	4,000	0
HazMat Team (spill prevention and control)	Cigarette Tax	4,392,432	4,346,187
TOTAL		\$27,109,819	\$32,233,667

¹ 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.

² 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).

³ Multi funds include PIAC funds (the sales tax through Public Improvements Advisory Committee), Energy & Water Approp to Army Corps of Engineers, and Johnson County, Kansas – Stormwater (SMAC).

⁴ Not available

Table 17. Activity summary

ENFORCEMENT ACTIONS					
Sediment and erosion control					
> 1 acre (Inspection): >2,200 site deficiencies					
≤ 1 acre (Complaint-driven investigation)					
15 Letters on site deficiency		6 Tickets written		0 Stop work orders	
165 Illegal dumping summons; 162 dispositions					
INSPECTIONS					
Public detention basin: 15			Private detention basin: 180		
Catch basin/Inlet: 17,180			Outfall: 210		
Missouri River levee: 11.5 miles*1 to 5 times			Blue River levee: 3.5 miles*5 times		
Municipal facility: 9			Private facility: 30		
TV sanitary sewer line: 389 miles					
Active construction site (erosion & sediment control)					
City projects ≥ 1 acre	Private development				
	≤ 1 acre	≤ 1 acre (Complaint-driven)		> 1 acre	
275 ^a	6,631	20 (investigation)		2,139	
PUBLIC EDUCATION AND OUTREACH					
City efforts: Programs/Activities					
WE KC		Stormwater Plinko		From KC to the Sea	
Litter pick-up events	Students	Events played at	Participants	Schools affected	Students taught
8	1,061	13	1,300	75	3,758
Water Quality Small Grant Program					
Organizations granted: 9			Grant amount: \$85,500		
Regional Effort: Lead Sponsoring Water Quality Public Education Program					
Brochures distributed			Storm drain markers		Grant issued
5,970			105		6 projects/\$16,100
Pet waste signage		Native seed packet		Pet waste bag dispenser	
69		700		800	

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 2017.

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 the database of stormwater infrastructure and assets
- 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 pre-determined goals and objectives
- Improve departmental maintenance capabilities for 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. APPENDIXES

Appendix 1. Industrial & Other High-Risk Runoff Facilities Inventory Kansas City, Missouri 2016

	Non-Municipal Facilities	Activity Address	Watershed
1	A Luster Metal Finishing-Division of Brady Enterprises	1019 West 24th St.	Turkey Creek
2	ABF Terminal - 003 Kansas City	4209 Gardner Ave.	NEID*
3	Advantage Powersports (formerly Kawasaki)	6401 NW Barry Rd.	Line Creek
4	All Star Auto Parts	6101 E 32nd St.	Blue River
5	Allied Aviation Service Company	217 Bern St.	Todd Creek
6	Avenue Auto Wrecking	2500 Manchester Tfwy	Blue River
7	AZZ Galvanizing (formerly Rogers Galvanizing Co., North American Galvanizing Company)	7700 E 12th St.	Blue River
8	Bartlett Grain Company, L.P.(KCT Elevator)	5801 Birmingham Rd.	Searcy Creek
9	Batliner Paper Stock Company	2501 E Front St.	Missouri River
10	Bayer Cropscience	8400 Hawthorn Rd.	NEID
11	Blount International KCDC	10331 NW Transcon	N. Brush Creek
12	Blount-Kansas City	4840 E 12th St.	Turkey Creek
13	Boulevard Brewing Company	2501 Southwest Blvd.	Turkey Creek
14	Brenntag Mid- South Inc.	5200 Still Well Ave.	NEID
15	C&H Auto and Truck Salvage	7604 E Truman Rd.	Blue River
16	Calvert's Express	1501 Main St	Gooseneck Creek
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
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 North Skiles Rd.	Randolph Creek
24	Charles Paint Research Inc.	2401 E. 85th St.	Blue River
25	Clay & Bailey	6401 E 40th St.	Blue River
26	Cook Brothers Insulation Inc.	1405 Saint Louis Ave.	CID**
27	Crunch Time Auto Salvage	7900 E 17th St.	Blue River
28	CTB Grain Systems (formerly Brock Grain & Feed)	7400 E 13th St.	Blue River

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29	D&D Detail	3701 E 12th St.	Goose Neck
30	Dayton Superior Corporation (Zea Corporation)	3101 Gardner Ave.	NEID
31	Don's Mobile Welding	7000 E US 40 Hwy.	Blue River
32	Economy Auto Salvage	3139 Stadium Dr.	Blue River
33	Eharas Services and Solutions	4980 Stillwell Ave.	NEID
34	Elite Trucking	900 N. Indiana	NEID
35	Environmental Specialists, Incorporated	3001 E 83rd St.	Blue River
36	Environmental Specialists, Incorporated	7300 E 63rd St.	Blue River
37	Fordyce Concrete Company Inc.-63rd St. Facility	5810 E, 63rd St.	Blue River
38	Fresh Del Monte Produce Inc.	6311 Deramus Ave.	NEID
39	Gateway Packaging Company	5910 Winner Rd.	Blue River
40	General Mills Operations Inc.	2917 Guinotte Ave.	NEID
41	Gerdau Ameristeel	1301 N Chouteau Tfwy	NEID
42	Hallmark Cards Inc.	2501 McGee	Turkey Creek
43	Hansen Mueller(KCS Elevator)	1031 N. Topping	NEID
44	Harley-Davidson Motor Group Comp.	11401 N. Congress Ave.	Second Creek
45	Hawthorn Generating Facility (Kansas City Power & Light)	8700 Front St.	NEID
46	HazMat Inc. (formerly Waste Express)	6300 Stadium Dr.	Blue River
47	Heritage Environmental Service	8525 NE 38th St.	Randolph Creek
48	Hiland Dairy (Roberts Dairy, Prairie Farms)	3805 South Emanuel Cleaver II Blvd.	Brush Creek
49	Hiles Plating Company	2028 Broadway	Turkey Creek
50	Import Auto Salvage	4120 Winchester Ave.	Blue River
51	Jackson Plating & Polishing, Inc.	2641 Jackson	Blue River
52	Jay Wolfe Acura	1029 W. 103rd St.	Indian Creek
53	Joe's Mobile Truck & Trailer Repair	3040 Manchester Trafficway	Blue River
54	Kansas City Ready Mix dba Talon (LaFarge North America Inc.)	3101 East 85th St.	Blue River
55	Kansas City Screw Products Inc.	2908 Truman Rd.	Blue River
56	Kauffman Stadium	1 Royal Way	Round Grove Creek
57	KC Southern Railway - Knoche Yard	3651 East Front St.	NEID
58	KC Streetcar Authority Maintenance Facility (Singleton Yard)	3rd St. and Holmes	CID
59	LabConco Corporation	8811 Prospect	Blue River
60	Langley Recycling, Inc.	3557 Stadium Dr.	Blue River
61	Little Will's Auto Salvage	7910 E 17th St.	Blue River

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62	Lowe's Home Improvement	8601 N. Boardwalk Ave.	Second Creek
63	Lowe's Home Improvement	1700 W, 133rd St.	Camp Branch
64	Mallin Companies Inc. (Mallin Brothers Co.)	3211 Gardner Ave.	NEID
65	Mark One Electric Company, Inc.	1001 Forest Ave., 921 Forest Ave.	Blue River
66	Marshall	13600 Madison Ave	Camp Branch
67	Martin Foundry Company	1510 Crystal Ave.	Blue River
68	Material Recovery & Transfer LLC	4020 Winchester Ave.	Round Grove Creek
69	Metals Protection Plating (MPP) Corporation	2800 East Truman Rd.	Blue River
70	MGI Global (Midwest Research Institute)	425 Volker Blvd.	Brush Creek
71	Mid America Car Inc. - Locomotive	1525 N. Monroe Ave.	NEID
72	Midway Ford Truck Center Corporation	7601 Northeast 38th St.	Randolph Creek
73	Midwest Locomotive, Inc.	6817 Stadium Dr.	Blue River
74	Midwest Scrap management	8116 Wilson Rd.	Blue River
75	Miller Material Company	2405 East 85th St.	Blue River
76	Missouri Dept. of Transportation- District 4 General Services	9101 E 40th Ter.	Round Grove Creek
77	Missouri Dept. of Transportation-Motorist Assistance	3505 E 18th St.	Gooseneck Creek
78	Missouri Plating Company	7001 East 13th St.	Blue River
79	Mizkan (Speaco Foods, Inc.)	2400 Nicholson Ave.	NEID
80	Mondi Bags USA, LLC (Graphic Packaging International, Inc., Stone Container Corp.)	3244 Gardner Ave.	NEID
81	Monier Life Tile LLC	12600 East 98th St.	Little Blue River
82	Nitto Denko Automotive, Missouri, Inc. (formerly Permacel Kansas City Inc.)	8485 Prospect Ave.	Blue River
83	NKC Transportation	3811 Gardner Ave.	NEID
84	Nostrum	1800 N Topping Ave	NEID
85	Ortho Mattress, Inc.	6301 NW Barry Rd.	Line Creek
86	PathFinder Systems, Inc.	6301 Deramus Ave.	NEID
87	Paulo Products Company	4827 Chelsea Ave.	Brush Creek
88	PBI Gordon Corporation	1217 W 12th St.	Turkey Creek
89	Penny's Concrete, Inc.- Parvin Road Plant	8601 NE 38th St.	Randolph Creek
90	Performance Roof Systems Inc.(Derbigum)	4821 Chelsea Ave.	Brush Creek
91	Permacel Kansas City	3900 Empire Rd.	NEID
92	Pick-n-Pull - KC (Self-Service Auto Parts Store)	8012 E Truman Road	Blue River
93	Pick-n-Pull (U-Pick-it)	7700 E Winner Rd.	Blue River
94	Plumbers & Gasfitters-Local 8	5950 Manchester Tfwy	Blue River
95	Porter's Auto Salvage	3231 Stadium Dr.	Blue River

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96	Quality Finishing Industries Inc. (NEW)	6015 Manchester Tfwy	Blue River
97	Quality Finishing Industries Inc. (OLD)	7615 East 17th St.	Blue River
98	Research Medical Center	2316 East Meyer Blvd.	Town Fork Creek
99	Rotadyne Roll Group	2035 Washington St.	Turkey Creek
100	Southeast Sanitary Landfill L.L.C.	8301 Indiana Ave.	Blue River
101	Stericycle Environmental Solution (Philip Services Corporation)	716 Mulberry St.	CID
102	Stones & Bricks Inc.	6701 E US 40 HWY	Blue River
103	Summit Machine Products Inc.	7101 E. 13th St.	Blue River
104	Superior Metal Treating & Equipment	2540 Indiana Ave	Blue River
105	T & E Service	4980 Stillwell Ave.	NEID
106	Target	1201 W 136th St	Camp Branch
107	The Nutro Company	1315 N Chouteau Trafficway	NEID
108	Thoroughbred Ford	8501 N. Boardwalk Ave.	Second Creek
109	Transmission Auto	8021 Prospect Ave.	Blue River
110	Truman Medical Center	2301 Holmes St.	Turkey Creek
111	Union Pacific Railroad	6400 Martin	NEID
112	Univar USA Inc. - Kansas City (formerly Vopak USA Inc.)	2000 Guinotte Ave.	NEID
113	University of Missouri-Kansas City	5100 Rockhill Rd.	Brush Creek
114	US Plating & Surface Finishing	1341 Montgall Ave.	Blue River
115	USC Technologies	1300 NW Briarcliff PKWY	Line Creek
116	VA Medical Center	4801 Linwood Blvd.	Blue River
117	Vance Brother - Chelsea Facility (Koch Materials Company)	4915 Chelsea St.	Brush Creek
118	Vance Brothers Inc.	5201 Brighton	Blue River
119	Veolia Energy (Trigen-KC Grand Avenue Station)	115 Grand Ave.	NEID
120	W.R. Meadows of Kansas City	3111 E 17th St.	Turkey Creek
121	Walker Towel & Uniform	2601 Truman Rd.	Blue River
122	Walmart	1701 W, 133rd St.	Camp Branch
123	Walmart Supercenter	8551 N Boardwalk Ave.	Second Creek
124	Yellow Transportation	3500 Booth St.	Blue River

	Municipal Facilities	Activity Address	Watershed
1	Habitat ReStore	4703 Deramus	NEID*
2	KCMO American Royal Arena Complex	1800 Genessee	CID**
3	KCMO Animal Control Kennel	4400 Raytown Rd.	Round Grove Creek
4	KCMO Birmingham Wastewater Treatment Plant	10801 NE 28th St.	Birmingham Bottom
5	KCMO Blue River Golf Academy	7501 Blue River Rd.	Blue River
6	KCMO Blue River Secondary Wastewater Treatment Plant	7300 Hawthorne Rd.	NEID*
7	KCMO Blue River Wastewater Treatment Plant	7600 Front St.	NEID*
8	KCMO Buckeye Maintenance Facility	5001 Birmingham	Searcy Creek
9	KCMO Central Patrol	1200 E Linwood	Turkey Creek
10	KCMO City Tow Lot	7750 Front St.	Missouri River
11	KCMO Communication Center	1111 Locust St	Turkey Creek
12	KCMO Crime Laboratory	6633 Troost Ave.	Town Fork Creek
14	KCMO East Patrol	5301 E 27th St.	Blue River
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 18	3211 Indiana Ave.	Brush Creek
19	KCMO Fire Station 19	550 W 43rd St	Brush Creek
20	KCMO Fire Station 23	4777 Independence Ave.	Blue River
21	KCMO Fire Station 35	3200 Clever II	Brush Creek
22	KCMO Fire Station 36	9903 Holmes	Indian Creek
23	KCMO Fire Training Academy	5130 Deramus	NEID* III
24	KCMO Fishing River WWTP	10600 NE 118th St.	Fishing River
25	KCMO Fleet Maintenance	1901 Brooklyn	Turkey Creek
26	KCMO Fleet Operations	5215 E. 27th St.	Blue River
27	KCMO Habitat Restore	4701 Deramus	Missouri River
28	KCMO Helicopter Unit	4601 Eastern	Round Grove Creek
29	KCMO Hodge Golf Course	7000 NE Barry Rd.	East Fork Creek
30	KCMO Holmes Annex	1525 Holmes	Turkey Creek
31	KCMO KCI Airport	125 Paris St.	Todd Creek
32	KCMO Kemper Arena	1800 Genessee	CID**
33	KCMO Lakeside Nature Center	4701 E Gregory Rd	Blue River
34	KCMO Leaf & Brush Drop off site	I-470 & Raytown Rd.	Little Blue River
35	KCMO Maintenance facility	1800 Prospect	Turkey Creek
36	KCMO Metro Patrol	7601 Prospect	Blue River
37	KCMO Minor Golf Course	11215 Holmes Rd	Blue River
38	KCMO Municipal Service Center	5300 Municipal Ave.	NEID*
39	KCMO North Patrol	1001 NW Barry Rd.	Line Creek
40	KCMO Nursery	5400 E. Gregory Ave.	Blue River
41	KCMO Pacaar Building & Lot	1301 NE Chouteau Tfwy	NEID*
42	KCMO Parks District 2	1520 West 9th St.	Turkey Creek
43	KCMO Parks District 3	6901 Elmwood Ave.	Blue River
44	KCMO Pistol Range	6900 Coal Mine Rd.	Round Grove Creek
45	KCMO Police Dept.- Headquarter	1125 Locust St.	Turkey Creek

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	Municipal Facilities	Activity Address	Watershed
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 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	NEID*
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/Police Academy	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

<p>*NEID: Northeast Industrial District; **CID: Central Industrial District</p>

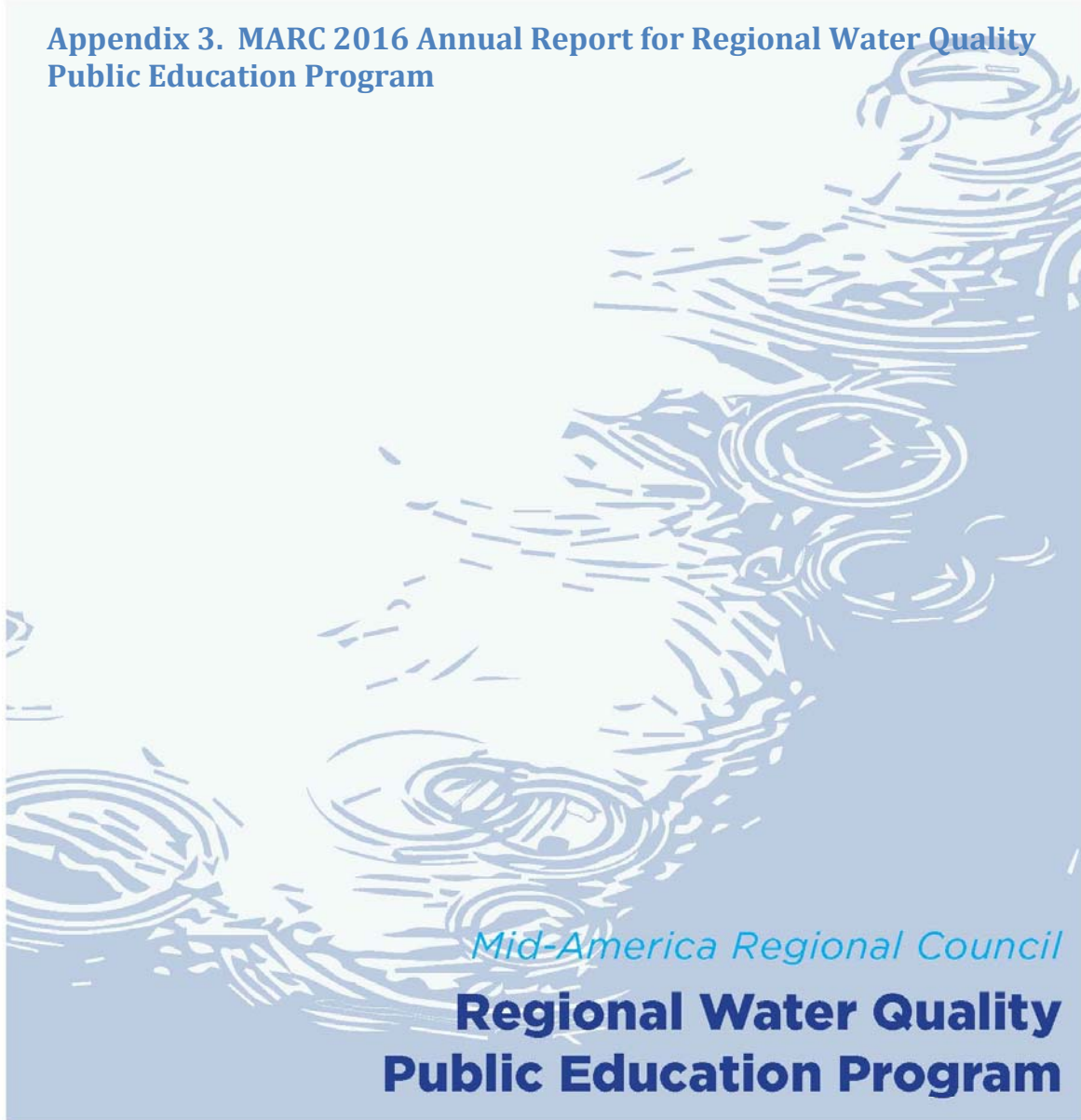
Appendix 2. 2016 Kansas City, Missouri Priority List of Industrial & Other High-Risk Runoff Facilities

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

MS4: municipal separate storm sewer system; CSO: combined sewer system

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**Appendix 3. MARC 2016 Annual Report for Regional Water Quality
Public Education Program**



Clean Water. Healthy Life.

2016
ANNUAL
REPORT

CLEAN WATER. HEALTHY LIFE.

Regional Water Quality Public Education Program Annual Report, January–December 2016

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 13 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 (WOEC), 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 scheduled for January 23-24, 2017.

PUBLIC ATTITUDE SURVEY

The committee administers a biennial public attitude survey to gauge the public's knowledge of and attitudes about water quality in the metropolitan area. Survey questions are designed to measure the impact that education efforts have on the public's overall awareness of water quality concerns and on behaviors that impact water quality in the region. The water quality survey provides a benchmark for objective evaluation of public education initiatives over time, and provides guidance for future public policy, planning and education efforts. Our seventh biennial survey, conducted in late 2016, highlighted the following:

- Eighty-two percent of the residents surveyed were very or somewhat concerned about pollution in lakes, streams, and other waterways in the Kansas City area, and seven percent were not concerned.
- Residents were asked if they had used various methods to manage how rainwater left their property. Fifty-seven percent said that they had placed flower beds or landscaping to absorb rain runoff from their property, and 17 percent had captured rain water in a rain barrel.
- Eighty-seven percent of residents agree that it is important to improve the quality of water in lakes and streams in their community; 78 percent feel the quality of local streams affects property values, and 77 percent would support local government working with other cities and counties to improve water quality.

View the 2016 Survey online at

<http://marc.org/Environment/Water-Resources/Reports-and-Publications/Reports>

2016 PROGRAM ACCOMPLISHMENTS

Media Campaigns

In 2016, the public outreach campaign continued to target residents and homeowners, focusing on the use of native plants to improve water quality. Campaigns typically include a variety of elements such as paid advertising, earned media, printed materials and other activities. MARC staff helps the committee with strategic planning for media campaigns, including message development, writing, graphic design and advertising purchases.

Native Plants

The 2016 native plant outreach campaigns featured “Leisurely Landscaping” in the spring and “Native Trees and Shrubs” in the fall. The media effort, specifically targeted to reach homeowners, local governments and contractors, and those interested in gardening, landscaping, and green living in the Kansas City region. The goal of the campaign was to promote the use of native plantings to improve water quality. Additionally, the campaign sought to direct individuals to the MARC water quality website landing page for further education relating to water quality issues.

The fall campaign delivered messaging in forms besides paid advertising, including blog posts and web content. Content addressed the benefits of native trees and shrubs for fall color, species that attract birds and beneficial insects, and urban forestry mobile apps.

Medium	Number of Ad Placements	Estimated Gross Impressions
Online	22	2,324,708
Print	8	2,056,000
Radio	30	52,000
Social Media	15	817,026
Total	75	5,249,734

The campaigns reached over 5.3 million impressions in 2016. Pinterest, a new advertising channel used this year, received the highest number of impressions out of all social media channels used. The total campaign cost was \$5.51 for every 1,000 times our messages were seen or heard.

Fall Web Ad



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. The Water Quality Education Committee received seven grant applications requesting a combined \$28,160. Grants were awarded to the following organizations:

Friends of the Kaw (\$1,778)

Friends of the Kaw (FOK) managed and facilitated a program designed to clean up and promote stewardship of the boat ramps along the Kansas River, as well as educate the public about the harmful effects that litter has on the environment and their drinking water. FOK worked within each community to engage local citizen groups to “adopt” their local boat ramp.

Food for People KC (\$1,000)

Food for People KC is dedicated to organic farming and native habitats in order to improve the health of our communities and our environment. This project addressed educating youth and adults about the importance of native plants in removing pollutants from the air and soil in order to improve stormwater quality. Participants learned what native plants are, how they protect air and water quality, how to plant them, and their relationship to pollinators and other insects. The project included the creation of a native habitat curriculum for 10 community members — five adults and five children — and creation of a native habitat at Highland Organic Farms.

Green Works in Kansas City (\$2,935)

Green Ink students participated in a “trash mob” project that involved dressing up in funny costumes, gathering rakes, bags and gloves and cleaning up an urban area/street that is near a stream. Students shot video of the trash mob and interspersed the action with dialogue and visual aids, including how to do your own trash mob, and what happens to trash on the ground. They will also design and distribute a flier to alert residents in the area that they have been hit by a “trash mob,” explaining the impact on our water from trash left on the ground.

Healthy Rivers Partnership (Project Blue River Rescue) (\$3,000)

Project Blue River Rescue (PBRR) XXVI was held April 2, 2016, at the Lakeside Nature Center in Swope Park. Held annually, PBRR is the largest one-day stream cleanup in Missouri. Thousands of volunteers have invested more than 100,000 hours removing solid waste from the banks of the Blue River as part of this event. For 26 years, it has offered a perfect demonstration of how storm drains convey trash in a non-point source way. The project serves

as a model for others to follow and the planning team has been instrumental in assisting other organizations with cleanup activities.

Healthy Rivers Partnership (Big Muddy Cleanup) (\$2,387)

Healthy Rivers Partnership gathered volunteers at Kaw Point Park on Oct. 1, 2016, 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.

StoneLion Puppet Theatre (\$5,000)

StoneLion Puppet Theater hosted a festival series to provide public education about the adverse effects of stormwater runoff and water pollution and promote policies and best management practices that reduce runoff and pollution.

This community outreach program was a series of three, free water festivals in public spaces that focused on educating adults and children about how their actions affect the water system and providing best management practices people can implement in their daily lives. Each event was held in partnership with a community center, library or event space in the Greater Kansas City Area.

TRAININGS

Webcasts

The committee hosted six webinars by the Center for Watershed Protection in 2016:

- “Surviving an MS4 Compliance Audit,” Mar. 16th, 2016
- “Education Programs to Enhance Pollutant Removal,” May 18, 2016
- “Green Infrastructure & Green Jobs: The Latest Trends,” June 15, 2016
- “Incentivizing BMP Installation in Communities with Stormwater Utilities,” Sept. 14, 2016
- “Retrofitting Revisited: Forward into the Past,” Oct. 12, 2016
- “Non-Traditional MS4s,” Nov. 16, 2016

Stormwater Training

The Water Quality Education Committee, in cooperation with the Missouri Water Environment Association and Kansas Water Environment Association, will host the first Greater Kansas City Urban Stormwater Conference on January 23–24, 2017. The conference will convene national, regional and local stormwater professionals to discuss growing issues around urban stormwater management. The program will include speakers from utilities, public works, planning, parks departments, engineering firms, regulatory entities and nonprofit organizations. Topics will include the role of integrated watershed planning and a keynote presentation from Howard Neukrug, previous CEO and commissioner of Philadelphia Water and a U.S. Water Alliance senior fellow.

CLEAN WATER. HEALTHY LIFE.

GRANTEE PROJECTS



Stone Lion Puppet Theatre



**Project Blue River Rescue
Healthy Rivers Partnership**

PROMOTIONAL ITEMS



Native Plant Rain Gauge



Imprinted Auto Trash Bag



Seed Packets

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PRINTED MATERIALS

Native Plants and Rain Gardens

Continued to distribute:

- How to "Build Your Own Rain Garden" and "Know Your Roots" brochures.
- Rain gauges designed with native species landscapes as promotional giveaway items.
- Outdoor-rated, "Do Not Mow/Native Planting" signage for BMPs.
- 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 items.



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.

ADDITIONAL WORK

Sponsorships

In October, the WQEC co-sponsored a Kansas City Native Plant Initiative (KCNPI) workshop hosted by Johnson County Park & Recreation District. The day started with an overview of Prairie Restoration given by Doug Ladd of The Nature Conservancy, and continued with presentations and panel discussions on subjects such as connecting the community with native plantings, funding and seed selection. In the afternoon, attendees broke into groups and toured three restoration field sites located within Shawnee Mission Park.

Art Requests in 2016

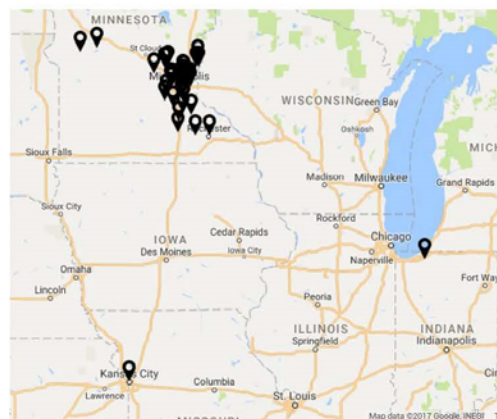
- Shared “Know your Roots” illustration, comparing roots of native plants with non-native plants, with Janet Allen, President of Habitat Gardening in Central New York, Wild Ones Chapter.
- Shared rain garden and stormwater brochure illustrations for use by Rosedale Development Association, Kansas City, Kansas.

Blue Thumb — Planting For Clean Water

The committee continues to use the Blue Thumb — Planting for Clean Water branding for its media campaign and giveaway materials to encourage planting of natives as a solution for stormwater pollution. In 2016, MARC staff was elected to represent the WQEC in the Blue Thumb Steering Committee. The role of the Steering Committee is to assist in strategic planning of outreach and education activities, as well as advise Blue Thumb staff on specific program activities. Additionally, the Steering Committee provides leadership in visioning program growth and maintaining relevance to its national partners.

Item	Quantity
Brochures	5,970
Storm Drain Markers	105
Portable/car Litter Bags	500
Pet Waste Public Signage	69
Native Planting Public Signage	68
Seed Packets	700
Rain Gauges	370
Pet Waste Bag Dispensers	800
Total	10,582

Map of Blue Thumb Partners



Matt Garrett of Johnson County Parks and Recreation District introduces one of many prairie restoration sites in Shawnee Mission Park as part of the KCNPI Prairie Workshop.

FUNDING

In January 2016, MARC submitted a program funding request to local governments for \$165,000. During the course of the year, 23 local governments supported the program. Participating governments are listed below.

PARTICIPATING GOVERNMENTS

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

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

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

WQEC COMMITTEE CO-CHAIRS

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KC Water Services,
Kansas City, Missouri

Heather Schmidt, Water Quality Specialist
Public Works and Infrastructure,
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CONTACT

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www.marc.org/water