ANNUAL REPORT

2011

CITY OF ROCKFORD, ILLINOIS

MUNICIPAL SEPARATE STORM SEWER SYSTEM

NPDES Permit No. ILS000001

THE CITY OF
ROCKFORD
ILLINOIS, USA

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1. INTRODUCTION

This report is prepared in compliance with the City of Rockford's NPDES Storm Water Permit No. ILS000001. The report contains information for calendar year 2011. Part V.C of the NPDES permit requires a system-wide report containing the following sections:

Required Information	See Herein
1. Status of SWMP	Chapter 2
2. SWMP Modifications	Chapter 3
3. Revisions to the Assessments of Controls and Fiscal Analysis	Chapters 3
4. Overall Summary of Data	Appendices B & C
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2. STATUS OF SWMP

Part III in the permit, Schedules for Implementation and Compliance, requires the City to provide summaries of implementation components of the storm water management program (SWMP):

- Structural Controls
- Erosion and Sedimentation Controls, Construction Site Runoff and Post-
- Construction Storm Water Management Program
- Roadways
- Flood Control
- Pesticide, Herbicide, and Fertilizer Application
- Illicit Discharge and Improper Disposal
- Industrial and High Risk Runoff
- Public Education, Pollution Prevention and Good Housekeeping

The activities undertaken in these areas and status of compliance with permit conditions are described in this chapter of the report.

2.1 STRUCTURAL CONTROLS

This section addresses Parts II.A.2 and III.A of the Permit.

2.1.1 Narrative Evaluation

The City continues to update and upgrade spatial and tabular databases relevant to its separate storm sewer system. These databases are useful tools for maintaining the storm sewer system, recording inspections, complaints and maintenance items, master planning, and complying with NPDES permit conditions. Some of the City's most relevant databases have been and are continually updated; details from a February 2011 overview of the most important databases for structural controls are tabulated below.

Table 1

CITY OF ROCKFORD STORM SEWER INFORMATION SYSTEM

Theme	Database Fields / Features	Comment
Detention Structure	Location, high water elevation, low water elevation, area, ID link to inspections	Documents detention structures, all but 9 of which are privately owned and maintained
Pond Inspection	Detention structure no., crew, date, last rainfall, sediment present, floatables present, water present, inspection ID	349 records
Culvert	Location, material type, ID, shape, length, upstream and downstream invert elevations, size, other	3,303 records
Storm water main	Location, ID, shape, size, upstream & downstream invert elevations, other	25,850 records
Manholes	Installation date, life cycle status, rim elevation, diameter, frame material, condition, inspection date, inspector	7,939 records
Inlets	Installation date, type, life cycle status, inspection date, inspector	19,493records

Per the permit, the City must operate and maintain any storm water structural controls for which they are the owner or operator in a manner so as to reduce the discharge of pollutant loading. In compliance with the permit, the City of Rockford continually works on maintenance and basin improvements. The following is a list of City-owned or City-operated storm water control basins including an update of recent maintenance activities and improvements:

1. Page Park Dam is on Kent Creek in Anna Page Park. This structure was built in 1980. The City owns the structure, and the Park District performs maintenance. The City hired a consultant to inspect the Page Park Dam the inspection occurred on September 23, 2011. Maintenance performed in 2011 included mowing and brush removal on earth embankment and the emergency spillway, and cleaning of the trash rack. The consultant also recommended removal of a downstream beaver dam and replacement of expansion joint filler.
2. Alpine Dam is on North Keith Creek, in Alpine Park. This dam is also owned by the City. Plans and specifications have been prepared for dam repairs, including modernizing the trash racks to facilitate future cleaning operations; the City is currently waiting on funding and construction permits for the improvements. The City hired a consultant to inspect the Alpine Dam; the inspection occurred on September 23, 2011. Maintenance performed in 2011 included mowing of the embankments, removal of accumulated silt and damaged concrete on the spillway,

and cleaning of the trash rack. The consultant also recommended additional silt removal, slope protection, vegetation management, and some concrete repairs.

3. Levings Lake Dam is on South Kent Creek. This structure was built in 1935. It is owned by the City, and the Park District performs routine maintenance. The City hired a consultant to inspect the Alpine Dam; the inspection occurred on September 23, 2011. Maintenance performed in 2011 included mowing of the embankments. The consultant recommended some brush removal, addition of riprap to the ends of the wing walls and concrete repairs of the bridge.
4. Arden Court Basin is owned by the City, which also maintains this storm water control structure. This structure is maintained and mowed regularly through a contractor. City evaluated Arden Court Basin as a retrofit pilot study to meet the requirements of the Permit Part II.A.2.c., but in 2010 their storm water planning consultant recommended against it.
5. Lowes Distribution Detention Basin is relatively new, built on a tributary of South Kent Creek. The basin has a multi-stage outlet structure. The City owns the structure but Lowes performs routine maintenance (i.e. mowing), as was performed in 2011.
6. Greater Rockford Industrial Park Basin is also owned by the City. This is a wet detention basin. Mowing is done regularly but the facility is currently overgrown and brush removal and mowing is scheduled for 2012.
7. Elliot Golf Course Regional Detention Facility is mowed by the Rockford Park District, but the City performs inspections and unusual maintenance. In 2008 this facility underwent a large-scale pollutant removal modernization to improve water quality. The facility was dredged, a new outlet structure was built, and a sediment basin was constructed. The project was completed in 2009. This modernization helps meets the objective of Permit Part II.A.2.c. In 2011, monitoring and mowing was performed.
8. Log Cabin West and Colorado Northeast are new basins in Rockford's Harmon Park neighborhood, built in the aftermath of recent flooding events.

The City regularly evaluates the storm sewer system for opportunities to improve water quality and reduce the discharge of pollutants from the system. In 2011, 125 inlets were repaired throughout the City and 84 inlets and 1,327 feet of storm drains were cleaned.

In 2008, the City of Rockford retained a storm water master planning consultant. Over the next three years, the consultant performed various work items, many of them meeting the requirements of NPDES permit conditions. The investigations are nearing completion. Parts II.A.2.a, A.2.c and A.2.d require the City to analyze the basin inlets, outlets and configurations to determine if modifications could be made to improve the basins, reduce discharge of pollutants to the MS4, and to identify channels requiring stabilization. The master planning document addresses several of these permit requirements.

The City's storm water master planning consultant evaluated the feasibility of retrofitting existing detention ponds with multi-stage outlet structures for improved flood control, prevention of erosion in the downstream channel, and promotion of the capture of pollutants in the detention facility. They recommended that, of the facilities owned by the City, only Alpine Dam, Levings Lake, Page Park Dam, and Elliott be considered for retrofitting, and that further studies were

necessary before final recommendations could be made. Elliott was retrofitted in 2008-09. Plans and specifications have been prepared for modifications to Alpine Dam, but not yet implemented.

Per Permit Part II.A.2.b, the City must establish and implement a program to monitor basins on a periodic basis to assess maintenance efforts. In 2011, the City continued their inspection program and increased the frequency of inspections of privately owned detention facilities. City of Rockford storm water staff visually inspected all detention and retention basins and took photos of each. The City is using this information to identify maintenance needs, and satisfy other requirements of the permit. This information has been incorporated into a GIS theme. Further, the City is preparing letters to send to each basin owner requesting they address any maintenance deficiencies.

Private property owners own and maintain more than 270 storm water facilities in Rockford. These owners are required to remove trash and floatables from their detention facilities. Neighborhood associations regularly request technical assistance from the Department of Public Works to improve their facilities, and to the extent possible, the City provides these services at no cost to the associations.

2.1.2 Compliance Schedule

Table 2

STRUCTURAL CONTROLS COMPLIANCE

Task	Action Date
Evaluate detention and retention basin configurations, outlet structures, cleaning frequencies, water surface elevations, drainage facilities and stream channels experiencing erosion as detailed in Part II.A.2.a, b, c and d.	Inspection of basins and stream channels complete. Stream erosion studies and emergency stabilization completed. Storm water master planning continues.
Analyze evaluations, compile data, summarize situations and implement solutions	Annually
Develop a cleaning and maintenance schedule for the retention basins maintained by the City based upon a pilot study of a small sampling of the basins	Currently follow twice annual cleaning and maintenance schedule.
Report to the IEPA status of compliance with Part II.A.2 and implementation of solutions.	Part of Annual Report

2.2 EROSION AND SEDIMENTATION CONTROL, CONSTRUCTION SITE RUNOFF AND POST-CONSTRUCTION STORM WATER MANAGEMENT PROGRAM

This section addresses Parts II.A.3 and III.A of the Permit.

2.2.1 Narrative Evaluation

September 5, 2006, the City of Rockford passed Ordinance No. 2006-157-0, adopting the "Surface Water Management Ordinance of the City of Rockford, Illinois" (details available at http://library3.municode.com/default-test/home.htm?infobase=14387&doc_action=whatsnew, Chapter 109 Flood Hazard Reduction. Among other activities, this ordinance requires construction site erosion controls as well as post-construction runoff quantity and quality controls. Adoption of Ord. No. 2006-157-0 demonstrates the City's compliance with the permit's requirement at Part II.A.3.a.i. NPDES Permit Parts II.A.3.a.ii through a.iii requires preparation of erosion control plans by developers, and review and approval of plans by the City. Ord. No. 2006-157-0 requires this, and the City has improved the review process, including documentation of plan review. The new process includes improved recordkeeping, increased inspections, additional staff, and permit review fees.

In 2011, 86 building permit applications were received and reviewed by City staff for application of proper construction site erosion controls. Most projects did not require erosion control plans or storm water pollution prevention plans, and, many projects were not built, but, staff reviewed all permit applications for compliance with the ordinance.

Photograph 1. City staff conducting an inspection in 2011 of erosion control plan implementation.

In 2011 the City inspected erosion control plan implementation at numerous construction sites. Table 3 gives the dates of these inspections and generalities of follow-up actions. These inspections are performed in compliance with Permit Parts II.A.3.a.iii.

Table 3

EROSION CONTROL INSPECTIONS AND CORRECTIVE ACTIONS PERFORMED IN 2011

Date	Construction Site	Permit # ILR10	Follow-Up Needed	Date of Follow-up	Corrective Actions Addressed	Submit To Code Enforcement
2/17/2011	Linden Pointe	H411	Yes	4/20/2011	Yes	No
3/22/2011	Allerton	NA	Yes	3/29/2012	Yes	No
3/24/2011	Rockford Well #5	N/A	Yes		Yes	No
6/30/2011	Lyford crossing	I893	Yes	9/8/2011	Yes	No
8/1/2011	Rockford VA	O971	Yes	8/15/2011	Yes	
8/2/2011	Harrison park	H273	No	N/A	N/A	N/A
8/2/2011	Rural St. (COR Project)	N/A	Yes	8/15/2011	Yes	No
8/3/2011	Turner St (RRWRD)	N/A	No	N/A	Na	N/A
8/4/2011	Garret Lane Recon. (COR Project)	NA	Yes	8/17/2011	Yes	No
8/4/2011	Renaissance, Plat 1	N278	No	N/A	N/A	N/A
8/4/2011	Rockford Christian	O541	No	N/A	N/A	N/A
8/4/2011	RMTD	M035	Yes	8/16/2011	Yes	N/A
8/15/2011	Harrison Park	H273	No	N/A	N/A	N/A
8/15/2011	Wesley Willows	N723	No	N/A	N/A	N/A
8/15/2011	Rockford Christian	O541	No	N/A	N/A	N/A
8/15/201	Renaissance, Plat 1	N278	No	N/A	N/A	N/A
8/16/2011	Cantis Lot, reconst.	N/A	No	N/A	N/A	N/A
9/13/2011	Harrison Park	H273	No	N/A	N/A	No
9/8/2011	IDOT, Spring Creek & 251	O086	Yes	9/30/2011	Yes	No
9/8/2011	Linden Point #5	H411	Yes	10/19/2011	Yes	No
9/8/2011	Redington Chase	G918	No	N/A	N/A	No
9/8/2011	Stevens Ridge	I409	No	N/A	N/A	No
9/9/2011	RRWRD, Spring Creek & 251	None required	Yes	9/30/2011	Yes	No
10/7/2011	Ingersoll	O759	Yes			

Table 3

EROSION CONTROL INSPECTIONS AND CORRECTIVE ACTIONS PERFORMED IN 2011

Date	Construction Site	Permit # ILR10	Follow-Up Needed	Date of Follow-up	Corrective Actions Addressed	Submit To Code Enforcement
10/7/2011	Joseph Behr	P191	Yes	10/13/2011	Yes	No
10/28/2011	Lyford Crossing	I983	Yes	11/30/2011	Yes, except stabilization due to winter conditions	No
10/28/2011	MPEC	O827	Yes	11/23/2011	Yes	No
10/28/2011	Wesley Willows, #2	N723	Yes	11/17/2011	Yes	No
11/14/2011	Nicholas Conservatory	O542	Yes	12/9/2011	Yes	No
12/6/2011	Rockford VA	O971	Yes	1/4/2011	Yes	No
12/12/2011	Wesley Willows, Catalpa Woods Dr.	no permit	Yes	12/22/2011	Yes	No
12/13/2011	William Charles, Spring Brook	O589	Yes	12/22/2011	No	No
12/13/2011	Rock Road, Prospect St.	none required	Yes	12/22/2011	Yes	No
12/13/2011	Rockford Christian	O541	Yes	12/29/2011	Yes	No
12/19/2011	N. IL Services, Campus of Care	N278	Yes	1/4/2011	Yes	No

Permit Parts II.A.3.a.vi and a.vii require the City to develop a field guide for inspection of construction site BMPs and to provide appropriate soil erosion education and training for developers, development engineers, and construction site operators. The City has adopted the Illinois Urban Manual and IDOT's Erosion and Sediment Control Field Guide for Construction Inspections, as their primary field guides for doing inspections.

In 2011, selected City staff and others participated in numerous storm water erosion control and related training opportunities (Table 4). This demonstrates the City's compliance with Permit Parts II.A.3.a.vi and a.vii. Table 4 includes training activities in other aspects of storm water management, included here for conciseness.

Table 4

STAFF TRAINING IN 2011

Training	Sponsor	Staff
Clean Water Act Permitting of Discharges from Pesticide Applications	US EPA	B. Holcomb, D. Kurth
Growing Sustainable Communities	Sustainable City Network	B. Holcomb, D. Kurth
Sediment and Erosion Control	Winnebago and Boone Counties Soil and Water Conservation Districts	D. Black, S. Sumner, C. Jumapao, J. Applegate
Storm Water Management Ordinance and NPDES	McHenry County	B. Holcomb, D. Kurth
Illicit Discharge Detection and Elimination Program In-House Policies and Procedures	City of Rockford	M. Leach, M. Vitner, J. Carter, M. Lattner, C.Simpson, S. Sumner. D. Black, C. Jamapao, K. Nokes, S. Sockwell, J. Rott, M. Ruvulo, R. Edwards, J. Small, J. Applegate, C. Englund, R. Lundberg
City Erosion and Sediment Control Program In-House Procedures	City of Rockford	M. Leach, M. Vitner, J. Carter, M. Lattner, C. Simpson, S. Sumner. D. Black, C. Jamapao, K. Nokes, S. Sockwell, J. Rott, M. Ruvulo, R. Edwards, J. Small, J. Applegate, C. Englund, R. Lundberg

The City is also required by the permit to continue to inspect citizen complaints. In 2011, the City received complaints from citizens regarding erosion controls (or the lack thereof); these complaints were logged and responded to by staff (included in Section 2.6).

Permit Part II.A.3.b requires the City to use a comprehensive master planning approach to minimize the discharge of pollutants from areas of development and redevelopment after construction is completed. Further, paragraph (i) of this section specifically requires the City to use the master planning approach to identify storm water management issues on a watershed scale. A storm water assessment has been completed, and the master planning process continues. The design of any projects recommended in this document will include applicable portions of the Illinois Urban Manual, consistent with Part II.A.3.b.ii of the permit conditions.

Permit Part II.A.3.b.iii requests that the City require multi-stage detention control to protect channel stability from erosion. The City's storm water master planning consultant studied this issue in 2010 and determined it will not likely be advantageous for smaller detention projects, but is worthy of consideration at the City's larger facilities.

Permit Part II.A.3.b.v requests that the City monitor facilities during dry weather, conduct field surveys, and work with private owners of existing facilities and neighborhood organizations to assess performance. In 2011, the City continued their storm water basin inspection program and increased the frequency of inspections of privately owned detention facilities. The City is preparing letters to send to each basin owner requesting they address any maintenance deficiencies. All of these activities demonstrate compliance with Part II.A.3.b.v.

2.2.2 Compliance Schedule

Table 5

EROSION AND SEDIMENTATION CONTROL COMPLIANCE

Task	Action Date
Adopt an ordinance, design standards and an erosion and sediment control manual, either independently or in conjunction with local entities, governing erosion control and sediment control as detailed in Part II.A.3.	Surface Water Management Ordinance adopted Sept. 5, 2006, amended Sept. 6, 2011 RMAP initiating a regional ordinance review in 2011
Report on the compliance with all parts of Part II.A.3	Part of Annual Report

2.3 ROADWAYS

This section addresses Parts II.A.4 and III.A of the Permit.

2.3.1 Narrative Evaluation

Street sweeping records for 2011 are tabulated below (Table 6). In total, the City performed sweeping on over 2,500 miles of roads, removing 3,345 tons of debris, keeping these pollutants out of the MS4.

Table 6

CITY OF ROCKFORD 2011 STREET SWEEPING PROGRAM

Month	Quantity (tons)	Street Sweeping Miles (Outside Central Business District)	Central Business District Miles
January	0	0	0
February	0	0	0
March	20	0	9.7
April	449	106.5	70.8
May	523	200.2	139.5
June	788	253.4	171.4
July	217	152.7	163.1
August	265	109.8	233.3
September	170	96.2	103.4
October	557	299.8	155.7
November	318	207.9	30.6
December	39	0	0
Total	3,345	1,426.5	1,077.5

Salt is used for deicing in preference to sand, the latter only being used when the salt supply is exhausted. Table 7 provides details for the City's deicing program for the last two years.

Table 7

CITY OF ROCKFORD DEICING PROGRAM

Year	Snow Accumulation	Salt Used	Salt/Snow	Sand Used	Mixed Salt & Sand
2009	37 inches	16,150 tons	436 tons/in	800 tons	0
2010	43 inches	22,900 tons	533 tons/in	0	100 tons
2011	32.6 inches	7,200 tons	221 tons/in	0	0

Deicing material use varies not only with snow accumulations, but with ice, freezing rain, and temperature.

During the first NPDES permit period, the City evaluated alternate side parking. The decision was made that alternate side parking will only be in effect for snow emergencies: parking on odd days will be on odd sides of the street and vice versa. This ordinance is enforced through ticketing. A second alternate side parking study was written into the last NPDES permit. The study was not performed and the City has requested that this language be removed from the new permit.

2.32 Compliance Schedule

Table 8

ROADWAYS COMPLIANCE

Task	Action Date
Continue evaluation of roadway maintenance activities and implement optimal procedures	Continual
Conduct a pilot study regarding the use of alternate side parking regulations and reach a conclusion on making alternate side parking regulations in effect year round	Previous study complete; requested that this requirement be removed from the new permit.
Report to IEPA compliance with Part II.A.4 and any changes in maintenance activities and/or procedures	Part of Annual Report

2.4 FLOOD CONTROL

This section addresses Parts II.A.5 and III.A of the Permit.

2.4.1 Narrative Evaluation

The City has an ongoing flood and storm water control program as part of its Capital Improvement Program (CIP), its public works engineering activities, and as part of its development ordinances. In 2011 or recent years, the City has:

- Performed reconstruction of 125 inlets and changed grates to enable more efficient flow.
- Completed a large flood control project along Keith Creek at Kishwaukee Avenue.
- Designed emergency repairs to Alpine dam, prepared plans and specifications.
- Completed cooperation with the Army Corps of Engineers for preparation of plans and specifications for modernizing Alpine Dam and watershed analysis (Keith Creek).
- City of Rockford and the Rockford Local Development Corporation (RLDC) have acquired over 100 properties in the Keith Creek floodplain and relocated residents.
- Performed channel clearing through Keith Creek.
- Commissioned a detailed hydraulic analysis of Keith Creek from Alpine Dam downstream to the Rock River.
- Continued twice annual cleaning of floatables and other debris from Alpine Dam trash racks and other storm water structures and channels.
- City acquired and demolished 11 properties in Harmon Park area, and is creating localized detention ponds that will eventually feed a larger basin.
- Construction of additional berm height on Arden Court Basin to better manage storm water.

- Large-scale modernization including dredging and construction of a sediment basin at Elliot Golf Course Regional Detention Facility.
- Ongoing maintenance of storm sewers, inlets, outfalls, stream channels and other structures.

In 2011, the City and Corps continued investigations along Keith Creek to evaluate whether additional work should be done in the interest of flood damage reduction, environmental restoration and protection, and related purposes.

Along Keith Creek at Kishwaukee Avenue the City completed a large flood control project in 2010. The channel was relocated to improve performance, and pools and riffles were installed. At this park, the City has removed two industrial buildings, six residential buildings, and a parking lot. Elsewhere in the Keith Creek flood plain, the City and RLDC have purchased and demolished over 100 properties, and relocated residents, all in an ongoing effort to restore the flood plain and reduce future flood damages.

Per Permit Part II.A.5.a, the City must review and revise as appropriate its Design Criteria Manual, Subdivision Ordinance, and Flood Hazard Reduction Ordinance to include water quality standards with respect to flooding and storm water detention/control facilities. In its recent comments to the Agency on the new permit application, the City asked that this permit condition be struck or reworded. Water quality standards are state law and do not need to be repeated in local design manuals or ordinances.

Per Permit Part II.A.5.b, the City must continue to study the incorporation of trash racks on the outlet structure of Alpine Dam. It must also conduct and document feasibility studies of retrofitting the City's existing flood control devices to provide additional pollutant removal. In the supplement to the permit application, the City has asked that this condition be removed from the permit. The City has prepared plans and specifications for emergency repairs to Alpine Dam, and the Corps of Engineers is continuing its design process for modernization of the structure.

The permit condition at Part II.A.5.c. requires the City coordinate regional flood control planning with surrounding communities. These efforts continued in 2011 on a number of projects. A regional detention facility, the I-90/Riverside detention pond, has been recently constructed through a public-private partnership led by the Village of Loves Park, but included City of Rockford, Winnebago County, Boone County, and the Rockford Memorial Hospital. The Winnebago County Watershed Improvement Plan Steering Committee (WCWIPSC) is a consortium of municipalities that include the City of Rockford. The WCWIPSC aims to effectively reduce nonpoint source pollution inputs in the watershed, attain water quality standards; improve habitat, and engage a wide range of audiences in the their efforts. WCWIPSC is undertaking a study of the Welworth/Wentworth and Madigan Creek watershed, with an aim of preparing an action plan for nonpoint source pollution control. In another regional effort, FEMA is funding a hydrologic and hydraulic study to update flood maps of the lower Rock River, including large portions of the City's MS4 area. This work is being performed by the Illinois State Water Survey.

Permit Part II.A.5.d. requires the City to investigate ways to significantly reduce "nuisance" flooding. Under the Inlet Reconstruction Program, City crews and contractors continued to reconstruct problem inlets. These efforts will help to reduce future nuisance flooding.

Storm water management staff attended training in 2011 on low-impact development (Table 4), aimed at reducing runoff rates and volumes.

2.4.2 Compliance Schedule

Table 9

FLOOD CONTROL COMPLIANCE

Task	Action Date
Incorporate water quality standards into the City's guidance documents – Part II.A.5.a	Reevaluation of this permit requirement under new permit application
Continue efforts to evaluate feasibility of retrofitting existing flood control devices – Part II.A.5.b	Large scale pollutant removal upgrades to Elliot Regional Detention Facility completed in 2009. Reevaluation of this permit requirement under new permit application.
Initiate meetings with surrounding communities concerning need for regional detention – Part II.A.5.c	New regional facility constructed as part of public-private partnership. City is a partner in several other regional projects
Report to IEPA progress of compliance with items in Part II.A.5	Part of Annual Report

2.5 PESTICIDE, HERBICIDE, AND FERTILIZER (PHF) APPLICATION

This section addresses Parts II.A.6 and III.A of the Permit.

2.5.1 Narrative Evaluation

The City monitors the use and application of PHF by Public Works Department and its contractors. The City also monitors its storm water and streams for nutrients and the aquatic effects thereof. Only City personnel that are licensed by the State are allowed to apply PHF, consistent with State regulations and label instructions, but most herbicides used on City facilities are applied by contractors for the Streets Division. All herbicides and pesticides are mixed and applied at a rate not to exceed the recommended amounts on the MSDS sheets.

Based on present conscientious practices, the City has not seen the need to modify its ordinances or to initiate actions to control the use of PHFs on City lands. Each year, Street Maintenance Division contractors apply herbicides to raised medians, paved ditches, and sidewalks. In addition, cut brush and trees stumps are treated along areas being cleared to minimize regrowth. Table 10 lists the herbicide products used in 2011 by the Street Maintenance Division.

Table 10

CITY OF ROCKFORD HERBICIDE USAGE IN 2011

Product & Packaging	Amount Used	Active Ingredient
Makaze (2.5-gal bottle)	48.5 gal	Glyphosate
ProClipse (5-lb container)	20.25 lbs	Prodiamine
Oust (3-lb bottle)	97 oz	Sulfometuron methyl
Perspective (1lb 4oz bottle)	85.6 oz	Aminocyclopyrachlor and Chlorsulfuron
Aqua Neat (2.5 gal containers)	14 gal	Glyphosate
Milestone (1 qt containers)	6 qts	Aminopyralid
LI-700 – 2.5 gal jug	1.5 gal	Non-ionic non-foaming penetrant
Pathfinder II (2.5 gal containers)	7 gal	Triclopyr
Attach (2.5 gal containers)	2.75 gal	Non-ionic sticker-spreader agent

The Street Maintenance Division performed testing on medians along Charles Street in 2011 to assess efficacy of reduced herbicide application rates. Chemical usage was reduced by 50% along these medians; weed regrowth was apparent, but the Division received no complaints. The Division proposes to make other adjustments, possibly reducing application by 25%.

The Street Maintenance Division also reworked overall formulas in an effect to reduce chemical usage. The Division stated that they used 5% less chemicals in 2011.

On October 31, 2011, Illinois EPA issued the General NPDES Permit for Pesticide Point Source Discharges. The City of Rockford has sent notices to area applicators informing them of their obligations to comply with this new regulation. Also, storm water management staff attended training in 2011 on Clean Water Act permitting of discharges from pesticide applications (Table 4).

In November 2011 the City printed a new education brochure on PHF use around water bodies. The brochures are available to the general public in the lobby of City Hall and in the Department of Public Works.

The Park District uses only state-certified applicators to maintain approximately 180 sites (golf courses, ball fields, parks), of which about 12 to 15 sites require PHF applications. In 1990, the Rockford Park District adopted the following PHF policy (See Environmental Policy at (http://www.rockfordparkdistrict.org/media/documents/pdf/Parks/Environmental%20Policy.pdf):

> "…to eliminate or restrict the use of pesticides and herbicides. We have determined that pesticides should only be used in critical areas. Critical areas are defined as:
>
> 1. Circumstances where destructive pests (insects, diseases, funguses, etc.) either create health hazards for human beings or damage to the environment.
>
> 2. High-use turf areas that require specific management practices for their intended use (irrigation, fertilization, weed control, aeration, reseeding, etc.) such as golf courses, athletic areas, special use facilities with high impact such as Magic

Waters, riverfront esplanades and parks. However, general dandelion spraying is not performed in neighborhood parks unless it is part of a specific turf management program.

During the spring and fall when we normally receive calls from citizens requesting dandelion spraying in neighborhood parks or in other areas that will not be sprayed, staff should explain that we have adopted an environmental policy, will review their request and make a determination based on approved policy."

The Park District has received an award from the Audubon Society for their golf course maintenance, vis a vis PHF applications. According to their Environmental Policy the Park District performs comprehensive soil testing to accurately forecast PHF needs and prevent unneeded PHF application on golf courses.

The Park District has added insect repellant to the suggested list for all child participants in outdoor programs, invested in public health education on this matter, and prioritized potential control/spray sites. High priority control sites are those high traffic facilities in deep woods settings where programs involve participants under the age of 18 (such as Getaway Playground). Other priority areas are high traffic facilities in deep woods settings open to the public for evening hour activities (i.e. Sinnissippi Park Band Shell, Marinelli Field). Control agents are applied by licensed commercial applicators on an as-needed basis.

2.5.2 Compliance Schedule

Table 11

PESTICIDE, HERBICIDE, AND FERTILIZER APPLICATION COMPLIANCE

Task	Action Date
Evaluate current PHF application practices with City and Park District and revise as needed – Part II.A.6.a	Study performed along Charles St. in 2011.
Implement a public education program in accordance with Part II.A.6.b	Brochure printed & distributed in 2011. Local applicators issued notices regarding new NPDES regulations.
Report on the City's authority to implement controls related to PHF application by commercial and wholesale distributors and applicators	Part of Annual Report
Report to IEPA progress of compliance with items in Part II.A.6	Part of Annual Report

2.6 ILLICIT DISCHARGES AND IMPROPER DISPOSAL

This section addresses Parts II.A.7 and III.A of the Permit.

2.6.1 Narrative Evaluation

On September 6, 2011 the Rockford City Council amended the City's storm water ordinance to include specific requirements to prevent, control, and reduce storm water pollutants by the use of best management practices (Chapter 109 Storm Water and Surface Water Management, Article

II). This amendment specifically demonstrates compliance with Part II.A.7 of the permit. In-house training occurred in 2011 for City Public Workd Department staff on its obligations regard illicit discharges detection and elimination (Table 4).

City storm water management staff regularly performs inspections for illicit discharges and improper disposal (Table 12). Inspection data are recorded in field logs and electronic databases. Supplemental dry weather inspections are performed on an ongoing basis by the City during storm water quality monitoring and the Rock River Water Reclamation District during their operation and maintenance activities.

The City also performs quarterly water quality testing and biennial bioassessments of the MS4 receiving streams as part of screening for illicit discharges and improper disposal under the presumption that the effects of such pollution would be evident in those chemical and biological surveys. The results of the water quality testing and bioassessment are provided in the appendices to this report. The bioassessments are scheduled to be repeated in 2012.

The City, in cooperation with the Illinois EPA and Rock River Water Reclamation District, collects household hazardous wastes as well as PHF, used tires, and used motor oil. Aerosols, corrosives, oxidizers, solvents, oil-based and latex paints, waste oils, pesticides, batteries, fluorescent lamps, and insulin disposal service are all accepted. Radioactive wastes, compressed gases, and explosives are not accepted. In 2011, there were over 444,000 pounds of household hazardous waste collected at the Rockford site (1,520 drums), but it is a regional facility and not all the waste was from Rockford. In 2011, about 75% of the cars dropping off HHW were registered to Rockford residents. The collection program is available to all City residents and is publicized on the Illinois EPA's web site (http://www.epa.state.il.us/land/hazardous-waste/household-haz-waste/hhwc-schedule.html).

Table 12

ILLICIT DISCHARGE AND IMPROPER DISPOSAL INSPECTIONS DURING 2011

Date	Location	Type of Discharge	Source Determined?	Nature of Follow-up	Submit to Code Enforcement	Notes
3/15/2011	Skyrise apt. Roof	Roof materials dumped in river	yes	warning issued and area cleaned	no	
4/1/2011	Stone Eagle restaurant	sanitary line overflowing	yes	sanitary line repaired and storm sewer cleaned.	no	
7/18/2011	Boylan H.S.	pool water being drained	yes	issue discussed with Boylan H.S.	no	
7/29/2011	Jt's	wastewater dumped into inlet	yes	warning issued	no	
8/18/2011	1300 Bl, Brown Ave	concrete waste in gutter	yes	warning issued and site cleaned	no	
8/19/2011	Argus Dr.	concrete waste in inlet	yes	Warning issued	no	
8/25/2011	3519 Robey Ave.	Sediment on street	yes	warning issued	no	sediment removed
8/29/2011	Guilford & Spring Creek	Sediment in drainage way	yes, well drilling	drilling stopped until more controls put in place	no	additional controls put in place and water is being tested for turbidity
8/81/2011	Rock River, near Sports Core	oily substance	no, not located	none, suspect it was detritus		
9/12/2011	3581 Sage	concrete waste in gutter	yes	warning issued	no	
9/21/2011	3622 Brookview	Sediment in creek	yes, water main break	none, public safety issue	no	
9/23/2011	3840 Broadway	grease dumped in inlet	yes	warning issued	no	
9/23/2011	4599 Chesterfield	pool drained to street	yes	none, allowable discharge	no	
10/4/2011	Morgan & Main St	grease dumped in inlet	unable to determine responsible party, inlets were cleaned	consulted with health department to continue monitoring		Traffic cameras were redirected temporarily to monitor the inlet. Nothing was observed.

Date	Location	Type of Discharge	Source Determined?	Nature of Follow-up	Submit to Code Enforcement	Notes
10/13/2011	Peoples Ave.	auto salvage	yes	closed due to code violations	yes	site not permitted, see industrial inspection
10/24/2011	17th & 11th	fuel dumped in inlet	no/could not locate	none		
10/28/2011	3507 Liberty	oil dumped on ground	unable to determine responsible party	talked to neighbors about proper disposal	no	
11/1/2011	3947 Sage	orange substance in drain	yes	none, probably iron bacteria	no	
11/18/2011	801 Beale	material pile near road	yes	industrial inspection scheduled for Rock Road Asphalt	see industrial inspection	
11/23/2011	333 - 18th Ave	industrial discharge into storm sewer	yes	industrial inspection scheduled for Modern Suspension	See industrial inspection	
12/1/2011	711 - 19th	boxes in creek	no, boxes could not be located	none	no	could not locate boxes
12/15/2011	4225 Charles	grease in inlet	verified, cannot determine source	warning sent to suspected party along with info	no	continue to monitor
12/16/2011	Alliance & Parkside (Amerock)	flowing water & foam in creek	yes (flowing water) no (foam)	none	no	water was from fire line flushing, foam appears to be natural material.
12/20/2011	Renaissance Center	sediment	yes	See ESC inspection	No	See ESC inspection for Northern Illinois Service

2.6.2 Compliance Schedule

Table 13

ILLICIT DISCHARGES AND IMPROPER DISPOSAL COMPLIANCE

Task	Action Date
Develop an ordinance, order or similar means to meet the requirements of Part II.A.7.b, c and d	Quarterly monitoring and biennial bioassessments of MS4 receiving stream Numerous inspections in 2011
Report progress in meeting requirements of Part II.A.7	Part of Annual Report

2.7 SPILL PREVENTION AND RESPONSE

This section addresses Parts II.A.8 of the Permit. The Rockford Fire Department is the "First Emergency Responder" in the City. In compliance with Part II.A.8.a, the Fire Department's records were searched for all incidents of a material spill that may have entered the storm sewer system within the MS4 service area (personal communication, Capt. Charles Barnes, Rockford Fire Department). In 2011, there were no spills encountered by the Fire Department that could have entered the storm sewer system within the MS4 service area.

Permit Part II.A.8.b requires the City to include a summary of 'spill prevention' activities in the Annual Report. Currently, most industries are responsible for their own training and education. Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) training is required by most industries; and spill containment/prevention procedures have been developed by most industries. The Fire Department visits every industrial facility to develop a Pre-fire Plan Survey which includes such information as egress/ingress routes, location and types of chemicals on-site, combustible and flammable materials, special hazards, fire suppression methods, facility maps, emergency contact information, etc. The City has an active recycling campaign, thereby indirectly removing possible spill material from the environment. Overall, the City does not experience many industrial spills.

2.8 INDUSTRIAL AND HIGH RISK RUNOFF

This section addresses Parts II.A.9 and III.A of the Permit.

2.8.1 Narrative Evaluation

The City of Rockford piloted an Industrial and High Risk Facility Inspection Program (IHRI) in 2011.The program was developed using databases of locations of industries and potential high risk runoff, and industrial NPDES permit data. These databases provide likely locations for industrial and high risk runoff and are currently the basis for future inspections. Such inspections may also be triggered either by citizen complaints, City crew field reports, storm water monitoring data reviews, or other information suggesting a need for inspections or monitoring.

The Permit requires the City to review and evaluate industry SWPPPs (Storm Water Pollution Prevention Plans). The Illinois EPA is responsible for implementing industrial storm water permitting and for compliance with the associated SWPPPs. No SWPPPs are sent to the City for

review by the permittees. However, during inspections the City staff request to see any SWPPPs, and record whether a SWPPP is present or missing from each facility.

Photograph 2. City Storm Water Inspector during an IHRR field inspection in 2011.

Twenty-three (23) industrial inspections were performed by City storm water staff during 2011. Table 14 is a summary report on the findings and follow-up actions.

Table 14

INDUSTRIAL INSPECTIONS PERFORMED DURING 2011

Date	Company/ Permit # ILR00	SIC†	NPDES/High Risk/SIU††	Follow-up Rq'd	Follow-up Date	Corrective Actions Addressed	Submit to Code Enforcement	Notes
3/24/2011	RRWRD - 6301	4952	NPDES	No	na	na	No	
3/25/2011	Hamilton Sundstrand - 6127	6102	NPDES/High risk/SIU	No	na	na	No	
4/7/2011	Hamilton Sundstrand - 6130	3728	NPDES/High risk	No	na	na	No	
8/18/2011	Readette & Dunn Platers - 0979	3471	NPDES	No	na	na	Na	
8/24/2011	Meyer Material - 3684	3273	NPDES	Yes	10/7/2011	Yes	No	
8/24/2011	Siemans Water Tech, No Exposure	3589	NPDES/High Risk/SIU	No	na	na	No	
8/25/2011	Rockford Foundaries, no exposure	3366	NPDES/High Risk	No	na	na	No	
9/7/2011	Eclipse - No exposure	3433	NPDES/High Risk/SIU	No	na	na	No	
9/20/2011	Rock River Heat Treat - 6377	3398	NPDES/High risk	no	na	na	No	
9/21/2011	Joseph Behr - 6300	3341	NPDES/High Risk	No	na	na	No	
9/21/2011	Hayes Beer	5000	High risk	Yes	10/17/2011	yes	No	
9/30/2011	Greenlee Textron - 4233	3423	NPDES/High Risk/SIU	No	na	na	No	
10/11/2011	Valspar - 6354	2821	NPDES/High Risk	No	na	na	No	
10/13/2011	Forest City Recovery - no permit		Not Licensed	No		No	Yes, shut down for violations	IEPA to follow-up
10/17/2011	LKQ Auto Parts - 6839	5015	NPDES	Yes		partially done due to conditions	No	Inlet protection installed. Onsite sewer cleaning scheduled, awaiting contractor
10/20/2011	Waldom Electronic - 1219	3669	NPDES	Yes		no	No	Appears site would qualify for No

Date	Company/ Permit # ILR00	SIC†	NPDES/High Risk/SIU††	Follow-up Rq'd	Follow-up Date	Corrective Actions Addressed	Submit to Code Enforcement	Notes
								Exposure
10/31/2011	Rockford Auto Parts - 6350	5015	NPDES/High Risk	No	na	na	No	
11/3/2011	S.A. Industries (Gates Rubber) - 4208	3429	NPDES/High Risk	No	na	na	No	
11/3/2011	UPS Freight - 3163	4212	NPDES	No	na	na	No	
12/8/2011	Modern Suspension	3363	SIU, no exposure applied for	Yes				No permitting, appears to qualify for no exposure
12/13/2011	Rock River Disposal - 5895	4212	NPDES	No	na	na	no	
12/14/2011	Fed Ex Freight - 5923	4213	NPDES, High Risk	No	na	na	No	
12/14/2011	Rock Road Companies - O563	2951	NPDES	Yes	12/19/2011	yes	no	Temporary measures installed. More permanent to be installed next year.

Notes:

† SIC: Standard Industrial Code is a United States government system for classifying industries by a four-digit code

†† SIC: Significant Industrial User, as defined by the Rock River Water Reclamation District

2.8.2 Compliance Schedule

Table 15

INDUSTRIAL AND HIGH RISK RUNOFF COMPLIANCE

Task	Action Date
Identify priorities and procedures for inspections in accordance with Part II.A.9.a	Draft industrial and high risk program has been prepared using current data.
Inspect and monitor select industries to verify discharges to MS4 are in compliance with their NPDES storm water permit	Piloting performed in 2011 and continuing in 2012.
Continue gathering of information for the known waste disposal sites located within the city boundaries	Continual
Report status of compliance with Part II.A.9	Part of Annual Report

2.9 PUBLIC EDUCATION, POLLUTION PREVENTION AND GOOD HOUSEKEEPING

This section addresses Parts II.A.10 and III.A of the Permit.

2.9.1 Narrative Evaluation

The City of Rockford continues to expand programs on public education, pollution prevention and good housekeeping. The City currently advertises these through brochures, workshops and speaking events, newspaper inserts, and its web site.

Recycling data for the last few years is tabulated below and suggests that residents are recycling an ever larger portion of Rockford's solid wastestream.

Table 16

CITY OF ROCKFORD RECYCLING PROGRAM

Year	Refuse(tons)	Recycled (tons)	Portion Recycled
2007	55,643	7,044	11%
2008	53,875	7,238	12%
2009	51,786	6,830	12%
2010	49,739	6,736	13.5%
2011	48,038	6,886	14.3%

As mentioned earlier, the City cooperates with the Illinois EPA for the collection of household hazardous wastes (HHW) as well. In 2011, there were over 444,000 pounds of household hazardous waste collected at the Rockford site (1,520 drums), but it is a regional facility and not all the waste was from Rockford. In 2011, about 75% of the cars dropping off HHW were registered to Rockford residents.

In 2011, the City printed pamphlets with the following titles:

- Managing Concrete Washout
- Hazardous Materials Around Your Home
- Water Friendly Landscaping Alternatives
- Erosion and Sediment Control
- Illicit Discharge Detection and Elimination
- Residential De-Icing
- Applying Fertilizers and Pesticides
- Pet Waste and Water Quality
- Yard Wastes
- Erosion Control for Homebuilders
- Stormwater Permitting Requirements

All of these brochures focus on protection of water quality and are available to the general public in the lobby of City Hall and the Department of Public Works.

In October and November 2011 the Storm Water Management Program installed an educational exhibit in the lobby of City Hall. The exhibit covered all major aspects of the water quality and storm water management.

In November 2011 Public Works staff had a table at the City of Rockford's Chili Shoot Out held at the Millennium Center. The Department's table was based on the theme "Illicit Discharge Chili". A display regarding illicit discharge was developed and approximately 150 people attended the event and viewed the display.

During 2011 Storm Water Program staff engaged outside civic and business groups to proactively educate them about water quality and flood control. On July 21, 2011, they hosted a meeting of Keith Creek residents affected by recent floods: 20-30 people attended. The attendees were updated on all three phases of demolitions, including recent bid openings. Staff also took the opportunity to explain proper disposal of yard wastes and inlet clearing to prevent nuisance flooding. On May 16, 2011, staff met with local utilities regarding erosion and sediment control requirements for their projects. On March 8, 2011 the City hosted a seminar on water and storm water requirements for developers. More than 35 people attended; the seminar reviewed permit requirements, water service, erosion controls and inspections. In the November 2011 meeting of Rock Stat, Public Works staff made

a presentation of all of its operations, but focused on the storm water management program. The Rock Stat presentation was broadcast on public television. On December 9, 2011, Storm Water Program staff presented a summary of its program accomplishments to the Illinois EPA Rockford Region MS4 Conference.

These brochures, presentations, meetings and seminars demonstrate the City's compliance with the permit condition to publicize, promote and facilitate improved storm water management in Rockford.

2.9.2 Compliance Schedule

Table 17

PUBLIC EDUCATION, POLLUTION PREVENTION AND GOOD HOUSEKEEPING COMPLIANCE

Task	Action Date
Prepare report on existing situation and make recommendations	Annually

3. SWMP FISCAL MATTERS, EFFECTIVENESS, AND OTHER ISSUES

3.1 ANNUAL EXPENDITURES

City expenditures for 2011 for SWMP activities are tabulated below. Table 18 also includes budgeted costs for 2012.

Table 18

SWMP FISCAL INFORMATION

Item(s)	2011 (Actual)	2012 (Budgeted)
Street Sweeping	$ 849,706	$ 1,053,188
Sewer Repair	$ 410,042	$ 478,011
Bridge, Dam, Ditch Maintenance	$ 74,631	$ 91,000
Inlet Cleaning	$ 70,736	$ 9,250
Storm Water City-Wide Drainage Fund		$ 150,000
Storm Water Sampling and Testing	$ 32,439	$ 50,000
Storm Water (Other Projects)		$ 495,000

3.2 PROGRAM REVIEW

The status of Rockford's SWMP implementation and compliance is reviewed in Section 2. During the first five years of the NPDES permit, the City of Rockford developed and implemented nearly all the program elements scheduled, with a few exceptions. The most recent five-year permit period expired in November 30, 2009. An application for a new permit was submitted to the Illinois EPA in June 2009, followed by supplemental correspondence in September 2009 and March 2011. A number of revisions to the draft permit revisions have been requested by the City, and currently being reviewed by the Agency.

An important improvement to the City's storm water program in 2011 was the new Industrial and High Risk Runoff inspection program. The preliminary program was piloted in 2011, as discussed in Section 2.8.1.

3.3 EFFECTIVENESS OF CONTROLS

The current storm water monitoring program was started in the 1990s. Monitoring stations were constructed and automation equipment purchased. But monitoring did not begin in earnest until summer 2003. Storm event and dry-weather screening of water quality began in 2003 and continued through 2011. Appendices A, B, and C contain these data and interpret their effectiveness.

Bioassessments of five streams fecal coliform bacteria concentrations regularly exceed the General Use Water Quality Standard and contact recreation use is not supported. Appendix C presents some evidence of improved macroinvertebrate communities at monitoring site T-4, Keith Creek at Dahlquist Park. No other stream sites show indications of improvement (or degradation).

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

3.4 ENFORCEMENT ACTIONS

In 2007 the US EPA began an audit of NPDES Permit ILS000001. A report was issued the following year (SAIC 2008). Implementation of the US EPA's recommendations continues. In December 2010, the US EPA again contacted the City regarding its follow-up activities for improving compliance with the NPDES Permit, and those discussions continue.

4. REFERENCES

SAIC. 2008. Municipal Separate Storm Sewer System (MS4) Audit, Rockford, Illinois September 18-20 and October 2-3, 2007. Prepared for US EPA Region 5, Chicago, Illinois by SAIC, Lakewood, Colorado.

APPENDICES

APPENDIX A - WATER QUALITY MONITORING DATA

This appendix reprints all storm water quality monitoring data collected by the City from 2003 to date. A map is attached showing the five monitoring locations, and a table providing chemical and microbiological data.

The City of Rockford's NPDES storm water permit cites five locations for monitoring. The City has prepared these locations and installed automatic samplers and rain gages. Much of the monitoring process is defined in the permit.

Table A.1

STORM WATER MONITORING LOCATIONS

Outfall	Latitude	Longitude	Locations	Watershed Description
R1 (001)	42.30576	89.09617	Paradise Boulevard Section 11, T44N, R1E	225-ac residential and open space
R2 (002)	42.27045	89.09043	Market St & North First Section 23, T44N, R1E	50-ac commercial, offices, and residential
R3 (003)	42.26955	89.04381	Fairview Blvd and Crosby St Section 19, T44N, R2E	510-ac residential
R4 (004)	42.23405	89.07985	8th St and Wills St Section 36, T44N, R1E	780-ac industrial, commercial, and residential
R5 (005)	42.23266	89.02128	Forest View Rd and 28th Ave Section 5, T43N, R2E	80-ac light industrial

Additionally, the wet weather screening requirements of the permit include two locations for monitoring and collection of floatables. These locations are at Alpine Dam and at the intersection of Kishwaukee and Sandy Hollow. Floatables from these locations were collected six (6) times during 2011. The City hauled 970 lbs of floatable debris from Kishwaukee and Sandy Hollow and about 1.5 tons from Alpine.

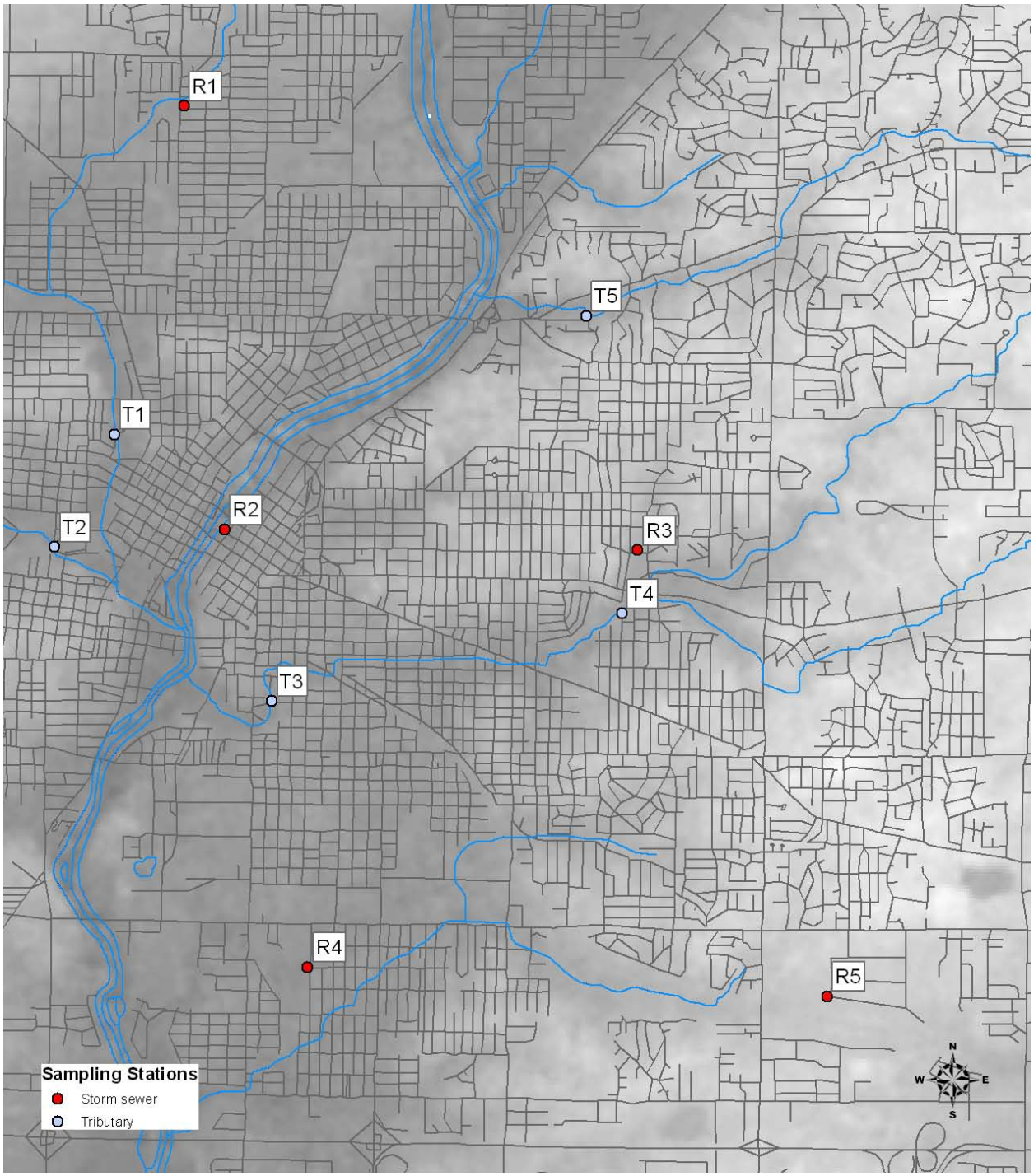

Figure A.1. Map of Storm Sewer and Tributary Sampling Locations

Appendix A
MS4 STORM WATER QUALITY DATA 2003-2011

Station	Date	Time	Latitude	Longitude	Location Description	FCB	FCB_Qualifier	FCB_Units	BOD	COD	Qualifier	TSS	TDS	FOG	Qualifier	Hardness	Qualifier
R1	26-Jun-03	12:15	42.30576	-89.09617	Paradise Boulevard	15000	B	CFU/100mL	44	297		422		10	K	44	
R1	1-Aug-03	11:45	42.30576	-89.09617	Paradise Boulevard	2000		CFU/100mL	22	161		162	48	10	K	40	
R1	4-Aug-04	8:45	42.30576	-89.09617	Paradise Boulevard			CFU/100mL	74	251		268	124			76	
R1	27-Aug-04		42.30576	-89.09617	Paradise Boulevard			CFU/100mL	9	61		61	78	10	K	34	
R1	11-May-06	13:45	42.30576	-89.09617	Paradise Boulevard	3100		CFU/100mL	18	91		17	128			47	
R1	21-Jun-06	10:00	42.30576	-89.09617	Paradise Boulevard	15000	B	CFU/100mL	14	105		122	80	10	K	46	
R1	3-Aug-06	8:30	42.30576	-89.09617	Paradise Boulevard	15000	B	CFU/100mL									
R1	4-Sep-08	14:01	42.30576	-89.09617	Paradise Boulevard	9600		CFU/100mL	10	37		43	42	18		15.2	
R1	27-Aug-09	9:43	42.30576	-89.09617	Paradise Boulevard	10000		CFU/100mL	7	28		26	38	10	K	37.8	
R1	23-Sep-09	9:55	42.30576	-89.09617	Paradise Boulevard			CFU/100mL		31		16	40	10	K	8	
R1	22-Oct-09	13:20	42.30576	-89.09617	Paradise Boulevard	30900		CFU/100mL									
R1	28-Jun-10	9:50	42.30576	-89.09617	Paradise Boulevard			CFU/100mL	15	56		6	82	10	K	45.8	
R1	1-Sep-10	10:55	42.30576	-89.09617	Paradise Boulevard			CFU/100mL	27	94		66	88	10	K	43.4	
R1	23-May-11	10:21	42.30576	-89.09617	Paradise Boulevard			CFU/100mL	64	159		60	112	10	K	33	
R1	26-Sep-11	13:30	42.30576	-89.09617	Paradise Boulevard	3100		CFU/100mL	7	24		2	38	10	K	17	
R2	26-Jun-03	11:50	42.27045	-89.09043	Market Street and North First	10	K	CFU/100mL	16	97		79		10	K	80	
R2	10-Jul-03	8:55	42.27045	-89.09043	Market Street and North First	4300		CFU/100mL	6	32		29				34	
R2	1-Aug-03	11:05	42.27045	-89.09043	Market Street and North First	4200		CFU/100mL	4	12		7	86	10	K	30	
R2	21-Jun-04		42.27045	-89.09043	Market Street and North First	1380		CFU/100mL	14	93		170	76	10	K	56	
R2	4-Aug-04	9:15	42.27045	-89.09043	Market Street and North First	5000		CFU/100mL	18	125		246	148			112	
R2	27-Aug-04		42.27045	-89.09043	Market Street and North First			CFU/100mL	7	90		262	48	10	K	25	
R2	11-May-05	9:30	42.27045	-89.09043	Market Street and North First	1500	B	CFU/100mL									
R2	7-Nov-05	12:10	42.27045	-89.09043	Market Street and North First			CFU/100mL	11	37		23	70			28	
R2	11-May-06	13:15	42.27045	-89.09043	Market Street and North First	8000		CFU/100mL	14	83		8	504	10	K	147	
R2	21-Jun-06	10:15	42.27045	-89.09043	Market Street and North First	15000	B	CFU/100mL	4	16		18	10	10	K	16	
R2	28-Jun-06	13:00	42.27045	-89.09043	Market Street and North First	500		CFU/100mL									
R2	3-Aug-06	10:30	42.27045	-89.09043	Market Street and North First	15000	B	CFU/100mL									
R2	5-Sep-06	11:00	42.27045	-89.09043	Market Street and North First	1440		CFU/100mL	6	32		38	44	11		26	
R2	5-Aug-08	9:50	42.27045	-89.09043	Market Street and North First	20		CFU/100mL	3	28		26	44			25	
R2	4-Sep-08	14:26	42.27045	-89.09043	Market Street and North First	109000		CFU/100mL	5	37		33	12	18		46	
R2	8-Oct-08	10:00	42.27045	-89.09043	Market Street and North First			CFU/100mL	14	56		16	78	10	K	34	
R2	27-Aug-09	9:14	42.27045	-89.09043	Market Street and North First	9600		CFU/100mL	3	10	K	20	32	10	K	20.1	
R2	2-Oct-09	8:29	42.27045	-89.09043	Market Street and North First			CFU/100mL	14	44		22	114	10	K	29.8	
R2	22-Oct-09	13:35	42.27045	-89.09043	Market Street and North First	2100		CFU/100mL									
R2	23-Oct-09	9:34	42.27045	-89.09043	Market Street and North First			CFU/100mL	10	38		8	72	10	K	19.6	
R2	1-Sep-10	10:39	42.27045	-89.09043	Market Street and North First	29600		CFU/100mL									
R2	9-Jun-11	9:31	42.27045	-89.09043	Market Street and North First	19000		CFU/100mL									
R2	22-Jul-11	14:16	42.27045	-89.09043	Market Street and North First			CFU/100mL	13			8	112	9		48	
R2	26-Sep-11	13:50	42.27045	-89.09043	Market Street and North First	1000		CFU/100mL	3	10	K	10	10	19		11	
R3	26-Jun-03	11:15	42.26955	-89.04381	Fairview Blvd and Crosby St	290		CFU/100mL	4	97		24		10	K	16	
R3	10-Jul-03	8:20	42.26955	-89.04381	Fairview Blvd and Crosby St	15000	B	CFU/100mL	2	12		17		10	K	16	
R3	1-Aug-03	0:15	42.26955	-89.04381	Fairview Blvd and Crosby St	15000	B	CFU/100mL	6	19		23	42	10	K	32	
R3	4-Aug-04	10:15	42.26955	-89.04381	Fairview Blvd and Crosby St	43000		CFU/100mL									
R3	27-Aug-04		42.26955	-89.04381	Fairview Blvd and Crosby St			CFU/100mL	2	16		33	24	10	K	10	K
R3	11-May-05	9:00	42.26955	-89.04381	Fairview Blvd and Crosby St	1500	B	CFU/100mL									
R3	11-May-06	14:00	42.26955	-89.04381	Fairview Blvd and Crosby St	8200		CFU/100mL				90	294			106	
R3	24-May-06	9:00	42.26955	-89.04381	Fairview Blvd and Crosby St	900		CFU/100mL									
R3	21-Jun-06	11:15	42.26955	-89.04381	Fairview Blvd and Crosby St	15000	B	CFU/100mL									
R3	3-Aug-06	0:40	42.26955	-89.04381	Fairview Blvd and Crosby St	15000	B	CFU/100mL									
R3	5-Sep-06	9:50	42.26955	-89.04381	Fairview Blvd and Crosby St	1040		CFU/100mL	4	36		168	24	10	K	17	
R3	11-Sep-06	10:00	42.26955	-89.04381	Fairview Blvd and Crosby St	30000		CFU/100mL									
R3	5-Aug-08	9:24	42.26955	-89.04381	Fairview Blvd and Crosby St			CFU/100mL	7	71		44	74			37	

Appendix A
MS4 STORM WATER QUALITY DATA 2003-2011

Station	Date	Time	Latitude	Longitude	Location Description	FCB	FCB_Qualifier	FCB_Units	BOD	COD	Qualifier	TSS	TDS	FOG	Qualifier	Hardness	Qualifier
R3	4-Sep-08	14:36	42.26955	-89.04381	Fairview Blvd and Crosby St	9400		CFU/100mL									
R3	24-Oct-08	22:36	42.26955	-89.04381	Fairview Blvd and Crosby St			CFU/100mL	56	129		8	104	12		42.5	
R3	27-Aug-09	10:02	42.26955	-89.04381	Fairview Blvd and Crosby St	9300		CFU/100mL									
R3	22-Oct-09	13:45	42.26955	-89.04381	Fairview Blvd and Crosby St	26000		CFU/100mL									
R3	9-Jun-11	9:15	42.26955	-89.04381	Fairview Blvd and Crosby St	40000		CFU/100mL									
R3	8-Nov-11	14:00	42.26955	-89.04381	Fairview Blvd and Crosby St			CFU/100mL	18	49		54	94	10	K	37.9	
R4	1-Aug-03	13:15	42.23405	-89.07985	9th St, 1 block south of Harrison	15000	B	CFU/100mL	3	91		820	94	10	K	40	
R4	28-Oct-03	11:25	42.23405	-89.07985	9th St, 1 block south of Harrison	240		CFU/100mL	27	180		623	146	10	K	120	
R4	21-Jun-04	14:05	42.23405	-89.07985	9th St, 1 block south of Harrison			CFU/100mL									
R4	4-Aug-04	9:45	42.23405	-89.07985	9th St, 1 block south of Harrison	16000		CFU/100mL	25	133		646	120			96	
R4	27-Aug-04		42.23405	-89.07985	9th St, 1 block south of Harrison			CFU/100mL	3	25		38	132			72	
R4	2-Nov-04	11:05	42.23405	-89.07985	9th St, 1 block south of Harrison			CFU/100mL	5	36		10	162	10	K	108	
R4	7-Nov-05	10:40	42.23405	-89.07985	9th St, 1 block south of Harrison			CFU/100mL	19	62		24	96			36	
R4	11-May-06	14:15	42.23405	-89.07985	9th St, 1 block south of Harrison	10800		CFU/100mL	19	94		19	94	10	K	44	
R4	21-Jun-06	11:00	42.23405	-89.07985	9th St, 1 block south of Harrison	15000	B	CFU/100mL	8	43		51	42	10	K	35	
R4	5-Sep-06	12:00	42.23405	-89.07985	9th St, 1 block south of Harrison	980		CFU/100mL	121	100		448	226	14		137	
R4	11-Sep-06	9:30	42.23405	-89.07985	9th St, 1 block south of Harrison	20000		CFU/100mL									
R4	27-Aug-09	11:15	42.23405	-89.07985	9th St, 1 block south of Harrison	9200		CFU/100mL									
R4	2-Oct-09	8:48	42.23405	-89.07985	9th St, 1 block south of Harrison			CFU/100mL	40	109		132	156	10	K	39.2	
R4	22-Oct-09	14:08	42.23405	-89.07985	9th St, 1 block south of Harrison	8700		CFU/100mL									
R4	9-Jun-11	8:45	42.23405	-89.07985	9th St, 1 block south of Harrison	9600		CFU/100mL									
R4	22-Jul-11	14:05	42.23405	-89.07985	9th St, 1 block south of Harrison			CFU/100mL	9			414	162	15		60	
R4	12-Oct-11	9:50	42.23405	-89.07985	9th St, 1 block south of Harrison	1320		CFU/100mL	11	38		77	80	10	K	70	
R5	19-Jun-03	8:20	42.23266	-89.02128	Forest View Rd and 28th			CFU/100mL	16	109		220				52	
R5	26-Jun-03	10:50	42.23266	-89.02128	Forest View Rd and 28th	15000	B	CFU/100mL	8	20		142		10	K	24	
R5	10-Jul-03	7:30	42.23266	-89.02128	Forest View Rd and 28th			CFU/100mL	8	24		35		10	K	20	
R5	1-Aug-03	0:45	42.23266	-89.02128	Forest View Rd and 28th	15000	B	CFU/100mL	6	27		34	32	10	K	22	
R5	21-Jun-04		42.23266	-89.02128	Forest View Rd and 28th	10	K	CFU/100mL									
R5	4-Aug-04	10:45	42.23266	-89.02128	Forest View Rd and 28th	7000		CFU/100mL	10	44		41	42			48	
R5	11-May-06	14:30	42.23266	-89.02128	Forest View Rd and 28th	15000	B	CFU/100mL									
R5	11-Sep-06		42.23266	-89.02128	Forest View Rd and 28th	10300		CFU/100mL									
R5	27-Aug-09	10:20	42.23266	-89.02128	Forest View Rd and 28th	9100		CFU/100mL									
R5	22-Oct-09	13:56	42.23266	-89.02128	Forest View Rd and 28th	3000		CFU/100mL									
R5	9-Jun-11	9:00	42.23266	-89.02128	Forest View Rd and 28th	10400		CFU/100mL									

Notes:
1. All units are mg/L unless otherwise indicated.
2. FCB: Fecal coliform bacteria BOD: 5-day biochemical oxygen demand COD: chemical oxygen demand
3. Qualifers: K: less than indicated limit B: greater than indicated value

Appendix A
MS4 STORM WATER QUALITY DATA 2003-2011

Station	Date	NH3	Qualifier	NO3NO2	Qualifier	TKN	Qualifier	P	Qualifier	CN	Qualifier	Phenols	Qualifier	Cu	Qualifier	Cd	Qualifier	Zn	Qualifier	Pb	Qualifier
R1	26-Jun-03	0.7		1	K			1.2		3	K	5	S	0.04		0.005	K	0.32		0.063	
R1	1-Aug-03	1.2		0.5				0.6		3	K	5	S	0.03		0.008		0.17		0.027	
R1	4-Aug-04	0.4		1	K	7		1.4						0.03		0.005	K	0.21		0.055	
R1	27-Aug-04	0.2	K	1	K	1.7		0.3						0.01		0.005	K	0.07		0.012	
R1	11-May-06	0.2		1	K	4.3		0.6						0.02		0.005	K	0.13		0.005	K
R1	21-Jun-06	0.5		1	K	4.1		0.5						0.02		0.005	K	0.1		0.013	
R1	3-Aug-06																				
R1	4-Sep-08	0.1	K	0.8	K	1.1		0.55						0.04		0.005	K	0.08		0.007	
R1	27-Aug-09	0.1	K	1	K	0.8		0.21						0.026		0.005	K	0.03	K	0.005	K
R1	23-Sep-09	0.2		1	K	0.9		0.18						0.036		0.005	K	0.074		0.005	K
R1	22-Oct-09																				
R1	28-Jun-10	0.1	K	1	K	2.7		0.28						0.243		0.094		0.276		0.228	
R1	1-Sep-10	1.2		1.2		2.2		0.45						0.021		0.005	K	0.08		0.007	
R1	23-May-11	0.6		1	K	5.3		1						0.12		0.005	K	0.1		0.005	K
R1	26-Sep-11	0.1	K	0.5		0.6		0.1						0.01		0.005	K	0.04		0.005	K
R2	26-Jun-03	0.2		1				3		3	K	5	S	0.04		0.005	K	0.26		0.03	
R2	10-Jul-03	0.2	K	1	K			1.1		3	K			0.02		0.005	K	0.09		0.012	
R2	1-Aug-03	0.2	K	1	K			1.3		3	K	5	S	0.02		0.005	K	0.1		0.006	
R2	21-Jun-04	0.4		1	K			0.4		3	K			0.03		0.005	K	0.17		0.355	
R2	4-Aug-04	0.2	K	1	K	1.4		0.6						0.05		0.005	K	0.19		0.055	
R2	27-Aug-04	0.2	K	1	K	2.1		0.5						0.06		0.005	K	0.27		0.103	
R2	11-May-05																				
R2	7-Nov-05	1		1.3		3								0.03		0.005	K	0.12		0.009	
R2	11-May-06	0.4		1.2		3		0.3						0.03		0.005	K	0.17		0.007	
R2	21-Jun-06	0.2		1	K	0.9		0.1						0.01	K	0.005	K	0.07		0.005	K
R2	28-Jun-06																				
R2	3-Aug-06																				
R2	5-Sep-06	0.1	K	1	K	1.2		0.23						0.02		0.005	K	0.1		0.016	
R2	5-Aug-08	1.6		1		1.4		0.11						0.03	K	0.005	K	0.099		0.007	
R2	4-Sep-08	0.1	K	0.7	K	0.7		0.35						0.03	K	0.005	K	0.134		0.009	
R2	8-Oct-08	0.2		1.2		1.1		0.18						0.103		0.005	K	0.113		0.007	K
R2	27-Aug-09	0.1	K	1	K	1.2		0.07						0.04		0.005	K	0.03		0.006	
R2	2-Oct-09	0.2		1.1		1.6		0.12						0.021		0.005	K	0.059		0.005	
R2	22-Oct-09																				
R2	23-Oct-09	0.4		0.6		0.4		0.2						0.015		0.005	K	0.049		0.005	K
R2	1-Sep-10																				
R2	9-Jun-11																				
R2	22-Jul-11	0.2		1	K			0.15						0.04		0.005	K	0.09		0.007	
R2	26-Sep-11	0.1		0.5		0.4		0.1	K					0.01		0.005	K	0.03		0.005	K
R3	26-Jun-03	0.3		1.1				0.3		1		5	S	0.01	K	0.005	K	0.01	K	0.005	K
R3	10-Jul-03	0.1	K	1				0.16		1		5	S	0.01		0.005	K	0.01	K	0.005	K
R3	1-Aug-03	0.1	K	1				0.2		1		5	S	0.01		0.005	K	0.1		0.005	K
R3	4-Aug-04																				
R3	27-Aug-04	0.1	K	1	K	0.9		0.2						0.01	K	0.005	K	0.05		0.007	
R3	11-May-05																				
R3	11-May-06	1		1										0.03		0.005	K	0.17		0.008	
R3	24-May-06																				
R3	21-Jun-06																				
R3	3-Aug-06																				
R3	5-Sep-06	0.2		1	K	2		0.81						0.02		0.005	K	0.08		0.02	
R3	11-Sep-06																				
R3	5-Aug-08	2		1.2		2.3		0.33						0.03	K	0.005	K	0.081		0.007	

Appendix A
MS4 STORM WATER QUALITY DATA 2003-2011

Station	Date	NH3	Qualifier	NO3NO2	Qualifier	TKN	Qualifier	P	Qualifier	CN	Qualifier	Phenols	Qualifier	Cu	Qualifier	Cd	Qualifier	Zn	Qualifier	Pb	Qualifier
R3	4-Sep-08																				
R3	24-Oct-08	0.2		1		2.1		1.57						0.048		0.005	K	0.092		0.007	K
R3	27-Aug-09																				
R3	22-Oct-09																				
R3	9-Jun-11																				
R3	8-Nov-11	0.1	K	1	K	1	K							0.01		0.005	K	0.039		0.005	K
R4	1-Aug-03	0.2	K	1.8				0.7		3	K	5	S	0.04		0.005	K	0.4		0.344	
R4	28-Oct-03	0.5		4.8				0.4		3	K	5	S	0.04		0.005	K	0.45		0.093	
R4	21-Jun-04																				
R4	4-Aug-04	0.1	K	1.2		1.8		0.9						0.05		0.005	K	0.22		0.125	
R4	27-Aug-04	0.1	K	1		0.8		0.3						0.01		0.005	K	0.4		0.007	
R4	2-Nov-04	0.1	K	1.1		0.8		0.3						0.02		0.005	K	0.17		0.005	K
R4	7-Nov-05	0.3		1.4		3								0.03		0.005	K	0.14		0.094	
R4	11-May-06	0.7		1.2		2.2		0.3						0.02		0.005	K	0.12		0.009	
R4	21-Jun-06	0.5		1	K	2		0.2						0.02		0.005	K	0.12		0.015	
R4	5-Sep-06	0.1	K	1.5		2.1		0.69						0.03		0.005	K	0.23		0.055	
R4	11-Sep-06																				
R4	27-Aug-09																				
R4	2-Oct-09	0.1	K	1	K	2.1		0.53						0.08		0.005	K	0.167		0.029	
R4	22-Oct-09																				
R4	9-Jun-11																				
R4	22-Jul-11	0.3		2										0.05		0.005	K	0.21		0.057	
R4	12-Oct-11	0.4		2.6		1.3		0.22						0.02		0.005	K	0.06		0.013	
R5	19-Jun-03	1		1	K			0.4		3	K			0.05		0.005	K	0.27		0.019	
R5	26-Jun-03	0.3		1	K			0.2		3	K	5	S	0.05		0.005	K	0.28		0.015	
R5	10-Jul-03	0.2	K	0.6				0.1						0.01		0.005	K	0.07		0.005	
R5	1-Aug-03	0.2	K	0.6				0.1		3	K	5	S	0.01		0.005	K	0.1		0.005	K
R5	21-Jun-04																				
R5	4-Aug-04	0.3		1	K	1.2		0.3						0.02		0.005	K	0.08		0.008	
R5	11-May-06																				
R5	11-Sep-06																				
R5	27-Aug-09																				
R5	22-Oct-09																				
R5	9-Jun-11																				

APPENDIX B – STORM WATER POLLUTANT LOADS

This appendix presents the storm water pollutant concentrations and loads from the City of Rockford's MS4.

B.1 Storm Water Pollutant Concentrations

During 2011, six storm events were sampled and runoff was analyzed for one or more pollutants. To compute event mean concentrations of storm water pollutants, data collected in 2011 were merged into the greater dataset that the City has assembled from prior year's monitoring efforts. The dataset represents MS4 sampling back to 2003. The entire storm water quality dataset was examined graphically and analytically to test for normality and equality of means and variances for the five sampling stations. The storm water concentrations with normal distributions were tested using ANOVA (Analysis of Variance), while those groups that were non-normal (nor could be transformed to approximate normality) were tested using the non-parametric Kruskal-Wallis test. The grand means were generally used as estimates of event mean concentrations (EMC). For all inference tests, the significance level, α, was 0.05.

In general, the grand means are assumed to be our best current estimate for event mean concentrations. Table B-1 includes the results of the testing for the null hypothesis, H_0, that all means, μ, are equal at all 5 monitoring stations. In those instances where the sampling station means were found not to be equal, multiple pairwise comparisons were performed. The ANOVA testing and multiple pairwise comparisons allowed the City to identify those drainage areas having higher storm water pollutant concentrations than other drainage areas.

Table B-1

MEAN STORM WATER POLLUTANT CONCENTRATIONS (2003-2011)

Pollutant	Grand Mean	Test of Equality of Station Means
Total Suspended Solids	115 mg/L (N=57)	p-value = 0.058
Total Dissolved Solids	94 mg/L (N=49)	p-value = 0.101
Biochemical Oxygen Demand	17 mg/L (N=55)	p-value = 0.120
Chemical Oxygen Demand	70 mg/L (N=54)	p-value = 0.050
Fats, Oils, Grease	8.2 mg/L (N=44)	p-value = 0.493
Ammonia	0.35 mg/L (N=57)	p-value = 0.959
Nitrate+nitrite	0.67 mg/L (N=57)	p-value = 0.002
Total Kjeldahl Nitrogen	1.89 mg/L (N=39)	p-value = 0.341
Total Nitrogen	2.46 mg/L (N=39)	p-value = 0.253
Total Phosphorus	0.487 mg/L (N=52)	p-value = 0.312
Copper	0.038 mg/L (N=57)	p-value = 0.744
Zinc	0.139 mg/L (N=57)	p-value = 0.011
Lead	0.035 mg/L (N=57)	p-value = 0.025
Hardness	46 mg/L (N=57)	p-value = 0.020

Below are discussions of each pollutant. Following that are estimates of storm runoff volume for the MS4 area and storm water pollutant loads for 2011.

B.1.1 Total Suspended Solids

The boxplot is a convenient method to display medians, quartiles, means, maxima, minima and outliers. Figure B.1 is a boxplot of all total suspended solids (TSS) concentrations observed at the five automated storm sewer stations. The vertical (or interquartile) ranges of the "boxes" reflect the 25th and 75th quartiles of the distribution. The lines, or whiskers, extend upward to the maximum concentration observed at each site and downward to the minimum. The median is shown as a horizontal line within the shaded box; the average is indicated by the by the circled cross. Potential outliers are shown as asterisks.

Station R3, which reflects the drainage of a 510-acre watershed that is largely residential, has the lowest mean TSS concentration, 51 mg/L. Station R4, reflecting a 780-acre industrial, commercial and residential area had the highest mean TSS concentration, 275 mg/L. A large storage yard adjacent to R4 has been identified as a significant source of TSS and is likely responsible for the high concentrations observed there. This property is identified for inspection under the IHRR Program.

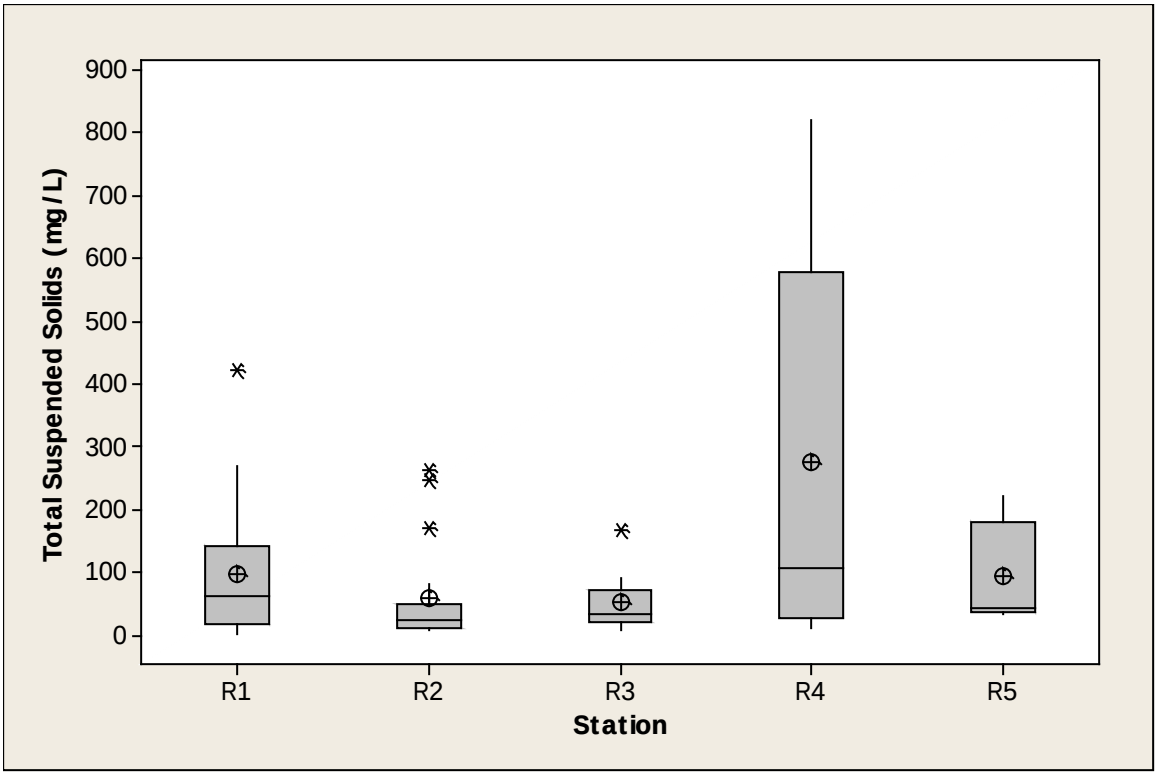

Figure B.1. Boxplot of TSS Concentrations

In spite of the occasional high concentrations of TSS at R4, the medians are much closer and ANOVA using the log-transformed concentrations at the five stations indicates that the means are equal, although very near the α level (p-value = 0.058). The grand mean TSS concentration is 115 mg/L and will be used as the event mean concentration (EMC).

B.1.2 Total Dissolved Solids

Total dissolved solids (TDS) in storm water are plotted in Figure B.2. ANOVA indicates that the log-transformed means are statistically the same at all monitoring sites (p-value = 0.101), supporting use of the grand mean, 94 mg/L, for the EMC. None of the samples reflect winter runoff events.

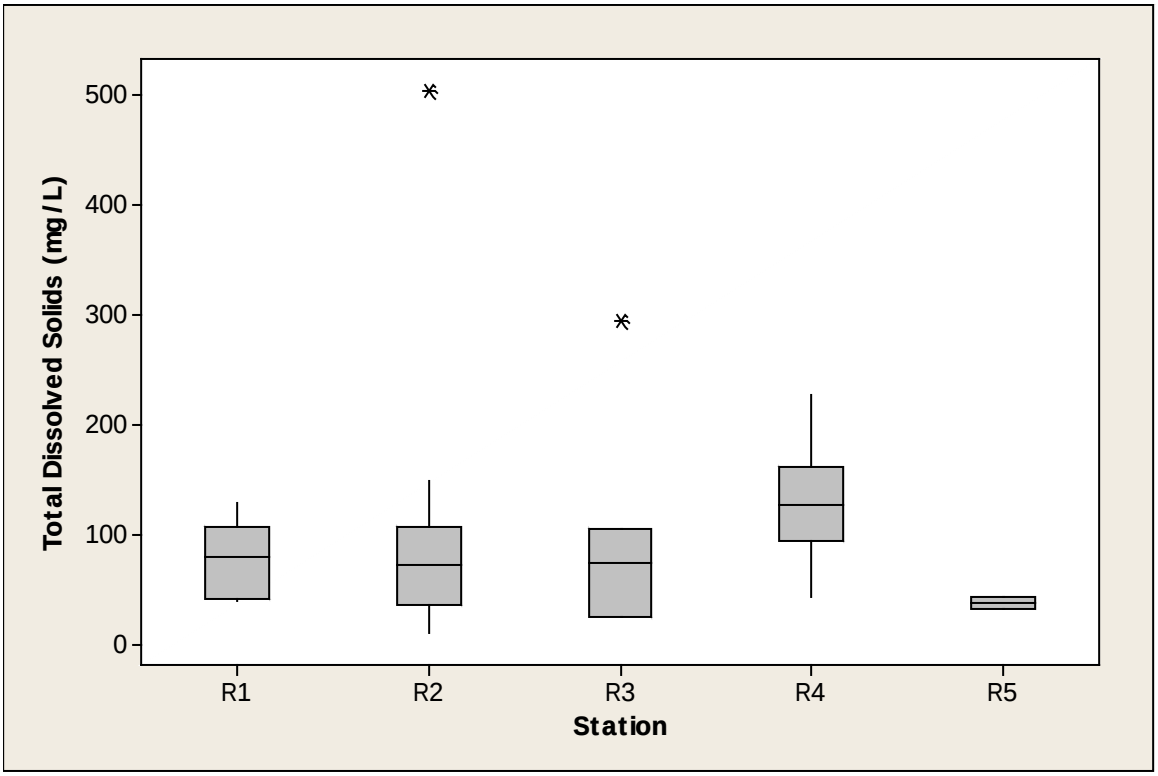

Figure B.2. Boxplot of TDS Concentrations

B.1.3 Oxygen Demand

The analytical program included 5-day biochemical oxygen demand (BOD) and COD, chemical oxygen demand. Figures B.3 and B.4 illustrate these data, combining data from all prior years of storm water monitoring. ANOVA testing of BOD concentrations found that the station means are equivalent (p=0.120). The grand mean BOD concentration is 16.6 mg/L and is our best estimate of event mean BOD concentration in the Rockford MS4.

ANOVA testing of log-transformed COD concentrations found that the station means are borderline equivalent (p=0.050). The grand mean COD is 70 mg/L and is a reasonable estimate of event mean concentration in the Rockford MS4. Individual station means are tabulated below.

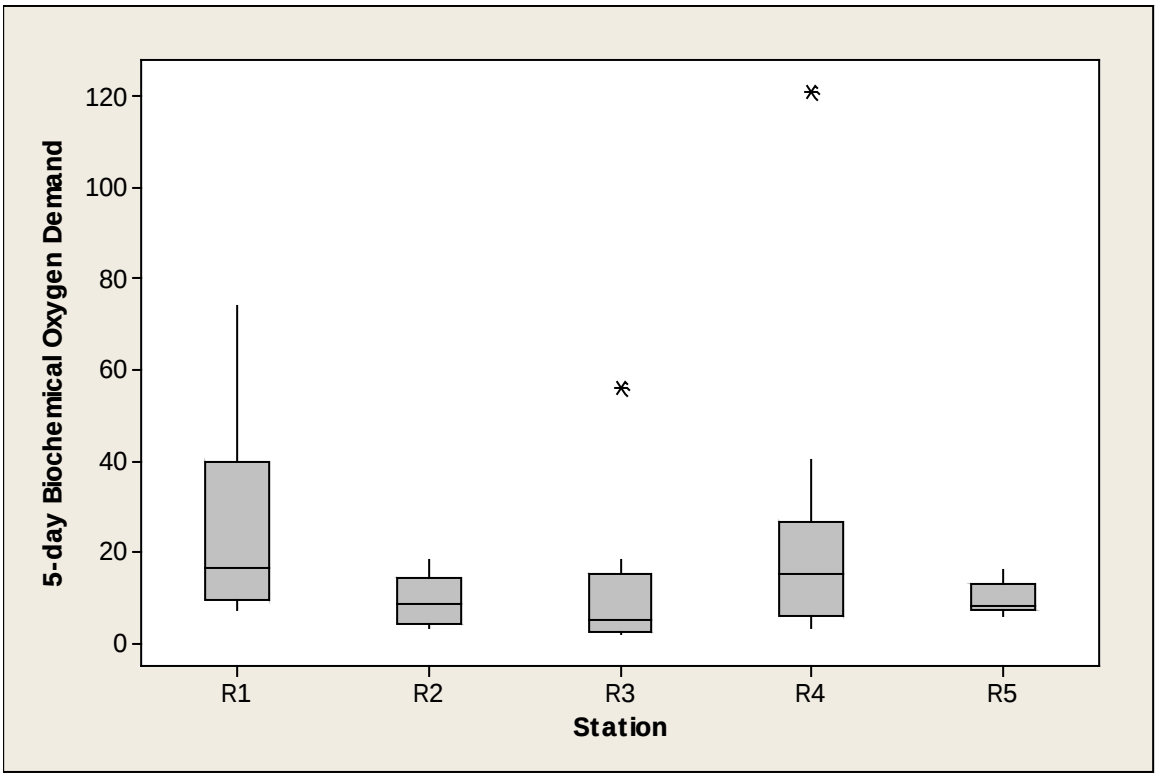

Figure B.3. Boxplot of Biochemical Oxygen Demand Concentrations

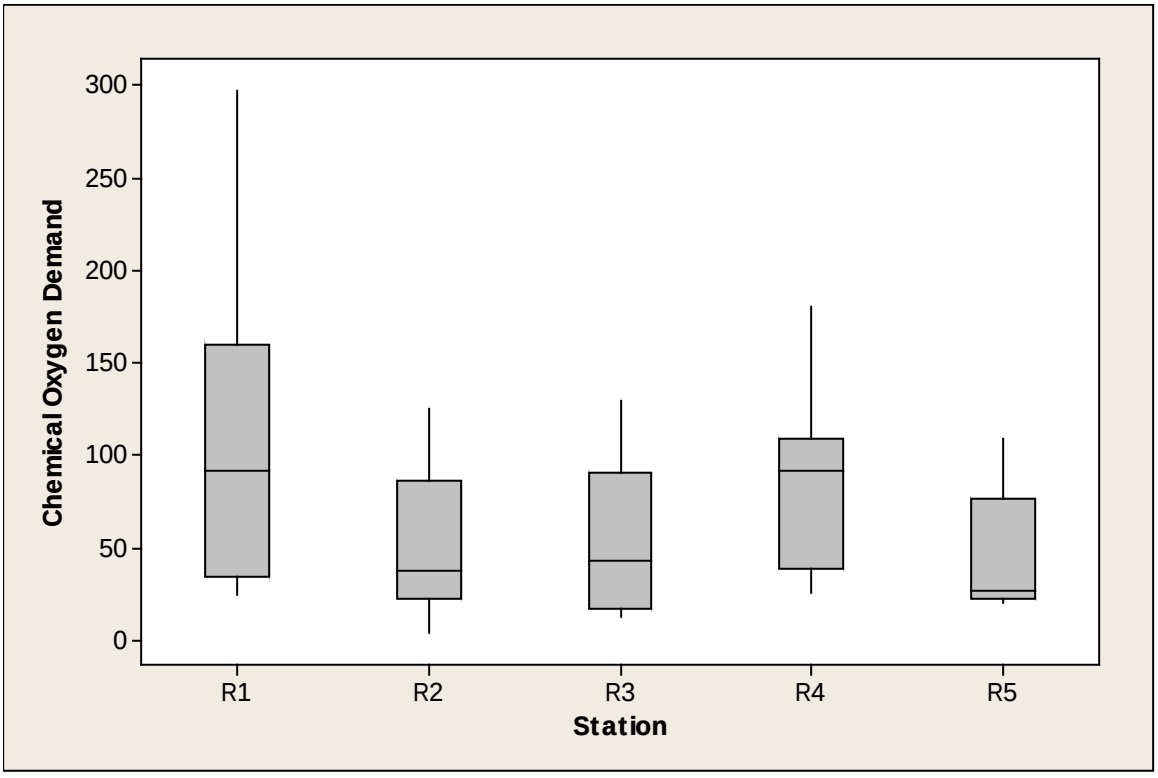

Figure B.4. Boxplot of Chemical Oxygen Demand Concentrations

Table B-2

MEAN CHEMICAL OXYGEN DEMAND (mg/L) IN STORM WATER (2003-2011)

Station	N	Mean
R1	13	107.3
R2	17	48.8
R3	8	53.6
R4	11	82.8
R5	5	44.8
All stations	54	70.2

B.1.4 Nitrogen and Phosphorus

Nutrients analyzed as part of monitoring storm water quality included ammonia, nitrate-nitrite, total Kjeldahl N (TKN) and total phosphorus. Total nitrogen is computed. Ammonia and nitrate-nitrite each had several observations that were less than the detection limits, and in those cases, we replaced the detection limits with statistical analyses included replacement of the values less than the method detection limit with values that were 50% of the MDL.

Boxplots of ammonia, nitrate-nitrite, TKN, total nitrogen, and total phosphorus are shown in Figures B.5 through B.9.

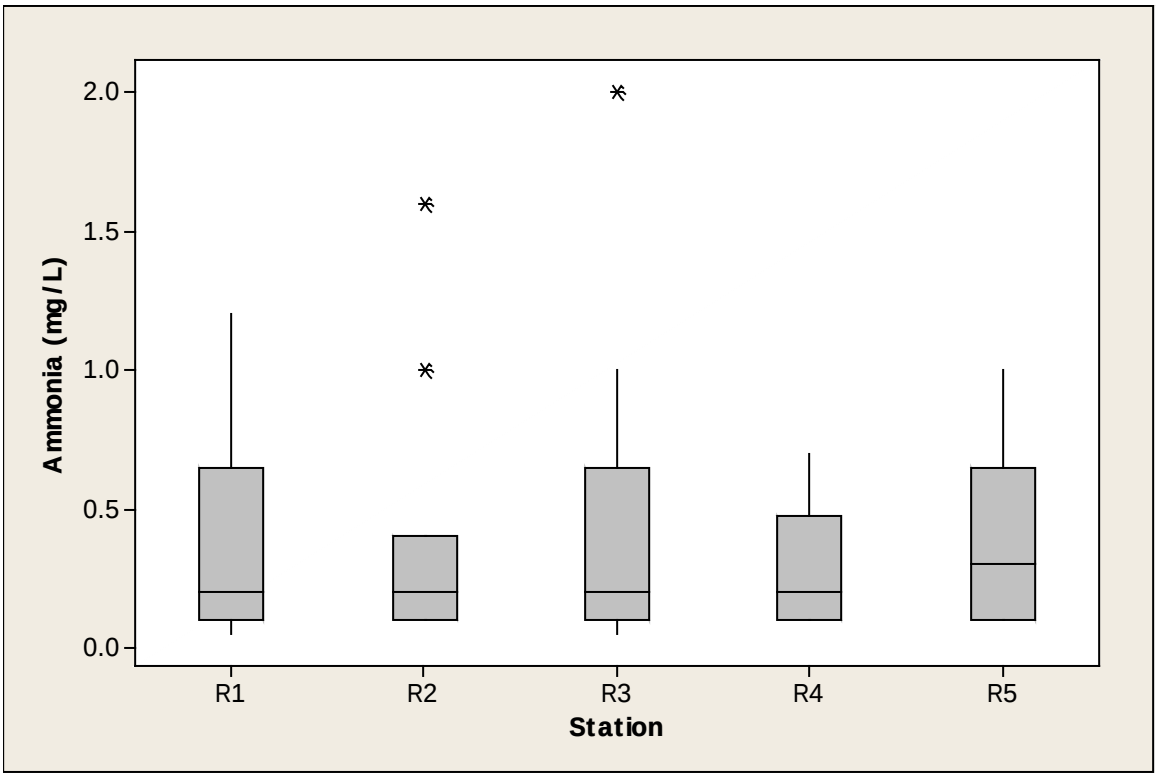

Figure B.5. Boxplot of Ammonia Nitrogen in Storm Water

Ammonia can be an indicator of sewage, so the City continues to utilize this contaminant in assessing potential illicit connections in the MS4. ANOVA using ln-transformed ammonia concentrations indicates that means of the five stations are equal (p-value = 0.959); the grand mean, 0.35 mg/L as N, is therefore the estimate of ammonia EMC.

Table B-3 gives summary statistics for nitrate-nitrite in storm water. Highest concentrations have been observed at R-4, near 8th and Wills Street; nitrate nitrogen concentrations at R4 average 1.6 mg/L. ANOVA and Krustal-Wallis (non-parametric) tests indicate that mean nitrate-nitrite concentrations are not equal among the five stations. Multiple pairwise comparisons indicate that the mean ln-transformed nitrate concentration at R4 is higher than all other stations except R3. The R4 sampling station reflects runoff from a 780-ac mixed-use watershed, including some heavy manufacturing businesses. Lowest concentrations have been observed at R1 and R5.

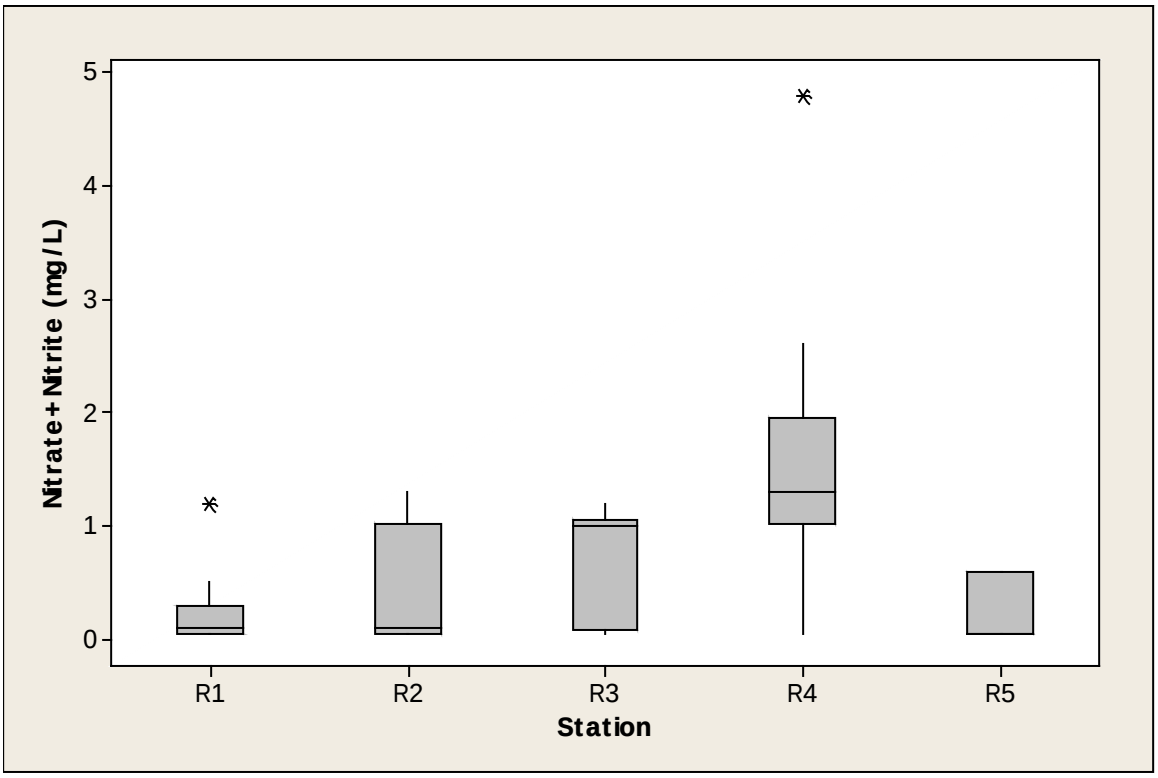

Figure B.6. Boxplot of Nitrate+Nitrite in Storm Water

Table B-3

MEAN NITRATE+NITRITE (mg/L) IN STORM WATER (2003-2011)

Station	N	Mean
R1	13	0.22
R2	18	0.47
R3	9	0.72
R4	12	1.56
R5	5	0.27
All stations	57	0.67

Analyses of TKN in the storm water quality database are somewhat more limited, with only 39 measurements. Station R5 has had a single TKN analysis and Station R3 has had five. ANOVA testing using log-transformed values indicates that station means are equivalent (p-value = 0.341). The grand mean TKN concentration will be used as the EMC (1.89 mg/L).

Mean total nitrogen concentrations (Figure B.8) are not statistically different between the five stations (p-value = 0.253). The grand mean in storm water is 2.46 mg/L and will be used as the EMC for load estimates.

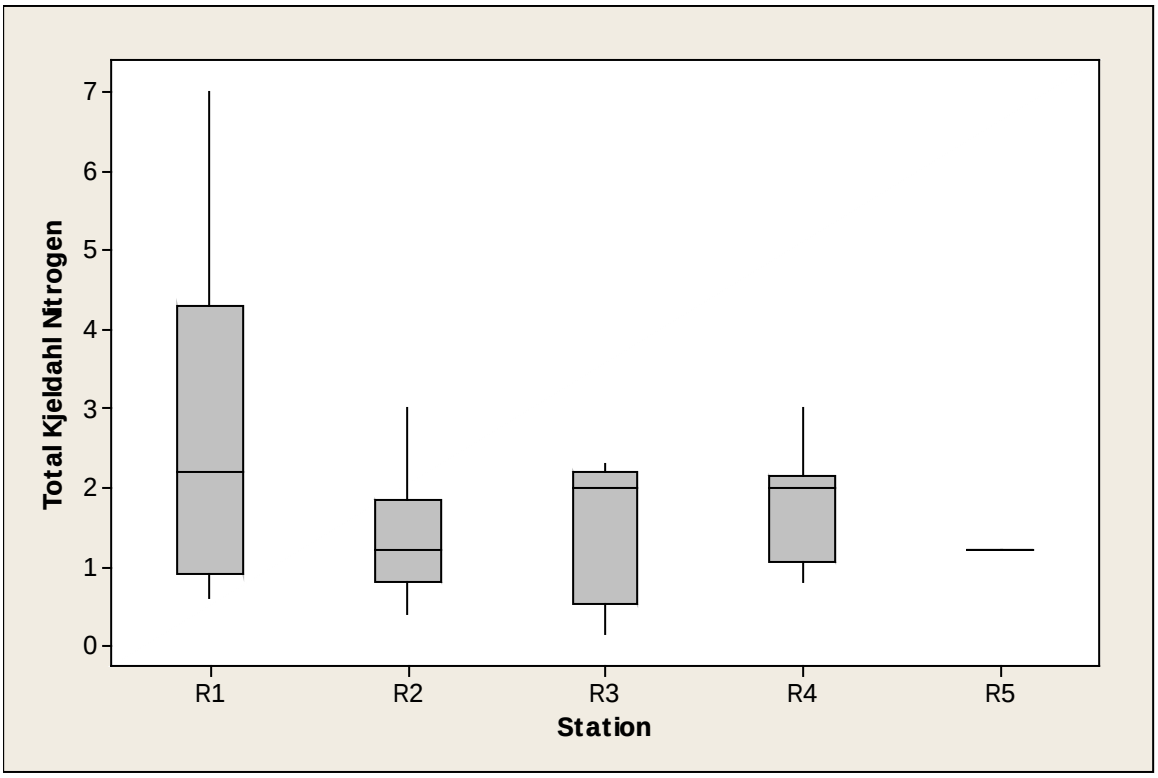

Figure B.7. Boxplot of TKN in Storm Water

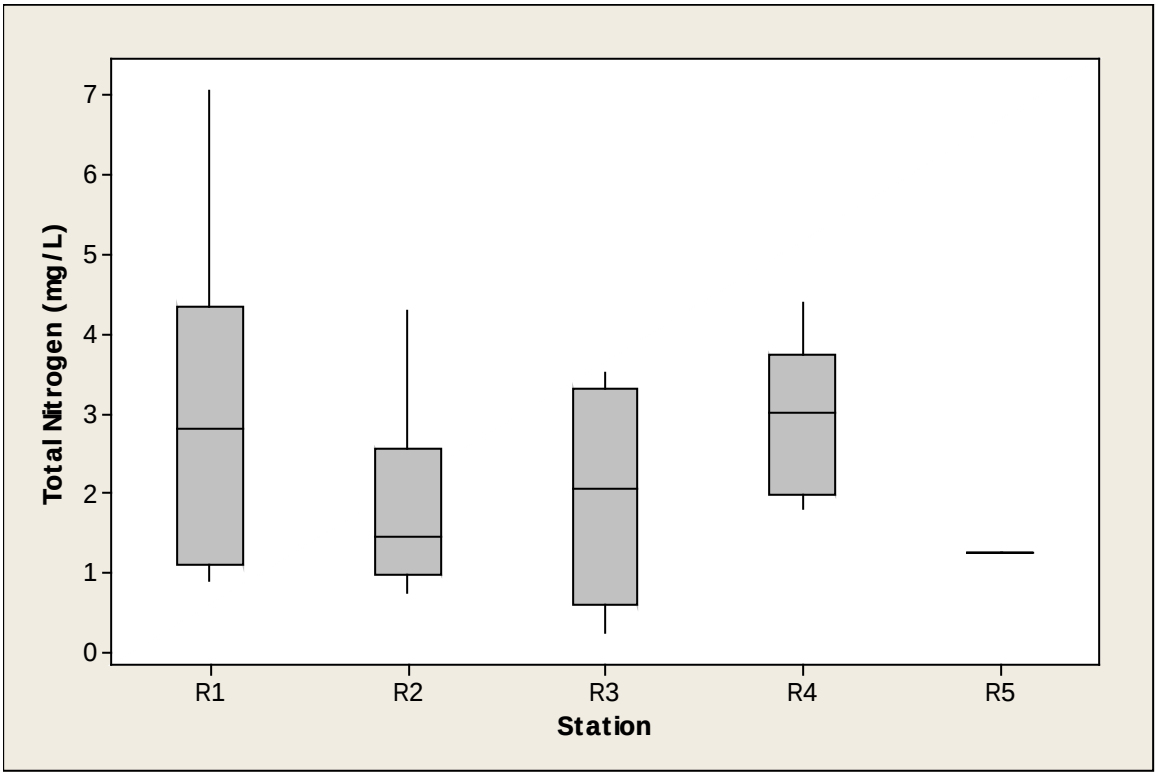

Figure B.8. Boxplot of Total Nitrogen in Storm Water

ANOVA testing of 52 log-transformed total phosphorus values indicates that they are not statistically different among the five stations (p-value = 0.312). The grand mean phosphorus concentration in storm water is 0.49 mg/L.

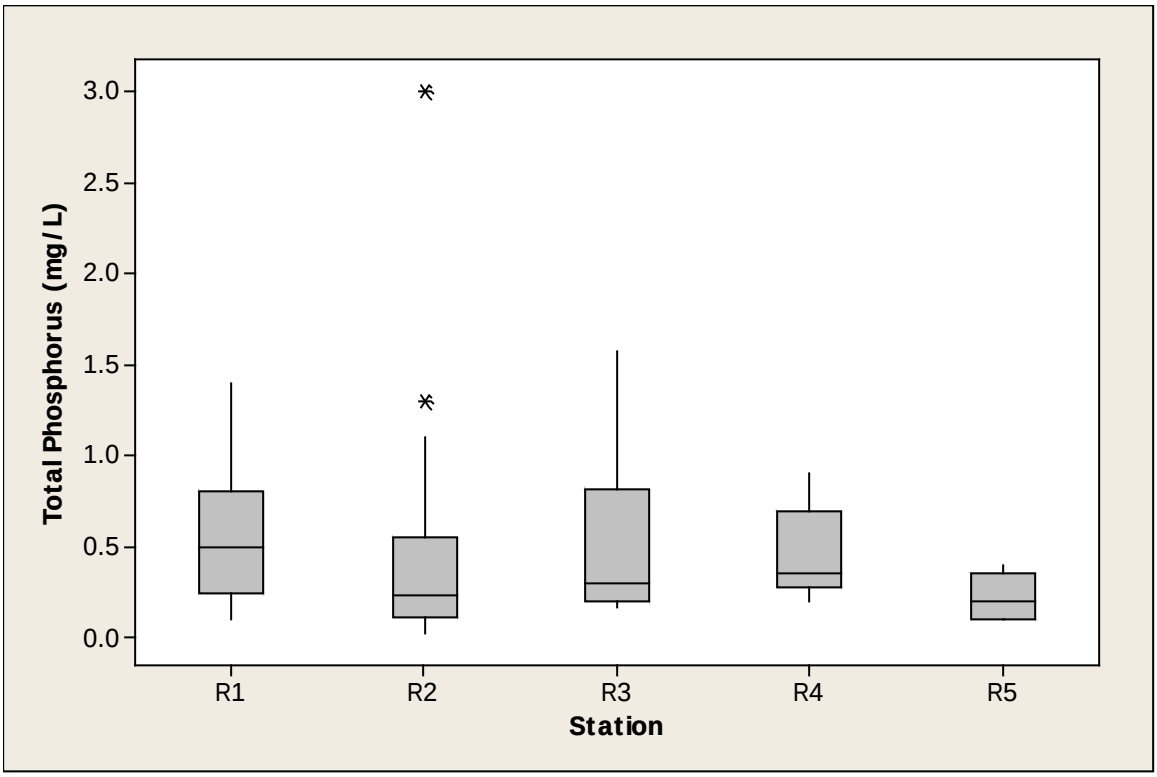

Figure B.9. Boxplot of Phosphorus in Storm Water

B.1.5 Heavy Metals

The metals analyzed in storm water samples include copper (Cu), cadmium (Cd), lead (Pb), and zinc (Zn). All analyses were for total metal concentrations; the samples were not filtered prior to analysis.

All 57 Cd measurements in storm water samples have been less than the 5 µg/L method detection limit (MDL) except two measurements at R1. Descriptive statistics for Cd were therefore not computed. On Aug. 3, 2003 Cd was measured to be 0.008 mg/L at R1, and on June 28, 2010 Cd was measured to be 0.094 mg/L at R1.

Concentrations of other metals with observations less than the MDL were replaced in the dataset used for statistical analysis by one-half of the MDL. Boxplots of the observations are shown in Figures B.10 through B.12. Table B.2 summarizes the metals data.

Station R4, adjacent to a storage yard and tool manufacturing facility, has been identified as a potential source of lead and zinc (Figures B.11 and B.12). Again, this property identified for further study under the IHRR Program.

Table B.4
SUMMARY STATISTICS FOR METALS IN STORM WATER (mg/L)

Metal	N	Mean	Minimum	Maximum
Copper	57	0.038	0.010	0.243
Zinc	57	0.139	0.005	0.450
Lead	57	0.035	0.002	0.355

ANOVA testing of the ln-transformed copper concentrations indicates no difference between station means (p-value = 0.744). Copper in Rockford MS4 storm samples averages 0.038 mg/L, which will be used as the EMC for estimating Cu loads.

Non-parametric ANOVA testing indicates the zinc concentration medians are not equal among all five stations (p-value = 0.011). Median Zn concentrations measured at R4, near 8th and Wills Street, are the highest of the five stations (0.19 mg/L). The lowest concentrations of Zn have been observed at station R3 (median = 0.080 mg/L).

ANOVA testing indicates the ln-transformed lead concentration means are not equal among all five stations (p-value=0.025). The lowest concentrations of Pb have been observed at station R3 (0.006 mg/L). And like Zn, the highest concentrations of Pb have been observed at Station R4, near 8th and Wills Street (0.070 mg/L).

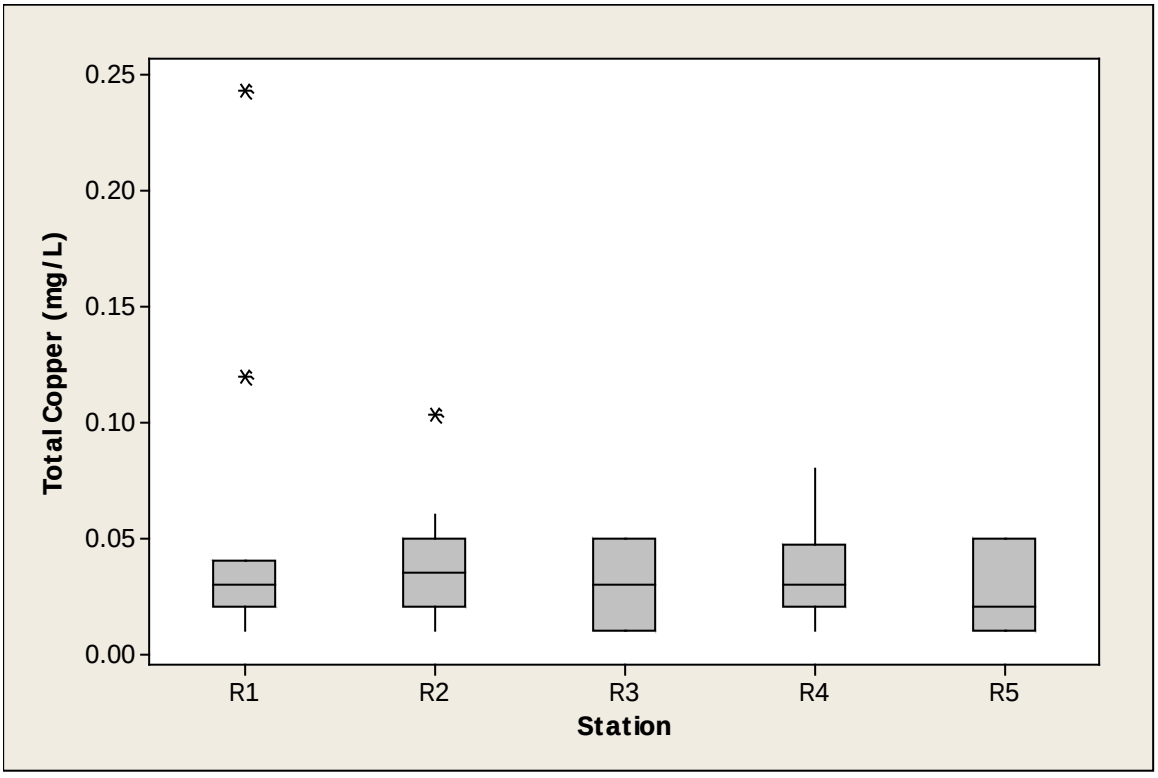

Figure B.9. Boxplot of Copper in Storm Water

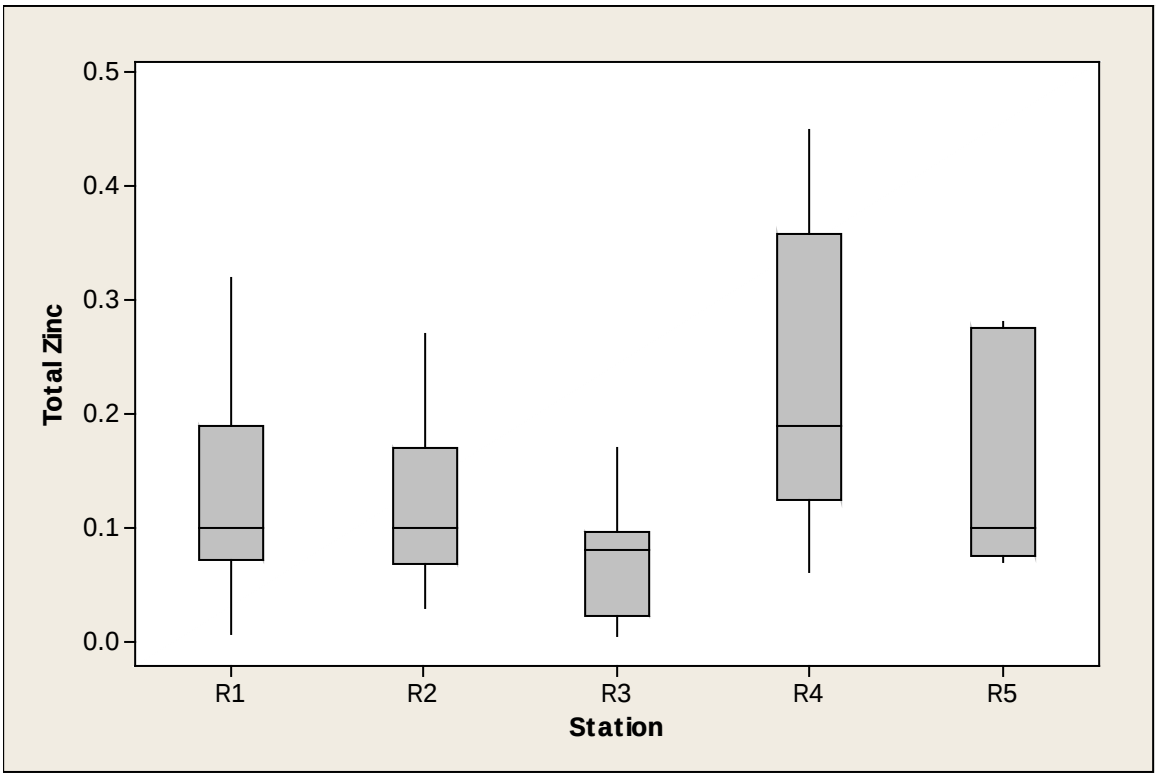

Figure B.10. Boxplot of Zinc in Storm Water

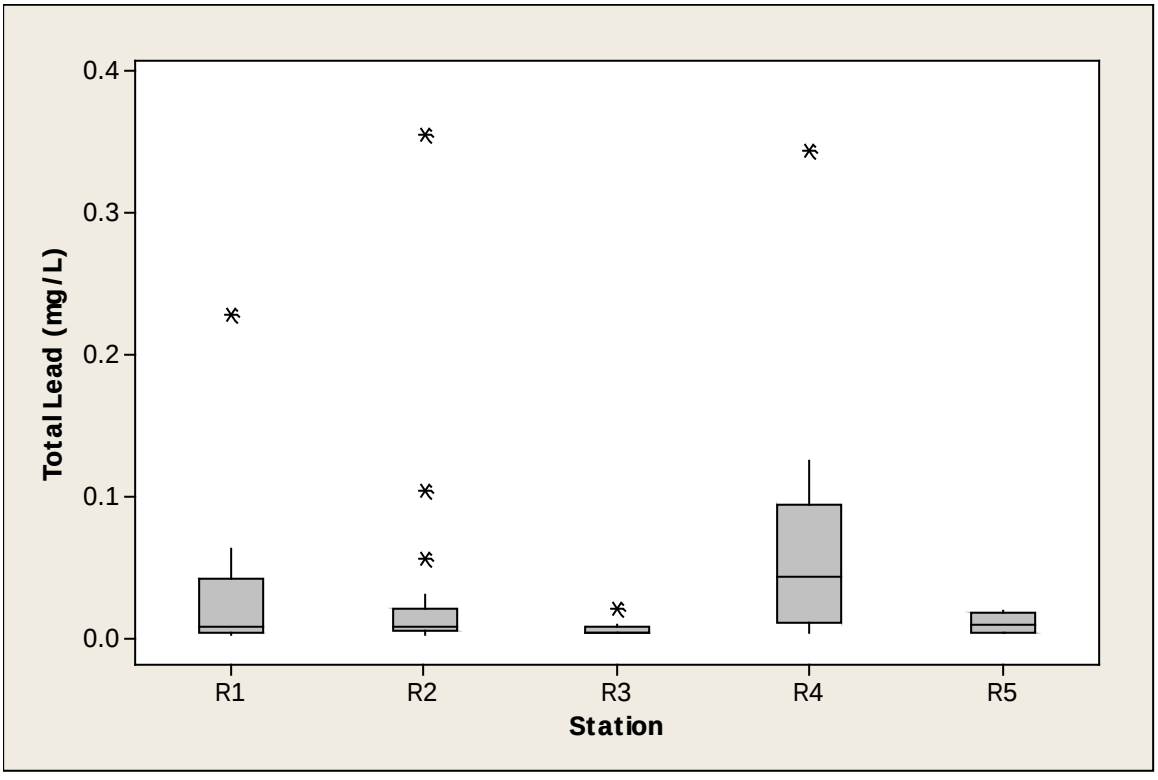

Figure B.11. Boxplot of Lead in Storm Water

B.1.6 Bacteria

In some years, there are several fecal coliform bacteria results flagged as being greater than the serial dilution series was able to quantify. Therefore, were used nonparametric statistics to analyze these data. We have 62 observations of fecal coliform bacteria in storm water grab samples. Krustal-Wallis testing indicates that the medians among the stations are equal (p-value = 0. 522). The grand median is 9,500 CFU/100 mL.

B.1.7 Hardness

Hardness is routinely analyzed because the toxicities of many metals are hardness-dependent and a hardness value is required to evaluate compliance with surface water quality standards. The other parameters are required by the NPDES Permit. Hardness from measurements in storm water had a grand mean of 46 mg/L. ANOVA indicates that ln-transformed hardness concentrations are not equal between the five sampling stations (p-value = 0.020). Pairwise comparisons indicate that the ln-transformed mean of hardness at R4 is significantly higher than R3; other pairwise comparisons are not significantly different from each other.

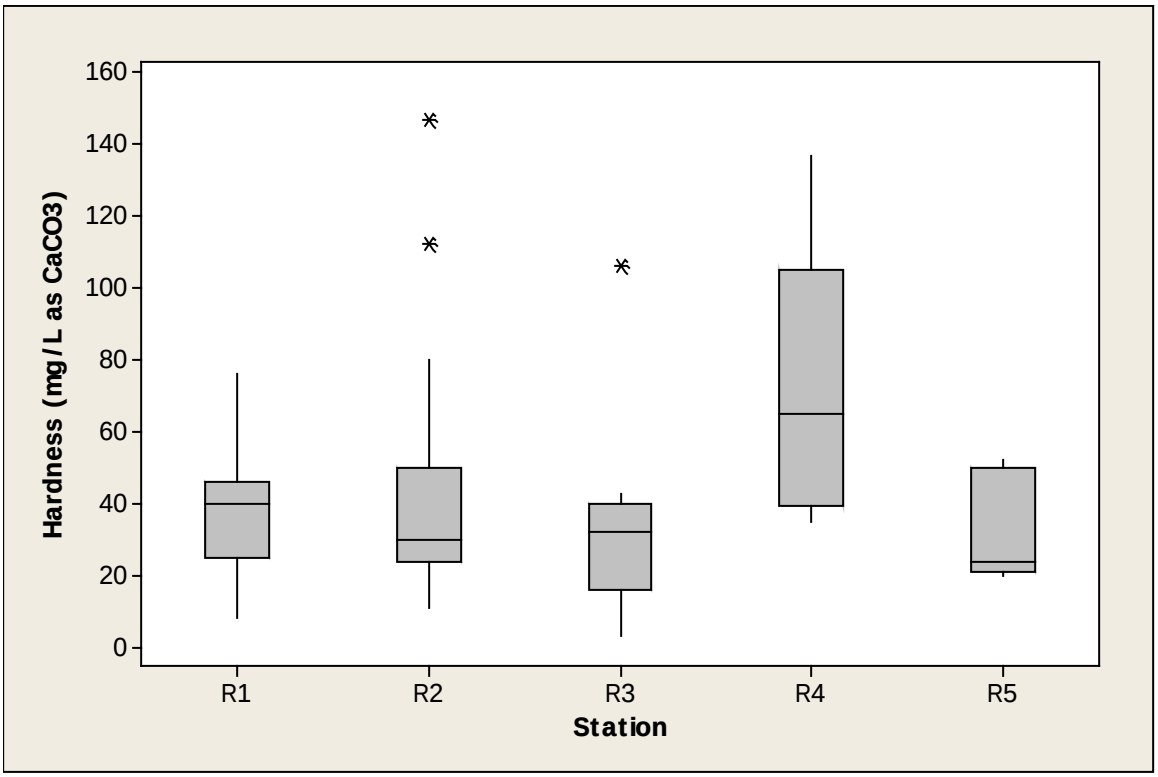

Figure B.12. Boxplot of Hardness in Storm Water

B.1.8 Fats, Oil, Grease

Fats, oil and grease (FOG) is analyzed in storm water collected from the system as well. We have 44 measurements of FOG. We were unable to transform the FOG data to remove heteroscedasticity, so nonparametric statistical tests were performed. The Krustal-Wallis test

indicated that median concentrations of FOG were equivalent among the five stations (p-value = 0.493). The grand mean FOG is 8.2 mg/L; this value will be used as the EMC.

B.2 Storm Events and Runoff

Forty years of precipitation at the Rockford Airport average 36.3 inches annually. In 2011 Rockford received 41.7 inches of precipitation, over 128 days of the year. In comparison to the long term average, 2003 and 2005 were dry years, 2008, 2009 and 2011 were wet years, and 2004, 2006, 2007 and 2010 had precipitation amounts closer to the long-term average (Table B.5).

Daily precipitation records for 2003 through 2011 are plotted in Figures B.13 through B.17. These plots also show the dates that storm water was sampled, as does Table B.6.

The automatic sampling stations are triggered by rain gages at each location. They are tipping bucket-type gages and do not record rain amounts other than the number of tips since the meter was last reset. The samplers are programmed to sample after the first 0.10-inch of rain is measured, and then to pump storm water into the sample bottle in proportion to the amount of rainfall (i.e., the number of bucket tips), thereby collecting a precipitation-weighted sample. Data shown in Tables B.5 and B.6 and Figures B.13 through B.17 are from the recording gage at the Rockford Airport. Rainfall across the MS4 area is not necessarily consistent with that measured at the airport. Because rainfall is not evenly distributed across Rockford, not all stations are triggered during all storm events. And, from time to time, the samplers have mechanical problems and water samples may not be collected or have to be discarded. Mechanical problems most commonly arise from flooding of the underground vault that house the samplers, from battery outages, or failures of fuses.

Table B.5

PRECIPITATION AT ROCKFORD AIRPORT

DAYS OF PRECIPITATION, 0.01 INCHES OR MORE													
	Yrs	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Ann**
1961-93	43	9	8	11	12	11	10	10	9	9	9	9	10	118
2003	1	6	4	13	8	14	9	9	6	6	7	12	7	101
2004	1	7	7	19	6	17	9	10	10	1	13	14	5	118
2005	1	13	11	9	10	12	9	6	7	9	4	10	11	111
2006	1	8	6	14	11	16	12	11	9	13	11	5	8	124
2007	1	10	10	11	9	11	11	8	17	6	11	5	15	124
2008	1	13	15	10	11	10	15	11	6	8	8	8	16	131
2009	1	9	7	9	11	9	10	9	11	5	17	8	15	120
2010	1	5	9	9	11	11	16	13	9	10	5	2	14	114
2011	1	14	12	8	16	13	11	8	10	9	9	7	11	128
MONTHLY PRECIPITATION (inches)														
	Yrs	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Ann**
1961 - 90	40	1.28	1.14	2.46	3.65	3.66	4.52	4.12	4.15	3.80	2.88	2.57	2.05	36.3
2003	1	0.34	0.16	1.45	2.33	4.20	1.98	3.71	0.48	1.89	1.30	3.70	3.20	24.7
2004	1	0.46	0.79	4.04	1.79	8.21	3.40	3.25	6.89	0.08	2.56	3.03	0.61	35.1
2005	1	3.29	1.51	0.43	1.71	1.78	2.45	1.45	5.10	1.86	0.24	2.81	0.98	23.6
2006	1	2.98	0.66	4.05	4.30	3.72	3.32	3.64	3.55	2.91	3.52	2.69	2.52	37.9
2007	1	0.79	1.43	3.25	2.73	1.25	4.1	2.4	14.0	2.04	1.44	0.4	3.27	37.1
2008	1	1.14	3.06	2.23	5.42	3.12	6.27	7.35	1.91	6.36	1.68	1.39	4.18	44.1
2009	1	0.81	2.22	5.8	4.6	3.35	7.4	2.6	7.19	1.69	5.94	1.44	3.55	46.6
2010	1	0.85	0.66	1.41	2.78	5.82	4.8	9.4	1.96	1.89	3.02	0.25	1.73	34.6
2011	1	0.88	1.90	3.41	3.40	3.18	3.39	8.0	4.47	5.33	1.58	4.1	2.06	41.7

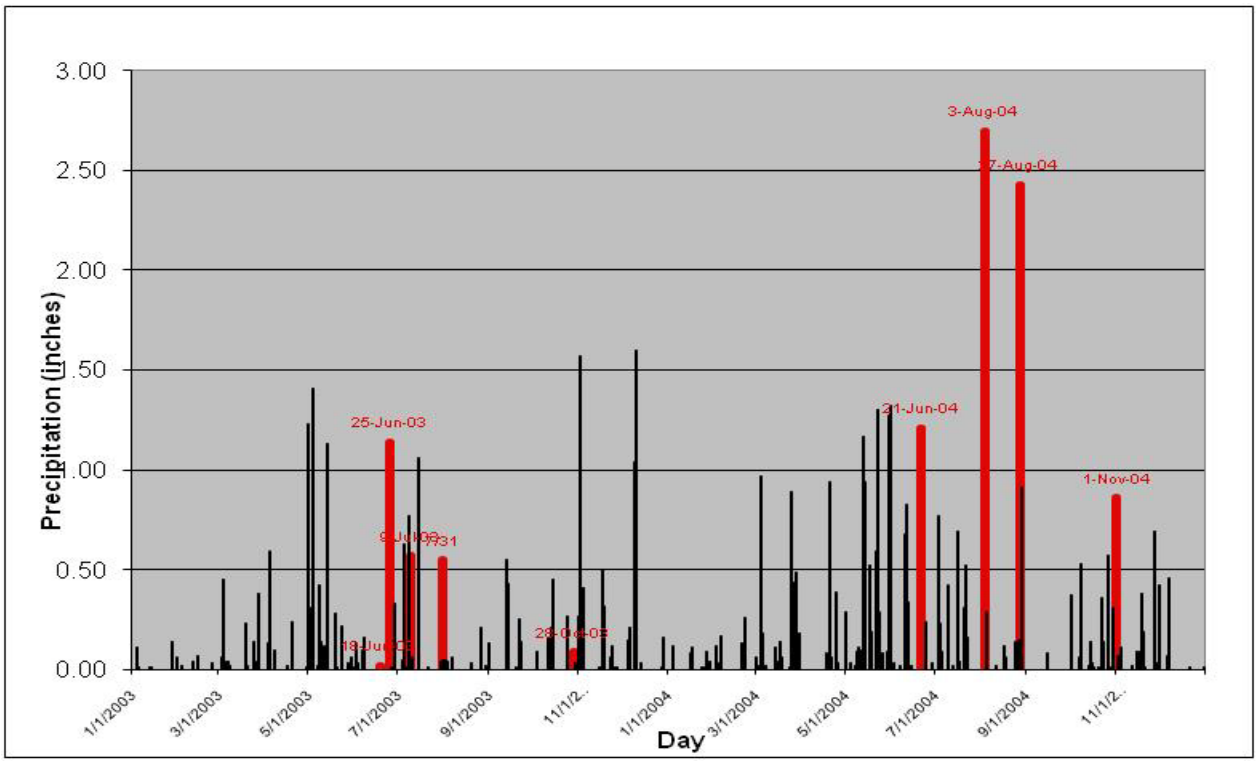

Figure B.13. Daily Precipitation and Sampling Events, 2003-2004

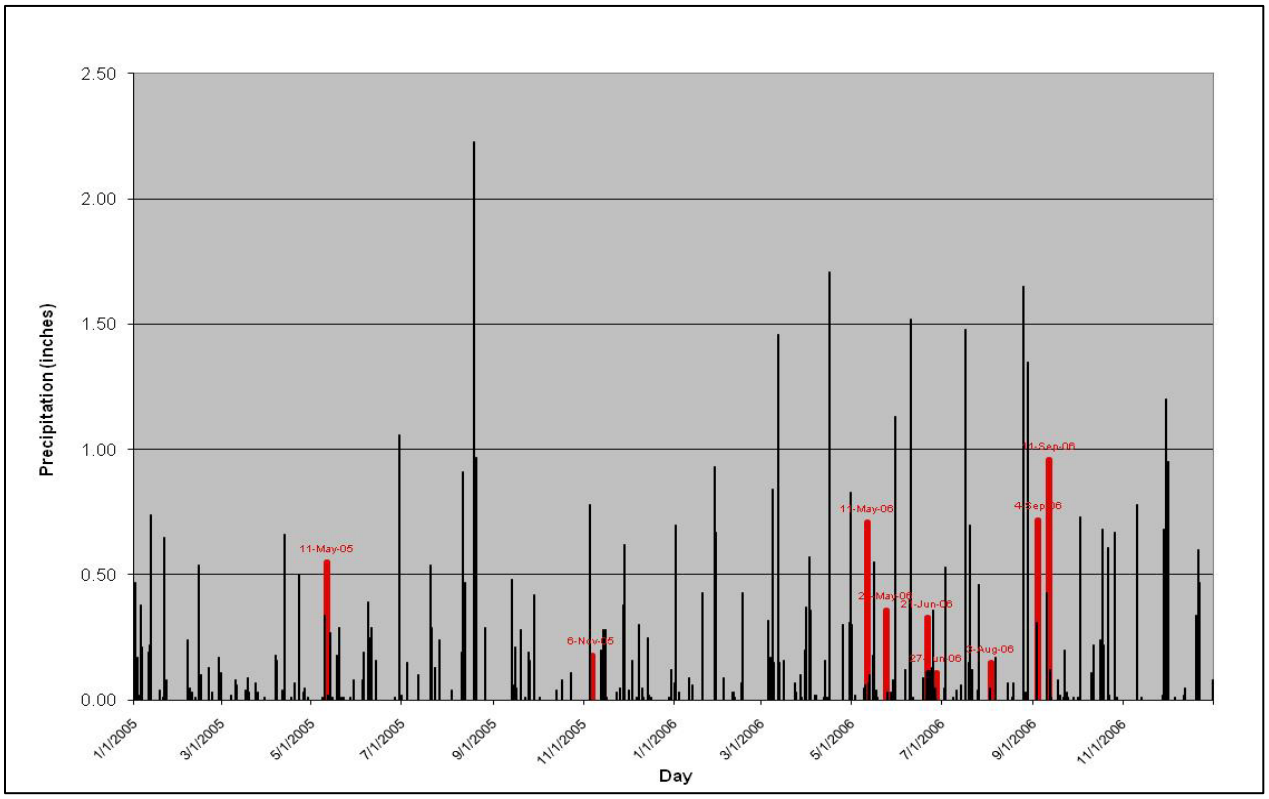

Figure B.14. Daily Precipitation and Sampling Events, 2005-2006

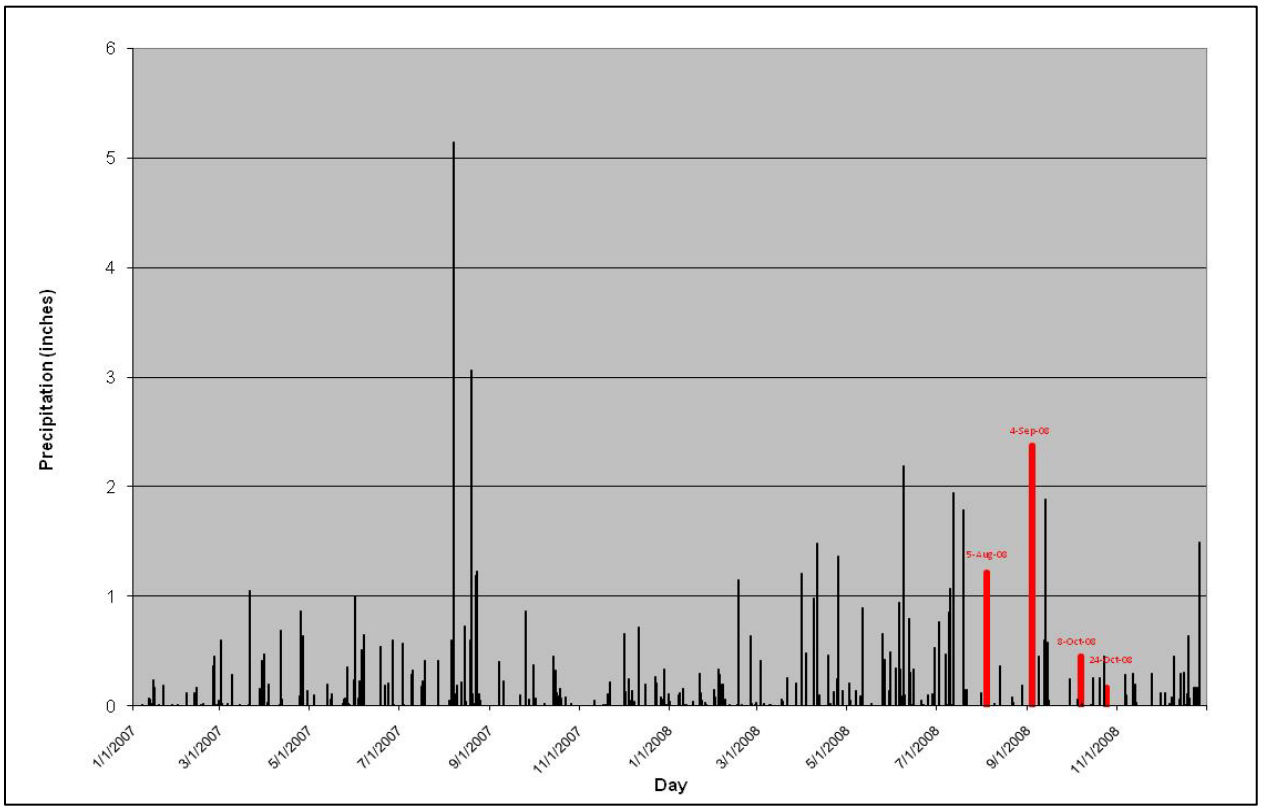

Figure B.15. Daily Precipitation and Sampling Events, 2007-2008

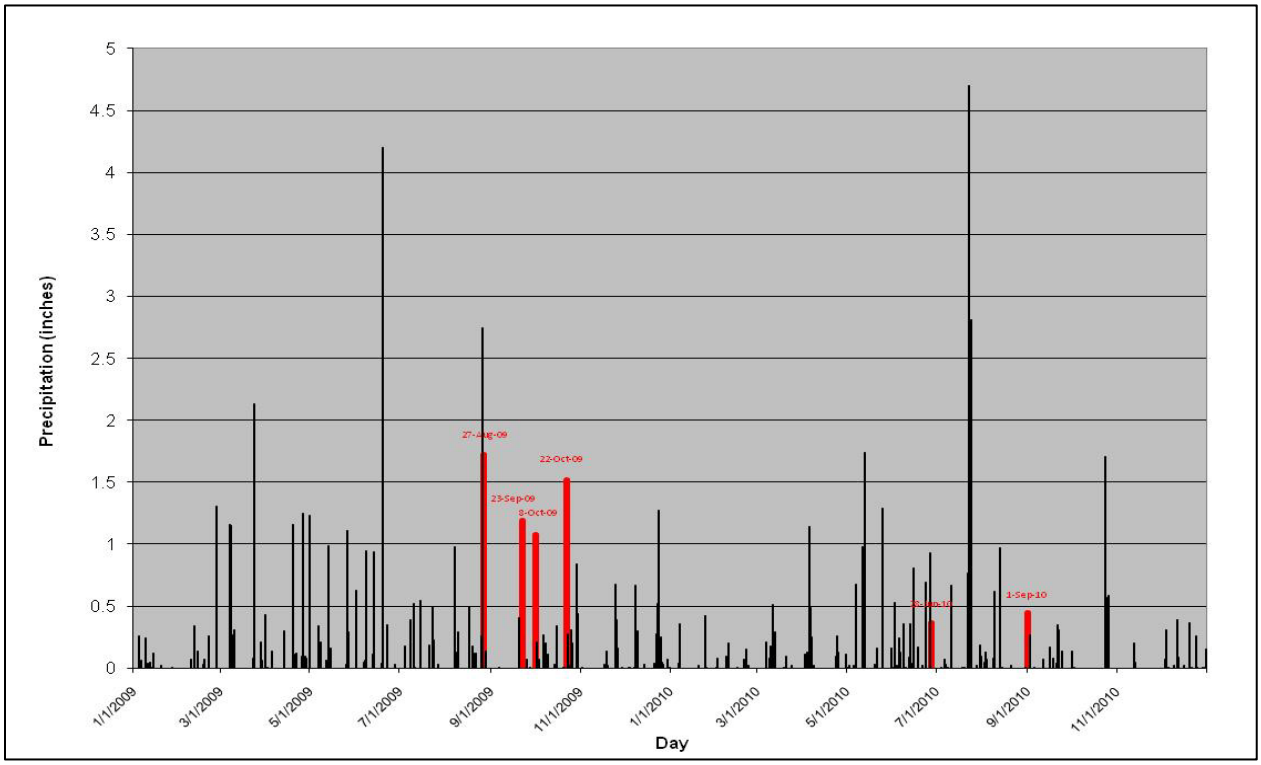

Figure B.16. Daily Precipitation and Sampling Events, 2009-2010

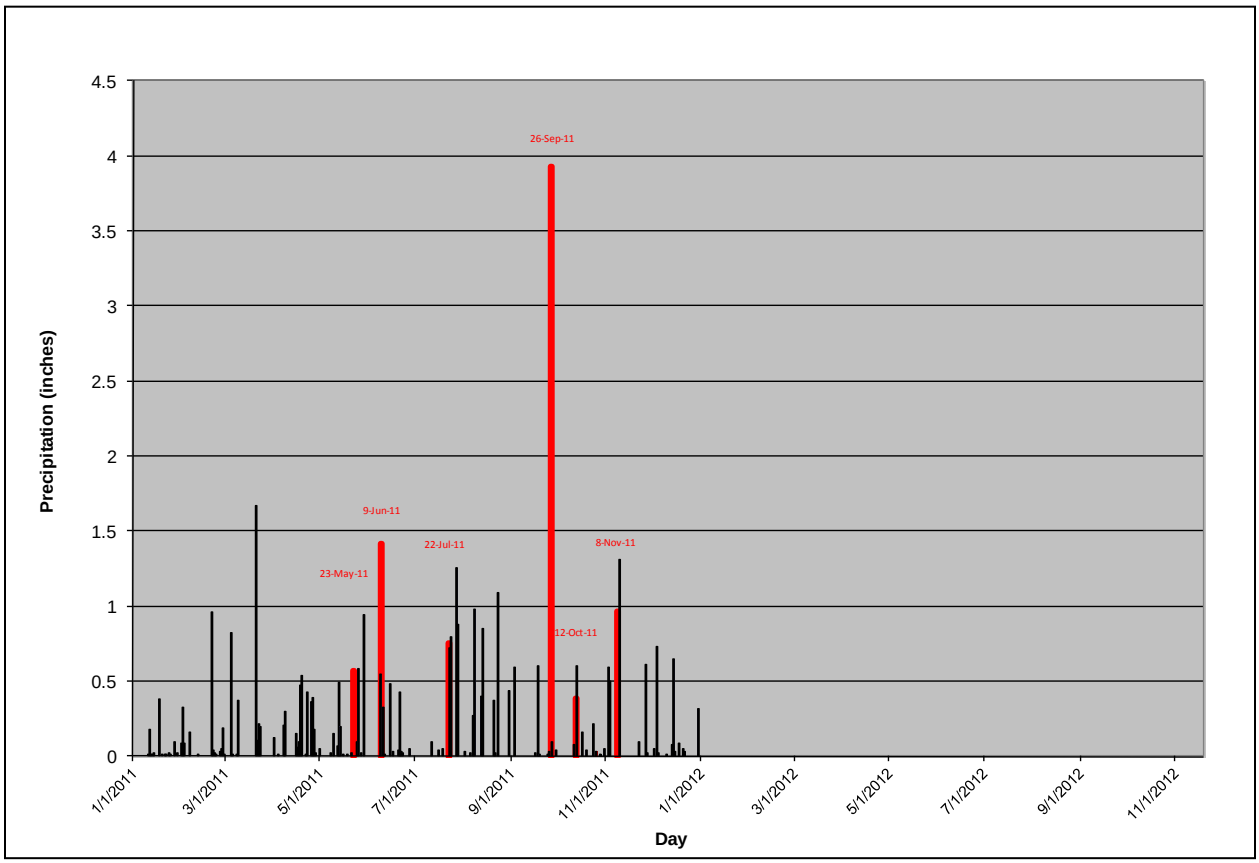

Figure B.17. Daily Precipitation and Sampling Events, 2011

Table B.6

STORM EVENTS, DATES SAMPLED, AND ANTECEDENT CONDITIONS, 2003 - 2011

Antecedent Day's Rain (in)	Date of Sample	Day of Sampling Rain (in)
0.02	June 19, 2003	0.00
1.14	June 26, 2003	0.01
0.57	July 10, 2003	0.06
0.55	August 1, 2003	0.03
0.00	October 28, 2003	0.09
0.00	June 21, 2004	1.21
2.70	August 4, 2004	0.29
0.15	August 27, 2004	2.43
0.86	November 2, 2004	0.07
0.00	May 11, 2005	0.55
0.18	November 7, 2005	0.00
0.06	May 11, 2006	0.71
0.00	May 24, 2006	0.36
0.09	June 21, 2006	0.33
0.11	June 28, 2006	0.00
0.05	August 3, 2006	0.15
0.72	September 5, 2006	0.00
0.43	September 11, 2006	0.96
1.22	August 5, 2008	0.00
0.16	September 4, 2008	2.38
0.45	October 8, 2008	0.02
0.45	October 24, 2008	0.17
2.75	August 27, 2009	1.72
1.19	September 23, 2009	0.00
1.08	October 2, 2009	0.21
0.01	October 22, 2009	1.52
1.52	October 23, 2009	0.28
0.27	June 28, 2010	0.00
0.00	September 1, 2010	0.45
0.57	May 23, 2011	0.00
0.55	June 9, 2011	1.42
0.00	July 22, 2011	0.75
0.03	September 26, 2011	3.93
0.08	October 12, 2011	0.39
0.00	November 8, 2011	0.97

B.3 Storm Water Pollutant Loads

As in prior annual reports, the Simple Method was used to develop storm runoff volumes and associated pollutant loads. The method is discussed in the EPA guidance manual[1]. In the Simple Method, annual pollutant loads are estimated as the product of storm runoff volume and event mean pollutant concentrations, summed over the course of one year. Annual runoff was estimated as the product of rainfall, a runoff coefficient and the fraction of annual rainfall events that produce runoff (recommended by USEPA guidance as 0.9). The runoff coefficients account for imperviousness, and were estimated from 30-m pixel satellite imagery from the Illinois GAP Project[2].

Table B.7 provides the updated event mean concentrations (EMC) and estimates for 2011 storm water pollutant loads. These loads do not include areas outside City limits or any baseflow (or natural background) pollutant loads. EMC values used in 2011 have been updated using the most recent data.

Figures B.18 through B.21 plot annual storm water pollutant loads from the MS4 for several key parameters. Trends in these plots are a function of not only changes in EMC but changes in annual runoff volumes.

[1] Guidance Manual for the Preparation of Part 2 of the NPDES Permit Applications for Discharges from Municipal Separate Storm Sewer Systems. EPA-833-B-92-002. November, 1992.

[2] Illinois Natural History Survey's 1999-2000 1:100,000 Scale Illinois Gap Analysis Land Cover Classification, Version 2.0, September 2003.

Table B.7

STORM WATER POLLUTANT LOADS FOR 2011

	Event Mean Concentration		Pollutant Load	
Total Suspended Solids	115	mg/L	12,500,000	lbs/yr
Total Dissolved Solids	94	mg/L	10,300,000	lbs/yr
Biochemical Oxygen Demand	17	mg/L	1,900,000	lbs/yr
Chemical Oxygen Demand	70	mg/L	7,600,000	lbs/yr
Ammonia	0.35	mg/L	38,000	lbs/yr
Nitrate-Nitrite	0.67	mg/L	73,000	lbs/yr
Total Kjeldahl Nitrogen	1.89	mg/L	206,000	lbs/yr
Total Nitrogen	2.46	mg/L	268,000	lbs/yr
Total Phosphorus	0.487	mg/L	53,000	lbs/yr
Copper	38	µg/L	4,100	lbs/yr
Cadmium	2.5	µg/L	300	lbs/yr
Zinc	139	µg/L	15,200	lbs/yr
Lead	35	µg/L	3,800	lbs/yr
Fecal Coliform Bacteria	9,500	CFU/100mL	4,700,000	billion CFU/yr
FOG	8.2	mg/L	895,000	lbs/yr
Cyanide	1.39	µg/L	150	lbs/yr
Total Phenols	1.5	µg/L	160	lbs/yr

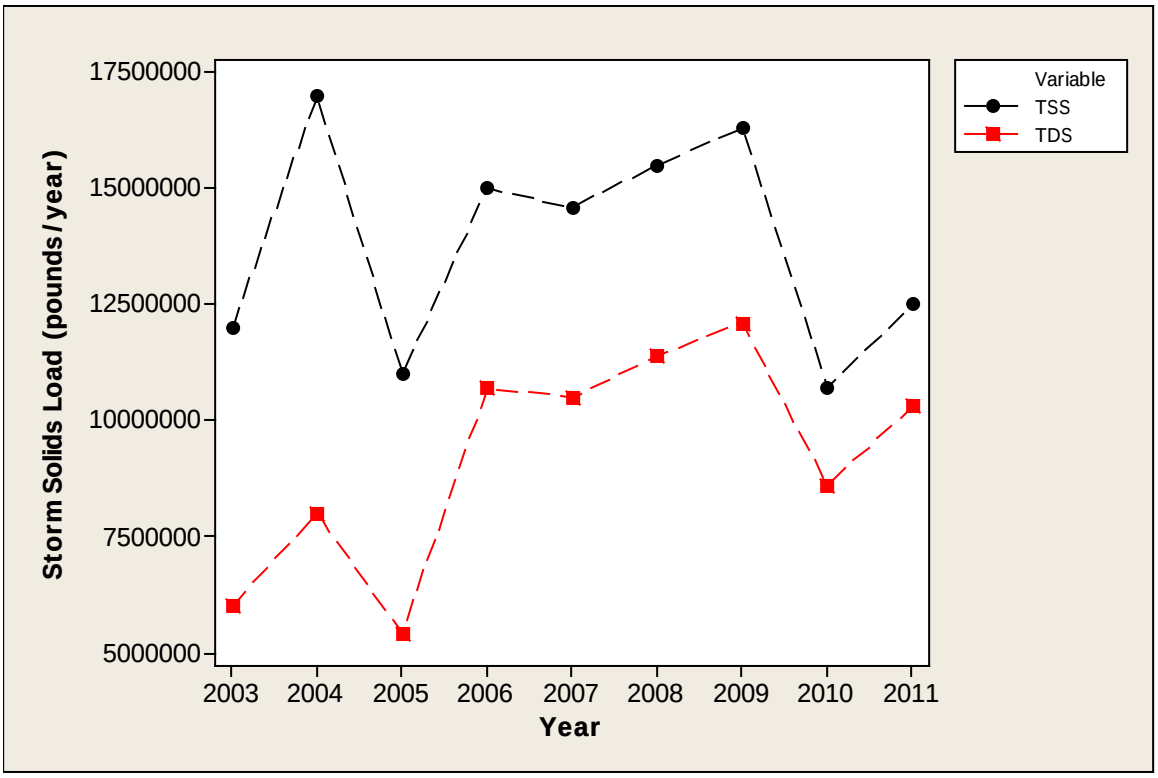

Figure B.18. Annual Solids Loads from Storm Water, 2003-2011

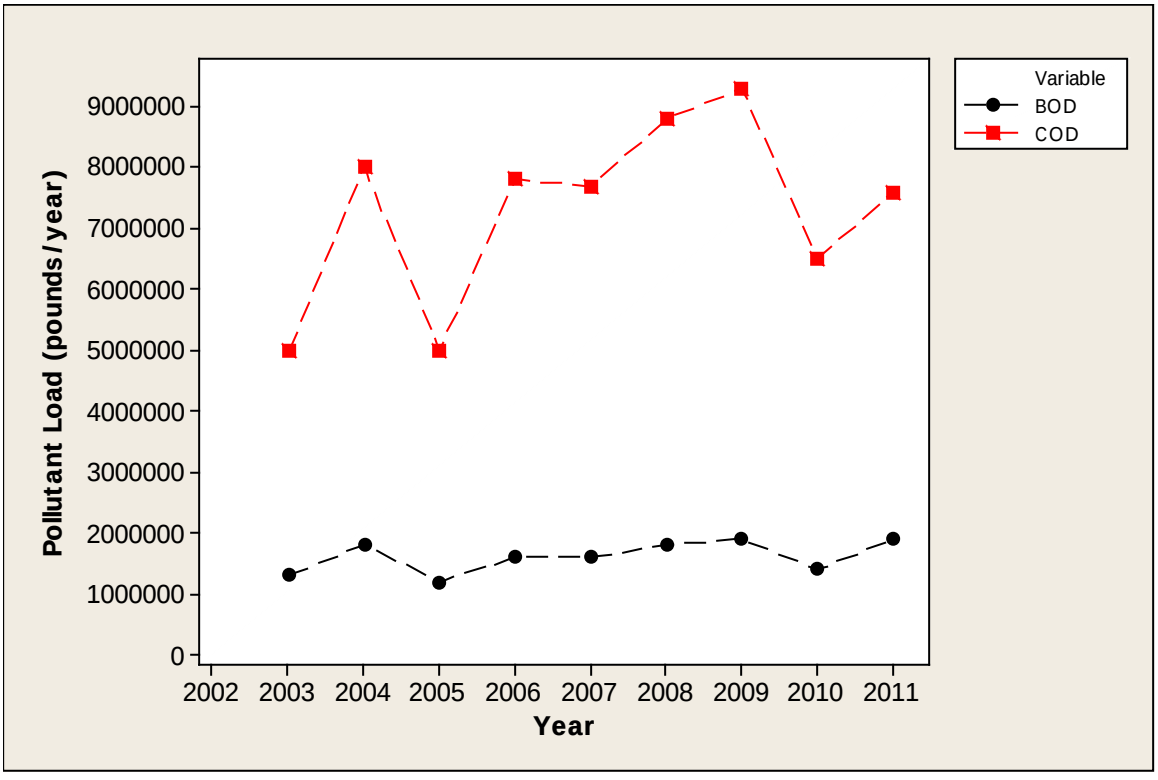

Figure B.19. Annual BOD and COD Loads from Storm Water, 2003-2011

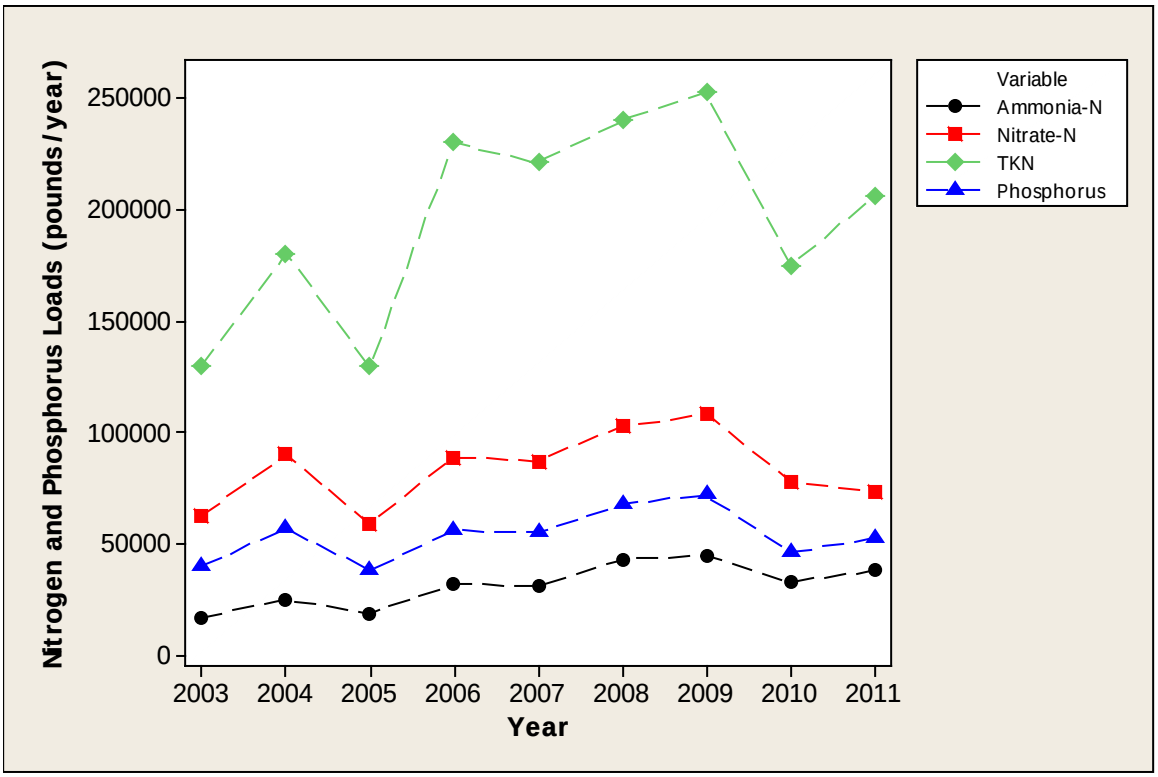

Figure B.20. Annual Nitrogen and Phosphorus Loads from Storm Water, 2003-2010

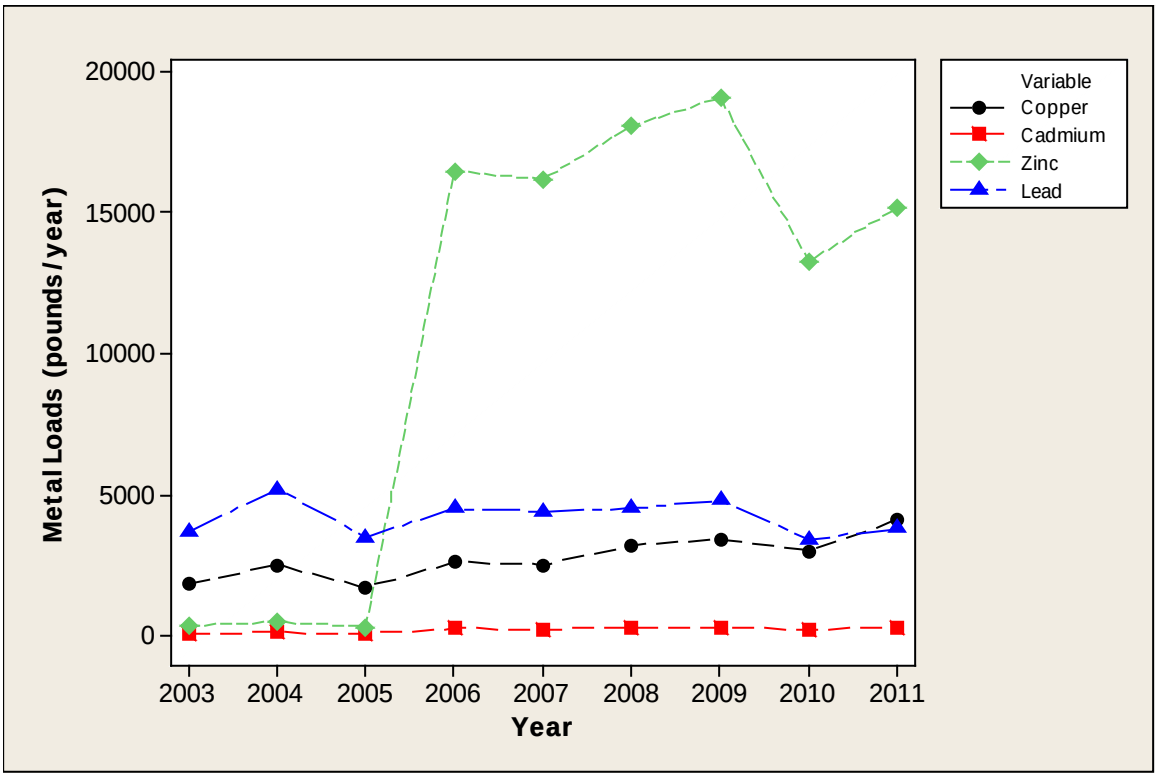

Figure B.21. Annual Loads of Metals from Storm Water, 2003-2010

APPENDIX C – MS4 STREAM ASSESSMENTS

This appendix presents the details of assessing the effects of storm water pollutant loads on water quality and aquatic health of streams in the City of Rockford. The stream bioassessment process is repeated biennially and was last performed in 2010. Data from the bioassessments can be reviewed in the City of Rockford's 2010 Annual Report.

The monitoring also includes stream water quality as part of the City's dry weather screening of the MS4.

C.1 Dry Weather Screening in the MS4 Tributaries

Water quality at five stream stations in the MS4 service area are monitored quarterly by the City to assess potential dry weather water quality effects of the MS4. Figure A-1 maps the tributary sampling sites.

Since mid-2008, the stations have been monitored quarterly regardless of weather conditions, but the data since that time reflect ambient conditions, largely dry weather (base flows). Prior to 2008, stream monitoring was biased towards wet weather sampling, per the QAPP. Stream water quality data collected before 2008 have been excluded from the discussion and conclusions below.

We provide summary statistics for the tributary water quality data, compare the data to the applicable water quality standards given in 35 Ill. Admin. Code 302, and interpret the data as indicators of illicit connections in the MS4 per the dry weather screening program required in the permit (Part V.B). And as we did with the storm water quality data, analytical values less than detection limits have been transformed to 50% of the method detection limit for summarization.

C.2.1 Dissolved Oxygen and other Field Measurements

Dissolved oxygen (DO), pH, conductivity and temperature are measured on every occasion that samples are collected. DO summary statistics are given in Table C.1.

Table C.1

DISSOLVED OXYGEN (mg/L) IN THE MS4 RECEIVING STREAMS

Location	N	Mean	Minimum	Median	Maximum
T1	11	9.0	7.3	9.1	11.0
T2	11	8.8	6.9	8.9	11.2
T3	11	9.7	8.3	9.0	12.7
T4	11	9.4	7.5	9.6	11.9
T5	11	9.1	7.8	9.1	10.7

The General Use Water Quality Standard applicable to all these streams is given in 35 Ill. Admin. Code 302.206:

1) During the period of March through July,
A) 5.0 mg/L at any time; and
B) 6.25 mg/L as a daily mean averaged over 7 days.

2) During the period of August through February,
A) 4.0 mg/L at any time;
B) 4.5 mg/L as a daily minimum averaged over 7 days; and
C) 6.0 mg/L as a daily mean averaged over 30 days.

There are no continuous DO measurement stations for evaluating use support in these streams. None of the tributaries in the City's MS4 service area (T1-T5) have had a DO measurement less that 6.9 mg/L during the 2008 – 2011 study period.

While Illinois' water quality standards do not address high DO levels, we routinely observe these in many of the tributaries. High DO is the result of photosynthesis in the streams. Like many streams in Illinois, this is the result of nutrient enrichment, and occurs in rural and urban streams throughout the state.

The lack of any low DO measurements whatsoever (including the pre-2008 data) indicates that the MS4 does not contain illicit connections for sewage.

Summary statistics on pH values measured in the MS4 tributaries are given in Table C.2. The General Use Water Quality Standard applicable to all these streams is given in 35 Ill. Admin. Code 302.204:

pH shall be within the range of 6.5 to 9.0 except for natural causes.

While none of the tributaries exceeded the upper pH standard, but one measurement in Keith Creek (site T3) had a measurement less than the pH 6.5 lower limit in November 2010. This could be a natural phenomenon in the region or there may be anthropogenic reasons.

Table C.2

pH IN THE MS4 RECEIVING STREAMS

Site	Name	N	Minimum	Median	Maximum
T1	North Kent Creek	11	7.2	7.5	8.2
T2	South Kent Creek	11	7.0	7.7	8.0
T3	Keith Creek at 10th Ave Pk	11	6.2	8.0	8.4
T4	Keith Cr at Dahlquist Pk	11	7.3	7.8	8.2
T5	Spring Creek	11	7.1	7.5	7.9

C.2.2 Solids

Summary statistics for total suspended solids and total dissolved solids are tabulated below. Among the five streams in the Rockford MS4 service area, the TSS levels are generally lowest in Keith Creek, T3 and T4, and highest in South Kent Creek, T2. The statistical differences between site TSS means however are insignificant (p-value > 0.05).

Table C.3

SUSPENDED SOLIDS (mg/L) IN THE MS4 RECEIVING STREAMS

Site	Name	N	Mean	Minimum	Median	Maximum
T1	North Kent Creek	11	23.4	2	14	58
T2	South Kent Creek	11	35.9	14	36	72
T3	Keith Creek at 10th Av Pk	11	14.1	0.5	12	56
T4	Keith Cr at Dahlquist Pk	11	19.6	2	18	56
T5	Spring Creek	11	16.1	1	12	48

Illinois has no numerical standards for suspended solids or dissolved in general use waters for comparison to these data. The Illinois EPA uses the 85th percentile of statewide stream TSS measurements as a threshold value to assess potential aquatic life impairment in streams; this value is 116 mg/L. Maximum values measured in the 2008 to 2011 program did not approach this threshold in any stream.

Dissolved solids are highest in Keith Creek and lowest in North Kent and South Kent Creeks. In fact, ANOVA indicates that mean TDS in streams draining areas west of the Rock River (North Kent and South Kent Creeks) are less than the streams draining areas east of the Rock River (Keith and Spring Creeks), and that the differences are significant (p=0.000+).

Table C.4

DISSOLVED SOLIDS (mg/L) IN THE MS4 RECEIVING STREAMS

Site	Name	N	Mean	Minimum	Median	Maximum
T1	North Kent Creek	11	424	344	426	492
T2	South Kent Creek	11	479	378	482	550
T3	Keith Creek at 10th Av Pk	11	554	406	560	640
T4	Keith Cr at Dahlquist Pk	11	588	492	582	686
T5	Spring Creek	11	551	440	548	622

C.2.3 COD

Chemical oxygen demand (COD) was also measured in streams draining the MS4 service area. Summary statistics are given in Table C.5. There is no water quality standard for COD.

The streams have low COD levels and do not have depressed DO concentrations. This is evidence that there are no significant illicit discharges in the MS4 above the monitoring stations.

Table C.5

CHEMICAL OXYGEN DEMAND (mg/L) IN THE MS4 RECEIVING STREAMS

Location	N	Mean	Minimum	Median	Maximum
T1	11	9.2	5	5	22
T2	11	10.6	5	12	21
T3	11	7.4	5	5	17
T4	11	8.2	5	5	14
T5	11	6.3	5	5	13

C.2.4 Nitrogen and Phosphorus

Nutrients analyzed as part of dry weather screening and tributary water quality assessment include ammonia, nitrate+nitrite, and total phosphorus. Table C.6 summarizes total phosphorus concentrations measured in the streams. There are no total phosphorus water quality standards to compare these values with, but they are typical of streams in north central Illinois. The Illinois EPA uses the 85th percentile of statewide stream measurements as a threshold value to assess potential aquatic life impairment in streams; this value is 0.61 mg/L. Maximum values measured in the 2008 to 2011 program did not approach this threshold in any stream. This lends further support that there are no illicit connections in the upstream storm sewer system.

Table C.6

TOTAL PHOSPHORUS (mg/L) IN THE MS4 RECEIVING STREAMS

Site	Name	N	Mean	Minimum	Median	Maximum
T1	North Kent Creek	11	0.122	0.05	0.12	0.27
T2	South Kent Creek	11	0.117	0.05	0.10	0.27
T3	Keith Creek at 10th Av Pk	11	0.149	0.05	0.10	0.55
T4	Keith Cr at Dahlquist Pk	11	0.122	0.05	0.14	0.19
T5	Spring Creek	11	0.126	0.04	0.11	0.23

Table C.7 summarizes nitrate concentrations measured in the streams in 2008, 2009 and 2010. There are no water quality standards to compare these values with, but, again, they are typical of streams in north central Illinois. Mean nitrate levels in the two branches of Kent Creek are significantly higher than the other two streams in the monitoring program (p-value=0.000+).

Table C.7

NITRATE (mg/L) IN THE MS4 RECEIVING STREAMS

Site	Name	N	Mean	Minimum	Median	Maximum
T1	North Kent Creek	11	7.4	5.8	7.3	8.7
T2	South Kent Creek	11	5.3	4.2	4.9	6.6
T3	Keith Creek at 10th Av Pk	11	1.6	1.1	1.4	2.5
T4	Keith Cr at Dahlquist Pk	11	1.8	1.2	1.6	2.5
T5	Spring Creek	11	1.9	1.3	1.6	3.5

High ammonia concentrations can indicate sewage contamination. Ammonia in the MS4 receiving streams is always below the 0.1 mg/L detection level.

C.2.5 Tributary Fecal Coliform Concentrations

Summary statistics on fecal coliform bacteria concentrations measured in tributaries are given in Table C.13. The General Use Water Quality Standard applicable to all these streams is given in 35 Ill. Admin. Code 302.209:

> *During the months May through October, based on a minimum of five samples taken over not more than a 30 day period, fecal coliform shall not exceed a geometric mean of 200 per 100 ml, nor shall more than 10% of the samples during any 30 day period exceed 400 per 100 ml in protected waters.*

Summary data for concentrations of fecal coliform bacteria at the MS4 tributary stations sampled between 2008 and 2011 are tabulated below. Direct comparison with the water quality standard is not possible due to the quarterly sampling.

High coliform bacteria can indicate illicit sewer connections, but there are other sources, such as wildlife, failing septic systems, and pet wastes. Earlier load duration analyses by the City strongly suggested that the coliform are primarily wet weather sources such as land runoff (e.g. pet wastes, Canada goose wastes) and not dry weather sources (such as an illicit connection).

Table C.8

FECAL COLIFORM BACTERIA (/100mL) IN THE MS4 RECEIVING STREAMS

Site	Name	N	Mean	Minimum	Median	Maximum
T1	North Kent Creek	11	1,135	40	240	5,880
T2	South Kent Creek	11	799	10	300	3,320
T3	Keith Creek at 10th Av Pk	11	1,395	10	500	7,500
T4	Keith Cr at Dahlquist Pk	11	1,311	50	760	5,000
T5	Spring Creek	11	1,166	40	250	9,000