NPDES MS4 Phase I Permit
Annual Report for 2012 Activities
City of Minneapolis and the Minneapolis Park & Recreation Board

NPDES MS4 Phase I Permit No. MN0061018 Annual Report

Prepared by:

Minneapolis Public Works Department

in conjunction with

Minneapolis Park & Recreation Board

June 30, 2013

Minneapolis Park & Recreation Board

Minneapolis
City of Lakes

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I hereby certify that this plan, specification, or report, was prepared by me or under my direct Supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.

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APPENDICES

Acronyms

BCWMC	Bassett Creek Water Management Commission
BMP	Best Management Practices
CB	Catch Basin
CSO	Combined Sewer Overflow
CWA	Clean Water Act
DNR	Department of Natural Resources
EPA	Environmental Protection Agency
ESC	Erosion and Sediment Control
FWMC	Flow Weighted Mean Concentration
LAURI	Lake Aesthetic and User Recreation Index
I & I	Inflow & Infiltration
LID	Low Impact Design
MCES	Metropolitan Council Environmental Services
MCWD	Minnehaha Creek Watershed District
MECA	Minnesota Erosion Control Association
MH	Manhole
MDR	Minneapolis Development Review
MnDOT	Minnesota Department of Transportation
MOU	Memorandum Of Understanding
MPCA	Minnesota Pollution Control Agency
MPRB	Minneapolis Park & Recreation Board
MPW	Minneapolis Public Works
MWMO	Mississippi Watershed Management Organization
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
NURP	Nationwide Urban Runoff Program
RDP	Rainleader Disconnect Program
SCWMC	Shingle Creek Watershed Management Commission
SOP	Standard Operating Procedure
SSO	Sanitary Sewer Overflow
SW	Stormwater
SWPPP	Storm Water Pollution Prevention Plan
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
XP-SWMM	Stormwater Modeling design software
WMO	Watershed Management Organization

I. Executive Summary

Report Objective

The National Pollutant Discharge Elimination System (NPDES) program was created in 1990 by the United States Environmental Protection Agency (EPA) to safeguard public waters through the regulation of the discharge of pollutants to surface waters including lakes, streams, wetlands, and rivers. The Minnesota Pollution Control Agency (MPCA) is the local authority responsible for administering this program. Under this program, specific permits are issued to regulate different types of municipal, industrial activities and construction.

This report is prepared in compliance with the requirements of NPDES (National Pollutant Discharge Elimination System) Permit No**.** MN0061018, is a Municipal Separate Storm Sewer System (MS4) Phase I permit issued to City of Minneapolis (City) and the Minneapolis Park & Recreation Board (MPRB) as co-permittees. This Report provides documentation and analysis of the activities conducted during the previous year, 2012. Public input into the development of the priorities and programs is required, as is adoption by City Resolution of the Annual Report.

Permit No. MN0061018 was issued in December 2000 and reissued in January 2011. A new Stormwater Management Program was submitted to the Minnesota Pollution Control Agency (MPCA) on September 28, 2011 for review and approval as required under the new permit. Revisions were submitted May 3, 2013, and the MPCA anticipated sending approval documentation in May 2013. The Permit requires the implementation of approved stormwater management activities, referred to as Best Management Practices (BMPs). The Minneapolis NPDES Stormwater Management program is developed and administered by the City and MPRB departments/agencies that are responsible for permit activities. These stakeholders are jointly responsible for the completion of the required Permit submittals. Public Works provides program management and completes each Annual Report. This year's Annual Report primarily follows the format used under the December 2000 permit, in transition to the format that will be used in conformance with the Stormwater Management Program, when approved.

II. Storm Drain System Operational Management and Maintenance

Program Objective

The objective of the NPDES stormwater management program is to minimize the discharge of pollutants through the proper operational management and maintenance of the City's storm drain system. Targeted pollutants include:

- Total Suspended Solids (TSS)
- Nutrients
- Floatable Garbage

Program Overview

The City's storm drain system is operationally managed and maintained by the Operations section of the Public Works Department Surface Water and Sewers Division. Design engineering and regulatory issues are managed by the division's Capital and Regulatory sections, respectively.

The current authorized staffing level of the Operations section is approximately 75 full-time employees. Of these, there are currently 65 permanent, full-time and 15 seasonal employees working directly within the operations and maintenance area, and the remainder work within the construction area. General operations and maintenance efforts include pump station and pipeline inspections, pipeline cleaning, system repairs, rehabilitation or reconstruction, inspection and operation of control structures, operation of pump stations, cleaning of water quality structures, and operational management of stormwater detention ponds.

The table below shows the base operational functions along with the corresponding staffing:

Crews	Staff/crew	Type	Tasks
4	2	Route Truck	Daily pipe line system inspections, complaint response, and resolution to minor system operational problems
4	2	Jet Truck	"As-requested" cleaning of storm system components, routine cleaning of sanitary system pipes, and "as-requested" cleaning of pump/lift stations. Hydro jet-wash technique.
2	2	Jet-Vac Truck	Routine cleaning of sanitary system pipes. Hydro jet-wash technique. Sanitary sewer cleaning by vacuum removal of sludge and debris build-up
3	2	TV Truck	Televise and inspect storm drain and sanitary sewer system components. Log and assess condition of televised lines to determine and prioritize rehabilitation and/or repair needs to storm drain and sanitary sewer system components.

2	2	Repair Truck	Perform medium-sized repairs, requiring minimum excavation, to storm drain and sanitary sewer system pipeline components. May assist in the repair or reconstruction of larger repair/ reconstruction jobs.
2	2	Vacuum Truck	Vacuum-cleaning of water quality structures, manholes, and catch basins within the storm drain system. Assist in sanitary sewer cleaning by vacuum removal of sludge and debris build-up. Assist in repair/ construction activities using vacuum excavation process. Assist in erosion control compliance using vacuum cleanup of eroded soils and/or cleaning of erosion control structures.
1	2	Rod Truck	Remove roots and foreign objects from sanitary sewer system. Remove large debris from storm drain pipes and free ice from frozen catch basin leads.
2	1	Pond & Pump	Operate, maintain, and repair sanitary lift station and stormwater pump stations. Operate and maintain stormwater detention basins.
1	1	Shop	Perform general maintenance and repair to specialty use vehicles and emergency response equipment. Fabricate, as needed, custom metal and wood objects for sewer and storm drain operations. Provide field deliveries of materials, tools, and equipment. Maintain material inventory and fleet management data.

Previous Year Activities

Some of the noteworthy 2012 cleaning and repair statistics are summarized in the following list:

- Responded to 747 complaints of plugged or backed-up catch basins
- Responded to 127 complaints of cave-ins around catch basins and manholes
- Performed 240 minor repairs to storm drain lines, catch basins or manholes
- Cleaned 3.15 miles of storm drain utilizing hydro-jet washing
- Televised and condition assessed 81 miles of storm drain pipes
- Performed inspection of 8.63 miles of deep stormwater drainage tunnels
- Repaired 100 feet of storm tunnel
- Removed approximately 526 cubic yards (789 tons) of eroded sandstone/limestone sand/sediment from storm tunnels
- Work on the 10th Avenue SE, St. Mary's Central City, and Phillips tunnels continues, which is improving the condition of the structures and reducing erosion/transfer of the sandstone outside of the tunnel. This is decreasing transport of sand particles/solids to the Mississippi River.
- Contaminated substance/hazardous waste spills responded to, and subsequently mitigated, by Public Works - Surface Water & Sewers Operations staff: zero
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III. Structural Controls Operational Management and Maintenance

Program Objective

The objective of this NPDES MS4 stormwater management program is to minimize the discharge of pollutants through the proper operational management and maintenance of structural controls within the City's storm drain system that affect system flow rates and water quality discharges.

Structural controls include:

- Grit Removal Chambers
- Outfall Structures
- Pump Stations and Level Control Weirs
- Stormwater Ponds, Stormwater Wetlands and Bio-(in)filtration (Rain Gardens)
- Catch Basins

Targeted pollutants include:

- Sediment
- Nutrients
- Floatable Garbage

Program Overview

Structural controls that are part of the City's overall storm drainage system are operationally managed and maintained by the Operations section of the Public Works Surface Water & Sewers Division. These components are routinely inspected and maintained to ensure proper operation and reliability. Frequency of inspections and assigned maintenance efforts are based on both operational experience and incurred environmental events. Structural controls are separated into five separate categories:

1. <u>Grit Removal Structures</u>

These are devices that have been installed for sediment, debris, and oil collection. The City continues with its effort to increase the number of grit chambers installed. The devices are inspected in the spring and fall of each year, and then cleaned, if required. The amount of sediment removed, the presence of floatables, and the dates that devices were cleaned are recorded on log sheets, and then added to a database. Appendix A35 contains a list of these devices, and maintenance dates.

2. <u>Storm Drain Outfalls</u>

These are the structural ends of system pipelines where conveyance of stormwater runoff is discharged into receiving water bodies. Outfalls are inspected on a 5-year schedule where 20% of the outfalls are inspected each year. Site inspections evaluate the general condition of structures, determine if any significant erosion has occurred and observe any contaminant discharges. When indications of illicit or otherwise contaminated discharges are observed, they are reported to Minneapolis Environmental Services for reporting to the Minnesota Duty Officer and for further investigation and resolution. Any identified structural repair or maintenance work is prioritized and scheduled within the constraints of available personnel, budget funding, and coordination with other essential operations. Appendix A36 contains maintenance information for these devices.

3. <u>Pumps & Weirs</u>

These are structural devices that mechanically affect the flow of stormwater runoff through the storm drain system. Pump stations are inspected on a regular basis for routine operational checks and are inspected annually for detailed condition assessment. Maintenance and/or repairs are performed with routine items being completed as needed and larger items being coordinated into a budgeted pump station operation program. Weirs and outlet structures are inspected and repaired as needed to facilitate their proper operational working order.

4. <u>Ponds and Bio-(in)filtration (Rain Gardens)</u>

These are structural devices that detain or retain stormwater runoff and improve the water quality. They are regularly maintained for volume and functionality, and also for their park-like amenities including native plantings, turf grass, pathways, benches, and lighting. Based on current level of experience, the need for dredging ponds of sediment buildup appears to be in a 15- to 20-year cycle. At present, only a few of the City's holding ponds are at or near this age such that the need for sediment removal from them is considerable.

5. <u>Catch Basins</u>

These are structural devices located along the City's street system that provide entrance of stormwater runoff into the storm drainage system. There is no formalized inspection schedule, however Surface Water & Sewers crews and Street maintenance crews both routinely look for plugged or damaged structures. Reported damages and/ or plugs are given a priority for repair and/or cleaning. Cleaning catch basins, while ensuring proper runoff conveyance from City streets, also removes accumulated sediments, trash, and debris. Augmenting this effort is the street sweeping program carried out by the Street maintenance section that targets the pick-up of street sands, leaves, and debris prior to their reaching catch basins. Repair of damaged catch basins is also a priority, given their location in city streets and ultimate impact to the traveling public.

<u>Previous Year Activities</u>

- Monitored and maintained 25 pump stations.
- Performed 122 grit chamber inspections on 111 individual structures (some were inspected more than once). Performed 115 cleanings on 104 of the structures (some were cleaned more than once, some did not need cleaning). A total of 362.5 cubic yards of material was removed from grit chambers. The majority of the grit chambers are both maintained and owned/operated by Public Works, however some are owned and operated by others, but cleaned by Public Works under contract.
- Inspected 320 of 416 storm drain outfalls in 2012 inspection program. Of the 320 outfalls inspected, 39 were found to be in need of repair or maintenance.
- Maintained 11 stormwater holding ponds.
- West Calhoun Pond 1, near the perimeter of Lake Calhoun, is a stormwater pond maintained by the Minnehaha Creek Watershed District. It was dredged in 2012 to return the pond to its design capacity. Dredging was carried out by the Minnehaha Creek Watershed District. An amount of 2,024 cubic yards of sediment was removed (described further in the next section).

Performance Measures

Structures operated and maintained annually:

- 25 pump stations
- 11 stormwater holding ponds
- 115 grit chamber cleanings

IV. Disposal of Removed Substances

Program Objective

A key component of the MS4 stormwater management program is collection and disposal of materials removed from the storm drain system and structural controls in a manner that will prevent pollution and that will comply with applicable regulations. Targeted pollutants include:

- Sediment
- Nutrients
- Floatable Garbage
- Additional for stormwater pond sediment dredging are Copper, Arsenic and Polycyclic aromatic hydrocarbons (PAH)

Program Overview

Minnehaha Creek Watershed District (MCWD): By agreement with the City of Minneapolis and the Minneapolis Park & Recreation Board, the MCWD monitors the design capacity of several stormwater ponds in Minneapolis and performs dredging and restoration as needed including testing for proper disposal.

Minneapolis Public Works: Targeted pollutants are collected from grit removal structures, catch basins, system piping, detention ponds, and deep drainage tunnels. Removed substances are screened for visual or olfactory indications of contamination. If contamination of the material is suspected, the Engineering Laboratory will select representative samples for an environmental analysis. Contaminated substances are disposed of in a landfill or another site that is approved by the Minnesota Pollution Control Agency (MPCA). Non-contaminated targeted pollutants are disposed of the same way as street sweepings, as reported in **Section VI. Roadways**. During cleaning and disposing operations, erosion control measures are applied when needed to prevent removed material from re-entering the storm drain system.

Previous Year Activities

Minnehaha Creek Watershed District removed 2,024 cubic yards of sediment from West Calhoun Stormwater Pond 1, a stormwater pond built for water quality of Lake Calhoun. Because the storm pond dredged material contamination was near the Level 2 Soil Reference Value for BaP Equivalent, the removed material was disposed of at a landfill. Below are the results of chemical testing:

West Calhoun Pond 1 results of chemical testing on sediment cores (mg/Kg)

Parameter	SRV Level 1	SRV Level 2	Calhoun SW Pond 1
Arsenic	9	20	6.6
Copper	100	9,000	28
Acenapthene	1,200	5,260	0.087
Acenapthylene	na	na	0.089
Anthracene	7,880	45,400	0.33
Benzo(g,h,i)perlyene	na	na	0.019
Fluoranthene	1,080	6,800	3.4
Fluorene	850	4,120	0.15
2-Methylnapthalene	100	369	0.027
Naphthalene	10	28	0.042
Phenanthrene	na	na	1.53
Pyrene	890	5,800	2.7
Quinoline**	4	7	ND
BaP Equivalent	2	3	2.959
Total Kjeldahl Nitrogen	na	na	2,000
Ammonia as N	na	na	210
Nitrate + Nitrite as N	na	na	140
Total Phosphorus	na	na	970
Cadmium	25	200	0.43
Chromium, III	44,000	100,000	15
Chromium, IV	87	650	3.8
Lead	300	700	25
Nickel	560	2,500	20
Selenium	160	1,300	1.9
Zinc	8,700	75,000	100
Mercury	0.5	1.5	0.0086
PCB	1.2	2.8	nd
Total Organic Carbon	na	na	3.49

- Minneapolis Public Works crews removed approximately 323 cubic yards of sediment and debris from grit chambers in 2012, and approximately 102 cubic yards from the Lake Harriet spillway at Humboldt Avenue S and W 49th Street. The removed material consisted primarily of sand and vegetative matter collected from grit removal chambers. See **Section III. Structural Control Operational Management and Maintenance** for operation and maintenance details. Additionally, approximately 526 cubic yards (789 tons) of eroded sandstone/limestone granular material was removed from storm tunnels. This material is stockpiled for use in making fill material.

V. Stormwater Management Requirements for Development/Redevelopment

Program Objective

The objective of this stormwater management program is to minimize the discharge of pollutants through the regulation of construction projects. Regulation includes erosion and sediment control, and approval of stormwater management including ongoing operation and maintenance commitments. Minneapolis Code of Ordinances Title 3 Air Pollution and Environmental Protection, Chapter 52 (Erosion and Sediment Control and Drainage) and Chapter 54 (Stormwater Management) contain erosion and sediment control requirements and stormwater management instructions for developments and other land-disturbing construction activities.

Targeted pollutants include:

- Phosphorus
- Total Suspended Solids (TSS)

Erosion and Sediment Control

Ordinance

In 1996 the Minneapolis City Council amended Title 3 of the Minneapolis Code of Ordinances relating to Air Pollution and Environmental Protection by adding Chapter 52, entitled *Erosion and Sediment Control for Land Disturbance Activities (*now *Erosion and Sediment Control and Drainage)*.

Requirements

The ordinance addresses development sites, demolition projects, and other land disturbing activities. Sites disturbing more than five cubic yards, or 500 square feet, are required to have an erosion control permit. Erosion & Sedimentation Control (ESC) Permits must be acquired prior to commencement of work, and must be obtained before a building permit will be issued for the site. If there will be a disturbance of greater than 5,000 square feet, demolition and construction sites also require an approved erosion control plan before the ESC Permit can be issued.

Enforcement

Ongoing site inspections are performed by Environmental Services inspectors. Inspectors may issue citations and fines. Failure by the permittee to comply with the ordinance will constitute a violation pursuant to Section 52.300. If there is a demonstrated failure to comply, the City reserves the right to terminate an ESC permit at any time. The City then has the option of proceeding with the necessary restoration of the site. This restoration would be done at the expense of the owner/permittee.

Previous Year Activities

A summary of the 2012 inspections is as follows:

- 388 permits issued
- 2,144 site inspections completed
- 147 enforcement actions issued for site compliance
- 34 citations for non-compliance after enforcement action
- Coordinated inspections with Minnehaha Creek Watershed District (MCWD)

Stormwater Management for Development

Ordinance

In 1999 the Minneapolis City Council amended Title 3 of the Minneapolis Code of Ordinances (relating to Air Pollution and Environmental Protection) by adding Chapter 54, which is entitled *Stormwater Management*. The ordinance establishes requirements for permanent stormwater management for development/redevelopment projects on sites that are greater than one acre.

The ordinance sets standards according to the receiving water body. These standards include but are not limited to:

- Reductions of TSS for discharges to all receiving water bodies
- In addition to TSS, controlled rate of runoff for discharges to streams, areas prone to flooding, and areas with infrastructure limitations
- In addition to TSS, a reduction in nutrients for stormwater that discharges to lakes and wetlands
- Provision for on-site, off-site, or regional stormwater facilities
- Maximizing infiltration by minimizing the amount of impervious surface
- Employing natural drainage and vegetation

Requirements

Redevelopment of existing sites provides an opportunity to lessen the impacts of urbanization on the Mississippi River and other Minneapolis water resources. Stormwater management plans are required for all construction projects on sites greater than 1 acre in size. Sites less than 1 acre are also encouraged to incorporate stormwater Best Management Practices (BMPs) in their design as a means of satisfying other city codes such as green space requirements. Plans are reviewed through the Minneapolis Development Review (MDR) process and approved by the Minneapolis Public Works Surface Water & Sewers Division. Operation and Maintenance Plans for BMPs are required as part of the approval process. Once constructed and inspected for compliance with approved plans, the BMP stormwater devices are registered with the City of Minneapolis Environmental Services, with an annual permit required for each stormwater device registered. Inspections and document checks are carried out annually or as needed, to ensure that the BMPs continue to function as approved.

Previous Year Activities

During 2012, Minneapolis Public Works took part in the preliminary review of 132 projects. Of those 132 site plans, 98 projects with a total of 110 BMPs received final approval, with the appropriate permits issued. These BMPs will provide rate control and water quality for approximately 120 acres of land, including 70+ acres of impervious area.

BMP types included:

- Rain gardens
- Pervious pavement
- Infiltration areas
- Ponds
- Green roofs
- Underground infiltration chambers/pipe galleries
- Underground storage/detention chambers
- Proprietary filter chambers
- Vegetated swales

VI. Roadways

Program Objective

The objective of this stormwater management program is to minimize the discharge of pollutants through the proper operation and maintenance of public streets, alleys, and municipal equipment yards. Targeted pollutants include:

- TSS[1]
- BOD5[2]
- COD[3]
- Phosphorus
- Chlorides

Program Overview

Street Sweeping

Minneapolis employs several street sweeping approaches in Minneapolis. Some are citywide, and some vary by area or land use. Curb-to-curb sweeping operations occur citywide every year in the spring and fall. At those times, all City streets and alleys are swept systematically, and temporary parking bans are enforced to aid with sweeping operations. Operational routines and special methods are employed to address seasonal conditions, and to optimize cleaning. Flusher trucks apply pressurized water to the streets in an effort to push sediment and debris to the gutters. Street sweepers follow behind the flusher trucks and clean the gutters. During the fall, leaves are first bunched into piles, and then the leaves are picked up before flushing and sweeping occurs. During the summer, between the spring and fall sweep events, sweepers are assigned to maintenance districts for periodic area sweeping. Downtown and other high traffic commercial areas are swept at night on a weekly basis. In addition, summer sweeping in the Chain of Lakes drainage areas has occurred since 1995 as part of the Clean Water Partnership project. Two sweepers are dedicated to cleaning drainage areas around the Chain of Lakes, and one sweeper is devoted to the Minneapolis Parkway System.

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1 Total Suspended Solids
2 Biochemical Oxygen Demand of wastewater during decomposition occurring over a 5-day period
3 Chemical Oxygen Demand

The materials collected from street sweeping are received at two different locations, based on time of the year and nature of the material. The inorganic materials go to a construction demolition landfill site in Becker, Minnesota, to be used as daily cover. A five-year 2008 contract states that the organic materials, which are collected mostly in the fall of the year, go to Carver County Minnesota to be composted and converted to a retail mulch material that is then distributed by a company called Organic Technologies. In 2012, The Mulch Store operated by SKB Industries was added, which has four retail locations and operates its mulch operation in Chaska, near the University of Minnesota Landscape Arboretum.

Snow and Ice Control

The Street Maintenance section applies salt and sand to City roadways every winter for snow and ice control. Efficient application of de-icing materials is sought to reduce costs, required maintenance, and environmental impact. The most obvious cost savings is realized in a reduction of the overall amount of materials used. Salt is harmful to aquatic life, groundwater and to most plant and tree species. Salt causes corrosive damage to bridges, reinforcement rods in concrete streets, metal structures and pipes in the street, and vehicles. Sand harms lakes and streams by disturbing the ecosystems, and in depositing pollutants that bind to sand particles in lake bottoms and streambeds. An accumulation of sand calls for more frequent cleaning of catch basins and grit chambers. In 2007, the EPA approved a Total Maximum Daily Load (TMDL) study that places limits on chlorides (salt) discharged to Shingle Creek which had been assessed as impaired for chlorides. Consequently, the City developed improved snow and ice control practices, and they are being implemented not only in the Shingle Creek drainage area but also citywide. A metro-wide chloride TMDL study is underway. Maintenance supervisors and equipment operators are trained in winter maintenance. Specific topics covered include guidelines for sand and salt application rates that are based on weather conditions, application techniques, and spreader calibration. Material spreaders are calibrated annually before the winter season. Maintenance yard housekeeping practices are designed to minimize salt/sand runoff. The materials that are used are tallied on a daily basis.

Storage of De-icing Materials

Salt stockpiles are stored under cover to minimize potential groundwater contamination and runoff. Opened in 2010, a new maintenance facility constructed at Hiawatha Avenue and E 26th Street consolidated some stockpile activities. For its permanent facilities, the new maintenance yard employs runoff collection systems installed around salt and sand stockpiles. Two temporary storage locations are scheduled to be eliminated when funding is available from the sale of several city facilities.

Downtown Improvement District

The Downtown Improvement District (DID) is a business-led non-profit organization with "a mission to make downtown Minneapolis a vibrant and attractive place for recruiting and retaining businesses, employees, residents, shoppers, students, and visitors. This is accomplished by providing services that make the 120 block district cleaner, greener, and safer." The organization is an important partner to the City, carrying out maintenance activities in the downtown public realm that minimize the discharge of pollutants through the proper maintenance of public right-of-way areas. The most notable activities related to stormwater runoff are operation of sweepers for gutters and sidewalks throughout the 120 block district.

Previous Year Activities

The 2012-2013 winter season was colder, with numerous snow events. There were 30 notable events with 67.2 inches for the season, as compared to an average of 48 inches. The most snowfall was observed in April. There were three declared snow emergencies, which is the annual average, and there were 166 days of snow and/or temperatures below freezing. The quantities of salt and sand used in snow and ice control are tracked by recording amounts that are delivered by suppliers, and also by estimating the quantities that are on-hand on a daily basis. Street sweepings are scaled at the disposal site and reported to the City for record purposes only. Leaves picked up are weighed at certified scales that are located at City facilities or contractor transfer in Minneapolis. The statistics for last year's program are as follows:

- 19,142 tons of salt applied to roadways
- 11,430 tons of sand applied to roadways
- 23,100 tons of materials reclaimed during spring and summer street sweeping operations
- 8,135 tons of leaves collected for composting during the fall citywide sweeping
- 22 staff members attended an eight-hour refresher for the 40-hour hazardous materials training class
- 11 staff members attended training on the use of salt as presented by watershed organizations
- All division shift–staff attended the annual review of procedures. The review covers the recognition and response to hazardous materials or situations.

Performance Measures

- Amount of materials recovered as a percentage of materials applied: 76%
- Amount of salt and sand applied relative to total snowfall: 455 tons/inch

VII. Flood Control

Program Objective

The objective of the Minneapolis stormwater management program is to design flood control systems that manage stormwater quantities so that the runoff does not exceed the capacity of the existing facilities while minimizing the adverse impacts on the water quality of the receiving water body. Targeted pollutants include:

- Phosphorus
- Total Suspended Solids (TSS)

Program Overview

In July 1997, Minneapolis experienced torrential rainstorms that exceeded the capacity of the City's existing storm drain system and caused flooding throughout the City, causing physical damage to homes, businesses and vehicles. In response, Minneapolis Public Works established the Flood Mitigation Program to develop potential solutions and a plan for implementation for each of 39 areas that experienced flooding and/or property damage as a result of the 1997 storms.

The Flood Mitigation Program began in 1998 and was originally scheduled to run through 2009. However, due to the state of the City's available finances, this Program was temporarily suspended. In addition, new flooding areas continue to be identified by residents, or through continued analysis of the system. In 2012, a new program, Flood Mitigation with Alternative Stormwater Management, was established to address the backlog of identified flood areas throughout the City, with consideration of alternative or "green infrastructure" strategies. The design storm is unchanged. Storm drains are still designed to accommodate open channel flow during a 10-year, 24-hour design[4] and minimize the risk of flooding of homes from the 100-year, 24-hour design event. However due to ever-increasing emphasis on water quality and Total Maximum Daily Load (TMDL) standards, flood mitigation strategies have changed to become one of several factors considered with projects. The new type of project tries to achieve the three R's or the three ***REDUCTIONS*** of ***VOLUME***, ***LOAD*** and ***RATE***.

With this strategy, the designer first looks for ***VOLUME REDUCTION***. This is a successful approach for responding to TMDL targets, because these volume reducing techniques do not

[4] City of Minneapolis 10-year design based on 4.2" of rainfall in a 24-hour event and 100-year design based on 5.9" of rainfall in a 24-hour event.

concentrate the phosphorus or suspended solids, so there is a corresponding ***LOAD REDUCTION***. Next the designer looks for ***RATE REDUCTION***. This also is a successful approach for responding to TMDL targets, because the techniques slow the water down at its source, thereby reducing the initial amount of sediment that reaches the stormwater system. Rather than only relying on enlarging pipes to drain more stormwater faster, new techniques focus on green initiatives that treat stormwater where it falls and this approach develops options that attempt to minimize the need for new or larger pipes. Examples of the new ***Three "R"*** techniques include:

- A proposal to use street right-of-way for infiltration is a ***Three "R"*** project because phosphorus-laden suspended solids would be filtered by porous media and then infiltrate into the soil
- Another proposal to use street right-of-way in areas with heavy soil is a ***Three "R"*** project because, once again, phosphorus-laden suspended solids would be filtered by porous media to an underground reservoir that feeds tree roots for evapotranspiration
- When volume-reducing strategies are precluded by soil conditions, rate control systems such as underground storage are used

In many cases, adding catch basins or augmenting inlet capacity has the negative effect of increasing the runoff rate. New strategies would look for volume-reducing techniques upstream so the existing system would then have capacity for existing flows. Here are other strategies to help control flooding:

- Operation of backup generators for existing pump stations during power outages
- Inspection and maintenance of catch basin inlets and storm drains that are located within flood-sensitive areas
- Inclusion of various rate control or volume control Best Management Practices (BMPs), including rain gardens, permeable pavers, etc.

Previous Year Activities

In 2012, two flood control projects were completed. The first is part of the long-term Blue Water Partnership project to improve water quality in Lake Hiawatha. A two-cell, approximately one-acre bio-infiltration "rain garden" was installed near E 43rd Street and 19th Avenue S, northwest of the lake, which will accommodate drainage from an alley that has historically had problems with flooding during large rain events. Instead of conveyance through the existing 99-inch pipe, the entire drainage of the alley was diverted though the new rain garden to solve the flooding problem and to improve water quality with volume, load and rate reductions. If necessary, the rain garden can overflow to the 99-inch pipe, however a backflow preventer protects the rain garden from surcharge in the 99-inch pipe.

Rain garden near Lake Hiawatha Golf Course

The second 2012 flood control project was to address repeated flooding in an alley behind Dean Parkway and Thomas Avenue South that was causing property damage and contributing to clear water inflow to the sanitary sewer system. In addition to addressing flood mitigation, a hydrodynamic separator-type grit chamber was installed as part of the project to address water quality. It treats the stormwater runoff of the entire pipeshed area of approximately 2.75 acres prior to discharge to the lagoon between Cedar Lake and Lake of the Isles.

Performance Measures

While most citizens will measure success by whether there is reduced neighborhood flooding, the flood control work now also targets water quality. Many of the projects are intended to determine and demonstrate technology that works specifically for this City. Continuing the objectives of previous years, the goal is increased water quality of lakes, river and streams in Minneapolis. The Flood Mitigation Program Projects now include attempting to treat stormwater where it falls and making ***VOLUME REDUCTION*** the common element of systems, because volume-reducing systems provide for reduction of TSS, nutrients, litter, and other pollutants, as well as providing some ***RATE CONTROL***.

VIII. Pesticides and Fertilizer Control

Program Objective

The objective of this stormwater management program is to minimize the discharge of pollutants by controlling the application of pesticides and fertilizers. Targeted pollutants include:

- Pesticides (insecticides, herbicides, fungicides etc.)
- Nutrients (phosphorus, nitrogen etc.)

Program Overview

Integrated Pest Management (IPM) Policy and Procedures

The Minneapolis Park and Recreation Board's (MPRB) IPM policy for golf courses and general park areas, is included in the MPRB's General Operating Procedures. Specific areas where IPM is heavily used are the Cowles Conservatory, the Minneapolis Sculpture Garden, and the major display gardens at Lyndale Park, Loring Park, and Minnehaha Falls Park. Plant Health Care/Integrated Pest Management Action Forms are filed when there are specific plant health problems for these garden areas. These forms document the specific problems and the recommended course of corrective action.

The golf course foremen, along with other staff, attend the annual Minnesota Green Expo in January. There they receive updated information on the newest turf and other related research as it applies to fertilizers, pesticides, biocontrols, etc.

MPRB Staff Pesticide Applicator Licensing and Continuing Education

All new hires for position of park keeper, Mobile Equipment Operator (MEO), gardener, golf course park keeper, and arborist are required to obtain their Minnesota Non-Commercial Pesticide Applicator license within one year of being hired. Every two years, as mandated by the Minnesota Department of Agriculture, staff attends re-certification training, offered and coordinated by the University of Minnesota. This effort is in conjunction with the Agronomy Services Division of the Minnesota Department of Agriculture.

Use of Pesticides and Fertilizers on Park Lands

The MPRB manages 6,400 acres of park land in the City of Minneapolis (approximately 18% of the City's 35,244 total land acres).

Pesticide Use

Use of pesticides to control turf weeds is not a regular practice of park maintenance. Weed control pesticides may be used when a park is being renovated, or when athletic fields and surrounding areas are being sodded/seeded. It may also be used when weeds exceed 50% of the ground "turf" cover. These procedures for general grounds and athletic fields are included in the MPRB's General Operating Procedures.

The MPRB actively manages Eurasian watermilfoil and purple loosestrife, which are two non-native invasive plant species. Eurasian watermilfoil, an aquatic weed, is harvested mechanically on Lakes Harriet, Wirth, Cedar, Isles and Calhoun throughout the summer months. In its General Operating Procedures, the MPRB has established that no chemical application will be used to control aquatic weeds. Eurasian watermilfoil harvesting is permitted through the Minnesota Department of Natural Resources, Division of Ecological Services. Coordination of control programs for Eurasian watermilfoil are determined and supervised by the Environmental Operations Section.

The MPRB does use herbicides to control certain problem invasive species in natural areas. Purple loosestrife, an invasive emergent plant in wetlands, is controlled using a leaf-feeding beetle. Purple loosestrife is the only invasive plant where a biocontrol agent has been successful at controlling the spread of the invasive species. In particular situations where the biocontrol agent is not as effective in controlling purple loosestrife, spot-spraying or hand-pulling is done by park maintenance staff. Common and glossy buckthorn are two woody invasive species controlled in woodlands through herbicide applications. Control of these species is done on a limited basis by Environmental Operations staff. Park Maintenance, Forestry and Environmental Operations staff document chemical applications made through our electronic database "PF Manager".

MPRB staff produce and maintain the necessary records of all pest management activities as required by the Minnesota Department of Agriculture. Annual paper records are kept by the District or Golf Course office. Electronic records of all applications began in 2008.

Since the 1980s, golf course foremen and park maintenance staff have documented the type, amount, and locations of the chemicals that are stored at park storage facilities. These chemical inventories provide detailed information to the Fire Department as to how to deal with a possible fire at these sites. The plans identify how the fires are best extinguished, and how to protect surface water in the surrounding area. The plans were put into place in the early 1980's, following a chemical company fire in north Minneapolis that resulted in the contamination of Shingle Creek.

Fertilizer Use

In September 2001, the Minneapolis City Council amended Title 3 of the Minneapolis Code of Ordinances (relating to Air Pollution and Environmental Protection) by adding Chapter 55, Lawn Fertilizer. Under the ordinance, since January 1, 2002 the retail sale of fertilizer containing any amount of phosphorus or other compound containing phosphorus, such as phosphates, is prohibited in Minneapolis, except as allowed by Minnesota Statute 18C.60 Phosphorus Turf Fertilizer Use Restrictions. The Minnesota Statute allows the use of phosphorus turf fertilizer if:

- An approved and recent test indicates that the level of available phosphorus in the soil is insufficient
- The fertilizer is being applied to newly established turf, and only during the first growing season

The fertilizer is for use on a golf course under certain conditions specified in the Statute

Fertilization of turf on Minneapolis Park & Recreation Board Property is performed for golf courses, around athletic fields, and in areas of heavy traffic. Golf course managers and maintenance foremen are instructed that no phosphorus can be used for turf fertilization unless a current soil test has demonstrated the need for this nutrient. MPRB staff is required to complete a report for every turf fertilizer application. These records are maintained for a period of 5 years, per state law.

Previous Year Activities

Staff Pesticide Applicator Licensing and Continuing Education

Currently 191 MPRB employees hold pesticide applicator licenses, through the Minnesota Department of Agriculture (MDA).

Use of Pesticides and Fertilizers on Park Lands

Pesticide Use

MPRB maintenance and environmental staff continue to maintain the purple loosestrife control program. Populations of released beetles in Minneapolis parks continue to maintain themselves at most sites, thereby reducing the need for chemical spraying.

Fertilizer Use

The MPRB included zero phosphorus turf fertilizers beginning with the 2002 fertilizer bid. This was done in response to the City/state regulation changes regarding phosphorus turf fertilizers.

A wide range of fertilizers was offered to allow park maintenance and golf course foremen to pick the highest performing fertilizer (based on soil test results).

Audubon Cooperative Sanctuary Program (ACSP) for Golf Courses

Audubon International provides comprehensive conservation and environmental education assistance to golf course superintendents and industry professionals through collaborative efforts with the United States Golf Association (USGA). The ACSP seeks to address environmental concerns while maximizing golf course opportunities thereby providing open space benefits. An important component of this program is the implementation of IPM procedures, and the reduction of chemical and fertilizer use to protect water quality and provide a healthier habitat for wildlife.

Participation in the program requires that golf course staff address environmental concerns related to the potential impacts of water consumption, and chemical use on local water sources, wildlife species, and native habitats. Additionally, the program provides assistance in comprehensive environmental management, enhancement and protection of existing wildlife habitats, and recognition for those who are engaged in environmentally responsible projects.

Audubon International provides information to help golf courses with:

- Environmental Planning
- Wildlife and Habitat Management
- Water Conservation
- Water Quality Management
- Outreach and Education

By completing projects in each of the above, the golf course receives national recognition as a Certified Audubon Cooperative Sanctuary. MPRB Operations staff, working with Theodore Wirth and Meadowbrook Golf Course foremen, received the ACSP certification for both courses. MPRB staff conducts yearly water quality and aquatic vegetation monitoring at the courses.

Performance Measures

- Number of MPRB staff with pesticide applicator licenses: 191
- Number of complaints, discoveries or known incidents of pesticide misuse or overuse responded to by City: 1
- Number of complaints, discoveries, or known incidents of improper phosphorus fertilizer application: none

IX. Illicit Discharges and Improper Disposal to Storm Sewer System

Program Objective

The objective of this program is to minimize the discharge of pollutants to lakes, creeks, wetlands and the Mississippi River by appropriately responding to spills and to detect, investigate and resolve illegal dumping and disposal of unpermitted, non-stormwater flows in the city's stormwater drainage system including pipes, gutters, swales and other conveyance infrastructure. Targeted pollutants include:

- All pollutants

Program Overview

Typical Hazardous Spill Response

The immediate goals of response are safety, containment of the spill, recovery of hazardous materials, and collection of data for use in assessment of site impacts. Motor vehicle collisions and electrical transformer overloads are examples of accidental releases, and results can include untreated waste and hazardous materials including heavy metals, toxics and solvents.

The life cycle of an event requires personnel from various departments and agencies to work as a team, utilizing available resources to protect people, the environment, and property. Training and response procedures are coordinated among the Regulatory Services, Public Works, and Fire Departments. The Regulatory Services Hazardous Materials Manager is responsible for coordinating recovery efforts. Events are followed by post-action debriefings to determine the causes of the events, to identify measures to improve the City's response, and to determine the means to limit future occurrences. As the assessment of the event progresses, other departments and/or outside agencies or contractors may become involved. Full procedures are documented in the City of Minneapolis Emergency Action Plan.

For small spills of petroleum products or other vehicle fluids, personnel are dispatched with appropriate equipment to apply sand. Once the sand has absorbed the spill, it is removed and then deposited in a leak-proof container. For large or extremely hazardous spills, a Hazardous Materials Response Team is also mobilized and augmented with staff from additional departments, outside agencies and/or contractors if warranted as the event progresses. For spills that reach the Mississippi River or Minneapolis lakes, boats are available for spill response and personnel are trained in boom deployment.

Spills are reported to the MPCA Public Safety Duty Officer, 911 Emergency Communications and, for qualified spills, to the National Duty Officer as required by law.

The protocol used by the Street Maintenance section for handling spills is documented in Appendix 32: Standard Operating Procedure for Vehicle Related Spills (VRS).

Emergency Response Program

The Department of Regulatory Services operates a boat for use on the Mississippi River and other Minneapolis water bodies, to be able to respond to spills that could impact our valuable water resources. The presence of a properly equipped boat facilitates addressing these events on the Mississippi River as well as on City lakes. Regulatory Services and Public Works staff are trained in the river deployment of booms, have field experience in placement of both containment and absorbent types of booms, and have years of experience on the water. These skills, coupled with an extensive level of knowledge of the Mississippi River, City lakes, landings and outfalls, provide a high level of protection for our precious natural resources.

Additionally, Regulatory Services uses the boat for the placement of monitoring and sampling equipment used for tracking water quality, identifying points of illegal discharges, illegal sewer connections, infiltration from a sanitary sewers or water mains, assessment of outfalls, and investigation of complaints that are inaccessible from shore. The City partners with the Mississippi Watershed Management Organization to conduct a joint sampling program of the storm drainage system that drains to the Mississippi River. The intent of this partnership is to detect illegal discharges, and to establish a baseline of chemical, physical, and biological parameters. The best avenue for a continued effective screening program in the City of Minneapolis, without duplication of services, is to continue to use current practices, and to explore the development of certain aspects of the program to improve enforcement results.

Previous Year Activities

- Spill response time in 2012: 42 minutes. Baseline spill response time in 2011: 38 minutes.

- Conducted 28 days of outfall sampling, visual inspections of outfalls and developing spill response strategies by boat. Participating agencies included Minneapolis Fire, Minneapolis Public Works, Minnesota Pollution Control Agency (MPCA) and Mississippi Watershed Management Organization. Also included are 2 spill response incidents to the Mississippi River where containment boom was deployed at affected outfalls. Minneapolis Fire, Minneapolis Public Works, Minneapolis Environmental Services and MPCA assisted in these efforts.

- Conducted training with Minneapolis Fire Hazardous Materials Teams and Minnesota Pollution Control Agency (MPCA) Emergency Response Team regarding the procedure for the removal of abandoned and unknown illegally dumped hazardous materials, including identification of the hazardous material and proper removal techniques.
- Participated in planning and implementation of Mississippi River Response Drill on August 22, 2012, which included planning a spill response scenario of diesel fuel spill from a cruise ship. Coordinated spill response efforts with Coast Guard, MPCA, and 4 Fire Departments, including boom deployment strategies and fuel recovery.
- Environmental Services field inspectors that received Hazardous Material training: 6. This training is required to respond to emergency spills in Minneapolis.

Unauthorized Discharges

Environmental Services personnel carry out pollution prevention and control activities. Results are achieved through educational efforts, inspections, and coordinated community outreach events. These activities may include enforcement, pursuant to Chapter 48[5] and other applicable City codes, and coordination with other regulatory agencies at the county, state and federal levels. Enforcement yields identification of the responsible party, documentation of clean-up activities, and also endeavors to reduce the flow of pollutants from illegal dumping and disposal. Response is made to reports of unauthorized discharges and illicit connections. Complaints are received from the public, City and private contractors, City staff and other government agencies, by the following means:

- Environmental Management Complaint Form
- Confidential calls to Minneapolis Information & Services. Within Minneapolis, the phone number is 311. Outside of Minneapolis, the phone number is 612-673-3000
- Reports from sewer maintenance crews, plumbing inspectors, and other City personnel
- Direct contact to Environmental Services staff at 612-673-3867

[5] Minneapolis Code of Ordinances, Chapter 48 Minneapolis Watershed Management Authority.

Previous Year Activities

- Addressed 99 calls for emergency response (containment of spills, chemical dumping, illegal disposal or handling of regulated or hazardous materials). These spills ranged from transformer leaks to spilled automotive fluids.
- 41 direct connections (registrations) to the storm drain (NPDES Permits)
- Investigated 1,251 water and land pollution complaints (illegal dumping, improper storage of material, and chemical storage)
- Inspected 73 contaminated soil cases
- Approved installation of 0 contaminated soil and ground water remediation systems and temporary storage of contaminated soil. Previous year's results of 24 active systems on 18 sites continue.
- Approved 15 limited duration sanitary sewer and storm drain discharge permits
- Approved 103 storage tank permits:

  Above ground, 1 abandoned-in-place, 5 installed, 0 removed

  Underground, 10 abandoned-in-place, 2 installed, 63 removed

  Enacted a new city ordinance prohibiting COAL TAR-BASED SEALER PRODUCTS (Minneapolis Code or Ordinances Title 3 Chapter 60).

Non-Stormwater Discharges

Environmental Services reviews non-stormwater permits and renewals while working with the MPCA permitting authority to address local concerns. Environmental Services also reviews alleged violations to a permit or code. If permits are violated, or if conditions indicate that the permit should be revised, Environmental Services staff will assist MPCA permitting staff in updating or revoking the permit.

Previous Year Activities

- Number of reported or discovered suspicious discharges: 15. All were investigated and eliminated.

Detection and Removal Screening Program

The field screening program to detect and investigate contaminated flows in the storm drain system is an integral part of Sewer Operations and Regulatory Services daily operations. Sewer

Maintenance crews routinely inspect and clean storm drain structures throughout the City. In addition, inspections of flows that generate unusual odors, stains, and deposits are included in the annual tunnel inspection, outfall inspection, and grit chamber inspection and cleaning programs. Any suspect flows are then reported to Environmental Services inspectors for further investigation. Environmental Services personnel also receive reports of alleged illicit discharges to the storm drain system from the public, other City departments, and various agencies. These combined efforts result in an annual screening of more than 20% of City drainage areas.

Facility Inspection Program

Inspectors perform site visits of facilities that store large quantities of regulated and hazardous materials. Inspections include review of handling, storage and transfer procedures as they relate to the site, spill response plans and equipment on site, employee training on spill response procedures, and identification of the required spill response contractor. The Minneapolis Fire Department participates in the majority of inspections, reviewing spill response strategies. In addition, site plan inspections yield the following information:

- Drainage patterns from the site to the nearest drain or water body
- Watershed destination and outlet location

Previous Year Activities

- Conducted inspections on 62 TIER II Hazardous Materials Facilities
- Reviewed 204 Emergency Response plans for TIER II Hazardous Materials Facilities

X. Storm Sewer Design for New Construction

Program Objective

There is a continuing effort to minimize the discharge of pollutants to public waters. This section describes the current focus and outlines the design measures used to control the discharge of pollutants by controlling the volume, loading or rate of stormwater discharged.

Targeted pollutants include:

- Total Suspended Solids (TSS)
- Phosphorus

Part A. CSO Program

CSO Program Overview

In 2012 the City of Minneapolis continued its program to reduce inflow and infiltration (I & I) to the sanitary sewer system (inflow is stormwater and other clear water sources connected directly to the sanitary sewer, and infiltration is groundwater that enters the sanitary sewer usually through pipe and system defects). The program is continuing a focus that the city has had since the 1960s when the city began a 40-year residential paving program.

The principal work is to continue to make reasonable progress of eliminating known public and private stormwater inlets or rainleaders connected to the sanitary sewer. Additionally the City is using a targeted sanitary sewer flow metering program to identify other sources. The flow metering program includes follow-up smoke testing where a smoke-like vapor is blown into the sanitary sewer in order to expose openings where inflow is entering the sanitary sewer.

The City's success with reducing I & I is transferring a problem from the sanitary sewer system to the stormwater management system, because there is limited storm sewer capacity for the inflow removed from the sanitary sewer. Management techniques are required for volume reduction or rate reduction, and the techniques vary with each project. Cumulatively, the runoff from these projects can be significant.

At this time, mitigation begins with an effort to reduce the volume of runoff. Options that reduce volume must have space within the right-of-way or must have an off-site area, with suitable soils for volume reduction in either case. Next, load reduction options are investigated, using recognized Best Management Practices (BMPs) such as prefabricated swirl-type grit chambers, bio-filtration or ponds. Space constraints in fully developed urban areas like Minneapolis limit many projects to use of compact prefabricated BMPs for load reduction.

Previous Year Activities

The storm drain project areas for 2012, and associated water quality impacts, are referenced in the following table:

PROJECT AREA	PROJECT DESCRIPTION	STORMWATER RUNOFF BENEFITS
CSO Area 032 (alley between 16th & 17th Av S, south of E 44th St)	Redirected catch basins from the sanitary sewer to the storm sewer	Eliminated CSO area of 3.10 acres; routed drainage to a series of existing stormwater ponds instead of directly to Lake Hiawatha
CSO Area 017 (alley between Cedar & 18th Av S, north of E 45th St)	Redirected catch basins from the sanitary sewer to the storm sewer	Eliminated CSO area of 2.50 acres; routed drainage to a series of existing stormwater ponds instead of directly to Lake Hiawatha
CSO Area 152 (44th St E and Cedar Av S)	Redirected catch basins from the sanitary sewer to the storm sewer	Eliminated CSO area of 1.20 acres; routed drainage to a series of existing stormwater ponds instead of directly to Lake Hiawatha
CSO Area 130 (Linden Av W near W Lyndale Av N)	Eliminated catch basins and regraded street	Eliminated CSO area of 1.6 acres
CSO Area 131 (vacated 7th S SE and Hennepin Av E)	Eliminated area drain connected to sanitary sewer	Eliminated CSO area of 1.0 acres
CSO Area 143 (36th St E and 10th Av S)	Redirected catch basins from the sanitary sewer to the storm sewer	Eliminated CSO area of 1.7 acres
CSO Area 145 (Nicollet Av S and W 35th St)	Redirected catch basins from the sanitary sewer to the storm sewer	Eliminated CSO area of 1.1 acres

Part B: Pilot Projects

For street renovation or reconstruction projects, whenever storm drain upgrades are required, installations of volume reduction systems, pollutant load-reducing facilities, and rate reduction BMPs are all considered.

Previous Year Activities

In 2012, three pilot projects were completed in conjunction with the full street reconstruction of Riverside Avenue. (See following page for photos.)

Riverside Stormwater Pilot Project 1 has two interconnected infiltration cells at the intersection of Riverside and Eighth Street. One cell is an infiltration basin "rain garden", and the other is an infiltration area beneath a small plaza of pervious pavers with trees.

Riverside Stormwater Pilot Project 2 has a block-long continuous infiltration trench under the sidewalk, using crushed rock for stormwater storage. To minimize clogging of the infiltration trench and to preserve void space in the crushed rock, stormwater from Riverside Avenue is first captured by sump catch basins that are periodically cleaned out with a vacuum truck. The water discharges from the sump catch basins into sand filters, that also require periodic maintenance. From there, the stormwater is routed into the trench to infiltrate into the soil. Proper maintenance of the pre-treatment devices is essential to maintain long-term void space in the trench.

Riverside Stormwater Pilot Project 3 has a block-long rock infiltration trench under a swale planted with turf grass and trees. To prevent clogging of the rock trench, stormwater from Riverside Avenue is first captured by sump catch basins that are periodically cleaned out with a vacuum truck. The water discharges from the sump catch basins into the swales. The stormwater filters through the swales and then infiltrates into the ground through the rock trench.

Above: RIVERSIDE AVENUE STORMWATER PILOT PROJECT 1: 8TH STREET INTERSECTION

Left: Pervious pavers over underground storage and infiltration area.

Right: adjacent infiltration basin (rain garden)

Above: RIVERSIDE AVENUE STORMWATER PILOT PROJECT 2: 20th to 21st Av S on U. of MN side

Left: During construction. Continuous infiltration trench with crushed rock for storage.

Right: After construction. Infiltration trench is under sidewalk. Sump catch basin and sand filters provide pre-treatment to maintain long-term void space in trench.

Above: RIVERSIDE AVENUE STORMWATER PILOT PROJECT 3: 21st to 22nd Av S on Augsburg College side

Left: During construction. Rock infiltration trench, swale and flow diversion structure.

Right: After construction. Rock trench is under swale. Sump catch basin and grassed boulevard provide pre-treatment to maintain long-term void space in trench.

Part C: Other

Central Corridor LRT Project

The Central Corridor Light Rail Transit line between downtown Minneapolis and downtown Saint Paul will begin service in 2014. As part of planning, engineering and design for the project, the City of Minneapolis worked closely with the Metropolitan Council project team, the University of Minnesota and Hennepin County on the best solutions for addressing water quality issues as part of the LRT project. A number of bio-filtration projects were completed, primarily on University of Minnesota properties. (The potential for volume reduction through infiltration was pursued at length, but was not allowed by the Minnesota Pollution Control Agency due to known or suspected groundwater contamination from historic land uses.) In addition, and with probably the greatest benefit to the Mississippi River, the LRT project was able to eliminate seven deteriorated, unsightly, and eroding outfalls to the river. This was possible due to re-routing of infrastructure segments owned separately by the City, the County and the University of Minnesota, redirection through an existing large outfall in good condition, addition of a large water quality structure for pollutant removal prior to discharge, and collaboration by the City and the University of Minnesota for ongoing operation and maintenance responsibilities.

XI. Public Education and Outreach

Program Objective

The objective of this stormwater management program is to educate the public regarding point and non-point source stormwater pollution. Targeted pollutants include:

- All pollutants

Program Overview

The City of Minneapolis and the Minneapolis Park & Recreation Board (MPRB) implement their Public Education Program to promote, publicize, and facilitate the proper management of stormwater discharges to the storm sewer system. The program's focus is to educate Minneapolis residents, business owners, employees and visitors about stormwater. The program's goals include showing how *everyone's* actions affect the quality of our lakes, wetlands, streams and the Mississippi River, and how to control pollutants at the sources to reduce the discharge of pollutants to our receiving waters. The desired result is to change behavior in ways that will improve water quality. Many of the components of the program can be found at the following City of Minneapolis Stormwater web site: http://www.ci.minneapolis.mn.us/publicworks/stormwater/. Some of the program activities are carried out directly by the co-permittees, the City and the MPRB. Other activities are coordinated with and carried out by watershed organizations, Hennepin County and other entities.

Previous Year Activities

Metro Blooms Rain Garden Workshop Program

A. Ongoing Program: In 2012, the City and others again sponsored a multi-part stormwater education workshop program conducted by Metro Blooms, a non-profit organization that grew out of the City's Committee on the Urban Environment (CUE). The goals of the workshop program are to reduce stormwater runoff, prevent stormwater pollution that damages our watersheds and improve the environmental and visual quality of the urban landscape. The two-part workshops serve to inform, coach and offer consultation to Minneapolis residents protecting the upper Mississippi River watershed by installing properly designed bio-infiltration areas (rain gardens), redirecting downspouts and using native plants. The ***Part A*** workshop focuses on watershed education, various types of rain garden design, and native plant choices. Attendees can then attend a ***Part B*** workshop, which offers practical, hands-on design sessions where participants bring pictures, measurements and sketches of their sites and receive plant and one-on-one design advice. One of the means of publicizing the workshops is a utility bill insert that reaches most of the approximately 100,000 households in Minneapolis. In 2011,7 ***Part A*** and 5 ***Part B*** workshops were held within Minneapolis.

B. In 2012, the City, the Minnehaha Creek Watershed District and neighborhood participants began a project to engage residents and business owners in an initiative to reduce pollutants in stormwater runoff entering Lake Nokomis, that has been determined by the State of Minnesota to be impaired due to excessive phosphorus. Building on the success of the Powderhorn Lake Rain Garden initiative, Metro Blooms will focus on minimizing the discharge of sediment-laden stormwater to streets and notably to alleys, by working with residents to install filter strips or rain gardens.

Minneapolis Park & Recreation Board Education Activities and Events

In 2012, Minneapolis Park & Recreation Board (MPRB) staff provided water quality education programs throughout the City. Environmental Operations naturalist staff participated in 61 Minneapolis community festivals and neighborhood events (see list below), as well as concerts at Lake Harriet, Father Hennepin Park and Minnehaha Park. Hands-on water quality educational displays focused on neighborhood watersheds and how human activities impact local water bodies.

List of neighborhoods with water-quality education program events. Several sites had multiple events.
Bottineau, Bryant Square, Corcoran, Creekview, Diamond Lake/Pearl, Dowling School, Elliot, Father Hennepin, Folwell, Kenny, King, Lake Harriet, Lake Hiawatha, Lake of the Isles, Linden Hills, Loring, Minnehaha, Lake Nokomis, Nicollet Island, Northeast, Painter, Pershing, Powderhorn, Sibley, Sumner Field, Van Cleve, Victory Memorial Parkway, and Waite Park.

CANINES for CLEAN WATER

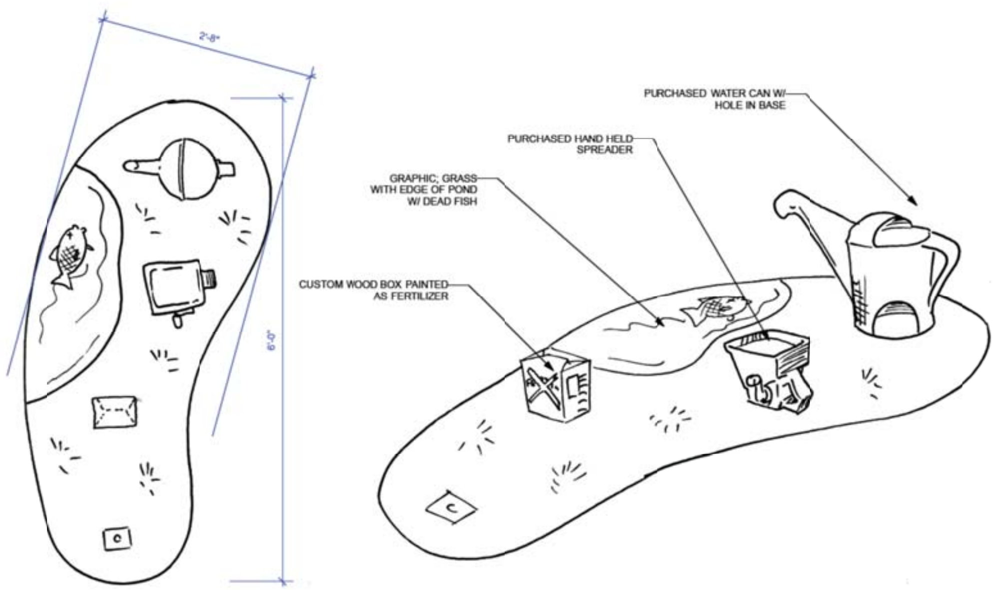
Canines for Clean Water

More than 100,000 dogs reside in the City of Minneapolis. They generate an estimated 41,000 pounds of solid waste each day. A water quality education program targeting dog owners was piloted in 2009 called Canines for Clean Water, and we continue to build on this work.

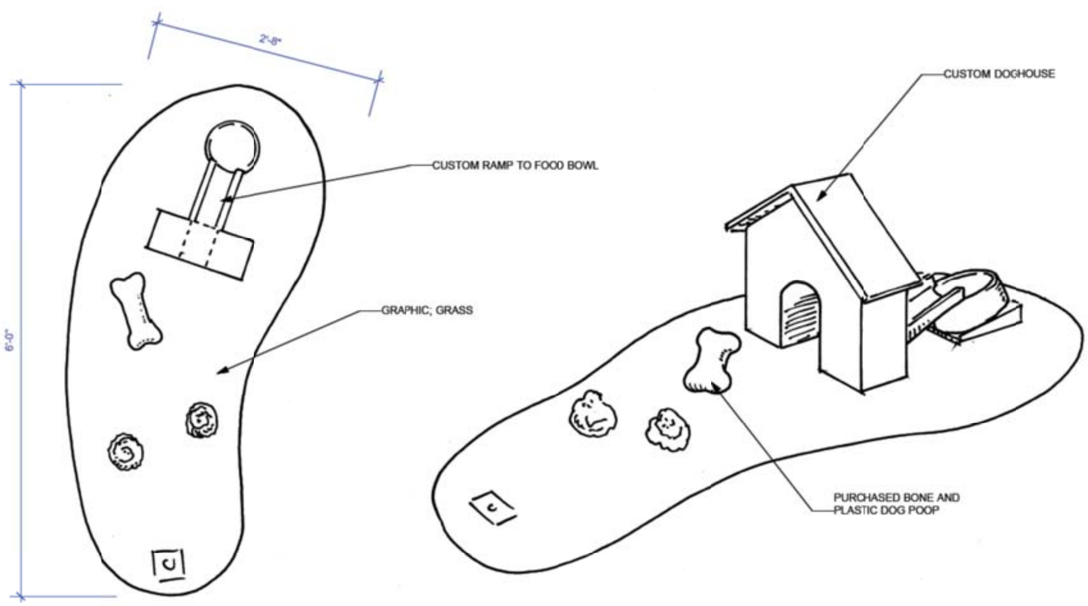
In 2012 the Canines for Clean Water campaign focused on Public Service Announcements (PSAs) shown at the Riverview Theatre. The PSAs focused on two main actions: getting pet owners to pick up after the dogs, and encouraging all property owners to stop or reduce their use of salt or chlorides. The PSAs had a simple message with images of the Mississippi River, Lake Nokomis, and Minnehaha Creek. The summer and fall message was to Protect the River, Protect the Lake, Protect the Creek: Grab a Bag and Scoop the Poop. For winter, the images featured winter scenes of the Mississippi River, Lake Nokomis, and dogs frolicking in the snow. The message here was to Protect the River, Protect the Lakes, Protect the Paws: Shovel, Don't Salt. The word *chloride* was not used in the PSA because more people understood ice melt as salt. However, detailed information about chlorides, their impacts, best practices for distribution was found on the Minneapolis Park & Recreation Board website www.minneapolisparks.org/dogs The same was true for information about the impact of dog poop on water quality.

Upgrade of Water Education Materials

Work began on creating a series of portable putt-putt golf holes that will feature water quality messages or best practices, such as reducing the use of fertilizer, redirecting the down spout, picking up after a pet, and keeping leaves and grass out of the street.



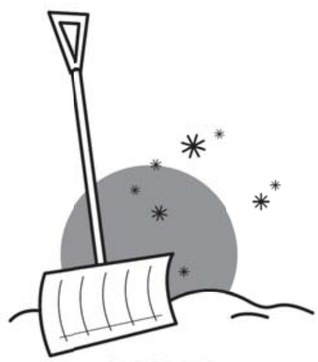
FERTILIZER GOLF COURSE
Scale: 1" = 1'-0"



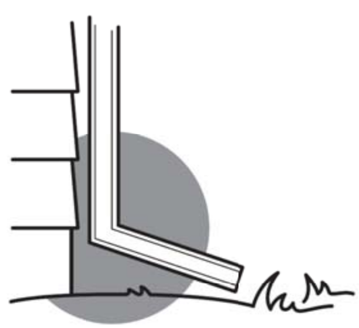
DOG POOP
Scale: 1" = 1'-0"

In addition, water quality education materials were upgraded to include simpler graphics that identify actions people can take to positively impact water quality. These images will be used on banners or flags, and in print materials. Several examples are below:

FIX THE LEAK



SHOVEL,
DON'T SALT



DIRECT
THE DOWNSPOUT

Mississippi River Green Team

The Mississippi River Green Team (Green Team) is made possible through a partnership between the Minneapolis Park and Recreation Board and the Mississippi Watershed Management Organization, with additional funding through STEP-UP.

The Green Team is a conservation-based teen crew engaged in daily hands-on environmental work throughout the summer. There are two crews of ten youth each that work in the natural areas of the Minneapolis park system, and mostly within the watershed of the Mississippi River. Typical work days include invasive species removal, weed wrenching, planting, watering, mulching, and citizen science work.

Blue Dasher. Photo by D. Thottungal

In 2012 the Green Team engaged in two citizen science programs focused on water quality. As part of the Minnesota Odonata Survey Project, each week the teens helped catch and identify dragonflies at North Mississippi Park. Dragonflies are an indicator species for assessing habitat and water quality in a wetlands, riparian forests, and lakeshore habitats. The Green Team claimed two Hennepin County records for catching a Wandering Glider (a migratory dragonfly) and a Russet-tipped clubtail. You can read more about the Odonata Project, and volunteer for it, here: http://www.mndragonfly.org

The Green Team also took to the streets to sample organic materials from selected curb lines in North Minneapolis neighborhoods. The team used protocols developed by the Fresh Water Society, the Mississippi Watershed Management Organization, and the U of MN's Water Resources Management Center. The samples are being analyzed so we can more accurately measure the nutrient content of leaves, grass clippings and other organic materials carried by storm drains into area lakes and rivers. High nutrient levels negatively impact water quality and contribute to stinky algae growth and fish kills.

Yellow-rumped warblers eat lots of insects.

As part of the Urban Migratory Bird Treaty, the Green Team installed several hundred native plants at North Mississippi Park and BF Nelson Park. Both parks serve as nurseries for many migratory and resident birds; and a baby songbird's diet is almost exclusively insects. Providing native plants that attract pollinators (insects) helps ensure that songbird hatches are successful.

Green Team installing native plants at Loring Park.

Other summer work sites included Heritage Park/Sumner Field, Audubon Park, Powderhorn Park, Loring Park and Mill Ruins Park. The Green Team also worked at stormwater holding ponds owned by the City of Minneapolis including the 37th/Columbus Pond and the two ponds located on Park Avenue. The crews mulched shrub beds and individual trees to create a buffer from mowers and weed whips, and to retain moisture. The teens picked up trash, and removed invasive species and volunteer trees that sprouted in the wrong places. Native flowering species were planted to support monarch butterflies and other pollinators.

The Green Team worked with the National Park Service to mentor children ages 6 to 11 from Webber Park. Over the course of the summer, teens showed the children how to use a plant key and how to install plants. The two groups planted native shrubs and perennials along Shingle Creek to reduce erosion, and planted trees along one of the entrances to North Mississippi Park. The children and teens tested the water quality of the creek, and used nets to catch and identify macro-invertebrates.

The Mississippi River Green Team was featured in a short video clip created by Minnesota 2020, which can be seen here: http://mn2020.org/issues-that-matter/economic-development/video-teenagers-on-the-mississippi And as part of an education day, the crew visited the Minnesota Television Network (MTN) studios to learn how to operate cameras and sound systems. They then created four ‘talkshow-style’ videos focused on the team, invasive species, dragonfly monitoring, and water quality. The videos can be seen here: http://mtn.org/youth/partners/2012/greenteam.html

Earth Day Watershed Clean-Up Event

Earth Day is a collaborative effort between the City of Minneapolis and the Minneapolis Park & Recreation Board. The 2012 Minneapolis Earth Day Clean Up was held on a very cold Saturday April 21, from 9:30 am to noon at 40 locations throughout Minneapolis. Approximately 1,500 volunteers participated in the 2012 event. Volunteers removed more than 10,000 pounds of trash during the two and a half hour event, compared to 30,000 lbs. in 2011.

This event involved cleaning major watersheds and waterbodies in the City of Minneapolis including: the Chain of Lakes, Lake Nokomis, Lake Hiawatha, Powderhorn Lake, Diamond Lake, Shingle Creek, Minnehaha Creek, Bassett Creek, and the Mississippi River. The goals of the Minneapolis Earth Day Clean Up include preventing trash and debris from entering local waterbodies, providing a rewarding volunteer experience, and sharing environmental information to Minneapolis residents and park users who participate in the event.

Storm Drain Inlet Stenciling

Stenciling of storm drain inlets, also called catch basins, educates the people painting stormwater messages on the storm drains, and also shares an environmentally friendly message for people passing by. A great team building exercise, it allows volunteer organizations to educate people about simple steps they can take to help improve the quality of Minnesota's lakes, rivers and streams.

In 2012, the City continued the program using four self-contained stenciling kits, each containing everything needed to stencil storm drains: stencils, map with catch basin locations, stenciling paint, traffic cones, facemasks, a broom for prepping the site, gloves and trash bags, safety vests and glasses, and door hangers to explain the stenciling to nearby residents. By providing educational stormwater door hangers to distribute to residents, dialogue is encouraged between the stencilers and people who live nearby.

The stencils vary by the type of receiving waterbody, thus referring to "Mississippi River", "lake", or "creek" as the case may be. The City has three versions of the "Mississippi River" stencils: in English, Spanish and Somali languages. The "lake" and "creek" stencils are only in English.

Safety is important, so we include traffic cones, and suggest to groups that they stencil on low volume streets to provide a safe environment. If children are part of the group, we request at least one adult be present to supervise. Trash bags and gloves are provided to pick up trash in the areas around the storm drain inlets, especially on the upstream side. Efforts of the organizations doing the stenciling are tracked, including the locations of the stenciled catch basins, the number of volunteers, the number of catch basins involved in the painting, and the number of door hangers distributed. In 2012, the City furnished the kits for 309 participants painting 897 catch basins and distributing 2,183 door hangers.

In October, Drake University chose this activity for Duke University Good Day activity:

Volunteers can visit the following web site:

http://www.minneapolismn.gov/publicworks/stormwater/stenciling

Web sites

STORM & SURFACE WATER MANAGEMENT – The City provides the following primary web

site for information about Storm and Surface Water Management:
http://www.minneapolismn.gov/publicworks/stormwater/index.htm

ENVIRONMENTAL MANAGEMENT – The City's Environmental Services section maintains the following web site for additional information about its initiatives and programs:

http://www.minneapolismn.gov/environment/index.htm

STORMWATER MANAGEMENT PROGRAM and ANNUAL MS4 REPORT – The City and MPRB work with local watershed organizations and other partners to fulfill the requirements of the City's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit. The Stormwater Management Program and current and prior annual reports can be reviewed at the following web site to provide education to interested parties:
http://www.minneapolismn.gov/publicworks/stormwater/stormwater_npdesannualreportdocuments

LOCAL SURFACE WATER MANAGEMENT PLAN – This document is a key component of the City's comprehensive plan, The Minneapolis Plan For Sustainable Growth:
http://www.minneapolismn.gov/publicworks/stormwater/stormwater_local-surface

REGULATORY CONTROLS OF SURFACE WATER MANAGEMENT – The City of Minneapolis provides information regarding pesticides, fertilizers, illicit discharges, improper disposal and other water
quality issues via the following City web site:
http://www.ci.minneapolis.mn.us/publicworks/stormwater/stormwater_regulatory-controls

FLOOD CONTROL INFORMATION – The City web site provides educational information regarding flood control. For information on flooding and safety precautions, the following web site can be viewed by interested parties:
http://www.minneapolismn.gov/publicworks/stormwater/flood/index.htm

COMBINED SEWER OVERFLOW (CSO) PROGRAM – The City maintains a web site to educate Minneapolis residents and property owners about the City's CSO program to eliminate Combined Sewer Overflows: http://www.minneapolismn.gov/publicworks/stormwater/cso/

STORMWATER UTILITY FEE and BEST MANAGEMENT PRACTICES (BMPs) – As a component of the City's Stormwater Utility Fee, the City web site encourages the implementation of various Best Management Practices (BMPs) such as rain gardens, rain swales and pervious pavement that would reduce the overall amount of impervious surface area throughout the City. These practices would also filter and cleanse stormwater. The City also maintains a link to the following MPCA web site where numerous BMP suggestions are available for implementation at various scales:

Minnesota Stormwater Manual:

http://www.pca.state.mn.us/index.php/water/water-types-and-programs/stormwater/stormwater-management/minnesota-s-stormwater-manual.html

PUBLIC EDUCATION & OUTREACH – Additional information about how the City and MPRB advance stormwater education activities can be found at the following web sites:

City of Minneapolis – http://www.minneapolismn.gov/publicworks/stormwater/stormwater_outreach

Minneapolis Park & Recreation Board – http://www.minneapolisparks.org/home.asp

Erosion and Sediment Control Education for Contractors and Developers

During Minneapolis Development Review and the Site Plan Review processes, and during on-site inspections, Public Works and Environmental Services personnel provide Erosion and Sediment Control (ESC) guidance to contractors and developers. This guidance includes information regarding the City's ordinances, and local, state and federal regulations.

XII. Public Participation Process

Program Objective

The objective of this stormwater management program is to maximize the effectiveness of the City's NPDES program by seeking input from the public. Targeted pollutants include:

- All pollutants

Program Overview

The City of Minneapolis and the MPRB are the joint holders of the NPDES MS4 Permit, and the Annual Report is a coordinated effort by various City departments and the MPRB. The Permit requires an opportunity for public input in the development of the priorities and programs necessary for compliance. The MPCA re-issued Municipal Separate Storm Sewer System (MS4) NPDES Permit No. MN0061018 to the City of Minneapolis and the MPRB as co-permittees in January 2011. The Permit requires the implementation of approved stormwater management activities, referred to as Best Management Practices (BMPs). A new Stormwater Management Program (SWMP), documenting the BMPs the City and the MPRB have or will put in place for the re-issued 2011 permit, was submitted to the MPCA for public comment and approval in September, 2011 and revised and finalized in May 2013.

The Annual Report is due June 30 or each year, for the prior year's activities. Each year, the City holds a public hearing at a meeting of the Transportation & Public Works Committee of the City Council. The hearing provides an opportunity for public testimony regarding the Program and Annual Report prior to report submittal to the Minnesota Pollution Control Agency. The hearing is officially noticed in the Finance and Commerce publication, and also publicized through public service announcements on the City cable television channel. This year's public hearing date was June 18, 2013 at 9:30 AM in Council Chambers, Room 317 City Hall, 350 S 5th Street, Minneapolis, MN.

A notice of the availability of the Stormwater Management Program was sent to all 81 Minneapolis neighborhood organizations, to the governmental entities that have jurisdiction over activities relating to stormwater management, and to other interested parties announcing the web site link, and informing that written comments were being accepted until Noon on June 22, 2012.

The notice explained that emails or faxes were the preferred methods for submitting written comments, rather than conventional mail due to the additional time involved. The contact information for written comments was listed as:

City of Minneapolis, Department of Public Works
Surface Water & Sewers Division c/o Lois Eberhart
300 City of Lakes Building, 309 2nd Avenue S, Room 300
Minneapolis MN 55401-2268
Phone: 612-673-3260 Fax: 612-673-2048
E-mail: lois.eberhart@minneapolismn.gov

All testimony presented at the public hearing, and all written comments received, are recorded and given due consideration. A response to those public comments is then included with the Annual Report as Appendix C. A copy of the City Council resolution adopting the Stormwater Management Program and Annual Report Activities is included each year with the submission to the Minnesota Pollution Control Agency. The Stormwater Management Program and the Annual Reports are available for viewing or downloading at http://www.minneapolismn.gov/publicworks/stormwater/stormwater_npdesannualreportdocuments.

Performance Measures

- Number of interested parties that were directly notified of public hearing and Stormwater Management Program availability: 97 (includes 81 neighborhood organizations)

XIII. Coordination with Other Governmental Entities

Program Objective

The objective of this Stormwater Management Program is to maximize stormwater management efforts through coordination and partnerships with other governmental entities.

Program Overview

Coordination and partnerships of the City and the MPRB with other governmental entities include the four watershed organizations in Minneapolis: Bassett Creek Water Management Commission, Mississippi Watershed Management Organization, Minnehaha Creek Watershed District, and Shingle Creek Watershed Management Commission. Coordination activities and partnerships with other governmental entities also include MnDOT, MPCA, neighboring cities, the Metropolitan Council, the University of Minnesota and various other entities.

The coordination and partnership activities can include the joint review of projects, joint studies, joint water quality projects, stormwater monitoring, water quality education, and investigation or enforcement activities.

Coordination with the Bassett Creek Water Management Commission (BCWMC)

The BCWMC approved its Second Generation Watershed Management Plan in September 2004, and has commenced its Third Generation planning efforts. Under the current plan, required are review of stormwater management, erosion control practices and floodplain management for redevelopment projects that are greater than 5 acres. Minneapolis provides yearly financial contributions to the BCWMC annual operations budget. The City and the MPRB are also stakeholders with other BCWMC joint power cities in development of several Total Maximum Daily Load (TMDL) studies and implementation plans.

Coordination with the Mississippi Watershed Management Organization (MWMO)

The MWMO adopted its Third Generation Watershed Management Plan in 2011. The City and MPRB participated in its planning committees. The MWMO delegates stormwater management requirements for new developments to its member cities and does not provide separate project review and approval. The MWMO receives revenue through direct taxation against properties within its jurisdiction.

Coordination with the Minnehaha Creek Watershed District (MCWD)

The MCWD adopted its Third Generation Plan in 2006. The District administers state mandated wetland protection rules and Department of Natural Resources regulations, as well as District rules relating to erosion control (land disturbance of 5,000 square feet or greater), floodplain alteration, wetland protection, dredging, shoreline & stream bank improvements, stream and lake crossings and stormwater management. The MCWD receives revenue through direct taxation against properties within its jurisdiction. The City of Minneapolis and the MPRB are stakeholders in development of TMDL studies and implementation plans, in collaboration with the MCWD and other stakeholders.

Coordination with the Shingle Creek Watershed Management Commission (SCWMC)

The SCWMC adopted its Second Generation Watershed Management Plan in August 2004, and is carrying out its Third Generation planning efforts. SCWMC reviews plans of any land development adjacent to or within a lake, wetland, or a natural waterway, within the 100-year floodplain, 15 acres or larger (for single-family detached housing use) and 5 acres or larger for all other land uses. SCWMC requires these developments to provide erosion protection during construction, in addition to on-site detention and treatment. Developments also have the option of demonstrating that adequate detention and treatment is available via a regional facility. Minneapolis provides yearly financial contributions to the SCWMC annual operations budget. The City of Minneapolis and the MPRB are stakeholders with other SCWMC joint power cities in development of TMDL studies and implementation plans.

Previous Year Activities and Ongoing Coordination Efforts

- The Minneapolis Park and Recreation Board (MPRB) and the City of Minneapolis coordinate stormwater management efforts, and coordinate with the watershed management organizations, the watershed district, and other governmental agencies on a number of water quality projects. Minneapolis Public Works maintains communications with all watershed management organizations and the watershed district within the City boundaries. Interactions take several forms to facilitate communication and provide support:
    - Attend selected local board and special issues meetings
    - Attend selected education and public outreach committee meetings
    - Take part in Technical Advisory Committee (TAC) meetings
    - Inform the organizations of upcoming City capital projects in an effort to identify projects that may benefit from partnerships

- Provide developers (who submit projects for site plan review) with information and contacts to meet watershed requirements
- Share information and data regarding storm drainage system infrastructure, watershed characteristics, flooding problems, modeling data, etc.
- A special 2012-2013 project with Bassett Creek Watershed Management Commission is shoreline restoration along the creek. The project was bonded by the Commission, and is being implemented by the City and the MPRB.
- A special multi-year project with the Minnehaha Creek Watershed District is determining capital projects that will be jointly funded that will address localized flooding challenges while also water quality issues.
- A special 2011-2013 project with the Minnehaha Creek Watershed District is Weather – Extreme Trends: A Stormwater Adaptation Study. Along with a team of academic principal investigators, the City and the District are aiming to quantify the impacts of projected precipitation trends and land cover changes on stormwater infrastructure in the Minnehaha Creek watershed, and explore community adaptation strategies.

- The City's Environmental Services section coordinates with the MPCA regarding investigations and enforcement for incidents of illegal dumping or illicit discharges to the storm drain system. Erosion and sediment control permit inspections are coordinated with the MCWD and the BCWMC.
- The MPRB coordinates with the watershed organizations and the Metropolitan Council on watershed outlet monitoring.
- The MPRB and the City coordinate and partner with the watershed organizations on capital projects and water quality programs.
- The MPRB works with the DNR and surrounding suburbs on various capital projects and programs.
- Public Works and MPRB staff coordinate with the MPCA, the watershed organizations and other stakeholders for Total Maximum Daily Load (TMDL) studies and implementation plans.
- Public Works staff participates in the MPCA's Minimal Impact Development Standards (MIDS) Committee and several of its sub-committees.

Finally, other sections of this Annual Report provide additional information about other projects or issues on which the permittees have cooperated with other governmental entities.

XIV. Stormwater Monitoring Results and Data Analysis

The purposes of monitoring and analysis under the MS4 permit are to understand and improve stormwater management program effectiveness, characterize pollutant event mean concentrations, estimate effectiveness of devices and practices, and calibrate and verify stormwater models.

Stormwater Runoff Monitoring Results[6]

In 2012, stormwater runoff monitoring was carried out at four representative management sites with Multi-Family Residential, Recreational/Parkland, Commercial/High-Rise, and Commercial/Industrial land uses. A complete description of the Stormwater Runoff monitoring program, including site locations, is located in Appendix A4 of this annual report.

The required number of samples was met or exceeded for the year. In 2012, storm event samples were collected from May through the beginning of November, and snowmelt grab samples were collected in January and March. Bacteria grab samples were taken throughout the season.

Best Management Practices Monitoring Results[7]

Best management practices (BMPs) include procedures and structures designed to help reduce pollutants in stormwater runoff. The City and the MPRB carry out BMP monitoring as part of the effort to determine and improve system/BMP effectiveness through adaptive management.

In 2012 baseline monitoring was in a watershed area on the southeast side of Lake Nokomis, a lake that is impaired for phosphorus. The purpose of the initial year of sample collection was to measure the baseline data before the BMP street sweeping begins in the target watershed. A complete description of the monitoring is located in Appendix A5 of this annual report.

Other Monitoring[8]

Minnehaha Creek at Xerxes Avenue South was again monitored in 2012. Xerxes Avenue South crosses Minnehaha Creek at the border of Minneapolis and Edina. Monitoring at the station is used to determine what is coming into the City from the upstream areas and help determine the impact of

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[6]For tables referenced in this section, see Appendix A4 of this report. This Section XIV – Stormwater Monitoring Results and Data Analysis - as well as Appendix A4, are adapted from the 2012 Water Resources Report, which is produced by the Minneapolis Park & Recreation Board. This and previous years' annual reports can be found at this Minneapolis Park & Recreation website.

[7] For tables referenced in this section, see Appendix A5. This section, along with Appendix A5, are adapted from the 2012 Water Resources Report, which is produced by the Minneapolis Park & Recreation Board. These annual reports can be found at this Minneapolis Park & Recreation website.

[8] For tables referenced in this section, see Appendix A6. This section, along with Appendix A6, are adapted from the 2012 Water Resources Report, which is produced by the Minneapolis Park & Recreation Board. These annual reports can be found at this Minneapolis Park & Recreation website.

Minneapolis's stormwater on Minnehaha Creek. A complete description of the station monitoring is found in Appendix A6 of this annual report.

Minneapolis Lake Trends

In 2012, MPRB scientists monitored 14 of the city's most heavily used lakes. The data collected were used to calculate a Trophic State Index (TSI) score for each of the lakes. Changes in lake water quality can be tracked by looking for trends in TSI scores over time. These values are especially important for monitoring long-term trends (5-10 years). Historical trends in TSI scores are used by lake managers to assess improvement or degradation in water quality.

All the lakes in Minneapolis fall into either the mesotrophic or eutrophic category. Calhoun, Cedar, Harriet, and Wirth Lakes are mesotrophic with moderately clear water and some algae. Brownie, Isles, Hiawatha, Nokomis, Spring, Loring and Powderhorn Lakes are eutrophic with higher amounts of algae. Webber Pond fluctuates between these two categories. Trends in lake water quality can be seen by using the annual average TSI score over the last 20 years.

Lakes with increasing water quality indicators	Lakes with stable trend	Lakes with decreasing water quality indicators
➢ Lake Calhoun	➢ Brownie Lake	➢ Diamond Lake
➢ Cedar Lake	➢ Lake of the Isles	➢ Loring Pond
➢ Lake Harriet	➢ Lake Nokomis	➢ Spring Lake
➢ Powderhorn Lake	➢ Webber Pond	
➢ Wirth Lake	➢ Lake Hiawatha	

Event Mean Concentration and Annual Pollutant Loadings

- The following formula was used to calculate the total annual pollutant load:

L = [(**P**) (**Pj**) (**Rv**) (**C**/1000) (**A***4046.9)], where:

L = seasonal pollutant load, kilograms/season

P = seasonal precipitation, inches/season (meters/season)

Pj = correction factor for storms which do not produce runoff = 0.85

Rv = runoff coefficient

C = median event mean concentration of pollutants, mg/L

A = area, in acres

Conversion factors were used to convert acres to square meters, and to adjust the concentration data units. Conversion factors are as follows:

4,046.9 for acres → square meters

1,000 for liters → cubic meters

Stormwater Monitoring Results and Data Analysis

The Flow Weighted Mean Concentration (FWMC), expressed as a mean of all sites, was used for the annual load estimation calculations. The FWMC most accurately reflects stormwater loading on an annual basis. The seasonal loads were calculated from the pooled data using the median event mean concentration, as there were too few data points from each watershed. The median of the data set is a better representation of the runoff data than the mean values (Bannerman, et al, 1992). The annual load, and a summation of the seasonal loads, will not be equal due to this difference in calculation methods.

- Seasonal loads were calculated on the following basis:

Season	Inclusive dates	Precipitation, National Weather Service
Winter/snowmelt	01/01/12 – 03/31/12	**3.47 inches (0.088 meters)**
Spring	04/01/12 – 05/31/12	**12.38 inches (0.314 meters)**
Summer	06/01/12 – 08/31/12	**9.87 inches (0.251 meters)**
Fall	09/01/12 – 12/31/12	**3.87 inches (0.098 meters)**
Total	01/01/12 – 12/31/12	**29.59 inches (0.752 meters)**

[end of document]

Appendix A

STORM DRAINAGE AREAS BY RECEIVING WATER BODY

Surface Water	Outfall	Total (acres)	Res. %	Comm. %	Ind. %	Public %	Open %	Rail %	Runoff Coeff.	Pop.
Mississippi River (Minneapolis)	10-xxx	18,077	0.53	0.16	0.16	0.04	0.07	0.04	0.46	263,400
Mississippi River (Columbia Heights)	10-100	348	0.48	0.11	0.33	0.00	0.08	0.00	0.37	2,765
Mississippi River (UofM)	15-xxx	100	0.00	0.00	0.00	1.00	0.00	0.00	0.55	0
Shingle Creek	20-xxx	1,365	0.62	0.17	0.06	0.03	0.04	0.07	0.44	11,493
Ryan Lake (Minneapolis)	21-xxx	49	1.00	0.00	0.00	0.00	0.05	0.00	0.45	388
Bassett Creek	40-xxx	2,293	0.58	0.12	0.13	0.03	0.08	0.05	0.44	26,756
New Bassett Creek Tunnel	41-xxx	219	0.22	0.26	0.26	0.04	0.10	0.11	0.45	669
Brownie Lake (Minneapolis)	51-xxx	34	0.99	0.00	0.01	0.00	0.00	0.00	0.45	193
Cedar Lake (Minneapolis)	52-xxx	224	0.79	0.01	0.00	0.00	0.17	0.03	0.38	1,674
Lake of the Isles	53-xxx	760	0.76	0.07	0.02	0.01	0.12	0.01	0.42	13,644
Lake Calhoun (Minneapolis)	54-xxx	1,249	0.69	0.11	0.03	0.10	0.07	0.00	0.46	13,640
Cemetary Lake	55-xxx	205	0.00	0.99	0.00	0.00	0.01	0.00	0.60	41
Sanctuary Pond	56-xxx	68	0.00	1.00	0.00	0.00	0.00	0.00	0.60	0
Lake Harriet	57-xxx	863	0.83	0.09	0.01	0.04	0.02	0.00	0.46	12,249
Hart Lake (Minneapolis)	61-xxx	3	0.32	0.68	0.00	0.00	0.00	0.00	0.55	0
Silver Lake (Minneapolis)	62-xxx	28	0.94	0.03	0.00	0.00	0.03	0.00	0.44	245
Crystal Lake (Minneapolis)	63-xxx	469	0.92	0.04	0.00	0.02	0.03	0.00	0.45	5,985
Legion Lake (Minneapolis)	64-xxx	49	1.00	0.00	0.00	0.00	0.00	0.00	0.45	332
Legion Lake (Richfield)	64-xxx	1,700	0.96	0.00	0.01	0.00	0.03	0.00	0.30	9,781
Richfield Lake (Minneapolis)	65-xxx	715	0.88	0.06	0.02	0.00	0.04	0.00	0.32	4,388
Richfield Lake (Richfield)	65-xxx	58	0.58	0.37	0.05	0.00	0.01	0.00	0.51	442
Wood Lake (Richfield)	66-xxx	627	0.75	0.05	0.02	0.00	0.18	0.00	0.29	7,316
Minnehaha Creek	70-xxx	3,213	0.85	0.07	0.01	0.04	0.03	0.00	0.44	38,399
Diamond Lake	71-xxx	685	0.72	0.11	0.09	0.03	0.05	0.00	0.47	6,456
Lake Nokomis	72-xxx	620	0.78	0.03	0.00	0.03	0.16	0.00	0.40	7,120
Taft Lake	73-xxx	100	0.76	0.00	0.00	0.00	0.24	0.00	0.37	675
Mother Lake (Minneapolis)	74-xxx	49	0.83	0.19	0.00	0.00	0.00	0.00	0.48	111
Mother Lake (Richfield)	74-xxx	245	0.71	0.09	0.00	0.00	0.20	0.00	0.30	2,025
Unnamed Wetland W of Mother Lake	75-xxx	41	0.91	0.00	0.00	0.00	0.00	0.09	0.41	344
Lake Hiawatha	76-xxx	1,008	0.87	0.07	0.02	0.03	0.02	0.00	0.46	14,707
Birch Pond	81-xxx	31	0.00	0.00	0.00	0.00	1.00	0.00	0.10	0
Powderhorn Lake	82-xxx	286	0.88	0.05	0.02	0.04	0.01	0.00	0.46	5,621
Grass Lake	83-xxx	386	0.90	0.04	0.00	0.05	0.02	0.00	0.46	4,128
Unnamed Wetland on Hwy 62	84-xxx	17	0.86	0.00	0.14	0.00	0.00	0.00	0.47	0
Unnamed Wetland on Ewing Ave S	85-xxx	22	0.86	0.00	0.14	0.00	0.00	0.00	0.47	0
GRAND TOTAL		**36,205**	**0.58**	**0.13**	**0.10**	**0.04**	**0.06**	**0.03**	**0.42**	**454,987**

Appendix A1 - Storm Drainage Areas by Receiving Water Body
Source: Minneapolis Public Works - Surface Water & Sewers

Appendix A-3: Sources of Pollutants in Stormwater Runoff[1]

	Coal Plants / Incinerators	Gasoline / Diesel Fuel Combustion	Metal Corrosion / Metal Protection	Road Salts	Deterioration of Brake Pads / Tires	Asphalt	Fertilizers / Pesticides / Soil Treatments	Wood Preservatives	Paints and Stains	Plastics	Soil Erosion	Sanitary Waste	Manufacturing	Animal Waste	Atmospheric Deposition	Grass Clippings, Leaves and other Plant Materials	Coal Tar Based Sealants for Parking Lots, Driveways
METALS																	
Copper [a, b]	X		X		X		X	X	X	X		X	X	X			
Lead [a]		X	X	X	X		X		X	X			X		X		
Zinc [a]			X	X	X		X		X	X			X	X			
OTHER POLLUTANTS																	
Arsenic [b]	X						X	X			X		X	X	X		
Bacteria: E. Coli [a]											X	X		X			
Cyanide		X	X	X					X	X		X					
Chloride, Total [a]	X	X		X						X		X		X			
Oil and Grease [a]		X			X	X							X				
Polycyclic Aromatic Hydrocarbons (PAH) [b]	X	X				X	X					X	X				X
Sulfate [a]	X	X				X			X	X		X		X	X		X
Volatile Organic Compounds (VOC)	X	X		X		X	X		X	X		X	X	X	X		
SEDIMENT AND OTHER SOLIDS																	
Total Dissolved Solids (TDS) [a]	X			X		X	X					X		X	X	X	
Total Suspended Solids (TSS) [a]	X		X	X	X	X	X			X	X	X	X	X	X	X	
NUTRIENTS																	
Nitrate / Nitrite [a]		X					X				X	X	X	X	X	X	
Nitrogen, Ammonia Un-Ionized [a]	X	X	X				X					X		X	X	X	
Nitrogen, Total Kjeldahl (TKN) [a]							X				X	X		X	X	X	
Phosphorus, Total [a]	X	X			X	X	X				X	X	X	X	X	X	
Phosphorus, Total Dissolved [a]	X	X					X				X	X		X	X	X	
LABORATORY ANALYSIS PARAMETERS																	
Biochemical Oxygen Demand (BOD_5) [a]							X				X	X		X	X	X	
pH [a]	X		X	X													

[a] MS4 Monitored Parameter
[b] Stormwater Pond Dredging Parameter

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[1] Sources:

Massachusetts Department of Environmental Protection, Source Water Assessment Program, DRAFT Land Use/Associated Contaminants Matrix, 1999

Mississippi Watershed Management Organization, 2006 Annual Report, Appendix C, Table 4

MPCA, Managing Dredged Materials in the State of Minnesota, Figure 2, 2009

Texas Commission on Environmental Quality (TCEQ) Source Water Assessment and Protection (SWAP) Program's List of Potential Source of Contamination Types and Subtypes Detailed Listing, Descriptions, and Applied Contaminants, 2009

24. NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) MONITORING

BACKGROUND

The Minneapolis Park and Recreation Board (MPRB) and Minneapolis Public Works (MPW) Department are co-signatories on the National Pollutant Discharge Elimination System (NPDES) stormwater permit. The MPRB has historically performed stormwater monitoring. The purpose of the stormwater monitoring is to characterize the impacts of stormwater discharges to receiving waters. In 2012 four different Minneapolis land use sites (residential, commercial/industrial, mixed use, and parkland) were monitored for stormwater runoff quantity and quality. The watersheds represent the major land uses in Minneapolis. Representative sampling is mathematically extrapolated in order to calculate contaminant loading on a citywide scale.

At the beginning of the NPDES permit (2001-2004) the MPRB and MPW partnered with the City of St. Paul to fulfill the NPDES monitoring requirements. Five (Minneapolis and St. Paul) sites were monitored between 2001–2004. In 2005 four new sites (in Minneapolis) were selected for monitoring. In 2006, new sites were chosen in Minneapolis to comply with the NPDES permit and to assist MPW with their modeling and load allocation efforts.

METHODS

The summary below includes descriptions of equipment installation at each site, parameters monitored, field quality assurance sampling, data handling, validation, and reporting.

Site Installation

The equipment installed at each site included an ISCO 3700 sampler, a low profile area/velocity pressure transducer, and ISCO 2150 datalogger. The dataloggers were flow-paced and adjusted throughout the year to collect samples over the entire hydrograph of a storm event.

Equipment installation began when freezing spring temperatures were no longer a concern in order to prevent area velocity transducer damage. See **Table 24-1** for site characteristics. See **Figure 24-1** for a map of site locations. Site 6 (22nd/Aldrich) and Site 7 (14th/Park) were installed on 4/25/12. 8a (Pershing Park) was installed on 4/23/12 and Site 9 (61st/Lyndale) was installed on 4/24/12.

Monitored Parameters

In 2012 flow-paced storm event samples were collected from May through the beginning of November. Two snowmelt grab samples were collected in 2012 from each site. Snowmelt was collected at Sites 6, 7, and 9 on 1/26/12 and 3/6/12 and at site 8a on 3/6/12-3/7/12. The new NPDES permit target frequency for storm event sample collection was more than once a month, and a total of 15 samples per site per year. If a sample was missed one month due to lack of precipitation events, then two or more were taken the next month. The total volume sampled for each site and total recorded volumes in 2012 are given in **Table 24-2** along with the seasonal aggregate percentage sampled. Detailed information on sampling events is shown in **Table 24-3**.

Table 24-4 shows the parameters tested as part of the NPDES permit for each sample collected. **Table 24-5** gives the approved methods used for analysis, reporting limit, and holding time for each parameter as reported by the contract laboratory Instrumental Research, Inc. (IRI). Legend Technical Services Laboratory analyzed all metals samples.

Grab samples were taken quarterly during the season from all sites except at Site 8a which was inaccessible for grab sampling following snowmelt. *E. coli* and pH samples were collected from grab samples (spring, summer, and fall). All required sampling was successfully accomplished and checked in 2012. The pH was measured in the field using an Oakton Waterproof pHTestr 2™ or at the laboratory IRI. The pH meter was calibrated with 2-point calibration prior to each sampling trip.

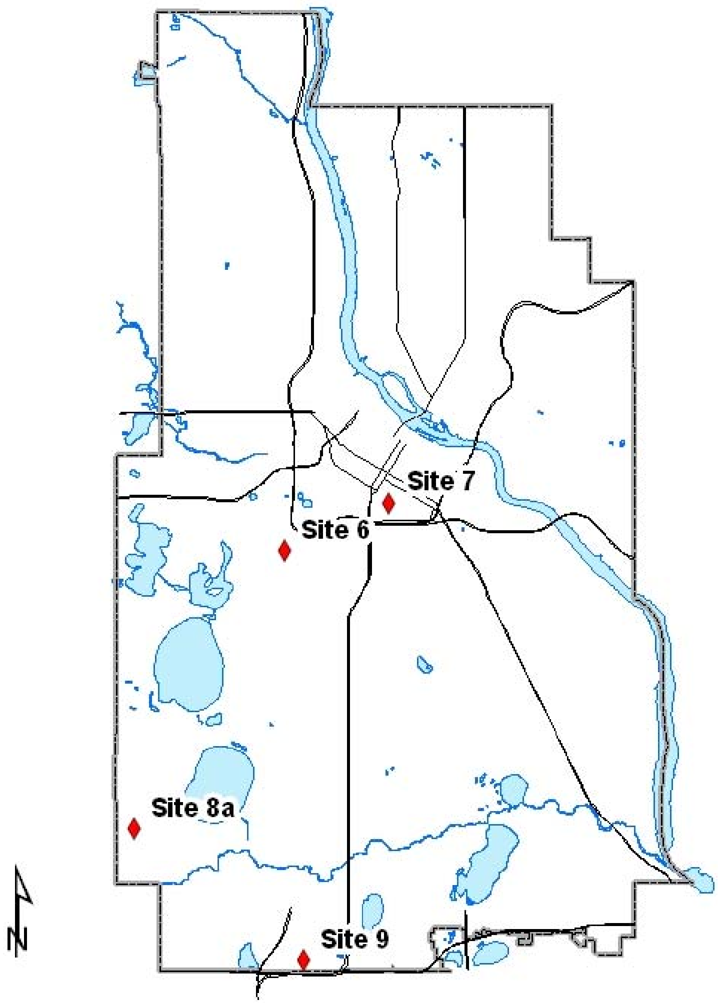


Figure 24-1. Map of the 2012 NPDES sites located in Minneapolis.

Table 24-1. 2012 NPDES stormwater monitoring sites for Minneapolis.

Site ID	Site 6	Site 7	Site 8a	Site 9
Location	22nd St & Aldrich Ave S	E 14th St & Park Ave S	Pershing Field east of 49th St & Chowen Ave	335 ft east of 61st St & Harriet Ave S
Land Use	Multi–Family Residential	Commercial/ High Rise Residential	Recreational/Parkland	Commercial/Industrial
Area (acres)	8.9	13.1	2.5	34.9
Pipe Diameter (inches)	18	42	12	36
Outfall ID#	10 – 430J	10 – 430D	57 – 100A/B	71 – 070

Table 24-2. NPDES site volume totals for the sampling period 1/1/12 – 11/6/12.

	Site 6	Site 7	Site 8a	Site 9
Total volume of sampled events (cf)	58,344	322,373	29,899	527,964
Total volume recorded (with P-8 and Flowlink) for 2012 (cf)	160,750	926,452	72,150	1,607,912
% sampled ANNUAL	36%	35%	41%	33%
% sampled SPRING (April- June)	22%	21%	23%	17%
% sampled SUMMER (July- September)	9%	12%	10%	13%
% sampled FALL (October- November)	1%	1%	5%	0.5%

Table 24-3. 2012 precipitation event data and samples collected for NDPES sites. A precipitation event is defined as being greater than 0.10 inches and separated by 8 hours. The rain gage is located at 3800 Bryant Ave. S., Minneapolis, MN.

										2012 NPDES Events Collected			
Event	**Start Date/Time**		**End Date/Time**		**Precip (inches)**	**Duration (hours)**	**Intensity (in/hr)**	**Time since last Precip. (hours)**	**Sample Type**	**Site 6 22nd/Aldrich**	**Site 7 14th/Park**	**Site 8a Pershing**	**Site 9 61st/Lyndale**
+1	1/26/2012	13:30	n/a		n/a	n/a	n/a		grab	X(w/Ecoli)	X(w/Ecoli)		X(w/Ecoli)
+2	3/6/2012	11:45	n/a		n/a	n/a	n/a		grab	X(w/Ecoli)	X(w/Ecoli)	X(w/Ecoli)	X(w/Ecoli)
+3	3/7/2012	13:10	n/a		n/a	n/a	n/a		grab			X(w/Ecoli)	
4	4/28/2012	9:45	4/28/2012	13:45	0.24	4.00	0.06	78.75	composite			X(lmtd)	
5	5/1/2012	21:15	5/2/2012	1:00	0.83	3.75	0.22	79.50	composite	X	X	X	
6	5/3/2012	3:45	5/3/2012	10:30	0.58	6.75	0.086	26.75	composite	X(lmtd)	X(lmtd)	X(lmtd)	X(lmtd)
7	5/19/2012	18:30	5/19/2012	22:00	0.10	3.50	0.029	189.50	composite	X(lmtd)			X
8	5/23/2012	20:30	5/24/2012	15:45	3.18	19.25	0.165	94.50	composite	X	X	X	X
9	6/14/2012	9:45	6/14/2012	16:45	0.74	7.00	0.106	81.75	composite	X(w/Ecoli)	X(w/Ecoli)	X	X(Ecoli only)
10	6/16/2012	8:45	6/16/2012	10:00	0.10	1.25	0.080	128.75	composite				X(lmtd)
11	6/17/2012	14:00	6/18/2012	1:15	1.17	11.25	0.104	28.00	composite				X
12	6/20/2012	13:45	6/20/2012	21:15	0.15	7.50	0.020	32.00	composite	X	X(lmtd)		X(lmtd)
13	7/6/2012	18:30	7/6/2012	23:45	0.33	5.25	0.063	85.50	composite	X(lmtd)	X(lmtd)	X(lmtd)	X(lmtd)
14	7/24/2012*	2:00	7/24/2012	10:00	1.69	8.00	0.211	64.75	composite	X	X	X	X
15	7/28/2012	21:30	7/29/2012	9:15	0.45	11.75	0.038	180.25	composite	X(lmtd)	X(lmtd)	X(lmtd)	X(lmtd)
16	8/9/2012	12:15	8/9/2012	12:30	0.16	0.25	0.640	131.00	composite	X(lmtd)	X		
17	8/15/2012	7:15	8/15/2012	8:30	0.58	1.25	0.464	138.75	composite	X(w/Ecoli)	X(w/Ecoli)	X	X
18	9/17/2012	3:15	9/17/2012	5:45	0.22	2.50	0.088	106.75	composite	X	X		X
19	10/19/2012	7:00	10/19/2012	12:45	0.10	5.75	0.017	769.25	composite	X(lmtd)			
20	10/23/2012	3:45	10/23/2012	7:00	0.26	3.25	0.080	87.00	composite	X(lmtd)	X(lmtd)		X
21	10/24/2012	14:45	10/25/2012	12:15	0.89	21.50	0.041	31.75	composite	X(w/Ecoli)	X(w/Ecoli)	X	X(Ecoli only)
22	11/11/2012	0:30	11/11/2012	8:30	0.38	8.00	0.048	112.50	composite			X(lmtd)	
			Totals		**12.15**					**17**	**15**	**13**	**16**

+ snowmelt event
n/a = not applicable
* NWS data
X = event sampled with full parameters
X(lmtd) = event sampled with limited parameters generally due to holding times e.g.BOD, TDP, etc.
X(w/Ecoli) = event sampled with fecal coliform
X(Ecoli only) = only E. coli sampled

Table 24-4. The list of monitored chemical parameters for the NPDES permit. BOD is biochemical oxygen demand.

Parameter	Abbreviation	Units	Sample Type
BOD –carbonaceous, 5 Day	cBOD	mg/L	Composite
Chloride, Total	Cl	mg/L	Composite
Specific Conductivity	Sp. Cond	µmhos/cm	Composite
E. coli (*Escherichia Coliform*)	E. coli	MPN/100mL	Grab (4X year)
Hardness	Hard	mg/L	Composite
Copper, Total	Cu	µg/L	Composite
Lead, Total	Pb	µg/L	Composite
Zinc, Total	Zn	µg/L	Composite
Nitrite+Nitrate, Total as N	NO_2NO_3	mg/L	Composite
Ammonia, Un-ionized as N	NH_3	mg/L	Composite
Kjeldahl Nitrogen, Total	TKN	mg/L	Composite
pH	pH	standard unit	Grab (4X year)
Phosphorus, Ortho-P	Ortho-P	mg/L	Composite
Phosphorus, Total Dissolved	TDP	mg/L	Composite
Phosphorus, Total	TP	mg/L	Composite
Solids, Total Dissolved	TDS	mg/L	Composite
Solids, Total Suspended	TSS	mg/L	Composite
Solids, Volatile Suspended	VSS	mg/L	Composite
Sulfate	SO_4	mg/L	Composite

Table 24-5. Analysis method, reporting limit, and holding times for parameters used by Instrumental Research, Inc.

Parameter	Method	Reporting Limit	Holding Times
cBOD, carbonaceous, 5 Day (20°C)	SM 5210 B	1.0 mg/L	24 hours
Chloride, Total	SM 4500-Cl^- B	2.0 mg/L	28 days
Specific Conductivity	SM 2510 B	10 µmhos/cm	28 days
E. coli (*Escherichia Coliform*)	SM 9223B	1 MPN per 100mL	< 24hrs
Hardness	SM 2340 C	2.0 mg/L	6 months
Copper, Total	EPA 200.9	1.4 µg/L	6 months
Lead, Total	SM 3500-Pb B	3 µg/L	6 months
Zinc, Total	SM 3500-Zn B	2 µg/L	6 months
Nitrite+Nitrate, Total as N	SM 4500-NO_3 E	0.030 mg/L	28 days
Ammonia, Un-ionized as N	SM 4500-NH_3 F	0.500 mg/L	7 days
Kjeldahl Nitrogen, Total	SM 4500-Norg B	0.500 mg/L	7 days
Phosphorus, Ortho-P	SM 4500-P A, B, G	0.010 mg/L	48 hours
Phosphorus, Total Dissolved	SM 4500-P A, B, G	0.010 mg/L	48 hours
Phosphorus, Total	SM 4500-P A, B, E	0.010 mg/L	48 hours
Solids, Total Dissolved	SM 2540 C	10.0 mg/L	7 days
Solids, Total Suspended	SM 2540 D	1.0 mg/L	7 days
Solids, Volatile Suspended	SM 2540 E	2.0 mg/L	7 days
Sulfate	ASTM D516-90	20 mg/L	28 days

When flow and time were sufficient, *E. coli* grab samples were collected four times per year. Two sites (22nd Aldrich, 14th Park) were collected five times, one site (61st Lyndale) four times and one site (Pershing) was collected twice for a total of sixteen *E. coli* grabs in 2012. In 2012 limited parameters were collected twenty two times. These samples were recovered after more than 24 hours (and parameters with short holding times were not analyzed e.g. cBOD, TDP) or there was limited composite volume.

FIELD QUALITY ASSURANCE SAMPLES

Ten percent of samples were used as laboratory quality assurance samples (e.g. duplicates, spikes). Field blanks consisted of deionized water which accompanied samples from the sites to the analytical laboratory. As part of the overall QA/QC program, blind monthly performance samples were made for all monitored parameters and delivered to IRI (**Table 24-4**). A field blank was generated for each sampling trip and was analyzed for all NPDES parameters. All field blank parameters were below the minimum detection limits (**Table 24-5**).

An equipment blank (~ 2 L sample) was collected at 8a (Pershing) 11/16/12. This site mirrors the other NPDES stormwater monitoring set up and equipment. To collect the equipment blank a large bottle of deionized water was placed at the strainer end of the sampler tubing. The intake line was filled and flushed with deionized water simulating the pre-sample flush. After the flush water was pumped to waste and a sample of deionized water was collected. The sample taken was of sufficient volume to allow analysis of all parameters. All analytes came back from the laboratory below the minimum detection limits.

Manual transcription of data was minimized to reduce any errors. A minimum of 10% of the final data were checked by hand against the raw data sent by the laboratory to ensure there were no errors entering, manipulating, or transferring the data. See **Section 30**, Quality Assurance Assessment Report for details.

Field measurements were recorded on the Field Measurement Form in the Field Log Book and then entered into a computer database. Computerized data from the laboratory were forwarded to the MPRB in pre-formatted spreadsheets via email. Computerized data from the laboratory were checked and passed laboratory quality assurance procedures. Protocols for data validity followed those defined in the Storm Water Monitoring Program Manual (MPRB, 2001). For data reported below the reporting limit the reporting limit value was divided in half and then used for all statistical calculations.

A Chain of Custody (sample receipt) form accompanied each set of sample bottles delivered to the lab. Each sampler tray or container(s) was iced and labeled indicating the date and time of collection, site location, and the field personnel initials. The ultimate collection date and time assigned to the sample was when the last sample of the composite was collected. The time that each (composite) sample was collected was recorded from the ISCO sampler onto field sheets. A complete description of methods can be found in the Storm Water Monitoring Program Manual (MPRB, 2001).

Statistics for event mean concentrations were calculated using Microsoft Excel. The computer model P8 v2.41 was calibrated and verified and used to estimate snowmelt runoff. The P8 snowmelt estimated runoff, ISCO Flowlink measured runoff and chemistry data were put into the computer program FLUX32 v3.10 and were used to calculate flow-weighted mean concentrations. In Flux32, the data were run unstratified, stratified by flow, and stratified by month if possible. FLUX32 methods 2 and 6 were recorded for each. The mean concentration value with the lowest CV (coefficient of variation) was chosen and used for load calculations.

A description of P8 as described in the software's introduction:

> P8 is a model for predicting the generation and transport of stormwater runoff pollutants in small urban catchments. Simulations are driven by hourly rainfall and daily air-temperature time series.

A description of FLUX32 as described in the help menu (US Army Corps, 2009):

> The theory and the file formats described in this original manual, as well as much of the software's operation and menu structure is still applicable to Flux.
>
> This version of FLUX for the Win32 environment is a major revision to the original DOS/FORTRAN program authored by William W. Walker Ph.D.
>
> Flux32 is interactive software designed for use in estimating the transport (load) of nutrients or other water quality constituents past a tributary sampling station over a given period of time. The basic approach of Flux32 is to use several calculation techniques to map the flow/concentration relationship developed (modeled) from the sample record onto the entire flow record. This provides an estimate of total mass transport for the whole period of study with associated error statistics. Note that this approach does NOT focus on estimating changes in loads over time (i.e. time series).
>
> An important option within Flux32 is the ability to stratify the data into groups based upon flow, date, and/or season. This is a key feature of the FLUX approach and one of its greatest strengths. In many (most) cases, stratifying the data increases the accuracy and precision of loading estimates.

RESULTS & DISCUSSION

The land uses monitored for the NPDES permit are as follows: Site 6 (22nd & Aldrich) is residential, Site 7 (14th & Park) mixed use, Site 8a (Pershing) parkland, and Site 9 (61st & Lyndale) industrial, **Table 24-1**.

In 2012 no NPDES chemical data records were flagged for errors. Further quality assurance protocols can be found in **Section 30**.

Event data concentrations are listed in **Table 24-6**. These data generally show peaks during snowmelt and early spring for many parameters, but at some sites there are examples of peaks that occurred in the fall.

Most snowmelt samples were brown to dark brown and very turbid except Site 8a which was relatively clear. The snowmelt clarity of site 8a is most likely due to the filtering effect of the parkland turf as this site has mostly park overland flow runoff and has little or no street runoff.

Road salt is used throughout the winter and subsequently washed off the streets and gutters during snowmelt and early spring rains. High Cl concentrations are typical during winter snowmelt and early spring stormwater. Site 9 (61st & Lyndale) and Site 6 (22nd and Aldrich) showed small amounts of chloride continuously washing off throughout the summer months. Site 9 has many commercial industries surrounding it which may be contributing to increased chloride levels during the summer months. (Site 9 also has a small baseflow indicating that there is discharge or infiltration coming from an unknown source.

E. coli values were generally lowest for the snowmelt event and peaked mid-summer to fall. This result is expected, since temperature plays a significant role in bacterial growth and survival. There was a significant drought during August and early September that may have played a role in build-up and wash-off of animal excrement. There currently is no standard for *E. coli* in stormwater.

When looking at this raw data, it is interesting again to note that Site 6 (22nd & Aldrich) had a marked increase in Pb (lead) when compared to the other sites. This is an older residential watershed and it is unknown where this Pb is originating. It is possible that it is a remnant from old lead house paint loading the surrounding soils and then continually washing off. Pb levels in stormwater have historically been decreasing since it was removed from gasoline in the 1990's. Maximum metal values generally followed the same trend as TSS. This is as expected since metals generally tend to stick to organic solids. It is interesting to note Pb was below the detection limit for half of Site 8a (Pershing) events and it continues to generally decrease in the environment.

TDS and TSS generally tend to be high during te snowmelt/spring months and late fall with the exception of Site 8a which is parkland. High TSS values in the snowmelt/spring might be attributed to the wash-off of accumulated sand applied to icy winter roads. A small amount of sand can lead to very high TSS values. The high late fall values were likely the product of a very dry fall and subsequent accumulation and wash-off. The VSS data show a much less than expected portion of the TSS number isorganic (~20-40%) and the remainder is likely sand (**Table 24-6**). Many of the VSS peaks came in the spring and fall, and it is likely organic material washing through.

Table 24-6. 2012 NDPES sampled event data by site.

Date Sampled	Time	Site Location	Type	TP mg/L	TDP mg/L	Ortho-P mg/L	TKN mg/L	NH3 mg/L	NO3NO2 mg/L	Cl mg/L	Hardness mg/L	TSS mg/L	VSS mg/L	TDS mg/L	cBOD mg/L	Sulfate mg/L	Sp.Cond. uhmos	pH std units	E. coli MPN/100mL	Cu ug/L	Pb ug/L	Zn ug/L
1/26/2012	13:30	Site 6, 22nd & Aldrich	Grab	1.13	0.201		6.64	2.79	1.20	5500	212	188	86	9181	51	56.6		6.3	10	51.0	110	310
3/6/2012	11:45	Site 6, 22nd & Aldrich	Grab	0.708	0.235		4.18	0.914	0.373	329	52	167	73	502	10	7.50	523	7.3	57	23.0	96.0	190
5/2/2012	1:38	Site 6, 22nd & Aldrich	Composite	0.220	0.082	0.087	1.18	0.250	0.249	1	18	38	16	18	5	7.50	35.1	6.3		12.0	20.0	58.0
5/3/2012	11:10	Site 6, 22nd & Aldrich	Composite	0.321			2.28		0.239	1	20	126	44			30.4				15.0	61.0	99.0
5/19/2012	20:58	Site 6, 22nd & Aldrich	Composite	2.34																		
5/24/2012	1:13	Site 6, 22nd & Aldrich	Composite	0.317	0.078	0.093	1.97	0.704	0.312	1	20	88	36	18	6	7.50	36.2	8.1		2.50	23.0	51.0
6/14/2012	16:58	Site 6, 22nd & Aldrich	Composite	0.293	0.035	0.036	2.17	0.250	0.446	1	16	58	22	44	8	7.50	35.7	7.3	3654			
6/20/2012	21:12	Site 6, 22nd & Aldrich	Composite	0.345	0.020	0.071	2.41		0.618	1	29	36	18				61.6			20.0	19.0	70.0
7/7/2012	0:04	Site 6, 22nd & Aldrich	Composite	0.781			3.66	1.25	0.330	1	20	65	29	47		7.50	55.3	7.2		22.0	19.0	73.0
7/24/2012	7:19	Site 6, 22nd & Aldrich	Composite	0.123	0.036	0.034	0.774	0.250	0.229	1	8	23	8	14	3	7.50	17.1	5.9		8.70	16.0	36.0
7/29/2012	3:04	Site 6, 22nd & Aldrich	Composite	0.292			1.31	1.00	0.540	22	68	1	1	164		20.9	127	6.6		6.70	1.50	10.0
7/29/2012	9:39	Site 6, 22nd & Aldrich	Composite	0.196			1.41	0.830	0.364	1	20	18	10	44		7.50	71	6.8		14.0	8.60	44.0
8/9/2012	12:38	Site 6, 22nd & Aldrich	Composite	0.699	0.190	0.088	5.44		0.050	3	39	96	53	74		7.50	77.4	7.3				
8/15/2012	8:41	Site 6, 22nd & Aldrich	Composite	0.252	0.064	0.047	1.86	0.507	0.154	1	20	58	33	3	7	7.50	32.3	6.7	4106			
9/17/2012	5:15	Site 6, 22nd & Aldrich	Composite	0.575	0.160	0.229	2.82	0.531	0.785	4	28	89	54	72	27	7.50	69.1	6.4		30.0	34.0	130
10/19/2012	13:57	Site 6, 22nd & Aldrich	Composite	1.25	0.772		5.38		0.323	23	76	38	34				190	6.4		29.0	11.0	100
10/23/2012	8:29	Site 6, 22nd & Aldrich	Composite	4.95	3.85		14.0	2.33	0.731	14	180	139	99	742	286	7.50	361	5.4		57.0	48.0	390
10/25/2012	14:05	Site 6, 22nd & Aldrich	Composite	0.443	0.177	0.202	2.00	0.250	0.067	1	28	39	30	80	17	7.50	65.8	6.5	3076	11.0	5.20	34.0
1/26/2012	13:45	Site 7, 14th & Park	Grab	0.608	0.088		6.60	2.76	1.25	6150	240	113	51	10193	33	47.9		6.4	958	40.0	22.0	240
3/6/2012	12:00	Site 7, 14th & Park	Grab	0.430	0.118		1.82	0.556	0.380	377	44	98	37	473	7	7.50	554	9.3	93	15.0	18.0	96.0
5/2/2012	1:29	Site 7, 14th & Park	Composite	0.119	0.057	0.062	0.897	0.250	0.228	1	16	27	11	23	3	7.50	31.3	6.4		9.60	6.30	46.0
5/3/2012	11:03	Site 7, 14th & Park	Composite	0.127			1.13		0.290	1	20	44	16			30.0				14.0	10.0	58.0
5/23/2012	21:59	Site 7, 14th & Park	Composite	0.409	0.044	0.113	3.06	1.25	0.781	2	32	96	33	52	14	7.50	66.6	7.9		2.50	12.0	91.0
6/14/2012	11:09	Site 7, 14th & Park	Composite	0.159	0.035	0.029	1.07	0.250	0.406	1	13	27	10	40	6	7.50	30.1	7.2	2282			
6/20/2012	19:54	Site 7, 14th & Park	Composite	0.168	0.070	0.040	1.88		0.545	1	24	26	13				58.4			13.0	10.0	55.0
7/6/2012	19:11	Site 7, 14th & Park	Composite	0.291			2.60	1.03	0.436	5	28	51	18	61		7.50	65.6	7.1		25.0	14.0	100
7/24/2012	6:24	Site 7, 14th & Park	Composite	0.070	0.021	0.023	0.526	0.250	0.171	1	12	12	6	13	3	7.50	18.5	5.7		9.00	3.30	31.0
7/29/2012	8:48	Site 7, 14th & Park	Composite	0.084			0.695	0.628	0.421	1	15	10	7	26		7.50	57.6	6.9		13.0	1.50	28.0
8/9/2012	12:39	Site 7, 14th & Park	Composite	0.188	0.103	0.099	1.04	0.723	0.447	1	16	13	5	12	5	7.50	35.6	5.8		17.0	3.00	56.0
8/15/2012	9:05	Site 7, 14th & Park	Composite	0.138	0.055	0.047	0.840	0.250	0.210	1	12	17	8	14	4	7.50	23.4	7.2	4884	13.0	5.40	39.0
9/17/2012	5:15	Site 7, 14th & Park	Composite	0.268	0.128	0.150	2.11	0.468	0.829	1	20	33	20	56	12	7.50	61.0	6.5		19.0	6.10	68.0
10/23/2012	6:49	Site 7, 14th & Park	Composite	0.867													122					
10/25/2012	5:54	Site 7, 14th & Park	Composite	0.195	0.070	0.080	0.924	0.250	0.187	1	16	42	25	31	3	7.50	31.3	6.6	4884	14.0	17.0	44.0

Table 24-6. 2012 NDPES sampled event data by site. (Continued)

Date		Site		TP	TDP	Ortho-P	TKN	NH3	NO3NO2	Cl	Hardness	TSS	VSS	TDS	cBOD	Sulfate	Sp.Cond.	pH	E. coli	Cu	Pb	Zn
Sampled	Time	Location	Type	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	uhmos	std units	MPN/100mL	ug/L	ug/L	ug/L
3/6/2012	13:20	Site 8, Pershing	Grab	0.576	0.321		2.68	0.995	0.323	92	92	16	13	100	14	7.50	98.9	7.1	21	2.50	1.50	38.0
3/7/2012	13:10	Site 8, Pershing	Grab	0.361	0.292	0.199	2.23	1.30	0.407	183	30	10	5	55	8	7.50	51.4	7.3	1203	2.50	1.50	27.0
4/28/2012	12:59	Site 8, Pershing	Composite	0.281	0.104			0.250	0.101	1	14			30			31.9	6.6				
5/2/2012	1:23	Site 8, Pershing	Composite	0.199	0.054	0.059	1.71	1.20	0.414	1	24	46	17	40	5	7.50	46.8	6.4		12.0	3.60	46.0
5/3/2012	11:06	Site 8, Pershing	Composite	0.391			2.72		0.263	1	34	155	47			64.0				14.0	16.0	67.0
5/24/2012	1:09	Site 8, Pershing	Composite	0.449	0.044	0.112	2.78	0.993	0.289	1	26	89	38	54	10	7.50	44.1	8.1		2.50	4.40	50.0
5/24/2012	15:07	Site 8, Pershing	Composite	0.160	0.062	0.069	1.57	0.588	0.449	1	50	26	11	54	5	7.50	77.8	7.1		2.50	1.50	10.0
6/14/2012	16:43	Site 8, Pershing	Composite	0.489	0.309	0.283	1.83	0.918	0.373	2	22	33	15	37	7	7.50	47.3	6.3				
7/7/2012	0:10	Site 8, Pershing	Composite	0.411			2.77	0.250	0.206	1	22	72	31	41		7.50	54.1	6.2		16.0	7.30	78.0
7/24/2012	7:29	Site 8, Pershing	Composite	0.344	0.228	0.215	1.73	2.10	0.203	1	24	25	10	40	3	7.50	43.2	6.6		9.90	1.50	23.0
7/29/2012	8:35	Site 8, Pershing	Composite	0.168			0.640		0.225	1	8	8	4	7		7.50	19.4	6.7				
8/15/2012	8:32	Site 8, Pershing	Composite	0.415	0.283	0.267	1.62	0.507	0.269	1	20	21	11	19	5	7.50	44.4	6.4		12.0	1.50	20.0
10/25/2012	6:57	Site 8, Pershing	Composite	0.372	0.200	0.210	1.16	0.250	0.062	3	36	16	9	66	5	7.50	66.1	6.4		13.0	1.50	10.0
11/11/2012	0:47	Site 8, Pershing	Composite	0.309			2.79	0.946	0.448	1	24	90	40	45		7.50	42.5			20.0	8.00	87.0
1/26/2012	14:15	Site 9, 61st & Lyndale	Grab	0.861	0.051		4.43	1.40	2.11	4600	267	196	89	7703	41	50.3		10.0	5	57.0	22.0	330
3/6/2012	12:40	Site 9, 61st & Lyndale	Grab	0.457	0.160		1.66	0.250	0.711	377	108	178	43	884	28	25.2	776	10.0	3	19.0	10.0	120
5/3/2012	10:14	Site 9, 61st & Lyndale	Composite	1.43			4.92		0.308	7	96	974	173			193				65.0	51.0	430
5/19/2012	20:52	Site 9, 61st & Lyndale	Composite	0.461	0.080	0.095	3.26	1.37	0.526	19	46	149	38	102	12	7.50	113	8.2				
5/24/2012	0:27	Site 9, 61st & Lyndale	Composite	0.249	0.047	0.081	1.53	0.831	0.501	6	30	70	16	36	6	7.50	62.5	8.0		2.50	4.10	58.0
6/14/2012	11:15	Site 9, 61st & Lyndale	Grab																24196			
6/16/2012	16:43	Site 9, 61st & Lyndale	Composite	0.183	0.039			0.25	0.744	20		51	15	114	3	7.50	110	7.1				
6/18/2012	8:39	Site 9, 61st & Lyndale	Composite	0.161	0.027	0.045	0.817	0.250	0.432	6	20	47	10	46	2	7.50	54.6	6.6				
6/20/2012	21:32	Site 9, 61st & Lyndale	Composite	0.257	0.021	0.060	2.10		1.05	27	44	72	26				140			19.0	6.60	100
7/7/2012	2:24	Site 9, 61st & Lyndale	Composite	0.367			1.87	0.590	0.372	6	36	122	25	70		7.50	87.9	7.3		20.0	11.0	110
7/24/2012	6:58	Site 9, 61st & Lyndale	Composite	0.238	0.024	0.071	0.927	0.250	0.376	4	34	102	16	47	4	7.50	62.6	6.3		14.0	5.70	94.0
7/29/2012	10:24	Site 9, 61st & Lyndale	Composite	0.112			0.985	0.967	1.12	1	32	27	8	72		7.50	78	6.6		12.0	1.50	59.0
8/15/2012	9:41	Site 9, 61st & Lyndale	Composite	0.321	0.075	0.149	1.52	0.623	0.221	8	48	147	39	43	5	7.50	95.4	7.4	1597	21.0	9.40	120
9/17/2012	5:41	Site 9, 61st & Lyndale	Composite	0.716	0.102	0.553	3.27	1.02	0.813	15	88	391	105	141	18	7.50	170	6.1		40.0	19.0	290
10/23/2012	6:49	Site 9, 61st & Lyndale	Composite	1.17	0.075		4.69	1.27	1.02	17	132	610	140	189	11	18.7	225	6.7		50.0	37.0	630
10/25/2012	10:00	Site 9, 61st & Lyndale	Grab																10462			

Table 24-7 lists each site's statistical calculations for all measured parameters. Most of the geometric mean maximums occurred at two sites (6 and 9). Site 6 (22^{nd} & Aldrich) had geometric mean maximums for TP, TKN, BOD, Cu and Pb. Site 9 (61^{st} and Lyndale) had geometric mean maximums for, NO_2NO_3, Cl, Hardness, TSS, VSS, TDS, Sulfate, and Zn. It is unknown why Site 6, which is a residential watershed, had a maximum geometric mean for TP, TKN, BOD, and Pb. It may be the dense leaf canopy in the watershed contributing to the phosphorus, nitrogen and BOD. Pb has been persistently high at this site and is likely a remnant of lead based paints shedding from the older houses and soils. Site 9 is a light industrial site (cement factory, natural gas facility, etc.) and one would expect it to be higher for many of the solids, Cl and metals parameters, including Zn.

Table 24-7. 2012 event concentration statistics.

Site ID	Statistical Function	TP mg/L	TDP mg/L	Ortho-P mg/L	TKN mg/L	NH3 mg/L	NO3NO2 mg/L	Cl mg/L	Hardness mg/L	TSS mg/L	VSS mg/L	TDS mg/L	cBOD mg/L	Sulfate mg/L	pH std units	E. coli MPN/100mL	Cu ug/L	Pb ug/L	Zn ug/L
6	MEAN (geometric)	0.515	0.101	0.071	2.43	0.643	0.332	5	30	45	24	63	10	11	6.8	7	304	15.3	21.2
6	MEAN (arithmetic)	0.846	0.454	0.099	3.50	0.912	0.41	347	50	74	38	786	42	13	6.7	2181	21.6	33.7	114
6	MAX	4.95	3.85	0.229	14.0	2.79	1.20	5500	212	188	99	9181	286	57	8.1	4106	57.0	110	390
6	MIN	0.123	0.020	0.034	0.77	0.250	0.050	1	8	1	1	3	3	8	5.4	10	2.50	1.50	10.0
6	MEDIAN	0.394	0.160	0.087	2.28	0.704	0.33	1	28	58	33	60	9	8	6.6	3076	17.5	19.5	71.5
6	STDEV	1.15	1.04	0.070	3.18	0.805	0.29	1330	58	54	28	2426	87	14	0.7	1994	15.9	33.6	111
6	NUMBER	18	13	9	17	13	17	17	17	17	17	14	10	15	15	5	14	14	14
6	COV	1.36	2.29	0.713	0.910	0.882	0.71	3.83	1.16	0.724	0.726	3.09	2.07	1.04	0.098	0.914	0.740	0.997	0.974
7	MEAN (geometric)	0.213	0.064	0.060	1.41	0.522	0.398	3	23	33	14	58	6	10	6.9	1371	13.4	7.7	61.4
7	MEAN (arithmetic)	0.275	0.072	0.071	1.80	0.722	0.470	467	36	44	18	916	9	12	6.9	2620	15.7	9.9	73.2
7	MAX	0.867	0.128	0.150	6.60	2.76	1.25	6150	240	113	51	10193	33	48	9.3	4884	40.0	22.0	240
7	MIN	0.070	0.021	0.023	0.53	0.250	0.171	1	12	10	5	12	3	8	5.7	93	2.5	1.5	28.0
7	MEDIAN	0.188	0.070	0.062	1.10	0.512	0.414	1	18	30	15	36	5	8	6.8	2282	14.0	10.0	56.0
7	STDEV	0.221	0.034	0.043	1.58	0.722	0.302	1639	59	34	14	2924	9	12	1.0	2209	9.01	6.41	55.4
7	NUMBER	15	11	9	14	12	14	14	14	14	14	12	10	13	12.0	5	13.0	13.0	13.0
7	COV	0.806	0.478	0.597	0.876	1.00	0.642	3.51	1.64	0.787	0.736	3.19	1.04	1.00	0.139	0.843	0.574	0.65	0.76
8a	MEAN (geometric)	0.330	0.150	0.154	1.88	0.697	0.255	2	26	32	15	39	6	9	6.7	159	7.32	2.99	32.9
8a	MEAN (arithmetic)	0.352	0.190	0.177	2.02	0.858	0.288	21	30	47	19	45	7	12	6.8	612	9.72	4.39	41.5
8a	MAX	0.576	0.321	0.283	2.79	2.10	0.449	183	92	155	47	100	14	64	8.1	1203	20.0	16.0	87.0
8a	MIN	0.306	0.112	0.129	1.70	0.548	0.211	1	23	23	11	30	6	8	6.7	41	5.17	2.28	25.1
8a	MEDIAN	0.367	0.214	0.205	1.83	0.932	0.279	1	24	26	13	41	5	8	6.6	612	12.0	1.50	38.0
8a	STDEV	0.121	0.113	0.086	0.703	0.540	0.122	53	20	43	14	23	3	16	0.5	836	6.27	4.55	26.8
8a	NUMBER	14	10	8	13	12	14	14	14	13	13	13	9	12	12.0	2	11.0	11.0	11.0
8a	COV	0.343	0.597	0.488	0.348	0.629	0.425	2.53	0.669	0.926	0.748	0.501	0.484	1.34	0.079	1.37	0.645	1.04	0.645
9	MEAN (geometric)	0.380	0.053	0.103	2.06	0.614	0.618	17	58	136	34	135	8	13	7.4	360	21.6	10.6	156
9	MEAN (arithmetic)	0.499	0.064	0.151	2.46	0.756	0.736	365	76	224	53	787	13	27	7.5	7253	29.0	16.1	213
9	MAX	1.43	0.160	0.553	4.92	1.40	2.11	4600	267	974	173	7703	41	193	10.0	24196	65.0	51.0	630
9	MIN	0.112	0.021	0.045	0.817	0.250	0.221	1	20	27	8	36	2	8	6.1	3	2.50	1.50	58.0
9	MEDIAN	0.344	0.051	0.081	1.87	0.727	0.619	11	46	135	32	87	8	8	7.2	1597	20.0	10.0	120
9	STDEV	0.402	0.041	0.181	1.48	0.452	0.490	1223	67	267	53	2190	13	51	1.3	10422	20.5	15.4	185
9	NUMBER	14	11	7	13	12	14	14	13	14	14	12	10	13	12.0	5	11.0	11.0	11.0
9	COV	0.806	0.648	1.20	0.602	0.598	0.666	3.35	0.889	1.19	0.993	2.78	0.996	1.88	0.174	1.44	0.706	0.953	0.870
All	MEAN (geometric)	0.349	0.092	0.091	1.98	0.620	0.372	5	32	51	21	69	8	10	6.9	528	13.8	8.8	70.1
All	MEAN (arithmetic)	0.513	0.206	0.121	2.51	0.814	0.473	303	48	97	33	628	18	16	7.0	3617	19.0	16.9	109
All	MAX	4.95	3.85	0.553	14.0	2.79	2.11	6150	267	974	173	10193	286	193	10.0	24196	65.0	110	630
All	MIN	0.070	0.020	0.023	0.526	0.250	0.050	1	8	1	1	3	2	8	5.4	3	2.50	1.50	10.0
All	MEDIAN	0.321	0.078	0.087	1.88	0.628	0.376	1	28	51	21	47	7	8	6.7	1597	14.0	10.0	67.0
All	STDEV	0.694	0.570	0.106	2.13	0.633	0.356	1205	55	152	34	2142	45	28	0.9	5969	15.3	22.4	124
All	NUMBER	61	45	33	57	49	59	59	58	58	58	51	39	53	51.0	17	49.0	49.0	49.0
All	COV	1.35	2.76	0.875	0.849	0.778	0.753	3.98	1.16	1.57	1.03	3.41	2.52	1.73	0.135	1.65	0.802	1.33	1.13

All = all 4 sites, STDEV = standard deviation, COV = coefficient of variation.

Table 24-8 shows median residential, commercial/industrial and composite values for the MPRB 2012 sites sampled. In comparison they were similar or less than Nationwide Urban Runoff Program (NURP) values with the notable exception of the TP and TKN values. Most MPRB representative watershed land use category values collectively were similar to the NURP values and all metals were well below NURP values. The NURP studies were done in the 1980's when lead was widely used in gasoline (from the 1920's to 1990's) and banned after 1996. The lead (Pb) drop off in the environment is clearly seen in the data sets. Most 2012 parameters were comparable or lower than the data from 2001-2011. In 2012 all of the representative land use categories saw a decrease in all the median value concentrations from the previous comparative years. It is important to note that the new sites monitored in 2005-2010 are located in different watersheds and have similar but not identical land uses to those monitored in 2001-2004.

Table 24-8 Typical Median stormwater sampled concentrations.

Land Use	**Residential**			**Mixed**			**Composite of all categories**		
Location	MPRB[1]	MPRB[2]	NURP	MPRB[3]	MPRB[4]	NURP	MPRB[5]	MPRB[6]	NURP
Year(s)	2012	2001–2011		2012	2001–2011		2012	2001–2011	
TP (mg/L)	0.394	0.441	0.383	0.188	0.260	0.263	0.32	0.367	0.330
TKN (mg/L)	2.28	2.4441	1.90	1.10	1.62	1.29	1.88	2.03	1.50
NO_3NO_2 (mg/L)	0.330	0.354	0.736	0.414	0.415	0.558	0.376	0.411	0.680
cBOD (mg/L)	9	11	10	5	10	8	7	10	9
TSS (mg/L)	58	91	101	30	67	67	51	87	100
Cu (µg/L)	17.5	17.9	33	14.0	20.0	27	14.0	18.6	30
Pb (µg/L)	19.5	27.7	144	10.0	14.5	114	10.0	14.8	140
Zn (µg/L)	71.5	81.0	135	56.0	89	154	67	85.0	160

[1] Site 6 data.
[2] Sites 1 and 2 data, (Site 6, 2005-2012).
[3] Site 7 data.
[4] Sites 5 and 5a data, (Site 7, 2005-2012).
[5] Sites 6 – 9 data.
[6] Sites 1 – 5a data, (Site 6 – 9, 2005-2012).
NURP = median event mean concentrations as reported by the Nationwide Urban Runoff Program (USEPA, 1996).
MPRB = median values calculated by the MPRB for the identified year(s).

Sampled meandata were comparable to typical urban stormwater data from the Nationwide Urban Runoff Program (NURP), Center for Watershed Protection (CWP), and Bannerman **Table 24-9**. Most MPRB mean concentrations were comparable to other studies as listed in **Table 24-9** below. Data from MPRB Sites 1–5a (2001–2004) and 6–9 (2005–2011) were generally similar to Sites 6–9 in 2012. All measured compared parameters were roughly equal to or lower in 2012, with the exception of TP, TDP, Cl, BOD and TDS. The 2012 increases in Cl and TDS are likely the result of winter and de-icing chemicals applied to the roadways.

Table 24-9. Typical MEAN urban stormwater concentrations. " -- " = not reported.

Parameter	NURP[1]	CWP[2]	Bannerman *et al.*[3]	Mpls PW[4]	St. Paul[5]	MWMO 2012[6]	MPRB[7] 2001–2011	MPRB[8] 2012
TP (mg/L)	0.5	0.3	0.66	0.417	0.484	0.419	0.474	0.513
TDP (mg/L)	--	--	0.27	0.251	--	0.154	0.139	0.206
TKN (mg/L)	2.3	--	--	--	2.46	2.16	2.79	2.51
NO_3NO_2 (mg/L)	0.86	--	--	--	0.362	0.675	0.517	0.495
NH_3 (mg/L)	--	--	--	0.234	--	0.301	1.04	.814
Cl (mg/L)	--	230 (winter)	--	--	--	293	288	303
BOD (mg/L)	12	--	--	14.9	25	17	16	18
TDS (mg/L)	--	--	--	73.3	78	558	541	628
TSS (mg/L)	239	80	262	77.6	129.2	136	125	97
Cu (µg/L)	50	10	16	26.7	30	28	27.0	19
Pb (µg/L)	240	18	32	75.5	233	23	25.5	17
Zn (µg/L)	350	140	204	148	194	139	127	109

[1] USEPA (1996)
[2] Center for Watershed Protection (2000)
[3] Monroe study area of Bannerman *et al*. (1993)
[4] City of Minneapolis Public Works Department (1992) – average from a combination of land uses
[5] City of St. Paul 1994 stormwater data – average from a combination of land uses
[6] Mississippi Watershed Management Organization 2012 data, average of storms from all sites
[7] MPRB arithmetic mean data calculated from NPDES Sites 1 – 5a (2001 – 2004), 6 – 9 (2005 – 2011)
[8] MPRB arithmetic mean data calculated from NPDES Sites 6 – 9 (2012)

The P8 model was used to estimate daily flows for snowmelt events and grab samples from January through early May. Average daily flows (using both P8 and Flowlink measurements) and collected chemical data were used as input for the interactive program FLUX32. Daily temperature and hourly precipitation files obtained from the National Oceanic and Atmospheric Administration (NOAA) National Data Center (NDC) were used as input for P8. Data from a heated rain gauge (for snowmelt water equivalent) was used and is located at the Minneapolis/St. Paul International Airport.

Wateshed rainfall measurement during a storm can be highly variable over short distances. The precipitation values are from one location, 3800 Bryant Ave. s., Minneapolis MN. Large rain events can lead to pipe surcharges. If surcharge water inundates the auto-sampler tray the samples are considered contaminated and dumped. Surcharges occur when the water backs up in pipes and creates a hydrostatic pressure head which can result in inaccurate daily flow calculations which must be considered when evaluating flow-weighted mean concentrations. These events usually happen during storm events with high precipitation totals or high intensity. With the exception of Site 8a, most of the surcharging events were storms greater than 1 inch. The following surcharges occurred at the NPDES sites in 2012:

- Site 6 (22nd and Aldrich): 6/18, 6/19.
- Site 7 (Park and 14th): None.
- Site 8a (Pershing): 5/2-6, 5/23-24, 5/26, 5/28, 6/10, 6/14, 6/18-19, 7/7, 7/13, 7/18, 7/24, 8/15, 10/25, 11/11.
- Site 9 (61st and Lyndale): 5/3, 5/6, 5/24, 5/27, 7/13.

Site 8a (Pershing) is of special concern as it had seventeen surcharges in 2012, storms as small as 0.24 inches or as large as 3.18 inches caused surcharging. At the site, two pipes and overland flow enter the manhole basin and the outlet is a 12 inch PVC pipe. This entire watershed/area of Minneapolis is lower in elevation than the surrounding areas causing a regular back up of many storm sewers in the system. Minneapolis Public Works is aware of this problem and doing its best to remediate it. The surcharges at this site do not appear to have caused any flooding problems. Site 8a samples appear to not be significantly affected by surcharging since the sampler is in a dog-house enclosure.

The flow-weighted mean concentrations presented in **Table 24-10** were calculated using FLUX32. FLUX32 calculates flow-weighted mean concentrations and associated error statistics based on six different calculation methods. Calculation methods 1-Direct Mean Loading, and 5-Regression, Second-Order were ignored because they are inappropriate for storm sewer applications where the daily flow file contains a significant number of zero flows (Bruce Wilson, MPCA Research Scientist, personal communication, 2001). In general calculation methods 2-Flow-Weighted Concentration and 6-Regression Applied to Individual Daily Flows were used. Sample concentrations and associated daily average flows were used as input for these calculations. The data were often stratified by flow or season to achieve the most accurate and precise results. The method and event mean concentration with the lowest coefficient of variation (CV) was chosen as the final value.

Table 24-10. Flow–weighted mean concentrations and related statistics for NPDES parameters in 2012.

Site	TP (mg/L)	TDP (mg/L)	Ortho-P (mg/L)	TKN (mg/L)	NO_3NO_2 (mg/L)	NH_3 (mg/L)	Cl* (mg/L)	Hardness (mg/L)	TSS (mg/L)	VSS (mg/L)	TDS* (mg/L)	cBOD (mg/L)	Sulfate (mg/L)	Cu (µg/L)	Pb (µg/L)	Zn (µg/L)
6	0.390	0.152	0.086	2.34	0.314	0.701	10.9	24.9	69	31	149	27	9.01	16.0	31.0	71.0
7	0.246	0.078	0.069	1.47	0.381	0.555	8.35	20.8	51	20	66	6	9.18	14.9	10.2	60.6
8a	0.379	0.201	0.145	2.28	0.353	0.952	7.85	37.9	59	24	51	7	12.0	11.6	2.56	44.1
9	0.458	0.062	0.087	1.90	0.540	0.669	27.8	64.5	223	48	121	13	43.3	21.5	15.0	184
MEAN	**0.368**	**0.123**	**0.097**	**2.00**	**0.397**	**0.719**	**14**	**37.0**	**101**	**31**	**97**	**13**	**18.4**	**16**	**15**	**90**
MEDIAN	**0.385**	**0.115**	**0.087**	**2.09**	**0.367**	**0.685**	**10**	**31.4**	**64**	**27**	**93**	**10**	**10.6**	**15**	**13**	**66**
STANDEV	**0.089**	**0.065**	**0.033**	**0.402**	**0.099**	**0.167**	**9**	**19.7**	**82**	**12**	**46**	**10**	**16.7**	**4**	**12**	**64**

(green) -Highest value
(yellow) -Lowest value

* Flow–weighted mean concentrations for Cl and TDS were difficult to estimate using FLUX32 due to large outliers from the two snowmelt samples; these estimates should be used with caution.
STANDEV= standard deviation.

Site 6 (22nd & Aldrich) is a multi-family residential watershed. Site 6 had the highest modeled concentrations of TDP, TKN, TDS, BOD, and Pb. Site 6 had the lowest NO3NO2 and sulfate. This may be due to its location between two heavily traveled thoroughfares (Hennepin and Lyndale) where a mature leaf canopy may filter and collect airborne material and depositing it following precipitation.

Site 7 (14th & Park) is a densely developed mixed-use watershed. Site 7 did not have any of the highest modeled parameters. Site 7 had the lowest modeled TP, Ortho-P, TKN, NH3, hardness, TSS, VSS and BOD.

Site 8a (Pershing) is an open parkland watershed. Site 8a had the highest modeled event mean concentrations of Ortho-P and NH3. The cause is unknown but it may be an artifact of turf maintenance. Site 8a had the lowest modeled Cl, TDS, Cu, Pb, and Zn.

Site 9 (61st and Lyndale) is a commercial/industrial watershed. Site 9 had the highest modeled concentration of TP, NO_3NO_2, Cl, Hardness, TSS, VSS, Sulfate, Cu and Zn. Site 9 had the lowest modeled TDP. Site 9 is located adjacent to a large cement aggregate mixing facility which may explain the higher TSS values. This site sometimes had a small baseflow which could be sampled during future monitoring to distinguish high concentrations from storm events or baseflow.

In 2012, the highest and lowest TP concentrations were modeled at Site 9 (0.458 mg/L) and Site 7 (0.246 mg/L), respectively. These data are similar to what has been historically found at for these sites.

For comparison purposes, **Table 24-11** includes flow-weighted mean pollutant concentrations of data collected in the 1980's and reported by the U.S. Geological Survey (USGS) for various sites within the Twin Cities (as cited in MPCA, 2000). The Yates watershed was a stabilized residential area. The Iverson site was a residential watershed under development and the Sandberg watershed was predominantly light industrial land-use area, as reported by the USGS. Site 6 is more closely related to the Yates watershed land-use characteristics. Sites 7 and 9 are more comparable to the Sandberg watershed land-use characteristics.

When comparing the USGS flow-weighted mean concentrations to the MPRB sites in **Table 24-11,** Site 6 had lower or similar concentrations with Yates for all parameters. Compared to Sandberg, Sites 7 and 9 have lower flow-weighted mean concentrations for all parameters and are well within the ranges shown in **Table 24-11**. (Site 7 had significantly lower values.)

The overall comparison of **Table 24-11** to MPRB water quality at sites 6, 7, 8a, and 9 shows they were the same or better. The Minneapolis Pb values are significantly lower than either the Yates or Sandburg studies.

Table 24-11. Flow–weighted mean stormwater pollutant concentrations (mg/L) and ranges as reported by the USGS (as cited in MPCA, 2000).

Pollutant		Monitoring Site		
		Yates area (stabilized residential)	**Iverson area (developing residential)**	**Sandburg area (light industrial)**
TSS	Mean Range	133 (2 – 758)	740 (17 – 26,610)	337 (7 – 4,388)
Pb	Mean Range	0.23 (0.015 – 1.8)	0.02 (0.008 – 0.31)	0.19 (0.003 – 1.5)
Zn	Mean Range	0.198 (0.02 – 2.2)	0.235 (0.028 – 0.53)	0.185 (0.02 – 0.81)
TKN	Mean Range	3.6 (0.6 – 28.6)	1.2 (1.0 – 29.2)	2.5 (0.4 – 16.0)
TP	Mean Range	0.63 (0.10 – 3.85)	0.62 (0.2 – 13.1)	0.63 (0.07 – 4.3)

Table 24-12 shows the flow-weighted mean concentrations in 2012 compared to previous years. Flow-

weighted mean concentrations for Cl and TDS were difficult to estimate using FLUX32 due to large outliers from the snowmelt samples. These estimates should be used with caution. When samples were below the MDL (minimum detection limit), half of the MDL was used for calculations.

Cadmium (Cd) was discontinued from monitoring in 2006, because Cd concentrations had typically been below detection for the Minneapolis/St. Paul area (**Table 24-12**) and it was not useful information. It should also be noted the detection limit for Cd has changed over time. In 2002 it was <0.500 µg/L; in 2003 it was <2.00 µg/L and in 2004 it was <5.00 µg/L.

In 2012, most parameters generally fell within the range of estimated flow-weighted mean concentrations of previous years as seen in **Table 24-12**. The parameter TDS and Cl had some significant outliers (snowmelt) which affected the final flow–weighted mean concentration for these parameters. 2011 was the first year of collection of Ortho-P, and sulfate.

Table 24-12. MPRB Flow–weighted mean concentration compared to previous years. Each year is the average flow–weighted mean concentration of all sites monitored that year.

	Flow-weighted mean concentrations											
	Sites 1-5a				**Site 6-9**							
Parameter	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
TP (mg/L)	0.470	0.337	0.474	0.332	0.354	0.548	0.472	0.486	0.583	0.341	0.355	0.368
TDP (mg/L)	0.112	0.095	0.114	0.121	0.123	0.135	0.108	0.139	0.249	0.063	0.126	0.123
Ortho-P (mg/L)	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	0.179	0.097
TKN (mg/L)	2.21	1.60	2.10	1.94	3.48	3.54	4.43	3.22	3.61	1.53	1.74	2.00
NO_3NO_2 (mg/L)	0.398	0.423	0.496	0.382	0.448	0.638	0.496	0.582	0.755	0.414	0.498	0.397
NH_3(mg/L)	0.494	0.722	0.346	0.918	1.74	1.64	0.970	0.966	1.64	0.666	0.922	0.719
Cl (mg/L)	37	11	587	40	18	91	412	139	803	60	213	14
Hardness (mg/L)	nc	na	nc	nc	na	nc	nc	nc	nc	na	48.0	37
TSS (mg/L)	116	83	116	70	108	156	180	148	121	107	104	101
VSS (mg/L)	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	30.2	31
TDS (mg/L)	306	85	725	130	252	183	737	507	3323	124	693	97
cBOD (mg/L)	12	8	16	20	9	9	17	25	53	7	11	13
Sulfate (mg/L)	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	15.4	18.4
Cd (µg/L)	0.532	0.518	2.11	2.80	2.50	nc	nc	nc	nc	nc	nc	nc
Cu (µg/L)	15	31	23	15	19	29	36	16	40	23	25	16
Pb (µg/L)	23	17	22	14	41	31	34	28	23	24	18	15
Zn (µg/L)	180	76	107	76	86	94	133	132	204	100	103	90

nc = data not collected.
na= data not analyzed for.

Chemical concentrations in stormwater are highly variable. Climatological factors, street sweeping, BMP maintenance, etc. can cause fluctuations in chemical concentrations. **Table 24-12** illustrates the variability of stormwater from year to year. This is due to three likely causes. First, the watersheds monitored for the designated land uses have occasionally changed. Second, the timing between street sweeping and sampling probably affect variability within the monitoring year and between years. Third, precipitation frequency, intensity, and duration affect results.

Seasonal statistics (snowmelt, spring, summer, and fall) of the actual data (not modeled) for combination of all sites were calculated and are listed in **Table 24-13**. Seasonal patterns are evident. Snowmelt had the highest geometric mean concentrations of the following parameters TKN, NH3, NO_2NO_3, Cl, hardness, TSS, TDS, BOD, sulfate, Pb, and Zn. Snowmelt is very dirty but it had the lowest geometric mean concentration for E *coli*. which is temperature dependent. Spring stormwater tied snowmelt for the highest TSS geometric mean concentration and it had the lowest geometric mean concentrations for NO2NO3 and Cl. Summer had none of the highest concentrations but had the lowest geometric mean concentrations for the majority of parameters TP, TDP, Ortho-P, TKN, NH3, Cl, hardness, TSS, VSS, TDS, BOD, sulfate, Pb, and Zn. Fall had the highest geometric mean concentrations of TP, TDP Ortho-P, NH_3, VSS, *E. coli* and Cu Fall had the lowest geometric mean concentration of sulfate.

Table 24-13. 2012 statistical summary of concentrations by season from all sites (6 –9).

2012 Season	Statistical Function	TP mg/L	TDP mg/L	Ortho-P mg/L	TKN mg/L	NH3 mg/L	NO3NO2 mg/L	Cl mg/L	Hardness mg/L	TSS mg/L	VSS mg/L	TDS mg/L	cBOD mg/L	Sulfate mg/L	pH std units	E. coli MPN/100mL	Cu ug/L	Pb ug/L	Zn ug/L
SNOWMELT (February-March)	MEAN (geometric)	0.601	0.157	0.199	3.32	1.07	0.673	769	99	82	36	976	19	20	7.8	46	16.2	14.6	124
	MEAN (arithmetic)	0.641	0.183	0.199	3.78	1.37	0.844	2201	131	121	50	3636	24	29	8.0	294	26.3	35.1	169
	MAX	1.13	0.321	0.199	6.64	2.79	2.11	6150	267	196	89	10193	51	57	10.0	1203	57.0	110	330
	MIN	0.361	0.051	0.199	1.66	0.250	0.323	92	30	10	5	55	7	8	6.3	3	2.50	1.50	27.0
	MEDIAN	0.592	0.181	0.199	3.43	1.15	0.559	377	100	140	47	693	21	25	7.3	39	21.0	20.0	155
	STDEV	0.255	0.096		2.02	0.943	0.634	2697	95	75	32	4520	17	22	1.56	491	20.9	42.8	117
	NUMBER	8	8	1	8	8	8	8	8	8	8	8	8	7	8.0	8	8	8	8
	COV	0.397	0.526		0.535	0.688	0.751	1.23	0.726	0.622	0.636	1.24	0.690	0.770	0.196	1.67	0.797	1.22	0.695
SPRING (April-May)	MEAN (geometric)	0.337	0.063	0.084	2.00	0.637	0.319	2	28	82	27	37	6	14	7.3	NA	7.4	10.4	61.1
	MEAN (arithmetic)	0.498	0.065	0.086	2.23	0.769	0.354	3	32	148	38	43	7	30	7.3	NA	12.8	17.7	88.7
	MAX	2.34	0.104	0.113	4.92	1.37	0.781	19	96	974	173	102	14	193	8.2	NA	65.0	61.0	430
	MIN	0.119	0.044	0.059	0.897	0.250	0.101	1	14	26	11	18	3	8	6.3	NA	2.50	1.50	10.0
	MEDIAN	0.317	0.060	0.087	1.97	0.768	0.299	1	25	88	33	38	6	8	7.5	NA	10.8	11.0	58.0
	STDEV	0.599	0.020	0.020	1.11	0.432	0.169	5	21	252	43	25	4	52	0.814	NA	17.3	19.2	110
	NUMBER	15	10	9	13	10	14	14	14	13	13	10	9	13	10.0	NA	12	12	12
	COV	1.20	0.307	0.232	0.499	0.562	0.478	1.56	0.671	1.70	1.12	0.587	0.505	1.75	0.111	NA	1.34	1.08	1.24
SUMMER (June-August)	MEAN (geometric)	0.237	0.059	0.070	1.46	0.507	0.340	2	22	31	13	33	4	8	6.7	4316	14.2	5.39	50.4
	MEAN (arithmetic)	0.279	0.091	0.094	1.71	0.633	0.406	4	25	46	17	46	5	8	6.7	6787	15.0	7.67	60.3
	MAX	0.781	0.309	0.283	5.44	2.10	1.12	27	68	147	53	164	8	21	7.4	24196	25.0	19.0	120
	MIN	0.070	0.020	0.023	0.526	0.250	0.050	1	8	1	1	3	2	8	5.7	1597	6.70	1.50	10.0
	MEDIAN	0.252	0.047	0.060	1.57	0.549	0.373	1	21	33	13	42	4	8	6.7	3880	14.0	6.60	56.0
	STDEV	0.171	0.094	0.083	1.07	0.459	0.249	7	14	37	12	36	2	3	0.50	8613	5.05	5.91	33.1
	NUMBER	27	18	17	26	22	27	27	26	27	27	24	14	24	24	6	19	19	19
	COV	0.612	1.04	0.885	0.628	0.725	0.614	1.59	0.547	0.80	0.730	0.791	0.394	0.339	0.075	1.27	0.336	0.770	0.548
FALL (Sept-Nov)	MEAN (geometric)	0.636	0.219	0.200	2.89	0.606	0.367	4	45	78	41	94	16	8	6.3	5397	24.4	12.3	98.0
	MEAN (arithmetic)	1.01	0.615	0.237	3.91	0.812	0.527	8	63	149	56	158	47	9	6.3	6141	28.3	18.7	178
	MAX	4.95	3.85	0.553	14.0	2.33	1.02	23	180	610	140	742	286	19	6.7	10462	57.0	48	630
	MIN	0.195	0.070	0.080	0.924	0.250	0.062	1	16	16	9	31	3	8	5.4	3076	11.0	1.5	10
	MEDIAN	0.575	0.160	0.206	2.81	0.531	0.590	4	32	65	37	72	14	8	6.4	4884	24.5	14	93.5
	STDEV	1.35	1.23	0.164	3.81	0.682	0.352	8	56	196	44	225	97	4	0.377	3850	16.1	15.8	199
	NUMBER	11	9	6	10	9	10	10	10	10	10	9	8	9	9	3	10	10	10
	COV	1.34	2.00	0.690	0.974	0.839	0.669	1.04	0.888	1.32	0.785	1.42	2.04	0.427	0.060	0.627	0.568	0.845	1.12

STDEV= standard deviation, COV= coefficient of variation

25. Nokomis 56TH & 21ST BMP Monitoring

Background

Best management practices (BMPs) include procedures, structures and practices designed to help reduce pollutants in stormwater runoff. The City and the MPRB carry out BMP monitoring as part of the effort to determine and improve system/BMP effectiveness through adaptive management. The monitoring of BMPs in Minneapolis is a part of Federal NPDES stormwater permit activities.

In 2012 baseline monitoring was carried out for attempting to quantify the measurable stormwater effects of street sweeping. The target watersheds chosen were on the southeast side of Lake Nokomis. Initially, a paired watershed design was attempted, but after doing initial reconnaissance it was deemed unworkable. Three sites were investigated. Woodlawn & 50th was too shallow to hang a sampler and had four 10 inch leaders making laminar flow and accurate measurement impossible. Woodlawn & 53rd had 12+ inches of standing water in the pipe which would negatively affect results. Only one watershed outlet (56th & 21st) was acceptable and did not have issues with standing water and had room for equipment so it was chosen and monitored in 2012 for pre-activity and baseline conditions (see **Figure 25-1)**.

The drainage area to the 56th and 21st site is approximately 95 acres and the majority land use is single family homes. The outfall ID is 72-060.

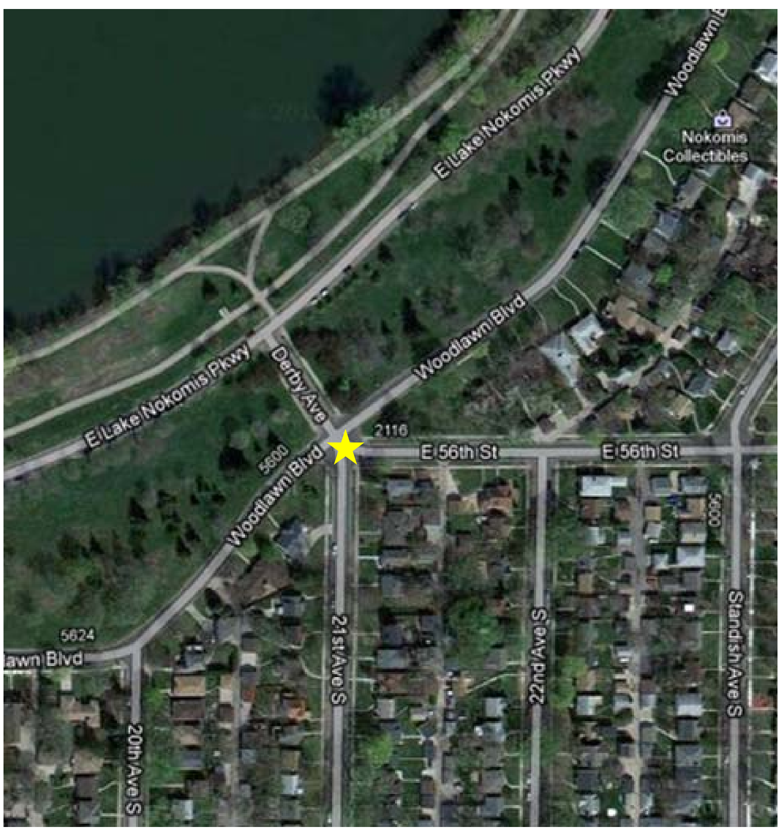


Figure 25-1. Aerial photograph of 56th and 21st located on the S.E. side of Lake Nokomis in Minneapolis.

METHODS

Due to the initial early summer installation on 6/5/12 no snowmelt samples were collected in 2012. Snowmelt samples will normally be collected in future monitoring. All stormwater samples in 2012 were collected by flow weighted auto monitoring.

The 56th & 21st outlet is a 30" reinforced concrete pipe, see **Figure 25-2**. The auto monitoring sampling period was from, 6/1/12 – 11-6/12. Auto-monitoring equipment consisted of a low profile area/velocity pressure transducer with an ISCO 2150 datalogger coupled with an ISCO 3700 sampler, see **Figure 25-3**.

Figure 25-2. The manhole street view of the 56th and 21st 30" pipe.

Figure 25-3. The AV probe and intake strainer being anchored to the invert.

The 56th & 21st site had approximately 3” of standing water that was present for most of the season. The exception to this was the drought of late summer when the standing water diminished. At times the site appears to have a small baseflow condition or water coming from a non-event source e.g. lawn sprinklers.

The parameters chosen for this site were solids (TSS, VSS) and phosphorus (TP, TDP). The chemical parameters monitored are listed in **Table 25-1**.

Table 25-1 Parameters monitored at 56th and 21st.

Parameter	Abbreviation	Units	Sample Type
Phosphorus, Total Dissolved	TDP	mg/L	Composite
Phosphorus, Total	TP	mg/L	Composite
Solids, Total Suspended	TSS	mg/L	Composite
Solids, Volatile Suspended	VSS	mg/L	Composite

Holding times and detection limits for all parameters are listed in **Section 24,** see **Table 24-5**.

RESULTS & DISCUSSION

In 2012, at 56th & 21st a total of 15 storms and 2 non-precipitation sample events were collected see **Table 24-2**. A total of 8 non-precipitation events were detected. Most of them occurred late summer during the drought. At this time it is unknown where these non-precipitation events are emanating from, but it may well be from automated lawn sprinklers in the watershed. A total of 3 surcharge events occurred in 2012.

Table 25-2 The 56th and 21st 2012 events (and non-precipitation) events. A precipitation event was defined as greater than 0.10 inches separated by 8 hours.

Event	Start Date/Time		End Date/Time		Precip (inches)	Duration (hours)	Intensity (in/hr)	Time since last Precip. (hours)	Sample Type	56th & 21st
	6/14/2012	9:45	6/14/2012	16:45	0.74	7.00	0.106	81.75	composite	X
	6/16/2012	8:45	6/16/2012	10:00	0.10	1.25	0.080	128.75	composite	X
	6/17/2012	14:00	6/18/2012	1:15	1.17	11.25	0.104	28.00	composite	X
	6/19/2012	3:15	6/19/2012	5:45	0.46	2.50	0.184	26.00	composite	X
	6/20/2012	13:45	6/20/2012	21:15	0.15	7.50	0.020	32.00	composite	X
	7/6/2012	18:30	7/6/2012	23:45	0.33	5.25	0.063	85.50	composite	X(lmtd)
	7/24/2012*	2:00	7/24/2012	10:00	1.69	8.00	0.211	64.75	composite	X
	7/28/2012	21:30	7/29/2012	9:15	0.45	11.75	0.038	180.25	composite	X(lmtd)
	8/9/2012	12:15	8/9/2012	12:30	0.16	0.25	0.640	131.00	composite	X
	8/15/2012	7:15	8/15/2012	8:30	0.58	1.25	0.464	138.75	composite	X
non-event	8/23/2013	23:00	8/25/2012	11:00	NA					
non-event	8/25/2013	12:00	8/26/2012	12:00	NA					
non-event	8/30/2012	12:00	8/30/2012	23:00	NA					
non-event	9/5/2012	2:00	9/5/2012	3:00	NA					
non-event	9/7/2012	13:00	9/7/2012	14:00	NA					
	9/12/2012	10:45	9/12/2012	16:30	0.08	5.75	0.014	674.25	composite	X
non-event	9/14/2012	11:00	9/14/2012	12:00	NA				composite	X
	9/17/2012	3:15	9/17/2012	5:45	0.22	2.50	0.088	106.75	composite	X
non-event	9/20/2012	11:00	9/20/2012	12:00	NA					
	10/19/2012	7:00	10/19/2012	12:45	0.10	5.75	0.017	769.25	composite	X
	10/23/2012	3:45	10/23/2012	7:00	0.26	3.25	0.080	87.00	composite	X
	10/24/2012	14:45	10/25/2012	12:15	0.89	21.50	0.041	31.75	composite	X
non-event	10/25/2012	4:30	10/25/2012	13:30	NA				composite	X
			Totals		**7.38**					

* NWS data

NA= not applicable

X(lmtd) = event sampled with limited parameters generally due to holding times e.g.TDP

X = event sampled with full parameters

The baseline or pre-BMP (street sweeping) flow-weighted composite data and the associated statistics are shown in **Table 25-3**. It is interesting to note that the geometric mean percentage of both TDP and VSS is 50% or greater.

Table 25-3 The 56th & 21st 2012 baseline sampled event data and the associated statistics. NA = data not available due to expired holding times or limited volume.

6/15/2012	11:37	56th & 21st	Composite	0.324	0.104	32%	28	16	56%
6/17/2012	16:58	56th & 21st	Composite	0.286	0.053	19%	42	17	40%
6/19/2012	8:22	56th & 21st	Composite	0.305	0.039	13%	52	7	13%
6/20/2012	19:40	56th & 21st	Composite	0.116	0.069	59%	14	11	81%
6/21/2012	1:37	56th & 21st	Composite	0.212	0.106	50%	11	7	61%
7/6/2012	23:07	56th & 21st	Composite	1.80	NA		246	137	56%
7/24/2012	10:37	56th & 21st	Composite	0.184	0.071	39%	30	14	47%
7/29/2012	9:08	56th & 21st	Composite	0.287	NA		13	NA	
8/9/2012	12:38	56th & 21st	Composite	0.316	0.250	79%	20	9	45%
8/10/2012	9:22	56th & 21st	Composite	0.500	0.325	65%	25	16	64%
8/15/2012	9:24	56th & 21st	Composite	0.375	0.238	63%	43	23	53%
9/12/2012	17:24	56th & 21st	Composite	1.33	0.958	72%	32	22	69%
9/14/2012*	10:00	56th & 21st	Composite	0.420	0.271	65%	7	5	72%
9/17/2012	10:16	56th & 21st	Composite	0.898	0.621	69%	30	21	69%
10/19/2012	13:49	56th & 21st	Composite	3.24	2.29	71%	172	107	62%
10/23/2012	4:21	56th & 21st	Composite	2.24	1.53	68%	60	41	68%
10/24/2012	18:07	56th & 21st	Composite	1.92	1.61	84%	73	48	65%
10/25/2012*	13:30	56th & 21st	Composite	0.695	0.517	74%	33	21	66%
*NWS data			**Mean**	0.858	0.566	66%	52	31	59%
			Geo Mean	0.547	0.274	**50%**	34	20	**58%**
			Median	0.398	0.261	66%	31	17	54%
			Std Dev	0.887	0.681		61	37	
			Max	3.24	2.29		246	137	
			Min	0.116	0.039		7	5	
			Number	18	16		18	17	

It would be expected that street sweeping would address the TP, TSS, and VSS but have a very small effect on TDP, which makes up approximately half of the load.

The purpose of the initial year of sample collection was to measure the baseline data before the BMP street sweeping begins in the target watershed. Attention will be paid to the non-events and further investigation will be done to uncover the mysterious baseflow in this watershed. Future monitoring will be compared to these initial data and conclusions drawn.

26. MINNEHAHA CREEK AT XERXES AVENUE MONITORING STATION

BACKGROUND

Minnehaha Creek originates at Gray's Bay on Lake Minnetonka and discharges into the Mississippi River below Minnehaha Falls, as seen in **Figure 26-1**. The creek carries significant amounts of stormwater from seven upstream suburban communities between Lake Minnetonka and Minneapolis. Approximately one third of Minnehaha Creek is located within Minneapolis.

Since 1999 the MPRB, City of Minneapolis, and Metropolitan Council Environmental Services (MCES) have partnered together to monitor the creek using a WOMP (Watershed Outlet Monitoring Program) station near the end of the creek (see MPRB Water Resources Report Chapter 23 for more information on the Minnehaha Creek WOMP station). The WOMP station provides information for the development of target pollutant loads for the watershed and helps evaluate the effectiveness of best management practices in an effort to improve water quality in streams and rivers. In 2009, the City of Minneapolis and MPRB added another monitoring station where Xerxes Avenue South crosses Minnehaha Creek (see **Figure 26-2)**.

The water in Minnehaha Creek at Xerxes has four main sources. First is runoff from the immediate watershed. Second is runoff between Lake Minnetonka and Xerxes. Third is discharge from Gray's Bay dam. This source is intermittent because the outlet from Lake Minnetonka into Minnehaha creek is adjustable so discharge rates vary and the dam closes when Lake Minnetonka reaches 928.6. The fourth source of water is groundwater flowing into and out of Minnehaha Creek.

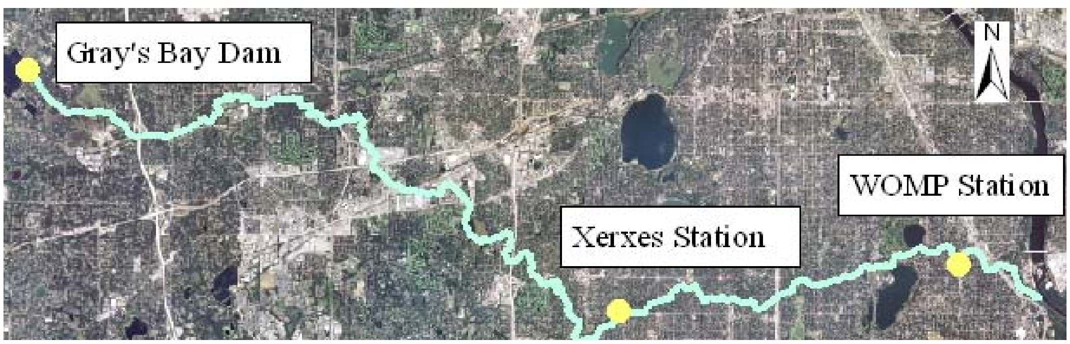


Figure 26-1. Map of Minnehaha Creek showing Gray's Bay Dam, the sole outlet from Lake Minnetonka. Also shown are the two stations monitored by MPRB Xerxes and the WOMP station.

METHODS

To monitor the creek, an ISCO 4150 datalogger was programmed with Flowlink 5.1 coupled with an A/V (area velocity) level probe. The sampler was a flow-paced ISCO 3700 equipped with 24 one liter bottles, 3/8" ID (inner diameter) vinyl tubing, and an intake strainer. The sampler was programmed to multiplex and take four flow-paced samples per bottle. Both the level probe cable and intake strainer tubing were armored in flexible metal conduit and anchored to the northwest upstream Xerxes bridge abutment (**Figure 26-2)**.

Figure 26-2. Top: Xerxes monitoring station location at Minnehaha Creek. The staff gauge as a vertical white line in the middle right. Left: Doghouse installation with sampler and datalogger. Right: Close up of intake strainer and level probe anchored to the northwest bridge abutment.

Stage readings were checked against tape downs from a fixed point located at the middle of the upstream side of the Xerxes bridges top beveled concrete edge. From the tape down point on the bridge to the stream bed is 18.00 ft. Eighteen feet minus the distance from the bridge to the water surface will give the water depth (stage). The bridge tape down point elevation is 863.01 msl. There is also a staff gauge affixed to the south bridge abutment. The staff gauge reading minus 4.00 equals the stream depth (stage) in feet.

The level feature of the A/V probe was used to obtain stage. In 2009, discharge was calculated with a weir discharge equation approximating the relatively flat stream bottom and the Xerxes bridge vertical cement wall restrictions as a broad crested weir with end contractions. After 2010, enough stage/discharge readings were taken (by stream gauging) to develop a look-up table with a rating curve, (see **Figure 26-3)**. The

MPRB has been building a rating curve using standard methodology, USGS wading rod (or #15 fish), and a Marsh McBirney Flowmate™ velocity meter. The MPRB continues to refine and check the stage/discharge rating curve.

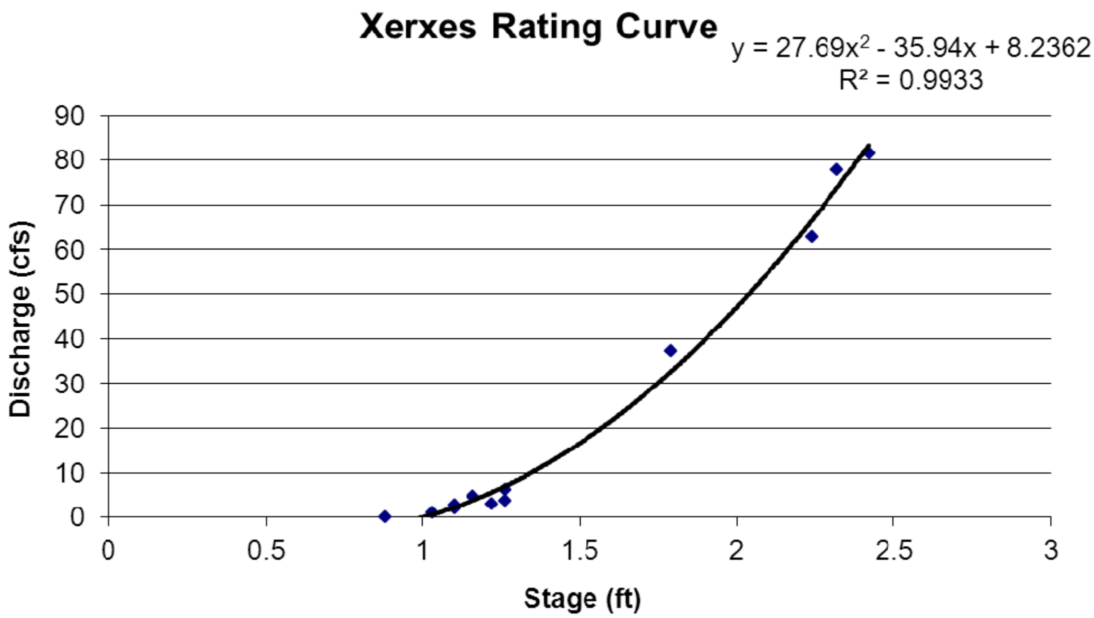


Figure 26-3. Xerxes rating curve at Minnehaha Creek.

RESULTS & DISCUSSION

2012 was the fourth year of monitoring at the Xerxes-Minnehaha Creek station. In 2012, installation was on 4/12/12 when freezing conditions had subsided. Stream stage (level) and discharge (cubic feet per second - cfs) fluctuated widely over the sampling season, (see **Figure 26-4)**. The average 2012 stage was approximately 16.5 inches. In 2012 peak stage was 34 inches on May 24, and the lowest stage was ~11 inches from Sept 1 through Sept 22.

Most of the storms are characterized by a sharp peak from the immediate watershed, followed by a sustained pulse of water from the larger watershed which can last two to four days. The spring of 2012 was very wet and by mid-summer followed by a significant drought. In **Figure 26-4** both the large and sustained storms of May and June and the August through October drought can be seen. The Gray's Bay Dam closed August 20, 2012 and remained closed through the rest of 2012. Closing the dam cut off discharge from the headwaters at Lake Minnetonka and a significant drop in the creek level can be seen.

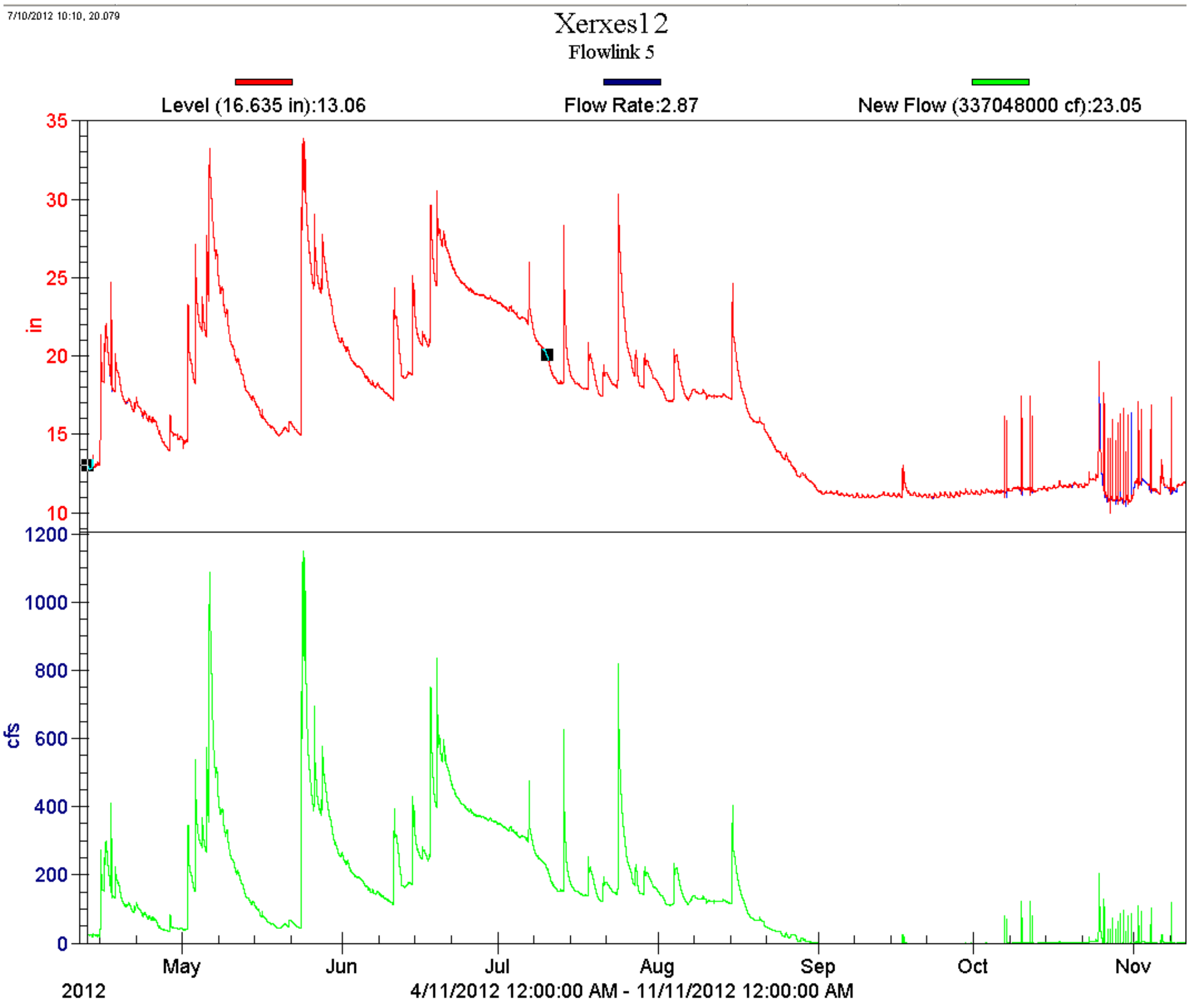


Figure 26-4. 2012 stage discharge graph of the Minnehaha Creek Xerxes monitoring station from late April to November. The (top) line represents stage data (in), and the (bottom) line depicts discharge (cubic feet per second). Data were edited to remove unreasonable fluctuations.

In 2012, eight baseflow samples and six storms of varying intensity (minimum 0.15 in, maximum 3.18 in storms) were captured throughout the sampling season, as can be seen in **Table 26-1**. The event pacing and stage trigger was adjusted accordingly to attempt collection of the entire hydrograph. The sampler's 24 bottles were multiplexed with 4 samples per bottle allowing for 96 flow-paced samples per storm event.

Table 26-1. Snowmelt and precipitation events captured at Minnehaha Creek at Xerxes in 2012. A precipitation event was defined as a storm greater than 0.10 inches, separated by eight hours or more from other precipitation. If the sample exceeded holding time, some parameters (e.g. TDP, cBOD) were dropped from analysis.

Event	Start Date/Time		End Date/Time		Precip (inches)	Duration (hours)	Intensity (in/hr)	Time since last Precip. (hours)	Sample Type	Xerxes
1	1/5/2012	12:50	n/a		n/a	n/a	n/a		Baseflow/Grab	X(w/Ecoli)
2	2/13/2012	13:40	n/a		n/a	n/a	n/a		Baseflow/Grab	X(w/Ecoli)
3	3/9/2012	13:30	n/a		n/a	n/a	n/a		Baseflow/Grab	X(w/Ecoli)
4	4/12/2012	10:00	n/a		n/a	n/a	n/a		Baseflow/Grab	X(w/Ecoli)
5	5/15/2012	14:00	n/a		n/a	n/a	n/a		Baseflow/Grab	X
6	5/23/2012	20:30	5/24/2012	15:45	3.18	19.25	0.165	94.50	Storm/Comp	X
7	6/14/2012	9:45	6/14/2012	16:45	0.74	7.00	0.106	81.75	Storm/Comp	X
8	6/19/2012	3:15	6/19/2012	5:45	0.46	2.50	0.184	26.00	Storm/Comp	X
9	6/20/2012	13:45	6/20/2012	21:15	0.15	7.50	0.020	32.00	Storm/Comp	X
10	7/6/2012	18:30	7/6/2012	23:45	0.33	5.25	0.063	85.50	Storm/Comp	X(lmtd)
11	7/24/2012*	2:00	7/24/2012	10:00	1.69	8.00	0.211	64.75	Storm/Comp	X
12	7/26/2012	9:00	n/a		n/a	n/a	n/a		Baseflow/Grab	X(w/Ecoli)
13	8/8/2012	9:00	n/a		n/a	n/a	n/a		Baseflow/Grab	X(w/Ecoli)
14	9/5/2012	10:30	n/a		n/a	n/a	n/a		Baseflow/Grab	X(w/Ecoli)
			Totals		**6.55**					**14**

* NWS data
X = event sampled with full parameters
X(lmtd) = event sampled with limited parameters generally due to holding times e.g.BOD, TDP, etc.
X(w/Ecoli) = event sampled with fecal coliform

Table 26-2 shows the raw data as reported, but the duplicates have been averaged.

Table 26-3 shows the baseflow water chemistry statistics. Throughout the 2012 sampling season, a total of eight baseflow samples were taken to determine background conditions in the stream. In June, October, November, and December no baseflow samples were collected, due to dry or frozen to the bed conditions. Seven *E. coli* grab samples were collected during baseflow.

Table 26-4 shows the storm event water chemistry statistics. In 2012, six storm runoff events were collected.

For **Tables 26-3, 26-4, and 26-5** statistics were only calculated for a chemical parameter if there were two or more measured values (not less than values). When statistical analysis is performed on the data sets, half of the less-than values are used in the calculations.

2012 baseflow conditions in the stream were markedly different from storm events; see **Tables 26-3, 26-4**. Baseflow samples generally had lower concentrations of nutrients and metals than storm events. But baseflow also had the highest geometric mean value concentrations for NO_2NO_3, Cl, Hardness, TDS, Sulfate, and Sp. Cond. These dissolved parameters indicate that baseflow is likely dominated by groundwater discharge comingled with Lake Minnetonka surface water discharge at Grey's Bay.

The 2012 storm events show the single highest individually measured TP and TSS values, as seen in **Table**

26-4. Storm event data consistently show higher TP and TSS values than baseflow. This was as expected since Minnehaha Creek receives much of its flow from stormwater.

Chloride values were low but higher than expected during the whole sampling season for both baseflow and storms, as seen in **Table 26-2**. The source of low level chronic Cl^- in Minnehaha Creek is likely caused by winter road salt (NaCl) continuously leaching from the upstream soils. The MPCA chronic stream chloride standard is 230 mg/L for four days and an acute standard of 860 mg/L for one hour. The two baseflow samples (January and February) were above 230 mg/L. The other samples collected were well below the chronic stream standard. No sample approached the acute 860 mg/L one hour standard.

Ideally the Xerxes station will be help compare Minnehaha Creek Xerxes, USGS and WOMP stations data. Baseflow grab and composite storm sampling will continue in 2013. It is important to understand both background and year to year variations in stream chemistry.

Table 26-2. **Minnehaha Creek at Xerxes Ave. water chemistry data for baseflow and precipitation events in 2012. Cells with "less than" values indicate that the concentration of that parameter was below detection limit. NA = data not available due to expired holding time. NC = data not collected.**

Date Sampled	Time	Site Location	Type	TP mg/L	TDP mg/L	Ortho-P mg/L	TKN mg/L	NH3 mg/L	NO3NO2 mg/L	Cl mg/L	Hardness mg/L	TSS mg/L	VSS mg/L	TDS mg/L	cBOD mg/L	Sulfate mg/L	Sp.Cond. uhmos	pH std units	E. coli MPN/100mL	Cu ug/L	Pb ug/L	Zn ug/L
1/5/2012	12:50	Xerxes BF	Grab	0.040	0.019	0.010	0.561	<0.500	0.339	300	380	5	<2	854	<1	18.9	NA	7.9	172	<5	<3	<20
2/13/2012	13:40	Xerxes BF	Grab	0.043	0.015	0.010	0.503	<0.500	0.587	301	540	4	<2	904	<1	27.4	1046	7.3	3	<5	<3	<20
3/9/2012	13:30	Xerxes BF	Grab	0.146	0.100	0.099	1.63	0.614	0.358	164	230	4	3	564	4	<15.0	543	7.8	138	<5	<3	32
4/12/2012	10:00	Xerxes BF	Grab	0.080	0.043	0.035	0.977	<0.500	0.117	223	330	3	3	615	<1	18.6	774	6.4	27	<5	<3	<20
5/15/2012	13:30	Xerxes BF	Grab	0.087	0.044	0.039	1.01	0.376	0.218	133	216	8	2	486	3	<15.0	429	6.6	NC	<5	<3	<20
5/24/2012	9:54	Xerxes	Composite	0.310	0.052	0.097	1.90	0.635	0.232	106	140	80	22	285	5	<15.0	306	8.1	NC	<5	5.7	35
5/25/2012	8:54	Xerxes	Composite	0.160	0.046	0.065	1.18	<0.500	0.191	111	136	26	9	283	3	<15.0	296	6.7	NC	<5	<3	<20
6/15/2012	8:39	Xerxes	Composite	0.247	0.061	0.073	2.59	1.890	0.249	74	153	52	16	304	3	<15.0	296	7.2	NC	NA	NA	NA
6/20/2012	13:19	Xerxes	Composite	0.123	0.050	0.058	0.946	<0.500	0.283	59	124	20	5	231	3	<15.0	247	6.6	NC	6.6	<3	<20
7/7/2012	7:19	Xerxes	Composite	0.144	NA	NA	1.17	<0.500	0.231	55	141	23	8	252	NA	<15.0	271	7.1	NC	14.0	<3.0	24
7/24/2012	8:09	Xerxes	Composite	0.268	0.047	0.073	1.86	1.87	0.267	34	104	98	26	187	3	<15.0	188	6.3	NC	14.0	8.4	39.0
7/26/2012	9:00	Xerxes BF	Grab	0.092	0.040	0.037	0.984	1.11	0.260	45	132	9	5	230	<1	<15.0	236	6.5	291	<5.0	<3.0	<20.0
8/8/2012	9:00	Xerxes BF	Grab	0.089	0.047	0.030	0.989	0.640	0.167	85	184	5	<2	349	<1	<15.0	325	7.9	158	<5.0	<3.0	<20.0
9/5/2012	10:30	Xerxes BF	Grab	0.073	0.048	0.035	0.643	<0.500	0.228	148	350	3	2	506	<1	22.0	493	7.5	387	<5.0	<3.0	<20.0

Table 26-3. Minnehaha Creek at Xerxes 2012 baseflow data showing water chemistry data collected during normal stream flow. All "less than data" were transformed into half the reporting limit for statistical calculations (e.g. Pb <3 becomes 1.5).

Date Sampled	Time	Site Location	Type	TP mg/L	TDP mg/L	Ortho-P mg/L	TKN mg/L	NH3 mg/L	NO3NO2 mg/L	Cl mg/L	Hardness mg/L	TSS mg/L	VSS mg/L	TDS mg/L	cBOD mg/L	Sulfate mg/L	Sp.Cond. uhmos	pH std units	E. coli MPN/100mL	Cu ug/L	Pb ug/L	Zn ug/L
1/5/2012	12:50	Xerxes Baseflow	Grab	0.040	0.019	0.010	0.561	0.250	0.339	300	380	5	1	854	1	18.9	NA	7.9	172	2.50	1.50	10.0
2/13/2012	13:40	Xerxes Baseflow	Grab	0.043	0.015	0.010	0.503	0.250	0.587	301	540	4	1	904	1	27.4	1046	7.3	3	2.50	1.50	10.0
3/9/2012	13:30	Xerxes Baseflow	Grab	0.146	0.100	0.099	1.63	0.614	0.358	164	230	4	3	564	4	7.50	543	7.8	138	2.50	1.50	32.0
4/12/2012	10:00	Xerxes Baseflow	Grab	0.080	0.043	0.035	0.977	0.250	0.117	223	330	3	3	615	1	18.6	774	6.4	27	2.50	1.50	10.0
5/15/2012	13:30	Xerxes Baseflow	Grab	0.087	0.044	0.039	1.01	0.376	0.218	133	216	8	2	486	3	7.50	429	6.6	NC	2.50	1.50	10.0
7/26/2012	9:00	Xerxes Baseflow	Grab	0.092	0.040	0.037	0.984	1.11	0.260	45	132	9	5	230	1	7.50	236	6.5	291	2.50	1.50	10.0
8/8/2012	9:00	Xerxes Baseflow	Grab	0.089	0.047	0.030	0.989	0.640	0.167	85	184	5	1	349	1	7.50	325	7.9	158	2.50	1.50	10.0
9/5/2012	10:30	Xerxes Baseflow	Grab	0.073	0.048	0.035	0.643	0.250	0.228	148	350	3	2	506	1	22.0	493	7.5	387	2.50	1.50	10.0
		Mean (Geometric)		0.075	0.039	0.029	0.854	0.399	0.255	149	270	5	2	519	1	12.7	494	7.2	86	2.5	1.5	11.6
		Mean (Arithmetric)		0.081	0.045	0.037	0.912	0.468	0.284	175	295	5	2	563	1	14.6	549	7.2	168	2.5	1.5	12.8
		Max		0.146	0.100	0.099	1.63	1.11	0.587	301	540	9	5	904	4	27.4	1046	7.9	387	2.5	1.5	32
		Min		0.040	0.015	0.010	0.503	0.250	0.117	45	132	3	1	230	0.5	7.5	236	6.4	3	2.5	1.5	10
		Median		0.084	0.044	0.035	0.981	0.313	0.244	156	280	5	2	535	0.5	13.1	493	7.4	158	2.5	1.5	10
		Standard Dev.		0.033	0.026	0.028	0.359	0.307	0.146	94	131	2	1	230	1	8.1	278	0.7	136	0	0	7.8
		Number		8	8	8	8	8	8	8	8	8	8	8	8	8	7	8	7	8	8	8
		COV		0.406	0.579	0.751	0.394	0.658	0.515	0.536	0.445	0.418	0.593	0.408	1.07	0.552	0.506	0.091	0.810	0.00	0.00	0.610

Table 26-4. Minnehaha Creek at Xerxes 2012 precipitation event water chemistry data showing concentrations during or after a major precipitation event (defined as more than 0.10 inches). All “less than data” were transformed into half the reporting limit for statistical calculations (e.g. Pb <3 becomes 1.5). NA = data not available.

Date Sampled	Time	Site Location	Type	TP mg/L	TDP mg/L	Ortho-P mg/L	TKN mg/L	NH3 mg/L	NO3NO2 mg/L	Cl mg/L	Hardness mg/L	TSS mg/L	VSS mg/L	TDS mg/L	cBOD mg/L	Sulfate mg/L	Sp.Cond. uhmos	pH std units	Cu ug/L	Pb ug/L	Zn ug/L
5/24/2012	9:54	Xerxes	Composite	0.310	0.052	0.097	1.90	0.635	0.232	106	140	80	22	285	5	7.50	306	8.1	2.50	5.70	35.0
5/25/2012	8:54	Xerxes	Composite	0.160	0.046	0.065	1.18	0.250	0.191	111	136	26	9	283	3	7.50	296	6.7	2.50	1.50	10.0
6/15/2012	8:39	Xerxes	Composite	0.247	0.061	0.073	2.59	1.89	0.249	74	153	52	16	304	3	7.50	296	7.2	NA	NA	NA
6/20/2012	13:19	Xerxes	Composite	0.123	0.050	0.058	0.946	0.250	0.283	59	124	20	5	231	3	7.50	247	6.6	6.60	1.50	10.0
7/7/2012	7:19	Xerxes	Composite	0.144	NA	NA	1.17	0.250	0.231	55	141	23	8	252		7.50	271	7.1	14.0	1.50	24.0
7/24/2012	8:09	Xerxes	Composite	0.268	0.047	0.073	1.86	1.87	0.267	34	104	98	26	187	3	7.50	188	6.3	14.0	8.40	39.0
		Mean (Geometric)		0.197	0.051	0.072	1.51	0.572	0.240	68	132	41	12	254	3	7.5	264	7.0	6.0	2.8	20.1
		Mean (Arithmetric)		0.209	0.051	0.073	1.61	0.858	0.242	73	133	50	14	257	3	7.5	267	7.0	7.9	3.7	23.6
		Max		0.310	0.061	0.097	2.59	1.89	0.283	111	153	98	26	304	5	7.5	306	8.1	14	8.4	39
		Min		0.123	0.046	0.058	0.946	0.250	0.191	34	104	20	5	187	3	7.5	188	6.3	2.5	1.5	10
		Median		0.204	0.050	0.073	1.52	0.443	0.241	67	138	39	13	267	3	7.5	284	6.9	6.6	1.5	24
		Standard Dev.		0.076	0.006	0.015	0.621	0.806	0.032	30	17	33	8	43	1	0	44	0.6	5.8	3.19	13.6
		Number		6	5	5	6	6	6	6	6	6	6	6	5	6	6	6	5	5	5
		COV		0.366	0.117	0.201	0.386	0.940	0.133	0.412	0.127	0.659	0.585	0.168	0.261	0	0.166	0.088	0.732	0.857	0.58

Comparision of Seasonal-based Loadings and Annual-based Outfall Loadings

Season	Precipitation		BOD	TSS	TDS	TKN	NH3-N	NO2-NO3	TP	TDP	Cu	Pb	Zn
	meters	inches	mg\l	mg\l	mg\l	mg\l	mg\l	mg\l	mg\l	mg\l	mg\l	mg\l	mg\l
Winter/snowmelt Median Event Mean Concentration			13.0	101	97	2.00	0.719	0.397	0.368	0.123	0.016	0.015	0.090
Precipitation	**0.088**	**3.47**											
Winter/snowmelt Season Sum (kilograms)			53,239	413,630	397,248	8,191	2,945	1,626	1,507	504	66	61	369
Spring Median Event Mean Concentration			13.0	101	97.0	2.00	0.719	0.397	0.368	0.123	0.016	0.015	0.090
Precipitation	**0.314**	**12.38**											
Spring Season Sum (kilograms)			189,944	1,475,716	1,417,272	29,222	10,505	5,801	5,377	1,797	234	219	1,315
Summer Median Event Mean Concentration			13.0	101	97.0	2.00	0.719	0.397	0.368	0.123	0.016	0.015	0.090
Precipitation	**0.251**	**9.87**											
Summer Season Sum (kilograms)			151,433	1,176,520	1,129,925	23,297	8,375	4,625	4,287	1,433	186	175	1,048
Fall Median Event Mean Concentration			13.0	101.0	97.0	2.00	0.719	0.397	0.368	0.123	0.016	0.015	0.090
Precipitation	**0.098**	**3.87**											
Fall Season Sum (kilograms)			59,377	461,310	443,040	9,135	3,284	1,813	1,681	562	73	69	411
Summation of Season Totals (kilograms)	**0.752**	**29.59**	453,993	3,527,175	3,387,485	69,845	25,109	13,864	12,851	4,295	559	524	3,143
Mean Flow Weighted Mean Concentration - all 2012 sites			13	101	97	2.00	0.719	0.397	0.368	0.123	0.016	0.015	0.090
Precipitation	**0.752**	**29.59**											
ANNUAL SUMMATION (kilograms)			453,993	3,527,175	3,387,485	69,845	25,109	13,864	12,851	4,295	559	524	3,143
ANNUAL POLLUTANT LOADINGS BY RECEIVING WATER (kilograms)			502,242	3,902,036	5,348,380	77,268	27,778	15,338	14,217	4,752	618	580	3,477

CITY OF MINNEAPOLIS
STORMWATER MANAGEMENT ORDINANCE SUMMARY

Ordinance: On November 24, 1999 the Minneapolis City Council amended Title 3 of the Minneapolis Code of Ordinances, relating to Air Pollution and Environmental Protection, by adding Chapter 54, entitled "*Stormwater Management*". The Chapter 54 ordinance establishes requirements for projects with land disturbing activities on sites greater than one (1) acre, including phased or connected actions, and for existing stormwater devices.

Goals: The purpose of this ordinance is to minimize negative impacts of stormwater runoff rates, volumes and quality on Minneapolis lakes, streams, wetlands, and the Mississippi River by guiding future significant development and redevelopment activity, and by assuring long-term effectiveness of existing and future stormwater management constructed facilities. The Chapter 54 Ordinance specifies that stormwater management standards be set according to the receiving water body, and the table below lists discharge requirements by receiving water. The standards include but are not limited to:

- Reductions of suspended solids for Mississippi River discharges
- Controlled rate of runoff for discharges to streams, areas prone to flooding and areas with infrastructure limitations
- A reduction in nutrients for stormwater discharging to Minneapolis lakes and wetlands

Minneapolis Development Review: Stormwater Management Plans are required for all construction projects greater than 1 acre in size. These plans are reviewed through the "Minneapolis Development Review" process. Responsibility for ongoing operation and maintenance is one component of the Stormwater Management Plan.

Registration: Stormwater devices shall be registered with the City of Minneapolis Department of Regulatory Services, with an annual permit being required for each registered stormwater device.

Stormwater 'Buyout' for off-site management, in lieu of on-site treatment:
This option is reserved for only those sites that demonstrate that performance of on-site stormwater management is not feasible. With approval of the City Engineer, the Chapter 54 Ordinance allows developers to contribute to the construction of a regional stormwater facility in lieu of on-site treatment/management. Final plan approval is conditional on payment received.

For the complete text of the *Chapter 54 Ordinance* requirements, see the Minneapolis Storm and Surface Water Management web site:
http://www.ci.minneapolis.mn.us/stormwater/stormwater-management-for-projects/CHAPTER54Ordinance.pdf

City of Minneapolis
Stormwater Management Ordinance Summary

Receiving Waters	Total Discharge Requirements
All receiving waters	70% removal of total suspended solids
Brownie Lake	10% phosphorus load reduction
Cedar Lake	40% phosphorus load reduction
Lake of the Isles	20% phosphorus load reduction
Lake Calhoun	30% phosphorus load reduction
Lake Harriet	20% phosphorus load reduction
Powderhorn Lake	30% phosphorus load reduction
Lake Hiawatha	42% phosphorus load reduction
Lake Nokomis	25% phosphorus load reduction
Loring Park Pond	0% phosphorus load increase
Webber Pond	0% phosphorus load increase
Wirth Lake[1]	30% phosphorus load reduction
Spring Lake	30% phosphorus load reduction
Crystal Lake[2]	30% phosphorus load reduction
Diamond Lake	30% phosphorus load reduction
Grass Lake	30% phosphorus load reduction
Birch Pond	0% phosphorus load increase
Ryan Lake	30% phosphorus load reduction
Other wetlands	30% phosphorus load reduction
Mississippi River	70% removal of total suspended solids
Minneapolis streams	No increase in rate of runoff from site

[1] Wirth Lake is not within the limits of the City of Minneapolis
[2] Crystal Lake in located in Robbinsdale, but receives run-off from Minneapolis

City of Minneapolis

Emergency Preparedness

Spill Response Protocol

1) Report to the State Duty Officer/911 Emergency Communications.

2) Assessment of the site/incident, determination of Incident Action Plan (IAP).

3) Secure appropriate City/ State/ Federal resources, as well as private contractors, for implementation of IAP.

4) Oversight of site incident remediation and recovery activities.

5) Investigation/determination of causation, potential penalties, and future prevention measures.

Source: Minneapolis Emergency Preparedness
February 2009

CITY OF MINNEAPOLIS
PUBLIC WORKS DEPARTMENT
Street Maintenance Division
Standard Operating Procedure for Vehicle Related Spills (VRS)
June, 2013

The purpose of this document is to provide detailed standard operating procedures for the Cleanup of VRS sites and the management/disposal of the impacted spill debris.

DEFINITION of TERMS

FIS: Fire Inspection Services (also historically known as Minneapolis Environmental Management or Minneapolis Pollution Control)

MPCA: Minnesota Pollution Control Agency

MSMD: Minneapolis (Public Works) Street Maintenance Division

VRM: Vehicle Related Material: Petroleum products or other vehicle fluids that are inherently related to vehicular operations. This does not include materials that are being transported by a vehicle, unless the material is clearly labeled as being one of the aforementioned products.

VT: Volumetric Threshold: Minnesota has a 5 gallon minimum quantity for reporting petroleum spills. Spill of all other chemical or material in any quantity is reportable.

Spill debris: Sand that has been placed to absorb VRM and subsequently recovered for disposal.

Scenario Number 1: MPCA informs FIS of VRS

The driver of a vehicle involved in a spill is responsible for notifying the MPCA Duty Officer, if the VT is exceeded. The Duty Officer will immediately notify the MPCA Emergency Response Unit. If the spill is of the size and nature that the Emergency Response Unit determines should be handled by FIS, the MPCA will notify FIS and provide them with the details relating to the spill incident. The FIS representative will make a determination based on the information provided by the MPCA on how to proceed, and if appropriate (typically VRM in manageable quantities), contacts MSMD.

The MSMD will dispatch personnel with appropriate equipment to apply sand to the spill site. The sand will be given a period of time in which to absorb the VRM. The sand (spill debris) will then be removed by means of a street sweeper, and deposited at the established disposal site in a designated VRM spill debris pile. If a secondary sanding is required, the procedure will remain the same. Since the volume of the spill is greater than 5 gallons, a Hazardous Material Spill Data form (see Appendix A) must be completed as soon as possible (i.e. within 24 hours or the next business day). The completed form will be sent to the FIS as soon as possible. A final report on the action(s) taken will be sent to the MPCA from FIS.

Spill Debris Pile Management

Arrangements for disposal of the spill debris pile will be a collaborative effort by the MSMD and the Engineering Laboratory. As the spill debris pile reaches a size that becomes difficult to manage within the boundaries of the disposal site, the Engineering Laboratory will be contacted. The spill debris pile will be mechanically blended and the Laboratory will select representative samples for laboratory analysis, as required by MPCA regulations. The sampling and testing will require approximately one week to complete. After receiving the laboratory analysis data, the spill debris will be disposed of in a manner pre-approved by the MPCA and the Minneapolis Procurement Division.

Scenario Number II: The MSMD discovers a VRS

MSMD personnel discover a spill or are informed of a potential VRM spill from sources other than FIS or MPCA. After arriving at the scene, they will determine whether the incident is a VRM spill, (possibly from a vehicle collision, a spill from a labeled container, etc.) and will determine if the volume of the spill is greater than the VT (5 gallons).

- Less than 5 gallons: If the spill quantity is judged to be less than 5 gallons, no contact with FIS is necessary. Sand will be applied and the procedure will continue as described in Scenario I (i.e. subsequent sanding/sweeping and stockpiling into the spill debris pile). A Hazardous Materials Spill Data form must be completed for record and documentation purposes and retained at MSMD, but is not to be sent to FIS.

- 5 gallons or more: If the MSMD representative determines that a volume of 5 gallons or more of VRM has been spilled, MSMD must contact FIS or MPCA. The same procedures for cleanup and reporting (using the Hazardous Material Spill Data form) as in Scenario I will be followed. This form must be sent to FIS.

For both cases, the disposal of the VRM spill debris pile is as detailed in Scenario I.

Potential Modification to Scenario I and II

Regulatory officials may require separate stockpiling of spill debris from specific spill incidents. Separate sampling and laboratory analysis will be required in these cases. This may also be requested to create a distinct tracking mechanism of a given spill of significant quantities and/or from a billable source. This scenario will be determined on a case-by-case basis. The process for disposal will be the same as previous scenarios.

Scenario Number III: The MSMD becomes aware of a spill of unknown material or composition

The MSMD shall contact 911 before taking any action to clean up a spill of unknown composition. FIS will manage these spills through their contracts with private entities specializing in these activities, or manage and coordinate the cleanup with the MSMD. If FIS cannot be contacted, the MPCA Duty Officer should be contacted immediately.

ADDITIONAL INFORMATION

1. Currently the disposal site for spill debris is at the Linden Yards site. The material shall be placed in two 20 cubic-yard leak-proof roll-off containers with counter-balanced lockable lids at the City Site.

2. List of Potential Contacts:

   - **Minnesota Pollution Control Agency (MPCA)**
     Duty Officer: 651-649-5451; 24 hours a day, seven days a week
   - **Fire Inspection Services (FIS)**
     Steve Kennedy: 612-685-8528 (work)
     Tom Frame: 612-673-8501 (work)
     Emergency after-hours contacts:
     Steve Kennedy 612-685-8528
   - **Engineering Laboratory**
     Paul Ogren: 612-673-2456
     Stephanie Malmberg: 612-673-3365
   - **Minneapolis Street Maintenance Division (MSMD)**
     Steve Collin: 612-673-5720 (work)
     Rick Jorgensen: 612-673-5720 (work)
     24 hours a day, 7 days a week: 612-673-5720

3. MSMD will be responsible for any billing of outside parties for services rendered for the cleanup/disposal of a spill event. The MSMD, FIS and the Engineering Laboratory will develop a system for tracking cost associated with these operations. This information will be distributed, as it becomes available.

4. This is a statement of policies and procedures, which will be revised and updated as new information becomes available.

CITY OF MINNEAPOLIS - STREET DEPARTMENT

OIL AND HAZARDOUS MATERIAL SPILL DATA

DATE OF REPORT	TIME OF REPORT	NAME & ADDRESS OF RESPONSIBLE PARTY
DATE OF INCIDENT	TIME OF INCIDENT	
TYPE OF POLLUTANT	QUANTITY	CAUSE OF SPILL
PRECISE LOCATION		PERSON MAKING REPORT/PHONE NUMBER
AREAS AFFECTED		PARTY REPORTING SPILL TO STREET DEPT.
PROBABLE FLOW DIRECTION	SOIL TYPE	OTHERS CONTACTED: FIS____________________________ MPCA________________________________ FIREDEPT_____________________________ POLICE__________________________________ OTHER
WATERS POTENTIALLY AFFECTED		
EFFECTS OF SPILL/ IMMEDIATE DANGER TO HUMAN LIFE, PROPERTY		PROXIMITY OF WELLS, SEWER, BASEMENTS
ACTION TAKEN TO DATE		IS THIS FIRST NOTICE REGARDING SPILL?
CONTAINMENT OF SPILL		WHO SHOULD BE CONTACTED FOR FURTHER INFORMATION? PHONE NO.
CLEAN-UP TO DATE: MATERIAL USED______________________ LOADER USED_________________________ TRUCKS USED_________________________ PICK-UP TRUCK USED________________ MACHINE SWEEPER USED______________ LABOR: FOREMAN HOURS______________ MAINT CREW LEADER ______________ CONST LABORER________________ OTHER______________________		COMMENTS?

ORIGINAL: When job completed, send immediately to Street Accounting.
COPY 1 : Send to Street Accounting with daily time when labor/eq. first used.
COPY 2 : PCA NOTIFICATION COPY - send immediately(first available interoffice mailing) to Steve Kennedy, FIS – Environmental Management, PSC, Room 401

STREET JOB#_____________

LABOR COST $____________
EQUIP COST $____________
MAT'L COST $____________
TOTAL COST$______________

Source: Minneapolis Public Works – Street Maintenance June 2013

Grit ID	Location	Date Inspected	Inspector	Estimated Vol In Cu Yds	Floatables Y/N	Cleaning Required Y/N	Vol Removed	Date Cleaned
1	UPTON AVE N & 53RD AVE N	24-Apr-12	D.G.	3	N	Y	3	24-Apr-12
2	RUSSELL AVE N & 53RD AVE N	24-Apr-12	D.G.	1	N	Y	1	24-Apr-12
3	SHERIDAN AVE N, N OF 52ND AVE N	26-Apr-12	D.G.	1	N	y	1	26-Apr-12
4	RUSSELL AVE N NORTH OF 52ND AVE N	25-Apr-12	D.G.	1	N	Y	1	25-Apr-12
5	PENN AVE N & 52ND AVE N	25-Apr-12	D.G.	2	N	Y	2	25-Apr-12
6	PENN AVE N & 52ND AVE N	25-Apr-12	D.G.	1	Y	Y	1	25-Apr-12
7	OLIVER AVE N & 52ND AVE N	27-Apr-12	D.G.	3	Y	Y	3	27-Apr-12
8	NEWTON AVE N & SHINGLE CREEK	01-May-12	D.G.	1	N	Y	1	01-May-12
9	OLIVER AVE N & 51ST AVE N	30-Apr-12	D.G.	2	Y	Y	2	30-Apr-12
10	MORGAN AVE N & 51ST AVE N	01-May-12	D.G.	1	Y	Y	1	01-May-12
11	KNOX AVE N & 51ST AVE N	01-May-12	D.G.	4	Y	Y	4	01-May-12
12	KNOX AVE N & 50TH AVE N	14-May-12	D.G	6	Y	Y	3	14-May-12
14	JAMES AVE N, NORTH OF 49TH AVE N	30-Apr-12	D.G.	1	N	Y	1	30-Apr-12
15	21ST AVE N & 1ST ST N	15-Aug-12	M.S.	40	Y	Y	35	17-Aug-12
17	XERXES AVE N & GLENWOOD AVE	16-May-12	D.G.	7	N	Y	7	16-May-12
18	MORGAN AVE N & CHESNUT AVE	17-May-12	D.G.	4	Y	Y	4	17-May-12
21	LAKE OF THE ISLES PKWY & LOGAN AVE	13-Jul-12	M.S.	7	Y	Y	5	13-Jul-12
22	W 22ND ST & JAMES AVE S	27-Jun-12	M.S.	3	N	Y	2.5	27-Jun-12
24	DREW AVE S & W LAKE ST	28-Jun-12	M.S.	3	N	Y	2.5	18-Jun-12
26	W LAKE ST & ALDRICH AVE S	03-May-12	M.S.	.5	Y	Y	0.5	03-May-12
27	W LAKE ST & ALDRICH AVE S	06-Aug-12	M.S.	0	N	N		
28	W 33RD ST & HOLMES AVE S	21-May-12	M.S.	5	Y	Y	4.5	21-May-12
29	W 33RD ST & GIRARD AVE S	02-Aug-12	M.S.	15	Y	Y	12	02-Aug-12
30	YORK AVE S & W LAKE CALHOUN PARKWAY	10-May-12	M.S.	2	Y	Y	2	10-May-12
30	YORK AVE S & W LAKE CALHOUN PARKWAY	13-Jul-12	M.S.		Y	Y	2	10-May-12
31	CHOWEN AVE S & W 41ST ST	06-Aug-12	M.S.	0	N	N		
32	E 42ND ST & BLOOMINGTON AVE S	10-Sep-12	M.S.	5	Y	Y	3.5	12-Sep-12
34	W 44TH ST & LAKE HARRIET PARKWAY	18-Sep-12	M.S.	7	Y	Y	6	18-Sep-12
35	E 44TH ST & OAKLAND AVE S	22-May-12	M.S.	1	Y	Y	0.5	22-May-12
36	E 46TH ST & 31ST AVE S	30-May-12	D.G.	2	N	Y	2	30-May-12
36	E 46TH ST & 31ST AVE S	30-May-12	D.G.	2	N	Y	2	30-May-12
36	E 46TH ST & 31ST AVE S	30-Jul-12	M.S.	3	Y	Y	1.5	30-Jul-12
37	46TH AVE S & GODFREY RD	18-Jul-12	M.S.	6	Y	Y	4	18-Jul-12
37	46TH AVE S & GODFREY RD	31-Jul-12	M.S.	4	Y	Y	1.5	31-Jul-12
38	W 47TH ST & YORK AVE S	24-Apr-12	M.S.	.5	N	Y	0.5	24-Apr-12
41	W 48TH ST & YORK AVE S	24-Apr-12	M.S.	1	N	y	1	24-Apr-12
42	QUEEN AVE S & LAKE HARRIET PARKWAY	25-Sep-12	M.S.	15	Y	Y	14	26-Sep-12
44	SHERIDAN AVE S & W 50TH ST	22-May-12	M.S.	3	Y	Y	2	22-May-12
45	JAMES AVE S & MINNEHAHA CREEK	14-Aug-12	M.S.	10	Y	Y	2.5	14-Aug-12
46	MORGAN AVE S & W 53RD ST	17-Jul-12	M.S.	15	N	Y	12	17-Jul-12
47	E 55TH ST & PORTLAND AVE S	30-Apr-12	M.S.	1	N	Y	1	30-Apr-12
48	E 56TH ST & PORTLAND AVE S	01-May-12	M.S.	2	N	Y	2	01-May-12
49	E 57TH ST & PORTLAND AVE S	01-May-12	M.S.	1	N	Y	1	01-May-12
50	E 58TH ST & PORTLAND AVE S	21-Aug-12	M.S.	5	Y	Y	3	21-Aug-12
51	GIRARD AVE S BETWEEN W 59TH ST & W 60TH ST	16-May-12	M.S.	1	N	Y	1	16-May-12
53	GIRARD AVE S & W 60TH ST	16-May-12	M.S.	0	N	Y	1	16-May-12
54	GIRARD AVE S, W 60TH ST - DUPONT AVE S	29-Aug-12	M.S.	20	Y	Y	18	29-Aug-12
55	GRASS LAKE TERRACE, GIRARD TO JAMES AVE S	19-Jul-12	M.S.	3	N	Y	1	19-Jul-12
60	IRVING AVE S & W 61ST ST	22-Aug-12	M.S.	0	N	N		
61	E RIVER ROAD & CECIL ST	04-Jun-12	B.R.	10	N	Y	8	05-Jun-12
62	HIAWATHA PARK REFECTORY TURN-A-ROUND	23-May-12	M.S.	1	Y	Y	1	23-May-12
64	26TH AVE N & PACIFIC (N TRANSFER STATION)	29-May-12	A.K.	2	N	Y	2	29-May-12
65	SOUTH TRANSFER STATION	31-May-12	D.G.	.5	N	Y	0.5	31-May-12
65	SOUTH TRANSFER STATION	19-Jun-12	M.S.	3	N	Y	1.5	19-Jun-12
66	MAPLE PLACE @ E ISLAND AVE	05-Jun-12	B.R.	0	N	N		
67	DELASALLE DR & E ISLAND	05-Jun-12	B.R.	0	N	N		
68	W ISLAND - 300' S OF MAPLE PLACE	05-Jun-12	B.R.	0	N	N		
69	EASTMAN AVE & W ISLAND	05-Jun-12	B.R.	0	N	N		
70	ROYALSTON & 5TH AVE N	23-May-12	D.G.	6	Y	Y	6	23-May-12
72	S OF 37TH AVE NE & ST ANTHONY PKWY	05-Jun-12	B.R.	8	N	Y	8	06-Jun-12
73	4552 KNOX AVE N (IN ALLEY BEHIND)	02-May-12	D.G.	1	N	Y	1	02-May-12
76	MARKET PLAZA & EXCELSIOR BLVD	20-Jul-12	M.S.	15	Y	Y	4	20-Jul-12
77	ALLEY - 38TH TO 39TH ST & NICOLLET TO BLAISDELL AVE	16-May-12	M.S.	.5	N	Y	0.5	16-May-12
78	SHINGLE CREEK WETLAND - W SIDE	19-Jul-12	A.K.	6	Y	Y	6	19-Jul-12
80	WOODLAWN BLVD & E 50TH ST	08-Aug-12	M.S.	3	Y	Y	3	08-Aug-12
82	12TH AVE S & POWDERHORN TERRACE	17-May-12	M.S.	1	Y	Y	1	17-May-12
83	13TH AVE S & POWDERHORN TERRACE	17-May-12	M.S.	1	Y	Y	1	17-May-12
84	3421 15TH AVE S (180' W OF CL)	25-Apr-12	M.S.	3	Y	Y	3	25-Apr-12
84	3421 15TH AVE S (180' W OF CL)	30-Oct-12	M.S.	2	Y	Y	1.5	30-Oct-12
85	3329 14TH AVE S	16-May-12	M.S.	1	N	Y	1	16-May-12
86	13TH AVE S & E 35TH ST	27-Apr-12	M.S.	4	Y	Y	4	27-Apr-12
86	13TH AVE S & E 35TH ST	30-Oct-12	M.S.	4	Y	Y	2.5	30-Oct-12
87	3318 10TH AVE S	17-May-12	M.S.	2	Y	Y	1.5	17-May-12
88	ACROSS THE STREET FROM 702, NO. BD. VAN WHITE BLVD.	02-May-12	D.G.	1	N	Y	1	02-May-12
89	ACROSS THE STREET FROM 706, NO. BD. VAN WHITE BLVD.	02-May-12	D.G.	1	Y	Y	1	12-May-12
90	10TH AVE. NO. & ALDRICH AVE. NO. (S.W.C.)	30-Apr-12	A.K.	2	Y	Y	2	30-Apr-12
91	SO. BD. VAN WHITE BLVD., 200' SO. OF 8TH AVE. NO.	01-May-12	A.K.	2	Y	Y	2	01-May-12
92	ACROSS THE STREET FROM 701, SO. BD. VAN WHITE BLVD.	02-May-12	A.K.	4	Y	Y	4	02-May-12
93	SO. BD. VAN WHITE BLVD., 250' SO. OF 10TH AVE. NO.	30-Apr-12	A.K.	4	Y	Y	4	30-Apr-12
94	10TH AVE. NO. & NO. BD. VAN WHITE BLVD. (S.W.C.)	27-Apr-12	A.K.	6	Y	Y	6	27-Apr-12
95	WEST SIDE OF ALDRICH AVE. NO. & 9TH AVE. NO.	30-Apr-12	A.K.	4	Y	Y	4	30-Apr-12
96	8TH AVE. NO. & NO. BD. VAN WHITE BLVD. (N.E.C.)	23-Apr-12	A.K.	6	Y	Y	6	23-Apr-12
96	8TH AVE. NO. & NO. BD. VAN WHITE BLVD. (N.E.C.)	22-Aug-12	D.G.	3	Y	Y	3	22-Aug-12
97	29TH AVE. & LOGAN AVE. - NO. STORM WATER DET. POND (E & W)	26-Apr-12	A.K.	8	Y	Y	8	26-Apr-12
97	29TH AVE. & LOGAN AVE. - NO. STORM WATER DET. POND (E & W)	04-Sep-12	D.G.	5	Y	Y	5	04-Sep-12
98	MALMQUIST LN. & HUMBOLDT NO.	04-Jun-12	A.K.	2	Y	Y	2	04-Jun-12
99	SHINGLE CREEK DR. & HUMBOLDT NO.	08-Jun-12	A.K.	4	Y	Y	4	08-Jun-12
100	SO. OF 49TH AVE. NO. & HUMBOLDT NO.	07-Jun-12	A.K.	8	Y	Y	8	07-Jun-12
109	22ND AVE N AND W RIVER ROAD	18-May-12	D.G.	3	Y	Y	3	18-May-12
110	W. CALHOUND PARKWAY 100' NO. OF RICHFIELD RD.	10-May-12	M.S.	.5	Y	Y	0.5	10-May-12
111	RICHFIELD RD. NEAR W. CORNER OF THE PARKING LOT	10-May-12	M.S.	.5	Y	Y	0.5	10-May-12
112	W. 36TH ST. 30' W. OF CALHOUN PARKWAY	10-May-12	M.S.	1.5	Y	Y	1.5	10-May-12

Source: Minneapolis Public Works - SWS Operations

113	20' EAST OF VAN WHITE MEM. BLVD (N.B.) AND 5TH AVE N (1016 - 5TH AVE N)	17-May-12	D.G.	1	Y	Y	1	17-May-12
114	DUPONT AVE. NO. & 4TH AVE. NO.	17-May-12	D.G.	3	Y	Y	3	17-May-12
115	VAN WHITE MEMORIAL BLVD (S.B.) & 4TH AVE N	17-May-12	D.G.	2	Y	Y	1	17-May-12
116	400' NORTH (60' INTO POND) VAN WHITE MEM. BLVD (S.B.) AND 4TH AVE N	23-May-12	D.G.	1	Y	Y	1	23-May-12
117	300' NORTH (WEST SIDE) OF VAN WHITE MEM. BLVD (S.B.) AND 4TH AVE N	09-Jul-12	A.K.	4	Y	Y	4	10-Jul-12
117	300' NORTH (WEST SIDE) OF VAN WHITE MEM. BLVD (S.B.) AND 4TH AVE N	06-Sep-12	D.G.	4	Y	Y	4	06-Sep-12
118	200' NORTH (POND SIDE) OF VAN WHITE MEM. BLVD (S.B.) AND 10TH AVE N	23-May-12	D.G.	3	Y	Y	3	23-May-12
119	11TH AVE N AND VAN WHITE BLVD (N.B.)	02-May-12	A.K.	2	Y	Y	2	02-May-12
121	50' NORTH (EAST SIDE) OF VAN WHITE MEM. BLVD (S.B.) AND FREMONT AVE N	31-May-12	A.K.	2	Y	Y	2	31-May-12
122	MINNEHAHA PARKWAY @ 39TH AVE S N SIDE OF PKWY	23-May-12	M.S.	2.5	N	Y	2.5	23-May-12
123	COLUMBUS AVE S SOUTH OF E 37TH ST REROUTE # 3719 - no as-builts	24-Apr-12	M.S.	1	N	Y	1	24-Apr-12
124	COLUMBUS AVE S - CHICAGO AVE S ALLEY - no as-builts	01-May-12	M.S.	1.5	N	Y	1.5	01-May-12
125	COLUMBUS AVE S ACROSS FROM #3644 - no as-builts	13-Jul-12	M.S.	1	Y	Y	0.5	13-Jul-12
126	E 37TH ST AND COLUMBUS S - no as-builts	01-May-12	M.S.	1	N	Y	1	01-May-12
134	W 22ND ST @ E LAKE OF THE ISLES BLVD, no as-builts	09-Jul-12	M.S.	5	Y	Y	3	09-Jul-12
139	EWING AVE S @ W FRANKLIN AVE - Pending as-built info	09-Jul-12	A.K.	2	N	Y	2	09-Jul-12
140	E LAKE ST WEST OF 14TH AVE S (Hennepin County const. Lake St.)	10-Jul-12	M.S.	2	Y	Y	1	10-Jul-12
141	W LAKE ST EAST OF 14TH AVE S (Hennepin County const. Lake St.)	26-Apr-12	M.S.	.5	Y	Y	1	26-Apr-12
142	18TH AVE S SOUTH OF E LAKE ST (Hennepin County const. Lake St.)	26-Apr-12	M.S.	.5	Y	Y	0.5	26-Apr-12
143	LONGFELLOW AVE S SOUTH OF E LAKE ST (Hennepin County const. Lake St.)	02-May-12	M.S.	.5	Y	Y	0.5	02-May-12
145	CEDAR AVE S AND E MINNEHAHA PARKWAY (20' S. of S. curb of Minnehaha & 5' W. of W. curb of Cedar)	18-Jul-12	M.S.	6	Y	Y	4	18-Jul-12
149	W 44TH ST AND ALDRICH AVE S SWC	31-May-12	M.S.	1	Y	Y	1	31-May-12
151	DIAMOND LK RD & CLINTON AVE S	28-Aug-12	M.S.	6	Y	Y	2.5	29-Aug-12
154	W LAKE ST AND DUPONT AVE S	02-May-12	M.S.	3	Y	Y	2	02-May-12
155	W LAKE ST AND BLAISDELL AVE S	03-May-12	M.S.	2	Y	Y	2	03-May-12
155	W LAKE ST AND BLAISDELL AVE S	17-May-12	M.S.	.5	Y	Y	0.5	17-May-12
157	STEVENS AVE S & DIAMOND LK RD	16-Aug-12	M.S.	2	Y	Y	2	16-Aug-12
158	E 61ST ST & COLUMBUS AVE S	21-Aug-12	M.S.	4	Y	Y	2.5	21-Aug-12
161	3RD AVE N & WASHINGTON AVE N	13-Aug-12	D.G.	3	N	Y	1	13-Aug-12
162	DOWLING AVE N & OLIVER AVE N	08-Aug-12	D.G.	5	Y	Y	5	08-Aug-12

Body of Water	Outfall_ID	Location	Inspection Date	Structure Type	Outfall Pipe Size	Material Type
Mississippi 1	10-130	27th Ave NE (Monroe St NE)	15-Oct-12	Pipe	24	CMP
Shingle Creek	20-010	52nd Ave N and Sheridan Ave N (extended)	27-Jul-12	Concrete Apron	60	RCP
Shingle Creek	20-012	53rd Ave N and Russell Ave N (extended)	27-Jul-12	Concrete Apron		RCP
Shingle Creek	20-013	52nd Ave N and Russell Ave N (extended)	27-Jul-12	Concrete Apron	12	RCP
Shingle Creek	20-020	Penn Ave N and 52nd Ave N	27-Jul-12	Diffuser	18	RCP
Shingle Creek	20-030	52nd Ave N (Penn Av N)	27-Jul-12	Concrete Apron	12	RCP
Shingle Creek	20-040	52nd Ave N (Oliver Ave N)	13-Aug-12	CMP Apron	24	CMP
Shingle Creek	20-050	Newton Ave N	13-Aug-12	Concrete Apron	12	RCP
Shingle Creek	20-060	51st Ave N (Newton Av N)	13-Aug-12			
Shingle Creek	20-060A	51st Ave N (Morgan Av N)	27-Aug-12	CMP Apron	12	CMP
Shingle Creek	20-060B	51st Ave N & Morgan Ave N (south bank)	27-Aug-12	Pipe	12	CMP
Shingle Creek	20-070	Knox Ave N	27-Aug-12	CMP Apron	36	CMP
Shingle Creek	20-080	50th Ave N (Knox Ave N)	27-Aug-12	Concrete Apron		RCP
Shingle Creek	20-090	50th Ave N (James Ave N)	04-Sep-12	Concrete Apron	12	RCP
Shingle Creek	20-100	49th Ave N (Ryan Creek)	27-Aug-12	Pipe	21	CMP
Shingle Creek	20-110	49th Ave N (Ryan Creek)	04-Sep-12	Box Culvert	60	RCP
Shingle Creek	20-120	49th Ave N (Humboldt Ave N)	04-Sep-12	Box Culvert	60	RCP
Shingle Creek	20-140	47th Ave N (Shingle Crk Pkwy)	04-Sep-12	Concrete Apron	36	RCP
Shingle Creek	20-150	47th Ave N (Girard Ave N)	04-Sep-12	Pipe	10	PVC
Shingle Creek	20-150	47th Ave N (Girard Ave N)	04-Sep-12	Pipe	24	CMP
Shingle Creek	20-160	Malmquist Lane	04-Sep-12	Concrete Apron	36	RCP
Shingle Creek	20-170	Fremont Ave N (Shingle Crk Pkwy)	04-Sep-12	Pipe	12	CMP
Shingle Creek	20-180	46th Ave N (Mamquist Lane)	04-Sep-12			
Shingle Creek	20-190	46th Ave N (Shingle Crk Pkwy)	04-Sep-12	CMP Apron	18	CMP
Shingle Creek	20-200A	Dupont Ave N (Shingle Crk Pkwy)	04-Sep-12	Pipe	24	CMP
Shingle Creek	20-200B	Dupont Ave N (Shingle Crk Pkwy)	04-Sep-12	Pipe	18	CMP
Shingle Creek	20-210A	45th Ave N (Dupont Ave N)	04-Sep-12	Concrete Apron	30	RCP
Shingle Creek	20-210B	44th Ave N (Soo Line RR)	04-Sep-12	Concrete Apron	60	RCP
Shingle Creek	20-220	45th Ave N (Colfax Ave N)	04-Sep-12	Pipe	60	CMP
Shingle Creek	20-230	Webber Pkwy and 43rd Ave N (goes through park to Shingle Creek)	10-Sep-12	Concrete Apron		RCP
Shingle Creek	20-240	Weber Pkwy (Aldrich Ave N)	10-Sep-12	Diffuser		
Shingle Creek	20-250	Lyndale Ave N (S of Creek)	10-Sep-12	Pipe	24	RCP
Shingle Creek	20-260	Lyndale Ave N (N of Creek)	10-Sep-12	Pipe	12	RCP
Shingle Creek	20-270	I- 94 (S of Creek)	10-Sep-12	Pipe	48	RCP
Shingle Creek	20-280	I-94 (E of I-94 at Creek)	10-Sep-12	Concrete Apron	18	RCP
Shingle Creek	20-290	I-94 (N of Creek)	10-Sep-12	Pipe	24	RCP

Body of Water	Outfall_ID	Location	Inspection Date	Structure Type	Outfall Pipe Size	Material Type
Shingle Creek	20-XXX	Shingle Creek (N side of Crk @ rr bridge).	10-Sep-12	CMP Apron	21	CMP
Shingle Creek	20-XXX	47Th & Humboldt bridge (westside)	04-Sep-12	Concrete Apron	18	RCP
Ryan Lake	21-095	49th Ave N and James Ave N (extended)	10-Sep-12	CMP Apron	36	CMP
Basset Creek	40-010	14th Ave N @ Xerxes Ave N	10-Sep-12	Diffuser	96	RCP
Basset Creek	40-010A	Xerxes Ave N (N of Plymoth Ave)	10-Sep-12	Pipe	27	RCP
Basset Creek	40-020	Xerxes Ave N (S of T.H. 55)	11-Sep-12	Concrete Apron	24	RCP
Basset Creek	40-030	Vincent Ave N (N. of T.H. 55)	10-Sep-12	Concrete Apron	36	RCP
Basset Creek	40-040	Upton Ave N (N of T.H.)	10-Sep-12	Concrete Apron	42	RCP
Basset Creek	40-060	100' N of 5th Av N @ Thomas Av N	10-Sep-12	Pipe	18	CPP
Basset Creek	40-070	S of Thomas Av N @ Inglewood St N	11-Sep-12	Pipe	15	CMP
Basset Creek	40-080	Thomas Av N (N of Chestnut Av N)	11-Sep-12	CMP Apron		CMP
Basset Creek	40-080A	Thomas Av N (N of Chestnut Av N)	11-Sep-12			
Basset Creek	40-090	Queen Av N (N of Chestnut Av N)	11-Sep-12	Pipe	54	RCP
Basset Creek	40-100	Queen Av N -S of 2nd Av N	11-Sep-12	Pipe	24	RCP
Basset Creek	40-110	Oliver Av N - S of 2nd Av N	11-Sep-12			
Basset Creek	40-120	Newton Av N (S of Bassett Creek)	11-Sep-12	Pipe	36	HDPE DUAL WALL
Basset Creek	40-130	Morgan Av N (N of Bassett Creek)	11-Sep-12	Concrete Apron	36	RCP
Basset Creek	40-140	Morgan Av N extended (S of Bassett Creek)	11-Sep-12			
Basset Creek	40-150	Irving Av N	11-Sep-12			
Basset Creek	40-400	Bassett Creek outlet to Mississippi River	11-Sep-12	Diffuser		BR
Basset Creek	40-XXX	Girard Ave N	11-Sep-12	Concrete Apron		RCP
Spring Lake	43-030	Kenwood Pkwy and Summit (extended)	11-Sep-12	Concrete Apron	15	RCP
Spring Lake	43-030A		11-Sep-12	Concrete Apron	15	RCP
Brownie Lake	51-010	North edge of Brownie Lake	07-Aug-12	Concrete Apron	36	RCP
Brownie Lake	51-020	Cedar Lake Road - 250' SW of Lake View	07-Aug-12	plastic apron	12	PVC
Brownie Lake	51-030	From St Louis Park--South edge of Brownie Lake	07-Aug-12	Pipe	48	RCP
Brownie Lake	51-040	Westside of lake	07-Aug-12	Concrete Apron	48	RCP
Cedar Lake	52-010X	W '21st St (extended)	25-Jul-12			
Cedar Lake	52-010X	SE corner of Kennelworth bridge	27-Jul-12	Pipe	12	PVC
Cedar Lake	52-020	Burnham Road @ Kenilworth Lagoon	25-Jul-12			
Cedar Lake	52-020	Burnham Road @ Kenilworth Lagoon	27-Jul-12	Pipe	12	CMP
Cedar Lake	52-030	Park Lane - 500' North of Burnham Road	25-Jul-12			
Cedar Lake	52-040	Burnham Road - '100' North of Cedar Lake Pkwy	25-Jul-12			
Cedar Lake	52-050	Cedar Lake Pkwy @ Depot	25-Jul-12			
Cedar Lake	52-060	Cedar Lake Pkwy @ Chowen (extended)	27-Jul-12	Concrete Apron		
Cedar Lake	52-070	Cedar Lake Pkwy @ Drew Ave S (extended)	27-Jul-12	Diffuser		
Cedar Lake	52-080	Cedar Lake Pkwy @ Ewing Av S (extended	27-Jul-12	Diffuser		

Body of Water	Outfall_ID	Location	Inspection Date	Structure Type	Outfall Pipe Size	Material Type
Cedar Lake	52-090	Cedar Lake Pkwy @ at Basswood Road	25-Jul-12			
Cedar Lake	52-100	Cedar Lake Pkwy @ West 24th St	27-Jul-12	Diffuser		
Cedar Lake	52-110	Cedar Lake Pkwy @ West 22nd St	25-Jul-12			
Cedar Lake	52-120	Cedar Lake Pkwy @ West Franklin Av	25-Jul-12			
Lake of the Isles	53-010	Upton Av S @ West 26th St	08-Aug-12			
Lake of the Isles	53-020	West 26th St @ Lake of the Isles Parkway	25-Sep-12	Concrete Apron	24	RCP
Lake of the Isles	53-030	Thomas Av S (Dean Blvd)	24-Sep-12	Pipe	24	RCP
Lake of the Isles	53-040	Lake of the Isles Parkway ('200' E of Russell Av S)	08-Aug-12			
Lake of the Isles	53-040	Lake of the Isles Parkway ('200' E of Russell Av S)	25-Sep-12	Concrete Apron	12	RCP
Lake of the Isles	53-050	Lake of the Isles Parkway (West 24th ST)	25-Sep-12	Concrete Apron	12	
Lake of the Isles	53-060	Lake of the Isles Parkway (Penn Av S)	25-Sep-12	CMP Apron	12	CMP
Lake of the Isles	53-070	Lake of the Isles Parkway (Newton Av S)	08-Aug-12			
Lake of the Isles	53-080	Lake of the Isles Parkway (Oliver Av S)	24-Sep-12	Pipe	24	RCP
Lake of the Isles	53-090	West 21st St @ Lake of the Isles Blvd	24-Sep-12	Pipe	12	RCP
Lake of the Isles	53-100	Lake of the Isles Blvd @Franklin Av	24-Sep-12	Diffuser		
Lake of the Isles	53-110	Lake of the Isles Blvd @Franklin Av	24-Sep-12	Pipe	12	CMP
Lake of the Isles	53-120	Lake of the Isles Pkwy @ West 22nd St	24-Sep-12	Pipe	36	CMP
Lake of the Isles	53-130	Lake of the Isles Pkwy @ West 25th St	24-Sep-12	Pipe	12	RCP
Lake of the Isles	53-140	Lake of the Isles Pkwy @ West 26th St	24-Sep-12	Pipe	15	RCP
Lake of the Isles	53-150	Lake of the Isles Pkwy @ Euclid Place	24-Sep-12	Pipe	84	RCP
Lake of the Isles	53-160	Lake of the Isles Pkwy @ West 27th St	24-Sep-12	Pipe	54	RCP
Lake of the Isles	53-160	Lake of the Isles Pkwy @ West 27th St	24-Sep-12	Pipe	54	
Lake of the Isles	53-170	Lake of the Isles Pkwy @ '250' SW of James Av S	24-Sep-12	Pipe	12	RCP
Lake of the Isles	53-180	Lake of the Isles Pkwy @ '500' W of Lagoon	24-Sep-12	Pipe	12	RCP
Lake of the Isles	53-190	Lake of the Isles Pkwy @ West 28th St	24-Sep-12	Pipe		RCP
Lake Calhoun	54-010	E. Isles Pkwy at The Mall	21-Sep-12			
Lake Calhoun	54-010	W. Calhoun Pkwy & Richfield Rd - Channel Pipe	24-Sep-12	Pipe	36	HDPE Corugatted Dual Wall
Lake Calhoun	54-010	W Calhoun Pkwy & Richfield Rd	24-Sep-12	CMP Apron	18	RCP
Lake Calhoun	54-040	E. Calhoun Pkwy at 33rd St. W	19-Sep-12			
Lake Calhoun	54-040	E. Calhoun Pkwy at 33rd St. W	21-Sep-12	Box Culvert	84	
Lake Calhoun	54-050	E. Calhoun Pkwy at 36th St W.	24-Sep-12	Pipe	21	CMP
Lake Calhoun	54-060	W. Calhoun Pkwy at Sheridan Av S.	24-Sep-12	Diffuser		
Lake Calhoun	54-070	W. Calhoun Pkwy at Vincent Av S	24-Sep-12	Diffuser		
Lake Calhoun	54-080	W. Calhoun Pwky at Xerxes Av S	24-Sep-12	Diffuser		
Lake Calhoun	54-090	W. Calhoun Pwky approx. '250' S. of W 36th St	24-Sep-12	Box Culvert		
Lake Calhoun	54-100	W. Calhoun Pwky at W. 36th St	24-Sep-12	Diffuser		

Body of Water	Outfall_ID	Location	Inspection Date	Structure Type	Outfall Pipe Size	Material Type
Lake Calhoun	54-110	W. Calhoun Pwky at Rose Lane	24-Sep-12	Diffuser		
Lake Calhoun	54-120	W. Calhoun Pwky at Ivy Lane	24-Sep-12	Concrete Apron	24	CMP
Lake Calhoun	54-130	W. Calhoun Pwky approx. '200' N of W 32nd St	24-Sep-12	Diffuser		
Lake Calhoun	54-140	W. Calhoun Pwky at Market Place (extended)	24-Sep-12	Diffuser		
Lake Calhoun	54-150	W. Calhoun Pwky at Calhoun Blvd (extended)	21-Sep-12	Pipe	24	RCP
Cedar Lake	54-170	W. Calhoun Pwky approx. 200' E of Thomas Av S	21-Sep-12	Pipe	14	PVC
Cedar Lake	54-170A	W. Calhoun Pwky approx. 500' E of Thomas Av S	21-Sep-12	Pipe	12	RCP
Lake Calhoun	54-180	W. Calhoun Pwky approx. 500' E of Thomas Av S	21-Sep-12	Pipe	10	PVC
Lake Harriet	56-010A	Bandshell	17-Sep-12	Pipe	24	RCP
Lake Harriet	56-010A	~160' W from 56-010B along Lk Harriet Pkwy	18-Sep-12	Concrete Apron	12	RCP
Lake Harriet	56-010B	~420' W from 56-010C along Lk Harriet Pkwy	18-Sep-12	Concrete Apron	12	RCP
Lake Harriet	56-010C	~170' W from 56-010D along Lk Harriet Pkwy	18-Sep-12	Concrete Apron	12	RCP
Lake Harriet	56-010D	~160' W from 56-010E along Lk Harriet Pkwy	18-Sep-12	Diffuser	12	RCP
Lake Harriet	56-010E	~170' W from 56-010F along Lk Harriet Pkwy	18-Sep-12	Concrete Apron	12	RCP
Lake Harriet	56-010F	~820' NW from 56-010G along Lk Harriet Pkwy	18-Sep-12			
Lake Harriet	56-010F	~820' NW from 56-010G along Lk Harriet Pkwy	18-Sep-12	Concrete Apron	12	RCP
Lake Harriet	56-010G	~250' NW from Lake Harriet Pkwy and Roseway Rd along Lk Harriet Pkwy	17-Sep-12	Concrete Apron	12	RCP
Lake Harriet	57-010	E. Harriet Pwky at 43rd St	17-Sep-12	Diffuser		
Lake Harriet	57-020	E. Harriet Pwky at 44th St	17-Sep-12	Box Culvert		CONC
Lake Harriet	57-030	E. Harriet Pwky at Kings Highway	18-Sep-12	Diffuser		
Lake Harriet	57-040	E. Harriet Pwky at W 47th St	18-Sep-12	Diffuser		
Lake Harriet	57-050	Harriet Pwky at Morgan Av S	18-Sep-12			
Lake Harriet	57-060	Harriet Pwky at Oliver Ave S.	18-Sep-12	Diffuser		RCP
Lake Harriet	57-070	W. Harriet Pwky @ Queen Av S	18-Sep-12	Diffuser		
Lake Harriet	57-080	W. Harriet Pwky @ Russel Av S	18-Sep-12	Pipe	12	PVC
Lake Harriet	57-090	W. Harriet Pwky @ Thomas Av S	18-Sep-12	Pipe	48	Hobas Liner
Lake Harriet	57-090A	80' North of W. Harriet Pwky @ Thomas Av S	18-Sep-12			
Lake Harriet	57-100	W. Harriet Pwky @ W. 47th St	18-Sep-12	Box Culvert	60	RCP
Lake Harriet	57-110	W. Harriet Pwky @ W.46th St (extended)	18-Sep-12			
Lake Harriet	57-120	W. Harriet Pwky @ W. 44th St.	18-Sep-12	Concrete Apron	36	RCP
Lake Harriet	57-130	W. Harriet Pwky @ approx. 400' N of W 44th St	18-Sep-12			
Lake Harriet	57-140	W. Harriet Pwky @ approx. 500' S W 42nd St	17-Sep-12	Diffuser		
Lake Harriet	57-160	Lake Harriet Pkwy approx. 50' N of W 42nd St	17-Sep-12			
Diamond Lake Area	64-100	Columbus Av S (extended) 200' S of E 61st St	02-Oct-12			
Diamond Lake Area	64-110	Elliot Av S (extended) S side of Hwy 62	02-Oct-12			
Diamond Lake Area	64-120	Oakland Av S (extended) @ 50' N of Hwy 62	02-Oct-12			
Diamond Lake Area	64-130	Park Av S 300' E of Portland Av (at curve)	02-Oct-12			

Body of Water	Outfall_ID	Location	Inspection Date	Structure Type	Outfall Pipe Size	Material Type
Minnehaha Creek 1	70 -080A	Penn ave 100' East of Bridge	13-Sep-12	Pipe	12	RCP
Minnehaha Creek 1	70 -180	W M 'haha Pkwy 400' S of W 50th St (Lk Harriet Overflow)	14-Sep-12	Concrete Apron	40	RCP
Minnehaha Creek 1	70 -180A	W 50th St & M'Haha Pkwy 100' North	14-Sep-12	Concrete Apron	40	RCP
Minnehaha Creek 1	70 -181	Culvert Under Bike Path (W 50th St & M'haha Pkwy 150' N)	14-Sep-12	Concrete Apron	48	RCP
Minnehaha Creek 1	70 -220	Dupont Av S @ W M' haha Pkwy (south bank)	18-Oct-12	Pipe	12	CP
Minnehaha Creek 1	70 -235	Bryant Av S @ W M' haha Pkwy (north bank)	18-Oct-12	Pipe	8	DIP
Minnehaha Creek 1	70 -240	Bryant Av S @ W M' haha Pkwy (south bank)	18-Oct-12	CMP Apron	24	CMP
Minnehaha Creek 1	70 -265A	W 54th St & Xerxes Ave S NE corner of bridge	13-Sep-12	Sluiceway		CONC
Minnehaha Creek 1	70 -265A	N Bank between Washburn & Vincent	13-Sep-12	Pipe	10	CMP
Minnehaha Creek 1	70 -265A	W 54th St & Xerxea Ave S SE corner of bridge	13-Sep-12	Pipe	15	CP
Minnehaha Creek 1	70 -265A	W 54th St & Xerxes Ave s NW corner bridge	13-Sep-12	Sluiceway		CONC
Minnehaha Creek 1	70-015	W 54th St 150' E of Zenith Av S	13-Sep-12	Diffuser		RCP
Minnehaha Creek 1	70-020	York Av S @ W 54th St (extended)	13-Sep-12	Sluiceway		CONC
Minnehaha Creek 1	70-025	Xerxes Av S @ 54th St	13-Sep-12	Pipe	15	CMP
Minnehaha Creek 1	70-030	Washburn Av S @ N Bank of Creek	13-Sep-12	Sluiceway	20	CMP
Minnehaha Creek 1	70-035	Washburn Av S @ S Bank of Creek	13-Sep-12	Pipe	15	PVC
Minnehaha Creek 1	70-040	Vincent Av S @ W 54th St	13-Sep-12	Pipe	12	RCP
Minnehaha Creek 1	70-045	W 54th St 50' W of Upton Av S	13-Sep-12			
Minnehaha Creek 1	70-050	Upton Av S - N Bank of Creek	13-Sep-12	Pipe		
Minnehaha Creek 1	70-055	W 54th St 250' E of Upton Av S	13-Sep-12	Diffuser		CONC
Minnehaha Creek 1	70-060	Forest Dale Rd 250' E of Upton Av S	13-Sep-12	Diffuser	24	CMP
Minnehaha Creek 1	70-065	Forest Dale Rd 750' E of Upton Av S	13-Sep-12	Concrete Apron	24	CMP
Minnehaha Creek 1	70-070	Forest Dale Rd @ Sheridan Av S (extended)	13-Sep-12	Pipe	12	PVC
Minnehaha Creek 1	70-075	Queen Av S @ W 53rd St S	13-Sep-12			
Minnehaha Creek 1	70-080	Penn Av S - S Bank of Creek	13-Sep-12	Concrete Apron	18	RCP
Minnehaha Creek 1	70-085	Morgan Av S 300' N of 53rd St	14-Sep-12	Diffuser		Precast Conc
Minnehaha Creek 1	70-090	W 52nd St - W Bank of Creek	14-Sep-12	Sluiceway	18	RCP
Minnehaha Creek 1	70-095	W 52nd St -E Bank of Creek	14-Sep-12			
Minnehaha Creek 1	70-100	300' SE of Newton Av S @ W 51st St	14-Sep-12	Pipe	12	RCP
Minnehaha Creek 1	70-105	Morgan Av S '500' N of W 52nd St	14-Sep-12	Concrete Apron	18	RCP
Minnehaha Creek 1	70-110	Morgan Av S @ 51st St	14-Sep-12			
Minnehaha Creek 1	70-130	James Av S @ N Bank of Creek	14-Sep-12	Diffuser		Precast Conc
Minnehaha Creek 1	70-150	W 49th St @ Humboldt Av S (vacated)	14-Sep-12	Pump Station		
Minnehaha Creek 1	70-155	Humboldt Av S '50' N of W 49th St	14-Sep-12	Diffuser		
Minnehaha Creek 1	70-165	W 48th St @ Humboldt Av S	17-Sep-12	Diffuser		CONC
Minnehaha Creek 1	70-170	W 49th St @ W M'haha Pkwy	14-Sep-12	Diffuser		RCP
Minnehaha Creek 1	70-180	W M 'haha Pkwy 400' S of W 50th St	18-Sep-12	Diffuser		

Source: Minneapolis Public Works - SWS Operations

Body of Water	Outfall_ID	Location	Inspection Date	Structure Type	Outfall Pipe Size	Material Type
Minnehaha Creek 1	70-185	W 51st St @ Humboldt Av S	18-Sep-12	Pipe	15	RCP
Minnehaha Creek 1	70-190	Humboldt Av S @ W M ' haha Pkwy (west bank)	18-Sep-12	Pipe	24	HDPE Dual wall
Minnehaha Creek 1	70-190	Humboldt Av S @ W M ' haha Pkwy (west bank)	17-Sep-12	Pipe	12	RCP
Minnehaha Creek 1	70-195A		18-Sep-12	Pipe	24	CMP
Minnehaha Creek 1	70-200	Girard Av S @ W M' haha Pkwy	18-Sep-12	Diffuser		
Minnehaha Creek 1	70-205	W M 'haha Pkwy 250' W of Emerson Av S (east bank)	15-Oct-12			
Minnehaha Creek 1	70-225	Dupont Av S @ W M' haha Pkwy (northbank)	18-Oct-12	Diffuser	24	RCP
Minnehaha Creek 2	70-245	Aldrich Av S @ W M"haha Pkwy (north bank)	18-Oct-12			
Minnehaha Creek 2	70-245	E M' haha Pkwy 1/2 mi. E of Longfellow Av (w bank)	21-Nov-12	Pipe	18	RCP
Minnehaha Creek 2	70-245	E M' haha Pkwy 1/2 mi. E of Longfellow Av (e bank)	21-Nov-12	Pipe	18	RCP
Minnehaha Creek 2	70-245	47th St E (extended) 1/2 mi. E Longfellow Av	21-Nov-12	Pipe	42	RCP
Minnehaha Creek 2	70-245	28th Av S @ W 47th St (s bank)	21-Nov-12	Pipe	15	PVC
Minnehaha Creek 2	70-250	Lyndale Av S @ W M ' haha Pkwy (south bank)	18-Oct-12			
Minnehaha Creek 2	70-255	Harriet Av S @ W M' haha Pkwy (north bank)	18-Oct-12	Diffuser	48	RCP
Minnehaha Creek 2	70-260	Gladstone Av S (ext) @ W M haha Pkwy (north bank)	18-Oct-12	Pipe	24	CMP
Minnehaha Creek 2	70-265A	Pleasant Av S @ W M'haha Pkwy (south bank)	22-Oct-12	Diffuser	24	CMP
Minnehaha Creek 2	70-265A	Pleasant Av S @ W M'haha Pkwy (south bank)	24-Oct-12	Diffuser		
Minnehaha Creek 2	70-265B	Pleasant Av S @ W M'haha Pkwy (south bank)	18-Oct-12			
Minnehaha Creek 2	70-270	Pratt St and M'haha Pkwy (extends to n bank)	24-Oct-12	Diffuser	60	RCP
Minnehaha Creek 2	70-275	W M 'haha Pkwy 250' W of Nicollet Ave S (east bank)	22-Oct-12	Diffuser	49	RCP
Minnehaha Creek 2	70-280	W M' haha Pkwy 300' S of Valley View (north bank)	24-Oct-12	Diffuser	18	RCP
Minnehaha Creek 2	70-280A	Under Nicollet ave bridge (N bank)	24-Oct-12	Pipe	36	RCP
Minnehaha Creek 2	70-285	W M 'haha Pkwy 250' W of Nicollet Ave S (east bank)	24-Oct-12	Diffuser		
Minnehaha Creek 2	70-300	E M ' haha Pkwy 50' W of Stevens Av S (south bank)	22-Oct-12	Diffuser		
Minnehaha Creek 2	70-300	E M ' haha Pkwy 50' E of Stevens Av S (south bank)	24-Oct-12	Diffuser		
Minnehaha Creek 2	70-305	E M ' haha Pkwy at Luverne Av S (north bank)	24-Oct-12	Concrete Apron		
Minnehaha Creek 2	70-310	E M ' haha Pkwy at 3rd Av S (north bank)	24-Oct-12	Diffuser		
Minnehaha Creek 2	70-315	E M ' haha Pkwy at 200' W of Tarrymore Av S (S bank)	24-Oct-12	Diffuser		
Minnehaha Creek 2	70-320	E M ' haha Pkwy at E 50th St (north Bank)	24-Oct-12	Diffuser		
Minnehaha Creek 2	70-325	E M ' haha Pkwy at E 50th St (south Bank)	24-Oct-12	Pipe	12	RCP
Minnehaha Creek 2	70-330	E M ' haha Pkwy at 5th Av S (north bank)	30-Oct-12	Pipe	48	Conc
Minnehaha Creek 2	70-335	E M ' haha Pkwy at 100' W of Portland Av S (s bank)	30-Oct-12	Diffuser		
Minnehaha Creek 2	70-340	E M ' haha Pkwy at Portland Av S (s bank)	30-Oct-12	Diffuser		
Minnehaha Creek 2	70-345	E M ' haha Pkwy at Oakland Av S (n bank)	30-Oct-12	Diffuser	60	RCP
Minnehaha Creek 2	70-350	E M ' haha Pkwy at Oakland Av S (s bank)	30-Oct-12	Pipe	18	CMP
Minnehaha Creek 2	70-360	E M ' haha Pkwy at Park Av S (s bank)	30-Oct-12	Pipe	48	RCP

Body of Water	Outfall_ID	Location	Inspection Date	Structure Type	Outfall Pipe Size	Material Type
Minnehaha Creek 2	70-365	E M ' haha Pkwy at Columbus Av S (s bank)	30-Oct-12	Pipe	12	RCP
Minnehaha Creek 2	70-370	E M ' haha Pkwy at Chicago Av S (n bank)	30-Oct-12	Diffuser		
Minnehaha Creek 2	70-375	E M ' haha Pkwy at Chicago Av S (s bank)	30-Oct-12	Concrete Apron	12	RCP
Minnehaha Creek 2	70-380	E M' haha Pkwy at 11th Av S (s bank)	31-Oct-12	Concrete Apron	24	RCP
Minnehaha Creek 2	70-385	E M ' haha Pkwy 150 ' W of 11th Av S (n bank)	31-Oct-12	Diffuser		
Minnehaha Creek 2	70-390	E M' haha Pkwy at 12th Av S (s bank)	31-Oct-12	Concrete Apron	24	RCP
Minnehaha Creek 2	70-395	E M' haha Pkwy at 12th Av S (n bank)	31-Oct-12	Diffuser		
Minnehaha Creek 2	70-400	E 50th St at 13th Av S (s bank)	31-Oct-12	Concrete Apron	12	RCP
Minnehaha Creek 2	70-405	E 50th St at Bloomington Av S (south bank)	31-Oct-12	Pipe	11	PVC
Minnehaha Creek 2	70-410	E 49th St at 16th Av S (south bank)	31-Oct-12	Pipe	12	RCP
Minnehaha Creek 2	70-415	E M' haha Pkwy at 16th Av S (north bank)	31-Oct-12	Box Culvert		
Minnehaha Creek 2	70-420	E M' haha Pkwy at 18th Av S (south bank)	31-Oct-12	HDPE APRON	24	
Minnehaha Creek 2	70-425	E M' haha Pkwy at Cedar Av S (north bank)	31-Oct-12	Concrete Apron	36	RCP
Minnehaha Creek 2	70-450	28th Av S 500' S of 46th St E (n bank)	21-Nov-12			
Minnehaha Creek 2	70-455	29th Av S 500' N E M' haha Pkwy (s bank)	21-Nov-12	Pipe	12	PVC
Minnehaha Creek 2	70-460	29th Av S 500' S of 46th St E (n bank)	21-Nov-12			
Minnehaha Creek 2	70-460	29th Av S 500' S of 46th St E (n bank)	21-Nov-12			
Minnehaha Creek 2	70-465	30th Av S 500' N of E M ' haha Pkwy (s bank)	21-Nov-12	Pipe	10	PVC
Minnehaha Creek 2	70-470	30th Av S 500' S of E 46th St (n bank)	21-Nov-12	Pipe	8	PVC
Minnehaha Creek 2	70-470	30th Av S 500' S of E 46th St (n bank)	21-Nov-12	Diffuser		
Minnehaha Creek 2	70-470	30th Av S 500' S of E 46th St (n bank)	21-Nov-12	Pipe	16	CMP
Minnehaha Creek 2	70-470A	30th Av S 500' S of E 46th St (n bank)	21-Nov-12	Pipe	12	RCP
Minnehaha Creek 2	70-475	Nokomis Av 200' S of 46th St (n bank)	01-Oct-12	Concrete Apron	60	RCP
Minnehaha Creek 2	70-480	31st Av S @ E 46th St (n bank)	21-Nov-12	Pipe	12	PVC
Minnehaha Creek 2	70-485	E 31st St 600' N of 47th St (s bank)	21-Nov-12			
Diamond Lake Area	71-010	Portland Av S 250' S of Diamond Lake Rd	02-Oct-12	Pipe	30	RCP
Diamond Lake Area	71-020	E 55th St @ Portland Av S	02-Oct-12	Sluiceway	24	CMP
Diamond Lake Area	71-030	E 56th St @ Park Av S	02-Oct-12	Concrete Apron	24	RCP
Diamond Lake Area	71-040	E 57th St @ Portland Av S	25-Sep-12	CMP Apron	30	CMP
Diamond Lake Area	71-050	E 58th St @ Portland Av S	25-Sep-12	CMP Apron	54	HDPE
Diamond Lake Area	71-060	Diamond Lake Lane @ E 59th St	25-Sep-12	Pipe	12	PVC
Diamond Lake Area	71-070	E 58th St & Clinton Av S	25-Sep-12	CMP Apron	54	CMP
Diamond Lake Area	71-070A	E 58th St & Clinton Av S	25-Sep-12	CMP Apron	78	CMP
Diamond Lake Area	71-080	E Diamond Lake Road @ Clinton Av S	02-Oct-12	Box Culvert		Concc
Diamond Lake Area	71-090	Hampshire Drive @ E Diamond Lake Rd	02-Oct-12			
Diamond Lake Area	71-100	Diamond Lake Rd 250' E of Hampshire Drive	02-Oct-12			

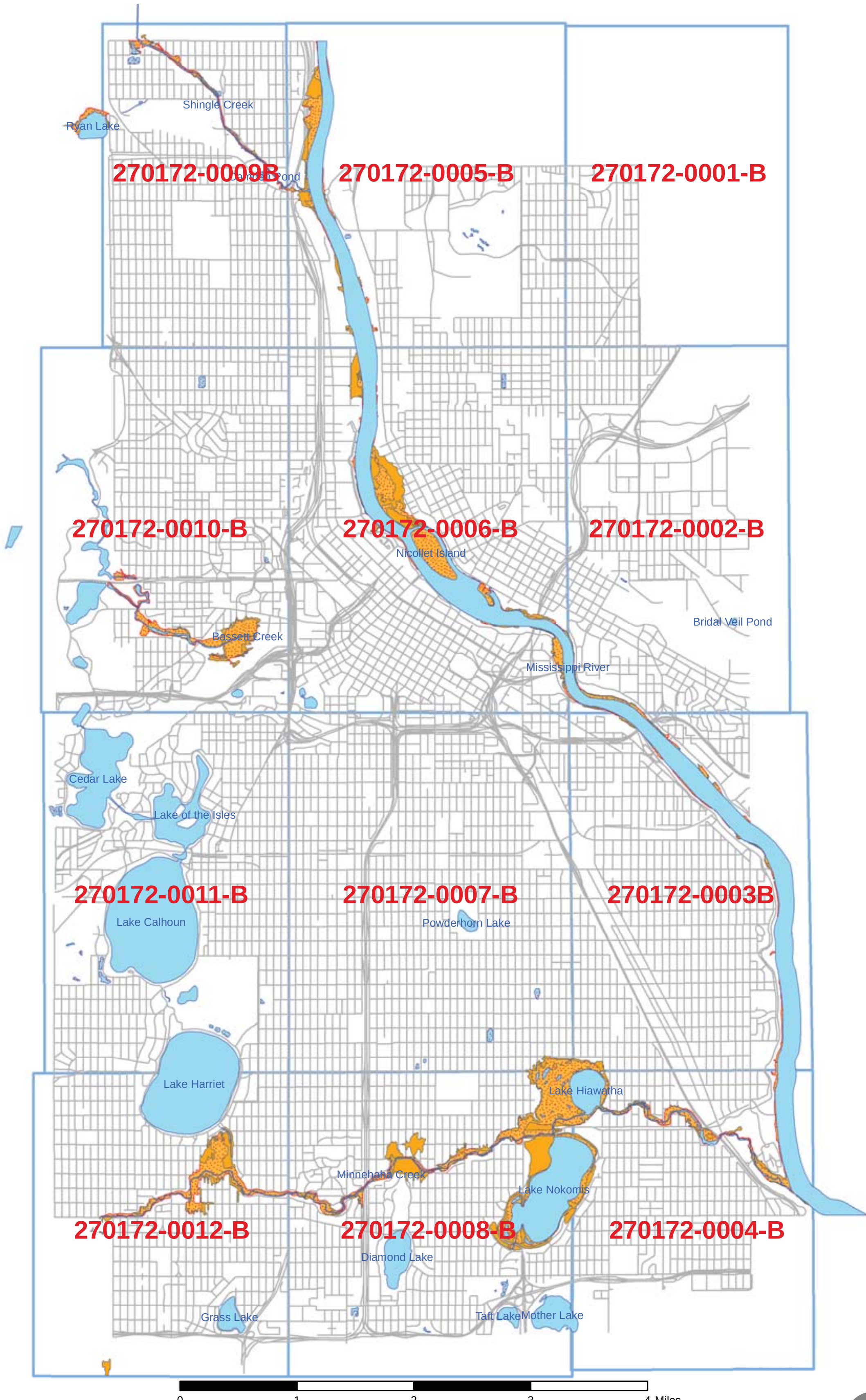
Body of Water	Outfall_ID	Location	Inspection Date	Structure Type	Outfall Pipe Siz	Material Type
Lake Nokomis	72-010	Nokomis Pkwy at Parking Lot on North Shore	26-Jul-12	Diffuser	18	RCP
Lake Nokomis	72-020	E Nokomis Pkwy approx. 100' N of 50th St	26-Jul-12			
Lake Nokomis	72-030	E Nokomis Pkwy approx 200 N of 52nd St	26-Jul-12	Diffuser		
Lake Nokomis	72-040	E Nokomis Pkwy @ E 53rd St	26-Jul-12	Pipe	24	RCP
Lake Nokomis	72-050	E Nokomis Pkwy @ 54th St (extended)	26-Jul-12			
Lake Nokomis	72-060	E Nokomis Pkwy E 56th St	26-Jul-12			
Lake Nokomis	72-070	Cedar Av S 500' N of Nokomis Pkwy	27-Jul-12			
Lake Nokomis	72-120	E Nokomis Pkwy at 54th St	27-Jul-12			
Lake Nokomis	72-130	Cedar Av S at E 52nd St	27-Jul-12	Pipe	24	HDPE
Lake Nokomis	72-140	E Nokomis Pkwy at Parking Lot on NW Shore	26-Jul-12			
Lake Nokomis	72-150	Nokomis Pkwy at Parking Lot on N Shore	26-Jul-12	Diffuser		
Lake Nokomis	72-160	W Nokomis Pkwy 500' S of Minnehaha Creek	26-Jul-12	Diffuser		
Taft Lake	73-010	59 1/2 St E at 26th Ave S	02-Oct-12	Pipe	48	CMP
Taft Lake	73-020	E 61st St @ Bloomington Av S	02-Oct-12	Pipe	48	CMP
Taft Lake	73-030	North Shore of Taft Lake	02-Oct-12	CMP Apron		CMP
Mother Lake	74-010	Hwy 62 at NW Shore of Mother Lake	02-Oct-12			
Mother Lake	74-020	59 1/2 St E at 26th Ave S	02-Oct-12	CMP Apron	18	CMP
Lake Nokomis overflow Pond	75-020	E 60th St 50' W of 15th Av S	02-Oct-12	CMP Apron	10	PVC
Lake Nokomis overflow Pond	75-030	14th Av S @ E 59th St	02-Oct-12	Pipe	12	CMP
Lake Nokomis overflow Pond	75-040	E 59th St @ 12th Av S	02-Oct-12	CMP Apron	36	Corrugatrd HDPE
Lake Hiawatha	76-010	27th Av S @ E44th St	26-Jul-12	Diffuser		
Lake Hiawatha	76-020	E 45th St @ 28th Av S	26-Jul-12			
Lake Hiawatha	76-030	E 44th St @ 27th Av S	25-Jul-12			
Lake Hiawatha	76-030	E 44th St @ 27th Av S	26-Jul-12	Pipe	12	CMP
Lake Hiawatha	76-040	E 46th St @ 28th Av S	26-Jul-12			
Powderhorn Lake	82-010A		27-Jul-12	Concrete Apron	18	RCP
Powderhorn Lake	82-020	15th Av S 300' S of E 34th St	27-Jul-12			
Powderhorn Lake	82-030	E 35th St @ 13th Av S	27-Jul-12			
Powderhorn Lake	82-040	10th Av S 200' S of E 33rd St	27-Jul-12	Concrete Apron		
Grass Lake	83-010	Girard Av S @ W 60th St (15' N of Barricade)	25-Sep-12	HDPE APRON	12	HDPE DUAL WALL
Grass Lake	83-010	W 59th St (extended) @ Grass Lake Terrace -in front of hse # 5962	25-Sep-12	Concrete Apron	24	RCP
Grass Lake	83-010	W Grass Lake Terr. @ W shore of Grass Lake - in front of hse # 6035	25-Sep-12	HDPE APRON	12	HDPE DUAL WALL
Grass Lake	83-010	W Grass Lake Terr. @ SW corner of Grass Lake	25-Sep-12	HDPE APRON	12	HDPE DUAL WALL
Grass Lake	83-012	100 ft nw of 83-010 along shore line	25-Sep-12	HDPE APRON	12	HDPE DUAL WALL

Body of Water	Outfall_ID	Location	Inspection Date	Structure Type	Outfall Pipe Size	Material Type
Grass Lake	83-015	S Shore of Grass Lake @ Grass Lake Terrace	25-Sep-12	HDPE APRON	12	HDPE DUAL WALL
Grass Lake	83-020	Road btwn W 61st St & Grass Lake Terrace	25-Sep-12	Sluiceway		Conc
Grass Lake	83-025	Road btwn W 61st St & Grass Lake Terrace	25-Sep-12	Concrete Apron	48	RCP
Grass Lake	83-060	Girard Av S 250' S Grass Lake Terrace	25-Sep-12	Concrete Apron	24	RCP
Grass Lake	83-080	Girard Av S 250' N of Dupont Av S	25-Sep-12	Concrete Apron	60	RCP
Lake of the Isles	f		24-Sep-12	Pipe	12	RCP
Minnehaha Creek 1	Unknown		18-Oct-12	Pipe	8	CP
Minnehaha Creek 1	Unknown		18-Oct-12			
Minnehaha Creek 2	Unknown	20' s of Bridge over M'haha Crk -200' E of Portland	30-Oct-12	Pipe	12	RCP
Minnehaha Creek 2	Unknown	16th Ave S (N bank)	31-Oct-12	Pipe	12	VCP
Minnehaha Creek 2	Unknown	16th Ave ped bridge (N bank)	31-Oct-12	Pipe	10	PVC

Source: Minneapolis Public Works - SWS Operations

Appendix B

2008 F.E.M.A. DESIGNATED FLOOD ZONES



EFFECTIVE DATE FOR MAP PANEL 270172-0010-B IS DECEMBER 12, 2002
EFFECTIVE DATE FOR ALL OTHER MAP PANELS IS FEBRUARY 18, 1981

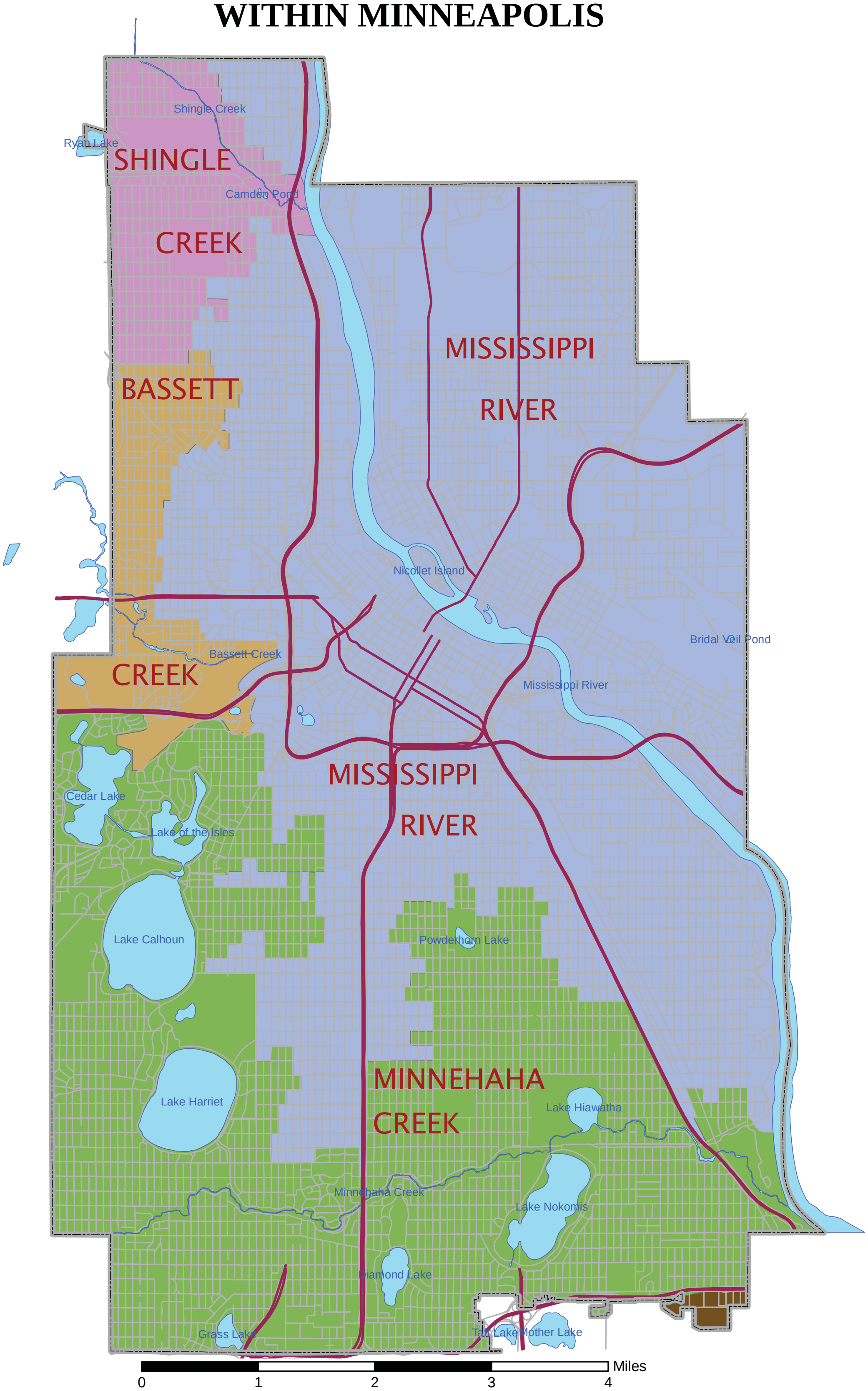
March, 2008

Map Panels
100 Year Flood Zone
500 Year Flood Zone

MINNEAPOLIS PUBLIC WORKS
SURFACE WATER & SEWERS DIVISION

This Map was created from the City of Minneapolis Public Work's Geographic Information System (GIS), it is a compilation of information and data from various sources. This Map is not a surveyed or legally recorded document and is intended to be used as a reference. The City of Minneapolis and its Public Works Department is not responsible for any inaccuracies contained herein or any consequences resulting from the user's use of or reliance on this GIS data.

WATERSHED MANAGEMENT BOUNDARIES WITHIN MINNEAPOLIS



- Lakes & Streams
- Bassett Creek Water Management Commission
- Minneapolis/St. Paul International Airport
- Minnehaha Creek Watershed District
- Mississippi Watershed Management Organization
- Shingle Creek Watershed Management Commission

MINNEAPOLIS PUBLIC WORKS
SURFACE WATER & SEWERS DIVISION

March, 2008

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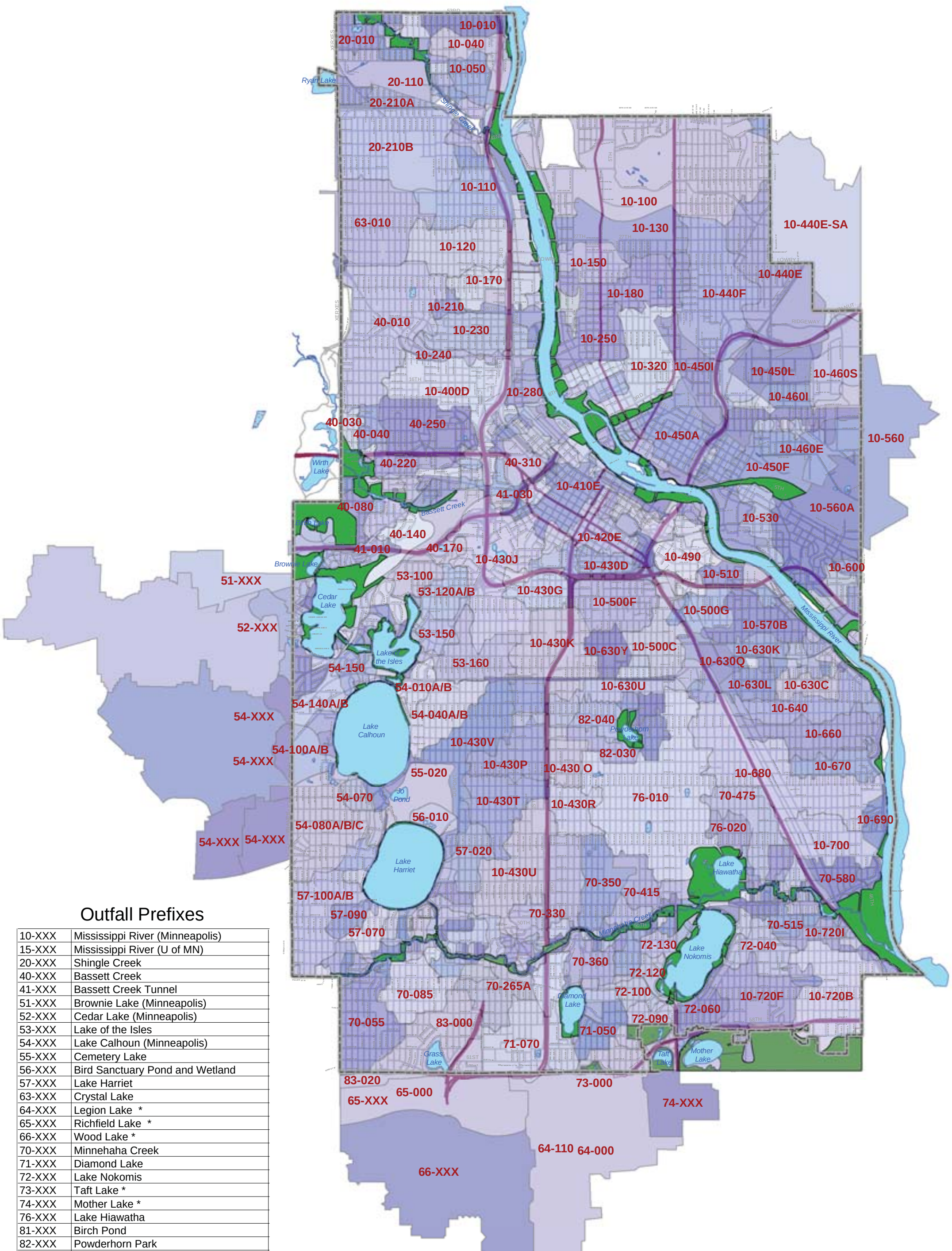
MINNEAPOLIS STORMWATER RUNOFF DRAINAGE SUB-AREA BOUNDARIES



Outfall Prefixes

10-XXX	Mississippi River (Minneapolis)
15-XXX	Mississippi River (U of MN)
20-XXX	Shingle Creek
40-XXX	Bassett Creek
41-XXX	Bassett Creek Tunnel
51-XXX	Brownie Lake (Minneapolis)
52-XXX	Cedar Lake (Minneapolis)
53-XXX	Lake of the Isles
54-XXX	Lake Calhoun (Minneapolis)
55-XXX	Cemetery Lake
56-XXX	Bird Sanctuary Pond and Wetland
57-XXX	Lake Harriet
63-XXX	Crystal Lake
64-XXX	Legion Lake *
65-XXX	Richfield Lake *
66-XXX	Wood Lake *
70-XXX	Minnehaha Creek
71-XXX	Diamond Lake
72-XXX	Lake Nokomis
73-XXX	Taft Lake *
74-XXX	Mother Lake *
76-XXX	Lake Hiawatha
81-XXX	Birch Pond
82-XXX	Powderhorn Park
83-XXX	Grass Lake
* Drainage from Richfield	

Miles 0 1 2 3 4

March, 2008

MINNEAPOLIS PUBLIC WORKS
SURFACE WATER & SEWERS DIVISION

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Appendix C

Appendix C: Public Comment

History

The Minneapolis stormwater management program endeavors to improve the water quality of Minneapolis lakes, streams, wetlands, rivers, and other surface waters, with the ultimate goal of preservation and enhancement of our natural and historic environment, while concurrently fulfilling regulatory requirements. The National Pollutant Discharge Elimination System (NPDES) is a program created in 1990 by the United States Environmental Protection Agency (EPA) to protect water quality through the regulating of discharges of pollutants to lakes, streams, wetlands and other surface waters. The Minnesota Pollution Control Agency (MPCA) is the Minnesota authority that is responsible for administering this program. Under this program, specific permits are issued in an effort to regulate municipal and industrial activities. The City of Minneapolis maintains two distinct NPDES permits:

- ***The Combined Sewer Overflow (CSO) permit***, which regulates combined storm and wastewater discharges from the sanitary sewer system (joint permittee with Metropolitan Council Environmental Services)
- The ***Municipal Separate Storm Sewer System (MS4) permit***, which regulates stormwater runoff discharges from the storm drain system (joint permittee with Minneapolis Park & Recreation Board).

Requirements for Annual Reporting, Public Comment, and Council Action

This Annual Report fulfills the requirement for documentation and analysis of the activities conducted in the previous year, 2012. It is a coordinated effort by various City departments, as well as the MPRB. The MPCA issued an NPDES MS4 Permit (MN0061018) to the City of Minneapolis and the Minneapolis Park & Recreation Board (MPRB) on December 1, 2000. The permit was re-issued on January 21, 2011. The 2011 permit required developing a new Stormwater Management Program, which was submitted to the MPCA for review and approval on September 28, 2011. It was revised in March 2013, and can be found at the following web site:

http://www.ci.minneapolis.mn.us/publicworks/stormwater/stormwater_npdesannualreportdocuments

The Permit also requires an opportunity for public input into the development of the priorities and programs necessary for compliance, and also requires the adoption of the Report through a formal Resolution. A Public Hearing notice was sent to interested parties, environmental groups, related governmental entities, and all Minneapolis neighborhood groups. A Public Hearing notice was also posted in Finance and Commerce. A summary of the public's input and the City's response to the comments along with the formal Resolution are required to be included with the Annual Report submittal. The public hearing was held on Tuesday, June 18, 2013. No testimony or questions were presented. Written comments were accepted until Friday, June 21, 2013. No written comments were submitted.