CITY OF OMAHA
NPDES PERMIT FOR THE MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)
NE0133698
2018 ANNUAL REPORT

Submitted by:
Environmental Quality Control Division
5600 S. 10 St.
Omaha, NE 68107

March 29th, 2019

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"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for known violations. See 18 U.S.C. 1001 and 33 U.S.C 1319, and Neb. Rev. Stat. 81-1508 thru 81-1508.02."

James Kee — 03/29/2019

Signature of Authorized Representative or Cognizant Official — Date

James Kee — EQCD Manager

Printed Name — Title

Introduction

The third Omaha Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) Permit (NE0133698/PCS 999428) was issued by the Nebraska Department of Environmental Quality (NDEQ) and became effective on April 1, 2018. The MS4 permit authorizes the City of Omaha to discharge storm water from all existing City of Omaha owned or operated MS4 outfalls to the Elkhorn River, the Papillion Creek, the Missouri River, and their tributaries subject to the identified limitations and the Storm Water Management Plan (SWMP) as modified. The City's Environmental Quality Control Division (EQCD) oversees the administration of the permit and ensures that the City is in compliance with the permit requirements.

The MS4 permit was issued for a five-year period and expires on March 31, 2023. The MS4 permit identifies the current City of Omaha SWMP. The SWMP requires the City to submit an annual report. In addition, reports will be made available to the public on the Omaha Stormwater Program (www.omahastormwater.org) and Papillion Creek Watershed Partnership web sites (www.papiopartnership.org).

The City of Omaha Departments that participates in meeting the MS4 permit requirements include:

- Public Works Department
  - Environmental Quality Control Division
  - Street Maintenance Division
  - Sewer Maintenance Division
  - Construction Division
  - Design Division
- Parks, Recreation and Public Property Department
  - Park Maintenance
  - Golf Operations
- Fire Department
- Law Department
- Planning Department

The City is committed to partnering with several organizations to meet the MS4 requirements in the most efficient manner possible. The major partners are listed below. The City intends to continue developing additional partnerships throughout the permit cycle to meet the permit requirements.

- Keep Omaha Beautiful (KOB)
- Papillion Creek Watershed Partnership (PCWP)
- Douglas-Sarpy County Extension Office
- Papio-Missouri River Natural Resource District (P-MRNRD)
- University of Nebraska at Omaha

This report satisfies the annual reporting requirement and covers the calendar year from January 1, 2018 through December 31, 2018. The permit was issued April 1st 2018, as a result April to December represent 9 months of permit year 1. The report is laid out as follows: the program minimum control measures (MCMs) are shaded, the permit requirements are underlined, and the City's description of permit compliance is in plain text.

A. Public Education & Outreach

1. BMPs 1, 3, and 4: Develop a plan for outreach that defines the goals, objectives, target audience and distribution process of materials for the public education and outreach program.

Target Goals & Implementation Schedule: *Year 1 – Develop a 5-year education and outreach plan. Years 2-5 – Review and update the plan each permit year and include the revised plan in the Annual Report.*

The City of Omaha, as of December 31st, is on track to develop a 5-year education and outreach plan. Education and outreach efforts have continued throughout 2018, as in previous years, while the plan is developed. Below is summary of those efforts.

Outreach Events and Material Distribution

In 2018, The City of Omaha Stormwater Program conducted 36 outreach events with the public, schools, commercial companies, and community organizations. Ten tours of UnderTheSink, the household hazardous waste facility, were conducted. The City also continued to contract with Keep Omaha Beautiful, Inc. (KOB) for stormwater education and outreach and to distribute educational information. KOB conducted 129 outreach events in 2018, for a total of 175 outreach events. The total estimated participation of these events was 20,273. Topics ranged from general stormwater education to rain barrel workshops to information on green infrastructure. A summary table of education and outreach events KOB's annual report can be found in Attachment E. Two of these events are the annual Sediment and Erosion Control Seminar and World O! Water which were included in the previous MS4 permit Stormwater Management Plan (SWMP). They were held in 2018 and are described in further detail below.

The City of Omaha Stormwater Program worked with the Papillion Creek Watershed Partnership (PCWP), Papio-Missouri River Natural Resource District (PMRNRD), Douglas County Environmental Services, and the Nebraska Department of Environmental Quality (NDEQ) to present the annual Sediment and Erosion Control Seminar on February 1st, 2018. There were 284 people that attended the seminar. Presentations at the event included:

- Stormwater 101 and the New PCWP Grading Permit
- Stream Restoration Projects
- Stormwater Runoff and Out Local Lakes, Streams, etc…
- Implementing Stormwater Pollution Prevention Plan Compliance in Sanitary and Improvement Districts (S&IDs)
- Panel Discussion: SEC Viewpoints from a Municipality, Consultant, and Home Builder

The World O! Water Festival was held on September 8th, 2018 from 12 PM until 4PM at Wehrspann Lake / Chalco Hills Recreation Area. There were approximately 50 organizations that participated by handing out information, conducting an activity or providing demonstrations. Approximately 1,600 visitors attended the event. Topics included water stewardship, recycling, water quality, and water conservation. Activities included a watershed pollution demonstrative model, canoe rides, nature hikes, and science experiments. This was the 14th successful year the event was held.

In 2018, the Omaha Stormwater Program distributed a total of 4,112 outreach materials and KOB distributed 6,595, for a total of 10,707 at outreach events. The materials distributed covered topics

concerning stormwater pollution, litter reduction, household hazardous waste, and more. An inventory of all outreach materials is provided in Attachment F.

In addition to the distribution of educational brochures and public outreach events, Keep Omaha Beautiful, Inc. coordinated several public service announcements (PSAs) and other information regarding stormwater pollution through radio, print, websites, social media, and other means such as e-newsletters in 2018. In total there were 196 PSA's with the breakdown by type provided in the table below. Topics and events addressed by these spots included stormwater pollution prevention, proper firework disposal, World O! Water, and storm drain marking.

PSA's	
Radio spots	4
Print ads	4
Websites	6
Television spots	32
Social media	137
Other	13
Total	**196**

Website

The City of Omaha Stormwater Program website is OmahaStormwater.org. The website provides many resources for stormwater management and is organized generally by target audience: residential, commercial, construction, and industrial. From the website homeowners can learn of what they can do at their home to manage stormwater runoff. Industrial facilities can learn how to apply for a permit as well as access resources to help them maintain compliance. Developers and engineers can access the necessary documents to apply for Grading Permits and Post-Construction Stormwater Management Plans (PCSMP).

Residents can also access information as to how they can improve water quality by actions they take at home. The Green Infrastructure Education Network was added to the residential section in 2018 and provides information and resources to schools and teachers to incorporate stormwater into the classroom. On the website, the public can also access the City's current MS4 permit, past and current annuals reports, and submit complaints or comments through an online form. The Stormwater Program also maintains a Facebook Page and provides additional communication with the public. Regular status updates sharing facts on stormwater, demonstration projects, and other related information were posted and helped to connect them to the Omaha Stormwater website.

In 2018 OmahaStormwater.org had 5,670 visitors with 17,590 total page views. The Omaha Stormwater Program Facebook page had a total reach of 16,548. Tables compiling the monthly breakdown for OmahaStormwater.org and the Omaha Stormwater Program Facebook Page can be found in Attachment E.

Signage

On-site, educational signage has been placed at many of the City's demonstration projects over the past 12 years, including at the UnderTheSink Facility, Orchard Park, Saddlebrook Joint Use Facility, Metropolitan Community College (MCC) Fort Omaha Campus, Creighton Prep, the University of Nebraska Omaha Welcome Center, Benson East Entrance at 58th & Maple, and Dundee Elementary School. No new signs were installed in 2018. Smaller, non-site-specific signs for rain gardens and permeable pavement have been developed and can be placed at other City green infrastructure (GI) project sites.

In addition to signage at demonstration projects, fact sheets for City of Omaha GI projects have been developed to share basic information on each project with the community. There are 26 project fact sheets, and these are shared with participants on tours and other outreach events. These GI fact sheets have also been uploaded to the Omaha Stormwater Program's website, OmahaStormwater.org, for public access and linked to their respective projects. Information provided includes photos, background information, and other project details.

Pet Waste Campaign

The City of Omaha Stormwater Program developed and implemented a pet waste campaign in 2009. Advertisements were developed and published in several publications and locations across the city. We continue to use these materials today as part of our education and outreach program. It was a very successful campaign and won the Silver Award in the Total Advertising Campaign category from the Eighth Annual Service Industry Advertising Awards. EQCD provided and distributed pet waste flyers (122) and bag dispensers (878) at outreach events in 2018.

This permit requirement is on schedule to be met.

2. BMP 2: Maintain and update appropriate messages for targeted residential, construction, and commercial issues.

Target Goals & Implementation Schedule: *Year 1 – Inventory current outreach materials in each of these targeted areas and develop new materials as needed. Years 2-5 – Provide copies of new outreach materials in the annual report.*

The City of Omaha Environmental Quality Control Division has developed many outreach materials over the years. These materials have been inventoried and categorized into the following target areas: residential, construction, commercial, and industrial. In 2018, one new outreach material was created, a field guide for construction site sediment and erosion control. The guide is based on the Omaha Regional Stormwater Design Manual (ORSDM) and describes sediment and erosion control BMPs, provides tips for effective use, and includes local pictures of good and bad BMPs. The flipbooks are being distributed to construction field staff, grading permit site inspectors, and other professionals who are involved with construction site stormwater runoff. A copy of the flipbook is included with the annual report submission and available online at OmahaStormwater.org

This permit requirement is being met.

B. Public Participation & Involvement

1. BMP 1: Provide opportunities for citizens to comment on new rules, ordinances, and regulations regarding the MS4

Target Goals & Implementation Schedule: *On-Going All Years – Post on the City Stormwater Website proposed changes to rules, ordinances, and regulations. Provide information in the annual report on approved changes and input received from the public.*

The City of Omaha's Environmental Quality Control Division updated its Grading Permit Terms and distributed a draft copy to stakeholders. No comments were received. The update was finalized in February 2018 and presented on at the 2018 Sediment & Erosion Control conference sponsored by the City of Omaha.

This permit requirement is being met.

2. BMP 2: Create opportunities for citizens to participate in the implementation of stormwater controls.

Target Goals & Implementation Schedule: *On-Going All Years – Post on the City Stormwater Website opportunities for public involvement in stormwater control related activities.*

The City of Omaha Stormwater Program's website is regularly updated throughout the year with information on opportunities for citizens to participate. Events and information include the Sediment & Erosion Control conference, World O! Water festival, proper handling of fireworks debris, and various outreach events. Social media, including Facebook, is used to further advertise the website to a broader audience.

The public is also encouraged to attend the Papillion Creek Watershed Partnership's meetings held regularly throughout the year, to discuss watershed and water quality policies. There were six meetings held in the 2018 calendar year. The following table summarizes the times and attendance for the meetings.

Date	Count	Target Market	Comments
4/26/2018	15	Partnership Members	Partnership Meeting
5/24/2018	16	Partnership Members	Partnership Meeting
6/28/2018	21	Partnership Members	Partnership Meeting
9/27/2018	19	Partnership Members	Partnership Meeting
10/25/18	17	Partnership Members	Partnership Meeting
11/29/18	24	Partnership Members	Partnership Meeting

Storm Drain Marking

KOB coordinated neighborhood groups and scout troops in 2018 to mark and clean storm sewer inlets. In total, 2,465 inlets were marked with disks and 340 inlets were cleaned. Through KOB's coordination, 724 youth and adult volunteers participated in inlet marking, totaling 1,498.5 hours of community service hours. A total of 138 bags of trash and 8 bags of recyclables were collected as part of this effort. Bilingual "Only Rain Down the Storm Drain" educational door hangers (which highlights HHW and Under the Sink) were

distributed to individuals living near storm drains that were marked. A total of 5,288 of these educational door hangers were distributed.

Dog Parks
The City of Omaha has partnered with the Omaha Dog Park Advocates by supplying Pet Waste Bag Stations and Pet Waste Bags for the two dog parks in Omaha. The Advocates keep the dispensers supplied with bags and submit a count to EQCD. A total of 105,600 bags were used during 2018.

This permit requirement is being met.

3. BMP 3: Provide access to information about the City's SWMP

Target Goals & Implementation Schedule: *On-going All Years – Maintain current City SWMP and MS4 annual reports on the Omaha Stormwater website.*

The Omaha Stormwater website is current with the 2017 Annual Report and current version of the SWMP. The website will be updated with the 2018 Annual Report in 2019.

This permit requirement has been met.

C. Illicit Discharge Detection & Elimination

1. BMP 1a: Maintain a compliance plan or mechanism to follow up on illicit discharges.

Target Goals & Implementation Schedule: *On-going All Years – Maintain the compliance procedures per the permit requirements.*

The City of Omaha's compliance plan is titled the Omaha Environmental Enforcement Manual and is included in Attachment B. This manual describes the City's enforcement goals, process and mechanisms, program priorities, and civil penalty policy. No updates were made in 2018.

This permit requirement is being met.

2. BMP 1b: Maintain a map showing all known MS4 outfalls and the location of all state-designated waters receiving direct discharges from MS4 outfalls.

Target Goals & Implementation Schedule: *On-Going All Years – Maintain a continually updated storm sewer system map per the permit requirements.*

The City of Omaha's Sewer Maintenance Division is responsible for maintaining and updating the separate storm sewer system map, in addition to sanitary and combined sewers. EQCD utilizes this information to catalogue outfalls and support outfall screening efforts. State-designated waters are maintained by the City's GIS department. They utilize USGS data and LiDAR flown periodically for the City to identify waterbodies and maintain the map layer. GIS map layers of impaired waters are obtained from the Nebraska Department of Environmental Quality (NDEQ), http://deq.ne.gov/Publica.nsf/Pages/WAT234. These layers are reviewed and updated as needed.

This permit requirement is being met.

3. BMP 1c: Conduct field screening activities per the permit requirements (set forth in 40 CFR Part 122.26(d)(1)(iv)(D)) specifically geared to local TMDL pollutants of concern such as *E. coli* and to eliminate illicit discharges.

Target Goals & Implementation Schedule: *Year 1 – Develop dry-weather screening, sampling, and quality control plan to address pollutants of concern. Conduct screening under current plan during Year 1. On-Going All Years – Annually conduct dry-weather monitoring according to screening and sampling plan.*

There were 268 potential outfalls identified by EQCD using GIS information collected by sewer maintenance in 2009. All these outfalls were inspected during dry weather. The outfalls were then classified as priority outfalls if they were 72" or greater or had a documented illicit discharge, regardless of size. Priority outfalls are screened annually. Outfalls that are documented with an illicit discharge are updated to priority status and screened annually for the next three years. If no illicit discharge is observed in that three years and it is less than 72", its status is updated to non-priority. Annexations of Sanitary & Improvement Districts (S&IDs) can occur periodically. When this occurs, all annexed outfalls are added as new to the outfall inventory for screening. Based on the screening, they are then classified as being a priority outfall or not. CityWorks asset management software is used to document outfall screening efforts.

Field screening in 2018 has been consistent with previous years. City of Omaha EQCD staff screened all outfalls identified the previous year as priority outfalls or new outfalls from annexed S&IDs. There were 38 outfalls inspected due to annexation of 8 S&IDs and 85 existing priority outfalls screened, for a total of 123. No suspicious discharges were found but 8 outfalls were characterized as potential (two physical characteristics observed) but had low severity index numbers, it was concluded that these 8 outfalls were not associated with illicit discharges. Outfall inspections were entered into the City of Omaha's CityWorks asset management system.

All outfall inspections are conducted after 48 hours of dry weather. A Physical Characteristics Examination is completed for each outfall, if flow was present. If an illicit discharge is encountered EQCD Inspectors are to call supervisory staff immediately. Photographs are taken of outfalls to be kept as a record of outfall conditions during the inspection.

The current outfall field screening procedures are being reviewed, updated, and are on schedule to be completed in permit year 1.

This permit requirement is being met.

4. BMP 1d: Implement procedures to investigate and trace sources of identified illicit discharges to the MS4.

Target Goals & Implementation Schedule: *On-Going All Years – Document investigations and include date observed, result of investigation(s), and date closed.*

The Omaha Stormwater Program operates a hotline, 402-444-3908, and a reporting form at OmahaStormwater.org to receive complaints from the public regarding stormwater issues, including illicit discharges. An Illicit Discharge Detection and Elimination (IDDE) Standard Operating Procedure (SOP) has been developed and is used to investigate and trace sources of illicit discharges. Inspections and supporting information for each complaint is tracked in CityWorks. A total of 128 complaints were received in 2018 with 18 having an illicit discharge associated with it. A summary of 2018 complaint investigations that involved illicit discharges is provided in the table below.

Date Initiated	Actual Finish	Address	Material Discharged	Resolution
3/5/2018	4/9/2018	2712 S 17th St	Carpet cleaning wastewater	Request for Voluntary Compliance - Written
3/15/2018	3/15/2018	7540 Dodge St	Sanitary sewer flow	Reported by Sewer Maintenance as an SSO
4/6/2018	04/20/2018	4612 L St	Car washing soaps	Request for Voluntary Compliance - Verbal
4/13/2018	4/24/2018	3606 McKinley	Water with coloring agent	Request for Voluntary Compliance - Verbal
4/20/2018	07/6/2018	103rd St & Camden Ave	Concrete washout	Unknown responsible party
5/7/2018	5/8/2018	8704 Grand Ave	Grass clippings	Request for Voluntary Compliance - Verbal
5/31/2018	02/13/2019	1229 S 180th St	Food debris	Letter of Warning

Date Initiated	Actual Finish	Address	Material Discharged	Resolution
5/31/2018	06/1/2018	12431 Farnam St	Pool water	Request for Voluntary Compliance - Verbal
5/31/2018	1/17/2019	5044 S 108th St	Cooking grease	Request for Voluntary Compliance - Written
6/21/2018	6/22/2018	9354 Douglas St	Sediment	Request for Voluntary Compliance - Verbal
6/22/2018	07/17/2018	4612 L St	Car wash water	Request for Voluntary Compliance- Written
7/25/2018	7/31/2018	801 S 15th St	Water in basement	No Action Taken
9/10/2018	09/21/2018	38th Street & Farnam St	Cooking grease	Request for Voluntary Compliance - Verbal
10/3/2018	10/3/2018	90th Between Shirley and Hickory	Concrete residue	Request for Voluntary Compliance - Verbal
10/11/2018	10/11/2018	1416 N 155th Ave	Concrete washout	Request for Voluntary Compliance - Verbal
10/12/2018	08/9/2018	4826 S 22nd St	Pool water	Letter of Warning
11/13/2018	1/18/2019	6017 S 36th St	Concrete washout	Request for Voluntary Compliance - Written
12/21/2018	Not resolved in 2018	2048 N 60th Ave	Sediment	Request for Voluntary Compliance - Verbal

This permit requirement is being met.

5. BMP 1e: Implement procedures to remove illicit discharges to the MS4. Document all interactions with potentially responsible parties.

Target Goals & Implementation Schedule: *On-Going All Years – Use the code enforcement procedures to eliminate unauthorized non-stormwater discharges identified during an investigation.*

Chapter 32 of the Omaha Municipal Code is the Stormwater Management Ordinance for the City of Omaha. Article II specifically addresses illicit discharges. Additionally EQCD works with the Planning Department's Plumbing Division to remove illicit connections when encountered. The Omaha Environmental Enforcement Manual, included in Attachment B, describes the City's process and mechanisms to obtaining compliance. A summary of complaints is included in Attachment C. A summary of complaint enforcement actions in 2018 is provided in the table below.

Complaint Enforcement Summary	
Notice of Violation	0
Letter of Warning	4
Request for Voluntary Compliance - Verbal	29
Request for Voluntary Compliance - Written	6
Forward to Adjacent MS4	2
No Action Taken	81
Not resolved at end of 2018	2

This permit requirement is being met.

6. BMP 1f: Identify and address allowable non-stormwater discharges determined to be significant contributors to pollutants. Identify any additional non-stormwater discharges that will not be addressed as illicit discharges.

Target Goals & Implementation Schedule: *On-Going All Years – Report on any local controls or conditions placed upon exempt non-stormwater discharges and additional identified exempted non-stormwater discharges.*

No local controls or conditions have been placed on allowable non-stormwater discharges in 2018. There were no additional allowable non-stormwater discharges identified as non-illicit discharges in 2018.

This permit requirement is being met.

7. BMPs 2 & 3: Coordinate with adjacent permitted MS4s to report illicit discharges to the appropriate authority having jurisdiction and respond to reports from other MS4s.

Target Goals & Implementation Schedule: *Year 1 – Develop procedures for coordination with adjacent permitted MS4s. On-Going All Years – Include in the annual report any known illicit discharge reports to and from adjacent MS4s.*

The Omaha Stormwater Program operates a hotline, 402-444-3908, and a reporting form at OmahaStormwater.org to receive complaints from the public regarding stormwater issues. These options for reporting complaints and illicit discharges are promoted through the Papillion Creek Watershed Partnership (PCWP). Complaints received by the Omaha Stormwater Program located in adjacent MS4s are forwarded immediately to the Authority Having Jurisdiction (AHJ) for investigating. Complaints received by adjacent MS4s that are in the City of Omaha limits or it's Extra Territorial Jurisdiction (ETJ), are immediately forwarded over to EQCD. The City of Omaha has a Memorandum of Understanding with Douglas County's Department of Environmental Quality and the Nebraska Department of Transportation (NDOT) to coordinate and cooperate on illicit discharge investigations and other stormwater permit-related activities. Through the inter-local agreement with the PCWP, IDDE is identified as a program area of cooperation between members.

A summary of complaints forwarded to adjacent MS4s is included in the table below.

Date	Address	Complaint Type	Adjacent MS4
5/3/2018	4609 Sheridan Rd & 13501 S 47th St	Construction	City of Bellevue
1/17/2018	Hwy 275 near Battle Creek, NE	Dust	NDOT

This permit requirement is being met.

8. BMP 4: Maintain written procedures for the IDDE component of the MS4 permit.

Target Goals & Implementation Schedule: *On-Going All Years – Make available upon request the standard operating procedures developed under this program component.*

The City is maintaining written procedures for the IDDE component of the MS4 permit and will provide a copy of the standard operating procedures developed under this program element upon request.

This permit requirement is being met.

9. BMP 5: Receive reports and complaints, internally and from the public, of illicit discharges and illegal dumping into the MS4. Respond to and investigate complaints about spills, dumping, or disposal of materials other than stormwater to the MS4.

Target Goals & Implementation Schedule: *On-Going All Years – Coordinate with others in the City to resolve complaints. Develop a system to generate reports and track the number of calls per year in regard to spills, dumping or improper disposal of materials to the MS4. Include a count of complaints received and investigations completed in the annual report.*

The Omaha Stormwater Program operates a hotline, 402-444-3908, and an online reporting form at OmahaStormwater.org to receive complaints from the public regarding stormwater issues, including illicit discharges. In addition to these options, the City of Omaha also operates the Mayor's Hotline, 402-444-5555 and the OmahaHotline.com website for citizen reporting of issues. CityWorks is an asset management system that the Omaha Stormwater Program and other City departments utilized to track complaints received. Notification of complaints relating to stormwater runoff are sent by service requests (SR). Once received, they are reviewed to ensure they are applicable to the Stormwater Program. Complaints not applicable are forwarded to the appropriate City department or outside agency. If applicable, a work order (WO) is created and assigned to an Environmental Inspector who will visit the site, identify the issue(s), work to correct the issue(s) as needed, determine responsible party, and resolve the identified issues.

A total of 125 complaints were received by the Omaha Stormwater Program in 2018. A summary of the complaints is included in Attachment C.

This permit requirement is being met.

10. BMP 6: Develop, implement, and maintain a training program for municipal field staff with respect to the IDDE.

Target Goals & Implementation Schedule: *Year 1 – Develop a strategy which identifies field staff and appropriate levels of training. Years 2-5 – Provide a count of employees which have received training in the annual report.*

The City of Omaha Stormwater Program is developing an IDDE training strategy and is on schedule to be completed in permit year 1.

This permit requirement is on schedule to be met.

D. Construction Site Program

1. BMP 1: Maintain the established program requiring operators of public or private construction activities to comply with local erosion and sediment control requirements.

Target Goals & Implementation Schedule: *On-Going All Years – Include any updates to City Code or Permit requirements in the annual report.*

The City of Omaha's Environmental Quality Control Division continued to implement the Grading Permit Program in 2018. The Grading Permit Terms and Conditions were updated early 2018 and were rolled out February 1st, 2018 as part of the annual 2018 Sediment & Erosion Control conference sponsored by the City of Omaha. The updates were made to stay consistent with the NDEQ's Construction Stormwater Permit NER160000 that was issued November 1, 2016. The Grading Permit Terms and Conditions are available at OmahaPermix.com and OmahaStormwater.org.

This permit requirement is being met.

2. BMP 2: Maintain a compliance plan or mechanism to follow up on construction site non-compliance.

Target Goals & Implementation Schedule: *On-Going All Years – Maintain the compliance procedures per the permit requirements.*

The City of Omaha's compliance plan is titled the Omaha Environmental Enforcement Manual and is included in Attachment B. This manual describes the City's enforcement goals, process, program priorities, enforcement and civil penalty policy. No updates were made in 2018.

This permit requirement is being met.

3. BMP 3: Review grading permit applications and maintain a continually updated inventory of all private and public construction sites.

Target Goals & Implementation Schedule: *On-Going All Years – Include in the annual report the number and type of grading permits reviewed.*

The Public Works Department, Environmental Quality Control Division, reviews the grading permit applications and the associated Storm Water Pollution Prevention Plans (SWPPP). Unless the SWPPP meets the requirements specified in the Omaha Regional Storm Water Design Manual, a grading permit will not be issued. Sites 5 acres or greater are given priority over sites less than 5 acres.

The City of Omaha issued a total of 98 permits in 2018 with 26 permits for sites greater than 5 acres and 72 permits issued for sites less than 5 acres in size. During 2018, there were a total of 470 active permits. The Omaha Municipal Code Section 32-101 (Grading Permit Required) requires owners/operators to obtain a grading permit on sites sufficiently large enough to require an NPDES construction general permit.

This permit requirement is being met.

4. BMP 4: Maintain the electronic records for inspection of construction sites and enforcement of erosion and sediment control measures.

Target Goals & Implementation Schedule: *Year 1 – Develop a strategy for site inspections by municipal staff and include in the annual report. On-Going All Years – Inspect construction sites on a regular basis and on a complaint basis. Track the number of sites inspected annually in a database. Initiate enforcement proceedings as appropriate to address violations. Include a summary of inspections completed and enforcement actions taken in the annual report.*

The City of Omaha Stormwater Program is updating their strategy for site inspections by municipal staff and is on track to complete this in year 1 of the permit. EQCD administers the inspection program for Erosion Control, both within the City of Omaha's jurisdiction as well as the Papillion Creek Watershed Partnership's (PCWP) individual member's jurisdiction. The City's Grading Permit Program requires that the owners of active sites assign a Project Inspector to do inspections weekly and after 0.5 inches of rain. In the 2018 calendar year, reports were submitted to an online permitting and reporting website, Permix, by City Inspectors and Project Inspectors for construction. The table below accounts for the reports submitted for sites within the City of Omaha's jurisdiction.

	City Inspection Reports	**Private Inspection Reports**
Phase I Sites (>5 acres)	598	5,291
Phase II Sites (<5 acres)	540	4,125
Total	1,138	9,416

The first step in the enforcement process is a Request for Voluntary Compliance (RVC). If the site is not brought into compliance, a Letter of Warning is sent to the violator regarding the issue(s) and establishes a timeline for compliance. If the site does not come into compliance by the established timeline, a Notice of Violation is issued and may include a fine. In 2018, there were 266 Requests for Voluntary Compliance (RVC) during City inspections. When a complaint is received regarding a grading permit site, the City Inspector visits the site and files a complaint inspection. There were 83 complaint inspections conducted on 51 grading permit sites, with 46 of those inspections including an RVC. A summary table of Letters of Warning and Notices of Violation, is summarized in the table below.

Permit Number	**Status**	**Date Submitted**	**Action Taken**
OMA-20151002-3313-GP2	Resolved	6/25/2018	NOV with fine
OMA-20160502-3581-GP2	Resolved	6/25/2018	NOV with fine
OMA-20170208-3962-GP1	Resolved	6/25/2018	NOV with fine
OMA-00050439-202-1	Resolved	9/5/2018	LOW
OMA-20160907-3786-GP2	Resolved	9/11/2018	NOV with fine
OMA20170410-4042-GP1	Active	10/1/2018	NOV with fine

This permit requirement is on schedule to be met.

5. BMP 5: Provide training for municipal staff with respect to their assigned duties as it relates to sediment and erosion control from construction activity. One formal training course for inspection staff during their employment with the City and internal training on an as-needed basis to maintain consistent reporting among all inspectors.

Target Goals & Implementation Schedule: *On-Going All Years – Include in the annual report the number of staff and their sediment and erosion control training.*

City of Omaha Environmental Inspectors who conduct inspections for sediment and erosion control must enroll and pass the Nebraska Local Technical Assistance Program's (LTAP) Erosion and Sediment Control for Inspectors. The training is a full-day course and includes a test at the end that if passed, the inspector becomes certified. This certification is valid for 5 years. When the certification expires, inspectors enroll for an online course to renew their certification. There are 16 certified inspectors in the City of Omaha's Environmental Quality Control Division (EQCD). A summary of active City inspectors is provided in the table below.

First Name	Last Name	Certification ID#	Recertification Date
Christopher	Anderson	2101	10/4/2022
Casey	Black	848	2/5/2016*
Mark	Ermeling	1979	10/5/2021
Neil	Graybill	1333	1/3/2022
Eric	Grimshaw	1261	12/8/2020
James	Kee Jr.	170	8/26/2019
Carla	Long (Shurter)	1666	1/6/2020
David	Nusser	924	9/12/2021
Matthew	Nusser	1986	10/5/2021
Matthew	O'Connell	2038	2/16/2022
Therese	Pogge	172	9/15/2019
Jennifer	Proescholdt	1987	10/5/2021
Jeffrey	Ryba	1353	9/13/2021
Carol	Sorensen	171	8/12/2019
Andy	Szatko	1278	11/30/2020
Christina	Tisko	1476	9/14/2021

*Recertified 1/23/19

In April of 2018, EQCD formally included sediment and erosion control training into the regular monthly safety toolbox meetings. Sediment and erosion control topics were discussed periodically at safety meetings prior but are now a formal part of the meeting. Combining these meetings have improved communications with staff and made more efficient use of their time. Sediment and erosion control topics that are covered include review of inspection processes, enforcements, and open discussion to discuss current issues among staff. A summary of 2018 sediment and erosion control training is provided in the table below.

Date	Title	Attendees
4/5/2018	Grading Permits and Complaints	4
8/28/2018	August Safety Toolbox, World O! Water, & EI Grading Permit Training	14
9/25/2018	September EI Training & Safety Toolbox	11
10/23/2018	October EI Training & Safety Toolbox	7
11/27/2018	November Safety Toolbox & EI Grading Permit Inspection Strategy Training	15
12/18/2018	December Safety Toolbox Meeting	8

This permit requirement is being met.

6. BMP 6: Communicate with the regulated community and other groups affected by the Construction Site Runoff program and provide a mechanism to receive complaints from the public.

Target Goals & Implementation Schedule: *On-Going All Years – Conduct workshops for developers, builders, site designers, contractors, and/or City staff as determined necessary (i.e., a rule or regulation is changed). Track reports from the public regarding construction sites. Include the number of reports received in the annual report and the permittees response.*

Workshops

The City of Omaha holds multiple outreach events with the regulated community, including the events listed in the table below. Outreach materials are handed out at these events and participants are encouraged to visit OmahaStormwater.org for additional information and resources. Phone calls, emails, and many other types of communications happen as part of regular job duties where City staff provide information and resources to support sediment and erosion control efforts in the community.

Date	Event Name	# of Attendees	Location	Details/Comments
1/22/2018	Rain Garden Workshop	12	RL Hotel - Omaha	4-hour workshop on design, construction and maintenance of rain and bioretention gardens
2/1/2018	2018 Sediment and Erosion Control Seminar	284	Hilton Hotel Downtown Omaha	Annual seminar to construction industry
2/15/2018	Lamp Rynerson and Associates Lunch-n-Learn Presentation	45	LRA Office	Presented & answered questions about grading permits & post-construction
4/17/2018	NWEA Great Plains Conference	130	La Vista Conference Center	Presentation on GI case studies
5/8/18	Olsson Lunch-n-Learn Presentation	23	Olsson's Omaha Office	Presented & answered questions about grading permits & post-construction

Date	Event Name	# of Attendees	Location	Details/Comments
7/16/2018	Ehrhart Griffin & Associates Lunch-and-Learn	17	EGA Office	Grading permit process & management; Permix use
8/1/2018	Terracon Lunch-and-Learn	18	Terracon Office	Presentation on grading permit processes
10/30/2018	Rain Garden Workshop	22	Douglas/Sarpy County Extension Office	4-hour workshop on design, construction and maintenance of rain and bioretention gardens

Complaints/Reports

When a complaint is received regarding a grading permit site, the City Inspector assigned to the site is notified, then visits the site, and files a complaint inspection to document findings. There were 83 complaint inspections conducted on 51 grading permit sites, with 46 of those inspections including an RVC. See BMP 4 in this section for information regarding construction site complaints in 2018.

This permit requirement is being met.

E. Post Construction Runoff Control

1. BMP 1: Continue to implement the Post Construction program as stipulated in the Omaha Municipal Code (OMC). Periodically update guidance material and develop divergent standards for difficult sites such as linear projects. Update as need the Omaha Regional Stormwater Design Manual (ORSDM)

Target Goals & Implementation Schedule: *Year 1 – Develop divergent standards for guidance document and update guidance as needed. Submit standards with the annual report. On-Going All Years – Revise as necessary. Include a summary of revisions in the annual report.*

The City of Omaha's guidance document for post-construction is titled *City of Omaha Post Construction Stormwater Management Planning Guidance* and was developed in July 2009 and updated in August 2015. The document is available on the City's website OmahaStormwater.org and OmahaPermix.com. There were no updates to the guidance document in 2018. No divergent standards were developed in 2018.

This permit requirement is being met.

2. BMP 2: Review and update, if needed, the standards outlined in the OMC and ORSDM for consistency with required performance standards as they relate to post-construction management plans.

Target Goals & Implementation Schedule: *On-Going All Years – Report on any updates to the OMC or ORSDM.*

The City of Omaha periodically reviews the ORSDM and guidance based upon feedback from the regulated community. No updates were made to the OMC or the ORSDM in 2018. However new policy was developed which requires Post Construction Stormwater Management Plan Applications be submitted prior to Grading Permit Approval. Additionally PCSMPs must be included in any Subdivision Agreements.

This permit requirement is being met.

3. BMP 3: Maintain an online submittal and review process for site plans, easement and maintenance agreements, as-built drawings, deed recordings, and drainage studies.

Target Goals & Implementation Schedule: *On-Going All Years – Report number of PCSMP projects and the status of their progress in the annual report.*

The City of Omaha reviews proposed post-construction stormwater management plants (PCSMP) for code compliance, functionality, and manageability. The City's online permitting and reporting website, Permix, is used for PCSMP review and approval. Documents that are included in the PCSMP include a drainage study, proposed plan sheets, applicant certification, maintenance agreement, as-built drawings, BMP certification statement, certification cover sheet, and a certificate of occupancy letter (as-needed). Upon physical completion of the post-construction BMP(s), the PCSMP is recorded with the property deed to ensure long term compliance.

The table provided below summarizes PCSMP projects from 2018. Active projects refer to those projects that are in the document review process or waiting for construction documents to be submitted at the end of 2018.

2018 Omaha PCSMP Projects	
Applications	**1**
Active Projects	**405**
Document Review	248
Construction Document	157
Projects Certified	**88**

This permit requirement is being met.

4. BMP 4: Develop SOP's for responding to complaints regarding Post Construction BMPs and a strategy for verifying BMPs are being installed and maintained in perpetuity.

Target Goals & Implementation Schedule: *Year 1 – Submit SOPs with the annual report. On-Going All Years – Report on any complaints and/or BMPs which have been certified as complete.*

The City of Omaha Stormwater Program is developing Standard Operating Procedures for responding to complaints regarding post-construction BMPs and is on track to complete this in year 1. In 2018, one complaint was received regarding certified post-construction BMPs.

The strategy for verifying BMPs are being installed and maintained properly is as follows, excerpted from the *City of Omaha Post Construction Stormwater Management Planning Guidance* document.

Installed
Upon construction completion, all stormwater BMPs that are part of the Final Post-Construction Stormwater Management Plan shall be certified by a licensed professional civil engineer registered in the State of Nebraska or other professional approved by the City of Omaha Public Works Department, the Designer. For BMP Certification, the Designer shall submit the following elements to the City of Omaha Public Works Department.

- Record Drawings of the Final Post-Construction Stormwater Management Plan Sheets
- BMP Certification Document

Maintained
Section 32-124 of the City of Omaha Municipal Code states, "the applicant or owner is required to execute an inspection and maintenance agreement, to be filed on record, binding on all subsequent owners of land served by a private stormwater management facility. Such agreements shall provide for access to the facility, at reasonable times, for inspections by the City or its authorized representative to ensure that the facility is maintained in proper working condition to meet design standards."

Such agreements shall document the responsibilities of the owner, the Home Owner's Association or other responsible party (for Sanitary and Improvement Districts), and the City of Omaha. The maintenance agreement shall be approved by the Public Works Department as part of the Final PCSMP and recorded with the Register of Deeds. A sample copy of the Maintenance Agreement can be downloaded at OmahaStormwater.org.

Maintenance Agreement exhibits shall include the following:

- Exhibit A – Real Property Depiction – Provide lot certificate or platted subdivision with legal description, or PCSMP plan sheet if that information is contained on the sheet already (11"x17")
- Exhibit B – BMP Maintenance Requirements as described in Section 2.5 of this document (See Appendix A also)

This permit is on schedule to be met.

5. BMP 5: Maintain a database that stores information on approved PCSMPs.

Target Goals & Implementation Schedule: *On-Going All Years – Provide an inventory of certified stormwater control measures installed as part of the PCSMP requirements. Include a count of BMP types as well as any known changes to BMPs in the annual report.*

In 2018, there were 76 projects certified with a total of 128 individual BMPs in Omaha. These BMPs are summarized by BMP type in the table below. At the end of 2018, there were a total of 929 certified BMPs in Omaha's jurisdiction.

2018 Certified BMP by Type	Count
Bioretention System	23
Constructed Wetland	1
Disconnected Impervious Cover	2
Extended Dry Detention Basin	5
Filter Strip	0
Grassed Swale	2
Green Roof	0
Infiltration Trench	0
Level Spreader	0
Manufactured System	22
Other (flow-based)	11
Other (volume-based)	3
Permeable Pavement	1
Rain Barrel/Cistern	0
Rain Garden	7
Retention Wet Ponds	1
Roof Drain Filters	22
Sand Filter	0
Subsurface Storage	17
Vegetated Bioswale	1
	128

This permit requirement is being met.

6. BMP 6: Inspect sites that are certified by the engineer of record and all sites identified as a deficient on a complaint basis. Develop a protocol to bring sites into compliance.

Target Goals & Implementation Schedule: *Year 1 – Develop protocol for compliance assistance and inspection strategy. On-Going All Years – Document and maintain inspection records of the certified PCSMP projects as identified in the strategy developed. Document any enforcement actions taken. Summarize activities in the annual report.*

A protocol for compliance assistance and inspection strategy of certified PCSMP BMPs is being developed and is on schedule to be completed in permit year 1.

There were no enforcement actions against a project's PCSMP BMPs in 2018.

This permit requirement is on schedule to be met.

F. Pollution Prevention/Good Housekeeping

1. BMP 1: Maintain an inventory and map of municipal facilities. Review annually and update if needed.

Target Goals & Implementation Schedule: *On-Going All Years – Maintain an inventory and map of all municipal facilities.*

The City of Omaha Facilities Management Division maintains an inventory of municipal facilities. The Sewer Maintenance Division maintains an inventory of municipal stormwater controls associated with the storm sewer system. The Omaha Stormwater Program maintains an inventory of municipal storm controls associated with stormwater basins and green infrastructure practices. These facilities have been included in the City's GIS system and are readily available for viewing and use.

This permit requirement is being met.

2. BMP 2: Conduct assessments of municipal maintenance facilities and review their municipal runoff control plans as applicable. Revise plans as needed if facilities expand or reduce activities and implement recommendations based on annual inspections.

Target Goals & Implementation Schedule: *Year 1 – Develop a strategy to assess municipal facilities and prioritize them based upon a defined set of criteria. Include strategy in the annual report. Years 2-5 – Track the number of assessments for municipal facilities based upon the strategy developed in year 1. Include the number of assessments completed, a description of the assessment procedure and any changes in facilities ranking in the annual report.*

The City of Omaha employed the services of Felsburg Holt & Ullevig (FHU) in 2009 to develop a program to assess facilities and assign a score according to the types of daily activities associated with each facility that have potential for stormwater exposure. The score is based on a 30-point scale with a score greater than 20 indicating a "Hot Spot", greater than 10 indicating a "Potential Hot Spot", and less than 10 "Not a Hot Spot". Facilities with municipal activities that present little to no exposure of pollutants to stormwater, such as office buildings and libraries, were removed from the list of sites requiring further evaluation. From the initial evaluation and an ongoing basis, high priority facilities have been prioritized as "Hot Spots", and are audited annually. Facilities classified as "Potential Hot Spots" are audited every two years, and remaining facilities are audited every three years.

The Municipal Hot Spot Evaluation Form is included as Attachment G. Facilities qualifying as "Hot Spots" have a Facility Runoff Control Plan (FRCP) implemented. FRCPs include provisions for general good housekeeping practices, storage of de-icing materials, fueling operations, vehicle maintenance, and equipment and vehicle washing.

This permit requirement is being met.

3. BMP 3: Continue to implement Omaha's Good Housekeeping Program for municipal facilities that addresses "high-priority" facilities (hot spot score of 20-30 out of 30) and site specific SOPs.

Target Goals & Implementation Schedule: *On-Going All Years – Annually report new, removed, or significantly-updated municipal facilities.*

The City of Omaha conducted compliance inspections at City Maintenance Facilities where FRCP's had been implemented. The audits are given an overall score of Outstanding, Satisfactory, or Needs Improvement. The scores were based upon a records and site review. The inspector not only looked to see that facility inspections were being conducted but that any corrective actions that were noted had been addressed in a timely manner. In 2018, the City of Omaha coordinated 15 inspections at 12 "Hot Spot" facilities with associated Facility Runoff Control Plans. The other 18 inspections were at sites with hot spot scores less than 20, primarily public parks/golf courses. In 2018, 9 facilities received a Needs Improvement, 17 facilities received a Satisfactory, and 7 received an Outstanding rating. Copies of EQCD findings were forwarded to the facility and department supervisors. In 2018, there were no changes or significant updates needed for FRCP program facilities.

This permit requirement is being met.

4. BMP 4: Implement practices for maintaining the storm sewer system that includes catch basin maintenance, open channels and other drainage structures, street sweeping, and structural stormwater controls. All maintenance procedures are to be performed such that waste water and waste materials don not enter the MS4.

Target Goals & Implementation Schedule: *Year 1 – Provide a description of the maintenance programs in the annual report. On-Going All Years – Annually report on Sewer maintenance activities related to maintaining the storm sewer system and changes to any of the maintenance practices.*

Descriptions for City maintenance programs for the storm sewer system are being developed and are on schedule to be completed in permit year 1.

Storm Sewer System Maintenance

The Sewer Maintenance Division is responsible for the inspecting, cleaning, repairing and maintaining of the storm sewer system. The Street Maintenance Division is responsible for any creek maintenance cleaning or clearing. They use the same work order tracking system to account for their activities. The table below represents both Divisions' storm sewer system activity for the permit year of 2018.

Work Order Type (Description of Work)	Storm/Storm Combined	Storm	Task Total
Clean FE - (Clean Flared End)	8	0	8
Clean Inlet - (Clean Inlet)	632	1,053	1,685
Clean MH - (Clean Manhole)	12	12	24
Clean Storm Struct - (Clean Stormwater Structure)	4	2	6
Dye Test - (Put Dye in Structure/Cavity to find flow)	219	88	307
I-Clean - (Clean the Inlet)	4	1	5
I-Flared End - (Reset/Daylight/New Grate)	3	0	3
Inlet Blown Off - (Inlet Grate was blown off but is not missing)	3	2	5
Inlet Broken - (Inlet Grate was broken and replaced)	11	4	15
Insp Inlet (Inspect Inlet)	0	2	2
Insp Structure - (Inspect Sewer Structure (ex. FE, MH, Inlet)	392	305	697
I-Repair - (Seal box, reset hood, reset grate, replace aprons)	165	58	223
I-Replace - (Replace Inlet, Includes all inlet types)	8	19	27
L/S Locate - (Locate where line segment is.)	36	10	46

Work Order Type (Description of Work)	Storm/Storm Combined	Storm	Task Total
MH Blown Off - (Manhole was blown off but not missing)	6	3	9
MH Broken - (Manhole broken and replaced)	3	7	10
MH Locate - (Find the location of manhole)	30	1	31
MH-Clean - (Clean the Manhole)	1	0	1
MH-R/C - (Reset/Replace Ring & Cover)	19	3	22
MH-Repair - (Ex-seal riser/brick or pipe wall link, floor rehab)	16	8	24
O-Ditchwork (Open ditching, culvert daylighting, etc…)	1	0	1
P-Abandon - (Abandon the Pipe)	0	1	1
Private - (Private Problem, notify owner)	13	8	21
P-Storm Repair - (Repair a Storm line)	32	16	48
P-Storm Replace - (Replace a Storm line)	7	14	21
Street Flooding - (Storm Water is flooding the street)	6	1	7
TV Assessment - (Complete PACP Assessment)	10	1	11
TV Inspection - (TV line to find defect)	43	59	102
Unscheduled Jet - (Jetting a line reactively)	19	13	32
Unscheduled Jet Vac - (Jet Vac'ing a line reactively)	84	100	184
Unscheduled Saw - (Jet Sawing a line reactively)	1	4	5
Creek Maintenance	-	-	0
Culvert Cleaning	-	-	8
Culvert Repair	-	-	2
Debris Removal	-	-	446
Ditch Maintenance/Cleaning	-	-	22
Storm Debris Removal - ROW	-	-	0
Task Total:	1,788	1,795	4,061

Street Sweeping

There are approximately 4,877 lane miles within the City of Omaha. In 2018, the City mechanically swept a total of 7,780 curb miles. The table below gives a more detailed accounting of the City's street sweeping activities. The street sweeping operation no longer allows for debris to be separated by areas of the city.

Area of City	Curb Miles Swept	Tons of Debris Removed
Business District & Major Streets	2,073	1,033
Residential Areas	5,707	2,329
Totals	7,780	3,362

Additionally the City of Omaha's Public Works Department's Parking Divisions mechanically sweeps municipally owned parking structures and lots twice a year, in Spring and Fall. Municipally owned parking structures are also washed twice per year in conjunction with sweeping, practices are used to capture the solids from the wash down which are then disposed of at the landfill.

Inlet Marking

The City of Omaha's standard plate for inlets includes a stamp to indicate it drains to the creek. To mark inlets without that stamp and increase stormwater awareness, the City of Omaha coordinated with Keep Omaha Beautiful to continue to organize groups to mark and clean storm sewer inlets in 2018. In total, an additional 2,465 inlets were labeled with disks, and an additional 340 already had a disk in place but were cleaned. In total, 724 youth and adult volunteers participated, totaling 1,498.5 hours of community service hours. There were 138 bags of trash and 8 bags of recyclables were collected as part of this effort. Bilingual "Only Rain Down the Storm Drain" educational door hanger (which highlights HHW and Under the Sink) were distributed to individuals living near storm drains that were marked. A total of 5,288 of these educational door hangers were distributed.

Date(s) of Service	Location Description [Starting Address]	# of Drains Marked	# of Drains Cleaned	# of Door Hangers Distributed
March - June	Applewood Heights [6338 S 104th St. 68127]	5	26	75
3/22/2018	Christie Heights Park	100	0	115
4/5/2018	Southeast of Fontenelle Elementary	21	0	108
4/17/2018	Near South High	12	13	75
4/10/2018	Near South High	15	9	7
4/11/2018	Various Northwest Omaha areas	267	10	221
4/17/2018	Southeast of Fontenelle Elementary	20	0	111
4/18/2018	Near South High	8	13	56
4/23/2018	Near South High	8	40	58
April & May	Central Park Elementary	25	0	0
6/15/2018	108th & Harrison/ Q Street	32	14	92
6/12/2018	Neighborhood Action and Fact neighborhood	73	0	74
6/13/2018	Neighborhood Action and Fact neighborhood	62	0	34
6/14/2018	Neighborhood Action and Fact neighborhood	51	0	42
6/15/2018	144th and Blondo area	9	23	32
6/22/2018	144th and Pacific area	9	6	66
6/8/2018	132 and Cumming area	23	47	123
5/23/2018	Area around 156 and Blondo & other northwest areas	257	23	112
6/29/2018	156th and pacific area	18	0	97
7/6/2018	108th and Center	39	0	89
7/9/2018	108th and Center	47	0	86
7/11/2018	Hartman Avenue Neighborhood Association	109	15	93
7/13/2018	156th and Pacific area	37	0	84
7/20/2018	Around Miller Park	16	0	51
7/20/2018	Around Miller Park	10	0	25

Date(s) of Service	Location Description [Starting Address]	# of Drains Marked	# of Drains Cleaned	# of Door Hangers Distributed
7/20/2018	Around Miller Park	14	0	38
7/20/2018	Blondo and 156th area	42	8	137
7/21/2018	Hartman Avenue Neighborhood Association	110	1	60
7/27/2018	Stonybrook	53	2	103
July	North of I-680 and East of Highway 75	16	11	100
August	Various Southwest Omaha areas	88	0	150
9/1/2018	Deer Park	698	0	1837
9/10/2018	Around Swanson Elementary	55	1	224
9/20/2018	Around Lewis and Clark Middle School	15	0	41
9/27/2018	Around Lewis and Clark Middle School	6	1	51
9/29/2018	Westmont neighborhood	20	1	70
10/8/2018	Around Montessori Middle School - 5304 S. 172	75	76	551

Stormwater Structure Maintenance

EQCD inspects City-owned stormwater basins at least once a year with most being inspected twice for any major maintenance issues in early spring and in early winter. Fontenelle Park Lagoon and Lake James Park were not inspected in 2018 due to active construction, part of the Lake James to Fontenelle Park CSO project. A physical characteristics examination form is completed during the inspection for structures that had flow or were wet. No basins needed a PCE form completed in 2018. Maintenance is performed by various City Departments based upon the type of activity required. Most of the City Departments are using CityWorks to track their maintenance activities. Additionally, EQCD employed staff members, one full-time and two part-time employees, who are dedicated to maintaining City owned stormwater BMP structures throughout the year. The table below indicates when the inspection occurred as well as any maintenance issues noted at that time.

Site	Inspection Dates	Sediment Removal	Trash Removal	Tree Removal & Chipping	Mowing
Storz Expressway (E)	3/30/2018	No	Yes	No	No
	11/19/2018	Yes	Yes	No	No
Storz Expressway (W)	3/30/2018	No	Yes	No	No
	11/19/2018	No	Yes	No	No
Adams Park Lagoon	4/26/2018	Yes	No	No	No
	12/18/2018	Yes	No	No	No
Lake James Park	Park under construction in 2018, part of the Lake James to Fontenelle Park CSO Project				
Fontenelle Park Lagoon	Park under construction in 2018, part of the Lake James to Fontenelle Park CSO Project				

Site	Inspection Dates	Sediment Removal	Trash Removal	Tree Removal & Chipping	Mowing
John J Pershing Drive 1.5	3/30/2018	No	Yes	No	No
	11/29/2018	No	Yes	No	No
Miller Park	6/15/2018	No	Yes	No	No
	11/30/2018	No	No	No	No
10th & Nicholas	3/30/2018	No	No	No	No
	11/19/2018	No	No	No	No
13th & Carter Blvd	4/12/2018	Yes	Yes	Yes	No
	11/29/2018	Yes	No	Yes	No
13 & Fowler	4/12/2018	No	No	Yes	No
	11/29/2018	No	Yes	No	No
Carter Lake	4/12/2018	No	No	No	No
	12/7/2018	No	No	No	No
19 & Carter Blvd	4/12/2018	No	Yes	Yes	No
	11/29/2018	Yes	Yes	Yes	No
18th Street E & Ave H	4/12/2018	Yes	Yes	Yes	No
	11/30/2018				Yes
14th & Ida St	4/12/2018	No	No	Yes	No
	11/19/2018				Yes
John J. Pershing No. 1	3/30/2018	No	Yes	Yes	No
	12/6/2018	No	No	Yes	No
John J. Pershing No. 2	3/30/2018	No	Yes	Yes	No
	12/6/2018	No	Yes	Yes	No
Gifford Dr. No 1	3/30/2018	No	No	No	No
	11/19/2018	No	No	No	No
9th & Storz	3/30/2018	No	Yes	No	No
	11/29/2018				Yes
Westlawn Cementary	7/9/2018	No	Yes	No	No
	11/30/2018	Yes	No	Yes	No
64th Street Channel	5/25/2018	No	No	No	No
	11/30/2018	No	No	Yes	No
Elmwood Park	4/27/2018	No	No	No	No
	12/7/2018	No	No	No	No
Spring Lake Park	6/15/2018	Yes	Yes	No	No
	12/7/2018	Yes	No	Yes	No

EQCD also inspects City-owned green infrastructure (GI) practices throughout the city. The GI practices were reviewed to ensure they are functioning property and identify maintenance needs. The table below indicates when the inspection occurred as well as an overall condition assessment for the site.

GI Site	Inspection Date	Condition
Country Club	6/14/2018	Satisfactory
Leavenworth LS	6/14/2018	Satisfactory
Orchard Park	6/14/2018	Satisfactory
Prairie Lane Park	6/14/2018	Satisfactory
Sewer Maintenance	6/14/2018	Satisfactory
SOIA LS	6/14/2018	Outstanding
The Colonies	6/14/2018	Satisfactory
50th & Pine	5/21/2018	Satisfactory
Hilton Omaha	5/21/2018	Outstanding
SE Police Precinct	5/21/2018	Needs Improvement
UTS	8/30/2018	Satisfactory
Vehicle Impound Lot	7/27/2018	Satisfactory
Zorinsky Water Park	9/17/2018	Needs Improvement
24th St Bioretention	8/30/2018	Satisfactory
Douglas Streeetscape	4/17/2018	Satisfactory
Florence Streetscape	4/20/2018	Satisfactory
Saddle Hills	5/25/2018	Outstanding
Saddlebrook	5/22/2018	Needs Improvement
58th & Maple	4/17/2018	Satisfactory
Fire & Police Training	3/28/2018	Satisfactory

This permit requirement is being met.

5. BMP 5: Provide training for municipal employees in pollution prevention and good housekeeping.

Target Goals & Implementation Schedule: *Year 1 – Develop a strategy for municipal employee training in pollution prevention and good housekeeping. Include strategy in annual report. On-Going All Years – Conduct training events for municipal staff. Include number of employees trained, based on strategy developed in Year 1, in annual report.*

The City of Omaha Stormwater Program is developing a training strategy for municipal employees involved in implementing pollution prevention and good housekeeping practices and is on schedule to be completed in permit year 1.

In 2018, training was provided to multiple municipal employees in various departments and divisions including Sewer Maintenance, Street Maintenance, Fleet Maintenance, Parks, and Planning. EQCD staff, including Environmental Inspectors, receive additional training throughout the year on various SWMP-related topics. In 2018, EQCD staff attended or participated in 28 workshops or in-house training sessions. In addition to these events, staff are encouraged to seek out webinars, conferences, and other training opportunity of interest that is stormwater and MS4 related. These opportunities continue to further our municipal employee knowledge and experience on water quality and stormwater management. The following table is a summary of 2018 workshops and in-house trainings for City staff.

Date	Title	Associated Program	Attendees
1/10/2018	Safety Toolbox Meeting	Good Housekeeping	13
2/14/2018	Safety Toolbox Meeting	Good Housekeeping	14
2/27/2018	ASP's Clean & Green	Construction	7
3/14/2018	Safety Toolbox Meeting	Good Housekeeping	13
4/5/2018	Grading Permit Training	Construction	3
4/9/2018	Grading Permit Training	Construction	4
4/11/2018	Safety Toolbox Meeting	Good Housekeeping	10
5/9/2018	Safety Toolbox Meeting	Good Housekeeping	13
6/5/2018	Confined Space Training	Good Housekeeping	12
6/11/2018	IDDE & Complaints	IDDE	5
6/12/2018	Confined Space Training	Good Housekeeping	12
6/13/2018	Safety Toolbox Meeting	Good Housekeeping	11
6/18/2018	Outfall Inspections	IDDE	5
7/11/2018	Safety Toolbox Meeting	Good Housekeeping	10
8/10/2018	City of Omaha's MS4 Permit	Good Housekeeping	4
8/21/2018	Confined Space Training	Good Housekeeping	5
8/28/2018	August Safety Toolbox, World O! Water, & EI Grading Permit Training	Good Housekeeping	14
9/19/2018	EPA MS4 Audit Training	Combination	2
9/20/2018	Omaha Green Infrastructure Tour	Post-Construction	11
9/25/2018	EI Training & Safety Toolbox	Good Housekeeping	11
10/23/2018	EI Training & Safety Toolbox	Good Housekeeping	7
10/26/2018	Retrieval Equipment for Confined Space	Good Housekeeping	6
10/30/2018	City/County Citizen Reporting Site	Combination	6
11/27/2018	November Safety Toolbox & EI Grading Permit Inspection Strategy Training	Construction	15
11/27/2018	EI Training & Safety Toolbox	Good Housekeeping	13
12/12/2018	FRCP Training - 52nd & Dayton	Good Housekeeping	18
12/12/2018	FRCP Training - 52nd & Dayton	Good Housekeeping	14
12/18/2018	Safety Toolbox Meeting	Good Housekeeping	8

As part of the City of Omaha's already established FRCP program, employees at FRCP locations have previously received stormwater awareness training. As part of the strategy for municipal employee training, applicable employees will be trained and records maintained. Implementing pollution prevention and good housekeeping practices are included in the training curriculum. The strategy for municipal employee training is on schedule to be completed in permit year 1.

The City's Environmental Quality Control Division and the Parks and Recreation Department have applicators who are required to be FIFRA certified. There are currently 55 certified applicators. All certifications are up to date and are obtained from the Douglas–Sarpy County Extension Office.

This permit requirement is being met.

6. BMP 6: Provide educational material to contractors hired to perform maintenance activities on the MS4.

Target Goals & Implementation Schedule: *Year 1 – Develop materials to provide to contractors and include in the annual report. Years 2-5 – Include in the annual report any new materials or updates to existing materials.*

City of Omaha personnel conduct most of the maintenance activities on the MS4. If an outside party is hired to complete maintenance activities, educational materials are available to share with the contractors to educate them on stormwater controls, good housekeeping practices, and maintaining compliance with applicable permits.

This permit requirement is being met.

G. Industrial Facilities

A. BMP 1: Maintain a program that identifies industries within the MS4 area that fall into sectors identified in the ISW- NPDES permit.

Target Goals & Implementation Schedule: *Year 1 – Develop a strategy that will identify industries and their compliance with NPDES permits. On-Going All Years – Review and update strategy developed in Year 1 and report on any changes in the annual report.*

The City of Omaha Stormwater Program is developing a strategy to identify industries and their compliance with NPDES permits and is on track to complete this in year 1.

This permit requirement is on schedule to be met.

2. BMP 2: Request a list of permitted facilities and the NOI from NDEQ in January of each permit year.

Target Goals & Implementation Schedule: *On-Going All Years – Maintain a database to track NPDES permitted facilities.*

In January 2018, Omaha requested and received from the NDEQ a list of industries in Omaha permitted under the NER910000 ISW-GP. 127 facilities were included on this list. The GIS database was updated with this list of facilities.

This permit requirement is being met.

3. BMP 3: Inform industries about the NPDES ISW permit and notify the state when industries are not in compliance with the state regulations.

Target Goals & Implementation Schedule: *On-Going All Years – Develop industry-specific publications regarding NPDES regulations and distribute to inspected facilities.*

The City of Omaha Stormwater Program has 22 sector-specific information sheets, brochures, and additional information regarding industrial stormwater on the Industry pages of OmahaStormwater.org. The website also has the ISW-GP NER910000 permit and FAQs to help industries with maintaining compliance.

Outreach to Omaha industries has continued in 2018 to update industries that the City of Omaha's Industrial Stormwater Program is focused on ensuring compliance with the NDEQ's ISW-GP. Industries that call or email the Omaha Stormwater Program are informed about the NDEQ's ISW-GP and how to stay in compliance.

No industries in 2018 were referred to the state for not maintaining compliance with state regulations.

This permit requirement is being met.

4. BMP 4: Inspect NPDES permitted industries from a list provided by NDEQ in January of each year. Maintain a tracking system for inspections and SWPPP reviews. Review SWPPP or NEC prior to completing an inspection.

Target Goals & Implementation Schedule: *On-Going All Years – Inspect 20% of the facilities on the list provided by NDEQ each year so that all industries are inspected once in the permit cycle.*

In January 2018, Omaha requested and received from the NDEQ a list of industries in Omaha permitted under the NER910000 ISW-GP. There were 127 facilities were included on this list. E&A Consulting Group (E&A) and Felsburg, Holt, and Ullevig (FHU) were contracted to assist the City with inspecting industrial facilities in 2018. Inspectors from these firms have extensive experience with industrial stormwater regulations and performing inspections. This inspection form they used as part of their inspections was provided to them from the Omaha Stormwater Program and was developed to be consistent with the NDEQ's inspection and capture necessary information to assess compliance. A total of 26 facilities were inspected for compliance with the NDEQ ISW-GP NER910000. The 26 inspected facilities represent 20% of the 127 NDEQ ISW-GP permitted facilities in Omaha, see summary table below.

Program_ID	Permit Type	Facility Name	Address	Inspection date	Report Sent
NER910740	Industrial Stormwater	NECO	9364 N. 45th Street	8/2/2018	9/17/2018
NER910730	No Exposure	Quality Refrigerated Services	3301 G Street	7/19/2018	7/24/2018
NER910242	No Exposure	W.N. Morehouse Truck Line, Inc.	4010 Dahlman Avenue	7/25/2018	8/20/2018
NER910215	No Exposure	Taylor Communications, Inc.	9503 F Street	8/8/2018	10/2/2018
NER910274	No Exposure	Teledyne CETAC	14306 Industrial Road	7/12/2018	10/3/2018
NER910402	Industrial Stormwater	Gibson Yard	4302 Gibson Road	8/8/2018	9/17/2018
NER910376	No Exposure	Packaging Corporation of America	1002 Missouri Ave.	6/26/2018	10/2/2018
NER910301	Industrial Stormwater	LALA Branded Products	7122 J Street	8/28/2018	9/18/2018
NER910575	Industrial Stormwater	International Paper - Omaha Container Plant	7517 F Street	6/25/2018	8/2/2018
NER910203	No Exposure	Cedric Hartman, Inc	1414 Marcy Street	7/5/2018	7/24/2018
NER910642	No Exposure	Kosiski Auto Parts	5040 I Street	6/27/2018	8/2/2018
NER910037	Industrial Stormwater	YRC Freight - Omaha (381)	4480 S. 90th Street	7/10/2018	7/27/2018
NER910489	No Exposure	Omaha Service Center (Safety Clean)	13915 A Plaza	8/8/2018	8/28/2018
NER910035	No Exposure	Anderson Print	6935 North 97th Circle	6/28/2018	8/6/2018
NER910580	Industrial Stormwater	William H. Harvey Company	4334 South 67th Street	8/2/2018	9/28/2018
NER910162	Industrial Stormwater	Saia Motor Freight Line, LLC	4423 South 67th Street	7/17/2018	8/23/2018
NER910309	No Exposure	Alfie Packers, Inc.	8901 J Street, Suite 10	6/21/2018	7/13/2018
NER910767	Industrial Stormwater	Nationwide Transportation, Inc.	4601 S 70th Circle	6/19/2018	8/23/2018
NER910027	Industrial Stormwater	Watco Terminal and Port Services	6801 North 9th Street	7/31/2018	9/17/2018
NER910200	Industrial Stormwater	Westway Feed Products, LLC	1201 M Street	7/25/2018	8/13/2018

Program_ID	Permit Type	Facility Name	Address	Inspection date	Report Sent
NER910674	Industrial Stormwater	OPPD Jones St Power Station	4th and Marcy Street	6/15/2018	9/27/2018
NER910764	Industrial Stormwater	TCC Materials - Omaha	3208 Keystone Drive	8/23/2018	9/28/2018
NER910675	Industrial Stormwater	OPPD North Omaha Station	7475 Pershing Drive	6/15/2018	9/27/2018
NER910635	Industrial Stormwater	Deffenbaugh Industries	5902 North 16th Street	8/22/2018	9/27/2018
NER910328	Industrial Stormwater	Pink Grading Inc.	6333 South 60th Street	7/3/2018	7/24/2018
NER910700	Industrial Stormwater	Omaha Neon Sign	1014 North 17th St/1623 Izard St	7/10/2018	9/27/2018

This permit requirement is being met.

5. BMP 5: Ensure inspectors completing industrial stormwater inspections are competent.

Target Goals & Implementation Schedule: *On-Going All Years – Report inspection activities in the annual report.*

The City of Omaha Stormwater Program contracted with E&A Consulting Group (E&A) and Felsburg, Holt, and Ullevig (FHU) to perform inspections of industrial sites. Inspectors from these firms have extensive experience with industrial stormwater regulations and performing inspections. Firms contracted to perform industrial stormwater inspections on behalf of the City of Omaha must have demonstrated knowledge, skills, and experience. Both E&A and FHU have performed multiple, successful industrial stormwater inspections on behalf of the City of Omaha previously. Omaha Stormwater Program Environmental Inspectors review and edit as needed the reports by the firms prior to sending to the industry. Each Environmental Inspector is adequately trained on the industrial stormwater program prior to reviewing inspection reports or conducting an inspection.

This permit requirement is being met.

H. Storm Water Monitoring Plan

1. BMP 1: Dry Weather Screening.

Target Goals & Implementation Schedule: *On-Going All Years – Implement a dry-weather screening of priority outfalls for IDDE following screening and sampling plan. Keep a record of outfalls observed and a record of the field screen results. Follow strategy in SWMP program Component C- IDDE for outfalls showing presence of an illicit discharge. Update priority list based on observations.*

In 2018, the City of Omaha EQCD staff inspected all outfalls identified the previous year as priority outfalls or new outfalls from annexed S&IDs. Any outfall with an obvious or suspicious discharge was to be reported immediately to EQCD. No new outfalls were inspected based on the previous year's inspection noting an illicit discharge. There were 38 outfalls inspected due to annexation of 8 S&IDs. No suspicious discharges were found but 8 outfalls were characterized as potential (two physical characteristics observed) but had low severity index numbers and concluded not to be associated with illicit discharges. Outfall inspections were entered into the City of Omaha's CityWorks asset management system. In 2018, there were 85 existing priority outfalls and 38 new outfalls were screened, for a total of 123. The inspections were reviewed, and the outfall priority list was updated.

This permit requirement is being met.

2. BMP 2: Develop a wet weather BMP assessment monitoring plan for demonstration BMPs to facilitate future SWMP planning. Evaluate the effectiveness of the selected BMPs. BMP assessment may include flow-based monitoring or water quality sampling. Biological systems may include plant assessments and visual observations. Construct structural BMPs and implement non-structural BMPs to evaluate the effectiveness of their ability to address pollutants of concern. Include in the BMP assessment program in applicable

Target Goals & Implementation Schedule: *Year 1 – Revise the BMP assessment monitoring plan and submit to NDEQ for approval. Amend as necessary when new demonstration projects have been constructed. On-Going All Years – Implement monitoring plan in demonstration projects. Report the following in the annual report: (1) The location of the monitoring site, (2) the intensity and duration of the storm event monitored, (3) the time of sampling in comparison to the occurrence of the storm event and to the discharge op peak stormwater flows, and (4) the monitoring data and a summary of the findings.*

The City of Omaha Stormwater Program is updating their BMP Assessment Monitoring Plan and is on schedule to complete this in year 1.

In 2015, the City of Omaha contracted with Burns and McDonnell to develop a BMP Monitoring Plan to assess the performance of existing green infrastructure demonstration projects to further assess their benefits on water quantity and quality. BMP monitoring in 2018 with Burns and McDonnell included the following sites and the full report is included in Attachment H:

- Creighton Prep – rainfall using a rain gauge, inflow and outflow using area velocity sensors, and ponding depth using a pressure transducer in perforated riser
- Orchard Park – rain fall with a rain gauge, soil moisture content inside and outside of the bioretention system using soil moisture sensors, and ponding depth using a pressure transducer in a perforated riser

- University of Nebraska at Omaha Welcome Center – plant and overall performance using two webcams to record plant growth, ponding depth using a pressure transducer in a perforated riser pipe, and soil moisture and temperature using soil moisture and temperature sensors nested in five locations at the site
- Adams Park – ponding depth using pressure transducers in perforated riser pipe and inflow and outflow using area velocity sensors
- Albright Park – water quality grab samples during wet weather
- South Omaha Industrial Area (SOIA) Lift Station – water quality grab samples during wet weather
- Sewer Maintenance Facility – water quality using grab samples during wet weather

Additional monitoring occurred during 2018 to assess the performance of BMPs at additional demonstration project sites. Below are summaries of those assessments in 2018.

Saddlebrook Joint Use Facility
The construction of a green roof and a bioretention garden was completed in 2009 at the Saddlebrook Joint Use Facility. The bioretention garden receives runoff from part of the northwest parking area at the facility. Monitoring stations were installed at the green roof discharge point, traditional roof discharge point, bioretention garden discharge point and a point of discharge from a parking area without a BMP upstream. Flows from each of these areas were monitored in 2018 and no water quality sampling occurred in 2018.

Flow monitoring data remains consistent with previous years in showing reduced peak runoff discharge rates and total volume from the green roof when compared to the traditional roof. There were 37 rain events monitored in 2018. 36 events generated runoff from the traditional roof and only 22 events generated runoff from the green roof. The green roof had 13581.88 cubic feet (849,651 gallons) less stormwater runoff than the grey roof, a 64% reduction in volume. The average peak runoff rate across the green roof was an average of 76% less than the grey roof.

The bioretention system also proved to reduce total runoff and peak runoff rates in 2018. The bioretention system had 11,524.21 cubic feet (86207.08 gallons) less flow than the control over 14 rain events, a 37% decrease in total flow. Peak runoff rates on average were decreased through the bioretention system by an average of 83% compared to untreated parking lot runoff.

Monitoring will be performed at this site in 2019 with no change in what data is being collected. As data is collected, the City will continue to compare the performance of the traditional versus the green infrastructure features in terms of volume and peak flow reduction.

Sewer Maintenance
In 2018, the City of Omaha Stormwater Program contracted with USGS to monitor the Sewer Maintenance Facility, which has a bioretention system and permeable pavement parking area. Monitoring at the site characterized the water balance components of 166 stormwater events from 2015-18. On average, the bioretention cell redirected approximately 43-percent of the stormwater volume away from the storm sewer through infiltration and evaporative processes. This and other metrics will be considered locally when trying to identify ways to improve performance in other green infrastructure projects. Regionally, those metrics will be put in the context of other cities to evaluate how different soils and climatic conditions may influence the design and performance of otherwise similar green infrastructure projects.

This permit requirement is being met.

3. BMP 3: Utilize data collected by others to help assess the effectiveness of BMPs.

Target Goals & Implementation Schedule: *On-Going All Years – Gather data from others and include in the annual report with a summary of the findings.*

The City of Omaha again partnered with the University of Nebraska at Omaha (UNO) and Omaha Public Schools' Northwest High School in 2018 on a project titled *Evaluating Regional Rain Garden Environmental Conditions, Functional Attributes, and Aesthetics over Time*. The project came about as part of a service-learning grant UNO received to engage science teachers in Omaha Public Schools in the scientific method by doing real-life research projects. Steve Rodie, Professor, Biology and Environmental Studies, was the project lead, Rachael Burns, Horticulture teacher at Northwest High School in Omaha, was the researcher, Andy Szatko, Environmental Quality Control Technician II with the City of Omaha. Their reports has been included in Attachment H.

This permit requirement is being met.

I. Additional Permit Reporting Requirements

1. Status of MCMs and Associated BMPs

This report satisfies the annual reporting requirement and covers the calendar year from January 1, 2018 through December 31, 2018. The permit was issued April 1st, as a result April to December represents 9 months of permit year 1. The City of Omaha's Stormwater Program is currently on schedule to reach all year 1 goals.

The City of Omaha continues to implement each of the eight minimum control measures, maintain associated BMPs of the SWMP, and maintain compliance with the MS4 Permit. As part of year 1 efforts, additional strategies are in development and we anticipate these enhancing the successfulness of our efforts to fulfill the eight MCMs in 2019.

2. Proposed SWMP Changes and Revisions

The third Omaha Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) Permit (NE0133698/PCS 999428) was issued by the Nebraska Department of Environmental Quality (NDEQ) and became effective on April 1, 2018. There are no SWMP changes in 2018.

The City annexed the following unincorporated areas in 2018 and would now be considered part of the MS4 Permit coverage area.

AREA NAME	SID #	DESCRIPTION	POPULATION	SQ MILE	ACRES	ANNEXATION DATE
Bay Ridge/West Bay Woods 2 and Adjacent Area	463	184th Ave-185th Ave, Vinton	133	0.22	139.19	8/29/2018
Cherry Ridge	380	NW of 208th & Military	1,401	0.23	145.74	8/30/2018
Cinnamon Creek and Adjacent Area	392	SE 180 & "Q"	1,978	0.48	309.52	8/31/2018
Lake Cunningham Ridge	445	NW 79th & I-680	882	0.14	90.15	9/1/2018
Manchester Park and Adjacent Area	493	SW 168th & Locust St.	321	0.13	82.4	9/2/2018
Pacific Pointe Estates and Adjacent Area	498	SW 192nd & Pacific St.	101	0.06	39.59	9/3/2018
Pacific Woods and Adjacent Area	500	HWS Cleveland Blvd & Pacific	300	0.24	150.64	9/4/2018
Quail Hollow and Adjacent Area	437	165 & Q St. - S. side	390	0.13	80.58	9/5/2018
West Bay Woods and Adjacent Area	439	NW 180th & F St	897	0.22	143.33	9/6/2018
West Dodge Station	487	Old Lincoln Hwy and 192nd St	-	0.27	171.79	9/7/2018
West Village Pointe / Village	483	SE 180th W	45	0.21	135.64	9/8/2018

Cove		Dodge Rd.				
Westin Hills, Westin Hills West and Adjacent Area	415	SW 144th & Fort	2,323	0.50	317.04	9/9/2018

3. Additional Monitoring Data and Land Use

A land use map was created defining land use based on zoning for the City of Omaha; this has been included in Attachment D. Land use patterns were based on current zoning procedures/practices and used to map areas within the City Limits and within the Extra Territorial Jurisdiction (ETJ). Areas that are not defined with a zoning code, i.e. public roads, are not included in the values provided. Five classifications were used to document current land use patterns including Agricultural, Commercial, Industrial, Mixed-Use, and Residential areas. In 2016, some zoning codes were not classified into one of the five classifications due to uncertainty of how to classify them. Those areas were highlighted in gray on the map provided in the 2016 annual report. In 2017, many of these areas have been updated. There is approximately 204 mi^2 covered by the four different classifications, as shown in the table below.

Land Use by Square Mile

Land Use	**Omaha (mi^2)**	**ETJ (mi^2)**	**Total (mi^2)**	**Percent Cover (%)**
Agricultural	4.80	56.00	60.80	28.73%
Commercial	53.85	13.00	66.85	31.59%
Industrial	7.63	0.49	8.12	3.84%
Residential	52.86	23.00	75.86	35.84%
Total	119.14	92.49	211.63	

This permit requirement is on schedule to be met.

Zoning by Square Mile

Omaha Only		**Omaha and ETJ**	
Zone	**Sq Mi**	**Zone**	**Sq Mi**
AG	4.90	AG	60.74
AV	4.26	AV	4.32
CBD	0.86	CBD	0.86
CC	5.06	CC	5.33
CH	0.02	CH	0.02
DR	13.63	DR	33.47
DS	0.51	DS	0.51
GC	1.24	GC	1.29
GI	9.19	GI	10.16
GO	1.44	GO	1.46
HI	2.76	HI	2.76
LC	0.21	LC	0.21
LI	0.38	LI	0.44
LO	0.30	LO	0.30
MH	0.23	MH	0.44
MU	3.79	MU	5.02
NBD	0.22	NBD	0.22
R1	2.83	R1	3.89
R2	9.55	R2	10.61
R3	10.47	R3	11.23
R4	28.44	R4	37.47
R5	5.51	R5	6.45
R6	2.95	R6	3.69
R7	3.74	R7	3.89
R8	0.66	R8	0.66
RR	1.51	RR	1.74
Total	114.66		207.18

A literature review of pollutant loads by land use type was conducted in 2017. There were a wide range of values found for several stormwater pollutants including total nitrogen, total phosphorus, total suspended solids, and E. coli. Pollutant load values were reported as either pollutant export coefficients or event mean concentrations. Pollutant export coefficients represent the average total amount of a pollutant loaded into a system annually from a defined area (kg/ha/yr), whereas event mean concentrations estimate the mass of pollutant per unit of volume (mg/L) based on data generated from local stormwater monitoring. In order to calculate total pollutant loads from event mean concentrations knowledge of surface imperviousness for a given land use type and precipitation data for the area must be used. These literature values, while not specific to Omaha, provide a basic assessment of the range of pollutant loading concentrations within the Omaha area based on current land use patterns.

Pollutant Export Coefficients for total nitrogen and total phosphorus and total nitrogen and phosphorus load based on land use type area. The highest and lowest estimates are shown.

		Total Nitrogen *(kg/ha/yr)*		**Total Phosphorus *(kg/ha/yr)***		**Total Nitrogen Load *(kg/yr)***		**Total Phosphorus *Load (kg/yr)***	
	Area *(ha)*	Low	High	Low	High	Low	High	Low	High
Agricultural	1,243.20	2.10	79.60	0.26	18.60	2,610.71	98,958.34	323.23	23,123.43
Commercial	13,947.12	1.90	13.80	0.10	7.60	26,499.52	192,470.22	26,499.52	105,998.09
Industrial	1,977.25	1.90	14.00	0.40	4.10	3,756.77	27,681.44	3,756.77	8,106.71
Residential	13,690.45	5.00	7.50	0.77	2.20	68,452.23	102,678.35	68,452.23	30,118.98

Event Mean Concentrations for total nitrogen, total phosphorus, and total suspended solids with the highest and lowest estimates shown.

	Total Nitrogen *(mg/L)*		**Total Phosphorus (*mg/L)***		**Total Suspended Solids (*mg/L)***	
	Low	**High**	**Low**	**High**	**Low**	**High**
Agricultural	0.23	41.49	0.08	2.29	19	582
Commercial	0.96	1.8	0.18	0.28	49.6	284
Industrial	0.86	2.9	0.27	0.36	92.2	231
Residential	1.5	5.92	0.38	75	73	299

4. Evaluation Assessment

Environmental Indicators

The City of Omaha continues its efforts to promote and implement green infrastructure practices. BMP assessment monitoring remains a cornerstone of our stormwater program. We continue to update BMP assessment monitoring to better understand how BMPs can be used to improve water quality in Omaha. Monitoring in 2018 again indicated that green infrastructure effectively reduces peak flows and total volume of stormwater and improves water quality. In 2019, efforts will include coordination with other organizations to share data that can be used for further comparison and reference.

Administrative Indicators – by MCM

Public Education & Outreach: As in past years, the Omaha Stormwater Program continues to successfully distribute education materials and host outreach events that raise stormwater awareness across various audience demographics. During this permit year, the program had a decline in social media presence; as a result, intentional efforts will be made during 2019 to increase our presence on social media avenues including the Omaha Stormwater Facebook page.

Public Participation & Involvement: As this report reflects only 9 months of our Year 1 activities, the Stormwater Program intends to increase exposure of participation opportunities for the public on social media platforms and the OmahaStormwater.org website during the end of the Year 1 period and going forth in Year 2.

Illicit Discharge Detection and Elimination: In 2018, the Program's efforts included further use of ArcGIS for tracking of outfalls. Looking forward to 2019, continued focus will be placed on improving the tracking system for more effective identification of potential sources and ultimately, the prevention/correction of illicit discharge upon discovery.

Construction: The Program continues to excel in reducing construction site runoff and erosion. The emphasis on compliance and education has provided positive results for public and private construction activity. By providing training to municipal staff, mechanisms for complaints, and education to developers and contractors, the Omaha Stormwater Program continues to promote construction site compliance. Public input and transparency prompts the Program to best serve the needs of the regulated community, the public, and the City.

Post Construction: Guidance for developers is improving in order to more clearly and effectively convey expectations for Post Construction Stormwater Management Plans. The Stormwater program provides an accessible and straightforward process for developers to submit plans for review. Education of municipal staff as well as other contributing parties has continued to expand to bolster incorporation of post-construction BMPs into new development and redevelopment projects, proper construction per specifications, and to ultimately operate effectively.

Pollution Prevention & Good Housekeeping: Ensuring the Stormwater Program is in compliance with its own regulations is crucial for maintaining integrity and achieving water quality goals. The City's facilities continue to be reviewed for potential pollutant exposure to stormwater, to identify vulnerabilities, and further educational needs. The Program continues to enhance training programs for City employees to provide more applicable information to more individuals. City-owned basins and green infrastructure have regular inspections and maintenance to ensure they are working to their highest potential.

Industry: We are coordinating our efforts with NDEQ to establish a list of industries in Omaha that is as up-to-date and accurate as possible. Permitting efforts have been well received by industries and the community. The Program will continue to improve education and outreach to industries in order improve water quality and industry compliance.

BMP Assessment Monitoring: Omaha Stormwater Program continues to update its BMP monitoring plan to increase knowledge of stormwater reduction methods. The locations and parameters for monitoring evolve but consistently support that BMPs are effective at improving water quality and reducing stormwater flows. Efforts are being made to partner with more groups to reference and compare data. This data helps the Program make recommendations to residents and developers for types and styles of BMPs that will be most effective under

specific conditions. Because of this monitoring the Omaha Stormwater Program can confidently say that recommendations are having a positive impact on environmental quality.

5. Expenditures for the Storm Water Program

At the time of preparation of this annual report the City Finance Department had not finalized the accounting for 2018 expenditures, so the following figures are subject to minor revisions. A copy of the complete City of Omaha budget with past expenditures can be found at http://finance.cityofomaha.org. Stormwater management activities are embedded in variety of City programs and work groups. These activities are funded by a variety of sources including the General Fund, Sewer Revenue Funds, Stormwater Administrative Fee Fund, Street and Highway Allocations, and the Street Maintenance Fund.

As such, it is difficult to accurately compile a comprehensive financial summary of every City activity that may have impacts on stormwater. For example, the City maintains litter cans in business districts throughout the City and has a contractor scheduled to empty them on a regular basis. This activity constitutes a stormwater source control or pollution prevention program. These costs are expended from the Solid Waste budget and are not included in the figures below.

1. Administrative

The Quality Control Division of the Omaha Public Works Department has responsibility for coordinating City activities to implement the SWMP and insure that the City meets its MS4 and CSO permit requirements. The estimated MS4 administrative expenditures for 2018 and appropriated 2019 budget amounts are listed below.

Administrative	2018 Expenditures	2019 Planned
Flood Control Administration	$206,877	$213,500
Baseline/BMP Monitoring[1]	$492,166	$492,166
Sediment/Erosion Control Program	$492,166	$492,166
Industrial Program[2]	$98,433	$98,433
Public Education/Outreach	$360,922	$360,922
MS4 Planning	$196,866	$196,866
Annual Administrative Total	$1,847,430	$1,854,053

[1] Includes outfall monitoring, outfall inspections, and illicit discharge investigations

[2] Includes industrial inspections and permitting

2. Operation and Maintenance

The major MS4-related Operation and Maintenance 2018 expenditures and budgeted amounts for 2018 are listed below. These amounts were estimated by evaluating the overall activity costs in the City budget organizations and assigning a percentage for the costs attributable to storm water related activities. There are undoubtedly additional City funded expenditures that impact storm water management, and the following is a conservative estimate of total costs for the City.

Operation and Maintenance	2018 Expenditures	2019 Budgeted
Engineering Design	$553,112	$772,547
Pavement Maintenance	$577,335	$1,689,800
Creek/Open Channel Maintenance	$896,452	$664,021
Street /Right of Way Cleaning	$3,079,654	$3,358,828
OWP (debris removal)	$10,463	$19,040
Residential Street Rehabilitation	$627,103	$588,377
Bridge Maintenance and Rehab	$93,757	$72,500
Sewer Maintenance	$701,245	$1,131,750
Annual O&M Total	$6,539,120	$8,296,863

ATTACHMENT A

City of Omaha - Storm Water Management Plan

Measurable goals listed in the Storm Water Management Plan are target goals on which progress will be reported on in the annual report.

A. Public Education and Outreach		
BMP #	**SWMP Element Description**	**Target Goals & Implementation Schedule**
1, 3, & 4.	Develop a plan for outreach that defines the goals, objectives, target audience and distribution process of materials for the public education and outreach program.	**Year 1 –** Develop a 5-year education and outreach plan. Submit the plan to NDEQ with the Annual Report. **Years 2-5** – Review and update the plan each permit year and include the revised plan in the Annual Report.
2.	Maintain and update appropriate messages for targeted residential, construction, and commercial issues.	**Year 1 –** Inventory current outreach materials in each of these targeted areas and develop new materials as needed. **Years 2-5 –** Provide copies of new outreach materials in the annual report.

B. Public Participation and Involvement		
BMP #	**SWMP Element Description**	**Target Goals & Implementation Schedule**
1.	Provide opportunities for citizens to comment on new rules, ordinances, and regulations regarding the MS4.	**On-Going All Years –** Post on the City Stormwater Website proposed changes to rules, ordinances, and regulations. Provide information in the annual report on approved changes and input received from the public.
2.	Create opportunities for citizens to participate in the implementation of stormwater controls.	**On-Going All Years –** Post on the City Stormwater Website opportunities for public involvement in stormwater control related activities.
3.	Provide access to information about the City's SWMP.	**On-Going All Years –** Maintain current City SWMP and MS4 annual reports on the Omaha Stormwater website.

C. **Illicit Discharge Detection and Elimination**			
BMP #		**SWMP Element Description**	**Target Goals & Implementation Schedule**
1.	a	Maintain a compliance plan or mechanism to follow up on illicit discharges.	**On-Going All Years** – Maintain the compliance procedures per the permit requirements.
1.	b	Maintain a map showing all known MS4 outfalls and the location of all state-designated waters receiving direct discharges from MS4 outfalls.	**On-Going All Years** – Maintain a continually updated storm sewer system map per the permit requirements.
1.	c	Conduct field screening activities per the permit requirements (set forth in 40 CFR Part 122.26(d)(1)(iv)(D))specifically geared to local TMDL pollutants of concern such as *E. Coli* and to eliminate illicit discharges,	**Year 1 –** Develop dry weather screening, sampling, and quality control plan to address pollutants of concern. Conduct screening under current plan during Year 1. **On-Going All Years –** Annually conduct dry weather monitoring according to screening and sampling plan.
1.	d	Implement procedures to investigate and trace sources of identified illicit discharges to the MS4.	**On-Going All Years** – Document investigations include date observed, result of investigation(s) and date closed.
1.	e	Implement procedures to remove illicit discharges to the MS4. Document all interactions with potentially responsible parties.	**On-Going All Years** – Use the code enforcement procedures to eliminate unauthorized non-stormwater discharges identified during an investigation
1.	f	Identify and address allowable non-stormwater discharges determined to be significant contributors to pollutants. Identify any additional non-stormwater discharges that will not be addressed as illicit discharges.	**On-Going All Years –** Report on any local controls or conditions placed upon exempt non-stormwater discharges and additional identified exempted non-stormwater discharges.
2 & 3.		Coordinate with adjacent permitted MS4s to report illicit discharges to the appropriate authority having jurisdiction and respond to reports from other MS4s.	**Year 1 –** Develop procedures for coordination with adjacent permitted MS4's. **On-Going All Years –** Include in the annual report any known illicit discharge reports to and from adjacent MS4s.
4.		Maintain written procedures for the IDDE component of the MS4 permit.	**On-Going All Years –** Make available upon request the standard operating procedures developed under this program component.
5.		Receive reports and complaints, internally and from the public, of illicit discharges and illegal dumping into the MS4. Respond to and investigate complaints about spills, dumping, or disposal of materials other than stormwater to the MS4.	**On-Going All Years** – Coordinate with others in the City to resolve complaints. Develop a system to generate reports and track the number of calls per year in regard to spills, dumping or improper disposal of material to the MS4. Include a count of complaints received and investigations completed in the annual report.
6.		Develop, implement and maintain a training program for municipal field staff with respect to IDDE.	**Year 1 –** Develop a strategy which identifies field staff and appropriate levels of training. **Years 2 - 5** – Provide a count of employees which have received training in the annual report.

D. Construction Site Runoff Control		
BMP #	**SWMP Element Description**	**Target Goals & Implementation Schedule**
1.	Maintain the established program requiring operators of public or private construction activities to comply with local erosion and sediment control requirements.	**On-Going All Years –** Include any updates to City Code or Permit requirements in the annual report.
2.	Maintain a compliance plan or mechanism to follow up on construction site non-compliance.	**On-Going All Years** – Maintain the compliance procedures per the permit requirements.
3.	Review grading permit applications and maintain a continually updated inventory of all private and public construction sites.	**On-Going All Years** – Include in the annual report the number and type of grading permits reviewed.
4.	Maintain the electronic records for inspection of construction sites and enforcement of erosion and sediment control measures.	**Year 1 –** Develop a strategy for site inspections by municipal staff, and include in the annual report. **On-Going All Years** – Inspect construction sites on a regular basis and on a complaint basis. Track the number of sites inspected annually in a database. Initiate enforcement proceedings as appropriate to address violations. Include a summary of inspections completed and enforcement actions taken in the annual report.
5.	Provide training for municipal staff with respect to their assigned duties as it relates to sediment and erosion control from construction activity. One formal training course for inspection staff during their employment with the City and internal training on an as needed basis to maintain consistent reporting among all inspectors.	**On-Going All Years –** Include in the annual report the number of staff and their sediment and erosion control training completed.
6.	Communicate with the regulated community and other groups affected by the Construction Site Runoff program and provide a mechanism to receive complaints from the public.	**On-Going All Years** – Conduct workshops for developers, builders, site designers, contractors, and/or City staff as determined necessary (i.e., a rule or regulation is changed). Track reports from the public regarding construction sites. Include the number of reports received in the annual report and the permittees response.

E. Post Construction Runoff Control		
BMP #	**SWMP Element Description**	**Measurable Commitments & Implementation Schedule**
1.	Continue to implement the Post Construction Program as stipulated in the OMC. Periodically update guidance material and develop divergent standards for difficult sites such as linear projects. Update as needed the Omaha Regional Stormwater Design Manual (ORSDM).	**Year 1 –** Develop divergent standards for guidance document and update guidance as needed. Submit standards with the annual report. **On-going All Years –** Revise as necessary. Include a summary of revisions in the annual report.
2.	Review and update, if needed, the standards outlined in the OMC and ORSDM for consistency with required performance standards as they relate to post-construction stormwater management plans.	**On-going All Years –** Report on any updates to the OMC or ORSDM.
3.	Maintain an online submittal and review process for site plans, easement and maintenance agreements, as built drawings, deed recordings and drainage studies.	**On-going All Years –** Report number of PCSMP projects and the status of their progress in the annual report.
4.	Develop SOP's for responding to complaints regarding Post Construction BMPs and a strategy for verifying BMPs are being installed & maintained in perpetuity.	**Year 1 –** Submit SOP's with the annual report. **On-going All Years –** Report on any complaints and/or BMP's which have been certified as complete.
5.	Maintain a database that stores information on approved PCSMPs.	**On-going All Years –** Provide an inventory of certified stormwater control measures installed as part of the PCSMP requirements. Include a count of BMP types as well as any known changes to BMPs in the annual report.
6.	Inspect sites that are certified by the engineer of record and all sites identified as deficient on a complaint basis. Develop a protocol to bring sites in to compliance.	**Year 1 –** Develop protocol for compliance assistance, and inspection strategy **On-going All Years –** Document and maintain inspection records of the certified PCSMP projects as identified in the strategy developed. Document any enforcement actions taken. Summarize activities in annual report.

F. Pollution Prevention and Good Housekeeping		
BMP #	**SWMP Element Description**	**Target Goals & Implementation Schedule**
1.	Maintain an inventory and map of municipal facilities. Review annually and update if needed.	**On-Going All Years** – Maintain an inventory and map of all municipal facilities.
2.	Conduct assessments of municipal maintenance facilities and review their municipal runoff control plans as applicable. Revise plans as needed if facilities expand or reduce activities and implement recommendations based on annual inspections.	**Year 1 –** Develop a strategy to assess municipal facilities and prioritize them based upon a defined set of criteria, include strategy in the annual report. **Years 2 - 5 –** Track the number of assessments for municipal facilities based upon the strategy developed in year 1. Include the number of assessments completed, a description of the assessment procedure and any changes in facilities ranking in the annual report.
3.	Continue to implement Omaha's Good Housekeeping Program for municipal facilities that addresses "high-priority" facilities (hot spot score of 20-30 out of 30) and site specific SOPs.	**On-Going All Years** – Annually report new, removed, or significantly updated municipal facilities
4.	Implement practices for maintaining the storm sewer system that includes catch basin maintenance, open channels and other drainage structures, street sweeping, and structural stormwater controls. All maintenance procedures are to be performed such that waste water and waste materials do not enter the MS4.	**Year 1 –** Provide a description of the maintenance programs in the annual report. **On-Going All Years –** Annually report on Sewer Maintenance activities related to maintaining the storm sewer system and changes to any of the maintenance practices.
5.	Provide training for municipal employees in pollution prevention and good housekeeping.	**Year 1 –** Develop a strategy for municipal employee training in pollution prevention and good housekeeping, include strategy in annual report. **On-Going All Years** – Conduct training events for municipal staff include number of employees trained, based on strategy developed in year 1, in annual report.
6.	Provide educational material to contractors hired to perform maintenance activities on the MS4.	**Year 1 –** Develop materials to provide to contractors and include in the annual report**.** **Years 2 - 5 –** Include in the annual report any new materials or updates to existing materials.

G. Industrial and Related Facilities		
BMP #	**SWMP Element Description**	**Target Goals & Implementation Schedule**
1.	Maintain a program that identifies Industries within the MS4 area which fall into sectors identified in the ISW- NPDES permit.	**Year 1 –** Develop strategy that will identify industries and their compliance with NPDES permits. **On-going All Years –** Review and update strategy developed in year on and report on any changes in the annual report.
2.	Request a list of permitted facilities and the NOI from NDEQ in January of each permit year.	**On-going All Years –** Maintain a database to track NPDES permitted facilities.
3.	Inform industries about the NPDES ISW Permit and notify the state when industries are not in compliance with the state regulations.	**On-going All Years –** Develop industry specific publications regarding the NPDES regulations and distribute to inspected facilities.
4.	Inspect NPDES permitted industries from a list provided by NDEQ in January of each year. Maintain a tracking system for inspections and SWPPP reviews. Review the SWPPP or NEC prior to completing an inspection.	**On-going All Years –** Inspect 20% of the facilities on the list provided by NDEQ each year so that all industries are inspected once in the permit cycle.
5.	Ensure inspectors completing industrial stormwater inspections are competent.	**On-going All Years –** Report inspection activities in the annual report.

H. Monitoring Program		
BMP #	**SWMP Element Description**	**Measurable Commitments & Implementation Schedule**
1.	Dry Weather Screening	**On-going All Years –** Implement a dry weather screening of priority outfalls for IDDE following screening and sampling plan. Keep a record of outfalls observed and a record of the field screening results. Follow strategy in SWMP Program Component C - IDDE for outfalls showing presence of an illicit discharge. Update priority list based on observations.
2.	Develop a wet weather BMP assessment monitoring plan for demonstration BMPs to facilitate future SWMP planning. Evaluate the effectiveness of the selected BMPs. BMP assessment may include flow based monitoring, or water quality sampling. Biological systems may include plant assessments and visual observations. Construct structural BMPs and implement non-structural BMPs to evaluate the effectiveness of their ability to address pollutants of concern. Include in the BMP assessment program if appropriate.	**Year 1 –** Revise the BMP assessment monitoring plan and submit to NDEQ for approval. Amend as necessary when new demonstration projects have been constructed. **On-going All Years –** Implement monitoring plan in demonstration projects. Report findings in the Annual Report. The following information shall be included in the Annual Activity Report: 1) the location of the monitoring site 2) the intensity and duration of the storm event monitored; 3) the timing of sampling in comparison to the occurrence of the storm event and to the discharge of peak storm water flows; 4) the monitoring data; and a summary of the findings.
3.	Utilize data collected by others to help assess the effectiveness of BMPs.	**On-going All Years** -– Gather data from others and include in the annual report with a summary of findings.

ATTACHMENT B

Omaha Environmental Enforcement Manual

Enforcement Goals, Delegation:

The City's environmental enforcement goals are to:

- ☐ Reduce the risk to human health and the environment
- ☐ Correct existing violations and deter future violations
- ☐ Prevent or have cleaned up pollution and minimize waste
- ☐ Preserve the integrity of the regulatory structure

To accomplish this the City will assure a high level of compliance, and strive for timely discovery and correction of significant compliance problems. This manual was written in order to maximize resources and ensure the effective and consistent enforcement of the various regulations.

It is very important in enforcement to understand that every enforcement action the City takes must have supportive power set out in the Federal State and/or City statues. To carry out the policies of the administrative branch of Government the Legislature has granted numerous powers and responsibilities to the City.

The Nebraska Statue # 84-901 et seq… governs various aspects of administrative Environmental Law, such as the adjudication of cases and judicial review of the City actions. *Agencies in their decision-making and enforcement cannot be arbitrary or capricious or disregard the law that applies to their actions.*

The City can exercise its enforcement powers in administrative, civil and / or criminal proceedings, or can refer cases to the NDEQ or EPA. The exercise of this authority is discretionary. The City also has informal and indirect enforcement options available. These include seeking voluntary compliance through warning communications (Faxes, e-mails, etc…) and compliance assistance to provide a violator an opportunity to return to compliance. It is important to keep in mind that the City's statues and regulations are part of a larger system of environmental law that includes federal and state court decisions, policies, and guidance. The

City has the power to enact and enforce laws and regulations that meet minimum federal criteria. In many cases the City has become the primary permitting and enforcement authority.

The EPA and NDEQ negotiate with the City through permits, work-plans and delegation Memorandums on how the agencies will work together. The EPA and NDEQ retain the right to take enforcement actions independently of the City, but defer to the City in most cases if the City's action has been timely and appropriate.

Process and Mechanisms

The primary goal of enforcement is compliance. A strong enforcement program establishes credibility that when violations are identified, a return to compliance is achieved and, if appropriate, penalties are obtained. The enforcement strategy and priorities developed by the City are implemented through regular inspections and complaint investigation activities. The enforcement program strives for compliance, prosecuting violators in as systematic and uniform manner as possible, while retaining enough flexibility to make adjustments based on the particular case.

The various program managers make the final decisions on the issuance of administrative orders, referrals to the Law Department, and settlement. The City staff in recommending enforcement action should consider the same factors that effect the managers' ultimate decision.

These considerations require the exercise of professional judgment and discretion in determining the most appropriate response. Some of the points to be considered during the review are:

- ☐ The severity of the violation in terms of its environmental impact; the degree of variance from the standards; the impact of the violation upon the integrity of the program under consideration.
- ☐ The enforcement history of the entity involved in terms of past violations and demonstration of good faith.
- ☐ Whether the violation can be corrected through improved operation and maintenance and, if so, will correction be lengthy? Has the problem already been corrected?
- ☐ Consideration of "Fairness and Equity." Is the requirement reasonable? Was it imposed with complete information? Is the City treating facilities with similar violations in the same

manner? Have events occurred beyond the control of the violator, which have resulted in the violation?

Program Priorities

Violations are classified in terms of their importance to the regulatory schemes and whether pollution is likely to result. Other factual considerations, such as whether the violations are chronic, the violator is cooperative or recalcitrant, or the extent of the deviation must be evaluated on a case-by-case basis.

Prompt and timely communication is the key to an effective enforcement program. Timeliness equates to importance in the eyes of the violator, regulatory community, public, and courts. Prompt communication ensures that evidence is gathered and presented while fresh and improves agency credibility.

Situations involving an emergency or imminent and substantial endangerment to public health and welfare or the environment should be given highest priority and the enforcement accelerated.

Discovery of violations

The City discovers violations in a variety of ways, including but not limited to, report reviews, compliance inspections, complaint investigations, and referrals from other agencies. Once a violation has been determined, they should be documented in an inspection report or memorandum as soon as possible, and filed in the company or complaint file.

Inspections:

Typically most site inspections occur as a result of routine, program-specific compliance inspections. When the City receives a complaint of a possible violation, the City staff should

document all of the information on a complaint form. The name of the complainant is confidential, but may be disclosed in an enforcement proceeding or if compelled by a court.

Entry / Access

An inspector, upon arriving at a facility, source, or site should attempt to locate the owner, operator, or agent in charge, and identify him or herself, show his or her credentials, and explain the reason for the inspection. Nebraska Statute authorizes the inspector "to enter and inspect, during reasonable hours, any building or place, except a building designed for and used exclusively for a private residence." Statute also allows a representative of the Director to enter and inspect any contaminant source with the consent of the person or persons in control.

An inspector may sign a login sheet, but cannot sign a sheet, which purports to hold the source harmless in the event of injury to the inspector regardless of the facility's negligence. It is the facility's right to refuse entry or access to records for that or other reasons, but if this should occur the inspector should inform the source that that is a violation, and leave the facility. The inspector should contact their supervisor. The supervisor should contact the Law Department to obtain an inspection and search warrant. Nothing prohibits an inspector from viewing the property from a location where the public has access, such as a roadway or adjacent property, with permission of the owner.

Evidence;

As a general rule, photographs should begin with the general area and then move in on the area that portrays the violation itself. At hearing or trial, photographs are most often used to illustrate the inspector's or another's testimony. Photographs are usually admissible as a form of non-verbal testimony. The photograph should be a good, fair, and accurate depiction of the object or scene at the relevant time. If videotape is used, only the voice of the person taping the video should be recorded.

Field Notes/sketches/diagrams

The field log should contain only relevant, objective observations and remarks. The major benefit to a field log is that it may be used latter in court or administrative hearing to "refresh" the inspector's memory of events. However, the decision to retain or discard field log notes must be consistent within the program.

When asking people information about a matter under investigation or in taking written statements, the inspector should focus on the basic questions of who, what, where, when, why, and how. If a person appears to have done an illegal act under the direction or order of another person, the inspector should find out who gave the order or direction. Inspectors should avoid intimidating people since a less confrontational approach usually elicits more information.

The inspector should also be aware of the records or documents that are required to be filed with the Department, such as weekly erosion control reports, semi annual air compliance reports, emission inventories, discharge monitoring reports, biennial hazardous waste reports and Title III reports. These documents may provide support for a determination as to the extent of harm that may result from a violation.

Samples

When samples are collected, the inspector should give a receipt to the facility representative, describing the sample(s) obtained. The sample shall be collected in a proper container, labeled with time, date, facility, sample collector, point of collection, type of sample, etc… The sample collector shall maintain a chain of custody form on the sample, which indicates when and to whom a sample is transferred. There must be no "broken link" in the chain of custody where the sample may be unknowingly tampered with. Once the results of the samples are reviewed, a copy of the results should be sent to the facility representative, unless otherwise directed by the Law Department.

Inspection Reports.

The central purpose of an inspection report is to clearly, accurately, and objectively communicate the factual information gathered during the inspection to the reader. It should be written as if the reader had no knowledge of the operation, or the facts outside of the report. The inspector should avoid any opinions, erroneous conclusions, inferences, or interpretations in the report. A good inspection report strengthens the credibility of the inspector as a witness.

Inspection reports should be written as soon as possible after the inspection, and filed. This helps to assure that the facts are recorded accurately while the events are fresh in the inspectors mind. An inspection report must make clear what actions are required of the facility, the inspector, or their supervisor.

After the report is written, a letter should be sent to the facility representative with a copy of the inspection. This is a courtesy, and in keeps them clearly informed of their compliance status, and if non-compliance was found during the inspection, it is a clear record of the violation and what actions, or timeframes where established to bring the facility back into compliance.

Enforcement:

The "Date of Discovery" is an important date to highlight with the report, this date establishes the statutory date that the Law Department has to bring legal action, or the action is barred.
During pending enforcement action, all discussions with the violator should, if possible, be coordinated first through the Law Department, unless otherwise instructed by the attorney.
The inspector or their supervisor should prepare any "Letter of Warning". The program manager should prepare and sign "Notices of Violation". For civil penalty actions or actions for injunctive relief, the manager will prepare an initial contact letter, that may be signed by the attorney, to send to the violator. This letter acknowledges to the source that the matter has been referred to the Law Department with the recommendation that enforcement action be taken. It will identify the violations or reference the LOW & NOV previously sent. It will outline the civil penalties, or injunctive relief deemed appropriate by the agency to settle the matter without litigation.

Settlement agreements are considered to be confidential, and any questions on an ongoing enforcement should be referred to the Law Department.

Penalty Policy:

The assessment of penalties for violations of environmental statutes, regulations, and permits provides incentives to comply with these requirements and services as a deterrent to further violations. The City's policy in seeking penalties is to ensure that penalties are:

1. Assessed in a fair, consistent, and equitable manner.
2. Appropriate to the circumstances of the violation
3. Sufficient to remove any economic benefit or other financial incentive to non-compliance
4. Sufficient in severity to deter further non-compliance by the violator and others similarly situated
5. Resolve any outstanding environmental problems quickly.

Penalty Compliance Workbooks:

There are EPA, NDEQ guidance on assessment of the size of a penalty. These workbooks should be used as a general guide in assessing a penalty. The factors used in evaluation the penalty are:

1. Statutory Factors

- ☐ Degree and extent of violation
  - Release or potential release
  - Nature of violation
- ☐ Size of the operation
- ☐ Duration of the violation
- ☐ Economic Benefit

Mitigating Factors

- ☐ Response measures taken by the violator

- ☐ Compliance History
- ☐ Ability to pay

Injunctive relief

- ☐ Fish Kill
- ☐ Wastewater Treatment cost
- ☐ Sewer line replacement

Enforcement Mechanisms.

It is important to provide the violator with the opportunity to voluntarily come into compliance prior to referring a violation to the Law Department for enforcement. The purposes of the various stages of notices are to document the violations that have been observed and alert the violator to the consequences for failing to comply.

Voluntary Compliance

The City's first course of action is to pursue correction of the violation through voluntary compliance, unless an emergency exists. Documentation of this steep is essential. This is typically done less formally, through Faxes, or e-mails. The violation should be clearly outlined, and the timeline for submitting a voluntary compliance schedule clearly stated, typically not more than 10 working days. Some cases will warrant enforcement action regardless of whether the violator voluntarily returns to compliance. The City can make the decision to forgo voluntary compliance efforts.

Letter of Warning

If voluntary compliance is not successful, or the violator has a history of non-compliance on the same issue, the City should send a "Letter of Warning". This letter should identify the specific violation(s), with citations, such as 40 CFR 61,145(b)(i), that has occurred and, when necessary, the required action to be taken to correct the violation. The "Letter of Warning" should require the violator to submit a written response with a compliance schedule within a specific number of

days, generally not more than thirty (30) days. The letter should state that failure to respond, or continued violation will result in referral to the Law Department with the recommendation of enforcement action (fine). Attach a copy of the specific regulation violated to this LOW. These LOW are always sent by certified mail, establishing the date of receipt of the information.
"Notice of Violation"

A "Notice of Violation" is a legal document that may be issued by the Program Manager whenever he or she has reason to believe that a violation of the City laws, regulations, or permit requirements has occurred. The "NOV" is a written complaint that specifies:

1) The provisions of the law, regulations, or permit alleged to be violated.
2) The facts alleged to constitute the violation thereof, and
3) The corrective action to be taken within a reasonable time necessary to achieve compliance.

The City does not have the authority to impose penalties in a "NOV". Therefore, a "NOV" is the appropriate vehicle to impose compliance schedules for improved operation and maintenance, capital improvements, installation of pollution control equipment, remedial actions, or any other actions necessary to achieve compliance.

A "NOV" can include a penalty calculation, which if agreed to and paid by the alleged violator through a voluntary consent order, would be acceptable in lieu of the City seeking judicial action. Advantages to accepting a "NOV" settlement over a judicial action are that a "NOV" is usually faster and therefore requires fewer resources. It also allows the Department more control of the conduct and progress of the action, rather than relying on Judicial Decisions.

Voluntary Consent Order:

These are voluntary, negotiated, written legal documents between the City and the violator that regulate any matter within the City's jurisdiction. They are signed by both the Director, or his representative, and a representative of the violator and are equally binding on both. They are frequently used when a violator agrees to come into compliance and is willing to make a written

commitment in good faith. These agreements may be negotiated before a NOV is issued, or as a result of a NOV.

If a compliance provision in a Voluntary Consent Order, agreement or stipulation is missed, unless otherwise agreed, this is a violation of a final order of the Director and the matter may be referred to the Law Department with a recommendation for further action.

Permit Denial, Revocation or Modification

If a chronic violation occurs at a site, a permit may need to be denied, revoked, or modified. Nebraska Statute provides that any person who is denied a permit by the director or who has one revoked or modified shall have the opportunity for an administrative hearing. The Public Works Director usually chairs all Administrative Hearings. The request for a hearing must be filed within thirty days of the permit action. After the hearing the director shall make his decision known. The permit holder may appeal the director's final decision in court.

Civil Action

If the City has exhausted all administrative alternatives, it may seek to impose civil penalties for a violation, the director may refer the matter to the Law Department for prosecution. In order for the Law Department to determine if there is sufficient legal merit to justify a civil or criminal proceeding, the program managers must develop a Litigation Report that should include basic factual information about the violation(s) and the violator(s), a description and analysis of the legal elements necessary to prove the statutory, regulatory, order or permit violations, the documentation on the potential penalties to which the violator may be subject, injunctive relief to which the City is entitled, and any potential weakness in the case or affirmative defenses and any suggested resolution of the matter.

In practice the City and the defendant in a civil action may negotiate a settlement of the matter. Typically, this settlement is memorialized in a consent decree that is filed with the court. A

consent decree may also include compliance requirements in addition to payment of civil penalties. Violation of a consent decree may be pursued in court.

Criminal Cases;

State law establishes criminal liability for many of the same violations subject to civil penalties, if they are committed "knowingly and willingly". In order to prevail in a criminal action, the City must prove each element of the case "beyond a reasonable doubt", which is a higher standard of proof than a civil action. Evidence gathering in a criminal case is more restrictive, and the Police Department or State Patrol should provide assistance with witness investigation.

City of Omaha
CIVIL PENALTY POLICY
Copied after:
EPA's CLEAN WATER ACT Civil Penalty Policy

Before the filing of the Notice of Violation (NOV), the City will use the following guidelines to determine the minimum amount the City will accept in settlement for counts based on violations of the erosion or dust regulations. This amount, along with the appropriate worksheet and a supporting rationale, should be included in the enforcement-confidential portion of the case file. After a complaint is filed, as the City receives more relevant information regarding liability and penalty issues, the City should adjust its settlement figure accordingly, documenting the rationale for the changes.

The bottom-line figure resulting from application of this civil penalty settlement policy and the specific calculation that led to it are not public. Each is privileged, enforcement-confidential information. It is work product developed for negotiation purposes and should not be shared with administrative judges, respondents or defendants, or the public.

This policy itself, however, is public and not confidential. In calculating the bottom-line settlement figure, the City should assume that all the allegations in the complaint will be successfully proven, except to the extent this policy specifically allows for the incorporation of litigation considerations into the penalty calculation. The subjective aspects of the various penalty factors should be applied conservatively in determining the settlement bottom-line because that figure represents the minimum the Agency will accept in settlement, which may be less than the penalty amount that the City considers otherwise ideally suited to the violation. The City may, of course, republish this policy to clarify the newly adjusted settlement amounts.

- The seriousness of the violation or violations;
- The degree of culpability involved;
- The nature, extent, and degree of success of any efforts of the violator to minimize or mitigate the effects of the discharge;
- Any history of prior violations.

STEP 1: SERIOUSNESS

The seriousness of a violation depends, in part, on the risk posed to the environment and the public as a result of the violation. Risk can encompass the coverage area of the violation, the likelihood of a spill, the sensitivity of the environment, and the duration of the violation. The coverage area of the violation, which also contributes to the seriousness of the violation, depends on the erodible area covered, the existence and adequacy of sediment containment, the degree and nature of the violations of relevant requirements, and the duration of the violation. The sensitivity of the environment can be characterized by considering the potential environment impact from a worst-case discharge at the site.

Step 1.a: Apply matrix. Determine an initial figure from the following table. Within each range, the City should exercise discretion, considering capacity and extent of noncompliance only, since other considerations are incorporated in later steps.

Extent of Noncompliance	Less than 1 acre	1 acre to 5 acres	5 acres to 10 acres	More than 10 acres
Minor	$50 to 100	$75 to $175	$125 to $250	$225 to $350
Moderate	$110 to $175	$175 to $275	$250 to $375	$350 to $450
Major	$175 to $225	$275 to $325	$375 to $450	$450 to $500

Use the following criteria to determine the extent of noncompliance:
Minor Noncompliance. Cumulatively, the violations have only a minor impact on the ability of the respondent to prevent or respond to worst-case erosion or dust violation through the development and implementation of a compliance plan.

> Minor noncompliance: Failure to have GR2 inspections on site in a timely manner; failure to submit required report online in a timely manner; failure of reports to reflect minor changes in BMP.

Moderate Noncompliance. Cumulatively, the violations have a significant impact on the ability of the respondent to prevent or respond to worst-case erosion or dust violation through the development and implementation of a compliance plan.

> Moderate Noncompliance: Site work inconsistent with BMP; Failure to update BMP or reflect major changes; Failure to amend plan after rainfall or work practices show the plan to be inadequate; Failure to submit information of a control measure failure.

Major Noncompliance. Cumulatively, the violations essentially undermine the ability of the respondent to prevent or respond to worst-case erosion or dust violation through the development and implementation of a compliance plan.

> Major Noncompliance: No BMP submitted; Work started prior to permit issuance; inadequate or incomplete plan resulting in major environmental or citizen harm; failure to maintain equipment and/or personnel to implement BMP/dust control measure resulting in hazardous conditions; intentional or known violations.

Step 1.b: Adjust the amount determined from the matrix to reflect the potential environmental impact of a worst-case discharge. Choose the most serious applicable category.
Major Impact. A discharge would likely have a significant on human health/safety, an actual or potential effect on a receiving lake or wildlife due to factors such as proximity or adequacy of containment. Upward adjustment of 25-50%.

Moderate Impact. A discharge would likely have a significant effect on storm sewers or receiving stream or vegetation due to factors such as proximity to water or adequacy of containment. Upward adjustment of up to 25%.

Minor Impact. No adjustment.
Step 1.c: Adjust the amount from **Step 1.b** to account for the duration of the violation. Determine the number of weeks that the violation continued. For each week, add one half of one percent to the amount from Step 1.b (e.g., if the violation continued for 32 weeks, increase the amount from the previous step by 16%) up to a 30% maximum.

STEP 2: CULPABILITY

Consider the degree to which the respondent should have been able to prevent the violation, considering the sophistication of the respondent, the resources and information available to them, and any history of regulatory staff explaining to the respondent legal obligations or notifying the respondent of violations. Depending upon the degree of culpability, the city may increase the amount from STEP 1 by as much as 75%.

STEP 3: MITIGATION

This policy requires that in assessing a penalty the City must consider the "nature, extent, and degree of success of any efforts of the violator to minimize or mitigate the effects of the discharge". Though a violation of the regulations increases the threat of a discharge rather than actually causing a discharge, this factor can be taken into account by considering how quickly the violator comes into compliance, thereby mitigating the threat of a discharge. The City should use the following guidelines:

> When the violator comes into compliance before being notified of violation by regulatory staff orally or in writing, reduce the amount from **STEP 2** by up to 25%.
>
> When the violator, after notification of violation, comes into compliance within a reasonable time period not exceeding six weeks: No adjustment.

This is a downward adjustment only because any failure to come into compliance promptly after being informed of the violation is accounted for in **STEP 2** (Culpability).

STEP 4: HISTORY OF PRIOR VIOLATIONS

Adjust the amount from **STEP 3** if the respondent has a relevant history of violations within the past five years. Consider violations of erosion and dust regulations, the BMP or reporting requirements, and any violation of an environmental statute that relates to the respondent's ability to prevent or mitigate a violation. Related violations, for example, could include certain operation and maintenance violations that indicate a respondent's inattention to pollution control requirements. Relevant violations at any other facility under common ownership or control should be considered under this step. Violations include admitted violations (such as reports or other required self-reporting), adjudicated violations, findings of violations by the City, NDEQ, EPA or other agencies that have not been withdrawn or overturned by a reviewing authority, and cases that were settled by consent and involved the payment of a penalty (whether or not liability was admitted). If there is a history of such violations, the City may increase the **STEP 3** amount by up to 100%, depending on the frequency and severity of such past violations.

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Omaha Environmental Quality Control
Supplemental Environmental Project Policy

In the settlement of environmental enforcement cases in Omaha, the City requires that violators resolve the violation, change standard operational procedures to avoid future non-compliance, and pay a civil penalty; in certain instances "Supplemental Environmental Projects" and their environmental and community benefits may be part of the settlement; the primary purpose of the SEP policy is to obtain environmental and/or public benefits that may not otherwise occur, in the community impacted by the violation. SEPs are offered as an opportunity to contribute to the community in lieu of paying a penalty, and to help the defendant / respondent understand that their action has had an impact on the community as a whole, and is therefore offered to first time offenders only.

The environmental programs administered by the City have penalty assessment criteria used in determining an appropriate penalty. These policies establish an appropriate initial settlement offer to avoid the time and cost of a court hearing where appropriate. These policies have been established with consideration of the economic benefit to the violator, the seriousness of the violation, and any prior history of violations. Penalties deter violations and level the playing field, while the use of SEP's add an additional role of securing the advantage environmental or public benefits. The penalty calculation worksheets from the appropriate program are used to determine the Initial Settlement offer, without the influence of a SEP;

The primary goal of the City's Environmental regulations is the avoidance or reduction of pollution, followed in order by the responsible recycling of pollutants, then the proper disposal of pollutants;

The Environmental Quality Control Division of the City of Omaha Public Works Department reviews SEP's with the following criteria:

1. The City of Omaha evaluates the types of settlement cases where SEP's would be appropriate, the types of projects that are acceptable, and the penalty mitigation that is allowed;

2. The City of Omaha uses this SEP policy is part of that evaluation process, and is typically only considered for first time violators;

3. All else being equal, the final settlement penalty cost will be lower for a violator who agrees to perform an acceptable SEP compared to one who does not agree to perform a SEP;

4. The City of Omaha encourages the use of SEP's that are consistent with this policy, and recognizes that SEP's may not be appropriate in settlement of all cases, but they are an important part of the City's environmental enforcement program;

5. SEP's that have an educational or pollution prevention aspect are preferred, and would be given preference in consideration;

The Environmental Quality Control Division determines that a SEP is qualified only if the SEP meets the following criteria;

1. The SEP is a project that has environmental benefits, that the violator is not otherwise legally obligated to perform;

2. The SEP cannot be inconsistent with any Environmental Statutes;

   2.1. The SEP must advance an environmental objective of the statues the enforcement action is based on.

   2.2. The SEP must reduce the likelihood of similar violations, or:

      2.2.1. Reduce the consequence on the public or the environment that was impacted by the violation, or

      2.2.2. Reduce the overall risk to the public or the environment affected by the violation;

3. The SEP should affect the Public or the environment in the Omaha Metropolitan area;

4. The City retains the right to oversee a SEP and ensure that it is implemented pursuant to the provisions of the settlement offer, and retains legal recourse if the SEP is not adequately performed;

5. The City may not play any role in managing or controlling the funds that are to provide for the SEP;

6. The SEP cannot be used to satisfy a City statutory obligation, and cannot provide the City with additional resources to support activities that are covered by budgetary obligations, e.g. a SEP cannot buy a computer for City personnel use;

7. The SEP cannot be used to extend an existing City contract;

There are several broad categories of projects that qualify as SEP's; these are:

1. Environmental Restoration & Protection: a restoration project is one that enhances or restores a natural environment, or a man-made environment in the Omaha Metropolitan area;

   1.1. Help protect the environment from actual or potential damage or improve the overall condition of the ecosystem; OR

   1.2. The protection of endangered species or their habitat; OR

   1.3. Augment another environmental restoration project with recreational improvements such as hiking & bicycling trails, or information signage not already earmarked for the project;

1.4. Remediation of pollution of man made environments, like community centers, may include the removal of asbestos, lead paint, or contaminated soils;

2. Environmental Compliance Promotion: These projects can be contracted to experts to develop and implement the compliance promotion project and shall provide training, or outreach to other parts of the community to;

   2.1. Achieve and maintain compliance with the regulatory requirements;

   2.2. Go further than the regulations and reduce pollution beyond legal requirements;

   2.3. Promote the same environmental program as the violation;

3. Public Health: a project to provide diagnostic, preventative and /or remedial components of health care to the population potentially harmed, including but not limited to, epidemiological data, examinations, or medical treatment;

4. Pollution Prevention: a project that targets the reduction at the source so that the amount of pollution entering into the atmosphere or waste stream is reduced;

5. Pollution Reduction: is a project which results in a decrease in the amount or toxicity of any pollutant in a waste stream or released into the environment (e.g. offsite recycling of waste collected and used as raw material for another products);

6. Other projects that do not fit into one of the above categories may be considered if they have environmental merit, and are consistent with the rest of the SEP goals;

The City of Omaha uses the above criteria to determine if a SEP is qualified, and excludes the following from SEP consideration;

1. Projects done for private gain;

2. Projects that the defendant / respondent would be required to do under any rule or regulation;

3. Projects that the respondent would directly benefit from;

4. Projects where the City needs to contribute significant resources to assure completion;

In a settlement where the defendant / respondent agree to a SEP, the SEP amount has to be calculated to;

1. Exceed any known economic benefit from the non-compliance activity;

2. Be at least 75% of the total agreed upon initial settlement offer;

The defendant / respondent shall submit a settlement agreement that accurately describes the SEP and provides reliable and objective means to verify that the defendant / respondent completes the project, including clear benchmarks that can be tracked and reported, and can be completed in a timely manner while having community benefit.

The settlement agreement shall outline a requirement that the defendant / respondent pay a stipulated penalty of at least 75% to 150% of the initial settlement amount originally proposed, depending on the degree of completion and the monies spent, if the SEP outlined in the settlement agreement is not completed, or is only partially completed.

The defendant /respondent may only publicize his involvement in the results of the SEP if it is prominently stated that the SEP was taken as a part of a settlement of an environmental enforcement action.

ATTACHMENT C

ATTACHMENT C – Complaint and Illicit Discharge Investigations

Date Initiated	Address	Valid Complaint	Illicit Discharge	Complaint Type	Enforcement Action Taken
1/8/2018	North of 62nd & L St	No	No	Dumping	No Action Taken
1/10/2018	10323 N 182nd Cir	Yes	No	Construction	No Action Taken
1/17/2018	6602 N 99th St	Yes	No	Grease	Request for Voluntary Compliance - Verbal
1/17/2018	Hwy 275 near Battle Creek, NE	Yes	No	Adjacent MS4	Forwarded to adjacent MS4
3/5/2018	2712 S 17th St	Yes	Yes	Illicit Discharge	Request for Voluntary Compliance - Written
3/15/2018	13336 B St	Yes	No	Runoff	No Action Taken
3/15/2018	7540 Dodge St	Yes	Yes	Private sanitary overflow	No Action Taken
3/20/2018	420 S 11th St	Yes	No	Illicit Discharge	No Action Taken
3/21/2018	13618 Miami St	Yes	No	Construction	No Action Taken
3/22/2018	4609 Sheridan Road Bellevue, NE	Yes	No	Adjacent MS4	Forwarded to adjacent MS4
3/26/2018	14456 Camden Cir	Yes	No	Runoff	No Action Taken
3/28/2018	1012 S 29th St	Yes	No	Construction	No Action Taken
3/30/2018	6008 Country Club Oaks Plaza	Yes	No	Construction	No Action Taken
4/5/2018	S 36th St & Farnam St	Yes	No	Construction	Request for Voluntary Compliance - Verbal
4/6/2018	4612 L St	Yes	Yes	Illicit Discharge	Request for Voluntary Compliance - Verbal
4/9/2018	Hanscom Blvd & Oak St	Yes	No	Illicit Discharge	No Action Taken
4/11/2018	822 S 182nd St	Yes	No	Runoff	No Action Taken
4/12/2018	5086 Ida St	Yes	No	Runoff	No Action Taken
4/13/2018	2603 S 160TH S ST	Yes	No	Other	Request for Voluntary Compliance - Verbal
4/13/2018	3606 McKinley	Yes	Yes	Illicit Discharge	Request for Voluntary Compliance - Verbal

ATTACHMENT C – Complaint and Illicit Discharge Investigations

Date Initiated	Address	Valid Complaint	Illicit Discharge	Complaint Type	Enforcement Action Taken
4/13/2018	1556 Florence Blvd	Yes	No	Construction	No Action Taken
4/16/2018	137 N 37th St	No	No	Runoff	No Action Taken
4/20/2018	7620 N 60th St	Yes	No	Construction	No Action Taken
4/20/2018	103rd St & Camden Ave	Yes	Yes	Illicit Discharge	No Action Taken
4/23/2018	14380 William St	Yes	No	Construction	No Action Taken
4/23/2018	4501 S 36th St	No	No	Dumping	No Action Taken
4/23/2018	2616 Edward Babe Gomez Ave	No	No	Other	No Action Taken
4/25/2018	11214 Bel Air Dr	No	No	Post-Construction	No Action Taken
4/30/2018	1918 S 14th St	No	No	Runoff	No Action Taken
5/3/2018	16505 Fort St	Yes	No	Dumping	Request for Voluntary Compliance - Verbal
5/7/2018	8704 Grand Ave	Yes	Yes	Grass clippings	Request for Voluntary Compliance - Verbal
5/7/2018	13750 Millard Ave	No	No	Other	No Action Taken
5/11/2018	84th street south of I-80	Yes	No	Other	No Action Taken
5/13/2018	6609 S 110th St	No	No	Other	No Action Taken
5/15/2018	4505 N 193 AVENUE CR	No	No	Runoff	No Action Taken
5/15/2018	1308 S 91st Ave	Yes	No	Construction	Letter of Warning
5/23/2018	4401 N 193RD CIRCLE DR	Yes	No	Runoff	Request for Voluntary Compliance - Verbal
5/31/2018	1229 S 180th St	Yes	Yes	Cooking grease	Letter of Warning
5/31/2018	5044 S 108th St	Yes	Yes	Cooking grease	Request for Voluntary Compliance - Written
5/31/2018	12431 Farnam St	Yes	Yes	Illicit Discharge	Request for Voluntary Compliance - Verbal
6/1/2018	524 Park Ave	Yes	No	Construction	Request for Voluntary Compliance - Verbal

ATTACHMENT C – Complaint and Illicit Discharge Investigations

Date Initiated	Address	Valid Complaint	Illicit Discharge	Complaint Type	Enforcement Action Taken
6/4/2018	9501 Douglas St	Yes	No	Other	No Action Taken
6/6/2018	2203 N 188TH TER	Yes	No	Construction	No Action Taken
6/6/2018	11274 Old Maple Road	Yes	No	Runoff	No Action Taken
6/7/2018	9117 R St	Yes	No	Runoff	No Action Taken
6/12/2018	1010 S 29th St	No	No	Runoff	No Action Taken
6/12/2018	631 S 70 St	No	No	Other	No Action Taken
6/12/2018	3348 Pedersen Drive	Yes	No	Post-Construction	No Action Taken
6/13/2018	8704 Maple St	Yes	No	Runoff	No Action Taken
6/14/2018	6424 Newport Ave	Yes	No	Runoff	No Action Taken
6/20/2018	3823 N 23rd St	Yes	No	Construction	No Action Taken
6/20/2018	5151 N 93rd St	Yes	No	Runoff	No Action Taken
6/21/2018	2222 N 204th Terrace	Yes	No	Runoff	No Action Taken
6/21/2018	9354 Douglas St	Yes	Yes	Illicit Discharge	Request for Voluntary Compliance - Verbal
6/22/2018	6508 John J Pershing Dr	No	No	Other	No Action Taken
6/22/2018	5532 Pine St	No	No	Runoff	No Action Taken
6/22/2018	4612 L St	Yes	Yes	Illicit Discharge	Request for Voluntary Compliance- Written
6/25/2018	3007 N 192nd Ave	Yes	No	Construction	No Action Taken
6/27/2018	21110 Marinda St	Yes	No	Illicit Discharge	No Action Taken
7/6/2018	1404 N 191st Ave	No	No	Runoff	No Action Taken
7/6/2018	6312 N 36th St	Yes	No	Construction	No Action Taken
7/6/2018	1903 S 7th St	Yes	No	Construction	No Action Taken
7/9/2018	811 Cole Creek Drive	No	No	Dumping	No Action Taken
7/13/2018	20602 Pine St	No	No	Post-Construction	No Action Taken
7/16/2018	1618 S 207th Ave	Yes	No	Construction	No Action Taken

ATTACHMENT C – Complaint and Illicit Discharge Investigations

Date Initiated	Address	Valid Complaint	Illicit Discharge	Complaint Type	Enforcement Action Taken
7/16/2018	24340 & 24348 Douglas Cir Dr	Yes	No	Construction	No Action Taken
7/16/2018	3807 S 150th Plaza	Yes	No	Dumping	Request for Voluntary Compliance - Verbal
7/16/2018	S 185th & Madison Circle	Yes	No	Construction	Request for Voluntary Compliance - Verbal
7/17/2018	N 216TH ST & Greenbriar Dr	Yes	No	Construction	Request for Voluntary Compliance - Verbal
7/20/2018	17620 Jones St	Yes	No	Illicit Discharge	No Action Taken
7/25/2018	801 S 15th St	Yes	Yes	Illicit Discharge	No Action Taken
7/27/2018	2120 S 189th Cir	Yes	No	Construction	No Action Taken
7/31/2018	S 6th St & Hickory St	No	No	Other	No Action Taken
8/1/2018	2628 N 166th St	No	No	Construction	Request for Voluntary Compliance - Verbal
8/6/2018	55th & Browne St	No	No	Other	No Action Taken
8/8/2018	6120 N 16th St	Yes	No	Other	Request for Voluntary Compliance - Verbal
8/8/2018	2700 Wyoming St	Yes	No	Construction	Request for Voluntary Compliance - Verbal
8/9/2018	199th & Blue Sage Parkway	No	No	Other	No Action Taken
8/10/2018	8162 Hascall St	Yes	No	Other	Request for Voluntary Compliance - Written
8/17/2018	2308 S 16th St	No	No	Dumping	No Action Taken
8/20/2018	1308 S 91st Ave	Yes	No	Runoff	Letter of Warning
8/22/2018	4717 N 19th St	Yes	No	Other	No Action Taken
8/22/2018	3920 S 132nd St	Yes	No	Runoff	No Action Taken
8/30/2018	8550 Whitmore Cir	Yes	No	Dumping	Request for Voluntary Compliance - Verbal
9/7/2018	N Saddle Creek Rd & Hamilton St	Yes	No	Construction	No Action Taken
9/7/2018	20487 Poplar St	Yes	No	Other	No Action Taken

ATTACHMENT C – Complaint and Illicit Discharge Investigations

Date Initiated	Address	Valid Complaint	Illicit Discharge	Complaint Type	Enforcement Action Taken
9/10/2018	4413 N 195th Cir	Yes	No	Other	Request for Voluntary Compliance - Written
9/10/2018	38th Street & Farnam Street	Yes	Yes	Illicit Discharge	Request for Voluntary Compliance - Verbal
9/13/2018	51st & Blondo - Bioretention System	No	No	Post-Construction	No Action Taken
9/14/2018	28th & Douglas St	Yes	No	Other	No Action Taken
9/24/2018	8113 Howard St	Yes	No	Runoff	Request for Voluntary Compliance - Verbal
9/26/2018	1243 & 1255 S 13th St	No	No	Runoff	No Action Taken
9/28/2018	3540 Center St	Yes	Yes	Spill	No Action Taken
10/2/2018	3290 & 3148 N 93rd Ave	Yes	No	Dumping	No Action Taken
10/3/2018	90th Between Shirley and Hickory	Yes	Yes	Illicit Discharge	Request for Voluntary Compliance - Verbal
10/11/2018	1416 N 155th Ave	Yes	Yes	Illicit Discharge	Request for Voluntary Compliance - Verbal
10/11/2018	2541 Binney ST	Yes	No	Construction	Request for Voluntary Compliance - Verbal
10/12/2018	4826 S 22nd St	Yes	Yes	Illicit Discharge	Letter of Warning
10/15/2018	4502 S 60th St	Yes	No	Post Construction	No Action Taken
10/18/2018	3817 Dewey Ave	Yes	No	Construction	Request for Voluntary Compliance - Verbal
10/19/2018	3125 California	Yes	No	Construction	Request for Voluntary Compliance - Verbal
10/22/2018	1238 S 10th St	Yes	No	Construction	Request for Voluntary Compliance - Verbal
11/6/2018	1916 Military Ave	Yes	No	Other	No Action Taken
11/8/2018	9521 Douglas Street	Yes	No	Construction	No Action Taken
11/8/2018	4902 NW Radial Hwy	Yes	No	Illicit Discharge	Request for Voluntary Compliance - Verbal
11/13/2018	94th Ave & Dewey	No	No	Other	No Action Taken

ATTACHMENT C – Complaint and Illicit Discharge Investigations

Date Initiated	Address	Valid Complaint	Illicit Discharge	Complaint Type	Enforcement Action Taken
11/13/2018	6017 S 36th St	Yes	Yes	Illicit Discharge	Request for Voluntary Compliance - Written
11/14/2018	200th & W Maple Rd	No	No	Other	No Action Taken
11/20/2018	5001 Western Ave	No	No	Other	No Action Taken
11/20/2018	745 N 57TH AVENUE P	No	No	Other	No Action Taken
11/26/2018	2517 N 189th St	No	No	Other	No Action Taken
11/27/2018	2601 No 189th Street	Yes	No	Other	Request for Voluntary Compliance - Verbal
11/29/2018	9515 Valley St	Yes	No	Other	No Action Taken
11/29/2018	8420 PINKNEY ST	Yes	No	Other	Request for Voluntary Compliance - Verbal
12/7/2018	2766 S 9th St	No	No	Construction	No Action Taken
12/10/2018	15314 Ohio Cir	Yes	No	Other	No Action Taken
12/12/2018	17546 Ohern St	Yes	No	Other	No Action Taken
12/14/2018	76th & Bedford	Yes	No	Construction	Request of Voluntary Compliance - Verbal
12/19/2018	12718 Burt St	Yes	No	Construction	No Action Taken
12/19/2018	N 28th Ave & Binney St, NE, 68111	Yes	No	Other	No Action Taken
12/21/2018	2048 N 60th Ave	Yes	Yes	Construction	Request of Voluntary Compliance - Verbal
12/27/2018	66th & A St	Yes	No	Other	Request for Voluntary Compliance - Verbal
12/27/2018	2734 S 90th St	No	No	Other	No Action Taken
12/27/2018	514 Pine Street	Yes	No	Construction	Request for Voluntary Compliance - Verbal
12/28/2018	6615 Davenport St	Yes	No	Construction	Request for Voluntary Compliance - Verbal

ATTACHMENT D

ATTACHMENT D – Inlet Marking Activities

Date(s) of Service	Location Description [Starting Address]	Organization [Group #]	# of Drains Marked	# of Door Hangers Distributed	Total # of Adult Volunteers	Total # of Youth Volunteers	Hours for the Event	Total Volunteer Hours	# of Trash Bags Collected	# of Recycling Bags Collected
March - June	Applewood Heights [6338 S 104th St. 68127]	Individual	5	75	2	0	2	4	0	0
3/22/2018	Christie Heights Park	UNO Signature Day of Service	100	115	4	23	4	108	15	8
4/5/2018	southeast of Fontenelle Elementary	Fontenelle Elementary 4th grade	21	108	6	24	1.5	45	4	0
4/17/2018	Near South High	Partnership 4 Kids [9B]	12	75	2	14	1	16	3	0
4/10/2018	Near South High	Partnership 4 Kids [10A]	15	7	3	7	1	10	4	0
4/11/2018	Various Northwest Omaha areas	Church of Jesus Christ Latter Day Saints	267	221	8	40	2	96	8	0
4/17/2018	southeast of Fontenelle Elementary	Fontenelle Elementary 4th grade	20	111	4	21	1.5	37.5	4	0
4/18/2018	Near South High	Partnership 4 Kids [10B]	8	56	3	18	1	21	4	0
4/23/2018	Near South High	Partnership 4 Kids [9A]	8	58	2	10	1	12	7	0
April & May	Central Park Elementary	Dream's Central Park Elementary	25	0	13	52	2	130	0	0
6/15/2018	108th & Harrison/ Q Street	Burton Family	32	92	1	4	2	10	1	0
6/12/2018	Neighborhood Action and Fact neighborhood	YMCA Youth Corps	73	74	1	6	3	21	3	0
6/13/2018	Neighborhood Action and Fact neighborhood	YMCA Youth Corps	62	34	1	5	3.5	21	3	0
6/14/2018	Neighborhood Action and Fact neighborhood	YMCA Youth Corps	51	42	1	6	2.5	17.5	3	0
6/15/2018	144th and Blondo area	Boystown Summer Enrichment Program	9	32	6	8	2	28	1	0
6/22/2018	144th and Pacific area	Boystown Summer Enrichment Program	9	66	7	17	2	48	4	0
6/8/2018	132 and Cumming area	Boystown Summer Enrichment Program	23	123	6	18	2	48	3	0
5/23/2018	Area around 156 and blondo & other northwest areas	Eagle Run Ward-LDS Church	257	112	10	15	1.5	37.5	5	0
6/29/2018	156th and pacific area	Boystown Summer Enrichment Program	18	97	6	25	2	62	3	0
7/6/2018	108th and Center	Boystown Summer Enrichment Program	39	89	4	10	2	28	2	0
7/9/2018	108th and Center	Boystown Summer Enrichment Program	47	86	6	16	1	22	2	0
7/11/2018	Hartman Avenue Neighborhood Association	Immanuel United Methodist Church	109	93	8	5	4	52	18	0
7/13/2018	156th and Pacific area	Boystown Summer Enrichment Program	37	84	5	18	2	46	3	0
7/20/2018	Around Miller Park	Kids Can	16	51	2	8	1	10	1	0
7/20/2018	Around Miller Park	Kids Can	10	25	2	7	1	9	1	0
7/20/2018	Around Miller Park	Kids Can	14	38	2	7	1.5	13.5	1	0
7/20/2018	Blondo and 156th area	Boystown Summer Enrichment Program	42	137	5	21	2	52	2	0
7/21/2018	Hartman Avenue Neighborhood Association	Lamp Rynearson	110	60	7	1	8	64	2	0
7/27/2018	Stonybrook	Boystown Summer Enrichment Program	53	103	6	20	2	52	2	0
July	North of I-680 and East of Highway 75	Uta Halee Roots and Shoots Club	16	100	1	6	4	28	4	0
August	Various Southwest Omaha areas	Water's Edge Church	88	150	5	5	3	30	5	0
9/1/2018	Deer Park	Eagle Scout Project	698	1837	8	14	6	132	0	0
9/10/2018	Around Swanson Elementary	Cub Scout pack 866	55	224	18	35	1.5	79.5	7	0
9/20/2018	Around Lewis and Clark Middle School	Trash to Treasure club	15	41	2	8	1	10	1	0
9/27/2018	Around Lewis and Clark Middle School	Trash to Treasure club	6	51	2	7	1	9	2	0
9/29/2018	Westmont neighborhood	Girl Scout troop 48129	20	70	2	5	2	14	1	0
10/8/2018	Around Montessori Middle School - 5304 S. 172	Montessori 7-8 grade	75	551	7	43	1.5	75	9	0
		TOTAL	**2,465**	**5,288**	**178**	**549**	**82.0**	**1,498.5**	**138**	**8**

ATTACHMENT E

City of Omaha Stormwater Program Public Education and Outreach Activities						
EVENT	**DATE**	**ACTIVITY**	**PEOPLE**	**TARGET AUDIENCE**	**TARGET AUDIENCE**	**TARGET AUDIENCE**
Rain Garden Workshop	1/22/18	Workshop	12	Construction	Residential	Commercial
Kennedy STEAM Night	1/25/18	Education Booth	125	Residential	Community	School
Sediment and Erosion Control Seminar	2/1/18	Workshop	284	Construction	Commercial	Community
Fontenelle Elementary - GI Toolkit for Schools roll out	2/7/18	Meeting	1	Residential	Community	School
UNO GI Class - Permeable Pavement	2/7/18	Presentation/ Demonstration	25	Community	Commercial	School
2018 Omaha Home Show & Garden Expo	2/8/18	Education Booth	1100	Community	Commercial	
LRA Lunch-n-Learn Presentation	2/15/18	Presentation/ Demonstration	45	Commercial	Construction	
MORE Nature Night - Rockbrook Elem	3/8/18	Education Booth	50	Community	Residential	School
Recycle Relay	3/16/18	Education Booth	10	Community		
Wheeler Elementary - Stormwater & GI	4/3/18	Presentation/ Demonstration	50	Community	School	
UNO/UNMC Sustainability Expo	4/5/18	Education Booth	50	Community		
MORE Nature Night - Adams Elementary	4/10/18	Education Booth	75	Community	School	
UNO GI Class - Maintenance & Management	4/11/18	Presentation/ Demonstration	25	Community	Commercial	
MORE Nature Night - Wheeler Elementary	4/17/18	Education Booth	80	Community	School	
NWEA Great Plains Conference	4/17/18	Conference Presentation	130	Commercial	Construction	
UNO GI Tour	4/21/18	Tour	25	Community	Commercial	
Earth Day	4/21/18	Education Booth	5000	Community		
MORE Nature Night - Sunset Hills Elem	5/3/18	Education Booth	100	Community	School	
Spring into Summer	5/11/18	Education Booth	250	Community	Residential	

City of Omaha Stormwater Program Public Education and Outreach Activities						
EVENT	**DATE**	**ACTIVITY**	**PEOPLE**	**TARGET AUDIENCE**	**TARGET AUDIENCE**	**TARGET AUDIENCE**
ODPA - Leashes at Lauritzen	5/14/18	Education Booth	200	Community	Residential	
Omaha Rocks	5/15/18	Education Booth	50	Community	Residential	
Indian Hill Career Fair	5/15/18	Presentation/ Demonstration	120	Community	Residential	School
NE Water Leaders Academy	5/17/18	Tour	40	Community	Commercial	
SAFE Fest 2018	6/2/18	Education Booth	500	Community	Residential	
Indian Hill Summer School Class	6/7/18	Presentation/ Demonstration	30	Community	Residential	School
Indian Hill Summer School Class	6/12/18	Presentation/ Demonstration	30	Community	Residential	School
Indian Hill Summer School Class	6/19/18	Presentation/ Demonstration	30	Community	Residential	School
Indian Hill Summer School Class	6/26/18	Presentation/ Demonstration	30	Community	Residential	School
Aim for the Stars Summer Camp	7/12/18	Presentation/ Demonstration	18	Community	Residential	School
American Solar Challenge	7/13/18	Presentation/ Demonstration	200	Community	Residential	
Ehrhart Griffin & Associates Lunch-and-Learn	7/16/18	Presentation/ Demonstration	17	Construction	Commercial	
World O! Water	9/8/18	Presentation/ Demonstration	1600	Community	Residential	
Goldenrod Festival	9/11/18	Education Booth	325	Community	Residential	
Walk for the Animals	9/30/18	Education Booth	400	Community	Residential	
UNO ENVN 2010 class presentation	10/3/18	Presentation/ Demonstration	15	Community	School	
Kennedy Project Based Learning Tour/Presentation	10/9/18	Presentation/ Demonstration	32	Community	School	
Kennedy Project Based Learning Open House	10/23/18	Presentation/ Demonstration	32	Community	School	
Terracon Lunch-and-Learn	8/1/18	Presentation/ Demonstration	18	Construction	Commercial	
Rain Garden Workshop	10/30/18	Workshop	22	Commercial	Residential	Construction
Olsson, outreach materials	12/7/18	Distribution		Construction	Commercial	

Keep Omaha Beautiful Public Education and Outreach Activities					
EVENT	**DATE**	**ACTIVITY**	**YOUTH**	**ADULTS**	**TARGET AUDIENCE**
School Presentation (private)	1/8/18	Presentation/ Demonstration	16	4	School
School Presentation (college)	1/16/18	Presentation/ Demonstration	0	36	School
School Presentation (OPS)	1/18/18	Presentation/ Demonstration	24	1	School
School Presentation (OPS)	1/19/18	Presentation/ Demonstration	22	1	School
North Omaha Neighborhood Alliance Meeting	1/26/18	Meeting Announcement	0	32	Community
South Omaha Neighborhood Alliance Meeting	2/1/18	Meeting Announcement	1	34	Community
Global Health Community Fair	2/2/18	Education Booth	0	16	Community
School Presentation (private)	2/6/18	Presentation/ Demonstration	15	3	School
Omaha Home and Garden Show	2/9/18	Education Booth	73	100	Community
School Presentation (Catholic)	2/12/18	Presentation/ Demonstration	18	2	School
Omaha Green Coalition Pecha Kucha	2/20/18	Presentation/ Demonstration	10	65	Community
Omaha Spring Cleanup Kickoff meeting	2/27/18	Presentation/ Demonstration	3	97	Community
School Presentation (Millard)	3/2/18	Presentation/ Demonstration	97	4	School
School Presentation (private)	3/5/18	Presentation/ Demonstration	17	4	School
Daughters of the American Revolution Chapter Meeting	3/6/18	Presentation/ Demonstration	0	39	Community
Girl Scout Meeting	3/12/18	Presentation/ Demonstration	14	3	Community
After School Club Presentation (OPS)	3/19/18	Presentation/ Demonstration	16	2	School
After School Club Presentation (OPS)	3/20/18	Presentation/ Demonstration	14	3	School
After School Club Presentation (OPS)	3/20/18	Presentation/ Demonstration	19	3	School
UNO Signature Days of Service	3/22/18	Presentation/ Demonstration	18	4	School
After School Club Presentation (OPS)	3/26/18	Presentation/ Demonstration	15	3	School

Keep Omaha Beautiful Public Education and Outreach Activities					
EVENT	**DATE**	**ACTIVITY**	**YOUTH**	**ADULTS**	**TARGET AUDIENCE**
After School Club Presentation (OPS)	3/28/18	Presentation/ Demonstration	24	5	School
School Presentation (OPS)	3/28/18	Presentation/ Demonstration	80	3	School
School Presentation (OPS)	3/29/18	Presentation/ Demonstration	24	1	School
School Presentation (college)	3/29/18	Presentation/ Demonstration	0	17	School
School Presentation (Westside)	3/30/18	Presentation/ Demonstration	14	1	School
School Presentation (college)	4/2/18	Presentation/ Demonstration	0	14	School
Bemis Park Neighborhood Association	4/3/18	Presentation/ Demonstration	0	24	Community
School Presentation (Catholic)	4/4/18	Presentation/ Demonstration	63	1	School
UNO/UNMC & Community Sustainability Fair	4/5/18	Education Booth	0	33	Community
School Presentation (OPS)	4/5/18	Presentation/ Demonstration	24	6	School
School Presentation (private)	4/9/18	Presentation/ Demonstration	15	4	School
School Presentation (private)	4/9/18	Presentation/ Demonstration	6	2	School
School Presentation (private)	4/10/18	Presentation/ Demonstration	24	1	School
School Presentation (OPS)	4/10/18	Presentation/ Demonstration	24	3	School
School Presentation (OPS)	4/11/18	Presentation/ Demonstration	31	6	School
Growing Up Wild class	4/12/18	Presentation/ Demonstration	0	28	School
School Presentation (westside)	4/13/18	Presentation/ Demonstration	14	1	School
School Presentation (private)	4/13/18	Presentation/ Demonstration	30	3	School
Pranam Seva	4/15/18	Presentation/ Demonstration	0	23	Community
School Presentation (OPS)	4/16/18	Presentation/ Demonstration	15	4	School
Distributing Materials	4/18/18	Flier/Brochure Distribution	0	0	Community
NE Scifest (weekend / community)	4/19/18	Education Booth	590	36	Community

Keep Omaha Beautiful Public Education and Outreach Activities					
EVENT	**DATE**	**ACTIVITY**	**YOUTH**	**ADULTS**	**TARGET AUDIENCE**
School Presentation (OPS)	4/19/18	Presentation/ Demonstration	22	2	School
School Presentation (Westside)	4/20/18	Presentation/ Demonstration	14	1	School
Earth Day Omaha	4/21/18	Education Booth	350	200	Community
School Presentation (OPS)	4/23/18	Presentation/ Demonstration	117	10	School
School Presentation (OPS)	4/24/18	Presentation/ Demonstration	24	1	School
Treemendous Trees	4/26/18	Education Booth	600	75	School
NE Scifest - Day 1 (school day / students)	4/27/18	Education Booth	400	33	School
NE Scifest - Day 2 (school day / students)	4/28/18	Education Booth	122	100	School
School Presentation (Millard)	5/1/18	Presentation/ Demonstration	18	2	School
School Presentation (Westside)	5/4/18	Presentation/ Demonstration	11	1	School
School Presentation (private)	5/7/18	Presentation/ Demonstration	19	4	School
School Presentation (OPS)	5/8/18	Presentation/ Demonstration	42	4	School
Hartman Neighborhood Association Meeting	5/9/18	Presentation/ Demonstration	0	23	Community
School Presentation (OPS)	5/10/18	Presentation/ Demonstration	113	10	School
School Presentation (Westside)	5/11/18	Presentation/ Demonstration	8	0	School
Spring Into Summer	5/11/18	Education Booth	45	20	Community
Girl Scouts After School Program	5/15/18	Presentation/ Demonstration	14	1	School
Presentation/Trash Walk	5/16/18	Presentation/ Demonstration	24	4	School
School Presentation (college)	5/16/18	Presentation/ Demonstration	0	29	School
Big Brothers Big Sisters End of Year Celebration	5/25/18	Presentation/ Demonstration	28	32	Community
Boystown Summer Enrichment	6/8/18	Presentation/ Demonstration	21	6	School
UNO MavKids Camp	6/11/18	Presentation/ Demonstration	70	13	Community

Keep Omaha Beautiful Public Education and Outreach Activities					
EVENT	**DATE**	**ACTIVITY**	**YOUTH**	**ADULTS**	**TARGET AUDIENCE**
Boystown Summer Enrichment	6/11/18	Presentation/ Demonstration	8	6	School
YMCA Youth Corps	6/12/18	Presentation/ Demonstration	5	2	Community
Ripple Glass Summit	6/14/18	Presentation/ Demonstration	2	80	Community
Yoga Rocks the Park	6/17/18	Presentation/ Demonstration	5	15	Community
Boystown Summer Enrichment	6/18/18	Presentation/ Demonstration	9	6	School
YMCA	6/21/18	Presentation/ Demonstration	65	6	Community
Benson Neighborhood Association	6/25/18	Presentation/ Demonstration	2	16	Community
Metro Community College	6/25/18	Presentation/ Demonstration	0	26	School
School Presentation (Millard)	6/26/18	Presentation/ Demonstration	80	6	School
School Presentation (Millard)	6/27/18	Presentation/ Demonstration	80	6	School
School Presentation (OPS)	6/27/18	Presentation/ Demonstration	50	6	School
School Presentation (OPS)	6/28/18	Presentation/ Demonstration	50	6	School
Boystown Summer Enrichment	6/29/18	Presentation/ Demonstration	18	7	School
Boystown Summer Enrichment	7/2/18	Presentation/ Demonstration	17	6	School
UNO Service Learning Academy	7/10/18	Education Booth	0	28	School
Boystown Summer Enrichment	7/13/18	Presentation/ Demonstration	18	7	School
Boystown Summer Enrichment	7/16/18	Presentation/ Demonstration	18	6	School
Kids Can	7/20/18	Presentation/ Demonstration	64	8	Community
Boystown Summer Enrichment	7/23/18	Presentation/ Demonstration	22	8	School
Werner Park Baseball Game	8/1/18	Education Booth	70	37	Community
Boy Scouts Roundtable	8/2/18	Education Booth	0	23	Community
Creighton Welcome Week Orientation	8/15/18	Presentation/ Demonstration	0	208	School

Keep Omaha Beautiful Public Education and Outreach Activities					
EVENT	**DATE**	**ACTIVITY**	**YOUTH**	**ADULTS**	**TARGET AUDIENCE**
After School Club Presentation (OPS)	8/23/18	Presentation/ Demonstration	13	0	School
Millard North Service Outreach Day	8/24/18	Education Booth	450	10	School
Creighton Welcome Week service day	8/25/18	Presentation/ Demonstration	0	68	School
UNO Volunteer Fair	8/29/18	Education Booth	0	76	School
After School Club Presentation (OPS)	8/30/18	Presentation/ Demonstration	13	0	School
Eagle Scout Project Kick off	9/1/18	Presentation/ Demonstration	14	8	Community
Boys Scouts Roundtable	9/6/18	Meeting Announcement	12	55	Community
After School Club Presentation (OPS)	9/6/18	Presentation/ Demonstration	13	0	School
World O! Water (Education tables)	9/8/18	Education Booth	267	133	Community
World O! Water (KOB info tables)	9/8/18	Education Booth	33	101	Community
Boy Scout Pack 866	9/10/18	Presentation/ Demonstration	35	18	Community
Goldenrod Festival	9/11/18	Education Booth	512	25	School
After School Club Presentation (OPS)	9/13/18	Presentation/ Demonstration	13	1	School
After School Club Presentation (OPS)	9/20/18	Presentation/ Demonstration	13	1	School
School Presentation (OPS)	9/25/18	Presentation/ Demonstration	25	2	School
After School Club Presentation (OPS)	9/27/18	Presentation/ Demonstration	8	1	School
Creighton Law School Day of Service	9/28/18	Presentation/ Demonstration	0	64	School
School Presentation (OPS)	10/2/18	Presentation/ Demonstration	17	3	School
Fiest of St. Francis	10/4/18	Education Booth	0	7	Community
After School Club Presentation (OPS)	10/4/18	Presentation/ Demonstration	12	0	School
Teacher Night	10/5/18	Education Booth	4	296	School

Keep Omaha Beautiful Public Education and Outreach Activities					
EVENT	**DATE**	**ACTIVITY**	**YOUTH**	**ADULTS**	**TARGET AUDIENCE**
School Presentation (OPS)	10/5/18	Presentation/ Demonstration	38	5	School
Lights On for Youth	10/6/18	Education Booth	300	48	Community
After School Club Presentation (OPS)	10/8/18	Presentation/ Demonstration	12	2	School
School Presentation (private)	10/9/18	Presentation/ Demonstration	11	3	School
School Presentation (private)	10/9/18	Presentation/ Demonstration	26	5	School
After School Club Presentation (OPS)	10/10/18	Presentation/ Demonstration	14	2	School
After School Club Presentation (OPS)	10/11/18	Presentation/ Demonstration	11	0	School
School Presentation (Westside)	10/15/18	Presentation/ Demonstration	22	2	School
School Presentation (Millard)	10/15/18	Presentation/ Demonstration	46	9	School
School Presentation (Westside)	10/16/18	Presentation/ Demonstration	23	2	School
School Presentation (OPS)	10/16/18	Presentation/ Demonstration	18	3	School
After School Club Presentation (Elkhorn)	10/22/18	Presentation/ Demonstration	23	2	School
School Presentation (Millard)	10/23/18	Presentation/ Demonstration	45	1	School
MCC ELL class	10/25/18	Presentation/ Demonstration	0	22	School
After School Club Presentation (OPS)	10/25/18	Presentation/ Demonstration	6	0	School
After School Club Presentation (OPS)	11/1/18	Presentation/ Demonstration	7	0	School
UN Foundation - Health & Wellness Fall Festival	11/8/18	Education Booth	0	47	Community
After School Club Presentation (OPS)	11/8/18	Presentation/ Demonstration	6	0	School
Girl Scout Volunteer Enrichment Conference	11/13/18	Education Booth	0	45	Community
After School Club Presentation (OPS)	11/15/18	Presentation/ Demonstration	3	0	School
School Presenation (Millard)	11/15/18	Presentation/ Demonstration	44	1	School

Target Markets

Construction – Developers, contractors, owners
Community – Non-profit groups, homeowner associations, etc...
School – Students, teachers, administrators
Residential – Homeowners, residential property managers
Commercial – Stores, commercial property managers
General Public – Applies to citizens of the community & the general public

Stormwater Facebook Page	
2017 Month	**Total Post Reach**
January	2,723
February	1,055
March	885
April	2,914
May	748
June	4,357
July	754
August	1,421
September	745
October	362
November	551
December	33
Total	**16,548**

Omaha Stormwater Website		
2017 Month	**Users**	**Page Views**
January	497	1,572
February	479	1,754
March	482	1,521
April	561	1,723
May	527	1,504
June	444	1,333
July	543	1,546
August	454	1,511
September	393	1,072
October	476	1,476
November	386	1,172
December	428	1,406
Totals	**5,670**	**17,590**

ATTACHMENT F

Official Name to Use	Title on Piece	Res	Com	Con	Ind	Developed by
Landscape Brochure	*Keep It Clean On Your Golf Course or Landscape Projects!*	X	X			OSW
Stormwater & Dust Control Brochure	*Stormwater & Dust Control*	X	X	X		OSW
Water Pollution Brochure	*Water Pollution Comes In Many Forms*	X	X	X		OSW
Rain Barrel Brochure	*Building A Rain Barrel*	X	X			OSW
Storm Drain Awareness Brochure	*Keeping Pollution Out Of Our Storm Drains*	X	X			OSW
Concrete Brochure	*Best Management Practices for Concrete Masonry and Ready Mix Professionals*				X	OSW
Pressure Washing Brochure	*Take Some Pressure Off Our Environment*				X	OSW
Metal Fabrication Brochure	*Shape Your Plans to Control Wastewater*				X	OSW
Proper Paint Disposal Brochure	*Know Your Role In Protecting The Environment*	X	X			OSW
Restaurant Brochure	*Keep It Clean At Your Restaurant!*		X			OSW
Outdoor Event Brochure	*Keep It Clean At Your Outdoor Event!*		X			OSW
LUPs Brochure	*Linear Underground Projects & Stormwater Best Management Practices*			X	X	OSW
10 Important Things Flyer	*10 Important Things To Remember On The Job Site*		X	X		OSW
Pet Waste Flyer	*Some Things Are Better Not Left Behind!*	X				OSW
Rain Garden Fact Sheet	*Rain Gardens*	X				OSW
Bioretention Garden Fact Sheet	*Bioretention Systems*		X			OSW
Bioswale Fact Sheet	*Bioswales and Filter Strips*		X			OSW
Green Roof Fact Sheet	*Green Roofs*	X				OSW
Downspout Disconnection Fact Sheet	*Downspout Disconnections*	X				OSW
Permeable Pavement Fact Sheet	*Permeable Pavement*		X	X		OSW
Rain Harvesting Fact Sheet	*Rain Harvesting*	X				OSW
Soil Conditioning Fact Sheet	*Soil Conditioning*					OSW
Storm Drain Fact Sheet	*Storm Drain*					
Bioretention Manual	*Bioretention Gardens*		X	X		OSW

Official Name to Use	Title on Piece	Res	Com	Con	Ind	Developed by
Sustainable Landscapes Manual	*Sustainable Landscapes*		X	X		OSW
OmahaPlants.com Postcard	*Omahaplants.org*	X	X	X		OSW
Grass Clipping Door Hanger	*Properly Dispose of Grass Clippings and Yardwaste*	X	X			OSW
Rain Barrel Door Hanger	*Omaha's Rain Barrel Program*	X				OSW
OSW Frisbees		X				OSW
Pet Waste Bag Dispensers		X				OSW
WOW! Activity Books	*WOW! Activity Books*	X				OSW
WOW! Crayon Boxes	*WOW! Crayon Boxes*	X				OSW
City of Omaha Environmental Field Guide	*City of Omaha Environmental Field Guide*		X	X		CSO
Automotive UTS		X		X		SW/Recycling
Guide to HHW		X				SW/Recycling
Housing Dangerous Products		X				SW/Recycling
How to Discard Your Unusued Medications		X				SW/Recycling
OmaGro		X	X	X		SW/Recycling
Used Motor Oil, Tires, etc.		X				SW/Recycling
Pollution Sources Around Your House		X				SW/Recycling
Prepare Yourself for UTS		X				SW/Recycling
Recycling Paint UTS		X				SW/Recycling
Illegal Dumping		X				SW/Recycling
Get the Point (Medical HHW)		X				SW/Recycling
UTS Drop-off Locations		X				SW/Recycling
Proper Paint Disposal		X				SW/Recycling

Official Name to Use	Title on Piece	Res	Com	Con	Ind	Developed by
Clean Water Team Certificate	*Clean Water Team Certificate*	X				OSW
Little Steps. Big Impact. Brochure		X				OAQ
Little Steps. Big Impact. Index Card		X				OAQ
SEC Flip Book				X		OSW
World O! Water patches		X				OSW
Inlet Marking Door Hanger	*Only Rain Down the Storm Drain*	X				KOB
Sector A - Timber Products	Sector A - Timber Products				X	OSW
Sector AA - Fabricated Metal Products	Sector AA - Fabricated Metal Products				X	OSW
Sector AB - Industrial Machinery and Auto Repair	Sector AB - Industrial Machinery and Auto Repair				X	OSW
Sector AC - Eletrical Photographic and Optical Goods	Sector AC - Electrical Photographic and Optical Goods				X	OSW
Sector B - Paper and Allied Products	Sector B - Paper and Allied Products				X	OSW
Sector C - Chemical and Allied Products	Sector C - Chemical and Allied Products				X	OSW
Sector D - Asphalt Paving and Roofing	Sector D - Asphalt Paving and Roofing				X	OSW
Sector E - Glass, Clay, Cement, and Gypsum	Sector E - Glass, Clay, Cement, and Gypsum				X	OSW
Sector F - Primary Metals	Sector F - Primary Metals				X	OSW
Sector J - Mineral Mining and Dressing	Sector J - Mineral Mining and Dressing				X	OSW
Sector K - Hazardous Waste Treatment, Storage, and Disposal Facilities	Sector K - Hazardous Waste Treatment, Storage, and Disposal Facilities				X	OSW
Sector M - Automotive Salvage Yards	Sector M - Automotive Salvage Yards				X	OSW
Sector N - Scrap Recycling	Sector N - Scrap Recycling				X	OSW
Sector O - Steam Electric Generating Facilities	Sector O - Steam Electric Generating Facilities				X	OSW

Official Name to Use	Title on Piece	Res	Com	Con	Ind	Developed by
Sector P - Land Transportation and Warehouse	Sector P - Land Transportation and Warehouse				X	OSW
Sector R - Ship and Boat Building	Sector R - Ship and Boat Building				X	OSW
Sector S - Air Transportation Facilities	Sector S - Air Transportation Facilities				X	OSW
Sector U - Food and Kindred Products	Sector U - Food and Kindred Products				X	OSW
Sector W - Furniture and Fixtures	Sector W - Furniture and Fixtures				X	OSW
Sector X - Printing and Publishing	Sector X - Printing and Publishing				X	OSW
Sector Y - Rubber, Misc Plastics Industries	Sector Y - Rubber, Misc Plastics Industries				X	OSW
Sector Z - Leather Tanning and Finishing	Sector Z - Leather Tanning and Finishing				X	OSW

Res – Residential
Com – Commercial
Con – Construction
Ind - Industrial

OSW - Omaha Stormwater Program
OAQ - Omaha Air Quality Program
SW/Recycling - Omaha Solid Waste & Recycling Programs
CSO - Omaha CSO Program
KOB - Keep Omaha Beautiful

ATTACHMENT G

Hot Spot Checklist Form

Facility: **Date:**

Activity	Never (0)	Occ. (1)	Freq. (2)	Routinely / Everyday (3)	Comments	Score
Maintenance & Repair						
Fueling (0, ≤10, 10-100, >100 gallons)						
Washing						
Storage						
Loading & Unloading						
Outdoor Material Storage						
Dumpsters/Trash Compactors						
Building & Ground Maintenance						
Parking Lot Maintenance						
Turf Management / Landscaping						
						0

Rating

Never = 0 or only rare occasion, Occasionally = 1-2/yr., Frequently = Approx. 1/mo., Routine = At least 1/wk.

Maintenance yards are defined as locations where activities include:
Vehicle & equipment maintenance & repair (excluding small engine repair)
Vehicle & equipment fueling (bulk fuel storage capacity - stationary or mobile)
Vehicle & equipment washing (particularly outdoor washing)
Vehicle & equipment storage outdoor)
Outdoor loading & unloading
Outdoor material storage (stockpiles & bulk storage, etc.)
Dumpster/trash compactors for waste management
Building & Grounds Maintenance (i.e. trench drains, sumps, o/w separators, stormwater drainages)
Parking Lot Maintenance (i.e. sweeping, patching, paving, grading)
Turf management & landscaping maintenance (i.e. fertilizer and pesticide management, mixing, storage)

Scale	Result	Action
>20	Hot Spot	FRCP required
10-20	Potential Hot Spot	Targeted Education & Policy (Consider FRCP)
<10	Not a Hot Spot	Targeted Education

ATTACHMENT H

Saddlebrook Green Infrastructure Assessment

2018 Monitoring Summary

The Saddlebrook Joint Use Facility is located at 149th Street and Laurel Avenue in northwest Omaha, Nebraska (Figure 1). This city-owned, multi-use facility sits on roughly 20 acres of land, slightly upstream of Standing Bear Lake. The Saddlebrook Joint Use Facility acts as a stormwater demonstration project with for two types of best management practices (BMPs), a green roof, and a bioretention system. In 2009, the sedum-type green roof was installed on the library portion of the building, which can be viewed from the community center's second floor walking/running track. On the North side of the multi-use building, a bioretention system was installed to collect stormwater runoff from the west parking lot. A traditional dry detention pond was installed on the northeast portion of the building to collect stormwater runoff from the east parking lot. The Saddlebrook demonstration project was designed to compare the effectiveness of various green infrastructure against traditional "grey" infrastructure in reducing stormwater runoff.

In this annual report, flow analysis is included for the green and grey roofs as well as the bioretention system for the 2018 sampling period. Flow monitoring data was collected with Isco 2150 Area Velocity Flow Modules and Sensors that produce quantity and velocity measurements of stormwater runoff. Data collected is used to compare volume, peak flow rate, and overall efficiency between the traditional and green infrastructure practices. Outflow (discharge) data was collected from the grey and green roofs for direct comparison. Outflow data was collected from the bioretention system and inflow (runoff) data was collected from the east parking lot. Runoff to the dry detention basin from the east parking lot has not been treated by a BMP and serves as a control for the bioretention system in this study. An Isco 674 Tipping Bucket rain gauge was also installed on site for local and accurate precipitation measurements.

Monitoring equipment collected data from May through August 2018. During this time there were 37 rain events totaling 17.03 inches of precipitation (Table 1). The total accumulation recorded at Saddlebrook is lower than the recorded values (during the same sampling period) at the National Weather Service Valley weather station (Valley, NE; station ID USC00258795) of 21.6 inches. The lowest measured precipitation in 2018 was .01 inches and the largest was 2.48 inches. The average precipitation across these events was 0.46 inches and rain event durations ranged from under 30 minutes to almost 36 hours.

Total discharge from the green and grey roofs varied greatly and largely depended on the amount of rainfall. During the 2018 sampling period the flow meter on the grey roof measured a total volume of 18,051.84 cubic feet (134,767.84 gallons). Monitoring equipment recorded discharge from the green roof in only 22 of the 37 rain events and observed 4,433.96 cubic feet (33,168.32 gallons) of total flow. The green roof had 13,581.88 cubic feet (101,599.51 gallons) less total flow than the grey roof, a 75% reduction in volume from May through August. Accounting for the variation in area of both roofs, on average one square foot of grey roof displaced 2.3 cubic feet (17.2 gallons) of stormwater runoff while one square foot of green roof displaced 0.48 cubic feet (3.59 gallons).

The period of study for the bioretention system was July through August because the data from earlier and later months could not be trusted. 14 rain events occurred during this time totaling 5.36 inches of precipitation. The drainage area for the bioretention system is 77,520 square feet and the drainage are for the dry detention basin is only 64,234 square feet. Adjusting for this variation, the calculated total flow over the sample period was 30,890.21 cubic feet (231,074.8 gallons) to the dry detention basin and

19,366.0 cubic feet (144,867.7 gallons) from the bioretention system. The bioretention system had 11,524.21 cubic feet (86,207.08 gallons) less total flow, a 37% reduction in volume (Table 2).

Both BMPs also showed a delay and reduction of peak flow rates compared to the traditional grey infrastructure. In all but four cases, the peak flow from the green roof occurred after the grey roof by times ranging from 1 minute to 1 hour and 40 minutes (Figures 2 and 3). Precipitation intensity and duration influenced this range. On average, peak flow was reduced by 76% through the green roof, a slight increase from the 75% percent reduction in 2017.

In the July through August sampling period, peak flow rates were lower through the bioretention system in all cases by an average of 83%. During smaller rain events (less than 0.5 inches) especially, flow through the bioretention system displayed a common pattern in which peak flows were muted, delayed and took much longer to draw down compared to untreated runoff (Figure 4).

Flow monitoring data from 2018 remains consistent with previous years in showing reduced peak discharge rates and total volume from the green roof when compared to the traditional grey roof. The same is true for the bioretention system. Monitoring will continue for this site in 2019 with no change in what data is being collected. To increase accuracy and reduce error, it is recommended that calibration of monitoring equipment and data retrieval be performed monthly and rain data be measured on tighter intervals. The City will continue to compare the performance of the traditional versus the green infrastructure features in terms of volume and peak flow reduction.

Figure 1. Site map of the Saddlebrook Joint Use Facility highlighting the BMP locations, drainage areas and flow monitoring locations.

Year	Month	Date	Total Precip	Volume Grey Roof	Volume Green Roof	Peak Rate Grey Roof	Peak Rate Green Roof	% Reduction Peak Flow
yyyy	*mmm*	*dd-mmm*	*in*	*cf*	*cf*	*cfs*	*cfs*	*%*
2018	MAY	11-May	0.28	233.70	61.44	0.087	0.003	96.55%
2018	MAY	12-May	0.05	4.14	0.00	0.012	0.000	100.00%
2018	MAY	14-May	0.57	299.28	113.76	0.08	0.019	76.25%
2018	MAY	19-May	0.01	30.96	0.00	0.005	0.000	100.00%
2018	MAY	20-May	0.2	338.94	0.00	0.083	0.000	100.00%
2018	MAY	22-May	0.77	272.10	352.86	0.079	0.147	-86.08%
2018	MAY	29-May	0.22	321.9	1.86	0.73	0.004	99.45%
2018	MAY	30-May	0.09	250.98	0.00	0.045	0.000	100.00%
2018	JUNE	1-Jun	1.20	1166.88	362.10	0.345	0.041	88.12%
2018	JUNE	6-Jun	0.06	28.68	0.00	0.001	0.000	100.00%
2018	JUNE	9-Jun	0.31	176.28	2.64	0.118	0.003	97.46%
2018	JUNE	10-Jun	0.04	68.58	0.00	0.047	0.000	100.00%
2018	JUNE	11-Jun	0.51	348.36	31.56	0.649	0.037	94.30%
2018	JUNE	12-Jun	0.75	1060.44	324.84	1.301	0.211	83.78%
2018	JUNE	17-Jun	0.45	87.36	10.08	0.036	0.018	50.00%
2018	JUNE	18-Jun	1.42	1765.32	629.16	1.987	0.312	84.30%
2018	JUNE	19-Jun	1.33	2726.04	718.62	2.507	0.352	85.96%
2018	JUNE	20-Jun	2.15	2823.36	1112.46	0.471	0.317	32.70%
2018	JUNE	21-Jun	0.15	424.8	48.9	0.027	0.002	92.59%
2018	JUNE	25-Jun	0.79	148.86	244.40	0.052	0.129	-148.08%
2018	JUNE	29-Jun	0.02	8.58	0.00	0.001	0.000	100.00%
2018	JUNE	30-Jun	0.50	654.48	52.86	1.06	0.016	98.49%
2018	JULY	1-Jul	0.3	530.34	55.26	0.149	0.022	85.23%
2018	JULY	13-Jul	0.63	0.00	16.56	0.000	0.009	-100.00%
2018	JULY	17-Jul	0.4	393.78	2.64	0.105	0.001	99.05%
2018	JULY	19-Jul	0.08	110.46	0.00	0.044	0.000	100.00%
2018	AUG	4-Aug	0.16	26.22	0.00	0.038	0.000	100.00%
2018	AUG	6-Aug	0.07	9.18	0.00	0.016	0.000	100.00%
2018	AUG	15-Aug	0.52	538.68	19.50	0.247	0.005	97.98%
2018	AUG	16-Aug	0.27	236.76	29.46	0.202	0.007	96.53%
2018	AUG	19-Aug	2.48	2587.74	233.58	0.263	0.026	90.11%
2018	AUG	21-Aug	0.07	89.28	9.42	0.087	0.002	97.70%
2018	AUG	24-Aug	0.03	69.36	0.00	0.039	0.000	100.00%
2018	AUG	25-Aug	0.01	2.28	0.00	0.001	0.000	100.00%
2018	AUG	26-Aug	0.02	25.44	0.00	0.029	0.000	100.00%
2018	AUG	28-Aug	0.11	135.18	0.00	0.099	0.000	100.00%
2018	AUG	31-Aug	0.01	21.12	0.00	0.008	0.000	100.00%
		Total:	17.03	18015.84	4433.96		**Average:**	76.01%

Table 1. Summary of 2018 rain/discharge events for the Grey and Green Roofs at Saddlebrook.

Year	Month	Date	Total Precip	Volume Basin	Adjusted Volume Basin	Volume Bio-retention	Peak Flow Basin	Peak Flow Bioretention	% Reduction in Peak Flow Rate
yyyy	*mmm*	*dd-mmm*	*in*	*cf*	*cf*	*cf*	*cfs*	*cfs*	*%*
2018	JUL	13-Jul	0.63	3330.66	4030.1	2317	1.416	0.134	90.54%
2018	JUL	17-Jul	0.4	1683.18	2036.65	1405.26	0.556	0.053	90.47%
2018	JUL	19-Jul	0.08	427.44	517.20	501.9	0.156	0.044	71.79%
2018	JUL	23-Jul	0.05	405	490.05	0	0.184	0	100.00%
2018	JUL	28-Jul	0.39	1967.76	2380.99	1479.18	0.203	0.082	59.61%
2018	AUG	4-Aug	0.16	756.42	915.27	373.8	0.137	0.042	69.34%
2018	AUG	6-Aug	0.14	807.24	976.76	344.4	0.264	0.033	87.50%
2018	AUG	15-Aug	0.52	1668.9	2019.37	1604.94	0.71	0.136	80.85%
2018	AUG	16-Aug	0.27	929.88	1125.16	1039.2	0.365	0.056	84.66%
2018	AUG	19-Aug	2.55	12408	15013.68	9724.02	1.766	0.353	80.01%
2018	AUG	24-Aug	0.03	369.48	447.07	6.42	0.109	0.002	98.17%
2018	AUG	26-Aug	0.02	165.9	200.73	11.94	0.079	0.002	97.47%
2018	AUG	28-Aug	0.11	485.04	586.89	476.76	0.262	0.043	83.59%
2018	AUG	31-Aug	0.01	124.2	150.28	81.18	0.007	0.002	71.43%
		Total:	5.36	25529.10	30890.20	19366.00		**Average:**	83.24%

Table 2. Summary of 2018 rain/discharge events for bioretention system and basin at Saddlebrook.

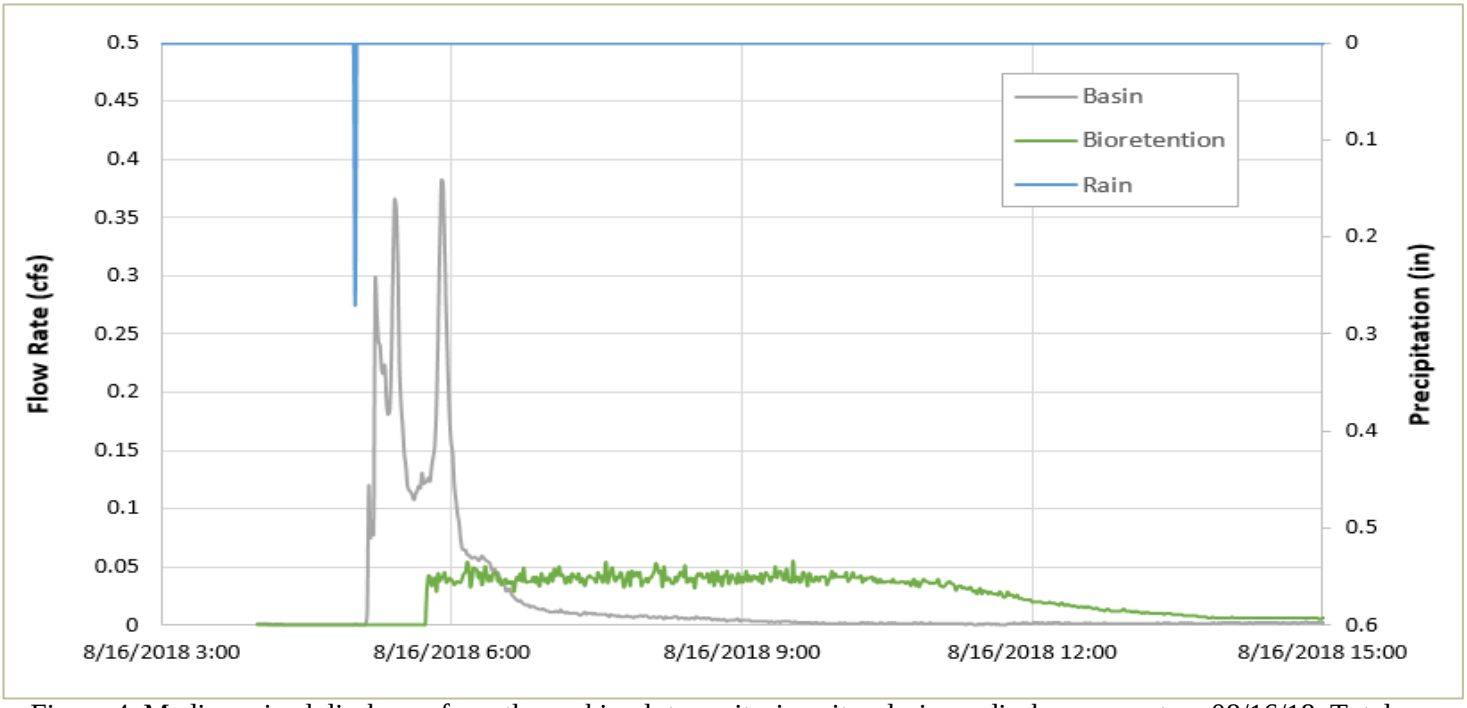


Figure 4. Medium-sized discharge from the parking lot monitoring sites during a discharge event on 08/16/18. Total precipitation for this event was recorded at 0.27 inches.

Green Infrastructure Monitoring – Investigation of Soils for Green Infrastructure Implementation in Omaha – NE, Phase 2 (2018)

David Rus & Kellan Strauch, USGS Nebraska Water Science Center

Research Objectives:

- To characterize the impacts of a green infrastructure project on the local water balance during storm events.
- To relate those impacts to the role of local, urban soils.
- To demonstrate green infrastructure performance in the soils and climate of Omaha, Nebraska for comparison to other sites nationwide.

Monitoring Approach: The project site was selected through consultation with the City of Omaha in anticipation of the design and construction of a green infrastructure project at their Sewer Maintenance Facility near 69th and Q Streets. The project included permeable pavers in sequence with a bioretention cell, and monitoring equipment was incorporated into the design. The project was designed in 2013, constructed in 2014, and non-winter monitoring occurred from 2015-18.

The water balance was measured in the bioretention cell in the following manner: inflow into the bioretention cell was measured by a cutthroat flume at one entrance to the cell and by a Palmer Bowlus flume to capture the flow entering the cell through the permeable pavers. Flow out of the cell through an underdrain was measured by a Palmer Bowlus flume installed on the underdrain pipe. Due to construction of the underdrain pipe at a slope greater than that specified in the design, the data from this underdrain flume was often compromised by critical velocities. Overflow leaving the cell through a standpipe during high-volume events was estimated by treating the standpipe opening as a weir and measuring the depth of water above the standpipe. Potential evapotranspiration was measured by a Campbell Scientific ET107 system, and rainfall was measured using a tipping bucket mechanism. Infiltration was estimated as the residual of that water balance.

Soil moisture was monitored using Time Domain Reflectometry probes distributed within and adjacent to the bioretention cell in an attempt to identify wetting fronts moving vertically as well as laterally. However, these data were problematic in their collection and interpretation, likely as a result of preferential flow-paths being introduced by the sensor cables in the clay-loam soils, especially when standing water was occurring. The utility of these data is still being assessed, and only a subset of the probe data will likely be incorporated into the final report.

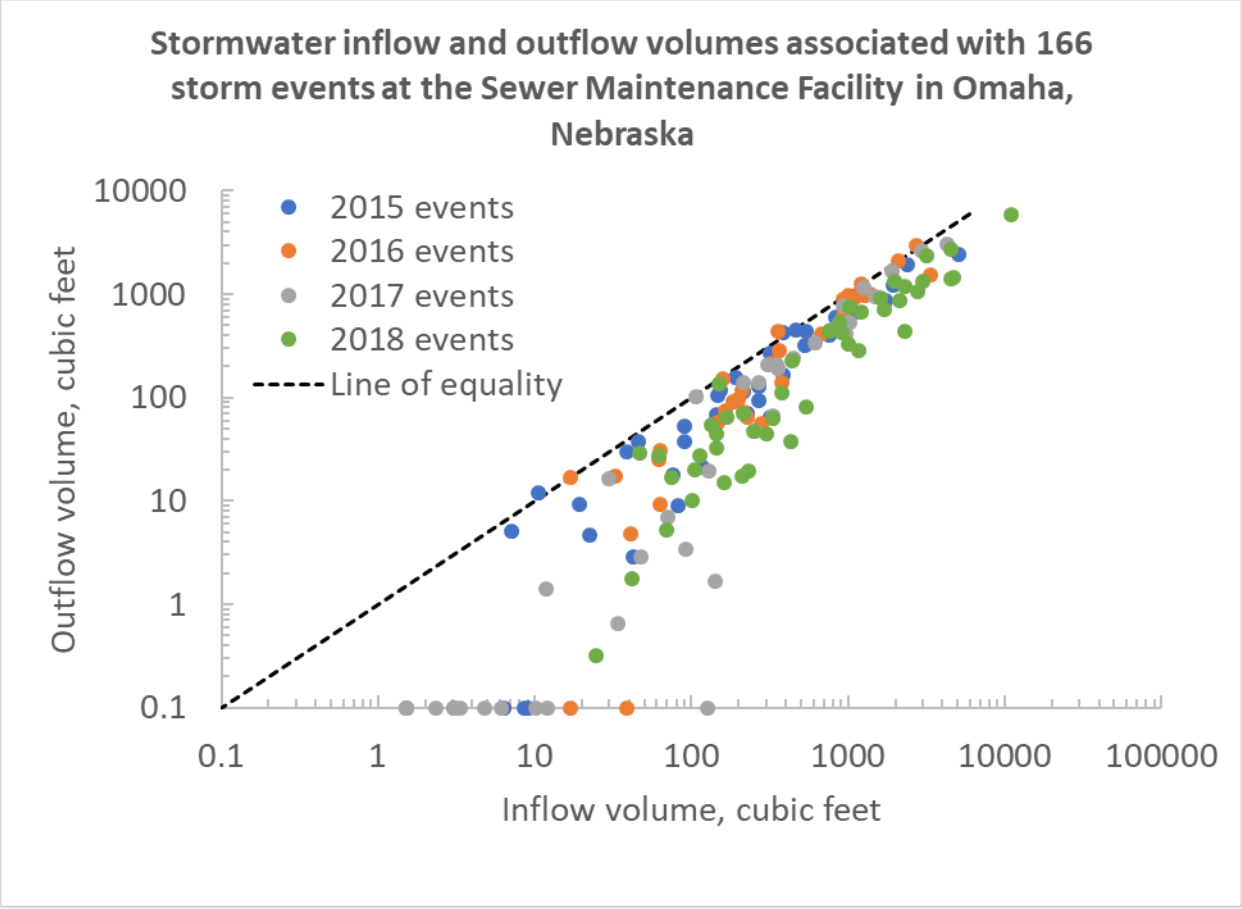
Preliminary Results:

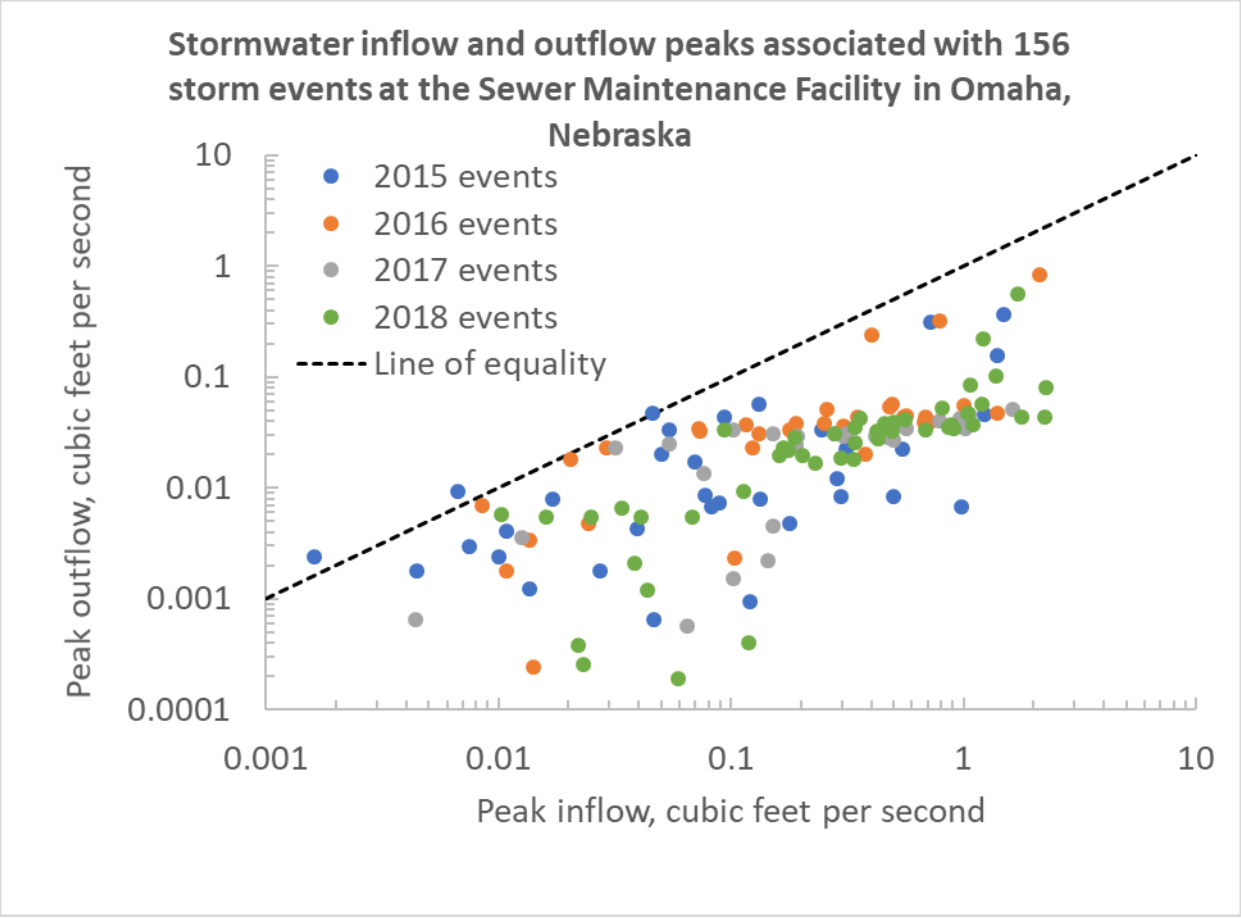
Monitoring at the site characterized the water balance components of 166 stormwater events from 2015-18. On average, the bioretention cell redirected approximately 43-percent of the stormwater volume away from the storm sewer through infiltration and evaporative processes. This and other metrics will be considered

locally when trying to identify ways to improve performance in other green infrastructure projects. Regionally, those metrics will be put in the context of other cities to evaluate how different soils and climatic conditions may influence the design and performance of otherwise similar green infrastructure projects.

Measured stormwater removed from the storm sewer system by the bioretention cell at the Omaha Sewer Maintenance Facility.

	Number of events	Inflow volume, cubic ft	Outflow volume, cubic ft.	Removal, cubic feet	Removal, percentage	Average peak reduction, percent	Maximum peak reduction, percent
Total	166	119,292	68,531	50,761	43%	79%	100%
2015	38	19,063	11,360	7,703	40%	73%	100%
2016	34	22,512	17,532	4,980	22%	76%	100%
2017	39	19,562	13,335	6,227	32%	89%	100%
2018	55	58,154	26,303	31,851	55%	91%	100%




Stormwater inflow and outflow peaks associated with 156 storm events at the Sewer Maintenance Facility in Omaha, Nebraska
2015 events
2016 events
2017 events
2018 events
Line of equality
Peak outflow, cubic feet per second
10
1
0.1
0.01
0.001
0.0001
0.001
0.01
0.1
1
10
Peak inflow, cubic feet per second

TRPP Report – Rodie/Arens
November 1, 2018

Project Title
Evaluating Regional Rain Garden Environmental Conditions, Functional Attributes, and Aesthetics over Time

Team Members:
Steven Rodie, Department of Biology, UNO
Rachael Arens, Omaha Northwest High School (ONW), OPS
Andy Szatko, MS4 Coordinator, City of Omaha Stormwater Program

Summary of the Funded Work/TRPP Support

Our work in 2018 paralleled the rain garden assessments completed in the first three years of the TRPP (2015-2017). For the fourth summer of the project, six gardens (two park, four residential) were tested in the Saddle Hills neighborhood in northwest Omaha. Infiltration rates were measured in each garden, and overall plant assessments were conducted (including total plant numbers, general health, relative growth) and other observed garden characteristics (including the impacts of unmanaged weed growth and sedimentation/poor infiltration caused by extreme rain events clogging soil porosity near garden inlets). A key aspect in 2018 was the use of infiltration equipment recommended by the Office of Research and Development at EPA. The equipment is small, easy for students to use and affordable, so it will help facilitate student data collecting in the future. Lastly, discussions with the City of Omaha led to ideas on emulating the water flow in a rain garden underdrain within a classroom setting, which will be pursued in follow-up engagement activities.

TRPP support is critical to our ability to study these gardens; cursory observations would occur if the funding were not available. The depth of study and comparison of year-to-year results not only provides ideas for curriculum development and hands-on learning, but it additionally provides valuable information as the City considers its investment in rain gardens and green infrastructure. Given I do not have a research lab at UNO and an established funding stream for green infrastructure research, the TRPP money enables research that would otherwise be difficult to complete. In addition to funding allocated work time, equipment was also purchased that will allow us to experiment with emulating soil and drainage conditions in a high school lab setting.

Significant Findings

- In 2018, infiltration capacity near forebays was relatively limited compared to other locations (as expected), but had increased in all gardens where runoff directly enters the garden forebay from the street. This may be due to an increase in overall plant rooting given the high level of weeds growing near and in forebays.
- There was no correlation between testing locations within sedge groupings and faster infiltration rates
- On average, overall infiltration rates continued to increase in 2018 compared to 2017 rates; excessive weed growth in some poorly maintained gardens, although unsightly, may add to infiltration rates due to the additional rooting.

- Plants have shown variable results relative to adaptability to wet/dry conditions, shade tolerance, overall survival, aggressive tendencies, and dwarf cultivars growing larger than anticipated

Post-Project K-12 Classroom Translation and Engagement

Rachael and I communicate regularly on TRPP project work as well as Service Learning projects conducted every semester. As in the past, ONW AP Environmental Studies students will be applying the rain garden assessment protocols to the rain gardens currently built on the ONW campus (as part of associated grant-funded projects with Rachael) and in the Saddle Hills neighborhood which is across the street from ONW. This fieldwork applies to a variety of curriculum objectives covering ecology, soils, etc., and allows students to gather and assess data after formulating thoughts about how the gardens and plants should be functioning.

Andy and I are in the process of assessing the compiled information and testing methods to see how they may support the City program to provide stormwater-related curriculum ideas to K-12 students and teachers (EPA Urban Waters Projects).

As an additional component, Rachael and I are in the process of building and testing 12" diameter x 24" tall plastic tubes filled with bioretention soil material, gravel underdrain material, and filter fabric that will emulate infiltration conditions in underdrained rain gardens in Omaha. The City is particularly interested in how different filter media work (or clog). Students will hypothesize how different configurations and types of layers will function and then create those conditions and run water through the tube to observe results. We are aiming to have students use the tubes this fall, but are still solving logistical issues related to weight and fabric integration into the materials column. If the testing is not completed this fall, it will be completed in the spring of 2019.

Mentor Impact

The ongoing mutual collaboration with Rachael continues to expand my awareness of high school science curriculum issues and the importance of interactive student learning opportunities at all levels. It allows me to gather a considerable amount of data which helps support my strong relationship with the City of Omaha, and it furthers City understanding of green infrastructure function and opportunities for data/analysis publication and sharing with other communities. The logistical problems that have arisen with the design of the infiltration lab testing equipment has been a good reminder of the creative side of research and the problem-solving that is embedded in research design.

Teacher Impact

Rachael has received significant recognition for her OPS science teaching, and she often credits her teaching success and productivity in part to TRPP project work. The TRPP project has led to not only additional service learning coursework with UNO/ONW students, but the expanded planning/design of an outdoor classroom at ONW that includes a solar panel donated by Nebraskans for Solar, and a rain garden recognized by the National Geographic Next Generation Leaders Project Program. Rachael was a runner-up for Nebraska Teacher of the Year in 2017, and is currently a Board Member for the Nebraska Academy of Sciences. She has been formally accepted into the Ed.D

program at UNL, and would tentatively like to focus her research on the area of student benefits that are derived from hands-on research in high school science courses.

Student Impact

We both believe that the application of research and field-related information in sciences courses at ONW has benefitted student interest and involvement with science. I am able to work with her AP Environmental Studies students every semester in our combined UNO/ONW Service Learning projects, and even though we don't work on rain gardens directly, I believe I do see a higher level of student interest and problem-solving than I did four years ago. As we work with the City towards the final design for the in-class infiltration testing, we are planning to assess how students approach hypothesis development and testing. In our ongoing work, we believe that students have gained a lot from field testing, but that their ability to develop a hypothesis and then test it will be more controllable and documentable in a classroom environment – hence the desire to develop the testing equipment.

Publications/Presentations/Grants

Rachael and I had abstracts approved for two TRPP-related presentations conferences in 2018:

- *Enhancing Environmental Awareness, STEM Outcomes and Curriculum Benefits through Rain Gardens; A Successful Project Case Study Analysis* – International Low Impact Development Conference, Nashville, TN August 2018
- *Collaborative Rain Garden Design and Research: Enhancing Student Learning* – North American Association for Environmental Education, Spokane, WA October 2018

In addition, I presented plant assessment and infiltration information that has been generated with support from TRPP (with Andy Szatko, MS4 Coordinator, City of Omaha):

- *Infiltration and Plant Assessment of Existing Bioretention and Rain Gardens in Omaha, NE* – International Low Impact Development Conference, Nashville, TN August 2018

Future Plans

I plan to continue to work with the City of Omaha to assess the six gardens, and would like to formally add the rain garden at Omaha Northwest High School to the list (as well as other recently installed city gardens) whose performance relative to newly selected species of plants and new forebay designs would be valuable to monitor.

Rachael and I have submitted a successful grant proposal to the Greener Towns Funding Program administered by the Nebraska Statewide Arboretum/Nebraska Forest Service to expand the ONW Outdoor Classroom. The expansion will include an additional rain garden that is fed with water from the greenhouse cooling system, and will provide additional research opportunities for students.

BURNS McDONNELL

Final Report

City of Omaha, Nebraska

2018 Stormwater BMP Monitoring
Project No. 84726

Revision 1
12/21/2018

Final Report

prepared for

City of Omaha, Nebraska
2018 Stormwater BMP Monitoring
Omaha, Nebraska

Project No. 84726

Revision 1
12/21/2018

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
BMP	Best Management Practice
Creighton Prep	Creighton Preparatory School
EPA	Environmental Protection Agency
FWS	Free Water Surface
E. coli	*Escherichia coli*
NO3/NO2-N	Nitrate/Nitrite Nitrogen
NOAA	National Oceanographic and Atmospheric Administration
NWS	National Weather Service
P	Phosphorous
PVC	Polyvinyl Chloride
SMS	Soil Moisture Sensor
STB	Stilling Basin
TKN	Total Kjeldahl Nitrogen
TSS	Total Suspended Solids
TDS	Total Dissolved Solids
UNO	University of Nebraska Omaha
USGS	United States Geological Survey
VMC	Volumetric Moisture Content

EXECUTIVE SUMMARY

The City of Omaha, Nebraska has implemented a Stormwater Best Management Practice (BMP) monitoring program to evaluate performance of installed BMPs over a range of conditions and over time. During the 2018 Stormwater BMP Monitoring period, data was collected and evaluated at five BMP sites: Orchard Park, Creighton Prep, UNO Welcome Center, Albright Park, and Adams Park. Additionally, water quality sampling was conducted at four BMP sites: Orchard Park, Albright Park, Sewer Maintenance, and South Omaha Industrial Area (SOIA) Lift Station. Three sites – Orchard Park, Creighton Prep, and the UNO Welcome Center – were monitored in 2017, whereas Albright Park and Adams Park were included in the monitoring list for 2018. Installation of components and equipment for future monitoring was completed at an additional site, Dundee Elementary.

A variety of sensors were deployed including flow meters, pressure transducers (to measure water level), soil moisture sensors, rain gauges, temperature probes, and cameras. Data was interpreted to evaluate BMP performance. A synopsis of the work completed and results of the evaluation for each site are discussed in the sections below:

Orchard Park

The Orchard Park bioretention system is a two-cell system managing runoff from 1 acre of the adjacent residential neighborhood. Ponding water level, soil moisture, and temperature data was collected and evaluated. Water quality sampling was attempted for two rainfall events; however, no outflow was observed at the drain pipe discharge location into Cole Creek during either attempt. Data collected with monitoring equipment provided information regarding infiltration and movement of the subsurface wetting front. The wetting front moving vertically within the soil profile before extending outward into the adjacent in-situ soils. Larger rainfall quantities produce more deep infiltration and/or lateral infiltration than smaller rainfall events.

Figure ES-1: Orchard Park Bioretention System Looking South

Creighton Prep

The Creighton Prep bioretention system manages runoff for 9.8 acres on the school property. Ponded water level and flow meter data was collected and evaluated for the site. Ponding and outflow data from the 2018 monitoring period suggests that the bioretention system underdrain dewaters at a rate up to 3 cfs when the maximum ponding depth is reached. Ponding data from the 8.25-inch rainfall event on 8/20 confirms that the bioretention system reached its max ponding depth during that event.

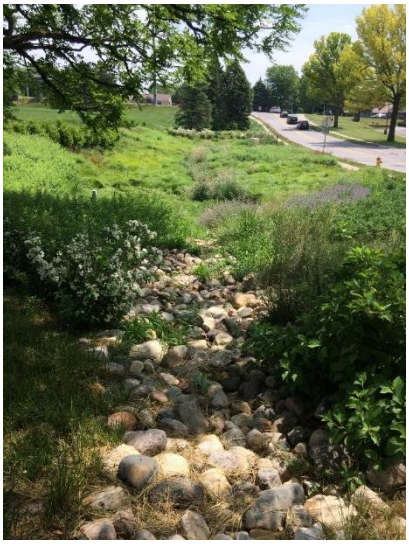

Figure ES-2: Creighton Prep Bioretention System Looking East

UNO Welcome Center

Figure ES-3: UNO Welcome Center Bioretention System Looking East

The UNO Welcome Center bioretention system manages runoff from the Welcome Center building. Ponded water level, soil moisture, and temperature data was collected at the site. This bioretention system dewaters the bioretention adjacent to bioretention infiltration trench B quickly and before it reaches maximum ponding depth indicating that the system is over sized for its drainage area. Results of the 2018 monitoring indicate that a rain event approaching 8.25 inches is necessary to maximize ponded storage in the bioretention adjacent to bioretention infiltration trench A. The 2018 subsurface soil temperature analysis results support 2017 conclusions that bioretention soils maintain a higher temperatures in winter months than in-situ soils.

Albright Park

The bioretention at Albright Park is a new 0.5-acre facility, with newly established vegetation, that was constructed in 2017. The site manages runoff from approximately 10 acres, 4 acres of drainage area received via inlet pipe and 6 acres of contributing area within the Park itself. Data for subsurface and ponded water level as well as water quality samples were collected at the site. Results of the 2018 monitoring period suggest that the bioretention will dewater in less than 15 hours for approximately less than a 1-year event, which is less than the discharge time of 24 - 48 hours for a bioretention system, described in the Omaha Regional Stormwater Design Manual.

Figure ES-4: Albright Park Bioretention Looking South

Adams Park

The Adams Park wetlands and detention facility manages stormwater runoff from 387 acres of drainage area. The 14-acre wetland site improves water quality, provides wildlife habitat, and detains the 100-year storm event. Flow metering data, provided by GBA, and ponded water level data were evaluated for the site. Monitoring results from 2018 verify the design stage-storage table and demonstrate over 16.8 million gallons of volume reduced during wet weather during the 2018 recreational season from 4/1/18 to 10/31/18.

Figure ES-5: Adams Park Wetland Looking North from Future Park Road

Dundee Elementary

Camera mounting posts were installed at the Green Infrastructure Outdoor Classroom at Dundee Elementary, which was constructed in 2017 to manage runoff at the site and to serve as an outdoor classroom for students. The camera will be used by students and teachers to observe vegetation growth and rain garden ponding during rain events at various locations on the site. It was proposed that a manometer be installed on the rain silo. The City/school will be completing this task at a later date.

Figure ES-6: Dundee Elementary School Looking South

Sewer Maintenance Facility

The City of Omaha Sewer Maintenance Facility manages stormwater runoff from 0.95 acres. The site includes three BMPs: permeable pavement, bioswale, and bioretention. Both the permeable pavement and the bioswale discharge to the bioretention. Water quality samples were collected at the curb cut to the bioswale, the outflow from the permeable pavement into the bioretention system, and at the outflow from the bioretention system. Results of the water quality sampling suggest that the treatment train of permeable pavement, bioswale, and bioretention BMPs at the site effectively removed Total Kjeldahl Nitrogen (TKN), Nitrate/Nitrite Nitrogen (NO3/NO2-N), Total Dissolved Solids (TDS), and Total Suspended Solids (TSS).

Figure ES-7: City of Omaha Sewer Maintenance Facility Looking West

SOIA

Figure ES-8: SOIA Bioretention System Looking East

A bioretention system and permeable underground stormwater storage was constructed as part of the 2014 SOIA lift station project. The bioretention system mostly manages stormwater from the local site, where runoff from the parking lot is conveyed overland to the bioretention system. Water quality samples were collected at the bioretention system, which observed very high concentrations of bacteria in the surface ponding area, greater than two orders of magnitude higher than the EPA Recreational Water Quality Criteria.

1.0 INTRODUCTION

The City of Omaha, Nebraska (City) has implemented a Stormwater Best Management Practice (BMP) monitoring program to evaluate performance of several BMP sites across the City. This report summarizes the sites evaluated during the 2018 monitoring period and the data collected, organized by site.

1.1 Background

In 2015 the City of Omaha partnered with Burns & McDonnell to develop a detailed implementation plan for the Draft BMP Monitoring Plan, dated November 5, 2014. The sites described in the Draft BMP Monitoring Plan include: Creighton Preparatory School (Creighton Prep) Bioretention; Florence Bioretention; Fort Omaha Metropolitan Community College (MCC) Bioretention; Orchard Park Bioretention and Rain Garden; and University of Nebraska Omaha (UNO) Welcome Center Bioretention.

In 2016, BMP monitoring was implemented at the Creighton Prep and Orchard Park sites. In 2017, BMP monitoring continued at Creighton Prep and Orchard Park, additional BMP monitoring equipment was selected and installed at the UNO Welcome Center, and detailed implementation plans were developed for the Dundee Elementary and Adams Park sites. In 2018, BMP monitoring continued at Creighton Prep, Orchard Park, and the UNO Welcome Center, additional BMP monitoring equipment was procured and installed at the Albright Park and Adams Park sites. Table 1-1 depicts this BMP monitoring schedule.

Table 1-1: BMP Monitoring Schedule

Monitoring Site	Site Plan Developed	Site Plan Implemented	Water Quality Sampling
Orchard Park	2015	2016, 2017, 2018	2015, 2018
Creighton Prep	2015	2016, 2017, 2018	2016
UNO Welcome Center	2015	2017, 2018	
Albright Park	2018	2018	2018
Adams Park	2017	2018	
Dundee Elementary	2016	2017	
Sewer Maintenance Facility			2018
SOIA			2018

1.2 Data Collection

Data was collected at each site based on the monitoring plans developed in conjunction with the City. Specific data collected for each site is described in Section 2.0 of this report and generally as follows:

- Water Level from Pressure Transducer Data
- Soil Moisture Sensor Data
- Flow Meter Data
- Water Quality Sampling Data

1.3 Rainfall Classification

The City of Omaha, Nebraska defines water quality control as control of the first 0.5 inches of stormwater runoff. Based on this description, the term water quality runoff event refers to an event that produces 0.5 inches of stormwater runoff from the contributing area. Rainfall events described by recurrence interval (i.e. 1-year event and 100-year event) refer to the Atlas 14 precipitation frequency estimates, provided in Appendix A.

2.0 MONITORING SITES

2.1 Orchard Park

2.1.1 Site Description

The Orchard Park site is located on the western edge of Orchard Park near the intersection of N 66th Street and Kansas Avenue. The bioretention system was constructed in 2009 and receives runoff from the street through two curb-cuts which serve approximately 1.0 acre of residential drainage area. For rain events when the bioretention system capacity is exceeded, stormwater runoff bypasses the bioretention system and enters adjacent storm inlets. The base of the bioretention system is approximately 900 square feet.

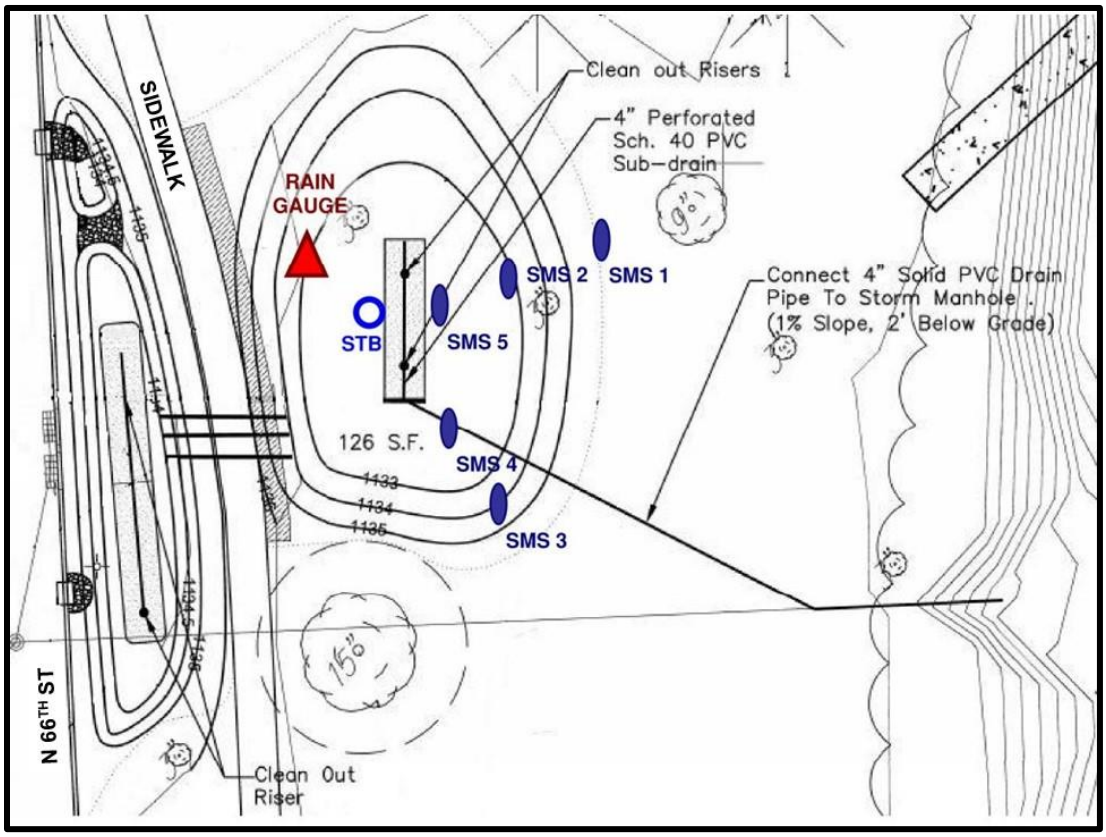

Figure 2-1: Orchard Park Site Layout

2.1.2 Monitoring

The following equipment was used to collect data at the Orchard Park site:

- Soil Moisture Sensors
  - ECH20 GS3 Soil Moisture Sensors by Decagon Devices, Inc.
- Pressure Transducer

  - WL16 Pressure Transducer and Data Logger Combination by Global Water
- Rain Gauge
  - ECRN-100 High Res Rain Gauge by Decagon Devices, Inc.
- Data Loggers
  - Em50 Data Loggers by Decagon Devices, Inc.

Three Em50 data loggers controlled the collection of data from the rain gauge and the soil moisture sensors (SMS). A total of ten soil moisture sensors were installed during previous monitoring efforts at depths of 6 inches and 36 inches below grade at five locations. The ponding depth within the bioretention system was monitored using a pressure transducer. The pressure transducer was mounted on the inside of the PVC pipe at ground level and recorded the ponding depth every 5 minutes. Perforations, 3/8-inch in diameter, were drilled into 4-inch polyvinyl chloride (PVC) pipe on 1.5-inch centers.

2.1.3 Period of Record

During the 2018 monitoring period, monitoring equipment was installed and replaced at different times due to the condition of the equipment. The rain gauge was installed on 6/6/18 and the pressure transducer was installed on 7/31/18. The soil moisture sensors remained in place year-round.

2.1.3.1 Soil Moisture Data

ECH20 GS3 Soil Moisture Sensor data was collected on site from January through October at five sites with some data gaps. Soil moisture sensor 1B at 36-inch depth and sensor 3B at 36-inch depth, were inoperable during the 2018 monitoring period. Soil moisture sensor data is provided electronically.

2.1.3.2 Rain Gauge Data

The rain gauge was installed in June but for the 2018 monitoring period no viable rainfall data was recorded. This rain gauge also had issues during the 2017 monitoring period. It is recommended that this rain gauge not be used in the future.

2.1.3.3 Pressure Transducer Data

A Global Water WL 16 pressure transducer was installed in July to obtain ponding depth on site through October. However, the pressure transducer stopped recording data on 9/28/18 for reasons unknown. Consistent recording of water level has been a reoccurring issue with the Global Water pressure transducers in previous years of monitoring. Recorded ponding depth data has been provided electronically.

2.1.3.4 Water Quality Sampling Data

Water quality sampling was attempted on 9/7/18 and 9/18/18 at the Orchard Park site. Inflow water quality samples were collected; however, no outflow from the 4-inch drain pipe at Cole Creek was observed during those events. Therefore, the inflow water quality samples were not submitted to the lab as there were no outflow samples for comparison of water quality constituents. Based on observations of the Orchard Park site during rain events, it is unclear as to the storm intensity and runoff volume that would be required to produce an effective sampling condition with sufficient inflow and outflow. Due to these unknowns and the two unsuccessful attempts, no further sampling was attempted, and no water quality data was obtained during the 2018 monitoring period.

2.2 Creighton Prep

2.2.1 Site Description

The Creighton Prep site is located on the southern edge of the Creighton Preparatory High School near the intersection of N 72nd Street and Western Avenue. The bioretention system at Creighton Prep was constructed in spring 2014. Most of the stormwater runoff to the bioretention system is generated by a parking lot to the west, where it enters the bioretention system through a 24-inch storm sewer. The contributing drainage area to this 24-inch storm sewer is 2.1 acres of 80% impervious land cover. The bioretention system receives additional runoff via overland flow from a 7.7-acre irrigated grass turf sports field to the north. A 4-inch PVC pipe underdrain runs the length of the bioretention system, regulating surface flow through the soils and subsurface drainage. For storm events producing runoff greater than 0.5-inches the cobble stone overflow weir is overtopped and the area inlet collects and conveys stormwater to the 36-inch storm sewer downstream in Western Avenue.

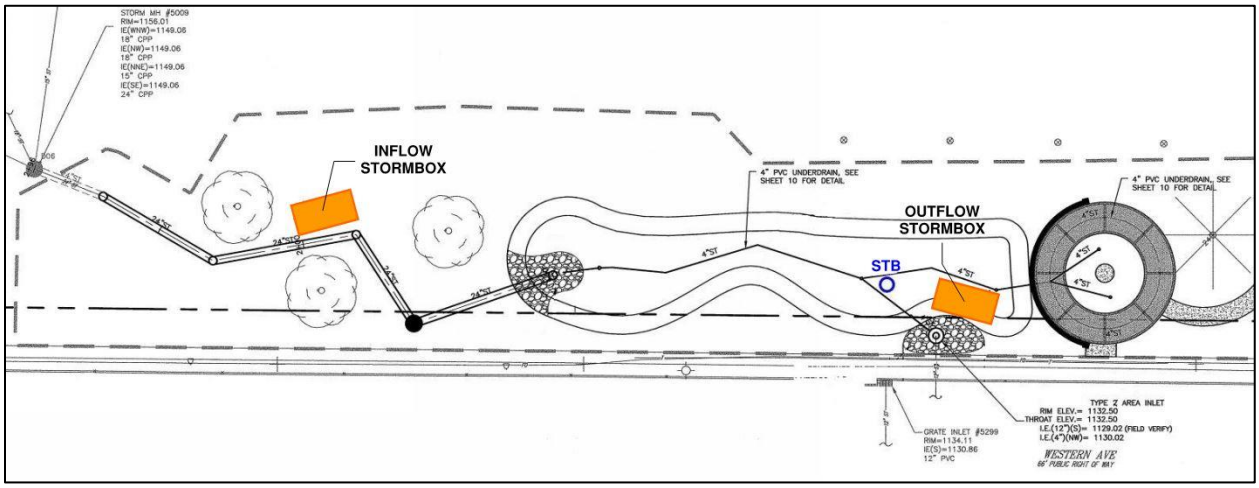

Figure 2-2: Creighton Prep Site Layout

2.2.2 Monitoring

The following equipment was used to collect data at the Creighton Prep site:

- Flow Meters
    - 2150 Area Velocity Module by Teledyne ISCO
- Pressure Transducers
    - WL16 Pressure Transducer and Data Logger Combination by Global Water

Two flow meters were installed at Creighton Prep. One area velocity meter was installed in the 24-inch inflow pipe and another area velocity meter was installed in the 12-inch area inlet outflow pipe.

The ponding depth within the bioretention system was monitored using a pressure transducer. The pressure transducer was mounted on the inside of the PVC pipe at ground level and recorded the ponding depth every 5 minutes. Perforations, 3/8-inch in diameter, were drilled into 4-inch polyvinyl chloride (PVC) pipe on 1.5-inch centers.

2.2.3 Period of Record

During the 2018 monitoring period, the rain gauge, pressure transducer, and area velocity meters were installed from June through October.

2.2.3.1 Flow Meter Data

The 2150 area velocity flow meters were installed on 6/6/18. During this monitoring period no reliable inflow data was recorded due to equipment malfunction. Outflow data was sporadic, therefore, only outflow data for 7/2/18 to 8/23/18 has been provided for the 2018 monitoring period.

2.2.3.2 Pressure Transducer Data

A Global Water WL 16 pressure transducer was installed on 6/11/18 and left in-place through October. However, the pressure transducer only recorded ponding depth from June through September. On 9/28/18, the pressure transducer stopped recording data for unknown reasons. Recorded ponding depth data has been provided electronically.

2.2.4 Water Quality Sampling Data

No water quality samples were collected during the 2018 monitoring period at Creighton Prep.

2.3 UNO Welcome Center

2.3.1 Site Description

The UNO Welcome Center site is located on the west side of the University of Nebraska - Omaha campus at 6001 Dodge Street near the Welcome Center. Runoff from the Welcome Center building, conveyed through two 8-inch drain pipes east of the bioretention system, constitutes most of the drainage to the bioretention system at the UNO Welcome Center site. The bioretention system was constructed in 2012. Two bioretention infiltration trenches, Type A and Type B (as indicated in Figure 2-3) tie into a 4-inch PVC pipe underdrain which regulates the subsurface drainage. For the Type B bioretention infiltration trench, ponding depths greater than 1 foot overtop the segmental retaining wall into the Type A bioretention infiltration trench. For the Type A bioretention infiltration trench, ponding depths greater than 1 foot overtop the precast wall cap unit onto the river rock apron, where the trench drain inlet collects and conveys stormwater to an existing 4-inch PVC pipe.

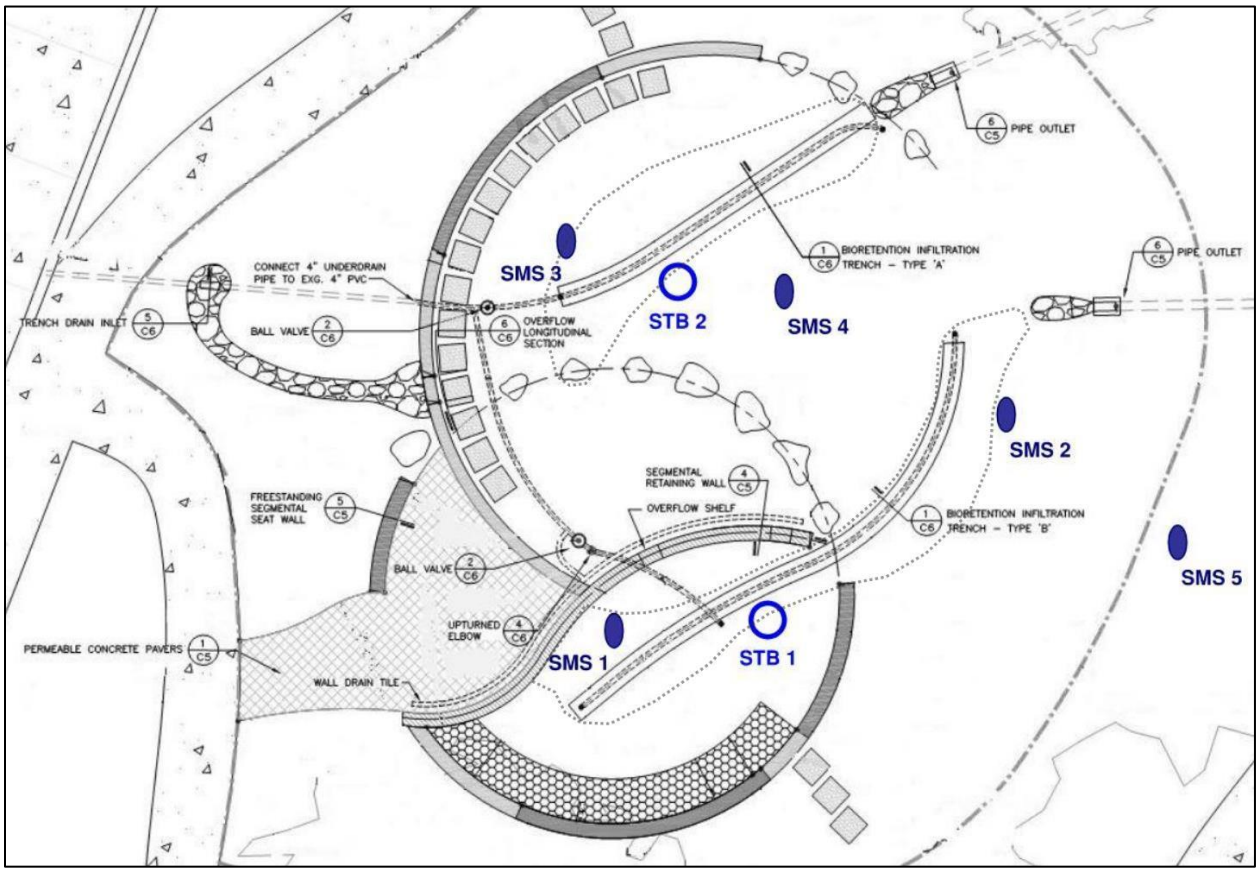

Figure 2-3: UNO Welcome Center Site Layout

2.3.2 Monitoring

The following equipment was used to collect data at the UNO Welcome Center site:

- Soil Moisture Sensors
    - 25 Campbell Scientific (Models: CS655-U-L40-PT-DS, CS655-U-L30-PT-DS, and CS655-U-L25-PT-DS) Soil Moisture Sensors
- Pressure Transducers
    - 2 Campbell Scientific CS451-75-SA-7-SN Pressure Transducers
- Data Loggers
    - Campbell Scientific CR6-NA-ST-SW Data Logger
- Camera
    - 2 Cameras with Network Video Recording (NVR)

The soil moisture sensors were installed at five locations in and around the bioretention system. At each of the five locations, a sensor was buried at 6 inches, 12 inches, 18 inches, 24 inches, and 30 inches below ground surface. The sensors recorded volumetric moisture content, temperature, and electric conductivity every 15 minutes.

The ponding depth within the bioretention system was monitored using a pressure transducer at two locations. The pressure transducers were mounted on the inside of a 4-inch PVC pipe with 3/8-inch perforation holes on 1.5-inch centers and recorded the ponding depth every 5 minutes.

2.3.3 Period of Record

During the 2018 monitoring period, the period of monitoring for the two pressure transducers and the 25 soil moisture sensors was year-round.

2.3.3.1 Soil Moisture Sensor Data

Campbell Scientific Soil Moisture Sensor data was collected on site at five locations from January through October. Soil moisture sensor data is provided electronically.

2.3.3.2 Pressure Transducer Data

Campbell Scientific pressure transducers recorded ponding depth on site at two locations from January through October. Though the pressure transducers were recording responses to precipitation events year-round, the validity of the data was suspect during winter months with consistent freezing temperatures, therefore, water level data from the pressure transducers was only considered from March through

October during the 2018 monitoring period. Recorded ponding depth data has been provided electronically.

2.3.3.3 Water Quality Sampling Data

No water quality samples were collected during the 2018 monitoring period at the UNO Welcome Center bioretention system.

2.4 Albright Park

2.4.1 Site Description

The Albright Park bioretention site is located on the east side of Albright Park, south of Gilmore Avenue and west of Highway 75. The bioretention site was constructed in 2017 and receives runoff from approximately 10 acres of drainage area: 6 acres of direct runoff from the park and 4 acres of drainage area from the south. The 4 acres of contributing area south of Albright Park enter a storm inlet on the west end of Madison Circle and is subsequently piped to the site. That flow then enters Albright Park at the southeast corner of the site and is conveyed to the bioretention system via meandering channel. The bioretention system has a perforated underdrain that ties into the outlet control structure. Ponding in the bioretention system is controlled by an AgriDrain grated outlet structure, containing an inline weir, which discharges water to a 12-inch outlet pipe when either the grated top and/or internal weir elevation is exceeded. The 12-inch outlet pipe taps into the recently constructed Gilmore Avenue separate storm sewer that then discharges to the South Barrel Outfall Sewer east of the site.

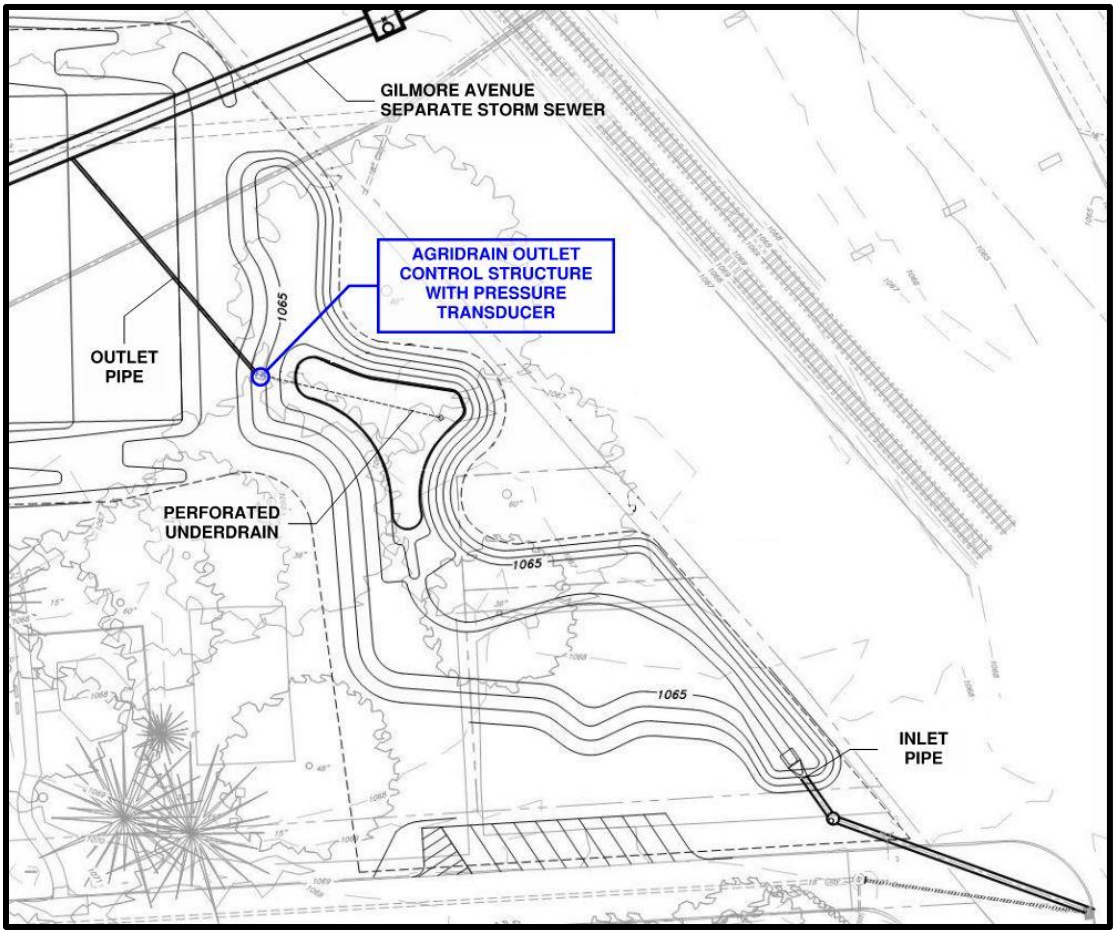

Figure 2-4: Albright Park Site Layout

2.4.2 Monitoring

The following equipment was used to collect data at the Albright Park site:

- Pressure Transducer
    - HOBO U20L-04 Water Level Logger by Onset

Both the subsurface and surface water level within the bioretention system was monitored using a pressure transducer that recorded water level every 5 minutes. The pressure transducer was inserted into a 2-inch polyvinyl chloride (PVC) pipe with 1/2-inch perforation holes on 1.5-inch centers. The pressure transducer was installed in the AgriDrain outlet structure, mounted on the upstream side of the inline weir, as shown in Figure 2-5.

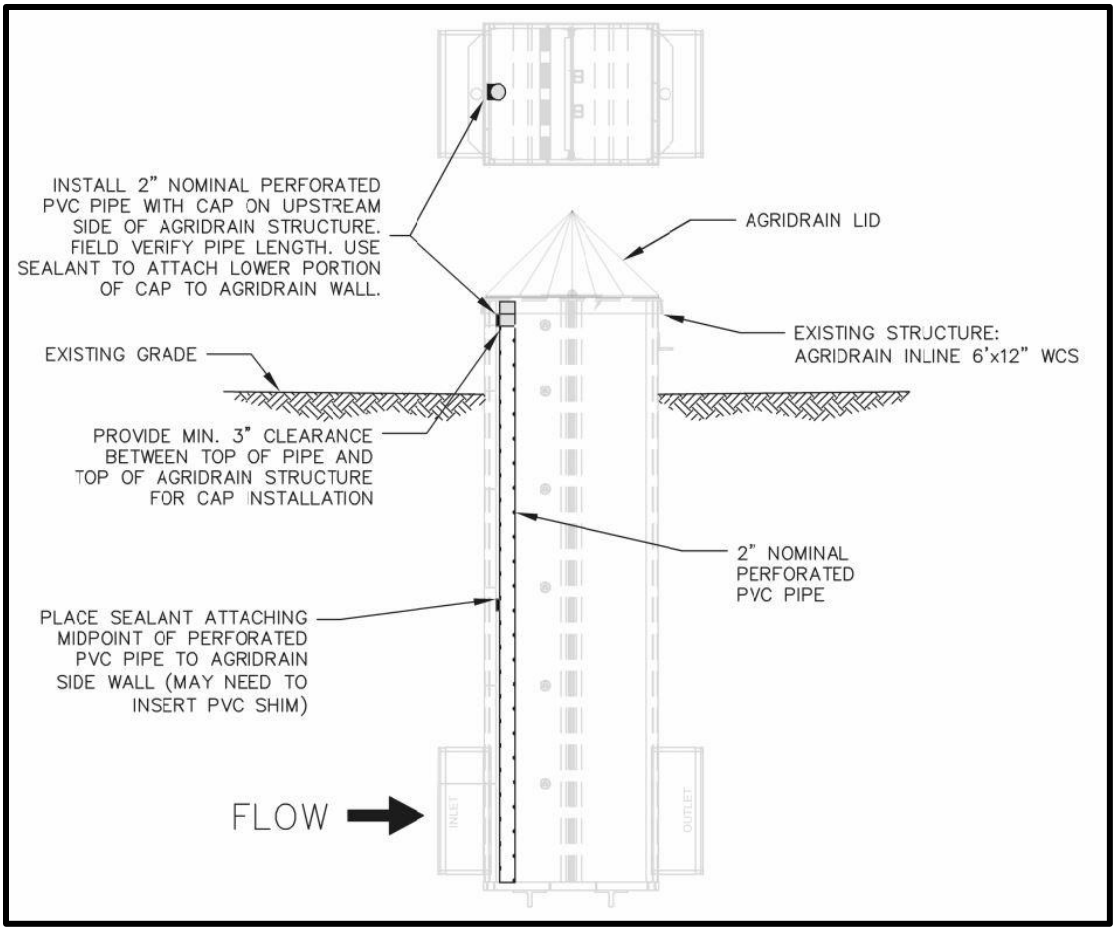

Figure 2-5: Albright Pressure Transducer Installation

2.4.3 Period of Record

During the 2018 monitoring period, water level data was collected at Albright Park from 7/31/18 to 10/30/18. Additionally, water quality samples were collected for one rainfall event on 9/20/18.

2.4.3.1 Pressure Transducer Data

A HOBO U20L-04 pressure transducer was installed on 7/31/18 within the AgriDrain outlet control structure to monitor water level at the bioretention site. The pressure transducer collected water level data from the date of installation through October. Pressure transducer data has been provided electronically.

2.4.3.2 Water Quality Sampling Data

Water quality samples were collected on 9/20/18 at the inlet pipe and from the AgriDrain outlet control structure, on the upstream side of the inline weir. Inflow and outflow water quality samples were submitted to Midwest Laboratories on 9/21/18 and subsequently processed.

2.5 Adams Park

2.5.1 Site Description

The Adams Park site is located on the west side of John A. Creighton Boulevard between Bedford Avenue and Maple Street. The 14-acre wetland detention facility that provides up to 77 acre-feet of storage to detain the 100-year event, was constructed in 2014 as part of the City of Omaha's Combined Sewer Overflow (CSO) Long Term Control Plan. Stormwater Runoff from 387 acres of drainage area enter the southwest corner of the facility via two basin inlet pipes 72 and 84 inches in diameter. The basin outlet structure on the north east corner of the site controls the discharge of stormwater through two 48-inch basin outlet pipes into the downstream combined sewer system.

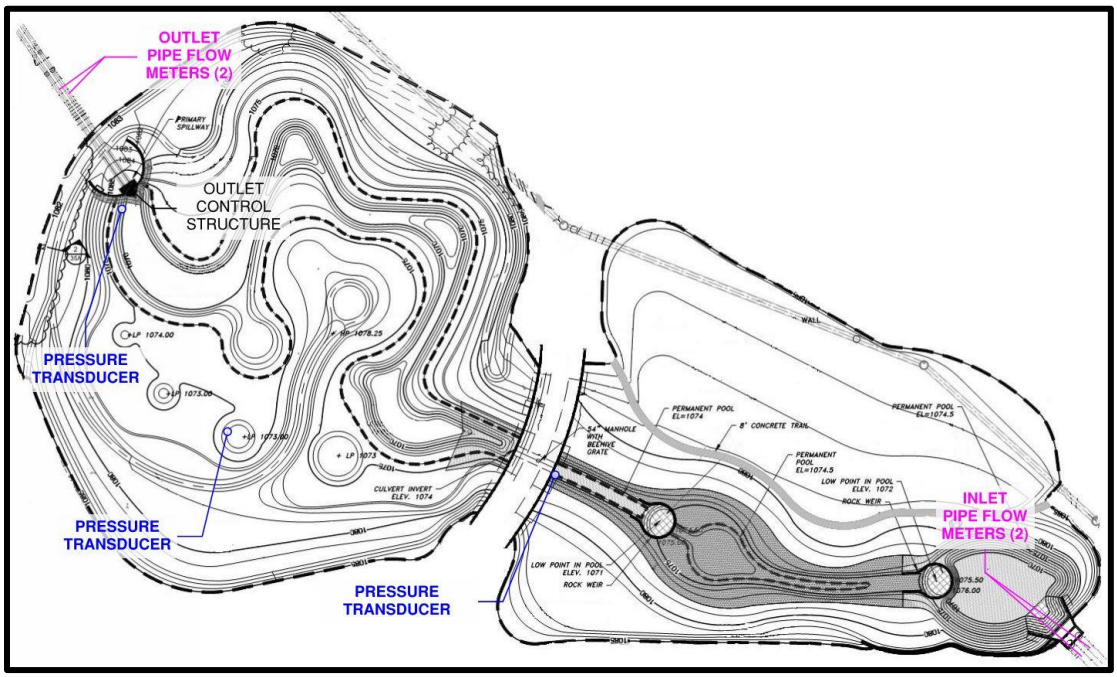

Figure 2-6: Adams Park Site Layout

2.5.2 Monitoring

The following equipment was used to collect data at the Adams Park site:

- Flow Meters –installation and data collection by George Butler Associates, Inc. (GBA)
  - Inflow: Laserflow Meters
  - Outflow: 2150 Area Velocity Meters
- Pressure Transducers
  - 3 HOBO U20L-04 Water Level Loggers by Onset

A total of three pressure transducers were installed, one upstream of the culvert beneath the future park road, one in a wetland micropool on the west side of the site, and one adjacent to the basin outlet structure. The pressure transducers were installed within polyvinyl chloride (PVC) pipe with 1/2-inch perforation holes on 1.5-inch centers, anchored to T-posts driven into the ground. The pressure transducers recorded the ponding depth every 5 minutes. The flow meters, installed and maintained by GBA, recorded flowrate in the two basin inflow pipes and two basin outflow pipes every 5 minutes. Flow meter data from March through October was provided to Burns & McDonnell to use in conjunction with the pressure transducer data for the Adams Park analysis.

2.5.3 Period of Record

During the 2018 monitoring period, monitoring equipment was installed at different times. GBA conducted flow metering from March through September, and at the request of the City of Omaha, extended flow metering through October. The pressure transducers were installed by Burns & McDonnell and the City of Omaha on 7/31/18 and removed on 10/29/18.

2.5.3.1 Flow Meter Data

GBA conducted flow metering at Adams Park. Comprehensive flow meter data for the two basin inflow pipes and two basin outflow pipes for the period from April through October was provided to Burns & McDonnell.

2.5.3.2 Pressure Transducer Data

Three pressure transducers were installed at Adams Park on 7/31/18 and removed from the site on 10/29/18. The pressure transducer recorded data continuously throughout this time period.

2.5.3.3 Water Quality Sampling Data

No water quality samples were collected during the 2018 monitoring period.

2.6 Dundee Elementary

2.6.1 Site Description

A site visit was completed on 7/31/18 at the Dundee Elementary Green Infrastructure Outdoor Classroom to install the four mounting posts for the monitoring camera. At the time of the mounting post installation, the monitoring camera was in the possession of the school principal and was to be used by the school once students reported back in early August. Installation of the rain barrel manometer is proposed for future monitoring efforts by the City and Dundee Elementary School.

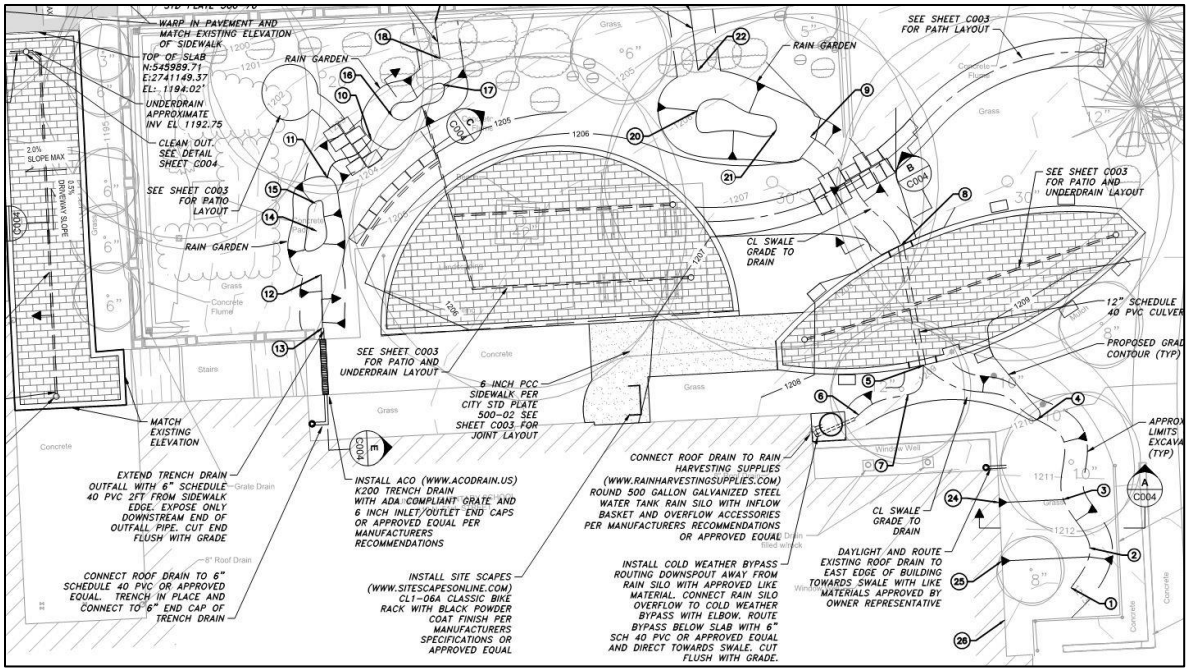

Figure 2-7: Dundee Elementary Site

2.6.2 Monitoring

No monitoring data was collected during the 2018 monitoring period at the Dundee Elementary site.

2.7 Sewer Maintenance Facility

2.7.1 Site Description

The City of Omaha Sewer Maintenance Facility is located at 6880 Q Street. The bioretention system receives inflow from a curb cut and from the underdrain pipe of a permeable pavement system, located on site. Outflow exits the bioretention system via an underdrain pipe and a high flow overflow structure that ties directly into the existing storm sewer.

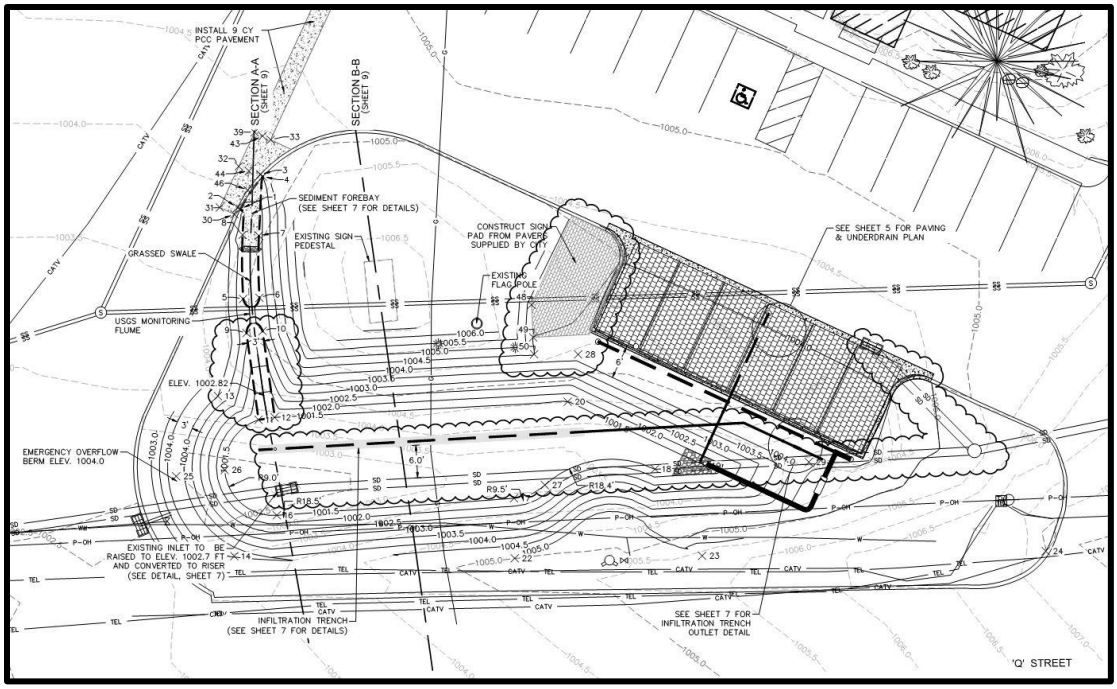

Figure 2-8: Sewer Maintenance Site

2.7.2 Monitoring

No monitoring equipment was used to collect data at the Sewer Maintenance site. The only monitoring that occurred at this location during the 2018 monitoring period was water quality sampling.

2.7.3 Water Quality Sampling Data

Water quality samples were collected on 9/20/18 at the site. Inflow samples were collected at the curb cut to the bioswale and the underdrain pipe from the PaveDrain permeable pavement system. Outflow samples were collected at the bioretention underdrain monitoring manhole, which has an access flume for monitoring. Inflow and outflow water quality samples were submitted to Midwest Laboratories on 9/21/18 and subsequently processed.

2.8 South Omaha Industrial Area (SOIA)

2.8.1 Site Description

SOIA is a lift station that pumps high-strength industrial waste, generated by local meat packing facilities, to the wastewater treatment plant. The bioretention system implemented to treat the stormwater runoff from the industrial lift station was completed in 2014. Parking lot drainage is conveyed to an underground detention system and the bioretention system receives surface runoff from the access drives on the west side of the building.

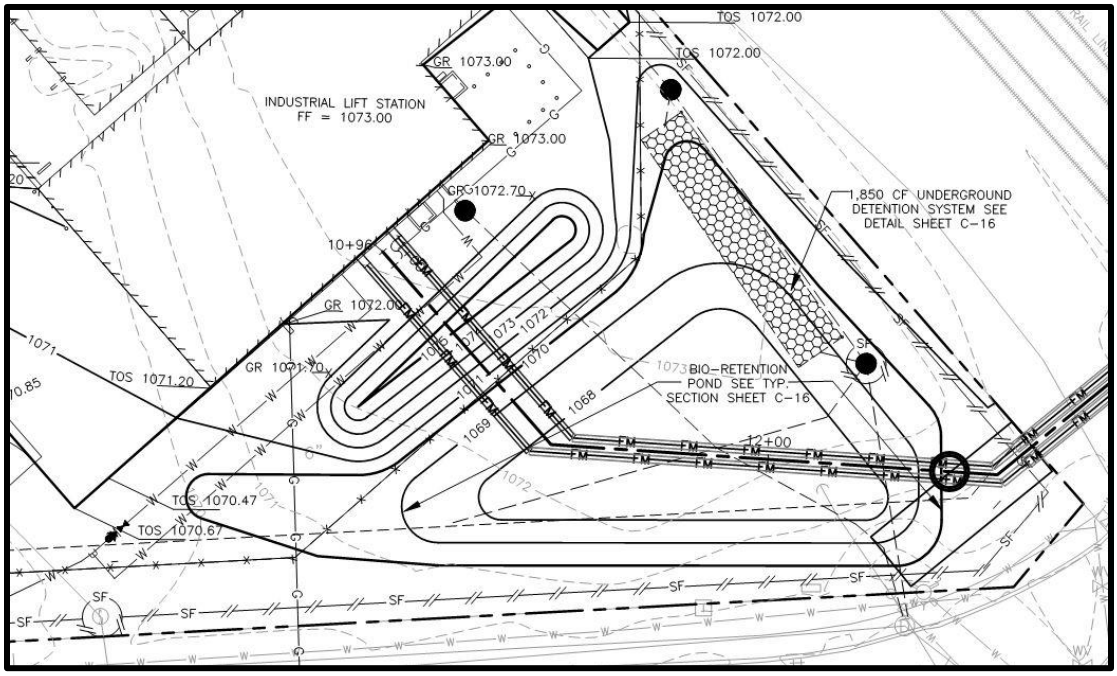

Figure 2-9: SOIA Site

2.8.2 Monitoring

No monitoring equipment was used to collect data at the SOIA bioretention site. The only monitoring that occurred at this location during the 2018 monitoring period was water quality sampling.

2.8.3 Water Quality Sampling Data

Water quality samples were collected on 9/20/18 at the bioretention system site. Inflow samples were collected at the western edge of the bioretention system where surface runoff enters the facility. The invert of the bioretention underdrain was submerged in the downstream manhole, therefore, the outflow samples collected were grab samples from surface ponding in the bioretention system. Inflow and outflow water quality samples were submitted to Midwest Laboratories on 9/21/18 and subsequently processed.

3.0 SITE WEATHER CONDITIONS

3.1 Data

Daily weather summaries and hourly precipitation data for the Omaha Eppley Airfield weather station from the National Oceanographic and Atmospheric Administration (NOAA) was used to in lieu of collected rainfall data due to past issues with on-site rain gauges and the inoperability of the Orchard Park rain gauge during the 2018 monitoring period. Weather data was obtained from the NOAA National Climatic Data Center website, per the Climate Data Online portal (https://www.ncdc.noaa.gov/cdo-web/). Table 3-1 and Table 3-2 summarize the daily rainfall and daily maximum temperatures, respectively, for the period from 4/1/18 through 10/31/18. Appendix A contains complete daily weather summaries and hourly precipitation information, downloaded from the NOAA website.

Table 3-1: Daily Precipitation (inches)

Day	April	May	June	July	August	September	October
1	0	0.1	0.38	0.11	0	0.24	0.18
2	0	0.28	1.04	0	0	0.35	0
3	0.01	0.05	0	0	0	0.25	0
4	0	0	0	0.86	0.2	0.67	0.04
5	0	0.05	0	0.03	0	0.06	0.09
6	0.02	0	0.06	0	0.14	0	0
7	0	0	0	0	0	0.05	0.45
8	0	0	0	0	0	0	0.86
9	0	0	0.03	0	0	0	0.76
10	0	0	0.38	0	0	0	0.01
11	0	0.29	0.88	0	0	0	0
12	0	0.01	0	0	0	0	0.12
13	0	0	0	0.4	0	0	0
14	0.07	0.18	0	0	0.15	0	0.25
15	0	0	0	0	0.33	0	0
16	0	0	0	0	0.35	0	0
17	0	0	0.13	1.06	0	0	0
18	0	0	0.82	0	0	0.09	0
19	0	0.01	1.6	0.02	2.16	0	0.01
20	0	0.18	0.47	0	6.17	0.91	0
21	0	0.02	0.05	0	0	0	0
22	0	0.71	0	0	0	0	0
23	0	0	0	0.01	0.02	0	0
24	0.04	0	0	0	0.1	0	0
25	0.13	0	0.69	0	0	0.64	0.17
26	0	0	0.02	0	0.04	0	0
27	0	0	0	0.01	0	0	0
28	0	0	0	0.43	0.13	0.05	0
29	0	0.06	0	0	0	0.06	0
30	0	0.03	0.34	0	0	0.09	0
31	-	0	-	0	0.02	-	0

Table 3-2: Daily Maximum Temperature (F)

Day	April	May	June	July	August	September	October
1	38	82	96	83	90	89	56
2	34	61	80	87	89	82	73
3	37	71	83	94	95	81	93
4	42	80	80	93	89	80	57
5	59	84	92	84	93	79	56
6	40	85	95	86	88	79	52
7	43	83	86	88	87	71	56
8	36	87	90	89	93	78	64
9	39	84	95	96	95	77	57
10	64	81	91	95	91	81	49
11	74	68	92	95	88	84	51
12	71	62	83	98	91	84	47
13	70	77	83	89	92	83	64
14	44	75	90	89	78	92	50
15	33	79	97	92	85	92	49
16	48	86	97	88	84	90	70
17	59	87	93	79	89	93	65
18	42	84	93	85	88	88	72
19	60	69	84	90	74	91	75
20	63	59	76	86	72	95	57
21	55	77	77	87	75	65	71
22	71	86	77	86	78	71	73
23	77	92	79	87	74	81	63
24	77	91	88	87	89	79	60
25	65	97	80	86	91	66	52
26	71	100	84	85	87	71	54
27	80	101	88	81	94	77	73
28	68	97	91	76	82	59	66
29	78	88	99	82	77	51	69
30	85	88	89	84	85	52	60
31	-	96	-	86	82	-	62

Average daily temperature fell within the normal range for July through October. Rainfall however was atypical for the 2018 monitoring period, as depicted in Figure 3-1. Cumulative rainfall was behind normal until August, when a record-setting 8.25 inches were accumulated from 8/19 to 8/20. As of 10/31, 2018 observed cumulative rainfall had exceeded the annual normal of 30.63 inches, resulting in a wetter than normal year, despite dry months in late Spring and early summer.

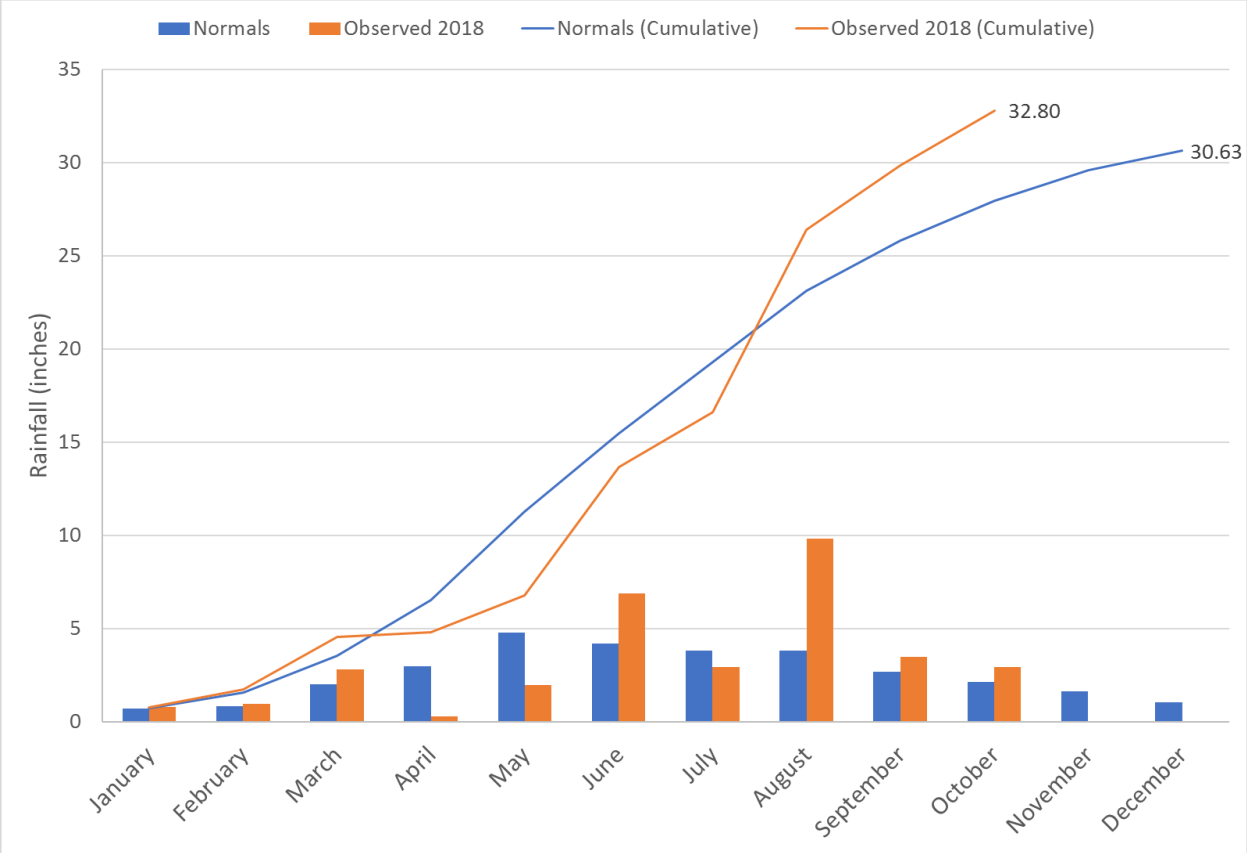

Figure 3-1: 2018 Comparison of Observed and Normal Rainfall

A summary of rainfall events 0.10 inches or greater between April and October was developed based on the NOAA rainfall data. There were no rainfall events in April that equaled or exceeded 0.10 inches in total depth. The 34 independent rainfall events depicted in Table 3-3 were identified based on a 6-hour minimum inter-event time.

Table 3-3: Rainfall Event Summary

Event No.	Rain Start	Rain End	Duration (hours)	Event Rainfall Total (in)
1	5/1/18 17:52	5/1/18 19:52	2.0	0.10
2	5/2/18 17:52	5/2/18 20:52	3.0	0.19
3	5/11/18 3:52	5/11/18 5:52	2.0	0.29
4	5/14/18 2:52	5/14/18 3:52	1.0	0.12
5	5/20/18 4:52	5/20/18 13:52	9.0	0.16
6	5/22/18 7:52	5/22/18 10:52	3.0	0.71
7	6/2/18 0:52	6/2/18 4:52	4.0	1.04
8	6/11/18 16:52	6/11/18 18:52	2.0	0.63
9	6/18/18 15:52	6/18/18 23:52	8.0	0.82
10	6/19/18 6:52	6/19/18 7:52	1.0	0.79
11	6/19/18 21:52	6/20/18 12:52	15.0	0.48
12	6/25/18 9:52	6/26/18 2:52	17.0	0.71
13	6/30/18 18:52	7/1/18 0:52	6.0	0.45
14	7/4/18 21:52	7/5/18 1:52	4.0	0.89
15	7/13/18 11:52	7/13/18 13:52	2.0	0.40
16	7/17/18 9:52	7/17/18 11:52	2.0	1.06
17	7/27/18 22:52	7/28/18 8:52	10.0	0.44
18	8/4/18 3:52	8/4/18 6:52	3.0	0.20
19	8/6/18 16:52	8/6/18 22:52	6.0	0.14
20	8/14/18 12:52	8/14/18 14:52	2.0	0.11
21	8/14/18 23:52	8/15/18 6:52	7.0	0.34
22	8/19/18 9:52	8/20/18 14:52	29.0	8.25
23	8/23/18 19:52	8/24/18 10:52	15.0	0.12
24	8/28/18 8:52	8/28/18 13:52	5.0	0.13
25	9/1/18 21:52	9/2/18 4:52	7.0	0.54
26	9/2/18 20:52	9/3/18 10:52	14.0	0.21
27	9/3/18 21:52	9/4/18 3:52	6.0	0.34
28	9/4/18 12:52	9/5/18 2:52	14.0	0.46
29	9/20/18 18:52	9/20/18 22:52	4.0	0.91
30	9/25/18 7:52	9/25/18 9:52	2.0	0.64
31	9/30/18 10:52	10/1/18 11:52	25.0	0.27
32	10/7/18 9:52	10/9/18 17:52	56.0	2.04
33	10/14/18 9:52	10/14/18 13:52	4.0	0.23
34	10/25/18 4:52	10/25/18 23:52	19.0	0.17

4.0 RESULTS

Two events were evaluated for each of the monitoring sites. All sites were analyzed for the same two events in 2018, a large event and a smaller event when water quality sampling occurred at 4 of the 6 sites.

The first event (Event 1) was an 8.25-inch event that occurred over approximately a 30-hour period on 8/19/18 to 8/20/18. Event 1 was the most severe event during the 2018 monitoring period. It was selected to observe BMP performance during severe events. Based on NOAA Atlas 14 for Omaha, Nebraska (see Appendix A for NOAA Atlas 14 tabular output), Event 1 was greater than a 100-year event.

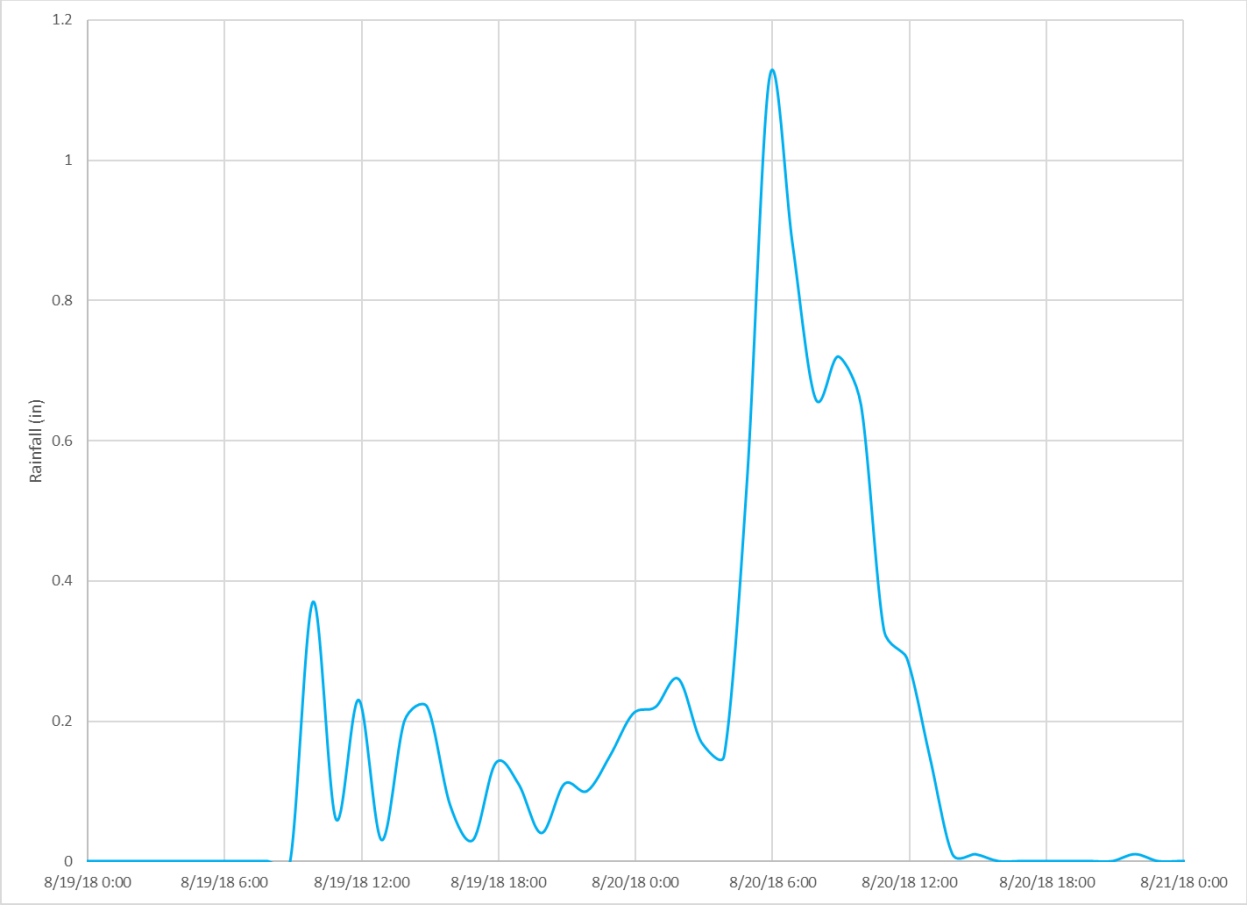

Figure 4-1: Event 1 Hydrograph

The second event (Event 2) was a 0.91-inch event that occurred over approximately a 4-hour period on 9/20/18. Based on NOAA Atlas 14, Event 2 is less than a 1-year event. For sites with 50-60% impervious area, this 9/20 event would closely resemble a water quality runoff event, a rainfall event that produces approximately 0.50 inches of runoff. Water quality sampling of Albright Park, Sewer Maintenance, and SOIA also occurred for the 9/20 event.

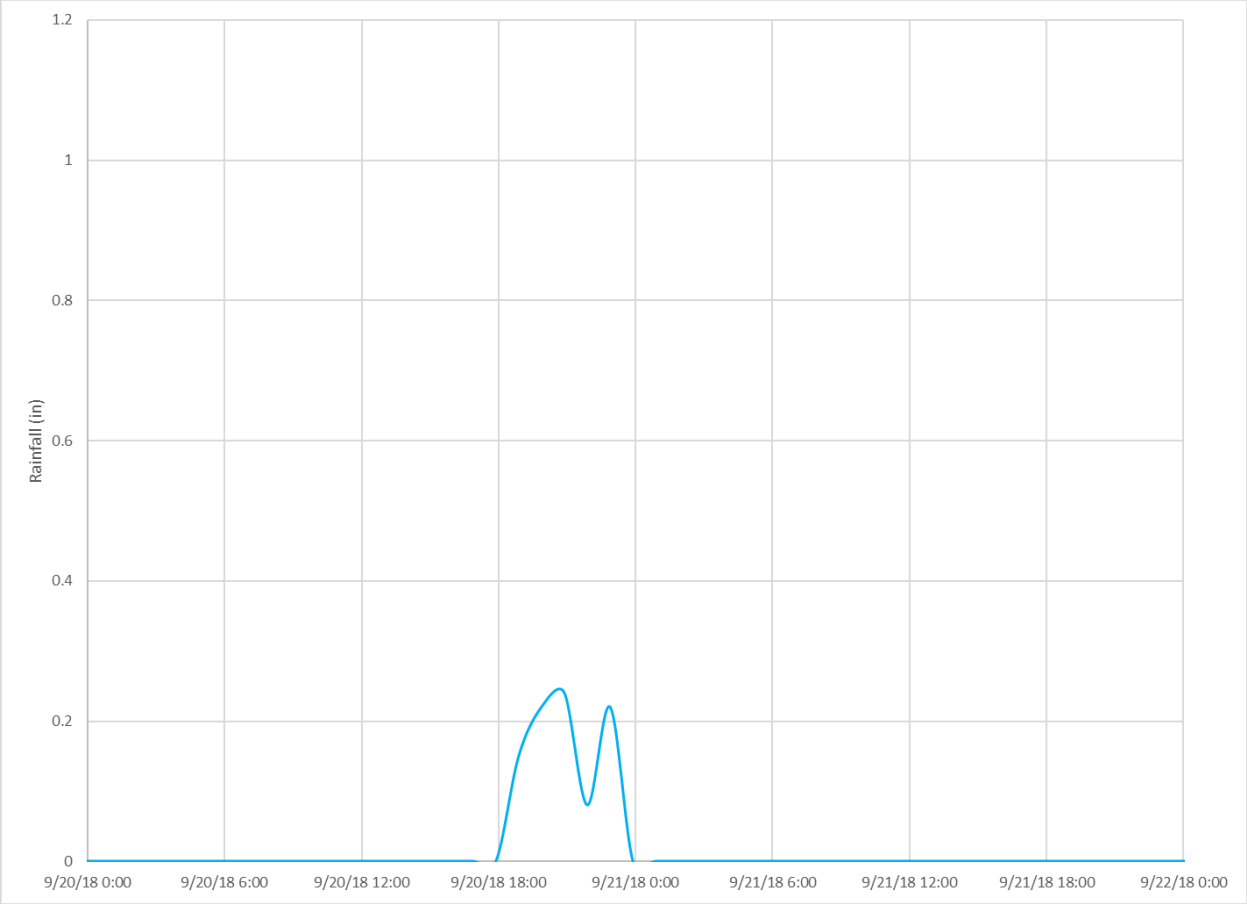

Figure 4-2: Event 2 Hydrograph

4.1 Orchard Park

At the Orchard Park site, the movement of the wetting front can be observed by comparing SMS-4, SMS-5, SMS-2, and SMS-1 volumetric moisture content (VMC) responses to rainfall. SMS-4, 6 inches below ground surface, SMS-5, 6 inches below ground surface, SMS-2, 6 inches below ground surface, and SMS-1, 36 inches below ground surface are located at approximately the same elevation. However, SMS-1, 36 inches was not functional during the 2018 monitoring period. SMS-4, 36 inches below ground surface, SMS-5, 36 inches below ground surface, and SMS-2, 36 inches below ground surface are located at approximately the same elevation. SMS-4, SMS-5, SMS-2 are located within the bioretention system extents. SMS-1 is the control and is located outside of the bioretention system extents.

Pressure transducer data was suspect during the 2018 monitoring period due to the presence of negative water level readings. Therefore, pressure transducer data was not used in detail during analysis.

4.1.1 Event 1

This event represents the bioretention system's response to an extreme rainfall event. Cumulative rainfall in the 30-days prior to Event 1 was less than 1.5 inches of total rainfall, which is reflected in the typically dry soil conditions (0.220 to 0.330 VMC) observed prior to this event. A plot of the VMC and NOAA rainfall data demonstrates the bioretention system's subsurface response to this large drawn-out rainfall event, in which the VMC at all locations increased significantly, showing both vertical and lateral infiltration. Figure 4-3 depicts the findings of the Event 1 analysis. The change in VMC for the 6-inch and 36-inch sensors for the 8/20 event is depicted in Table 4-1 and Table 4-2. SMS-5 and SMS-4 are located in the base of the bioretention system. Looking at SMS-5 and SMS-4 for Event 1, it takes at least 25 hours for the wetting front to move through the 6-inch deep soil layer and more than 50 hours to reach a 36-inch depth. For SMS 5, the wetting front moved from a 6-inch to a 36-inch depth in 8.5 hours.

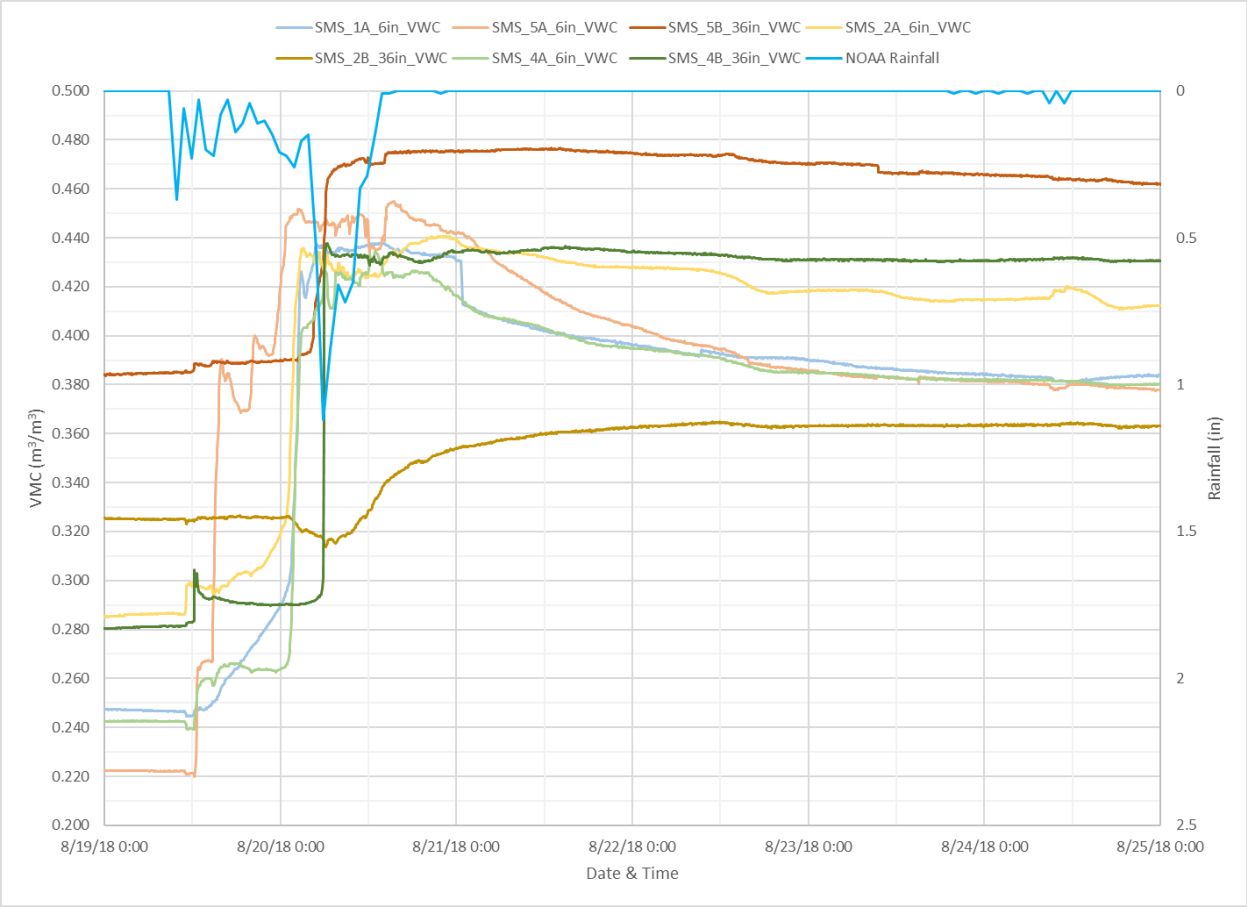

Figure 4-3: Orchard Park Event 1 (8.25 inches) VMC Response

Table 4-1: Event 1 VMC for SMS-5

Sensor Depth	Volumetric Moisture Content (VMC)				Time to Max VMC (hours)
	Before	Maximum	After*	Change (Before to Max)	
6"	0.221	0.455	0.384	0.234	27
36"	0.384	0.477	0.470	0.093	52

* 72 hours after peak rainfall intensity of Event 1

Table 4-2: Event 1 VMC for SMS-4

Sensor Depth	Volumetric Moisture Content (VMC)				Time to Max VMC (hours)
	Before	Maximum	After*	Change (Before to Max)	
6"	0.239	0.434	0.384	0.195	25.5
36"	0.281	0.436	0.431	0.155	55.25

* 72 hours after peak rainfall intensity of Event 1

4.1.2 Event 2

The contributing area to Orchard Park is approximately 60% impervious, therefore, this 0.91-inch event would likely produce runoff slightly greater than the water quality runoff event. As observed in 2017, the wetting front moves vertically though the soil profile before it moves laterally, as witnessed by the lag in VMC response for SMS-2. The change in VMC for SMS-5 and SMS-4 during Event 2, described in Table 4-3 and Table 4-4, is less than the change in VMC for Event 1. For Event 2, it takes approximately 3 hours for the wetting front to move through the 6-inch deep soil layer and more than 6 hours to reach a 36-inch depth. Figure 4-4 depicts the findings of the Event 2 analysis.

Table 4-3: Event 2 VMC for SMS-5

Sensor Depth	Volumetric Moisture Content (VMC)				Time to Max VMC (hours)
	Before	Maximum	After*	Change (Before to Max)	
6"	0.321	0.451	0.353	0.130	3.5
36"	0.458	0.469	0.463	0.011	6.75

* 72 hours after peak rainfall intensity of Event 2

Table 4-4: Event 2 VMC for SMS-4

Sensor Depth	Volumetric Moisture Content (VMC)				Time to Max VMC (hours)
	Before	Maximum	After*	Change (Before to Max)	
6"	0.361	0.429	0.378	0.068	3
36"	0.427	0.456	0.438	0.029	6.25

* 72 hours after peak rainfall intensity of Event 2

Event 2, a 0.91-inch event, would produce approximately 15,500 gallons of runoff contributing to the Orchard Park bioretention system. The runoff volume was calculated based on the rainfall depth, contributing area, and 60% impervious area approximation. Assuming the VMC observed at the 6-inch sensor represents the VMC for the top 12 inches of soil, approximately 900 gallons (6%) of stormwater runoff is held up in this 12-inch top soil layer. The storage volume in the top 12-inch soil layer was calculated based on the bioretention footprint and change in VMC from before the event to the maximum VMC. The volume of water in the soil horizon moves down through the soil profile with a portion (14%) available for plant use.

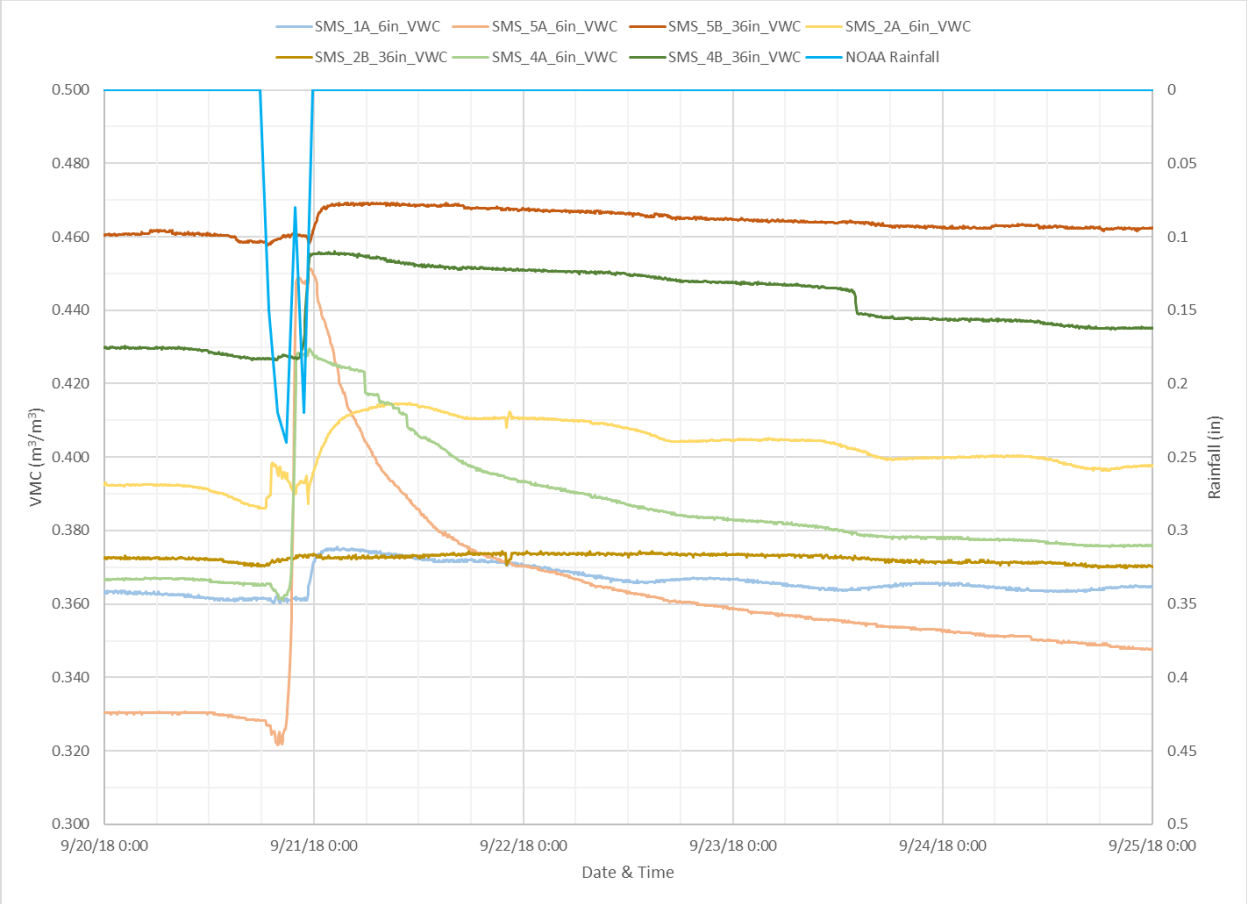

Figure 4-4: Orchard Park Event 2 (0.91 inches) VMC Response

Event 2, which was less rainfall than Event 1, produced a soil moisture response in the 6-inch depth soil moisture sensor, but less response in the 36-inch depth soil moisture sensor, moving laterally from the center of the bioretention system.

The starting soil moisture was greater for Event 2 than Event 1. Though a direct correlation could not be drawn between rainfall event depth and VMC, Figure 4-5 illustrates the response of the SMS-5 6-inch and 36-inch soil moisture from 6/6/18 through 10/25/18. SMS-5 is in the bottom of the bioretention system and best reflects the change in soil moisture over time within the bioretention soils. The 6-inch VMC responses is significant for most rainfall events showing the wetting of the top soils. The exception was the drier prior from July 6, 2018 through the large extreme event on 8/20/218 when only drying of the top soil was indicated. The 36-inch VMC was generally between 0.450 and 0.475 indicating a near saturated condition except for the dry period from 7/21/18 through 8/20/18. The 36-inch VMC was least just prior to the 8.25-inch event that occurred from 8/19/18 through 8/20/18.

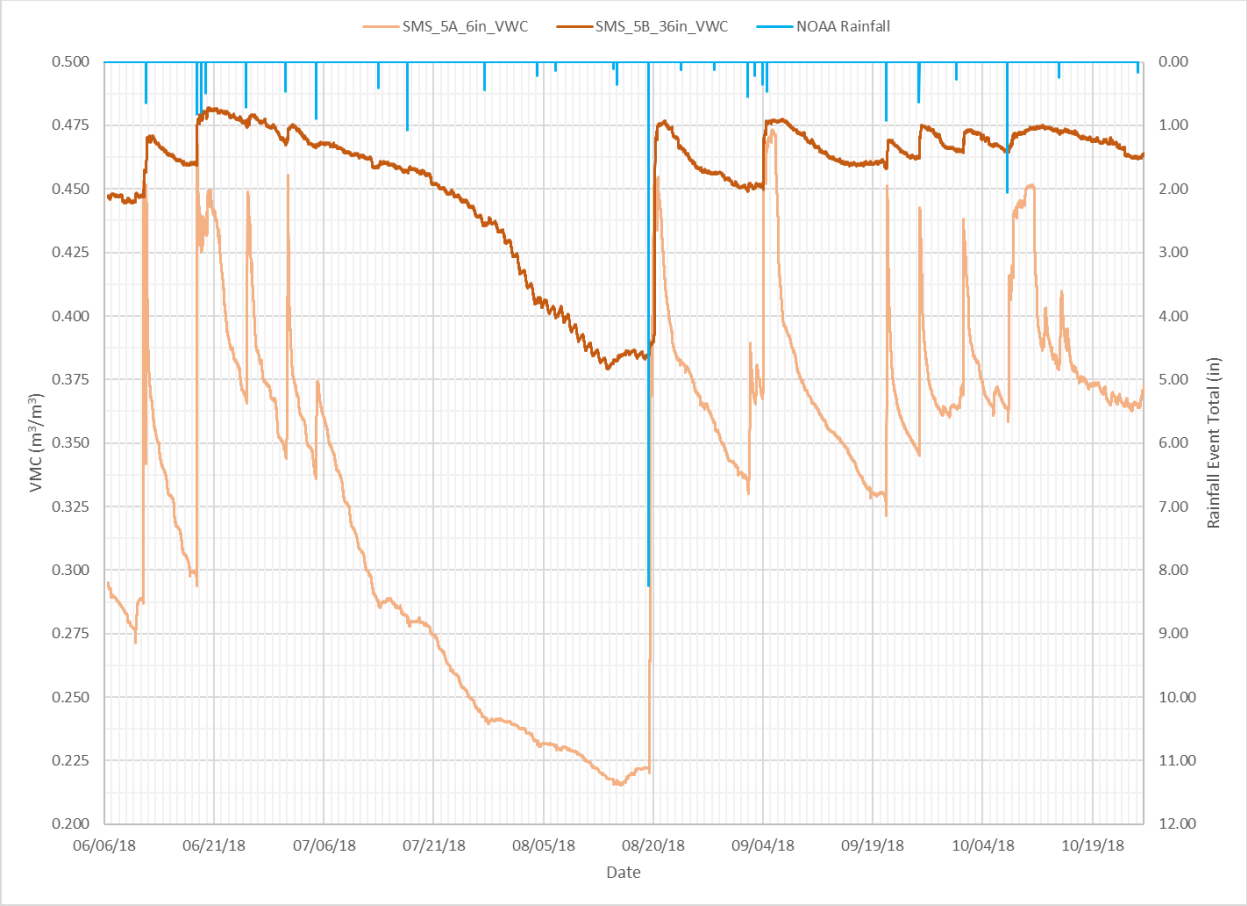

Figure 4-5: Orchard Park VMC Response for SMS-5

4.2 Creighton Prep

The flow meters installed on the inflow pipe and outflow pipe at the Creighton Prep bioretention site did not produce sufficient and consistent data to calculate storage volumes. However, outflow data was available for the period from 7/2/18 to 8/23/18, from which a stage-discharge curve could be developed. Based on the stage-discharge data plotted in Figure 4-6, the Creighton Prep bioretention system contributes flow at a rate of approximately 3 cfs when the bioretention system is full.

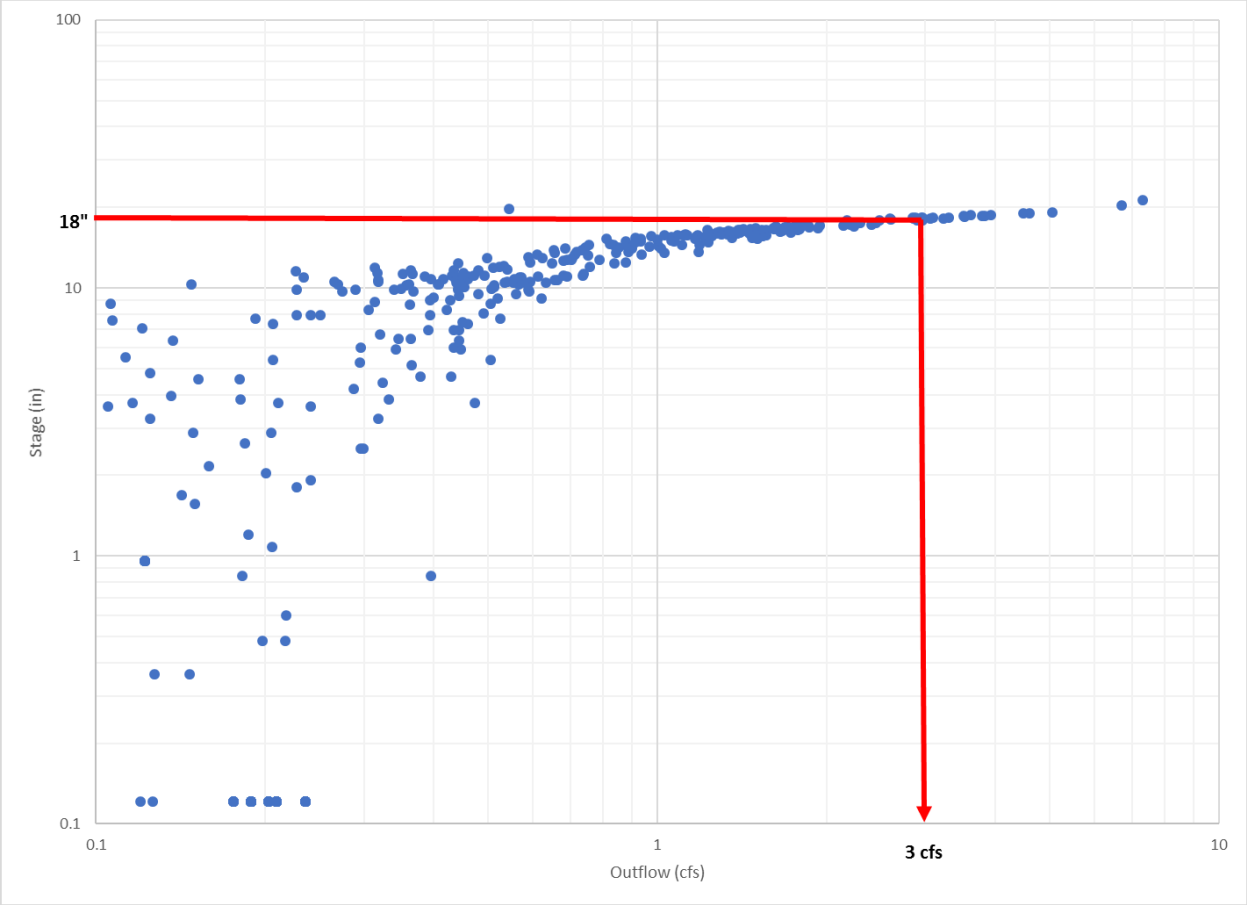

Figure 4-6: Creighton Prep Stage-Discharge

4.2.1 Event 1

During this event, the maximum ponding depth of approximately 18 inches was exceeded for a short period of time (as seen in Figure 4-7). At this time, the BMP would have been bypassed and there likely would have been localized flooding adjacent to the site on Western Avenue. When the water level in the bioretention system was 18-inches, the observed outflow was between 2.5 and 3 cfs. The observed drawdown rate during the event was between 4.4 and 6 inches per hour. The bioretention system dewatered approximately 4 hours after rainfall had ended, resulting in an after-event drawdown rate of approximately 4.6 inches per hour. The sharp drawdown in water level observed in the bioretention is likely due to the capacity of the underdrain system.

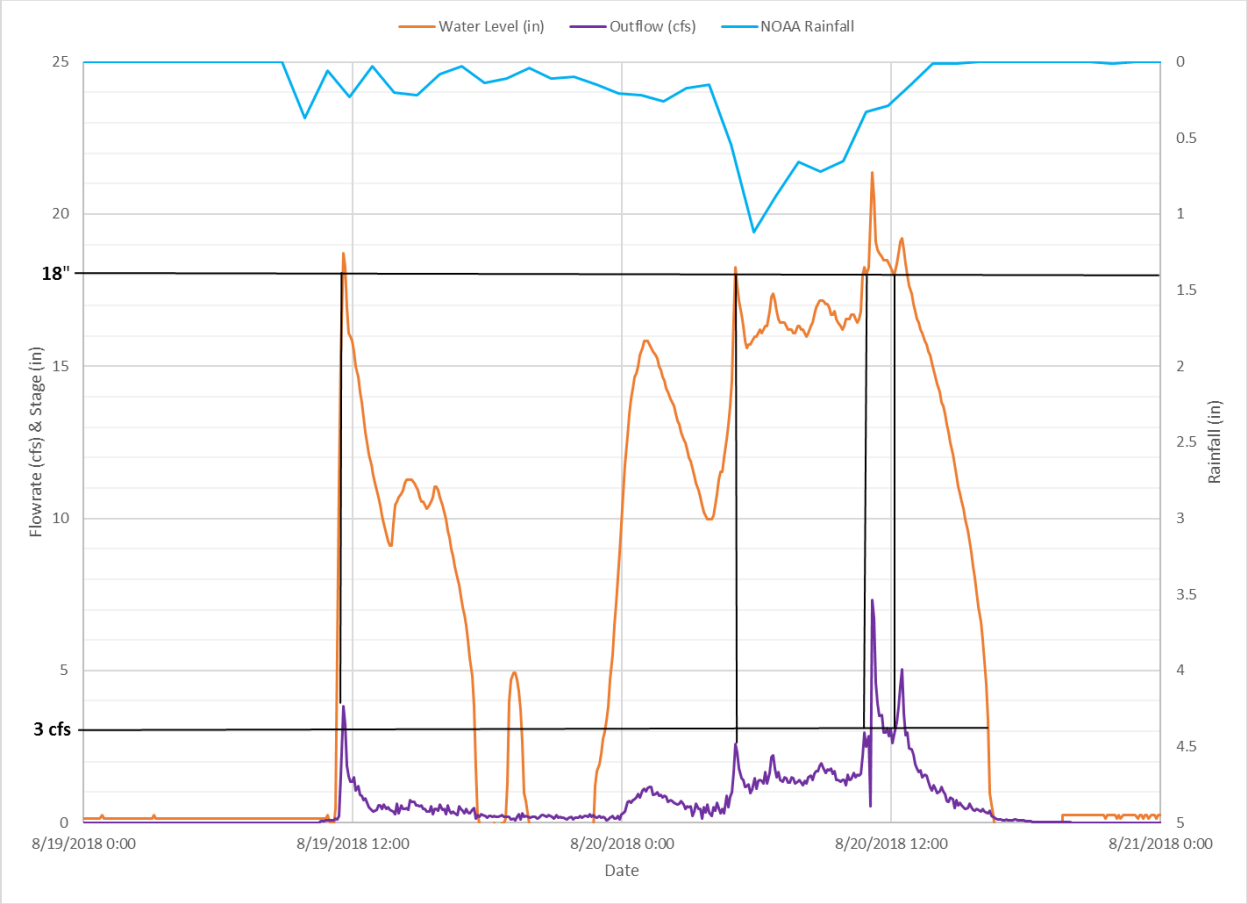

Figure 4-7: Creighton Prep Event 1 (8.25 inches) Water Level and Outflow

4.2.2 Event 2

Event 2 invoked an immediate response in the filling of the Creighton Prep bioretention system, suggesting a very short time of concentration for this site. The water level only reached a depth of 12 inches during this less than 1-year event, as seen in Figure 4-8. When the basin was 12 inches full, the peak outflow is estimated to be approximately 1 cfs based on the stage-discharge plot. The bioretention system dewatered in 2 hours and 15 minutes, reflecting an after-event drawdown rate of approximately 5.1 inches per hour. The sharp drawdown in water level, observed in the bioretention system, is far less than the 24 - 48 hours of discharge time defined in the Omaha Regional Stormwater Design Manual.

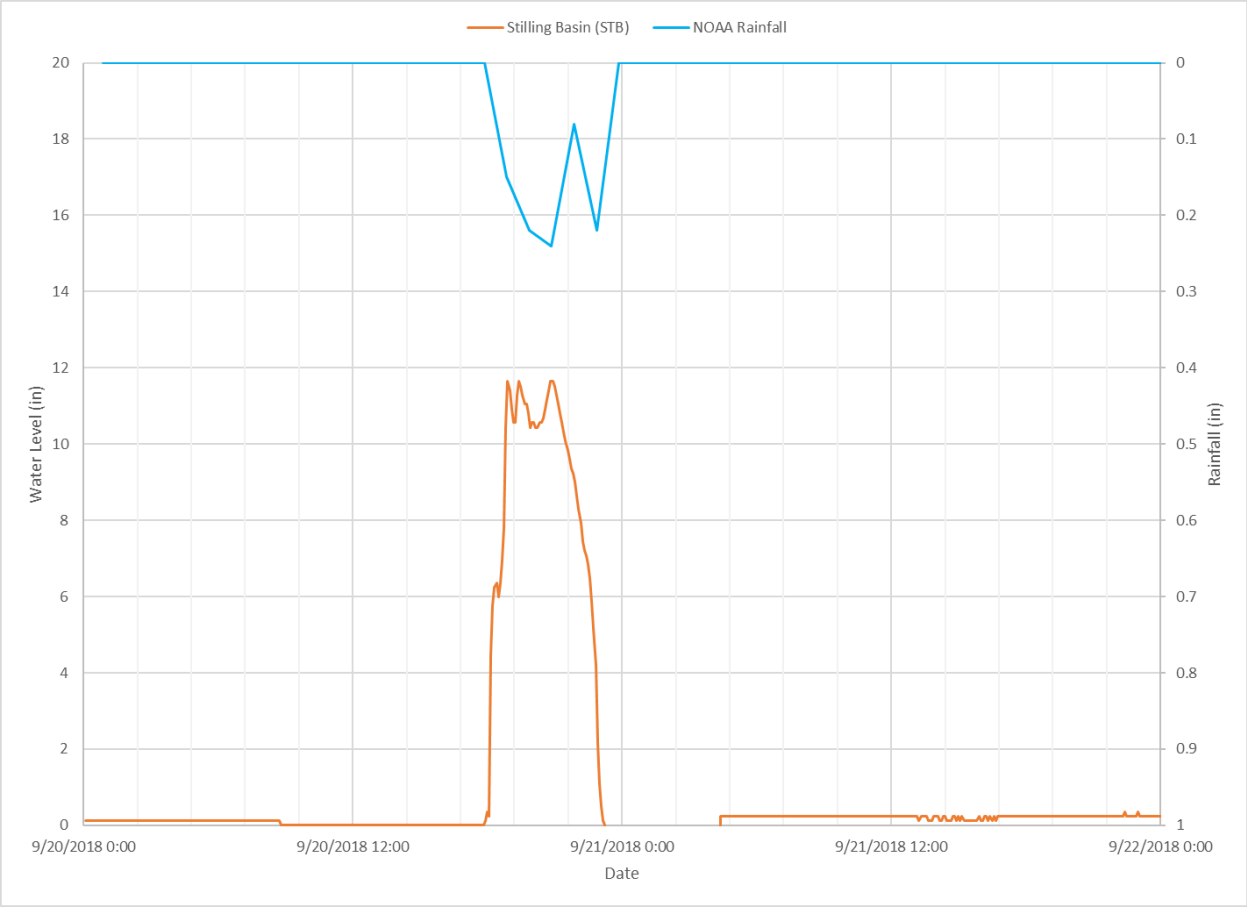

Figure 4-8: Creighton Prep Event 2 (0.91 inches) Water Level

4.3 UNO Welcome Center

Pressure transducer, temperature, and soil moisture sensor data from the 2018 monitoring period were analyzed for two events.

4.3.1 Event 1

During this large event, the pressure transducer STB-2, adjacent to the Type A bioretention infiltration trench, showed peak water level equal to the bioretention system cap of 12 inches. This Type A bioretention infiltration trench has a during-event drawdown rate between 2.8 and 4.3 inches per hour and an after-event drawdown rate of 2.8 inches per hour. Pressure transducer STB-1, adjacent to the Type B bioretention infiltration trench, however, only reached a max ponding depth of about 1.5 inches, indicating that there is rapid dewatering. We do not know the cause of this rapid drawdown, though similar results were observed in 2017. See Figure 4-9.

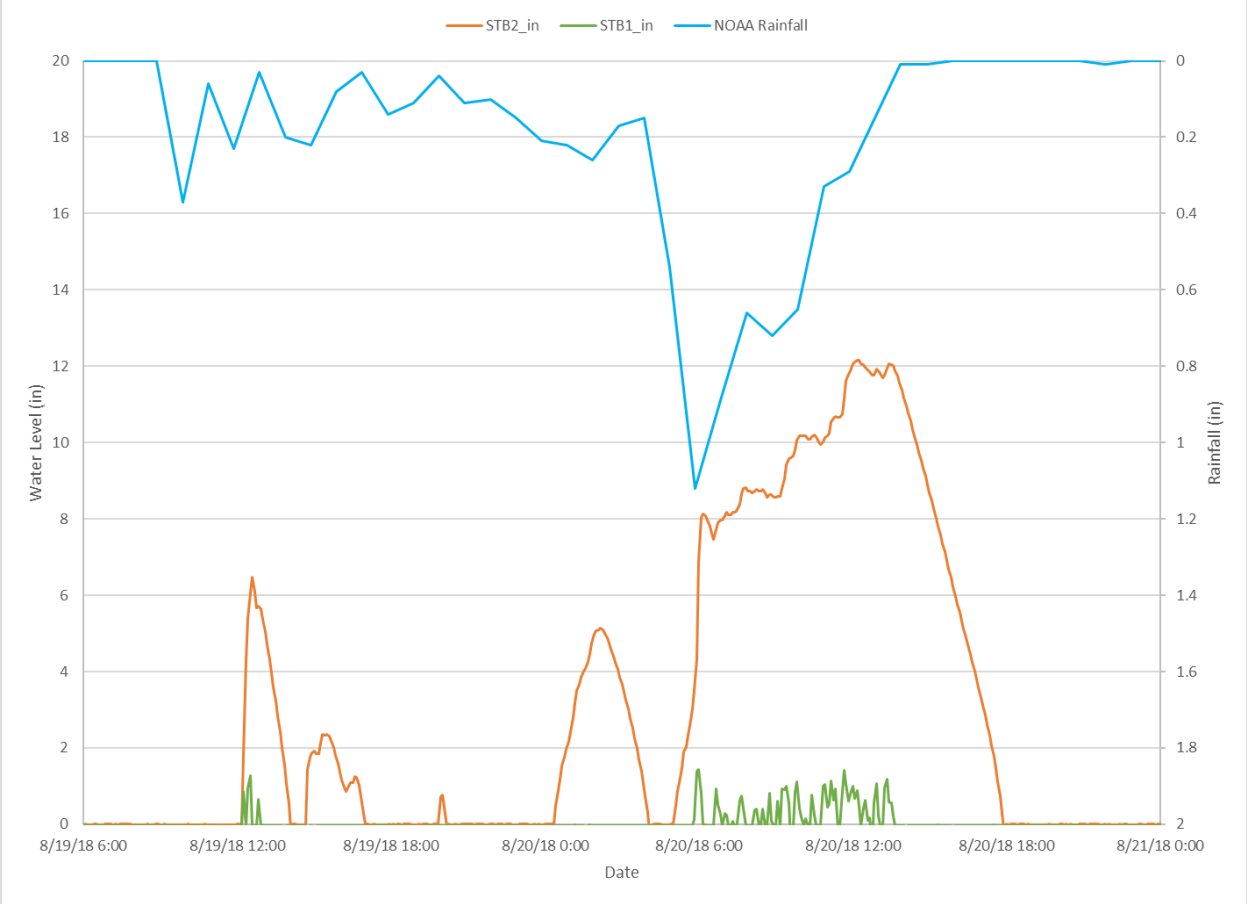

Figure 4-9: UNO Welcome Center Event 1 (8.25 inches) Water Level

Soil moisture increased shortly after the rain event began. The wetting front moved vertically within the soil profile, which can be observed in the response of the soil moisture sensors at varying depths (see Figure 4-10). After the event ends, the soil dries in the same order that the wetting front moved through the soil profile; the top soil layers dry faster and the bottom soil layers dry slower. Despite the 30 days of relatively dry weather prior to Event 1, the VMC of the deepest soil layer (30 inches below grade) approached saturation. The VMC of saturated soils is typically around 0.48 to 0.49 m^3/m^3. The initial movement of the wetting front is depicted in Figure 4-10. Table 4-5 describes the time after rainfall at which the soil moisture sensor reports an increase in VMC, representing the time at which the wetting front reaches that soil depth.

Table 4-5: UNO Welcome Center Event 1 VMC Response Times

Point	Time After Start of Rainfall (hrs)
1	3.5
2	4
3	8.5
4	14.5

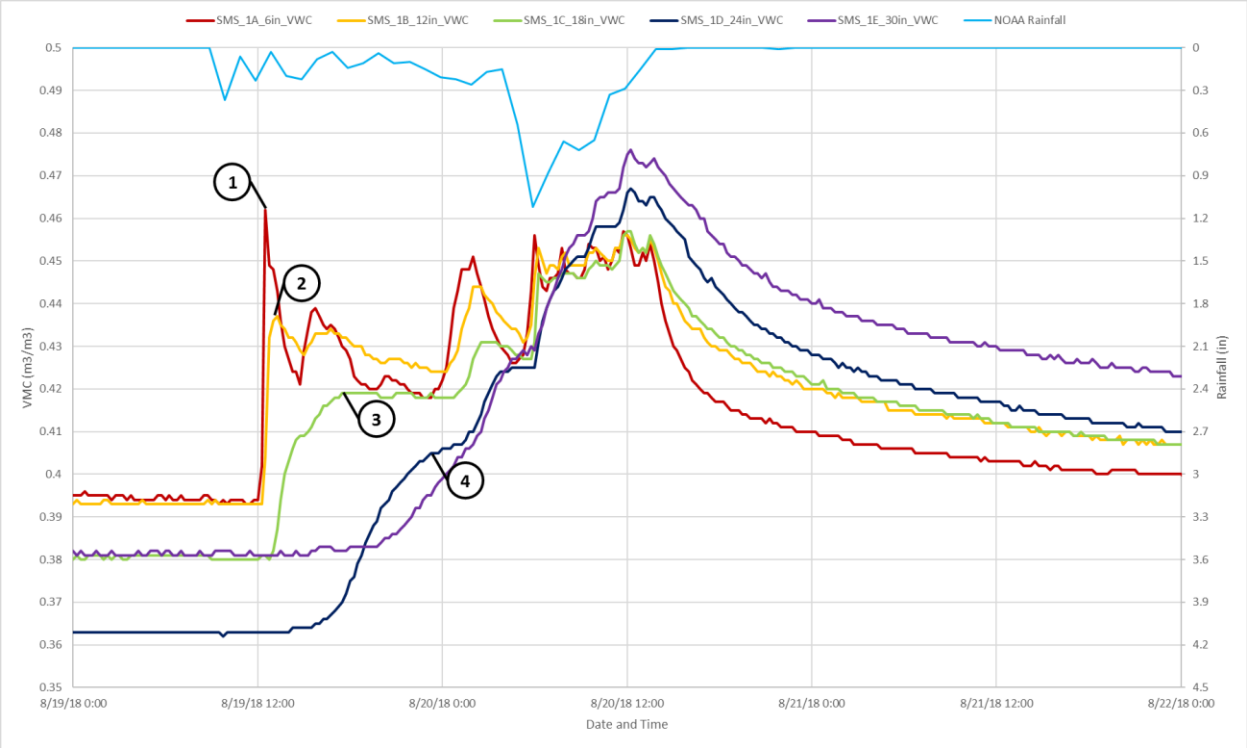

Figure 4-10: UNO Welcome Center Event 1 (8.25 inches) VMC

To draw further conclusions from the UNO Welcome Center VMC data, recommendations for future work include collecting soil core samples. Submitting the collected soil core samples to obtain field porosity, field capacity, and wilting point, would allow for quantification of evapotranspiration rates observed in VMC data.

4.3.2 Event 2

Event 2 pressure transducer responses further confirm that the Type B bioretention infiltration trench, sees little to no ponding (up to 1 inch). Figure 4-11 is plotted to the same scale as Figure 4-9 for comparison. The drawdown rate of 3 inches per hour, observed during Event 2, falls within the range of during-event drawdown of 2.8 to 4.3 inches per hour provided in the Event 1 analysis.

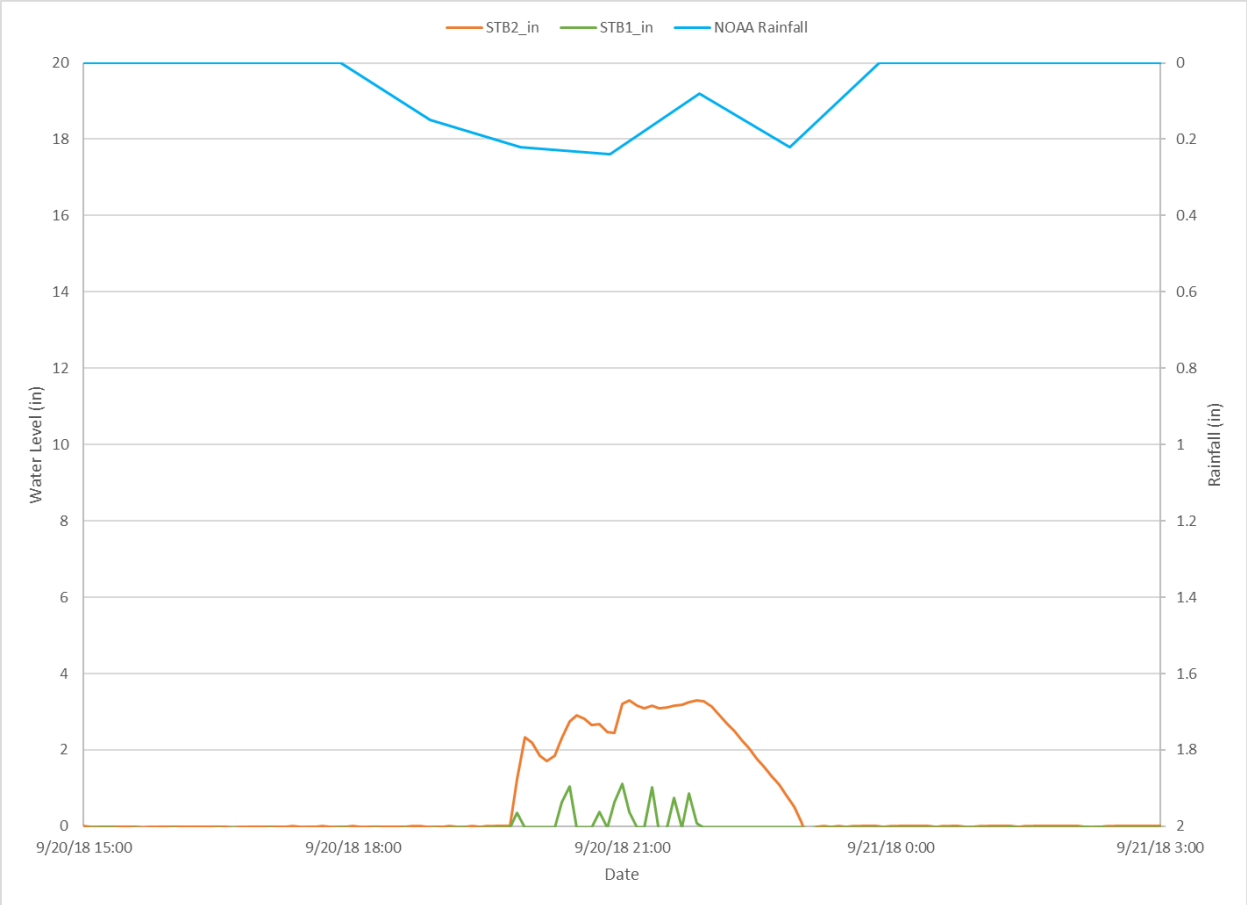

Figure 4-11: UNO Welcome Center Event 2 (0.91 inches) Water Level

Similar to Event 1, the response as the wetting front moves through soil profile can be observed during Event 2 in the top three soil layers, and a slight change in VMC is observed in the 24-inch soil moisture sensor. However, for this smaller event, smaller than Event 1, the wetting front did not reach the deeper soil layer at 30 inches below grade as seen in Figure 4-12.

The percolation rates, calculated as the wetting front moved vertically through the soil layers, are provided in Table 4-6. These percolation rates represent the hydraulic conductivity of those soil layers. The percolation rate of 2.7 inches per hour observed as the wetting front moved vertically from the 6-inch sensor to the 12-inch sensor (point 1 to 2) is expected of amended soils. BMPs in Omaha typically amends native soils outside of the infiltration cell by mixing a minimum of 1 - 2 inches of compost with the native soils for the top 6-inch soil layer. The percolation rates from the 12-inch sensor to the 18-inch sensor (points 2 to 3) of 0.5 inches per hour and the 18-inch sensor to the 24-inch sensor (points 3 to 4) of 0.3 inches per hour are representative of clayey hydrologic soil group type C/D soils.

Table 4-6: UNO Welcome Center Percolation Rates by Soil Layer

From Point to Point	Percolation Rate (in/hr)
1 to 2	2.7
2 to 3	0.5
3 to 4	0.3

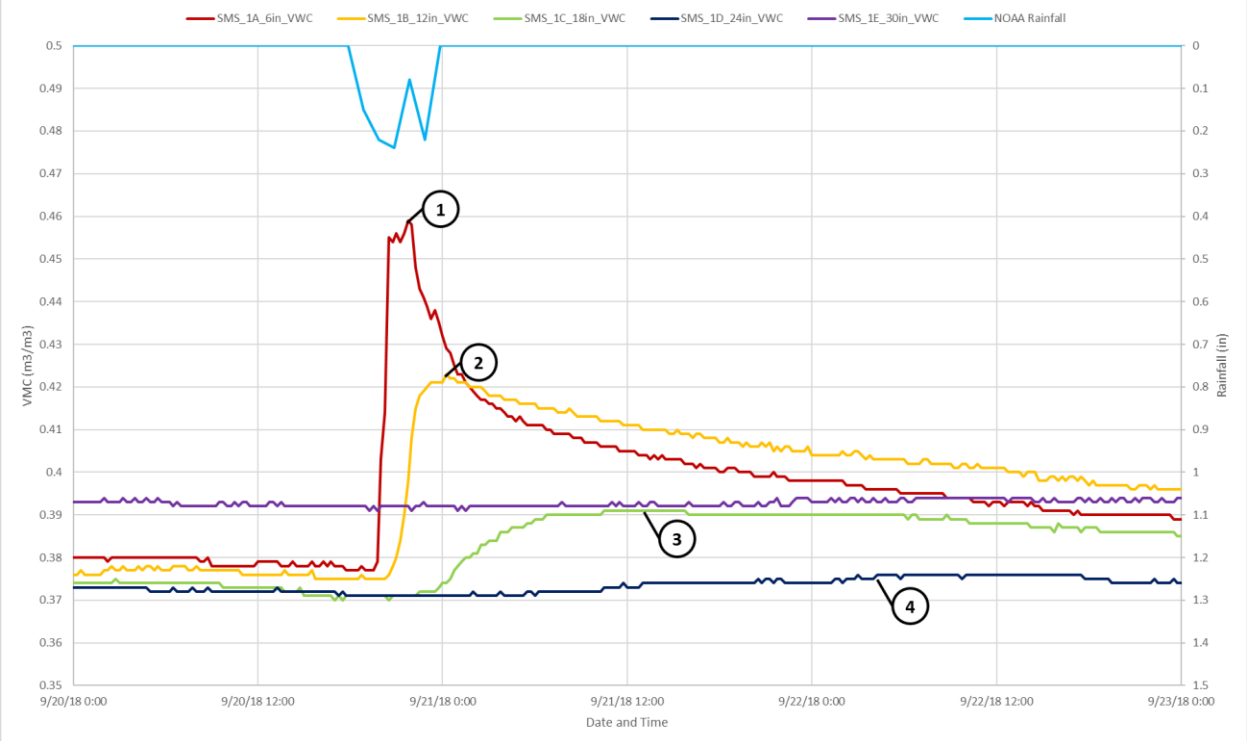

Figure 4-12: UNO Welcome Center Event 2 (0.91 inches) VMC

4.4 Soil Temperature

Subsurface temperature data, collected by the soil moisture sensors from January through mid-March, were analyzed to compare the compare soil temperatures between engineered soils in bioretention to in-situ soils. Soil moisture sets SMS-1 adjacent to the Type B bioretention infiltration trench, SMS-3 adjacent to the Type A bioretention infiltration trench, and SMS-5 the control within in-situ soils, were analyzed. In-situ soil temperatures at the 6-inch depth (SMS-5A) were below freezing for all of January and February, as seen in Figure 4-13 and Figure 4-14.

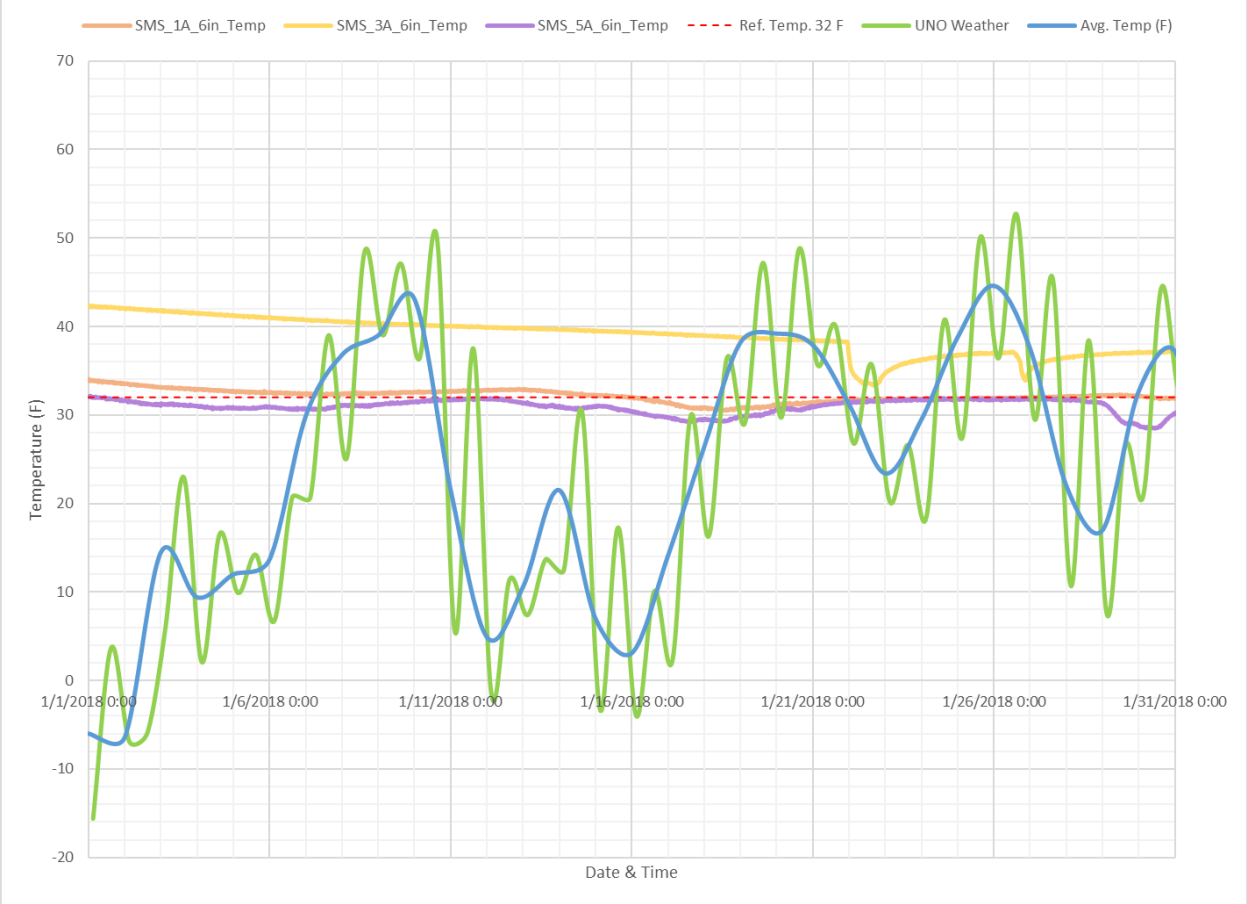

Figure 4-13: January 2018 Subsurface Temperatures

Soil temperatures adjacent to the Type B bioretention infiltration at 6-inch depth (SMS-1A) remained below freezing for most of January and February as well, however, these soil temperatures were greater than the in-situ soils. The bioretention soils at SMS-3A, a sensor located 6 inches deep adjacent to the Type A bioretention infiltration trench, maintained temperatures above freezing for all of January and February. These soil temperatures at SMS-3A were nearly 5 degrees higher in January and February of 2018 than they were in January and February in 2017. Looking back at precipitation data for January/February 2018 compared to January/February of 2017, rainfall totals were similar, however approximately 3 more inches of snowfall accumulated in 2018.

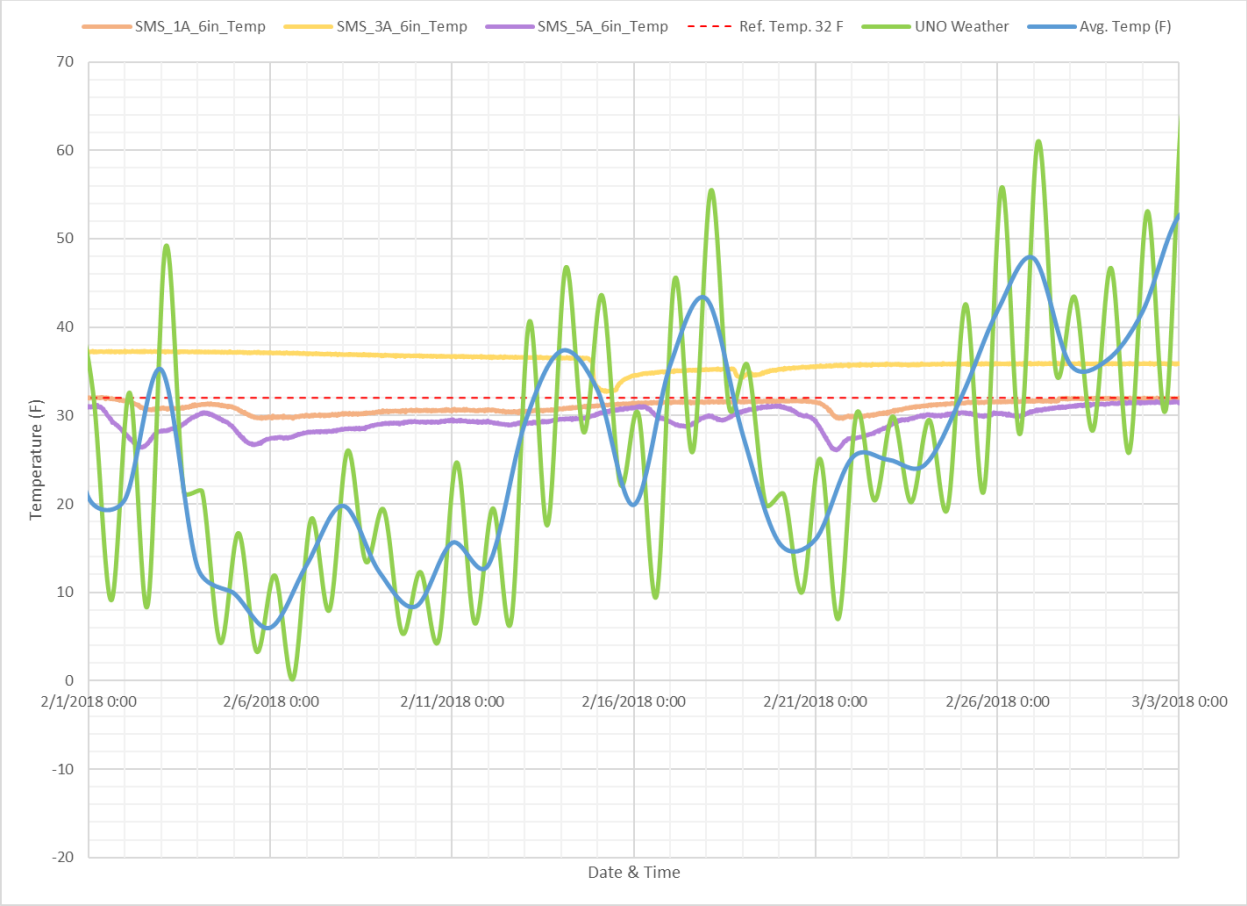

Figure 4-14: February 2018 Subsurface Temperatures

4.5 Albright Park

One pressure transducer was installed in the AgriDrain outlet control structure, on the upstream side of the inline weir. Installing the pressure transducer at this location would allow for observation of the drawdown rate within the bioretention system due to evaporation (in the case of ponded water), infiltration, and evapotranspiration. The pressure transducer was installed at the bottom of the AgriDrain structure, approximately 72 inches below the structure rim elevation, as depicted in Figure 4-15. The top of the inline weir is approximately 66 inches above the bottom of the AgriDrain structure. Ponding occurs when the water depth reaches approximately 36 inches above the sensor level. Based on the construction plans, there is approximately 30 inches of ponding available until the hydraulic grade line of the ponded water exceeds the weir elevation, when water from the bioretention system would discharge to the downstream system. Ponded water that overtopped the AgriDrain rim elevation would enter control structure through the bar grate lid and could bypass the inline weir, discharging directly to the outlet pipe.

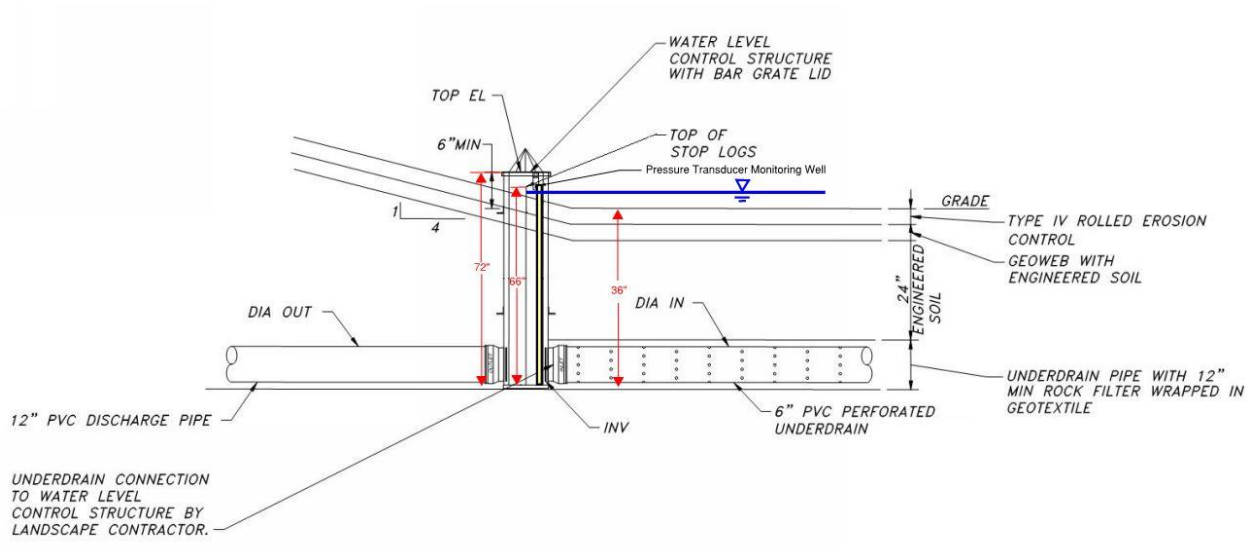

Figure 4-15: Albright Park AgriDrain Structure

4.5.1 Event 1

Recorded water level in the AgriDrain structure during Event 1, allows conclusions to be made about how the bioretention system performs during a large event. The drawdown rate from the bioretention system is linear from a depth of 64 inches above the bottom of the AgriDrain structure until a depth of about 38 inches. The time from a water depth of 64 inches to 38 inches in the AgriDrain structure is closely representative of the time for surface ponding, which extended for 54 hours after the rain event, resulting in a drawdown rate of 0.48 inches per hour for ponding. A different linear drawdown rate is demonstrated from about 38 inches to 32 inches depth above bottom of AgriDrain structure. A new drawdown curve

continues from 32 inches depth to approximately 6 inches depth and then another break can be drawn below 6 inches. This change in drawdown rate at various depths could be due to seepage between the stop logs that form the weir of the AgriDrain structure.

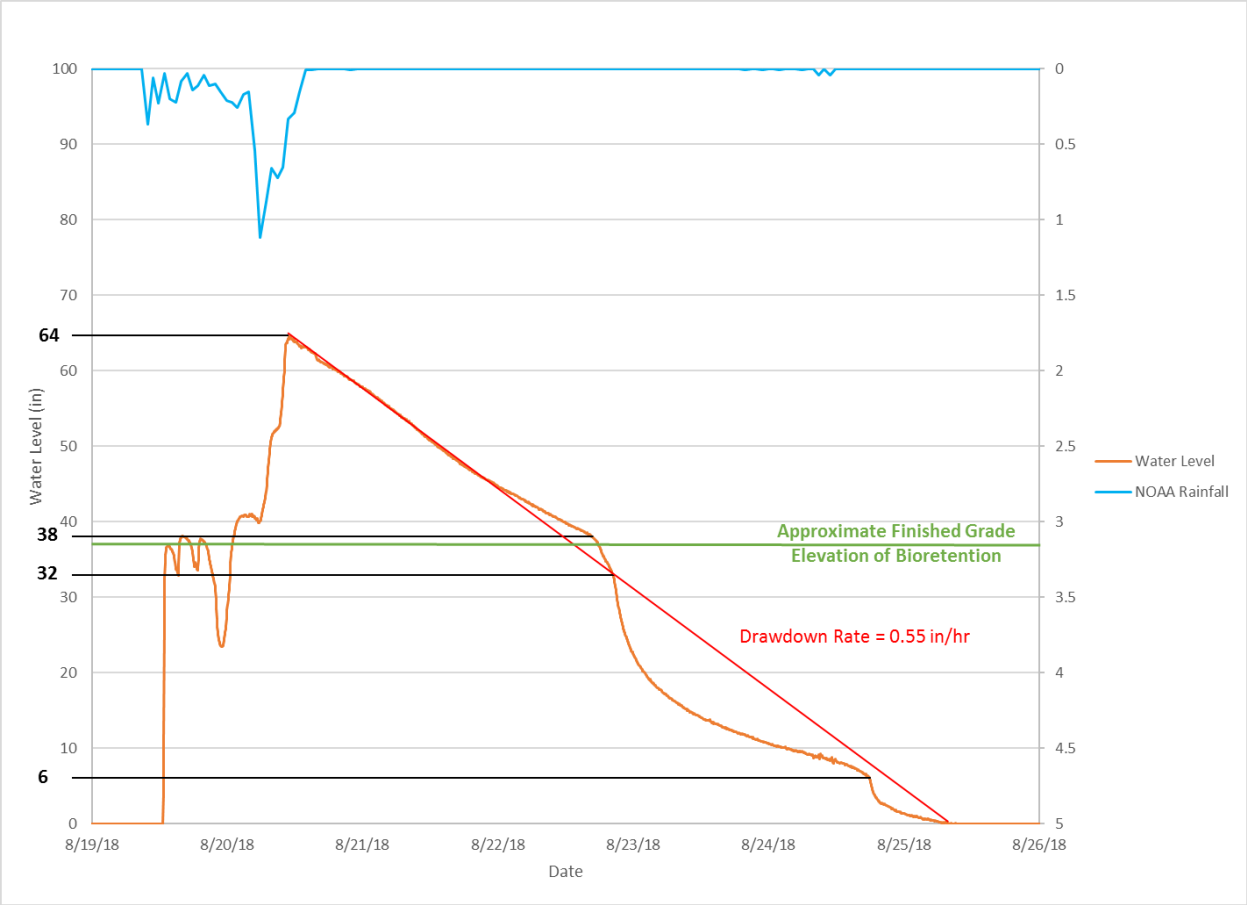

Figure 4-16: Albright Park Event 1 (8.25 inches) Water Level

The average after-event drawdown rate of the bioretention system following Event 1 is approximately 0.55 inches per hour, obtained by dividing the total height of water (64 inches) by the time it took to dewater from the upstream side of the weir (116.25 hours). This drawdown rate is less than the drawdown rate observed during a smaller event, Event 2. The slower drawdown rate observed during Event 1 could have been affected by unknown downstream hydraulic conditions uninvestigated as part of this study.

4.5.2 Event 2

Though Event 2 results in minimal surface ponding within the bioretention system, it does demonstrate similar breaks, as illustrated in Figure 4-17, in drawdown curves to those depicted in Figure 4-16. The maximum ponding depth for Event 2 is approximately 3.5 inches. This ponding occurs for approximately 4 hours, resulting in a drawdown rate of 0.85 inches per hour. The average drawdown rate of the

bioretention system following Event 2 is approximately 2.25 inches/hour, obtained by dividing the total height of water (40 inches) by the time it took to dewater from the upstream side of the weir (17.75 hours). This 17.75-hour drawdown time is less than the 24 - 48 hours for discharge described in the Omaha Regional Stormwater Design Manual.

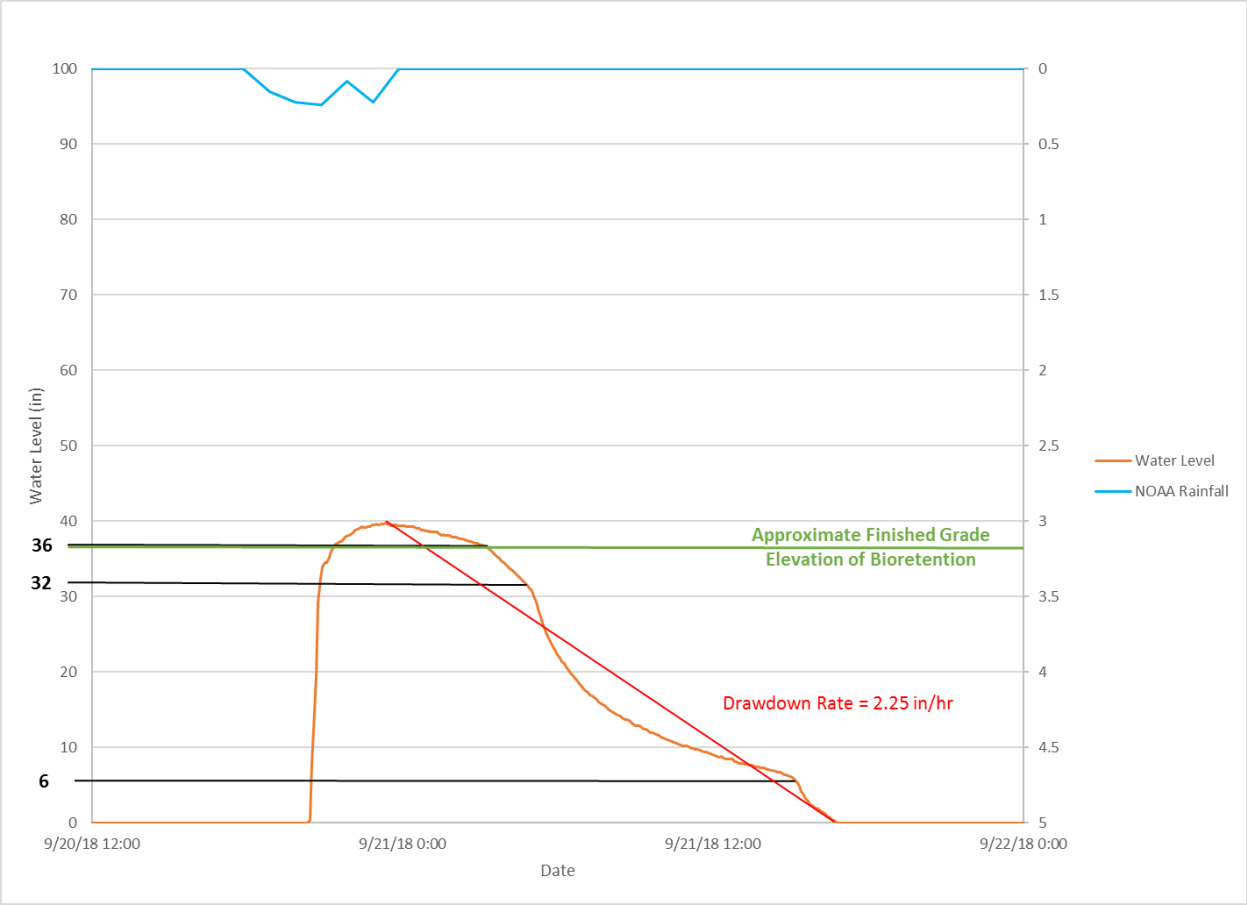

Figure 4-17: Albright Park Event 2 (0.91 inches) Water Level

Water quality samples were collected for one inflow location and one outflow location as depicted in Figure 4-18 during Event 2. Three inflow grab samples were collected from the inlet discharge point into the low flow channel at the southeast corner of the site. The AgriDrain structure has a bar grate lid and receives flow from three sources: 1) direct rainfall, 2) underdrain system, and 3) ponded water level overtopping the bar grate lid. Three outflow samples were collected from the AgriDrain water level control structure. Due to the configuration of the AgriDrain structure, outflow samples were unable to be collected from the downstream side of the inline weir, therefore, the outflow samples collected were grab samples taken from the inside of the AgriDrain structure on the upstream side of the inline weir.

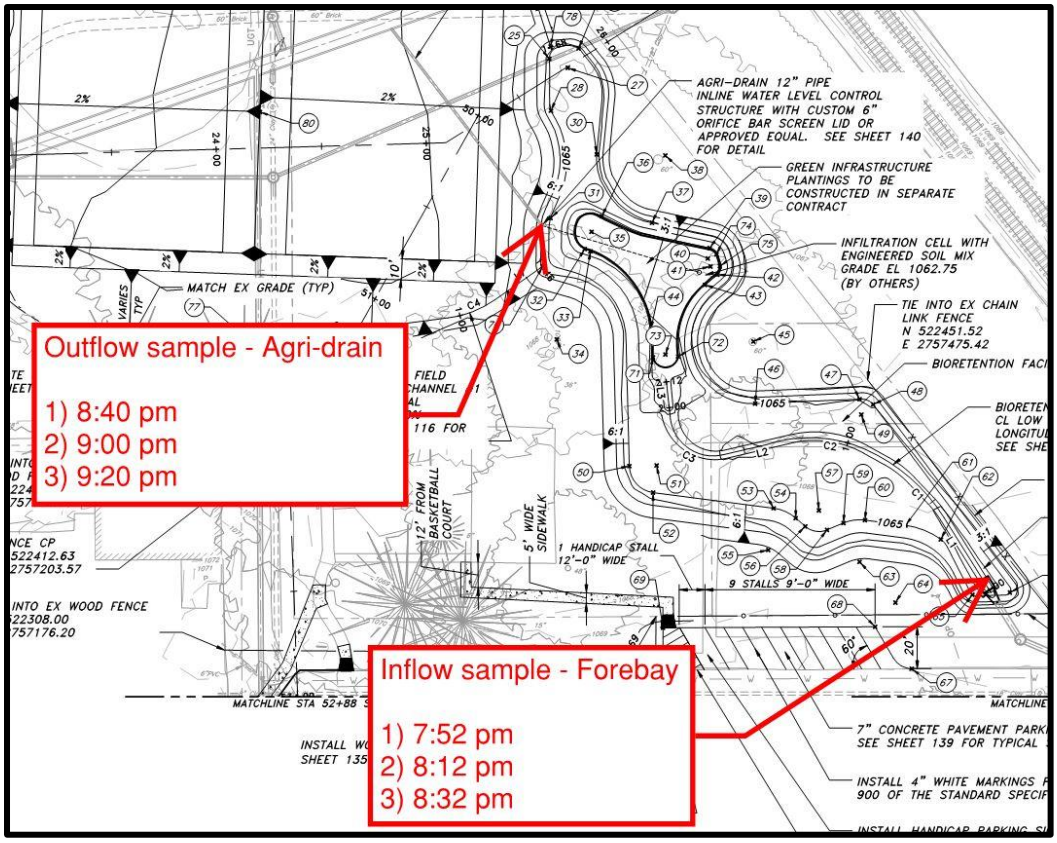

Figure 4-18: Albright Park Water Quality Sampling Locations

Water quality samples were delivered to Midwest Laboratories in an iced cooler on 9/21/18, at 8:25AM. Water quality samples were tested for Total Kjeldahl Nitrogen (TKN), Nitrate/Nitrite Nitrogen (NO3/NO2-N), Phosphorous (P), Total Dissolved Solids (TDS), Total Suspended Solids (TSS), and *E. coli*. At the time of delivery, the Albright Park grab samples had exceeded the regulatory holding time of 6 hours for *E. coli* but were tested anyway. The sample holding time from sample collection until sample preparation for *E. coli* by Midwest Laboratories ranged from 11.5 - 14.5 hours. Laboratory technicians at Midwest Laboratories recommended that *E. coli* samples be tested within 48 hours if not for regulatory compliance. When hold times are exceeded, the bacteria can start to grow more, and the concentration from the lab testing may be greater than actual concentrations in the field. Therefore, actual concentrations of *E. coli* may be less than the values reported. Table 4-7 summarizes the results of the water quality testing. Full reports from Midwest Laboratories are included in Appendix C.

Table 4-7: Albright Park Water Quality Results

Lab ID:	1542331-01	1542331-02	1542331-03	1542331-04	1542331-05	1542331-06	Reporting Limit
Sample Time:	7:52 PM	8:12 PM	8:32 PM	8:40 PM	9:00 PM	9:20 PM	
Constituent	Inflow 1	Inflow 2	Inflow 3	Outflow 1	Outflow 2	Outflow 3	
TKN (mg/L)	4.08	2.51	2.28	2.44	2.21	2.56	0.50
NO3/NO2-N (mg/L)	0.80	0.68	0.69	5.06	5.50	5.56	0.20
P (mg/L)	1.26	0.68	0.79	1.16	1.13	1.10	0.05
TDS (mg/L)	112	40	132	332	294	314	10
TSS (mg/L)	1350	332	196	27	23	22	4
E. coli (CFU/100mL)[1]	880	2120	9100	8300	7500	6900	1

[1] *E. coli* results are provided but may not be representative as sample holding times exceeded regulatory holding time for *E. coli* of 6 hours.

Nitrogen, Phosphorus, and suspended solids concentrations in the inflow generally decreased as rainfall continued. Outflow concentrations for TKN, NO3/NO2-N, P, TDS, and TSS were fairly consistent throughout the event. *E. coli* inflow concentrations increased over the duration of the event and outflow concentrations decreased, however, all *E. coli* concentrations were more than an order of magnitude greater than the EPA Recreational Water Quality Criteria of 126 CFU/100mL (geometric mean). *E. coli* concentrations are provided but may not be representative of actual *E. coli* concentrations due to exceeded holding times.

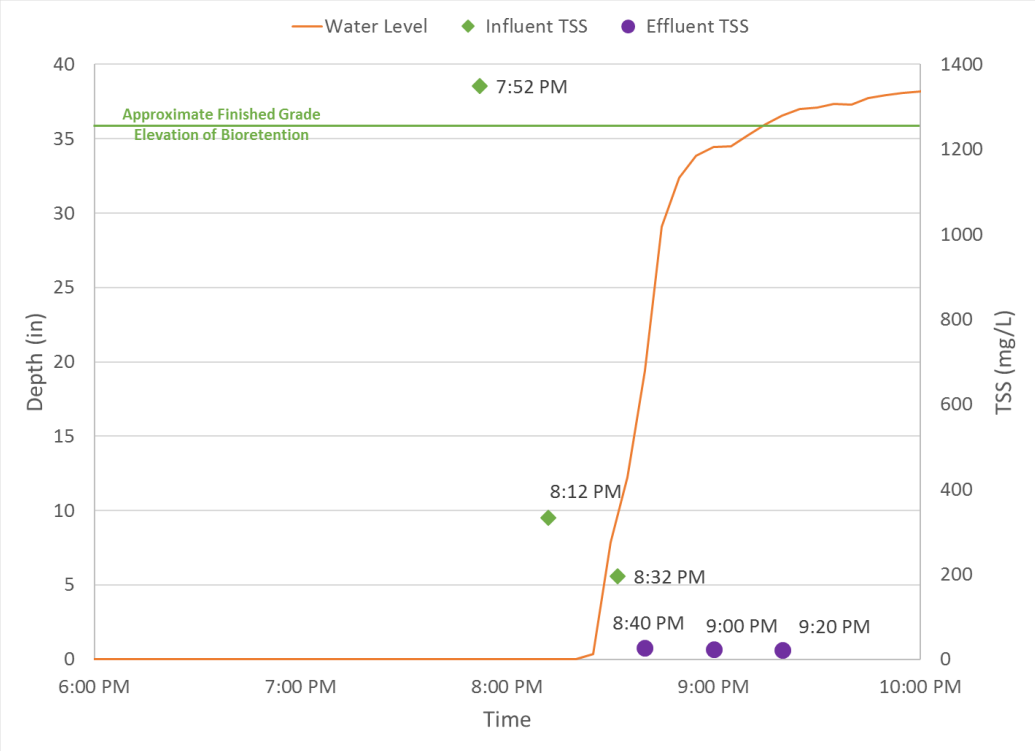

Figure 4-19: Albright Park Water Quality Sampling TSS

4.6 Adams Park

Water level data and flowrate data were used to analyze the Adams Park site. Water level data was collected from three pressure transducers installed on site: 1) upstream of outlet structure, 2) in a micropool on the west side of the wetland area, and 3) upstream of culvert beneath the future park road. Flow meter data was provided by GBA for the basin inflow and basin outflow pipes. The available basin inflow and basin outflow data aligned well with the recreational year from 4/1/18 to 10/31/18, which should include most of the rainfall events that have or likely will occur in 2018, as 80% of annual rainfall normally occurs from April through October in Omaha, Nebraska. Wet weather volume reduction was estimated for each event where total rainfall equaled or exceeded 0.10 inches, as described in Chapter 3.0, based on basin inflow and basin outflow flow meter data. Table 4-8 describes the event volume reduction. The total estimated volume reduced during wet weather for the 2018 recreational year was 16.8 million gallons, resulting in a 44.5% volume reduction. This total volume reduced excludes events 11, 12, and 13, because of unrealistic flow volumes.

Table 4-8: Estimated Wet Weather Volume Reduction for Adams Park

Event No.	Rain Start	Rain End	Duration (hrs)	Event Rainfall Total (in)	6 hrs After End of Rain	Time Since Last Rain (days)	Volume In (CF)	Volume Out (CF)	% Vol. Reduced	Water Elev. Prior to Event
1	5/1/18 17:52	5/1/18 19:52	2.0	**0.10**	5/2/18 1:52	6.38	19,979	695	96.5%	NA[1]
2	5/2/18 17:52	5/2/18 20:52	3.0	0.19	5/3/18 2:52	0.92	25,463	16,098	36.8%	NA[1]
3	5/11/18 3:52	5/11/18 5:52	2.0	0.29	5/11/18 11:52	8.29	28,386	-	100.0%	NA[1]
4	5/14/18 2:52	5/14/18 3:52	1.0	0.12	5/14/18 9:52	2.88	4,205	-	100.0%	NA[1]
5	5/20/18 4:52	5/20/18 13:52	9.0	0.16	5/20/18 19:52	6.04	740	9	98.8%	NA[1]
6	5/22/18 7:52	5/22/18 10:52	3.0	0.71	5/22/18 16:52	1.75	194,487	38,979	80.0%	NA[1]
7	6/2/18 0:52	6/2/18 4:52	4.0	1.04	6/2/18 10:52	10.58	156,714	99,032	36.8%	NA[1]
8	6/11/18 16:52	6/11/18 18:52	2.0	0.63	6/12/18 0:52	9.50	174,127	84,072	51.7%	NA[1]
9	6/18/18 15:52	6/18/18 23:52	8.0	0.82	6/19/18 5:52	6.88	245,228	102,173	58.3%	NA[1]
10	6/19/18 6:52	6/19/18 7:52	1.0	0.79	6/19/18 13:52	0.29	205,386	196,171	4.5%	NA[1]
11	6/19/18 21:52	6/20/18 12:52	15.0	0.48	6/20/18 18:52	0.58	66,067	217,123	-228.6%	NA[1]
12	6/25/18 9:52	6/26/18 2:52	17.0	0.71	6/26/18 8:52	4.88	58,533	94,583	-61.6%	NA[1]
13	6/30/18 18:52	7/1/18 0:52	6.0	0.45	7/1/18 6:52	4.67	46,393	67,115	-44.7%	NA[1]
14	7/4/18 21:52	7/5/18 1:52	4.0	0.89	7/5/18 7:52	3.88	25,058	13,034	48.0%	NA[1]
15	7/13/18 11:52	7/13/18 13:52	2.0	0.40	7/13/18 19:52	8.42	13,378	1,779	86.7%	NA[1]
16	7/17/18 9:52	7/17/18 11:52	2.0	1.06	7/17/18 17:52	3.83	64,640	12,299	81.0%	NA[1]
17	7/27/18 22:52	7/28/18 8:52	10.0	0.44	7/28/18 14:52	10.46	61,993	9,064	85.4%	NA[1]
18	8/4/18 3:52	8/4/18 6:52	3.0	0.20	8/4/18 12:52	6.79	41,352	609	98.5%	1073.66
19	8/6/18 16:52	8/6/18 22:52	6.0	0.14	8/7/18 4:52	2.42	17,975	1,463	91.9%	1073.91
20	8/14/18 12:52	8/14/18 14:52	2.0	0.11	8/14/18 20:52	7.58	25,639	69	99.7%	1073.63
21	8/14/18 23:52	8/15/18 6:52	7.0	0.34	8/15/18 12:52	0.38	98,709	41,974	57.5%	1073.73
22	8/19/18 9:52	8/20/18 14:52	29.0	8.25	8/20/18 20:52	4.13	1,869,675	1,388,191	25.8%	1073.88
23	8/23/18 19:52	8/24/18 10:52	15.0	0.12	8/24/18 16:52	3.21	24,608	9,697	60.6%	1074.04
24	8/28/18 8:52	8/28/18 13:52	5.0	0.13	8/28/18 19:52	3.92	20,120	1,094	94.6%	1073.86
25	9/1/18 21:52	9/2/18 4:52	7.0	0.54	9/2/18 10:52	4.33	172,109	40,646	76.4%	1074.18
26	9/2/18 20:52	9/3/18 10:52	14.0	0.21	9/3/18 16:52	0.67	61,304	39,028	36.3%	1074.70
27	9/3/18 21:52	9/4/18 3:52	6.0	0.34	9/4/18 9:52	0.46	303,507	128,850	57.5%	1074.51
28	9/4/18 12:52	9/5/18 2:52	14.0	0.46	9/5/18 8:52	0.38	174,404	169,410	2.9%	1076.02
29	9/20/18 18:52	9/20/18 22:52	4.0	0.91	9/21/18 4:52	15.67	151,209	51,059	66.2%	1073.95
30	9/25/18 7:52	9/25/18 9:52	2.0	0.64	9/25/18 15:52	4.38	50,568	38,400	24.1%	1073.85
31	9/30/18 10:52	10/1/18 11:52	25.0	0.27	10/1/18 17:52	5.04	87,892	7,871	91.0%	1073.87
32	10/7/18 9:52	10/9/18 17:52	56.0	2.04	10/9/18 23:52	5.92	620,984	308,073	50.4%	1073.89
33	10/14/18 9:52	10/14/18 13:52	4.0	0.23	10/14/18 19:52	4.67	68,894	10,694	84.5%	1073.95
34	10/25/18 4:52	10/25/18 23:52	19.0	0.17	10/26/18 5:52	10.63	54,562	419	99.2%	1073.73
		Average	**9.09**	**0.72**		**5.02**	**5,234,289**	**3,189,774**	**39.1%**	
		Median	**5.5**	**0.4**		**4.5**				

Event Rainfall Total (in)	**24.38**
Total Rainfall April-Oct (in)	**25.87**

Without Shaded	**5,063,296**	**2,810,953**	**44.5%**

Notes: Rainfall events => 0.1 inches

NA[1] indicates no water level data available

Shaded cell indicates unrealistic flow volumes

Estimated Gallons of Volume Reduced during Wet Weather	**16,847,527**	**16.8**	**MG**

4.6.1 Event 1

There is approximately a 15-minute lag time between the peak water surface elevation in the detention area upstream of the future park road and the peak water surface elevation observed in the wetland. The ponding in the upstream detention area dewatered to its permanent pool elevation in approximately 2 days after the rain event, whereas the permanent pool adjacent to the outlet structure dewatered to its permanent pool elevation in approximately 3.5 days as seen in Figure 4-20. When the water surface elevation is above 1076.50 feet, drawdown is controlled by the slotted weir at the outlet structure. After the water surface elevation drops below 1076.50 feet, drawdown is controlled by an 8-inch orifice with an invert elevation of 1074.00 feet, resulting in an average after-event drawdown rate of approximately 0.75 inches per hour at the outlet for Event 1. The drawdown rate in the micropool was 0.02 inches per hour.

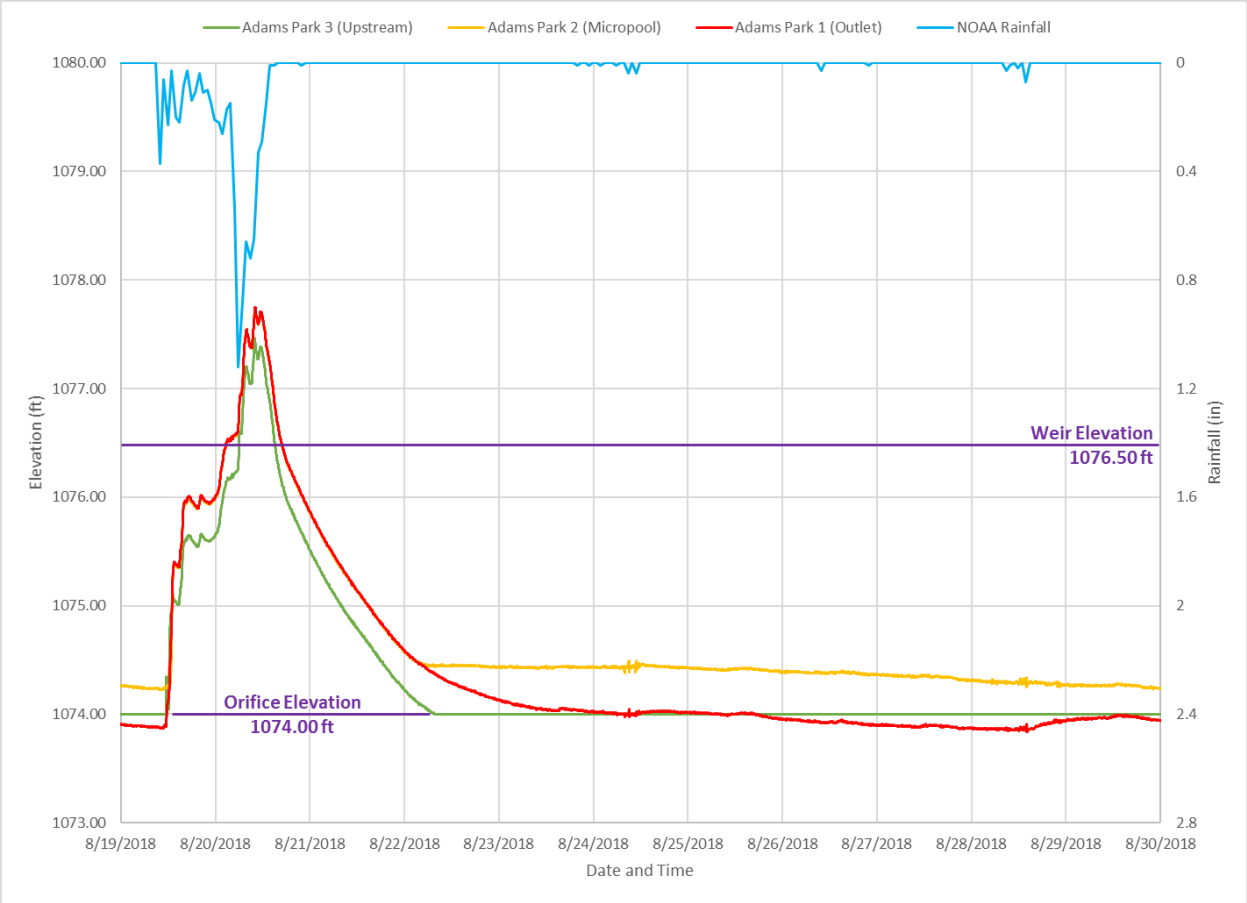

Figure 4-20: Adams Park Event 1 (8.25 inches)

Since Event 1 was such a large event, the data was used to develop a stage-storage curve that was then compared to the design stage-storage curve, as seen in Figure 4-21.

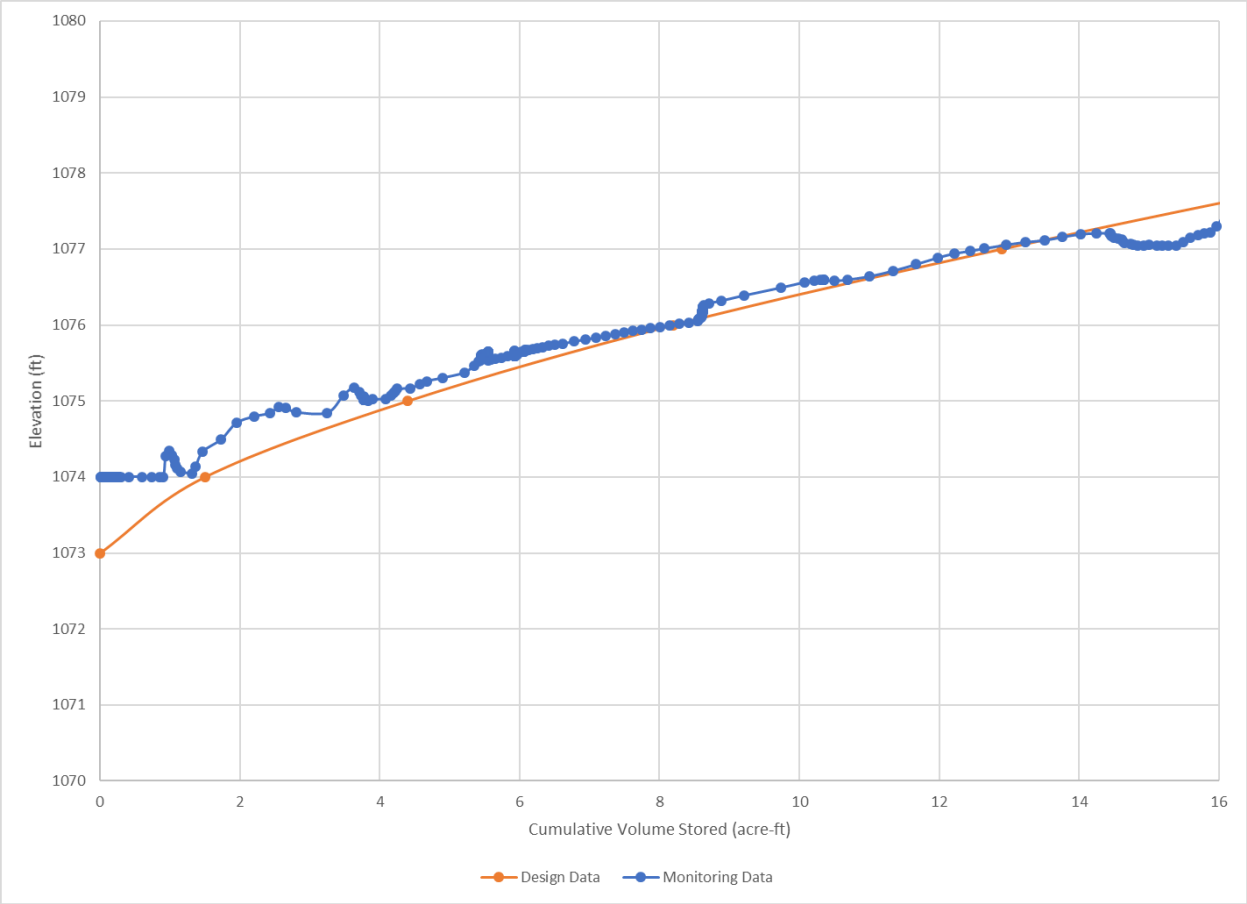

Figure 4-21: Adams Park Stage-Storage Curve

4.6.2 Event 2

During Event 2, the water surface elevation does not reach the slotted weir elevation, therefore, drawdown rate is controlled by the 8-inch orifice with an invert of 1074.00 feet. The average drawdown rate when the water level is below the slotted weir elevation of 1076.5 feet until it reaches the 8-inch orifice, is approximately 0.58 inches per hour. The drawdown rate between the slotted weir and the orifice is driven by head above the orifice. Therefore, the observed average drawdown rate of Event 2 is less than the average drawdown rate for Event 1 because the water depth is shallower for Event 2 than Event 1. After Event 2, the micropool does not dewater to the permanent pool elevation of 1074.00 feet prior to an event that occurs approximately 5 days later. See Figure 4-22. The micropool drawdown rate was 0.02 inches per hour.

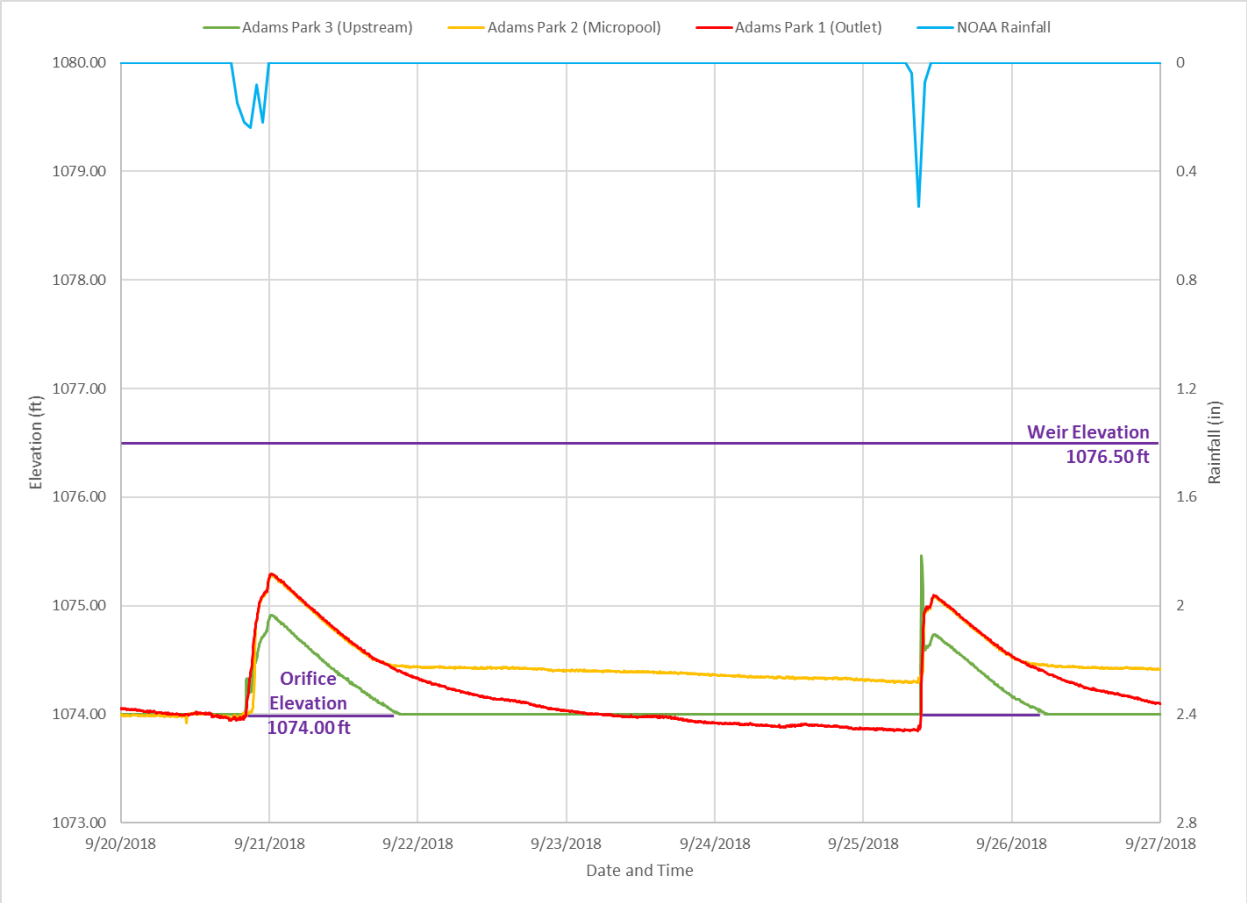

Figure 4-22: Adams Park Event 2 (0.91 inches)

4.6.3 Dry Weather Drawdown

Dry weather flow analysis is typically based on a dry period lasting 14 days, however, no dry weather period lasted for 14 days during the 2018 monitoring period. The longest dry period for each of the 3 months (August, September, and October) where water level data was available, was analyzed to approximate evapotranspiration and evaporation. The average drawdown rate was calculated based on the pressure transducer data at the outlet structure for each of the three dry weather periods depicted in Table 4-9. Mean monthly Class A pan evaporation was obtained from NOAA Technical Report NWS 34 for August, September, and October. Mean monthly pan evaporation data was converted to mean monthly free water surface (FWS) evaporation using the pan coefficient of 0.74 for Omaha, Nebraska, obtained from NOAA Technical Report NWS 33. The dry weather drawdown rate is a function of three mechanisms: 1) FWS evaporation, 2) evapotranspiration, and 3) infiltration. Assuming that the wetland liner is impervious, subtracting mean FWS rate from the dry weather drawdown rate provides an approximation for evapotranspiration.

Table 4-9: Adams Park Dry Weather Drawdown Summary

Start Date	End Date	Duration	Decrease in Water Level (feet)	Drawdown Rate (inches/day)	Mean FWS Evaporation Rate (inches/day)	Approximated Evapotranspiration Rate (inches/day)
8/7/18	8/14/18	7 days, 8 hours	0.23	0.376	0.190	0.186
9/7/18	9/18/18	11 days	0.47	0.414	0.142	0.272
10/16/18	10/25/18	8 days, 21 hours	0.28	0.379	0.115	0.264

4.7 Sewer Maintenance

Water quality samples were collected on 9/20/18 at two inflow locations and one outflow location as depicted in Figure 4-23. Three inflow grab samples were collected from the curb cut that discharges to the bioswale and conveys flow to the bioretention system. Three additional inflow grab samples were collected from the 10-inch underdrain that dewaters the permeable pavement parking area into the bioretention system. Three outflow samples were collected from the bioretention underdrain via monitoring flume.

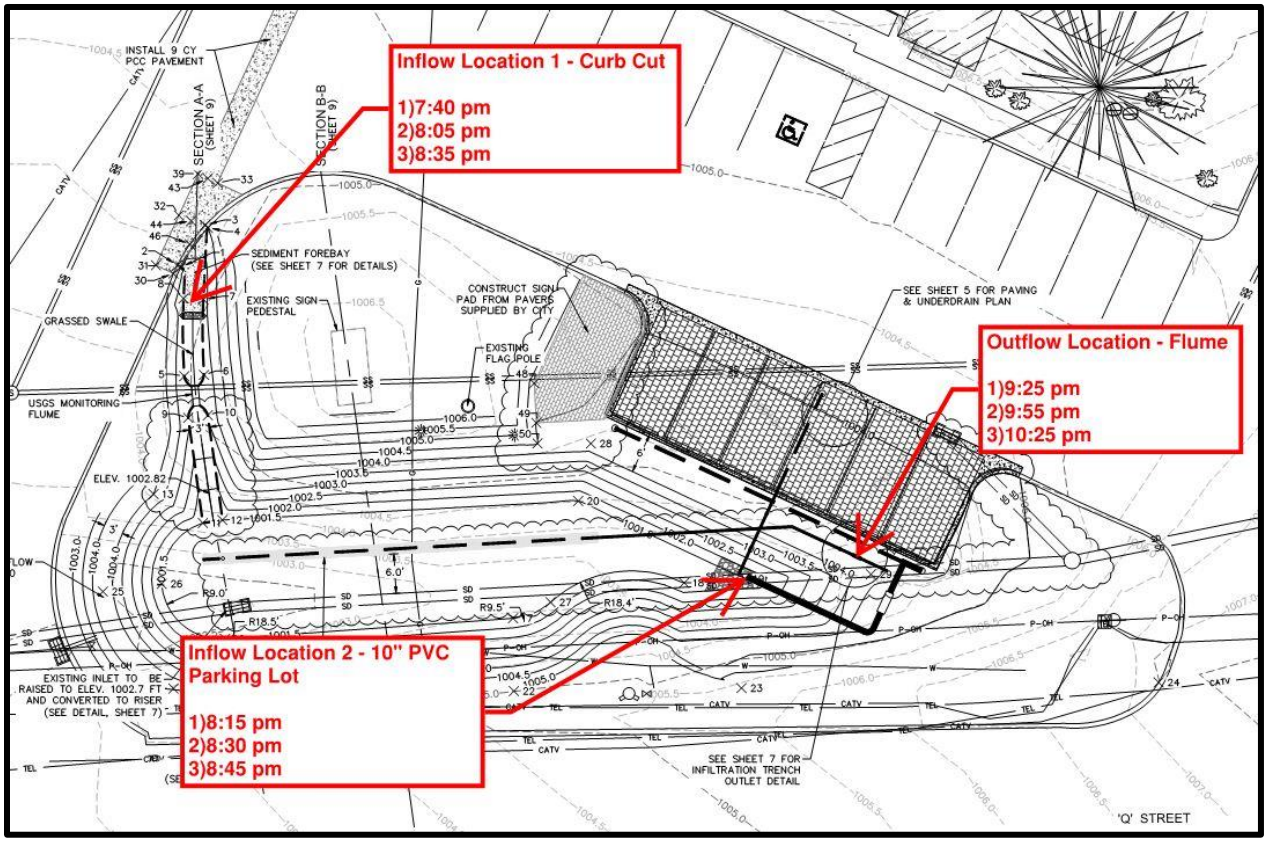

Figure 4-23: Sewer Maintenance Water Quality Sampling Locations

Water quality samples were delivered to Midwest Laboratories in an iced cooler on 9/21/18, between 8:25AM and 8:30AM. Water quality samples were tested for TKN, NO3/NO2-N, P, TDS, TSS, and *E. coli*. At the time of delivery, the Sewer Maintenance samples had exceeded the allotted holding time for *E. coli* but were tested anyway. The sample holding time from sample collection until sample preparation for *E. coli* by Midwest Laboratories ranged from 13 - 14.5 hours. Therefore, actual concentrations of *E. coli* may be less than reported values. Table 4-10 and Table 4-11 summarize the results of the water quality testing. Full reports from Midwest Laboratories are included in Appendix C.

Table 4-10: Sewer Maintenance Inflow Water Quality Results

Lab ID:	1541055-01	1541055-02	1541055-03	1541056-01	1541056-02	1541056-03	
Sample Time:	7:40 PM	8:05 PM	8:35 PM	8:15 PM	8:30 PM	8:45 PM	
Constituent	Inflow Curb 1	Inflow Curb 2	Inflow Curb 3	Inflow Parking 1	Inflow Parking 2	Inflow Parking 3	Reporting Limit
TKN (mg/L)	2.22	0.99	0.96	<	<	<	0.50
NO3/NO2-N (mg/L)	1.15	0.26	0.26	0.90	0.84	0.76	0.20
P (mg/L)	0.23	0.15	0.06	<	<	<	0.05
TDS (mg/L)	324	18	88	596	482	390	10
TSS (mg/L)	78	116	28	7	6	7	4
E. coli (CFU/100mL)[1]	170	32	18	388	318	360	1

[1] *E. coli* results are provided but may not be representative as sample holding times exceeded regulatory holding time for *E. coli* of 6 hours.

Table 4-11: Sewer Maintenance Outflow Water Quality Results

Lab ID:	1541055-04	1541055-05	1541055-06	
Sample Time:	9:25 PM	9:55 PM	10:25 PM	
Constituent	Outflow 1	Outflow 2	Outflow 3	Reporting Limit
TKN (mg/L)	<	<	<	0.50
NO3/NO2-N (mg/L)	0.52	0.44	0.43	0.20
P (mg/L)	0.13	0.13	0.14	0.05
TDS (mg/L)	218	216	204	10
TSS (mg/L)	8	<	6	4
E. coli (CFU/100mL)[1]	260	430	376	1

[1] *E. coli* results are provided but may not be representative as sample holding times exceeded regulatory holding time for *E. coli* of 6 hours.

Assuming an even contribution of flow between the two inflow sources, outflow concentrations were lower than average inflow concentrations for TKN, NO3/NO2-N, TDS, and TSS. Concentrations of TKN, NO3/NO2-N, and TDS decreased for most samples throughout the rain event. The curb cut inflow was the greatest source of TKN, P, and suspended solids. The inflow from the parking lot underdrain was the greatest source of dissolved solids, and *E. coli*. The inflow phosphorus concentration from the parking lot underdrain was below the reportable limit. Outflow concentrations for P and *E. coli* were greater than average inflow concentrations. All effluent *E. coli* concentrations exceeded the EPA Recreational Water Quality (RWQ) Criteria of 126 CFU/100mL. The highest *E. coli* concentration was in the underdrain from the bioretention system. *E. coli* concentrations are provided but may not be representative of actual *E. coli* concentrations due to exceeded holding times. Rainfall had not occurred since 0.05 inches of rainfall on 9/7/18, resulting in 13 days of buildup prior to the 9/20 event.

United States Geologic Survey (USGS) monitoring equipment was in-place at the Sewer Maintenance Facility during the 2018 monitoring period. USGS discharge data for the facility was plotted against TSS data from the water quality sampling results. A complete list of the available parameters and available period for data can be found on the USGS website at: https://nwis.waterdata.usgs.gov/nwis/.

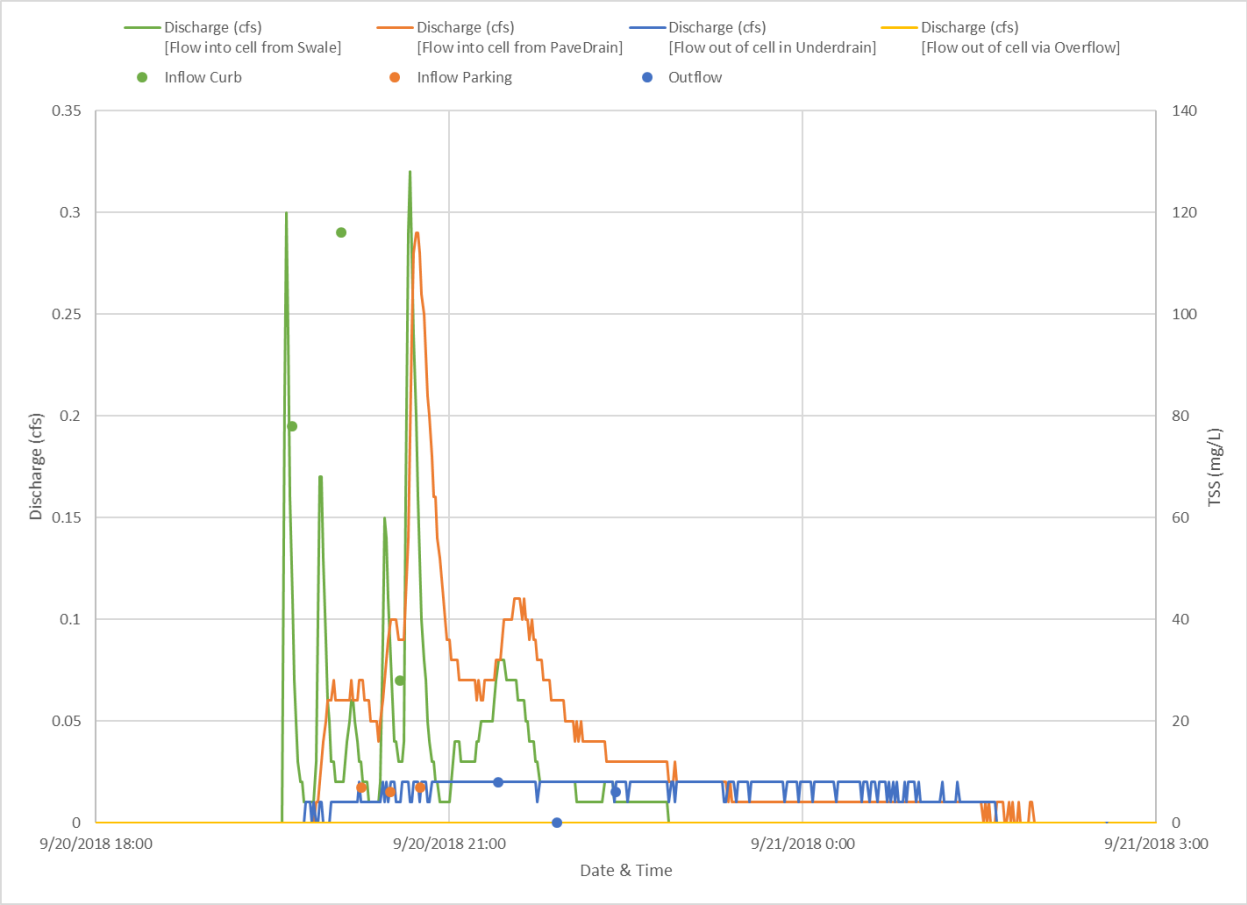

Figure 4-24: Sewer Maintenance TSS Discharge Comparison

4.8 SOIA

No monitoring equipment was installed at SOIA during the 2018 monitoring period, however, water quality grab samples were collected at the bioretention system site during Event 2 on 9/20/18. Water quality samples were collected for one inflow location and one ponded location, referenced as "outflow" in Appendix C, as depicted in Figure 4-25. Three inflow grab samples were collected from the overland flow path on the west side of the bioretention system that receives runoff from the west side of the industrial sanitary sewer lift station. The underdrain discharge point in the manhole east of the bioretention system was the logical location to collect outflow samples. However, during the sampling event, the underdrain invert was below the manhole sump water level, and a grab sample of the

underdrain discharge could not be collected. Therefore, three samples were collected from the ponded water near the middle of the bioretention system, north of the rock infiltration trench, in lieu of outflow samples from the underdrain system. These three ponded samples represent the water quality of the bioretention ponded water.

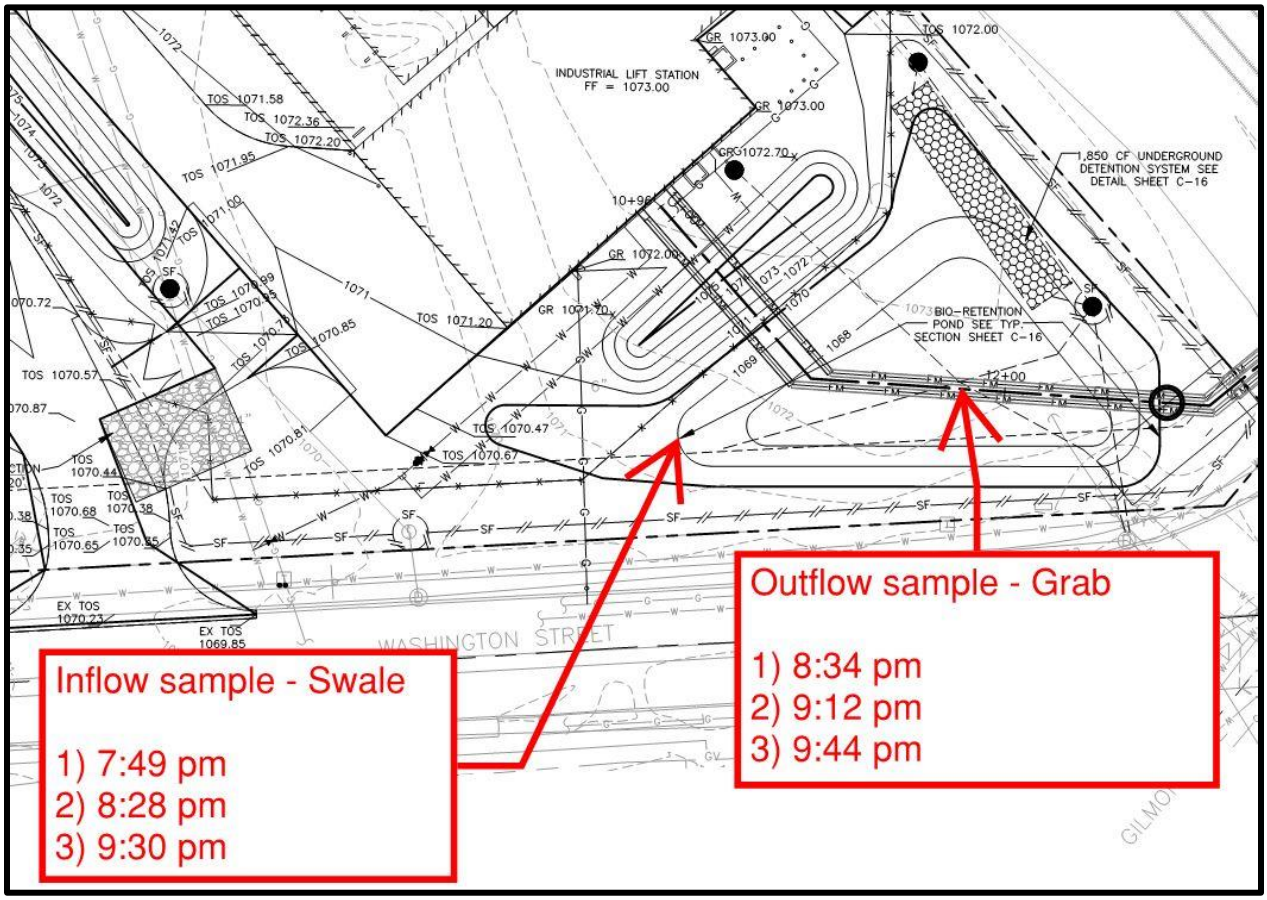

Figure 4-25: SOIA Water Quality Sampling Locations

Water quality samples were delivered to Midwest Laboratories in an iced cooler on 9/21/18, at 8:25AM. Water quality samples were tested for TKN, NO3/NO2-N, P, TDS, TSS, and *E. coli*. Similar to the Sewer Maintenance grab samples, the SOIA grab samples had also exceeded the allotted holding time for *E. coli* but were tested anyway. The sample holding time from sample collection until sample preparation for *E. coli* by Midwest Laboratories ranged from 13.5 - 15 hours. Therefore, actual concentrations of *E. coli* may be less than the values reported. Table 4-12 summarizes the results of the water quality testing. Full reports from Midwest Laboratories are included in Appendix C.

Table 4-12: SOIA Water Quality Results

Lab ID:	1542330-01	1542330-02	1542330-03	1542330-04	1542330-05	1542330-06	
Sample Time:	7:49 PM	8:28 PM	9:30 PM	8:34 PM	9:12 PM	9:44 PM	
Constituent	Inflow 1	Inflow 2	Inflow 3	Ponded 1	Ponded 2	Ponded 3	Reporting Limit
TKN (mg/L)	1.73	0.84	0.72	1.42	1.25	1.39	0.50
NO3/NO2-N (mg/L)	0.38	<	<	0.38	0.45	<	0.20
P (mg/L)	0.73	0.42	0.44	0.70	0.44	0.64	0.05
TDS (mg/L)	68	12	56	68	36	108	10
TSS (mg/L)	70	40	13	82	24	63	4
E. coli (CFU/100mL)[1]	184	528	296	20400	9900	14400	1

[1] *E. coli* results are provided but may not be representative as sample holding times exceeded regulatory holding time for *E. coli* of 6 hours.

Nitrogen and phosphorus concentrations in the inflow generally decreased as the rainfall event continued. Ponded sample concentrations exceeded inflow sample concentrations for nearly every testing parameter. Bacteria levels in the ponded water were two orders of magnitude higher than inflow concentration, suggesting aggregation of bacteria within the bioretention system. All observed *E. coli* concentrations were above the EPA Recreational Water Quality Criteria of 126 CFU/100mL. Data from the National BMP Database from North Carolina State University research also observed effluent *E. coli* concentrations an order of magnitude greater than influent concentrations for a bioretention site. *E. coli* concentrations are provided but may not be representative of actual *E. coli* concentrations due to exceeded holding times.

4.9 Water Quality Sampling Summary

Inflow and ponded event geometric means were calculated for the 9/20 events based on the collected water quality samples. For values where the water quality testing results were below the reporting limit, the minimum reporting limit value was used to calculate geometric mean, as indicated by the footnotes for Table 4-13 and Table 4-14. Table 4-15 includes the SOIA ponded water sample water quality data, which is neither representative of inflow or outflow from the SOIA bioretention system. Changes in event geometric mean results from inflow to outflow for the 9/20/18 event are as follows:

- TKN decreased by approximately 45% from inflow to outflow
- NO3/NO2-N increased by approximately 200%
- P decreased by approximately 50%
- TDS increased by approximately 410%
- TSS decreased by approximately 90%

- *E. coli* increased by approximately 195%

  (*E. coli* results are provided but may not be representative as sample holding times exceeded regulatory holding time for *E. coli* of 6 hours.)

Table 4-13: Summary of Inflow Water Quality Results

Constituent	TKN (mg/L)	NO3/NO2-N (mg/L)	P (mg/L)	TDS (mg/L)	TSS (mg/L)	*E. coli* (CFU/100mL)[1]
Albright Inflow 1	4.08	0.80	1.26	112	1350	880
Albright Inflow 2	2.51	0.68	0.68	40	332	2120
Albright Inflow 3	2.28	0.69	0.79	132	196	9100
Sewer Maintenance Inflow Curb 1	2.22	1.15	0.23	324	78	170
Sewer Maintenance Inflow Curb 2	0.99	0.26	0.15	18	116	32
Sewer Maintenance Inflow Curb 3	0.96	0.26	0.06	88	28	18
SOIA Inflow 1	1.73	0.38	0.73	68	70	184
SOIA Inflow 2	0.84	< [2]	0.42	12	40	528
SOIA Inflow 3	0.72	< [2]	0.44	56	13	296
Inflow Event Geometric Mean	1.55	0.42	0.39	62	98	331

[1] *E. coli* results are provided but may not be representative as sample holding times exceeded regulatory holding time for *E. coli* of 6 hours.
[2] Reporting limit for NO3/NO2-N is 0.20 mg/L.

Table 4-14: Summary of Outflow Water Quality Results

Constituent	TKN (mg/L)	NO3/NO2-N (mg/L)	P (mg/L)	TDS (mg/L)	TSS (mg/L)	*E. coli* (CFU/100mL)[1]
Albright Outflow 1	2.44	5.06	1.16	332	27	8300
Albright Outflow 2	2.21	5.50	1.13	294	23	7500
Albright Outflow 3	2.56	5.56	1.10	314	22	6900
Sewer Maintenance Inflow Parking 1 [2]	< [3]	0.90	< [4]	596	7	388
Sewer Maintenance Inflow Parking 2 [2]	< [3]	0.84	< [4]	482	6	318
Sewer Maintenance Inflow Parking 3 [2]	< [3]	0.76	< [4]	390	7	360
Sewer Maintenance Outflow 1	< [3]	0.52	0.13	218	8	260
Sewer Maintenance Outflow 2	< [3]	0.44	0.13	216	< [5]	430
Sewer Maintenance Outflow 3	< [3]	0.43	0.14	204	6	376
Outflow Event Geometric Mean	0.84	1.27	0.20	318	10	976

[1] *E. coli* results are provided but may not be representative as sample holding times exceeded regulatory holding time for *E. coli* of 6 hours.
[2] Samples from the permeable pavement parking underdrain, although an inflow source to the bioretention system, were considered as "outflow" for calculating event geometric mean due to the pretreatment provided by the permeable pavement.
[3] Reporting limit for TKN is 0.50 mg/L.
[4] Reporting limit for P is 0.05 mg/L.
[5] Reporting limit for TSS is 4 mg/L.

Table 4-15: Summary of SOIA Ponded Water Quality Results

Constituent	TKN (mg/L)	NO3/NO2-N (mg/L)	P (mg/L)	TDS (mg/L)	TSS (mg/L)	*E. coli* (CFU/100mL) [1]
SOIA Ponded 1	1.42	0.38	0.70	68	82	20400
SOIA Ponded 2	1.25	0.45	0.44	36	24	9900
SOIA Ponded 3	1.39	< [2]	0.64	108	63	14400

[1] *E. coli* results are provided but may not be representative as sample holding times exceeded regulatory holding time for *E. coli* of 6 hours.
[2] Reporting limit for NO3/NO2-N is 0.20 mg/L.

5.0 CONCLUSIONS

Based on the results from the 2018 monitoring period, several general conclusions have been made regarding observed BMP performance and monitoring procedures. The following includes a summary of the monitored performance of the sites evaluated:

- Orchard Park
  - Both 2017 and 2018 monitoring data confirm that larger, more prolonged rainfall events are required to encourage lateral movement of the wetting front. In general, the top soils (0 to 12 inches below ground surface) within the bioretention system reach a saturated soil condition in 3 to 25 hours, depending on the pre-event soil moisture condition. Following an event, approximately 15% to 20% of the maximum volumetric soil moisture was removed from the top soils in 72 hours.
- Creighton Prep
  - Ponding and outflow data were utilized to define that the peak discharge rate of the bioretention system underdrain is approximately 3 cfs during an 8.25-inch, when the maximum ponding height is reached. A quick drawdown rate was also observed for the 0.91-inch event, confirming that the primary mechanism for drawdown from the bioretention system is percolation through the media and discharging via the underdrain system. Drawdown times were between 2 and 4 hours, far less than the discharge time of 24 - 48 hours for a bioretention system, prescribed in the Omaha Regional Stormwater Design Manual.
- UNO Welcome Center
  - This site exemplifies overengineering of BMPs. BMPs are usually sized for the stormwater quality event, however, these facilities have so much redundancy and factors of safety that they often do not function as designed. The bioretention system at the UNO facility does not reach maximum ponding at the Type B bioretention infiltration trench, even during an 8.25-inch. Likewise, the Type B bioretention infiltration trench briefly reaches its maximum ponded storage capacity, for a period of up to 2 hours, during an 8.25-inch event. Drawdown rates were observed at 2.8 to 4.3 inches per hour.
  - A subsurface temperature analysis provided data to support the 2017 soil temperature conclusion that bioretention soils maintain a warmer soil temperatures in winter months than in-situ soils.

- Albright Park
  - Average drawdown rates at the Albright Park bioretention site raged from 0.55 to 2.25 inches per hour for the two events analyzed. Based on a ponding depth of 2.5 feet, as designed at the bioretention system, standing water should drawdown within 15 hours for less than a 1-year event (Event 2) and in less than 55 hours for greater than a 100-year event (Event 1).
- Adams Park
  - Based on flow metering data provided by GBA, Adams Park removed approximately 16.8 million gallons of wet-weather discharge to the combined sewer system during the 2018 recreational season from 4/1/18 to 10/31/18. Overall, for wet weather events in 2018 the discharge volume was reduced by 44.5%.
- Dundee Elementary
  - This outdoor green infrastructure classroom has the potential to be a great learning environment for the Dundee Elementary children. Installation of a manometer on the rain silo and observation camera(s) can help students better understand green infrastructure and how stormwater can be used as a resource.
- Sewer Maintenance Facility
  - The permeable pavement parking area underdrain discharge had considerably lower concentrations of most constituents compared to the curb cut inflow samples. The source of these constituents may be less contributing to the parking area or the permeable pavement system may act as pretreatment prior to the bioretention system.
- SOIA
  - Ponded bacteria concentrations were nearly two orders of magnitude greater than inflow concentrations. Likely source of *E. coli* concentrations in ponded water is aggregation of deposits, collected in the bioretention system.

APPENDIX A NOAA ATLAS 14 TABULAR OUTPUT

NOAA Atlas 14, Volume 8, Version 2
Location name: Omaha, Nebraska, USA*
Latitude: 41.2576°, Longitude: -95.9715°
Elevation: 1210.92 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.359 (0.296-0.438)	0.426 (0.351-0.520)	0.538 (0.441-0.658)	0.634 (0.517-0.778)	0.770 (0.608-0.975)	0.878 (0.677-1.12)	0.990 (0.737-1.29)	1.11 (0.789-1.48)	1.26 (0.867-1.72)	1.39 (0.925-1.91)
10-min	0.526 (0.433-0.641)	0.623 (0.513-0.761)	0.787 (0.646-0.963)	0.928 (0.757-1.14)	1.13 (0.891-1.43)	1.29 (0.991-1.65)	1.45 (1.08-1.89)	1.62 (1.16-2.16)	1.85 (1.27-2.53)	2.03 (1.36-2.80)
15-min	0.641 (0.529-0.782)	0.760 (0.626-0.928)	0.960 (0.788-1.18)	1.13 (0.923-1.39)	1.38 (1.09-1.74)	1.57 (1.21-2.01)	1.77 (1.32-2.31)	1.98 (1.41-2.63)	2.26 (1.55-3.08)	2.48 (1.65-3.42)
30-min	0.942 (0.777-1.15)	1.12 (0.924-1.37)	1.42 (1.17-1.74)	1.68 (1.37-2.06)	2.04 (1.61-2.58)	2.33 (1.79-2.98)	2.62 (1.95-3.42)	2.93 (2.09-3.90)	3.34 (2.29-4.56)	3.66 (2.44-5.05)
60-min	1.23 (1.01-1.50)	1.48 (1.22-1.81)	1.91 (1.57-2.33)	2.28 (1.86-2.80)	2.82 (2.23-3.58)	3.25 (2.51-4.17)	3.70 (2.76-4.84)	4.18 (2.99-5.59)	4.84 (3.32-6.62)	5.36 (3.58-7.40)
2-hr	1.52 (1.26-1.84)	1.84 (1.53-2.23)	2.39 (1.98-2.90)	2.88 (2.37-3.51)	3.59 (2.87-4.54)	4.17 (3.25-5.32)	4.78 (3.59-6.22)	5.43 (3.91-7.22)	6.34 (4.39-8.62)	7.06 (4.75-9.67)
3-hr	1.68 (1.40-2.03)	2.04 (1.70-2.46)	2.67 (2.21-3.22)	3.23 (2.67-3.92)	4.07 (3.27-5.14)	4.76 (3.73-6.07)	5.51 (4.16-7.15)	6.30 (4.57-8.36)	7.42 (5.17-10.1)	8.32 (5.62-11.4)
6-hr	1.98 (1.66-2.36)	2.36 (1.98-2.83)	3.06 (2.56-3.67)	3.71 (3.08-4.47)	4.70 (3.82-5.93)	5.54 (4.38-7.03)	6.45 (4.92-8.34)	7.44 (5.44-9.83)	8.86 (6.22-12.0)	10.0 (6.81-13.6)
12-hr	2.29 (1.93-2.71)	2.66 (2.25-3.16)	3.35 (2.83-3.99)	4.01 (3.36-4.79)	5.03 (4.13-6.30)	5.90 (4.71-7.44)	6.86 (5.28-8.82)	7.91 (5.84-10.4)	9.43 (6.68-12.7)	10.7 (7.32-14.4)
24-hr	2.62 (2.23-3.09)	2.97 (2.53-3.51)	3.65 (3.10-4.31)	4.30 (3.63-5.10)	5.33 (4.42-6.64)	6.23 (5.01-7.81)	7.22 (5.61-9.23)	8.32 (6.19-10.9)	9.92 (7.09-13.2)	11.2 (7.77-15.0)
2-day	2.96 (2.54-3.46)	3.37 (2.89-3.94)	4.13 (3.53-4.84)	4.84 (4.12-5.70)	5.94 (4.94-7.31)	6.88 (5.57-8.53)	7.90 (6.17-9.99)	9.03 (6.76-11.7)	10.6 (7.65-14.1)	12.0 (8.33-15.9)
3-day	3.22 (2.78-3.75)	3.69 (3.18-4.29)	4.53 (3.89-5.28)	5.29 (4.52-6.20)	6.45 (5.38-7.88)	7.43 (6.03-9.15)	8.48 (6.65-10.7)	9.62 (7.23-12.4)	11.2 (8.12-14.8)	12.6 (8.79-16.6)
4-day	3.46 (3.00-4.01)	3.96 (3.43-4.60)	4.85 (4.18-5.64)	5.65 (4.84-6.59)	6.84 (5.72-8.31)	7.84 (6.38-9.60)	8.90 (6.99-11.1)	10.0 (7.57-12.8)	11.7 (8.44-15.2)	13.0 (9.10-17.1)
7-day	4.13 (3.60-4.76)	4.67 (4.06-5.39)	5.61 (4.86-6.48)	6.45 (5.55-7.47)	7.67 (6.43-9.22)	8.68 (7.10-10.5)	9.74 (7.69-12.1)	10.9 (8.23-13.8)	12.5 (9.07-16.2)	13.7 (9.70-18.0)
10-day	4.72 (4.13-5.42)	5.31 (4.64-6.10)	6.32 (5.50-7.27)	7.20 (6.23-8.32)	8.48 (7.13-10.1)	9.52 (7.81-11.5)	10.6 (8.40-13.1)	11.8 (8.93-14.8)	13.3 (9.74-17.2)	14.6 (10.4-19.1)
20-day	6.37 (5.61-7.25)	7.18 (6.31-8.17)	8.51 (7.47-9.72)	9.64 (8.40-11.0)	11.2 (9.46-13.2)	12.4 (10.3-14.8)	13.7 (10.9-16.7)	15.0 (11.4-18.7)	16.7 (12.3-21.3)	18.0 (12.9-23.3)
30-day	7.74 (6.84-8.76)	8.74 (7.72-9.90)	10.4 (9.13-11.8)	11.7 (10.2-13.3)	13.5 (11.4-15.8)	14.9 (12.3-17.6)	16.3 (13.0-19.7)	17.6 (13.5-21.8)	19.4 (14.3-24.7)	20.8 (14.9-26.8)
45-day	9.49 (8.43-10.7)	10.7 (9.51-12.1)	12.7 (11.2-14.3)	14.2 (12.5-16.1)	16.3 (13.8-18.9)	17.8 (14.8-20.9)	19.3 (15.5-23.2)	20.8 (16.0-25.5)	22.6 (16.7-28.5)	23.9 (17.3-30.7)
60-day	11.0 (9.81-12.4)	12.4 (11.0-13.9)	14.6 (12.9-16.4)	16.3 (14.4-18.4)	18.6 (15.7-21.4)	20.2 (16.8-23.6)	21.7 (17.4-25.9)	23.2 (17.9-28.3)	25.0 (18.5-31.3)	26.2 (19.0-33.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

APPENDIX B WEATHER DATA-PROVIDED ELECTRONICALLY

APPENDIX C WATER QUALITY SAMPLING LAB RESULTS

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01 October 2018

Work Order: 1541055

JOHN HYNES
CITY OF OMAHA QC DIV - 9602
5600 S 10TH ST
OMAHA, NE 68107-

RE: Green Infrastructure Monitoring

Enclosed are the results of analyses for samples received by the laboratory on 2018-09-21 08:25. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Heather Ramig

Heather Ramig
Project Manager
heather@midwestlabs.com

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OMAHA, NE 68107-

Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:18

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Infliw Curb 1	1541055-01	Aqueous	2018-09-20 19:40	2018-09-21 08:25
Inflow Curb 2	1541055-02	Aqueous	2018-09-20 20:05	2018-09-21 08:25
Inflow Curb 3	1541055-03	Aqueous	2018-09-20 20:35	2018-09-21 08:25
Outfall 1	1541055-04	Aqueous	2018-09-20 21:25	2018-09-21 08:25
Outfall 2	1541055-05	Aqueous	2018-09-20 21:55	2018-09-21 08:25
Outfall 3	1541055-06	Aqueous	2018-09-20 22:25	2018-09-21 08:25

Containers used for the following analyses:

1541055-01 A:	EPA 1603
1541055-01 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1541055-01 C:	SM 2540 C-1997, SM 2540 D-1997
1541055-02 A:	EPA 1603
1541055-02 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1541055-02 C:	SM 2540 C-1997, SM 2540 D-1997
1541055-03 A:	EPA 1603
1541055-03 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1541055-03 C:	SM 2540 C-1997, SM 2540 D-1997
1541055-04 A:	EPA 1603
1541055-04 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1541055-04 C:	SM 2540 C-1997, SM 2540 D-1997
1541055-05 A:	EPA 1603
1541055-05 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1541055-05 C:	SM 2540 C-1997, SM 2540 D-1997
1541055-06 A:	EPA 1603
1541055-06 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1541055-06 C:	SM 2540 C-1997, SM 2540 D-1997

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Analysis Results Reviewed by:

EPA 351.2 reviewed by cmw2.

EPA 353.2 reviewed by cmw2.

SM 2540 C-1997 reviewed by cmw2.

SM 2540 D-1997 reviewed by cmw2.

SM 4500-P F-1999 reviewed by cmw2.

EPA 1603 reviewed by jzh4.

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Project Manager: JOHN HYNES

Reported:
2018-10-01 09:18

Sample ID: Infliw Curb 1
Laboratory ID: 1541055-01
Sampled Date/Time: 2018-09-20 19:40

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	2.22	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	1.15	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	0.23	0.05	mg/L	SM 4500-P F-1999	2018-09-24	2018-09-26	jdb5	(B)
Total Dissolved Solids	324	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	78	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	170	1	CFU/100 mL	EPA 1603	2018-09-21/09:59	2018-09-22/10:40	kas2	(A)/ HT

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Project Manager: JOHN HYNES

Reported:
2018-10-01 09:18

Sample ID: Inflow Curb 2
Laboratory ID: 1541055-02
Sampled Date/Time: 2018-09-20 20:05

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	0.99	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	0.26	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	0.15	0.05	mg/L	SM 4500-P F-1999	2018-09-24	2018-09-26	jdb5	(B)
Total Dissolved Solids	18	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	116	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	32	1	CFU/100 mL	EPA 1603	2018-09-21/10:00	2018-09-22/10:40	kas2	(A)/ HT

Work Order: 1541055

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Project Manager: JOHN HYNES

Reported:
2018-10-01 09:18

Sample ID: Inflow Curb 3
Laboratory ID: 1541055-03
Sampled Date/Time: 2018-09-20 20:35

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	0.96	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	0.26	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	0.06	0.05	mg/L	SM 4500-P F-1999	2018-09-24	2018-09-26	jdb5	(B)
Total Dissolved Solids	88	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	28	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	18	1	CFU/100 mL	EPA 1603	2018-09-21/10:04	2018-09-22/10:40	kas2	(A)/ HT

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Reported:
2018-10-01 09:18

Sample ID: Outfall 1
Laboratory ID: 1541055-04
Sampled Date/Time: 2018-09-20 21:25

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	<	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	0.52	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	0.13	0.05	mg/L	SM 4500-P F-1999	2018-09-24	2018-09-26	jdb5	(B)
Total Dissolved Solids	218	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	8	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	260	1	CFU/100 mL	EPA 1603	2018-09-21/10:04	2018-09-22/10:40	kas2	(A)/ HT

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Reported:
2018-10-01 09:18

Sample ID: Outfall 2
Laboratory ID: 1541055-05
Sampled Date/Time: 2018-09-20 21:55

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	<	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	0.44	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	0.13	0.05	mg/L	SM 4500-P F-1999	2018-09-24	2018-09-26	jdb5	(B)
Total Dissolved Solids	216	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	<	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	430	1	CFU/100 mL	EPA 1603	2018-09-21/10:08	2018-09-22/10:40	kas2	(A)/ HT

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Reported:
2018-10-01 09:18

Sample ID: Outfall 3
Laboratory ID: 1541055-06
Sampled Date/Time: 2018-09-20 22:25

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	<	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	0.43	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	0.14	0.05	mg/L	SM 4500-P F-1999	2018-09-24	2018-09-26	jdb5	(B)
Total Dissolved Solids	204	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	6	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	376	1	CFU/100 mL	EPA 1603	2018-09-21/10:08	2018-09-22/10:40	kas2	(A)/ HT

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Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:18

Environmental Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B806736										
Blank (B806736-BLK1)				Prepared & Analyzed: 2018-09-24						
Total Suspended Solids	<	4	mg/L							
LCS (B806736-BS1)				Prepared & Analyzed: 2018-09-24						
Total Suspended Solids	52.0	4	mg/L	50.0		104	90-110			
Duplicate (B806736-DUP1)		**Source: 1541055-01**		Prepared & Analyzed: 2018-09-24						
Total Suspended Solids	75.2	4	mg/L		78.1			3.73	10	
Duplicate (B806736-DUP2)		**Source: 1541055-02**		Prepared & Analyzed: 2018-09-24						
Total Suspended Solids	116.9	4	mg/L		116.4			0.480	10	
Batch B806737										
Blank (B806737-BLK1)				Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	<	0.20	mg/L							
LCS (B806737-BS1)				Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	5.03	0.20	mg/L	5.00		101	90-110			
Matrix Spike (B806737-MS1)		**Source: 1540707-01**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.67	0.20	mg/L	4.00	0.48	105	90-110			
Matrix Spike (B806737-MS2)		**Source: 1541056-03**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.82	0.20	mg/L	4.00	0.76	101	90-110			
Matrix Spike Dup (B806737-MSD1)		**Source: 1540707-01**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.66	0.20	mg/L	4.00	0.48	105	90-110	0.257	10	

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Reported:
2018-10-01 09:18

Environmental Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B806737										
Matrix Spike Dup (B806737-MSD2)		**Source: 1541056-03**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.82	0.20	mg/L	4.00	0.76	102	90-110	0.0622	10	
Batch B806762										
Blank (B806762-BLK1)				Prepared: 2018-09-24 Analyzed: 2018-09-26						
Phosphorus	<	0.05	mg/L							
LCS (B806762-BS1)				Prepared: 2018-09-24 Analyzed: 2018-09-26						
Phosphorus	0.528	0.05	mg/L	0.500		106	90-110			
Matrix Spike (B806762-MS1)		**Source: 1540707-01**		Prepared: 2018-09-24 Analyzed: 2018-09-26						
Phosphorus	0.692	0.05	mg/L	0.500	0.186	101	90-110			
Matrix Spike (B806762-MS2)		**Source: 1541055-03**		Prepared: 2018-09-24 Analyzed: 2018-09-26						
Phosphorus	0.571	0.05	mg/L	0.500	0.055	103	90-110			
Matrix Spike Dup (B806762-MSD1)		**Source: 1540707-01**		Prepared: 2018-09-24 Analyzed: 2018-09-26						
Phosphorus	0.703	0.05	mg/L	0.500	0.186	103	90-110	1.58	10	
Matrix Spike Dup (B806762-MSD2)		**Source: 1541055-03**		Prepared: 2018-09-24 Analyzed: 2018-09-26						
Phosphorus	0.565	0.05	mg/L	0.500	0.055	102	90-110	1.06	10	
Batch B806796										
Blank (B806796-BLK1)				Prepared: 2018-09-26 Analyzed: 2018-09-27						
Total Dissolved Solids	<	10	mg/L							

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OMAHA, NE 68107-

Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:18

Environmental Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B806796										
LCS (B806796-BS1)				Prepared: 2018-09-26 Analyzed: 2018-09-27						
Total Dissolved Solids	964.0	10	mg/L	1000		96.4	90-110			
Duplicate (B806796-DUP1)		**Source: 1542331-05**		Prepared: 2018-09-26 Analyzed: 2018-09-27						
Total Dissolved Solids	316.0	10	mg/L		294.0			7.21	10	
Duplicate (B806796-DUP2)		**Source: 1542331-06**		Prepared: 2018-09-26 Analyzed: 2018-09-27						
Total Dissolved Solids	308.0	10	mg/L		314.0			1.93	10	
Batch B806806										
Blank (B806806-BLK1)				Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	<	0.50	mg/L							
LCS (B806806-BS1)				Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	2.070	0.50	mg/L	2.00		104	90-110			
Matrix Spike (B806806-MS1)		**Source: 1541055-01**		Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	4.120	0.50	mg/L	2.00	2.220	95.0	90-110			
Matrix Spike (B806806-MS2)		**Source: 1541056-03**		Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	2.260	0.50	mg/L	2.00	0.370	94.5	90-110			
Matrix Spike Dup (B806806-MSD1)		**Source: 1541055-01**		Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	4.140	0.50	mg/L	2.00	2.220	96.0	90-110	0.484	10	
Matrix Spike Dup (B806806-MSD2)		**Source: 1541056-03**		Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	2.230	0.50	mg/L	2.00	0.370	93.0	90-110	1.34	10	

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Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:18

Certified Analyses included in this Report

Method	Analyte	Certifications
EPA 1603 in Aqueous	E. Coli	IA,FL
EPA 351.2 in Aqueous	Total Kjeldahl Nitrogen	IA,OK,UT
EPA 353.2 in Aqueous	Nitrate/Nitrite Nitrogen	TX,FL,UT,OK,IA
SM 2540 C-1997 in Aqueous	Total Dissolved Solids	IA,FL,KS,OK,TX,WA,UT
SM 2540 D-1997 in Aqueous	Total Suspended Solids	FL,KS,TX,UT,IA,OK
SM 4500-P F-1999 in Aqueous	Phosphorus	FL,IA,TX,OK,KS

Code	Description	Number	Expires
FL	Florida Department of Health	E87918	06/30/2019
FL-B	Florida Department of Health	E871122	06/30/2019
IA	Iowa Department of Natural Resources	064	05/01/2019
KS	Kansas Department of Health and Environment	E-10402	04/30/2019
OK	Oklahoma Department of Environmental Quality	2018-118	08/31/2019
TX	Texas Commission on Environmental Quality	T104704416-18-12	07/31/2019
TX-B	Texas Commission on Environmental Quality	T104704546-18-2	07/31/2019
UT	State of Utah Department of Health	NE000012018-8	07/31/2019
WA	State of Washington Department of Ecology	C912	06/07/2019

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Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:18

Notes and Definitions

HT	Hold time exceeded, not suitable for regulatory purposes.
<	Less than reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

EPA 524.2, EPA 624, EPA 8260, OA-1, TCLP VOC, GRO, and all microbiological analyses are conducted in the facility located at 13606 B Street, Omaha, NE 68144. All other analyses are conducted in the main facility located at 13611 B Street, Omaha, NE 68144.

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CHAIN OF CUSTODY

Lab Work Order Number: 1541055
Date Generated: 08/08/2018

Client Name	Project Name
CITY OF OMAHA QC DIV - 9602	Green Infrastructure Monitoring
Client Contact	Project Description
JOHN HYNES	
Address	Purchase Order Number
5600 S 10TH ST	
City	Midwest Labs Contact
OMAHA	Heather Ramig
State/Zip	Regulatory (Circle One)
NE, 68107-	Yes No
Phone / Fax	Regulatory Agency
4024443908 / 4024443904	
Sampler Name (printed)	Sample Type (Circle One - See Below) D G W S/H U P

Requested Analyses (Test Names): Ecoli-EPA1603; Nitrate/Nitrite, TKN-Discrete, Total Phosphorus; TDS, TSS

WORKORDER: 1541055 COC Sticker #: 1

Copy To:

Email to:

Lab ID	Sample Name or Field ID	Sampled Date	Sampled Time	Sample Code	Matrix Code	Container Count	Preservation Code 10	4	1	Sample Comments
01	01	9/20/2018	7:40pm		A	3	1	1	1	Inflow Curb 1
02	02	9/20/2018	8:05pm		A	3	1	1	1	Inflow Curb 2
03	03	9/20/2018	8:35pm		A	3	1	1	1	Inflow Curb 3
04	04	9/20/2018	9:25pm		A	3	1	1	1	Outfall 1
05	05	9/20/2018	9:55pm		A	3	1	1	1	Outfall 2
06	06	9/20/2018	10:25pm		A	3	1	1	1	Outfall 3

Relinquished By	Date/Time	Received By	Date/Time
ALEX EVANS	9/21/2018 8:15am		9/21/18 0825
Relinquished By	Date/Time	Received By	Date/Time
	9/21/18 8:27		

Comments:

Lab Internal Use Only:
Temperature Upon Receipt: 7.2
Cooler Numbers:
Notes:

Matrix Codes: A=Aqueous

Preservation Codes: 1=Cool 6°C,10=Sterile, Na2SO3, Cool 6°C,4=pH<2; H2SO4

Sample Type Codes: D = Drinking Water (Safe Drinking Water Act), G = Groundwater, W = Wastewater (Clean Water Act), S/H = Solid/Hazardous Waste (RCRA), U = Underground Storage Tank (UST), P = Process Water

Chain of Custody will have a signature upon receipt but no subsequent signatures.

RC Form 15 - Effective 10/31/2013

Work Order 1541055

Midwest Laboratories®

Sample Acceptance Checklis
Document Number: RC CHKLIST 0
Revision No.:
Effective Date: 1/31/1
Page 1 of

WORKORDER: 1541055
COC
Sticker #: 2

Lab Number:

Thermometer Used: ☐ Therm Fisher IR 13

Sample Temperature (°C): 7.2°C

Cooler Intact: ☑ Yes ☐ No
Received on Ice: ☐ Yes ☑ No
Hand Delivered: ☑ Yes ☐ No

Date & Initials of person accepting samples: Olm 9/21/18

				Comments:
Chain of Custody present?	☑ Yes	☐ No	☐ N/A	
Chain of Custody complete?	☐ Yes	☑ No	☐ N/A	
Sample ID(s):	☑ Yes	☐ No	☐ N/A	
Sample Location(s):	☑ Yes	☐ No	☐ N/A	
Client Contact:	☑ Yes	☐ No	☐ N/A	
Analysis Requested:	☑ Yes	☐ No	☐ N/A	
Sampler name on COC?	☐ Yes	☑ No	☐ N/A	
Date & Time of collection:	☑ Yes	☐ No	☐ N/A	
Sample labels match COC?	☑ Yes	☐ No	☐ N/A	
Written in indelible ink?	☑ Yes	☐ No	☐ N/A	
Labels indicate proper preservation?	☑ Yes	☐ No	☐ N/A	
Chain of Custody relinquished with signature?	☑ Yes	☐ No	☐ N/A	
Samples arrived within hold time?	☑ Yes	☑ No	☐ N/A	coc expired - Olm 9/21/18
Sufficient volume?	☑ Yes	☐ No	☐ N/A	
Appropriate containers used?	☑ Yes	☐ No	☐ N/A	
Filtered volume received for dissolved tests?	☐ Yes	☐ No	☑ N/A	
Headspace in VOA vials?	☐ Yes	☐ No	☑ N/A	
Trip Blank present?	☐ Yes	☑ No	☐ N/A	

Client Notification/Resolution: Date/Time Contacted: _____

Person Contacted: _____ Contacted By: _____

Comments/Resolution: _____

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01 October 2018

Work Order: 1541056

JOHN HYNES
CITY OF OMAHA QC DIV - 9602
5600 S 10TH ST
OMAHA, NE 68107-

RE: Green Infrastructure Monitoring

Enclosed are the results of analyses for samples received by the laboratory on 2018-09-21 08:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Heather Ramig
Project Manager
heather@midwestlabs.com

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CITY OF OMAHA QC DIV - 9602
5600 S 10TH ST
OMAHA, NE 68107-

Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:17

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Inflow Park 1	1541056-01	Aqueous	2018-09-20 20:15	2018-09-21 08:30
Inflow Park 2	1541056-02	Aqueous	2018-09-20 20:30	2018-09-21 08:30
Inflow Park 3	1541056-03	Aqueous	2018-09-20 20:45	2018-09-21 08:30

Containers used for the following analyses:

1541056-01 A:	EPA 1603
1541056-01 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1541056-01 C:	SM 2540 C-1997, SM 2540 D-1997
1541056-02 A:	EPA 1603
1541056-02 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1541056-02 C:	SM 2540 C-1997, SM 2540 D-1997
1541056-03 A:	EPA 1603
1541056-03 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1541056-03 C:	SM 2540 C-1997, SM 2540 D-1997

Analysis Results Reviewed by:

EPA 351.2 reviewed by cmw2.

EPA 353.2 reviewed by cmw2.

SM 2540 C-1997 reviewed by cmw2.

SM 2540 D-1997 reviewed by cmw2.

SM 4500-P F-1999 reviewed by cmw2.

EPA 1603 reviewed by jzh4.

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Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:17

Sample ID: Inflow Park 1
Laboratory ID: 1541056-01
Sampled Date/Time: 2018-09-20 20:15

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	<	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	0.90	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	<	0.05	mg/L	SM 4500-P F-1999	2018-09-24	2018-09-26	jdb5	(B)
Total Dissolved Solids	596	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	7	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	388	1	CFU/100 mL	EPA 1603	2018-09-21/10:12	2018-09-22/10:40	kas2	(A)/ HT

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Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:17

Sample ID: Inflow Park 2
Laboratory ID: 1541056-02
Sampled Date/Time: 2018-09-20 20:30

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	<	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	0.84	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	<	0.05	mg/L	SM 4500-P F-1999	2018-09-24	2018-09-26	jdb5	(B)
Total Dissolved Solids	482	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	6	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	318	1	CFU/100 mL	EPA 1603	2018-09-21/10:12	2018-09-22/10:40	kas2	(A)/ HT

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Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:17

Sample ID: Inflow Park 3
Laboratory ID: 1541056-03
Sampled Date/Time: 2018-09-20 20:45

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	<	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	0.76	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	<	0.05	mg/L	SM 4500-P F-1999	2018-09-24	2018-09-26	jdb5	(B)
Total Dissolved Solids	390	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	7	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	360	1	CFU/100 mL	EPA 1603	2018-09-21/10:16	2018-09-22/10:40	kas2	(A)/ HT

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Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:17

Environmental Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B806736										
Blank (B806736-BLK1)				Prepared & Analyzed: 2018-09-24						
Total Suspended Solids	<	4	mg/L							
LCS (B806736-BS1)				Prepared & Analyzed: 2018-09-24						
Total Suspended Solids	52.0	4	mg/L	50.0		104	90-110			
Duplicate (B806736-DUP1)		**Source: 1541055-01**		Prepared & Analyzed: 2018-09-24						
Total Suspended Solids	75.2	4	mg/L		78.1			3.73	10	
Duplicate (B806736-DUP2)		**Source: 1541055-02**		Prepared & Analyzed: 2018-09-24						
Total Suspended Solids	116.9	4	mg/L		116.4			0.480	10	
Batch B806737										
Blank (B806737-BLK1)				Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	<	0.20	mg/L							
LCS (B806737-BS1)				Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	5.03	0.20	mg/L	5.00		101	90-110			
Matrix Spike (B806737-MS1)		**Source: 1540707-01**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.67	0.20	mg/L	4.00	0.48	105	90-110			
Matrix Spike (B806737-MS2)		**Source: 1541056-03**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.82	0.20	mg/L	4.00	0.76	101	90-110			
Matrix Spike Dup (B806737-MSD1)		**Source: 1540707-01**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.66	0.20	mg/L	4.00	0.48	105	90-110	0.257	10	

Work Order: 1541056

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Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:17

Environmental Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B806737										
Matrix Spike Dup (B806737-MSD2)		**Source: 1541056-03**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.82	0.20	mg/L	4.00	0.76	102	90-110	0.0622	10	
Batch B806763										
Blank (B806763-BLK1)				Prepared: 2018-09-24 Analyzed: 2018-09-26						
Phosphorus	<	0.05	mg/L							
LCS (B806763-BS1)				Prepared: 2018-09-24 Analyzed: 2018-09-26						
Phosphorus	0.501	0.05	mg/L	0.500		100	90-110			
Matrix Spike (B806763-MS1)		**Source: 1541491-01**		Prepared: 2018-09-24 Analyzed: 2018-09-26						
Phosphorus	0.834	0.05	mg/L	0.500	0.357	95.4	90-110			
Matrix Spike (B806763-MS2)		**Source: 1541491-09**		Prepared: 2018-09-24 Analyzed: 2018-09-26						
Phosphorus	0.785	0.05	mg/L	0.500	0.281	101	90-110			
Matrix Spike Dup (B806763-MSD1)		**Source: 1541491-01**		Prepared: 2018-09-24 Analyzed: 2018-09-26						
Phosphorus	0.863	0.05	mg/L	0.500	0.357	101	90-110	3.42	10	
Matrix Spike Dup (B806763-MSD2)		**Source: 1541491-09**		Prepared: 2018-09-24 Analyzed: 2018-09-26						
Phosphorus	0.790	0.05	mg/L	0.500	0.281	102	90-110	0.635	10	
Batch B806796										
Blank (B806796-BLK1)				Prepared: 2018-09-26 Analyzed: 2018-09-27						
Total Dissolved Solids	<	10	mg/L							

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Reported:
2018-10-01 09:17

Environmental Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B806796										
LCS (B806796-BS1)				Prepared: 2018-09-26 Analyzed: 2018-09-27						
Total Dissolved Solids	964.0	10	mg/L	1000		96.4	90-110			
Duplicate (B806796-DUP1)		**Source: 1542331-05**		Prepared: 2018-09-26 Analyzed: 2018-09-27						
Total Dissolved Solids	316.0	10	mg/L		294.0			7.21	10	
Duplicate (B806796-DUP2)		**Source: 1542331-06**		Prepared: 2018-09-26 Analyzed: 2018-09-27						
Total Dissolved Solids	308.0	10	mg/L		314.0			1.93	10	
Batch B806806										
Blank (B806806-BLK1)				Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	<	0.50	mg/L							
LCS (B806806-BS1)				Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	2.070	0.50	mg/L	2.00		104	90-110			
Matrix Spike (B806806-MS1)		**Source: 1541055-01**		Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	4.120	0.50	mg/L	2.00	2.220	95.0	90-110			
Matrix Spike (B806806-MS2)		**Source: 1541056-03**		Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	2.260	0.50	mg/L	2.00	0.370	94.5	90-110			
Matrix Spike Dup (B806806-MSD1)		**Source: 1541055-01**		Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	4.140	0.50	mg/L	2.00	2.220	96.0	90-110	0.484	10	
Matrix Spike Dup (B806806-MSD2)		**Source: 1541056-03**		Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	2.230	0.50	mg/L	2.00	0.370	93.0	90-110	1.34	10	

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Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:17

Certified Analyses included in this Report

Method	Analyte	Certifications
EPA 1603 in Aqueous	E. Coli	IA,FL
EPA 351.2 in Aqueous	Total Kjeldahl Nitrogen	IA,OK,UT
EPA 353.2 in Aqueous	Nitrate/Nitrite Nitrogen	TX,FL,UT,OK,IA
SM 2540 C-1997 in Aqueous	Total Dissolved Solids	IA,FL,KS,OK,TX,WA,UT
SM 2540 D-1997 in Aqueous	Total Suspended Solids	FL,KS,TX,UT,IA,OK
SM 4500-P F-1999 in Aqueous	Phosphorus	FL,IA,TX,OK,KS

Code	Description	Number	Expires
FL	Florida Department of Health	E87918	06/30/2019
FL-B	Florida Department of Health	E871122	06/30/2019
IA	Iowa Department of Natural Resources	064	05/01/2019
KS	Kansas Department of Health and Environment	E-10402	04/30/2019
OK	Oklahoma Department of Environmental Quality	2018-118	08/31/2019
TX	Texas Commission on Environmental Quality	T104704416-18-12	07/31/2019
TX-B	Texas Commission on Environmental Quality	T104704546-18-2	07/31/2019
UT	State of Utah Department of Health	NE000012018-8	07/31/2019
WA	State of Washington Department of Ecology	C912	06/07/2019

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OMAHA, NE 68107-

Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:17

Notes and Definitions

HT	Hold time exceeded, not suitable for regulatory purposes.
<	Less than reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

EPA 524.2, EPA 624, EPA 8260, OA-1, TCLP VOC, GRO, and all microbiological analyses are conducted in the facility located at 13606 B Street, Omaha, NE 68144. All other analyses are conducted in the main facility located at 13611 B Street, Omaha, NE 68144.

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CHAIN OF CUSTODY

Lab Work Order Number: 1541056
Date Generated: 08/08/2018

Client Name: CITY OF OMAHA QC DIV - 9602	Project Name: Green Infrastructure Monitoring
Client Contact: JOHN HYNES	Project Description:
Address: 5600 S 10TH ST	Purchase Order Number:
City: OMAHA	Midwest Labs Contact: Heather Ramig
State/Zip: NE, 68107-	Regulatory (Circle One): Yes No
Phone: 4024443908 Fax: 4024443904	Regulatory Agency:
Sampler Name (printed):	Sample Type (Circle One - See Below): D G W S/H U P

Requested Analyses (Test Names): Ecoli-EPA1603; Total Phosphorus; Nitrate/Nitrite, TKN-Discrete,; TDS, TSS

WORKORDER: 1541056 COC Sticker #: 1

Copy To:

Email to:

Lab ID	Sample Name or Field ID	Sampled Date	Sampled Time	Sample Code	Matrix Code	Container Count	Preservation Code: 10	4	1							Sample Comments
01	01	9/20/18	8:15pm		A	3	1	1	1							Inflow Park 1
02	02	9/20/18	8:30pm		A	3	1	1	1							Inflow Park 2
03	03	9/20/18	8:45pm		A	3	1	1	1							Inflow Park 3
04	04				A	3	1	1	1							
05	05				A	3	1	1	1							
06	06				A	3	1	1	1							

Relinquished By: [signature] Date/Time: 9/21/2018 8:15am	Received By: [signature] 9/21/18 Date/Time: 0830
Relinquished By: [signature] Date/Time: 9/21/18 8:19AM	Received By: Date/Time:
Comments:	

Lab Internal Use Only:
Temperature Upon Receipt: 5.2°
Cooler Numbers:
Notes:

Matrix Codes: A=Aqueous

Preservation Codes: 1=Cool 6°C,10=Sterile, Na2SO3, Cool 6°C,4=pH<2; H2SO4

Sample Type Codes: D = Drinking Water (Safe Drinking Water Act), G = Groundwater, W = Wastewater (Clean Water Act), S/H = Solid/Hazardous Waste (RCRA), U = Underground Storage Tank (UST), P = Process Water

Chain of Custody will have a signature upon receipt but no subsequent signatures.

RC Form 15 - Effective 10/31/2013

Work Order 1541056

Midwest Laboratories®

Sample Acceptance Checklist
Document Number: RC CHKLIST 001
Revision No.: 3
Effective Date: 1/31/17
Page 1 of 1

WORKORDER: 1541056
COC
Sticker #: 2

Lab Number:

Thermometer Used: ☐ Therm Fisher IR 13

Sample Temperature (°C): 5.2°

Cooler Intact: ☑ Yes ☐ No
Received on Ice: ☑ Yes ☐ No
Hand Delivered: ☑ Yes ☐ No

Date & Initials of person accepting samples: KH 9/21/18

				Comments:
Chain of Custody present?	☑ Yes	☐ No	☐ N/A	
Chain of Custody complete?	☐ Yes	☑ No	☐ N/A	
Sample ID(s):	☑ Yes	☐ No	☐ N/A	
Sample Location(s):	☑ Yes	☐ No	☐ N/A	
Client Contact:	☑ Yes	☐ No	☐ N/A	
Analysis Requested:	☑ Yes	☐ No	☐ N/A	
Sampler name on COC?	☐ Yes	☑ No	☐ N/A	
Date & Time of collection:	☑ Yes	☐ No	☐ N/A	
Sample labels match COC?	☑ Yes	☐ No	☐ N/A	
Written in indelible ink?	☑ Yes	☐ No	☐ N/A	
Labels indicate proper preservation?	☑ Yes	☐ No	☐ N/A	
Chain of Custody relinquished with signature?	☑ Yes	☐ No	☐ N/A	
Samples arrived within hold time?	☑ Yes	☒ No	☐ N/A	ecoli expired - 10m 9/21/18
Sufficient volume?	☑ Yes	☐ No	☐ N/A	
Appropriate containers used?	☑ Yes	☐ No	☐ N/A	
Filtered volume received for dissolved tests?	☐ Yes	☐ No	☑ N/A	
Headspace in VOA vials?	☐ Yes	☐ No	☑ N/A	
Trip Blank present?	☐ Yes	☑ No	☐ N/A	

Client Notification/Resolution: Date/Time Contacted: _____

Person Contacted: _____ Contacted By: _____

Comments/Resolution: _____

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01 October 2018

Work Order: 1542330

JOHN HYNES
CITY OF OMAHA QC DIV - 9602
5600 S 10TH ST
OMAHA, NE 68107-

RE: Green Infrastructure Monitoring

Enclosed are the results of analyses for samples received by the laboratory on 2018-09-21 08:25. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Heather Ramig
Project Manager
heather@midwestlabs.com

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CITY OF OMAHA QC DIV - 9602
5600 S 10TH ST
OMAHA, NE 68107-

Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:00

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
01	1542330-01	Aqueous	2018-09-20 19:49	2018-09-21 08:25
02	1542330-02	Aqueous	2018-09-20 20:28	2018-09-21 08:25
03	1542330-03	Aqueous	2018-09-20 21:30	2018-09-21 08:25
04	1542330-04	Aqueous	2018-09-20 20:34	2018-09-21 08:25
05	1542330-05	Aqueous	2018-09-20 21:12	2018-09-21 08:25
06	1542330-06	Aqueous	2018-09-20 21:44	2018-09-21 08:25

Containers used for the following analyses:

1542330-01 A:	EPA 1603
1542330-01 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1542330-01 C:	SM 2540 C-1997, SM 2540 D-1997
1542330-02 A:	EPA 1603
1542330-02 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1542330-02 C:	SM 2540 C-1997, SM 2540 D-1997
1542330-03 A:	EPA 1603
1542330-03 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1542330-03 C:	SM 2540 C-1997, SM 2540 D-1997
1542330-04 A:	EPA 1603
1542330-04 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1542330-04 C:	SM 2540 C-1997, SM 2540 D-1997
1542330-05 A:	EPA 1603
1542330-05 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1542330-05 C:	SM 2540 C-1997, SM 2540 D-1997
1542330-06 A:	EPA 1603
1542330-06 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1542330-06 C:	SM 2540 C-1997, SM 2540 D-1997

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Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:00

Analysis Results Reviewed by:

EPA 351.2 reviewed by cmw2.

EPA 353.2 reviewed by cmw2.

SM 2540 C-1997 reviewed by cmw2.

SM 2540 D-1997 reviewed by cmw2.

SM 4500-P F-1999 reviewed by cmw2.

EPA 1603 reviewed by jzh4.

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Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:00

Sample ID: 01
Laboratory ID: 1542330-01
Sampled Date/Time: 2018-09-20 19:49

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	1.73	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	0.38	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	0.73	0.05	mg/L	SM 4500-P F-1999	2018-09-27	2018-09-28	jdb5	(B)
Total Dissolved Solids	68	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	70	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	184	1	CFU/100 mL	EPA 1603	2018-09-21/10:16	2018-09-22/10:40	kas2	(A)/ HT

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Project Manager: JOHN HYNES

Reported:
2018-10-01 09:00

Sample ID: 02
Laboratory ID: 1542330-02
Sampled Date/Time: 2018-09-20 20:28

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	0.84	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	<	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	0.42	0.05	mg/L	SM 4500-P F-1999	2018-09-27	2018-09-28	jdb5	(B)
Total Dissolved Solids	12	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	40	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	528	1	CFU/100 mL	EPA 1603	2018-09-21/10:21	2018-09-22/10:40	kas2	(A)/ HT

Work Order: 1542330

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Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:00

Sample ID: 03
Laboratory ID: 1542330-03
Sampled Date/Time: 2018-09-20 21:30

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	0.72	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	<	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	0.44	0.05	mg/L	SM 4500-P F-1999	2018-09-27	2018-09-28	jdb5	(B)
Total Dissolved Solids	56	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	13	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	296	1	CFU/100 mL	EPA 1603	2018-09-21/10:21	2018-09-22/10:40	kas2	(A)/ HT

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Project Manager: JOHN HYNES

Reported:
2018-10-01 09:00

Sample ID: 04
Laboratory ID: 1542330-04
Sampled Date/Time: 2018-09-20 20:34

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	1.42	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	0.38	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	0.70	0.05	mg/L	SM 4500-P F-1999	2018-09-27	2018-09-28	jdb5	(B)
Total Dissolved Solids	68	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	82	4	mg/L	SM 2540 D-1997	2018-09-25	2018-09-25	bjs0	(C)
Microbiology								
E. Coli	20400	1	CFU/100 mL	EPA 1603	2018-09-21/10:32	2018-09-22/10:55	kas2	(A)/ HT

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Reported:
2018-10-01 09:00

Sample ID: 05
Laboratory ID: 1542330-05
Sampled Date/Time: 2018-09-20 21:12

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	1.25	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	0.45	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	0.44	0.05	mg/L	SM 4500-P F-1999	2018-09-27	2018-09-28	jdb5	(B)
Total Dissolved Solids	36	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	24	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	9900	1	CFU/100 mL	EPA 1603	2018-09-21/10:32	2018-09-22/10:55	kas2	(A)/ HT

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Project Manager: JOHN HYNES

Reported:
2018-10-01 09:00

Sample ID: 06
Laboratory ID: 1542330-06
Sampled Date/Time: 2018-09-20 21:44

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	1.39	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	<	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	0.64	0.05	mg/L	SM 4500-P F-1999	2018-09-27	2018-09-28	jdb5	(B)
Total Dissolved Solids	108	10	mg/L	SM 2540 C-1997	2018-09-27	2018-09-28	bjs0	(C)
Total Suspended Solids	63	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	14400	1	CFU/100 mL	EPA 1603	2018-09-21/10:37	2018-09-22/10:55	kas2	(A)/ HT

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Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:00

Environmental Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B806736										
Blank (B806736-BLK1)				Prepared & Analyzed: 2018-09-24						
Total Suspended Solids	<	4	mg/L							
LCS (B806736-BS1)				Prepared & Analyzed: 2018-09-24						
Total Suspended Solids	52.0	4	mg/L	50.0		104	90-110			
Duplicate (B806736-DUP1)		**Source: 1541055-01**		Prepared & Analyzed: 2018-09-24						
Total Suspended Solids	75.2	4	mg/L		78.1			3.73	10	
Duplicate (B806736-DUP2)		**Source: 1541055-02**		Prepared & Analyzed: 2018-09-24						
Total Suspended Solids	116.9	4	mg/L		116.4			0.480	10	
Batch B806739										
Blank (B806739-BLK1)				Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	<	0.20	mg/L							
LCS (B806739-BS1)				Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	5.14	0.20	mg/L	5.00		103	90-110			
Matrix Spike (B806739-MS1)		**Source: 1542133-22**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.14	0.20	mg/L	4.00	<	104	90-110			
Matrix Spike (B806739-MS2)		**Source: 1542133-32**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.15	0.20	mg/L	4.00	<	104	90-110			
Matrix Spike Dup (B806739-MSD1)		**Source: 1542133-22**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.10	0.20	mg/L	4.00	<	103	90-110	0.898	10	

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OMAHA, NE 68107-

Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:00

Environmental Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B806739										
Matrix Spike Dup (B806739-MSD2)		**Source: 1542133-32**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.16	0.20	mg/L	4.00	<	104	90-110	0.216	10	
Batch B806740										
Blank (B806740-BLK1)				Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	<	0.20	mg/L							
LCS (B806740-BS1)				Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	5.19	0.20	mg/L	5.00		104	90-110			
Matrix Spike (B806740-MS1)		**Source: 1542330-05**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.40	0.20	mg/L	4.00	0.45	98.6	90-110			
Matrix Spike (B806740-MS2)		**Source: 1542420-01**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.16	0.20	mg/L	4.00	<	104	90-110			
Matrix Spike Dup (B806740-MSD1)		**Source: 1542330-05**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.37	0.20	mg/L	4.00	0.45	97.8	90-110	0.639	10	
Matrix Spike Dup (B806740-MSD2)		**Source: 1542420-01**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.16	0.20	mg/L	4.00	<	104	90-110	0.0961	10	
Batch B806765										
Blank (B806765-BLK1)				Prepared & Analyzed: 2018-09-25						
Total Suspended Solids	<	4	mg/L							

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Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:00

Environmental Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B806765										
LCS (B806765-BS1)				Prepared & Analyzed: 2018-09-25						
Total Suspended Solids	54.6	4	mg/L	50.0		109	90-110			
Duplicate (B806765-DUP1)		**Source: 1540814-01**		Prepared & Analyzed: 2018-09-25						
Total Suspended Solids	304.0	4	mg/L		320.0			5.13	10	
Duplicate (B806765-DUP2)		**Source: 1540818-01**		Prepared & Analyzed: 2018-09-25						
Total Suspended Solids	416.0	4	mg/L		432.0			3.77	10	
Batch B806796										
Blank (B806796-BLK1)				Prepared: 2018-09-26 Analyzed: 2018-09-27						
Total Dissolved Solids	<	10	mg/L							
LCS (B806796-BS1)				Prepared: 2018-09-26 Analyzed: 2018-09-27						
Total Dissolved Solids	964.0	10	mg/L	1000		96.4	90-110			
Duplicate (B806796-DUP1)		**Source: 1542331-05**		Prepared: 2018-09-26 Analyzed: 2018-09-27						
Total Dissolved Solids	316.0	10	mg/L		294.0			7.21	10	
Duplicate (B806796-DUP2)		**Source: 1542331-06**		Prepared: 2018-09-26 Analyzed: 2018-09-27						
Total Dissolved Solids	308.0	10	mg/L		314.0			1.93	10	
Batch B806806										
Blank (B806806-BLK1)				Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	<	0.50	mg/L							

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5600 S 10TH ST
OMAHA, NE 68107-

Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:00

Environmental Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B806806										
LCS (B806806-BS1)				Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	2.070	0.50	mg/L	2.00		104	90-110			
Matrix Spike (B806806-MS1)		**Source: 1541055-01**		Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	4.120	0.50	mg/L	2.00	2.220	95.0	90-110			
Matrix Spike (B806806-MS2)		**Source: 1541056-03**		Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	2.260	0.50	mg/L	2.00	0.370	94.5	90-110			
Matrix Spike Dup (B806806-MSD1)		**Source: 1541055-01**		Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	4.140	0.50	mg/L	2.00	2.220	96.0	90-110	0.484	10	
Matrix Spike Dup (B806806-MSD2)		**Source: 1541056-03**		Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	2.230	0.50	mg/L	2.00	0.370	93.0	90-110	1.34	10	
Batch B806832										
Blank (B806832-BLK1)				Prepared: 2018-09-27 Analyzed: 2018-09-28						
Total Dissolved Solids	<	10	mg/L							
LCS (B806832-BS1)				Prepared: 2018-09-27 Analyzed: 2018-09-28						
Total Dissolved Solids	972.0	10	mg/L	1000		97.2	90-110			
Duplicate (B806832-DUP1)		**Source: 1541090-01**		Prepared: 2018-09-27 Analyzed: 2018-09-28						
Total Dissolved Solids	1670	10	mg/L		1665			0.326	10	
Duplicate (B806832-DUP2)		**Source: 1541091-01**		Prepared: 2018-09-27 Analyzed: 2018-09-28						
Total Dissolved Solids	2213	10	mg/L		2272			2.64	10	

Work Order: 1542330

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OMAHA, NE 68107-

Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 09:00

Environmental Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B806834										
Blank (B806834-BLK1)				Prepared: 2018-09-27 Analyzed: 2018-09-28						
Phosphorus	<	0.05	mg/L							
LCS (B806834-BS1)				Prepared: 2018-09-27 Analyzed: 2018-09-28						
Phosphorus	0.527	0.05	mg/L	0.500		105	90-110			
Matrix Spike (B806834-MS1)		**Source: 1541278-01**		Prepared: 2018-09-27 Analyzed: 2018-09-28						
Phosphorus	1.803	0.05	mg/L	0.500	1.299	101	90-110			
Matrix Spike (B806834-MS2)		**Source: 1542330-01**		Prepared: 2018-09-27 Analyzed: 2018-09-28						
Phosphorus	1.230	0.05	mg/L	0.500	0.726	101	90-110			
Matrix Spike Dup (B806834-MSD1)		**Source: 1541278-01**		Prepared: 2018-09-27 Analyzed: 2018-09-28						
Phosphorus	1.784	0.05	mg/L	0.500	1.299	97.0	90-110	1.06	10	
Matrix Spike Dup (B806834-MSD2)		**Source: 1542330-01**		Prepared: 2018-09-27 Analyzed: 2018-09-28						
Phosphorus	1.208	0.05	mg/L	0.500	0.726	96.4	90-110	1.80	10	

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Project Manager: JOHN HYNES

Reported:
2018-10-01 09:00

Certified Analyses included in this Report

Method	Analyte	Certifications
EPA 1603 in Aqueous	E. Coli	IA,FL
EPA 351.2 in Aqueous	Total Kjeldahl Nitrogen	IA,OK,UT
EPA 353.2 in Aqueous	Nitrate/Nitrite Nitrogen	TX,FL,UT,OK,IA
SM 2540 C-1997 in Aqueous	Total Dissolved Solids	IA,FL,KS,OK,TX,WA,UT
SM 2540 D-1997 in Aqueous	Total Suspended Solids	FL,KS,TX,UT,IA,OK
SM 4500-P F-1999 in Aqueous	Phosphorus	FL,IA,TX,OK,KS

Code	Description	Number	Expires
FL	Florida Department of Health	E87918	06/30/2019
FL-B	Florida Department of Health	E871122	06/30/2019
IA	Iowa Department of Natural Resources	064	05/01/2019
KS	Kansas Department of Health and Environment	E-10402	04/30/2019
OK	Oklahoma Department of Environmental Quality	2018-118	08/31/2019
TX	Texas Commission on Environmental Quality	T104704416-18-12	07/31/2019
TX-B	Texas Commission on Environmental Quality	T104704546-18-2	07/31/2019
UT	State of Utah Department of Health	NE000012018-8	07/31/2019
WA	State of Washington Department of Ecology	C912	06/07/2019

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Project: Green Infrastructure Monitoring

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Reported:
2018-10-01 09:00

Notes and Definitions

HT	Hold time exceeded, not suitable for regulatory purposes.
<	Less than reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

EPA 524.2, EPA 624, EPA 8260, OA-1, TCLP VOC, GRO, and all microbiological analyses are conducted in the facility located at 13606 B Street, Omaha, NE 68144. All other analyses are conducted in the main facility located at 13611 B Street, Omaha, NE 68144.

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CHAIN OF CUSTODY

Lab Work Order Number: 1542330
Date Generated: 09/13/2018

Client Name: CITY OF OMAHA QC DIV - 9602	Project Name: Green Infrastructure Monitoring
Client Contact: JOHN HYNES	Project Description:
Address: 5600 S 10TH ST	Purchase Order Number:
City: OMAHA	Midwest Labs Contact: Heather Ramig
State/Zip: NE, 68107-	Regulatory (Circle One): Yes No
Phone: 4024443908 / Fax: 4024443904	Regulatory Agency:
Sampler Name (printed):	Sample Type (Circle One - See Below): D G W S/H U P

Requested Analyses (Test Names): Ecoli-EPA1603; Nitrate/Nitrite, TKN-Discrete, Total Phosphorus; TDS, TSS

WORKORDER: 1542330 COC Sticker #: 1

Copy To:

Email to:

Lab ID	Sample Name or Field ID	Sampled Date	Sampled Time	Sample Code	Matrix Code	Container Count	Preservation Code: 10	4	1							Sample Comments
01	01	9/20	7:49pm		A	3	1	1	1							
02	02	9/20	8:28pm		A	3	1	1	1							
03	03	9/20	9:30pm		A	3	1	1	1							
04	04	9/20	8:34pm		A	3	1	1	1							
05	05	9/20	9:12pm		A	3	1	1	1							
06	06	9/20	9:44pm		A	3	1	1	1							

Relinquished By: Alex Evans	Date/Time: 9/21/2018 8:15am	Received By: Laura S	Date/Time: 9/21/18 0825
Relinquished By: Taryn Alderdice	Date/Time: 9/21/18 8:15	Received By:	Date/Time:
Comments:			

Lab Internal Use Only:
Temperature Upon Receipt: 3.6°C
Cooler Numbers:
Notes:

Matrix Codes: A=Aqueous

Preservation Codes: 1=Cool 6°C,10=Sterile, Na2SO3, Cool 6°C,4=pH<2; H2SO4

Sample Type Codes: D = Drinking Water (Safe Drinking Water Act), G = Groundwater, W = Wastewater (Clean Water Act), S/H = Solid/Hazardous Waste (RCRA), U = Underground Storage Tank (UST), P = Process Water

Chain of Custody will have a signature upon receipt but no subsequent signatures.

RC Form 15 - Effective 10/31/2013

Work Order 1542330

Midwest Laboratories®

Sample Acceptance Checklist
Document Number: RC CHKLIST 001
Revision No.: 3
Effective Date: 1/31/17
Page 1 of 1

WORKORDER: 1542330
COC
Sticker #: 2

Lab Number:

Thermometer Used: ☐ Therm Fisher IR 13

Sample Temperature (°C): 3.6°C

Cooler Intact: ☑ Yes ☐ No
Received on Ice: ☑ Yes ☐ No
Hand Delivered: ☑ Yes ☐ No

Date & Initials of person accepting samples: Olm 9/21/18

				Comments:
Chain of Custody present?	☑ Yes	☐ No	☐ N/A	
Chain of Custody complete?	☐ Yes	☑ No	☐ N/A	
Sample ID(s):	☑ Yes	☐ No	☐ N/A	
Sample Location(s):	☑ Yes	☐ No	☐ N/A	
Client Contact:	☑ Yes	☐ No	☐ N/A	
Analysis Requested:	☑ Yes	☐ No	☐ N/A	
Sampler name on COC?	☐ Yes	☑ No	☐ N/A	
Date & Time of collection:	☑ Yes	☐ No	☐ N/A	
Sample labels match COC?	☐ Yes	☐ No	☐ N/A	
Written in indelible ink?	☑ Yes	☐ No	☐ N/A	
Labels indicate proper preservation?	☑ Yes	☐ No	☐ N/A	
Chain of Custody relinquished with signature?	☑ Yes	☐ No	☐ N/A	
Samples arrived within hold time?	☑ Yes	☑ No	☐ N/A	ecoli expired - Olm 9/21/18
Sufficient volume?	☑ Yes	☐ No	☐ N/A	
Appropriate containers used?	☑ Yes	☐ No	☐ N/A	
Filtered volume received for dissolved tests?	☐ Yes	☐ No	☑ N/A	
Headspace in VOA vials?	☐ Yes	☐ No	☑ N/A	
Trip Blank present?	☐ Yes	☑ No	☐ N/A	

Client Notification/Resolution: Date/Time Contacted: _____

Person Contacted: _____ Contacted By: _____

Comments/Resolution: _____

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01 October 2018

Work Order: 1542331

JOHN HYNES
CITY OF OMAHA QC DIV - 9602
5600 S 10TH ST
OMAHA, NE 68107-

RE: Green Infrastructure Monitoring

Enclosed are the results of analyses for samples received by the laboratory on 2018-09-21 08:25. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Heather Ramig
Project Manager
heather@midwestlabs.com

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5600 S 10TH ST
OMAHA, NE 68107-

Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 08:59

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
01	1542331-01	Aqueous	2018-09-20 19:52	2018-09-21 08:25
02	1542331-02	Aqueous	2018-09-20 20:12	2018-09-21 08:25
03	1542331-03	Aqueous	2018-09-20 20:32	2018-09-21 08:25
04	1542331-04	Aqueous	2018-09-20 20:40	2018-09-21 08:25
05	1542331-05	Aqueous	2018-09-20 21:00	2018-09-21 08:25
06	1542331-06	Aqueous	2018-09-20 21:20	2018-09-21 08:25

Containers used for the following analyses:

1542331-01 A:	EPA 1603
1542331-01 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1542331-01 C:	SM 2540 C-1997, SM 2540 D-1997
1542331-02 A:	EPA 1603
1542331-02 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1542331-02 C:	SM 2540 C-1997, SM 2540 D-1997
1542331-03 A:	EPA 1603
1542331-03 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1542331-03 C:	SM 2540 C-1997, SM 2540 D-1997
1542331-04 A:	EPA 1603
1542331-04 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1542331-04 C:	SM 2540 C-1997, SM 2540 D-1997
1542331-05 A:	EPA 1603
1542331-05 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1542331-05 C:	SM 2540 C-1997, SM 2540 D-1997
1542331-06 A:	EPA 1603
1542331-06 B:	EPA 351.2, EPA 353.2, SM 4500-P F-1999
1542331-06 C:	SM 2540 C-1997, SM 2540 D-1997

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Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 08:59

Analysis Results Reviewed by:

EPA 351.2 reviewed by cmw2.

EPA 353.2 reviewed by cmw2.

SM 2540 C-1997 reviewed by cmw2.

SM 2540 D-1997 reviewed by cmw2.

SM 4500-P F-1999 reviewed by cmw2.

EPA 1603 reviewed by jzh4.

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Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 08:59

Sample ID: 01
Laboratory ID: 1542331-01
Sampled Date/Time: 2018-09-20 19:52

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	4.08	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	0.80	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	1.26	0.05	mg/L	SM 4500-P F-1999	2018-09-27	2018-09-28	jdb5	(B)
Total Dissolved Solids	112	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	1350	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	880	1	CFU/100 mL	EPA 1603	2018-09-21/10:38	2018-09-22/10:55	kas2	(A)/ HT

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Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 08:59

Sample ID: 02
Laboratory ID: 1542331-02
Sampled Date/Time: 2018-09-20 20:12

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	2.51	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	0.68	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	0.68	0.05	mg/L	SM 4500-P F-1999	2018-09-27	2018-09-28	jdb5	(B)
Total Dissolved Solids	40	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	332	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	2120	1	CFU/100 mL	EPA 1603	2018-09-21/10:43	2018-09-22/10:55	kas2	(A)/ HT

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Project Manager: JOHN HYNES

Reported:
2018-10-01 08:59

Sample ID: 03
Laboratory ID: 1542331-03
Sampled Date/Time: 2018-09-20 20:32

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	2.28	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	0.69	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	0.79	0.05	mg/L	SM 4500-P F-1999	2018-09-27	2018-09-28	jdb5	(B)
Total Dissolved Solids	132	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	196	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	9100	1	CFU/100 mL	EPA 1603	2018-09-21/10:42	2018-09-22/10:55	kas2	(A)/ HT

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Project Manager: JOHN HYNES

Reported:
2018-10-01 08:59

Sample ID: 04
Laboratory ID: 1542331-04
Sampled Date/Time: 2018-09-20 20:40

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	2.44	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	5.06	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	1.16	0.05	mg/L	SM 4500-P F-1999	2018-09-27	2018-09-28	jdb5	(B)
Total Dissolved Solids	332	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	27	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	8300	1	CFU/100 mL	EPA 1603	2018-09-21/10:46	2018-09-22/10:55	kas2	(A)/ HT

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Project Manager: JOHN HYNES

Reported:
2018-10-01 08:59

Sample ID: 05
Laboratory ID: 1542331-05
Sampled Date/Time: 2018-09-20 21:00

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	2.21	0.50	mg/L	EPA 351.2	2018-09-27	2018-09-27	arh3	(B)
Nitrate/Nitrite Nitrogen	5.50	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	1.13	0.05	mg/L	SM 4500-P F-1999	2018-09-27	2018-09-28	jdb5	(B)
Total Dissolved Solids	294	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	23	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	7500	1	CFU/100 mL	EPA 1603	2018-09-21/10:46	2018-09-22/10:55	kas2	(A)/ HT

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Reported:
2018-10-01 08:59

Sample ID: 06
Laboratory ID: 1542331-06
Sampled Date/Time: 2018-09-20 21:20

Analyte	Result	Reporting Limit	Units	Method	Prepared	Analyzed	Analyst	(Container) / Notes
Environmental Chemistry								
Total Kjeldahl Nitrogen	2.56	0.50	mg/L	EPA 351.2	2018-09-28	2018-09-28	arh3	(B)
Nitrate/Nitrite Nitrogen	5.56	0.20	mg/L	EPA 353.2	2018-09-24	2018-09-24	arh3	(B)
Phosphorus	1.10	0.05	mg/L	SM 4500-P F-1999	2018-09-27	2018-09-28	jdb5	(B)
Total Dissolved Solids	314	10	mg/L	SM 2540 C-1997	2018-09-26	2018-09-27	bjs0	(C)
Total Suspended Solids	22	4	mg/L	SM 2540 D-1997	2018-09-24	2018-09-24	bjs0	(C)
Microbiology								
E. Coli	6900	1	CFU/100 mL	EPA 1603	2018-09-21/10:49	2018-09-22/10:55	kas2	(A)/ HT

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Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 08:59

Environmental Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B806736										
Blank (B806736-BLK1)				Prepared & Analyzed: 2018-09-24						
Total Suspended Solids	<	4	mg/L							
LCS (B806736-BS1)				Prepared & Analyzed: 2018-09-24						
Total Suspended Solids	52.0	4	mg/L	50.0		104	90-110			
Duplicate (B806736-DUP1)		**Source: 1541055-01**		Prepared & Analyzed: 2018-09-24						
Total Suspended Solids	75.2	4	mg/L		78.1			3.73	10	
Duplicate (B806736-DUP2)		**Source: 1541055-02**		Prepared & Analyzed: 2018-09-24						
Total Suspended Solids	116.9	4	mg/L		116.4			0.480	10	
Batch B806740										
Blank (B806740-BLK1)				Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	<	0.20	mg/L							
LCS (B806740-BS1)				Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	5.19	0.20	mg/L	5.00		104	90-110			
Matrix Spike (B806740-MS1)		**Source: 1542330-05**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.40	0.20	mg/L	4.00	0.45	98.6	90-110			
Matrix Spike (B806740-MS2)		**Source: 1542420-01**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.16	0.20	mg/L	4.00	<	104	90-110			
Matrix Spike Dup (B806740-MSD1)		**Source: 1542330-05**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.37	0.20	mg/L	4.00	0.45	97.8	90-110	0.639	10	

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Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 08:59

Environmental Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B806740										
Matrix Spike Dup (B806740-MSD2)		**Source: 1542420-01**		Prepared & Analyzed: 2018-09-24						
Nitrate/Nitrite Nitrogen	4.16	0.20	mg/L	4.00	<	104	90-110	0.0961	10	
Batch B806796										
Blank (B806796-BLK1)				Prepared: 2018-09-26 Analyzed: 2018-09-27						
Total Dissolved Solids	<	10	mg/L							
LCS (B806796-BS1)				Prepared: 2018-09-26 Analyzed: 2018-09-27						
Total Dissolved Solids	964.0	10	mg/L	1000		96.4	90-110			
Duplicate (B806796-DUP1)		**Source: 1542331-05**		Prepared: 2018-09-26 Analyzed: 2018-09-27						
Total Dissolved Solids	316.0	10	mg/L		294.0			7.21	10	
Duplicate (B806796-DUP2)		**Source: 1542331-06**		Prepared: 2018-09-26 Analyzed: 2018-09-27						
Total Dissolved Solids	308.0	10	mg/L		314.0			1.93	10	
Batch B806806										
Blank (B806806-BLK1)				Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	<	0.50	mg/L							
LCS (B806806-BS1)				Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	2.070	0.50	mg/L	2.00		104	90-110			
Matrix Spike (B806806-MS1)		**Source: 1541055-01**		Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	4.120	0.50	mg/L	2.00	2.220	95.0	90-110			

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CITY OF OMAHA QC DIV - 9602
5600 S 10TH ST
OMAHA, NE 68107-

Project: Green Infrastructure Monitoring

Project Manager: JOHN HYNES

Reported:
2018-10-01 08:59

Environmental Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B806806										
Matrix Spike (B806806-MS2)		**Source: 1541056-03**		Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	2.260	0.50	mg/L	2.00	0.370	94.5	90-110			
Matrix Spike Dup (B806806-MSD1)		**Source: 1541055-01**		Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	4.140	0.50	mg/L	2.00	2.220	96.0	90-110	0.484	10	
Matrix Spike Dup (B806806-MSD2)		**Source: 1541056-03**		Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	2.230	0.50	mg/L	2.00	0.370	93.0	90-110	1.34	10	
Batch B806807										
Blank (B806807-BLK1)				Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	<	0.50	mg/L							
LCS (B806807-BS1)				Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	1.930	0.50	mg/L	2.00		96.5	90-110			
Matrix Spike (B806807-MS1)		**Source: 1542331-04**		Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	4.640	0.50	mg/L	2.00	2.440	110	90-110			
Matrix Spike Dup (B806807-MSD1)		**Source: 1542331-04**		Prepared & Analyzed: 2018-09-27						
Total Kjeldahl Nitrogen	4.710	0.50	mg/L	2.00	2.440	114	90-110	1.50	10	
Batch B806834										
Blank (B806834-BLK1)				Prepared: 2018-09-27 Analyzed: 2018-09-28						
Phosphorus	<	0.05	mg/L							

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Environmental Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B806834										
LCS (B806834-BS1)				Prepared: 2018-09-27 Analyzed: 2018-09-28						
Phosphorus	0.527	0.05	mg/L	0.500		105	90-110			
Matrix Spike (B806834-MS1)		**Source: 1541278-01**		Prepared: 2018-09-27 Analyzed: 2018-09-28						
Phosphorus	1.803	0.05	mg/L	0.500	1.299	101	90-110			
Matrix Spike (B806834-MS2)		**Source: 1542330-01**		Prepared: 2018-09-27 Analyzed: 2018-09-28						
Phosphorus	1.230	0.05	mg/L	0.500	0.726	101	90-110			
Matrix Spike Dup (B806834-MSD1)		**Source: 1541278-01**		Prepared: 2018-09-27 Analyzed: 2018-09-28						
Phosphorus	1.784	0.05	mg/L	0.500	1.299	97.0	90-110	1.06	10	
Matrix Spike Dup (B806834-MSD2)		**Source: 1542330-01**		Prepared: 2018-09-27 Analyzed: 2018-09-28						
Phosphorus	1.208	0.05	mg/L	0.500	0.726	96.4	90-110	1.80	10	
Batch B806835										
Blank (B806835-BLK1)				Prepared: 2018-09-27 Analyzed: 2018-09-28						
Phosphorus	<	0.05	mg/L							
LCS (B806835-BS1)				Prepared: 2018-09-27 Analyzed: 2018-09-28						
Phosphorus	0.489	0.05	mg/L	0.500		97.8	90-110			
Matrix Spike (B806835-MS1)		**Source: 1542331-04**		Prepared: 2018-09-27 Analyzed: 2018-09-28						
Phosphorus	1.669	0.05	mg/L	0.500	1.165	101	90-110			
Matrix Spike Dup (B806835-MSD1)		**Source: 1542331-04**		Prepared: 2018-09-27 Analyzed: 2018-09-28						
Phosphorus	1.668	0.05	mg/L	0.500	1.165	101	90-110	0.0599	10	

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Environmental Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B806857										
Blank (B806857-BLK1)				Prepared & Analyzed: 2018-09-28						
Total Kjeldahl Nitrogen	<	0.50	mg/L							
LCS (B806857-BS1)				Prepared & Analyzed: 2018-09-28						
Total Kjeldahl Nitrogen	1.840	0.50	mg/L	2.00		92.0	90-110			
Matrix Spike (B806857-MS1)		**Source: 1542539-01**		Prepared & Analyzed: 2018-09-28						
Total Kjeldahl Nitrogen	3.780	0.50	mg/L	2.00	1.900	94.0	90-110			
Matrix Spike Dup (B806857-MSD1)		**Source: 1542539-01**		Prepared & Analyzed: 2018-09-28						
Total Kjeldahl Nitrogen	3.670	0.50	mg/L	2.00	1.900	88.5	90-110	2.95	10	

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Certified Analyses included in this Report

Method	Analyte	Certifications
EPA 1603 in Aqueous	E. Coli	IA,FL
EPA 351.2 in Aqueous	Total Kjeldahl Nitrogen	IA,OK,UT
EPA 353.2 in Aqueous	Nitrate/Nitrite Nitrogen	TX,FL,UT,OK,IA
SM 2540 C-1997 in Aqueous	Total Dissolved Solids	IA,FL,KS,OK,TX,WA,UT
SM 2540 D-1997 in Aqueous	Total Suspended Solids	FL,KS,TX,UT,IA,OK
SM 4500-P F-1999 in Aqueous	Phosphorus	FL,IA,TX,OK,KS

Code	Description	Number	Expires
FL	Florida Department of Health	E87918	06/30/2019
FL-B	Florida Department of Health	E871122	06/30/2019
IA	Iowa Department of Natural Resources	064	05/01/2019
KS	Kansas Department of Health and Environment	E-10402	04/30/2019
OK	Oklahoma Department of Environmental Quality	2018-118	08/31/2019
TX	Texas Commission on Environmental Quality	T104704416-18-12	07/31/2019
TX-B	Texas Commission on Environmental Quality	T104704546-18-2	07/31/2019
UT	State of Utah Department of Health	NE000012018-8	07/31/2019
WA	State of Washington Department of Ecology	C912	06/07/2019

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2018-10-01 08:59

Notes and Definitions

HT	Hold time exceeded, not suitable for regulatory purposes.
<	Less than reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

EPA 524.2, EPA 624, EPA 8260, OA-1, TCLP VOC, GRO, and all microbiological analyses are conducted in the facility located at 13606 B Street, Omaha, NE 68144. All other analyses are conducted in the main facility located at 13611 B Street, Omaha, NE 68144.

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CHAIN OF CUSTODY

Lab Work Order Number: 1542331
Date Generated: 09/13/2018

Client Name	Project Name
CITY OF OMAHA QC DIV - 9602	Green Infrastructure Monitoring
Client Contact	Project Description
JOHN HYNES	
Address	Purchase Order Number
5600 S 10TH ST	
City	Midwest Labs Contact
OMAHA	Heather Ramig
State/Zip	Regulatory (Circle One)
NE, 68107-	Yes No
Phone / Fax	Regulatory Agency
4024443908 / 4024443904	
Sampler Name (printed)	Sample Type (Circle One - See Below)
	D G W S/H U P

Requested Analyses (Test Names): Ecoli-EPA1603; Nitrate/Nitrite, TKN-Discrete, Total Phosphorus; TDS, TSS

WORKORDER: 1542331
COC
Sticker #: 1

Copy To

Email to:

Lab ID	Sample Name or Field ID	Sampled Date	Sampled Time	Sample Code	Matrix Code	Container Count	Preservation Code 10	4	1	Sample Comments
01	01	9/20	7:52pm		A	3	1	1	1	
02	02	9/20	8:12pm		A	3	1	1	1	
03	03	9/20	8:32pm		A	3	1	1	1	
04	04	9/20	8:40pm		A	3	1	1	1	
05	05	9/20	9:00pm		A	3	1	1	1	
06	06	9/20	9:20pm		A	3	1	1	1	

Relinquished By	Date/Time	Received By	Date/Time
Alex Evans	9/21/2018 8:15am	Sara	9/21/18 825
Relinquished By	Date/Time	Received By	Date/Time
	9/21/2018		

Comments:

Lab Internal Use Only:
Temperature Upon Receipt: 1.6 C
Cooler Numbers:
Notes:

Matrix Codes: A=Aqueous

Preservation Codes: 1=Cool 6°C,10=Sterile, Na2SO3, Cool 6°C,4=pH<2; H2SO4

Sample Type Codes: D = Drinking Water (Safe Drinking Water Act), G = Groundwater, W = Wastewater (Clean Water Act), S/H = Solid/Hazardous Waste (RCRA), U = Underground Storage Tank (UST), P = Process Water

Chain of Custody will have a signature upon receipt but no subsequent signatures.

Work Order 1542331

RC Form 15 - Effective 10/31/2013

Midwest Laboratories®

Sample Acceptance Checklis
Document Number: RC CHKLIST 00
Revision No.:
Effective Date: 1/31/1
Page 1 of

WORKORDER: 1542331
COC
Sticker #: 2

Lab Number:

Thermometer Used: ☐ Therm Fisher IR 13

Sample Temperature (°C): 1.6 °C

Cooler Intact: ☑ Yes ☐ No
Received on Ice: ☑ Yes ☐ No
Hand Delivered: ☑ Yes ☐ No

Date & Initials of person accepting samples: Olm 9/21/18

				Comments:
Chain of Custody present?	☑ Yes	☐ No	☐ N/A	
Chain of Custody complete?	☐ Yes	☑ No	☐ N/A	
Sample ID(s):	☑ Yes	☐ No	☐ N/A	
Sample Location(s):	☑ Yes	☐ No	☐ N/A	
Client Contact:	☑ Yes	☐ No	☐ N/A	
Analysis Requested:	☑ Yes	☐ No	☐ N/A	
Sampler name on COC?	☐ Yes	☑ No	☐ N/A	
Date & Time of collection:	☑ Yes	☐ No	☐ N/A	
Sample labels match COC?	☐ Yes	☐ No	☐ N/A	
Written in indelible ink?	☑ Yes	☐ No	☐ N/A	
Labels indicate proper preservation?	☑ Yes	☐ No	☐ N/A	
Chain of Custody relinquished with signature?	☑ Yes	☐ No	☐ N/A	
Samples arrived within hold time?	☑ Yes	☑ No	☐ N/A	ecoli expired - Olm 9/21/18
Sufficient volume?	☑ Yes	☐ No	☐ N/A	
Appropriate containers used?	☑ Yes	☐ No	☐ N/A	
Filtered volume received for dissolved tests?	☐ Yes	☐ No	☑ N/A	
Headspace in VOA vials?	☐ Yes	☐ No	☑ N/A	
Trip Blank present?	☐ Yes	☑ No	☐ N/A	

Client Notification/Resolution: Date/Time Contacted: _____

Person Contacted: _____ Contacted By: _____

Comments/Resolution: _____

APPENDIX D MONITORING DATA-PROVIDED ELECTRONICALLY

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