Appendix E: Water Resources

Overview

Minnesota law requires all municipalities to develop three chapters that constitute their water resources management plan:

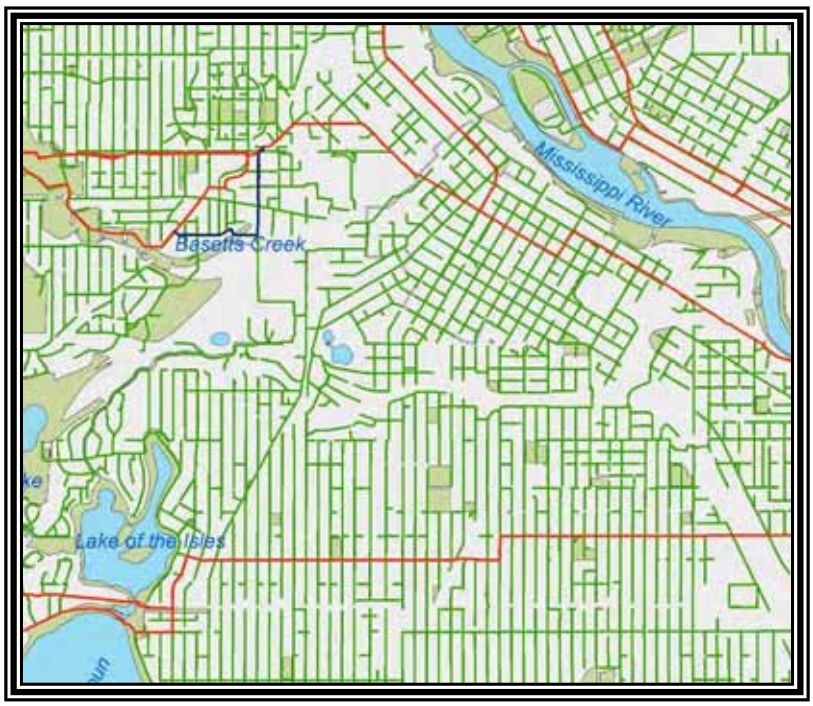
- A wastewater and comprehensive sewer plan that specifies areas to be sewered by the public system, sets standards of operation for private systems and identifies areas that are not suitable for public or private systems.

- A surface water management plan that protects water quality and addresses water quantity issues.

- A water supply plan that ensures a safe and sufficient water supply now and in the future.

Copies of these three plans are included here. These plans are incorporated as part of the City's comprehensive plans, and their content addresses the state and Metropolitan Council requirements for this topic.

City of Minneapolis
Sanitary Sewer Plan
2008



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August 2008

Prepared for submission to the Metropolitan Council as part of
The Minneapolis Plan for Sustainable Growth

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Background

The sanitary sewer system within the City of Minneapolis is 852 miles in length. Of those, 777.2 miles of sewers belong to the City while 74.8 miles are owned by Metropolitan Council Environmental Services (MCES). See **Figure 1** for map of overall system. The oldest sewers on record were constructed in 1870, along Washington Avenue through downtown. Sewers were constructed as the City expanded and reached its current geographic extent in the 1930s. Because the City is fully developed, new additions to the sanitary sewer system have been rare in recent decades.

The oldest sewers are brick or non-reinforced cement construction. Brick was used for larger sewers, usually 24 to 96 inches in diameter and were usually egg-shaped with the smaller section at the bottom to convey sanitary flows. The larger section at the top was reserve capacity for the larger flows experienced during rainstorms. The cement sewers were generally smaller than the brick sewers, 12 to 24 inches in diameter, and oval in shape. The oval shape served the same purpose as the egg shape. The brick and cement sewers are still in operation today.

In approximately 1896, the City abandoned the use of cement pipe construction and started using clay pipe for new construction. Clay is still the preferred material for sanitary sewer construction. For larger sewers, brick construction was abandoned in approximately 1930 and replaced with concrete. The following information is a summary of materials that exist in the Minneapolis sanitary sewer system:

Material	Range in Size	Years of Construction	% of System
Clay	8” to 36”	1880 to 1996	80%
Brick	24” to 96”	1870 to 1930	10%
Cement	12” to 24”	1882 to 1884	3%
Concrete	12” to 102”	1927 to 1996	4%
Other	6” to 30”	1931 to 1996	3%

In 1922, in the developing areas of the City, the Sewer Department began construction of a storm drain system that was separate from the sanitary sewers. Except in these newer areas, the older sanitary sewers continued to serve as combined sewers until 1960, when the City began actively constructing storm drains in areas served by combined sewers.

Capacity

As explained above, most of the City’s sanitary sewers were constructed as combined sewers and therefore were designed with the extra capacity needed to convey both sewage and stormwater. Removal of the stormwater from the sanitary sewers has created extra capacity in the sanitary system that is available for growth. However, there are a small number of sanitary sewers that are in need of reconstruction to increase the flow capacity.

Service Connections

There are 97,446 sanitary sewer accounts within the City of Minneapolis representing approximately 97,600 connections to the system. As Minneapolis is a fully developed urban area, most new growth will occur as redevelopment of existing properties and therefore a significant change in the total number of connections is not anticipated.

Sewer Availability
The South East Minneapolis Industrial area, also referred to as University Research Park and as part of the Biosciences Zone, is the only major area of Minneapolis that was never served with sanitary sewers. Construction of a sanitary collection system was discussed as part of the proposed SEMI Master Plan for the area. Funding of this system, and how it will be constructed, is yet to be determined.

Individual Sewage Treatment Systems Management
There are no known Individual Sewage Treatment Systems (ISTS), including septic systems, privy vaults or cesspools, operating within the City. The Minneapolis Code of Ordinances Chapter 101 prohibits the use of such systems where public sewers are available, and Chapter 511 prohibits the construction of such systems for new buildings. Although there are no known sites, the City transferred authority to Hennepin County to regulate ISTS locations within the City, if any should be found to exist. Hennepin County Environmental Health provides septic inspection and enforcement programs under the authority of Hennepin County Ordinance No. 19. This ordinance adopts Minnesota Rules Chapter 7080 governing ISTS and went into effect January 1, 2000.

Sanitary Pumping Stations
Only 10 sanitary pumping stations exist within the City. The majority of the wastewater flows by gravity to the MCES interceptors. See **Figure 2** for map of connections to MCES interceptor sewers.

II. Combined Sewer Separation and Inflow & Infiltration Reduction Program

Combined Sewer Separation History In Minneapolis
From the late 1800s through the early 1920s all sewers in Minneapolis were constructed as a combined system, designed to carry both sewage and stormwater. In 1922, construction started for a separate storm drain system around Minneapolis lakes, as well as in newly developing areas of the City. Older areas continued to be served by combined sewers. Sewer separation began in earnest in the 1960s, in conjunction with a Citywide paving program.

In 1986, the City began an accelerated sewer separation program called Minneapolis Combined Sewer Overflow Program - Phase I. Combined Sewer Overflows (CSOs), wherein a combination of raw sewage mixed with stormwater from major rain events discharged directly to the Mississippi River, were greatly reduced by Phase I efforts. Phase I was supported in part by federal and state funds and was responsible for disconnecting storm infrastructure that contributed more than 4,600 acres of surface area to Minneapolis sanitary sewers.

The Minneapolis Combined Sewer Overflow Program – Phase II was developed in 2002, based on a 1999/2000 comprehensive planning process and an April 2002 study entitled Combined Sewer Separation Elimination that identified inflow, rather than infiltration, as the major contributor to CSOs (the terms “inflow” and “infiltration” are described on the following page).

The 2002 study (in its Table ES-4) recommended that Minneapolis:

ES-4 (1) -- Disconnect remaining public sector inflow sources: isolated catch basins (inlets), alley drains, and storm drains

ES-4 (3) -- Disconnect remaining private sector inflow sources: rainleader connections, area drains, or other clean water discharges

ES-4 (6) – Provide Permanent in-line storage

The status of these recommended actions is as follows:

ES-4 (1) – See **Figure 8** for table of the remaining capital projects.

ES-4 (3) – See section entitled Rainleader Disconnection Program (below) and **Figure 5** for status.

ES-4 (6) – This will be kept as an alternative of last resort. This would be a high maintenance alternative that could damage the pipe due to hydrogen sulfide gas production.

The City's Tier II Comprehensive Sewer Plan, that documented the City's implementation plan for Phase II CSO improvements, was approved by MCES in January 2003.

Progress in elimination of CSOs appears dramatic throughout Phase I and Phase II as upgrades to the sewer system were carried out. Both the frequency and the volume of untreated sewage overflowing into the stormwater system during intense rainstorms and discharging into the Mississippi River have steadily diminished. In 2007, no CSO events occurred in the City of Minneapolis, marking the first year since the City of Minneapolis built its first sewer in 1870 that untreated sewage did not pollute the Mississippi River in Minneapolis. While the City's efforts in CSO reduction are in large part responsible for this improvement, it should be noted that the metropolitan area has experienced several periods of drought conditions during the past several years. Therefore, overflows could still occur and the separations that remain are generally the most difficult and complex to locate and resolve.

Goals and Strategies

The goal of Phase II of the CSO Program is to eliminate CSOs at the eight outfalls/regulators that still have CSOs. The following table shows information about these regulators:

Regulator Site Location	NPDES Permit Number	Responsible Party
39th Av S & Minnehaha Parkway	M001	MCES
38th St E & 26th Av S	M002	MCES
Southwest Meters	M004	MCES
Northwest Meters	M005	MCES
East Meters	M006	MCES
26th St E & Seabury Av	M007	MCES
Oak St SE & 5th St SE	M012	City
Portland Av & Washington Av S	M020	MCES

The elimination of overflow structures may not be feasible in every case without causing a public health or safety hazard. Some overflow regulators may need to remain operational for emergency bypasses necessitated by extreme storm or flood events, or to minimize damage due to accidents or system failures. The City's minimum goal is to meet or exceed the EPA's current sewer overflow control policy.

Inflow & Infiltration Reduction Program

New in 2007 is a specific program for Inflow & Infiltration (I & I) capital projects. This program augments the current CSO program. The I & I reduction program is being implemented to meet goals established by MCES. Infiltration is the seepage of groundwater into sanitary sewer pipes through cracks and joints. Inflow is typically a structure or device that collects stormwater and drains to the sanitary sewer. The stormwater source can be catch basins, roof rainleaders, area drains or other devices, all connected directly to the sewer system. MCES has measured the amount of I & I, called Excess Flow, from the City of Minneapolis. The Excess Flow from all metropolitan area communities, including Minneapolis, creates problems in the regional sanitary sewer system and wastewater treatment plants. The addition of surface water into the City of Minneapolis sanitary sewer system creates problems for MCES and problems for the City of Minneapolis.

For MCES, this Excess Flow uses pipe capacity and treatment plant capacity that was desired for growth. In some cases, the Excess Flow exceeds the capacity of the interceptor pipes and is bypassed to public waters. Or, in some cases, the Excess Flow exceeds the capacity of the treatment plants, and the Excess Flow bypasses plant treatment and is discharged to public waters.

For the City, this Excess Flow creates problems because (1) it degrades the City's environment, (2) the City is being charged for treatment of this Excess Flow as though it were wastewater, and (3), the most costly problem, the Excess Flow makes the City subject to the MCES Surcharge, described as follows:

MCES has established I & I goals for all communities discharging into their treatment system. All communities that exceed their I & I goals are required to develop and implement a program to reduce I & I, no later than 2012, to the established goal. In 2007 MCES initiated a surcharge program to compel communities to solve their I & I problems. In the program, MCES penalizes a community that has Excess Flow and plans to hold the penalty in escrow until the community performs work that results in an actual reduction of the Excess Flow. However, if the community develops and implements a successful I & I program, MCES will waive all or part of the surcharge for the subject year, with the amount waived proportionate to the Excess Flow successfully removed.

For the City of Minneapolis, MCES calculated the 2007 surcharge amount to be $ 7.9 million. The City established its I & I reduction program to proactively plan and implement an I & I reduction program to meet its goal for 2007 within the specified timeframe and did not have to pay an MCES 2007 surcharge. As pertains to the City of Minneapolis, the most significant part of I & I for MCES is the Inflow, and as a result of effective efforts to reduce Inflow sources of Excess Flow in 2007, the City achieved reduction goals set by MCES.

Rainleader Disconnection Program

A City of Minneapolis ordinance called Chapter 56: Prohibited Discharges to Sanitary Sewer System went into effect in August 2003. Its purpose is stated as follows:

> *MCO 56.10 Purpose: The City of Minneapolis has been pursuing an aggressive campaign of separating its sanitary sewer system from its stormwater drainage system to reduce the number of combined sewer overflows (CSO). However, some rainleaders and other components, which handle stormwater, are still connected to the sanitary sewer system. During rain events, infiltration and inflow from buildings and parking lots with rainleaders and area drains connected to the sanitary sewer system, cause its capacity to be exceeded resulting in overflows to adjacent storm drains. This overflow ends up discharging sewage and stormwater into the*

Mississippi River. Rooftop drains (rainleaders) that are connected to the sanitary sewer system are one of the major causes of combined sewer overflows.

Residential and commercial buildings, usually built before [1930], sometimes have pipes that lead underground directly into the sanitary sewer system, rather than through gutters to lawns or the stormwater drainage system. To protect the environment and prevent these overflows as well as preventing the possibility of sewage backing up into homes and businesses, rainleaders and other connections which deliver stormwater into the sanitary system rather than the stormwater drainage system or to pervious surfaces need to be disconnected. State and federal environmental mandates require us to work to eliminate combined sewer overflows.

The city and metropolitan council have conducted studies that determined the main contributor to these overflows is rainleader connections. The purpose of [City of Minneapolis Code of Ordinances Chapter 56] is to define regulations that will aid the city in limiting inflow of rainwater to the sanitary sewer system. The ordinance will help to minimize the overflow problem resulting from the lack of capacity of the sanitary system to handle large amounts of rainwater. Rainwater runoff will be more appropriately handled through natural filtration and/or the stormwater drainage system. The net result will be a cleaner Mississippi River and a more efficient waste treatment system.

Previous City ordinances and state plumbing codes affected only new construction, not existing connections. Revisions to Chapter 56 were approved in 2006 that were designed to accelerate compliance. These included adding Chapter 2 Administrative Citation enforcement, adding the ability to order connection to the City storm drain as the disconnection method, and utilizing assessments to cover disconnection costs.

The objective of the Rainleader Disconnect Program (RDP) is to identify and disconnect all rainwater pipes, rainleaders, area drains or other connections from any building, structure, ground or premises in Minneapolis. The RDP staff includes the Program Manager, RDP field inspectors and administrative positions. Minneapolis Regulatory Services, Environmental Management & Safety Division, in coordination with Minneapolis Public Works, Surface Water & Sewers Division, is responsible for managing the RDP.

Under the RDP, property inspections for private stormwater connections to sanitary sewers began in February 2003 and were completed in 2007. All privately owned and publicly owned parcels in the city were inspected, with the exception of University of Minnesota properties. The RDP is continuing a joint inspection program with the University of Minnesota Environmental Health and Safety department.

The 2003-2007 inspection results are summarized as follows: Over the five years of inspections, 103,711 parcels were inspected. A total of 5,997 violations were found. Of the 5,997 violations, 3,789 (63%) were Downspouts or Open Standpipes, 1,763 (29%) were Roof Drains, and 439 (7%) were Area Drains. The violation locations and status (open or closed) as of April 11, 2008 are shown on the map on the following page. It should be noted that by April 11, 2008 the number of violations had increased from 5,997 to 6,031. This increase is not because properties had been missed during the 2003-2007 inspections, but because new information had come to light. The number may increase again, if additional violations are found to exist.

Inspections were undertaken in advance of planned street reconstruction and renovation projects. These inspections provided property owners with sufficient notice to plan disconnection work in conjunction with MPW operations. This saved property owners money on street restoration costs and minimized the damage to newly constructed road surfaces.

As noted on **Figure 6**, as of April 11, 2008, 3,251 (approximately 54%) of the sites in violation (not 54% of the connected acreage – see **Figure 5** for acreage) that, at the time the Chapter 56 ordinance went into effect were still connected to the sanitary sewer system, had been corrected (meaning they had been disconnected from the sanitary sewer system). By the end of 2008, it is anticipated that approximately 70% of the sites in violation will have been corrected. Of those that remain, there are generally four categories, as follows:

Category A. Projects for which permits have been issued and are in progress.

Category B. For some parcels, a "time extension" has been applied for and granted, due to various circumstances (other than Category D, below). Once granted, there is an ongoing fee based on the square footage of the parcel area that is tributary to the sanitary sewer system. The time extension can be for one, two or three years, after which time the parcels are reviewed on a case-by-case basis for a change in circumstances that allows the property owner to proceed with disconnection.

Category C. For some violations, the property owners have been non-responsive. For these parcels, a citation program has been established, with associated fines. The first citation bears a fine of $750. If there has been no response within 30 days, the city is able to issue a second citation imposing a fine of $1,500. It there still has been no response within 30 days, the city is able to issue a third citation, and monthly thereafter if necessary, each imposing a fine of $2,000.

Category D. The final category is those parcels that do not have green space for redirecting the stormwater, such as those in commercial areas or downtown, and also lack a public storm drain in close proximity to which a connection can be made. For these properties, municipal storm drain infrastructure needs to be built to accomplish the disconnection. In some instances the only storm drain networks available for these extensions of service are already at or near their design capacity and thus, before the additional stormwater that will result from sanitary sewer disconnections can be added to the storm drain system, rate control facilities need to be installed to prevent localized flooding in downstream areas.

Additionally, several metro area watershed management organizations have placed new restrictions on the addition of both new volume and discharge rates to receiving bodies of water, as has the Minnesota Department of Transportation for receiving MnDOT storm tunnels. These challenges have dramatically increased the cost of construction as compared to earlier CSO projects. A cost-benefit approach is utilized to determine the optimum sequence of these RDP facilitation public storm drain projects and other types of CSO and I/I projects, so that the projects with the greatest cost-benefit ratio are constructed earliest, and so on. Completion of the RDP facilitation public storm drain projects is anticipated by the year 2014. If additional projects are developed, however, to eliminate as yet unknown sources of CSO and I/I, and if these additional projects are found to have a higher cost-benefit ratio, then completion of the RDP facilitation public storm drain projects may extend to the year 2017.

Summary of Categories A-D. In summary, approximately 70% of Rainleader sites (not acreage) that were still connected to the sanitary sewer system at the time the Chapter 56 ordinance went into effect will have been disconnected by the end of 2008. Of those that remain, some disconnections are in progress (Category A), some parcels are being charged a fee for stormwater tributary to the sanitary sewer system until some point in the future when disconnection is made (Category B), some property owners have been non-responsive and are subject to cumulative fines (Category C), and some disconnections are postponed pending City projects to install storm drains that facilitate the disconnections (Category D).

Capital Improvement Projects and Maintenance Programs

MPW refers to capital projects to eliminate cross-connections of stormwater to the sanitary system as CSO projects. Since Phase II started, MPW personnel have identified, categorized, and prioritized 127 CSO project areas to date. The CSO Program coordinates with the Minneapolis Capital Improvement Project schedule to ensure that any CSO project areas within construction limits of a pending capital project are addressed in conjunction with that project's schedule. Occasionally, new CSO project areas are discovered by SW&S maintenance or other staff. This information is a result of:

- Private sewer and water connection reviews (for possible combined connections) are done prior to issuing any new/repair permits
- Utility and plumbing inspector's identification of cross-connections as part of their current activities
- Continued education of City staff on the importance of identifying and disconnecting connections

Additional Efforts

These activities directly or indirectly benefit the elimination of I/I & CSOs:

Sanitary System Maintenance

- Inspections of infrastructure to determine needed repairs
- The annual pipe rehabilitation program
- Repairs and bulkheading of sanitary pipes where an overflow previously existed
- Replacement of older sanitary manhole covers (with more than one hole) in ponding areas. Approximately 700-800 manholes have been replaced thus far.

Sanitary System Smoke Testing

Determining the location of structures or devices that permit stormwater to enter the sanitary sewer requires numerous tools. Smoke testing is one of those tools. In 2007, smoke testing was used in the Bryn Mawr neighborhood after metering did not locate the source of inflow in the area. The Bryn Mawr area and an industrial area along Interstate-94 in north Minneapolis were tested by forcing a smoke-like oil vapor into the sanitary sewer and then observing where the smoke surfaced. As a result of this testing, foundation drains, leaking castings and other defects were identified. This technique will be used in the future if metering does not identify the sources of I & I.

Sanitary System Flow Metering

In August 2008, flow meters are being placed in sewer mains that earlier I & I studies identified as contributing major amounts of Inflow. The meters are intended to converge on the major sources of Inflow so that those sources can be identified and removed.

Regulatory Efforts

Minneapolis Regulatory staff assists the CSO Program in locating, investigating and resolving areas through the review of record drawings, or through the preliminary development review process. MPW staff require complete separation of all sites that are reviewed by the Minneapolis Development Review (MDR) committee. This includes the following combined connections:

- Roof drains
- Surface parking lots
- Uncovered rooftop parking ramps
- Loading docks and area drains
- Internal drains
- Sump pumps
- Permitted non-stormwater clean water connections (cooling, heating, etc.)

The City reviews sewer and water connections for possible combined connections before issuing any new construction or repair permits for those properties.

City utility and plumbing inspectors identify and report combined systems as part of their work duties.

The City educates City staff from MPW, the City's Planning and Zoning sections, and the Regulatory Services Department on the importance of eliminating combined sewer connections.

New Combined Sewer Overflow Area Identification and Separation

Storm and sanitary record drawings are reviewed to identify instances of connections between sanitary sewers and storm drains that might have been missed during Phase I of the CSO Program. Questionable areas are investigated and field-verified.

The amount of acreage still connected to the sanitary system continues to decline, as does the number of cross-connections. The 2007 estimate of 130.67 acres of remaining CSO area is minimal and a good indicator that the City is nearing completion for this activity.

Temporary Connections or Overflow Inspections

MPW staff has identified all currently known temporary connections or overflows that should have been eliminated with the program. These connections are verified and our sewer database is updated.

Regulator Elimination and Maintenance

A regulator is a device installed in combined systems to control the amount of flow into the sanitary sewer system during periods of wet weather. Excess Flows are routed to an outfall. The Pig's Eye Sewage Treatment Plant began operating in 1938. Flows from the combined sewers were diverted from the Mississippi River to the treatment plant by a system of interceptor sewer tunnels located on either side of the Mississippi River. As part of this system, 34 overflow regulators were constructed to divert normal dry weather flows to the interceptor sewer. They also allowed relief overflows into the Mississippi during heavy rainstorms.

The result of this modification was a significant improvement in the river's water quality, except for brief periods during heavy rainfall. During these peak flow periods, the regulators prevented overloading of the treatment plant, sanitary backups into homes, and pressure surges that could cause structural damage to the pipe system.

Of the original 34 overflow regulators, there are eight remaining. Of the eight, one is owned by the City and the remainder by MCES. The City's remaining regulator is located at Oak Street SE Outfall M012 (R20). CSO Area 56 drains to Outfall M012 and is responsible for more than 13 acres draining to the sanitary system. Monitoring at Outfall M012 will continue until this CSO area is resolved. The financing and schedule for redevelopment of the University Research Park area (also known as the South East Minneapolis Industrial (SEMI) project) are still being worked out and affect the successful resolution of CSO Area 56.

Once this CSO area is resolved, short-term monitoring should confirm that Outfall M012 could be closed. The elimination of overflow regulator structures may not be feasible in every case without causing a public health or safety hazard. Some overflow regulators may need to remain operational for emergency bypasses necessitated by extreme storm or flood events, or to minimize damage due to accidents or system failures.

III. Sewer Service Areas

Interceptor Service Areas

Twenty-five separate interceptor service areas serve Minneapolis. These areas range in size from the smallest, area MN-305 (3.4 acres), serving three residential and four commercial properties, to the largest, area MN-344 (5113 acres), serving over 16,000 single-family and multi-family homes, as well as commercial properties.

The characteristics of the service areas were defined by tracing the sanitary sewers from their uppermost connection to the point of connection with MCES interceptors. Additional information was provided by MCES. Using the Minneapolis Geographic Systems (GIS) database, the updated area map was used to extract area, land use and census information. **Appendix C** contains detailed information for each of the 25 service areas:

Service Area	Population (2000)	Area (sq. mi.)
MN-300	20,600	3.81
MN-301	2,985	0.82
MN-302	5,638	2.22
MN-303	3,769	0.96
MN-305	9	0.01
MN-306	1,165	0.38
MN-310	63,643	6.79
MN-311	1,235	0.37
MN-312	4,363	0.66
MN-313	1,145	0.17
MN-314	896	0.14
MN-315	4,548	0.92
MN-316	8,690	1.17
MN-320	37,194	5.42
MN-330	44,417	4.71
MN-340	14,252	3.44
MN-341	68,102	7.39
MN-342	581	0.07
MN-343	2,184	0.36
MN-344	50,358	7.98
MN-345	7,883	1.16
MN-346	9,643	1.48
7026	2,771	0.81
8255	27,495	3.81
8754	780	0.11

For detailed statistics on year 2007 land use, population and households see **Appendix C**

Sanitary Flows from Outside of Minneapolis

In addition to the sanitary flows from properties within the City limits, there are a number of connections from outside the City. These can be categorized into two groups: 1) government properties in the Fort Snelling area; and 2) individual properties connecting to a sanitary sewer in a border street.

Government Properties in the Fort Snelling Area

Eleven agencies in the Fort Snelling area have agreements with Minneapolis for water and sewer service. The primary contributor of wastewater is the Metropolitan Airports Commission, with 237,672,690 gallons of wastewater in the year 2007. This equates to approximately 64% of sanitary flows from the area. The second largest contributor is the Minneapolis VA Medical Center with 59,259,772 gallons in 2007 (19%). A complete list of agencies and 2007 flow contributions is contained in **Appendix E**. Copies of the interagency water/sewer agreements are available from the Water Treatment & Distribution Division of Minneapolis Public Works.

Individual Properties Connecting to a City of Minneapolis Sanitary Sewer in a Border Street

A total of 139 properties outside Minneapolis fall into this category. These properties received permits from the City of Minneapolis for these connections and are sent monthly water/sewer bills from Minneapolis Utility Billing. There are no inter-city agreements that oversee these connections.

City	# of Accounts
Brooklyn Center	16
Edina	69
Golden Valley	20
Robbinsdale	4
St. Anthony	27
St. Louis Park	2

A complete list of properties is contained in **Appendix F**.

Projection of Wastewater Flows

Introduction

The analysis presented below has been completed in partial fulfillment of the sewer portion of the comprehensive planning requirements of the Minnesota Metropolitan Land Planning Act. Estimates of 2007 annual volume of sewage generated within the City of Minneapolis are projected out to year 2030 based on the population and employment projections completed for the Minneapolis Comprehensive Plan. Figures are given for each of the 25 Interceptor Service Areas located in the City and also for subdivisions of six of the service areas (MN-310, 320, 330, 340, 341 & 344) with the largest number of localized connections to the interceptor system. Described below is the basic methodology used to complete the analysis and the results. A detailed analysis of the techniques used is contained in **Appendix A**.

Methodology

Sewage flow in Minneapolis is not metered at the source, rather billing is based on water consumption; billing data provides the most accurate and accessible source of sewage flow estimates available. In the present data environment of the City it is not possible to provide reliable water and sewer billing data by Interceptor Service Area. To overcome this hurdle the Interceptor Service Area totals were derived through an apportionment process. Apportionment on the basis of simplified land use characteristics assumed a uniform distribution of all sub-types of land use throughout the City (single family residential, apartment, different types of commercial and industrial uses, etc.). This is unavoidable given the nature of available growth projections.

Base year sewage flow estimates (2007) for the City of Minneapolis were derived from customer billings for water service from the Minneapolis Utility Billing Department. The data are grouped into two broad categories, residential and non-residential, with the latter category including all non-residential customers. It is assumed that annual water use equals annual sewage flow for commercial users, and that winter quarter water usage multiplied times 4 equals annual sewage flow for residential users.

Base year sewage flow estimates (2007) for the 25 individual Interceptor Service Areas in the City were then extrapolated from City totals on the basis of the land use characteristics of each Service Area. The acreage of land devoted to residential and non-residential uses (with the latter deemed to include all non-residential, non-park and non-transportation related land uses) in a given Service Area is divided by the total acreage of the City devoted to these uses. The resulting number is then multiplied with the City total to determine the volumes attributed to each Service Area. (I.e., if a given Service Area contains 5% of the total residential land use area of the City, 5% of total residential sewage flow is attributed to this Service Area.)

Projections of change in sewage flow by Interceptor Service Area to year 2030 were calculated on the basis of population and employment projections provided by the City of Minneapolis Department of Community Planning & Economic Development/Planning Division and based on the TAZ[1] unit of analysis. For purposes of the analysis per capita sewage generation is assumed to remain constant; thus, changes in population are assumed to equate to changes in residential sewage flow on a one-to-one basis (i.e., a 1% increase in population for a given Interceptor Service Area is assumed to equal a 1% increase in residential sewage flow for that area). Similarly, changes in employment are assumed to equate to changes in commercial sewage flow on a one-to-one basis (i.e., a 1% increase in employment in a given Interceptor Service Area is assumed to equate to a 1% increase in commercial sewage flows for that area).

[1] Traffic Analysis Zone (TAZ) is the base unit of analysis for comprehensive planning population and employment projections. There are 138 TAZs in the City of Minneapolis.

Results:

Excluding flows from the Metropolitan Airports Commission and the Minneapolis VA Medical Center, total sanitary sewer usage for Minneapolis (excluding inflow & infiltration) equaled 16.034 billion gallons of flow in 2007. Using the methodology described above, it is projected that this will increase by 10.05% by the year 2030, to an estimated sewage volume of 17.641 billion gallons.

City of Minneapolis Estimated Total Base Flow For Sanitary Sewers

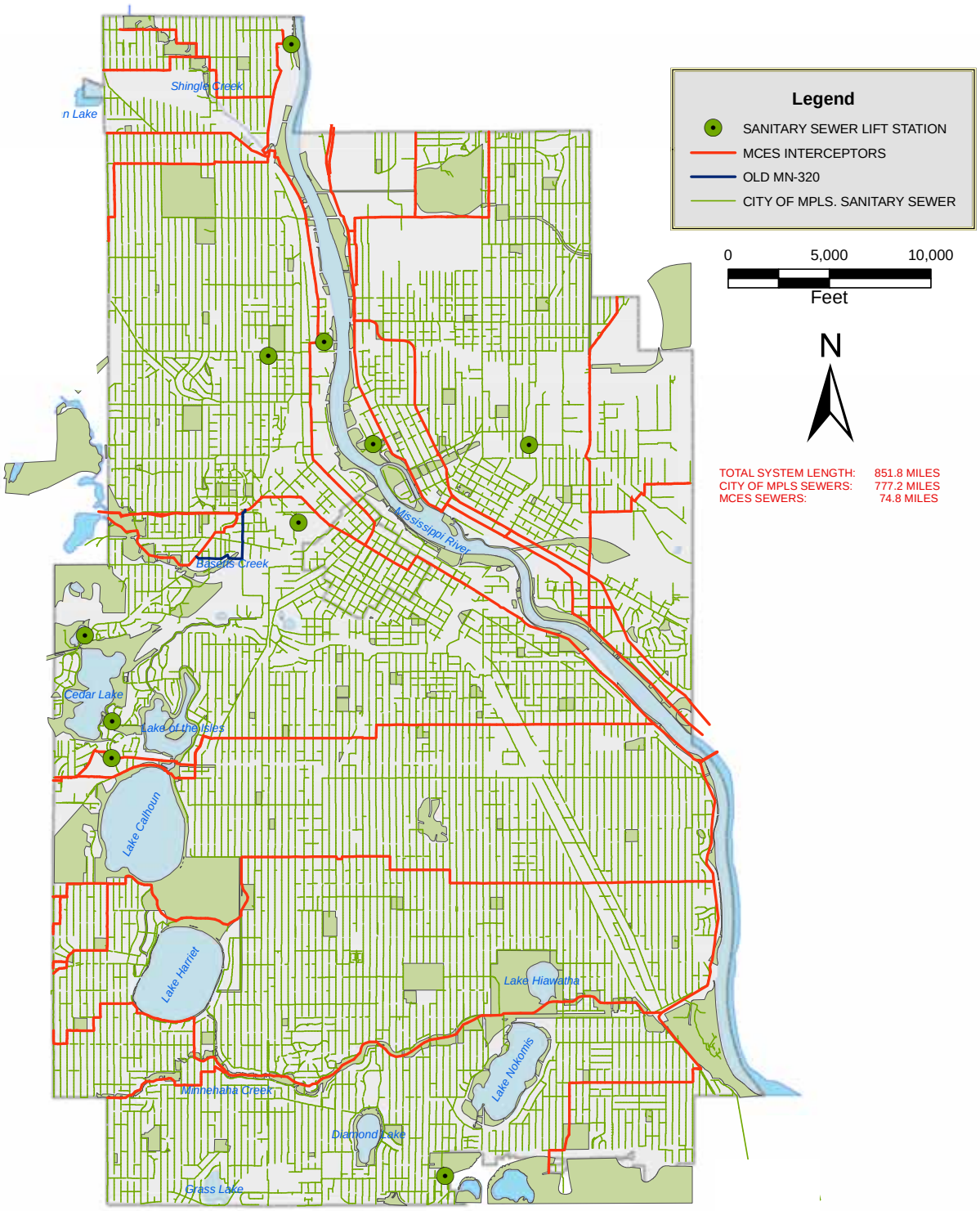
2000 – 2030

(Billions of Gallons)

2000 TOTAL BASE SEWAGE FLOW	15,606,909,702
2005 TOTAL BASE SEWAGE FLOW	15,912,599,066
2007 TOTAL BASE SEWAGE FLOW	16,034,873,617
2010 TOTAL BASE SEWAGE FLOW	16,218,285,445
2015 TOTAL BASE SEWAGE FLOW	16,627,881,124
2020 TOTAL BASE SEWAGE FLOW	17,037,472,211
2025 TOTAL BASE SEWAGE FLOW	17,339,602,204
2030 TOTAL BASE SEWAGE FLOW	17,641,727,383

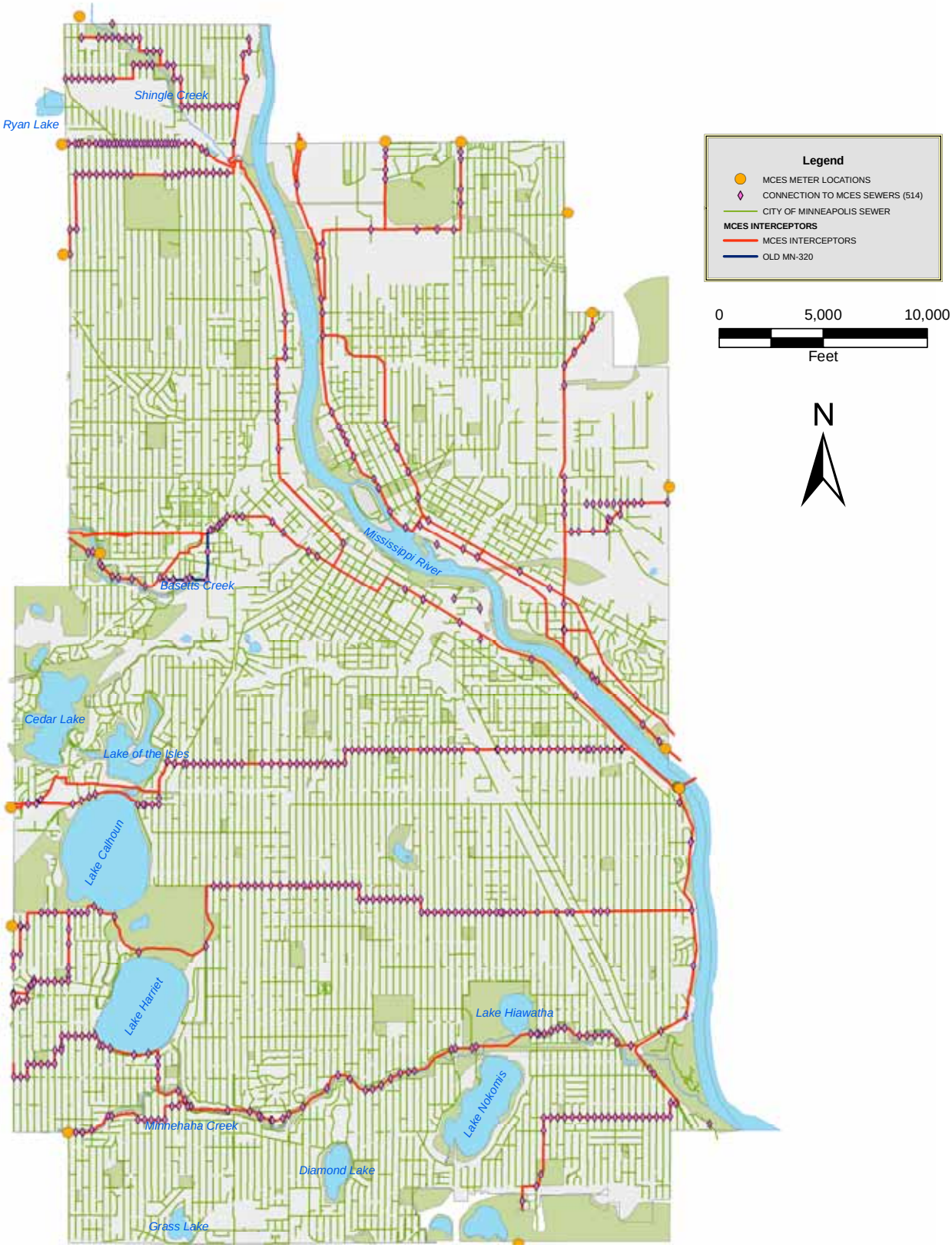
See **Appendix A** for tables that estimate total sewage flow for each sanitary service area for the years 2000, 2005, and 2007 and projected total sewage flow for the years 2010 thru 2030 in five-year increments. These figures are the base wastewater flow and do not include estimates of inflow or infiltration.

FIGURES and TABLE



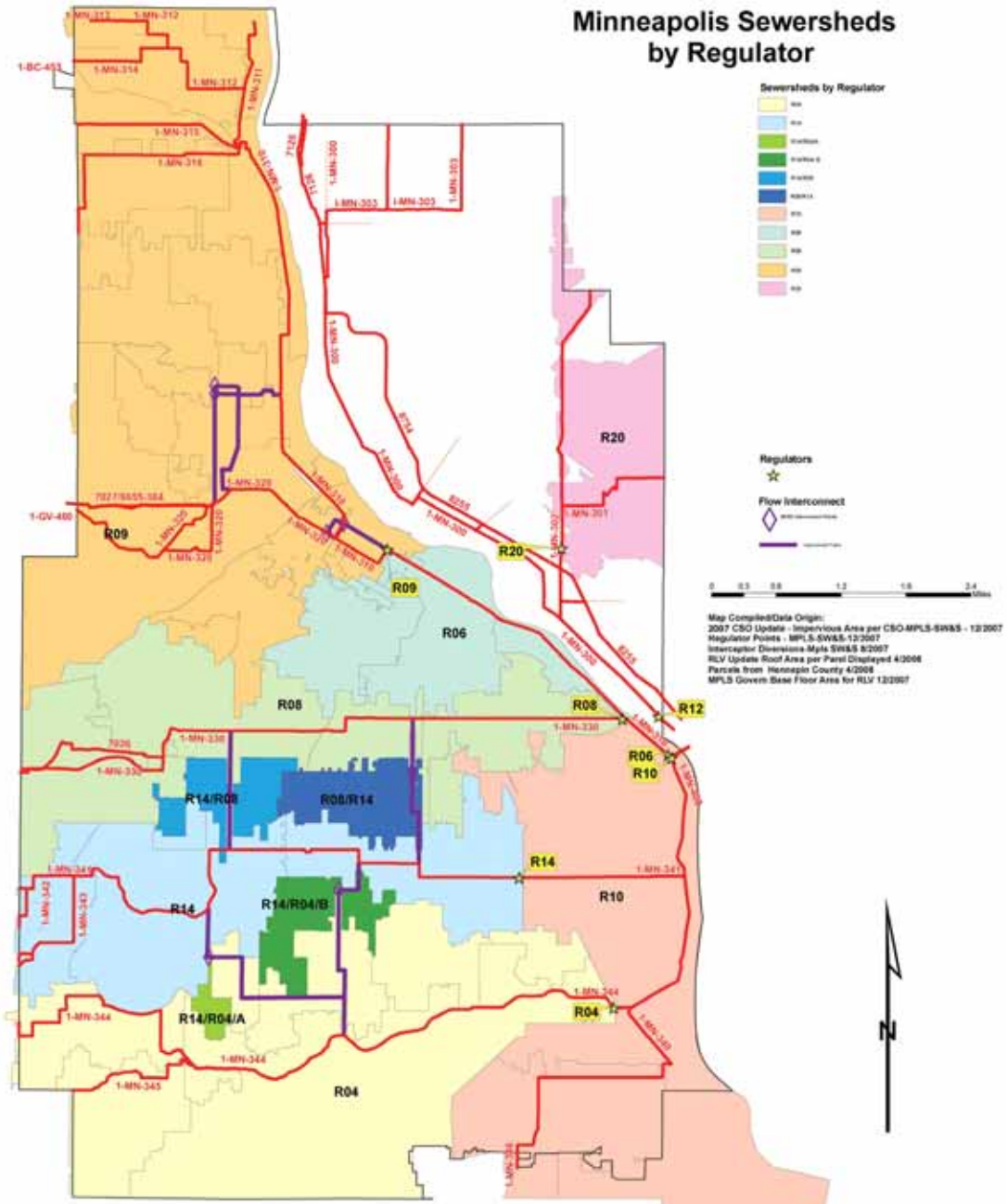
CITY OF MINNEAPOLIS
SANITARY SEWERS & LIFT STATIONS

APRIL 2008



CITY OF MINNEAPOLIS
CONNECTIONS TO MCES SEWERS
&
SANITARY SEWER METER LOCATIONS

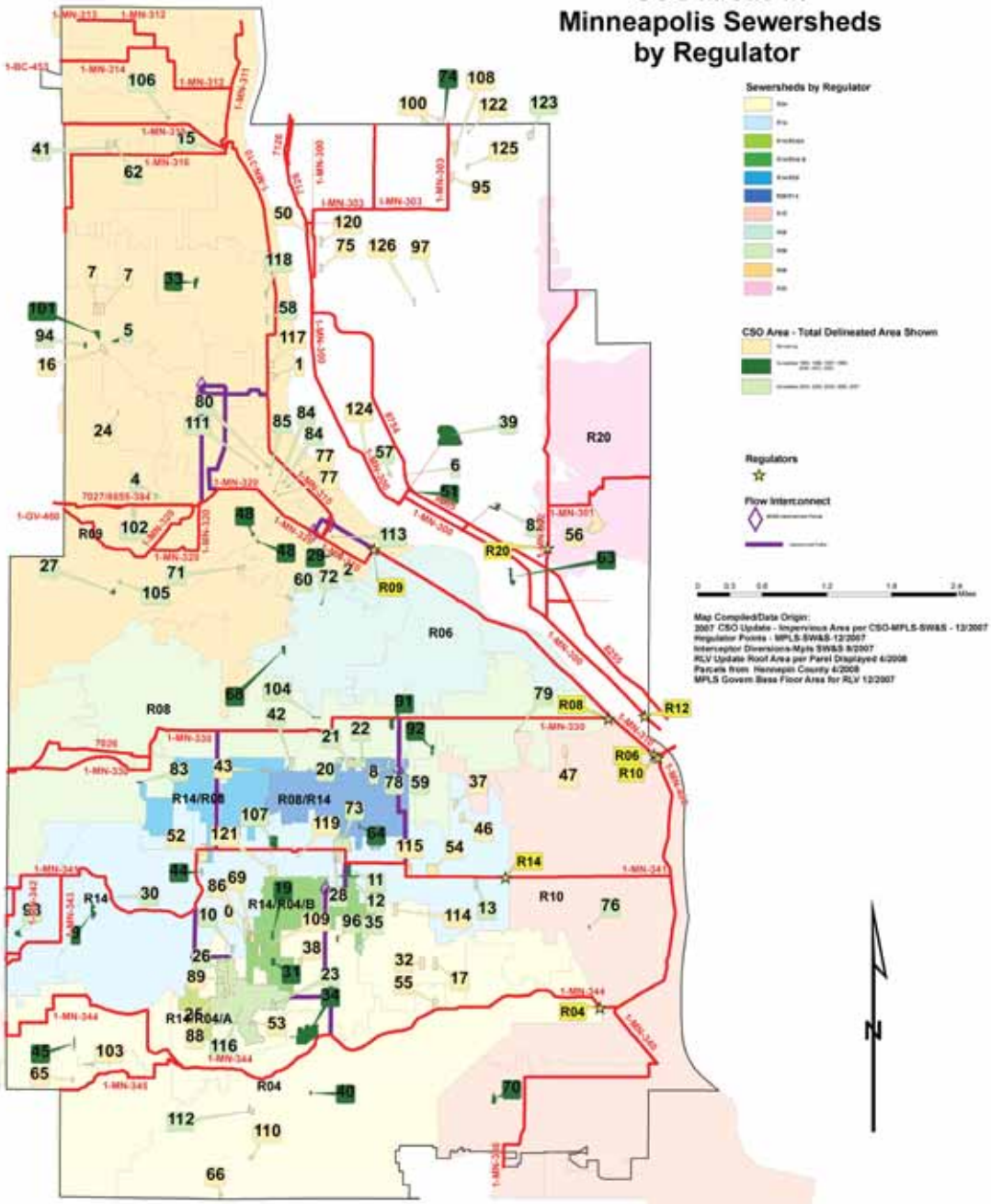
APRIL 2008



REGULATOR AREAS & RAINLEADER VIOLATIONS (RLV) & CSO BY REGULATOR IMPERVIOUS AREA (UNITS IN ACRES)

REGULATOR AREA	REGULATORS	LOCATION	RLV 2007 COMPLETED	RLV 2007 REMAINING	RLV 2007 TOTAL	CSO PRE 2002 COMPLETED	CSO 2002-2007 COMPLETED	CSO 2007 REMAINING	CSO 2007 TOTAL	COMBINED PRE 2002 COMPLETED	COMBINED 2002-2007 COMPLETED	COMBINED 2007 REMAINING	COMBINED 2007 TOTAL
8575	R04	Minnehaha Pkwy & 37th Ave S	8.8	11.9	20.6	12.4	104.1	14.1	130.5	12.4	113.1	26.0	151.4
8650	R14	38th St E & 29th Ave S	26.2	27.9	57.2	2.1	33.6	18.7	54.4	2.1	62.6	46.6	111.3
5700	R10	Lake St E & Mississippi River	46.1	22.5	68.1	1.1	1.7		2.8	1.1	47.8	22.5	71.9
1740	R08	Lake St E & Mississippi River	11.9	8.0	20.0	1.4	1.2		2.6	0.0	13.3	10.2	23.5
4344	R08	26th St W & Sidbury Ave	54.8	44.0	98.8	2.3	15.3	0.6	18.9	2.3	70.4	44.6	117.7
5400	R09	Portland Ave S / Washington Ave S	54.7	55.8	130.6	2.7	15.8	6.7	25.2	2.7	165.5	75.8	243.8
1387	R20	Oak St SE & 5th St SE	13.1	31.2	46.3			12.8		0.0	15.1	43.9	59.1
	NE Pond		61.8	47.1	108.7	0.0	22.6	10.4	46.3	0.0	83.8	58.1	142.3
	TOTAL		387.8	350.6	738.3	24.2	326.0	86.3	348.5	24.3	703.7	448.9	1176.8
	Double Counted		118.3	103.8	222.3	4.8	51.7	32.9	89.1	4.9	171.0	135.5	311.4

CSO Areas in Minneapolis Sewersheds by Regulator



REGULATOR AREAS & RAINLEADER VIOLATIONS (RLV) & CSO BY REGULATOR IMPERVIOUS AREA (UNITS IN ACRES)

REGULATOR AREA	REGULATORS	LOCATION	RLV 2007 COMPLETED	RLV 2007 REMAINING	RLV 2007 TOTAL	CSO PRE 2002 COMPLETED	CSO 2002-2007 COMPLETED	CSO 2007 REMAINING	CSO 2007 TOTAL	COMBINED PRE 2002 COMPLETED	COMBINED 2002-2007 COMPLETED	COMBINED 2007 REMAINING	COMBINED 2007 TOTAL
6572	R04	Minnehaha Pkwy & 37th Ave S	9.0	11.9	20.9	12.4	104.1	14.1	130.6	12.4	112.1	26.0	151.4
4866	R14	38th St E & 28th Ave S	29.3	27.9	57.2	2.1	33.6	15.7	54.4	2.1	62.5	46.0	111.6
5799	R10	Lake St E & Mississippi River	46.1	23.0	69.1	1.1	1.7		2.8	1.1	47.8	23.0	71.9
1746	R06	Lake St E & Mississippi River	11.9	8.0	20.9		1.4	1.2	2.6	0.0	13.3	10.2	23.5
4344	R08	28th St W & Stadium Ave	54.8	44.0	98.8	2.5	15.0	0.9	18.3	2.5	70.4	44.8	117.7
8496	R09	Portland Ave S / Washington Ave S	64.7	65.4	130.0	2.7	19.8	5.7	28.2	2.7	165.5	75.6	243.8
1367	R20	Oak St SE & 5th St SE	15.1	31.2	46.3			12.8		0.0	15.1	43.9	59.1
	NE Area		61.8	47.1	108.7	0.8	22.0	10.9	46.3	0.8	83.8	58.1	142.3
	TOTAL		387.8	350.6	738.3	24.2	326.0	86.3	346.5	24.2	753.7	449.2	1174.9
	Double Counted		116.3	103.9	222.3	4.9	51.7	32.5	89.1	4.8	171.0	135.5	311.4

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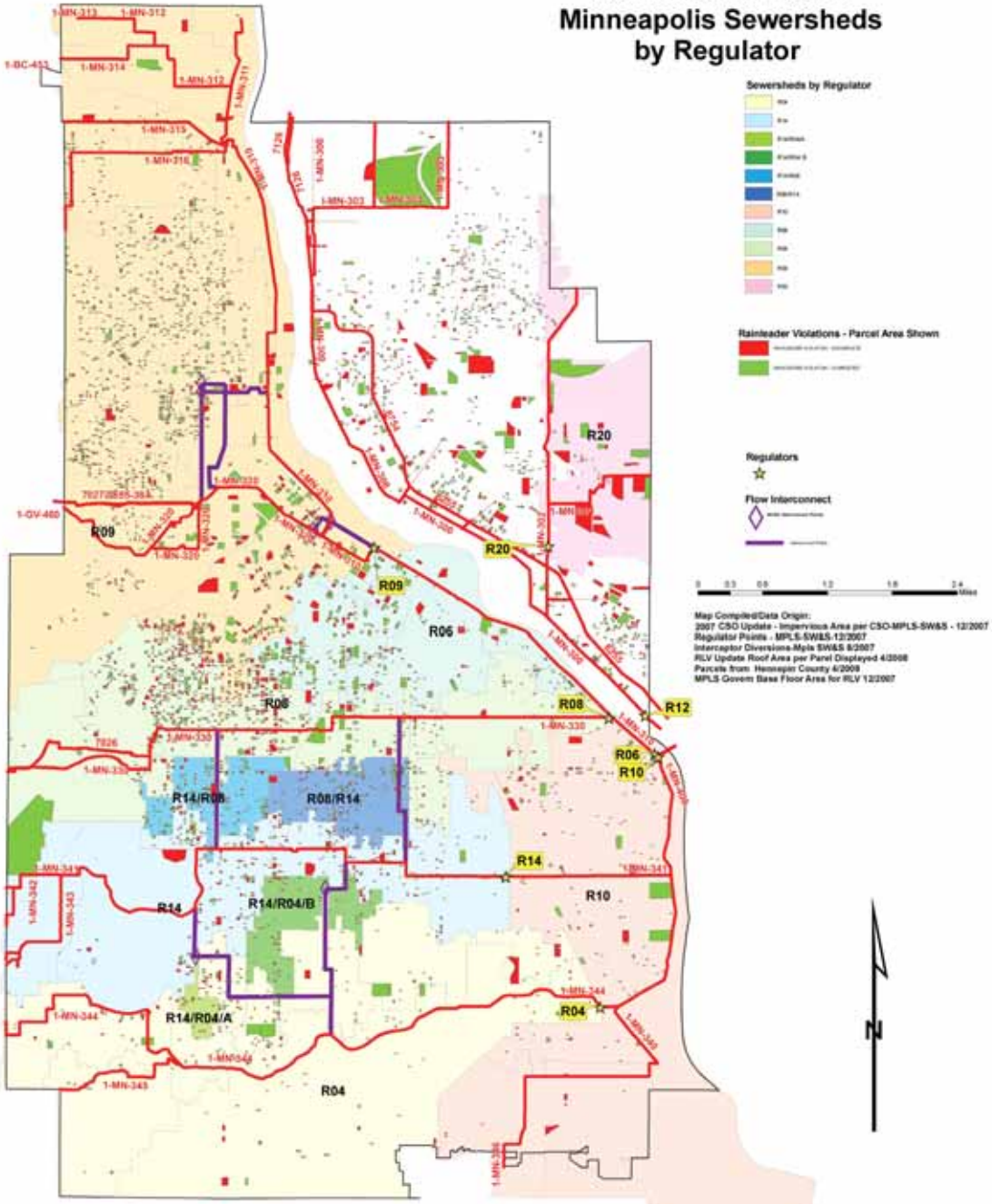
Rainleader Areas in Minneapolis Sewersheds by Regulator



REGULATOR AREAS & RAINLEADER VIOLATIONS (RLV) & CSO BY REGULATOR IMPERVIOUS AREA (UNITS IN ACRES)

REGULATOR AREA	REGULATORS	LOCATION	RLV 2007 COMPLETED	RLV 2007 REMAINING	RLV 2007 TOTAL	CSO PRE 2002 COMPLETED	CSO 2002-2007 COMPLETED	CSO 2007 REMAINING	CSO 2007 TOTAL	COMBINED PRE 2002 COMPLETED	COMBINED 2002-2007 COMPLETED	COMBINED 2007 REMAINING	COMBINED 2007 TOTAL
[illegible]	R04	Minnehaha Pkwy & 27th Ave S	8.0	11.9	20.0	12.4	104.1	14.1	130.6	12.4	113.1	26.0	151.4
[illegible]	R14	38th St E & 38th Ave S	29.3	27.9	57.2	2.1	33.6	18.7	54.4	2.1	62.9	46.6	111.6
[illegible]	R10	Lake St E & Mississippi River	46.1	23.0	69.1	1.1	1.7		2.8	1.1	47.8	23.0	71.9
[illegible]	R08	Lake St E & Mississippi River	11.6	8.8	20.4		1.4	1.2	2.6	0.0	13.0	10.0	23.0
[illegible]	R08	38th St W & Sheridan Ave	54.8	44.0	98.8	2.5	15.5	0.8	18.9	2.5	70.4	44.8	117.7
[illegible]	R08	Portland Ave S ? Washington Ave S	84.7	66.6	150.6	2.7	19.8	0.7	23.2	2.7	104.5	70.6	243.8
[illegible]	R20	Oak St SE & 9th St SE	15.1	31.2	46.3			13.8		0.0	15.1	45.0	59.1
	NE-Rest		91.6	47.1	138.7	0.8	22.0	15.9	48.3	0.8	93.6	58.1	142.5
	TOTAL		387.6	350.6	738.3	24.2	238.0	86.1	348.3	24.2	703.7	448.6	1176.5
	Double Counted		110.3	133.0	222.3	4.9	81.7	32.5	99.1	4.9	171.0	130.0	301.4

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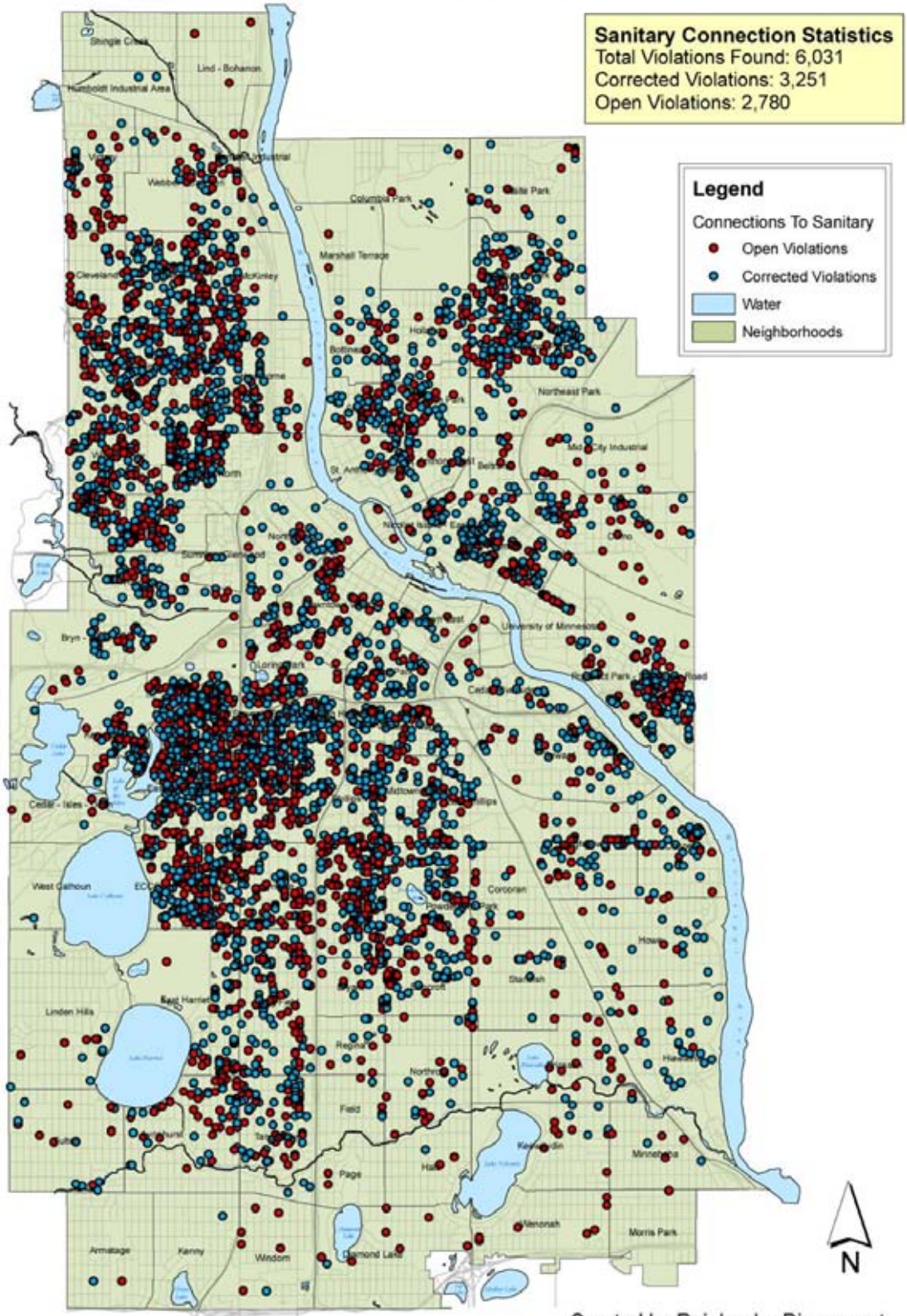
City of Minneapolis - Rainleader Disconnect Program

Violation Status as of April 11th, 2008



Created by Rainleader Disconnect Program Staff on April 11, 2008

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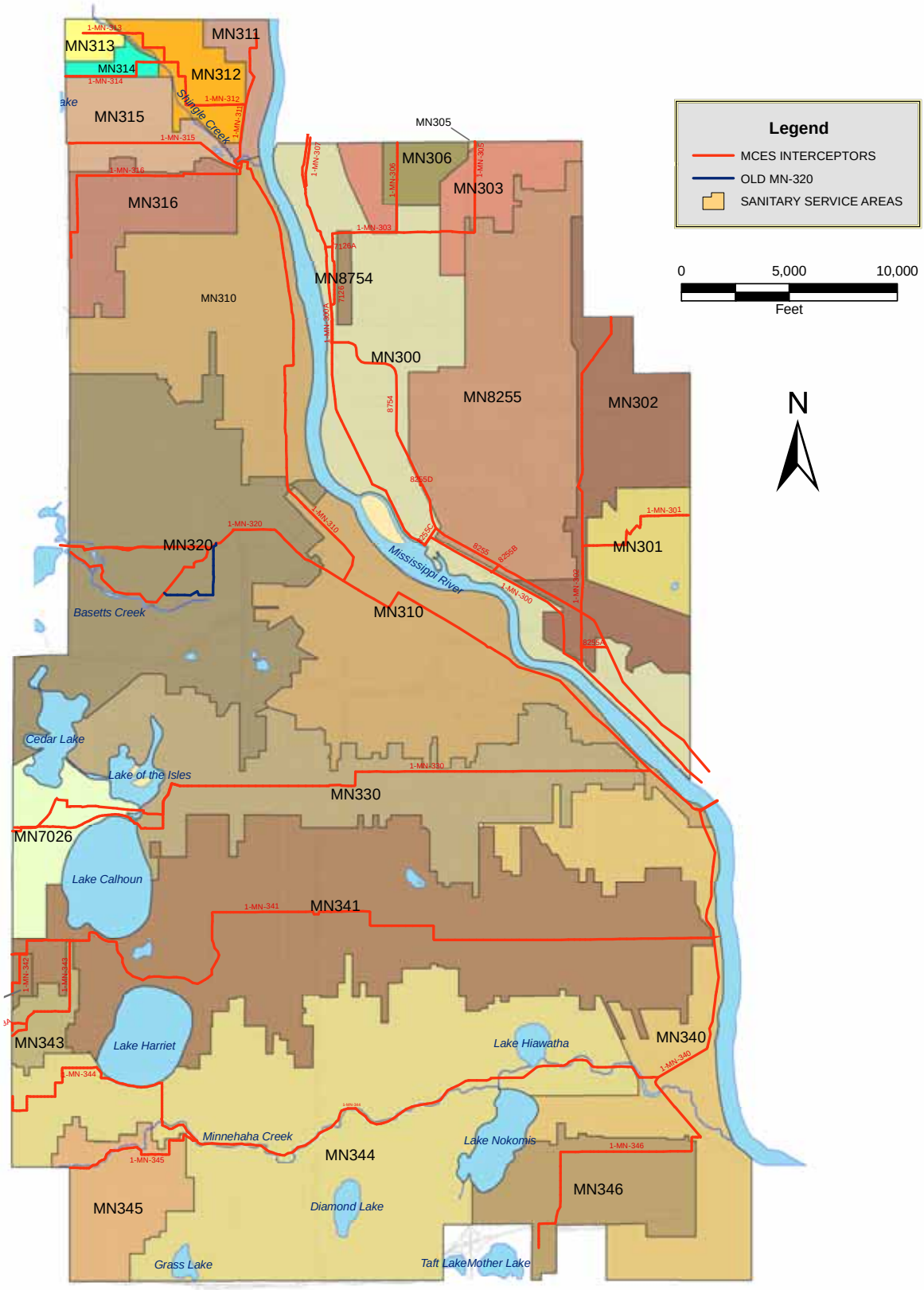


CITY OF MINNEAPOLIS
SANITARY SEWER SERVICE AREAS
BY
M.C.E.S. INTERCEPTOR

APRIL 2008

CSO Program List by Cost Benefit

Priority Rank	CSO Area ID	Location Description	Project Manager	Status	Scheduled Construction Year	Sanitary Service Area	Regulator No.	Study Basin	Acres	Revised Runoff Coeff.[1]	V.I. (Runoff Coeff x Acres)	Cumulative Virtual Inflow	Cumulative % Inflow	Estimated Cost	Estimate Source/Notes[2]	Cost Benefit (Cost / V.I.)	Benefit	Cost Benefit Ratio	Cumulative Cost
1	042	E Lake St & Stevens Av S	Mitchell Sawh	5. Finalization	2007	1-MN-330	M007XM002	10A	3.13	0.70	2.1910	2.19	3.8%	$301,000	Preliminary	$137,380	$645,302	0.47	$301,000.00
2	100	37th Av NE, Van Buren to Central Av NE	Bill Fellows	3. Pre-Construction	2007	1-MN-306	NE	06	6.16	0.36	2.2176	4.41	7.7%	$314,000	Construction Estimate	$141,595	$653,137	0.48	$615,000.00
3	052	W 36th to 37th St, Bryant to Dupont Av S	Seifedin Burka	3. Pre-Construction	2007	1-MN-341	M002	210E	7.53	0.46	3.4638	7.87	13.7%	$996,000	Preliminary	$287,545	$1,020,173	0.98	$1,611,000.00
4	066	W 62nd St & Lyndale Av S	Lisa Cerney	2. Design 90%	2008	1-MN-344	M001	16	0.81	0.85	0.6885	8.56	14.9%	$0	Project absorbed costs	$0	$202,780	-	$1,611,000.00
5	043	Blaisdell Av & W Lake St	Mitchell Sawh	1. Project Development	2008	1-MN-341	M002XM007	10X	0.87	0.90	0.7830	9.34	16.3%	$24,000	Preliminary	$30,651	$230,612	0.10	$1,635,000.00
6	025	46th to 47th St W, Lyndale to Garfield Av S	Seifedin Burka	2. Design 30%	2008	1-MN-344	M001	214A	1.30	0.48	0.6240	9.97	17.4%	$30,000	Preliminary	$48,077	$183,783	0.16	$1,665,000.00
7	037	E 32nd St, 19th to 20 Av S	Mitchell Sawh	2. Design 100%	2008	1-MN-341	M002	10X	2.10	0.46	0.9660	10.93	19.1%	$65,000	Preliminary	$67,288	$284,510	0.23	$1,730,000.00
8	001	22nd Av N & 2nd St N *Need Easemnt	Kelly MacIntyre	2. Design 100%	2008	1-MN-310	M020	05	2.62	0.80	2.0960	13.03	22.7%	$200,829	Construction Estimate	$95,815	$617,323	0.33	$1,930,829.00
9	046	E 34th St, 20th to 21st Av S	Mitchell Sawh	2. Design 100%	2008	1-MN-341	M002	10X	2.00	0.45	0.9000	13.93	24.3%	$120,000	Preliminary	$133,333	$265,072	0.45	$2,050,829.00
10	010	W 43rd St, Harriet to Garfield Av S	Seifedin Burka	4. Construction	2008	1-MN-344	M001	214A	1.80	0.48	0.8640	14.79	25.8%	$200,000	Preliminary	$231,481	$254,469	0.79	$2,250,829.00
11	016	Sheridan Av N & 24th Av N	Dan Cazanacli	1. Project Development	2008	1-MN-320	M020	06	2.00	0.44	0.8800	15.67	27.4%	$250,000	Cost per Acre	$284,091	$259,181	0.96	$2,500,829.00
12	124	Main St NE & 3rd Av NE	Spurrier	1. Project Development	2008	1-MN-310	NE	None	0.33	0.85	0.2805	15.95	27.8%	$83,000	Cost per Acre	$295,900	$82,614	1.00	$2,583,829.00
13	117	2nd St N & 23rd Av N	Kelly MacIntyre	2. Design 90%	2008	1-MN-310	M020	05	3.37	0.80	2.6960	18.65	32.5%	$843,000	Cost per Acre	$312,685	$794,037	1.06	$3,426,829.00
14	038	44th St E, 2nd to 3rd Av S	Seifedin Burka	2. Design 0%	2008	1-MN-344	M001	14	1.26	0.42	0.5292	19.18	33.5%	$180,500	Preliminary	$341,081	$155,862	1.16	$3,607,329.00
15	053	49th St W, Pleasant to Rustic Lodge Av	Spurrier	1. Project Development	2008	1-MN-344	M001	14	0.60	0.48	0.2880	19.47	34.0%	$103,000	Preliminary	$357,639	$84,823	1.21	$3,710,329.00
16	119	2nd Av S & 36th St E	Spurrier	1. Project Development	2008	1-MN-341	M002	10X	0.09	0.70	0.0630	19.53	34.1%	$23,000	Cost per Acre	$365,079	$18,555	1.24	$3,733,329.00
17	110	Pleasant St, W 59th to 59th+1/2 Sts	Seifedin Burka	4. Construction	2008	1-MN-344	M001	16	0.90	0.49	0.4410	19.97	34.9%	$174,000	Preliminary	$394,558	$129,885	1.34	$3,907,329.00
18	089	Lyndale to Garfield Av S, W 45th to 46th St	Seifedin Burka	1. Project Development	2008	1-MN-344	M001	214A	2.51	0.48	1.2048	21.18	37.0%	$540,000	Cost per Acre	$448,207	$354,843	1.52	$4,447,329.00
19	122	Fillmore St NE, 36th 1/2 Av NE to RR tracks	Dan Cazanacli	1. Project Development	2008	1-MN-301	NE	None	0.23	0.50	0.1150	21.29	37.2%	$58,000	Cost per Acre	$504,348	$33,870	1.71	$4,505,329.00
20	069	W 43rd St, Pillsbury to Pleasant Av S	Seifedin Burka	1. Project Development	2008	1-MN-341	M002XM001	10C	2.20	0.48	1.0560	22.35	39.0%	$550,000	Cost per Acre	$520,833	$311,017	1.77	$5,055,329.00
21	109	W 43rd St, Pillsbury to Wentworth Avs	Seifedin Burka	1. Project Development	2008	1-MN-344	M002XM001	10C	2.12	0.48	1.0176	23.37	40.8%	$530,000	Cost per Acre	$520,833	$299,708	1.77	$5,585,329.00
22	088	W 46th St, Garfield to Harriet Av S	Seifedin Burka	1. Project Development	2008	1-MN-344	M001	214A	2.16	0.48	1.0368	24.40	42.6%	$540,000	Cost per Acre	$520,833	$305,363	1.77	$6,125,329.00
23	121	Nicollet Av & W 38th St	Kelly MacIntyre	2. Design	2008	1-MN-341	M002	10C	3.38	0.46	1.5548	25.96	45.3%	$845,000	Cost per Acre	$543,478	$457,926	1.85	$6,970,329.00
24	077	6th Av N, Washington Av N to 4th St N	Kelly MacIntyre	3. Pre-Construction	2008	1-MN-310	M020	06	0.54	0.80	0.4320	26.39	46.1%	$291,984	Construction Estimate	$675,889	$127,234	2.29	$7,262,313.00
25	024	Penn Av N & 17th Av N	Dan Cazanacli	1. Project Development	2008	1-MN-320	M020	06	0.33	0.30	0.0990	26.49	46.2%	$83,000	Cost per Acre	$838,384	$29,158	2.85	$7,345,313.00
26	054	18th to Cedar Av S, E 37th to 38th St	Dan Cazanacli	2. Design 30%	2008	1-MN-341	M002	10X	6.45	0.46	2.9670	29.45	51.4%	$2,900,000	Preliminary	$977,418	$873,853	3.32	$10,245,313.00
27	055	18th Av S - Cedar; E 47th St - M'haha Pkwy	Kelly MacIntyre	1. Project Development	2008	1-MN-344	M001	16	2.39	0.46	1.0994	30.55	53.3%	$1,188,000	Cost per Acre	$1,080,589	$323,800	3.67	$11,433,313.00
28	086	W 42nd St, Grand to Pleasant Av S	Seifedin Burka	1. Project Development	2009	1-MN-341	M002	10X	4.25	0.46	1.9550	32.51	56.7%	$630,000	Cost per Acre	$322,251	$575,795	1.09	$12,063,313.00
29	017	E 45th St, Cedar Av to 18th Av S	Dan Cazanacli	1. Project Development	2009	1-MN-344	M001	16	2.50	0.46	1.1500	33.66	58.7%	$625,000	Cost per Acre	$543,478	$338,703	1.85	$12,688,313.00
30	032	16th to 17th Av S, E 44th St to E 45th St	Dan Cazanacli	1. Project Development	2009	1-MN-344	M001	15	3.10	0.46	1.4260	35.09	61.2%	$775,000	Cost per Acre	$543,478	$419,991	1.85	$13,463,313.00
31	115	E 38th St, 15th & Bloomington Av S	Dan Cazanacli	1. Project Development	2009	1-MN-341	M002	10X	2.59	0.46	1.1914	36.28	63.3%	$648,000	Cost per Acre	$543,898	$350,896	1.85	$14,111,313.00
32	114	E 41st St, 13th to 14th Av S	Dan Cazanacli	1. Project Development	2009	1-MN-320	M001	10X	2.37	0.46	1.0902	37.37	65.2%	$593,000	Cost per Acre	$543,937	$321,090	1.85	$14,704,313.00
33	126	Monroe St NE & 23rd Av NE	Spurrier	1. Project Development	2009	1-MN-303	NE	None	2.98	0.45	1.3410	38.71	67.6%	$745,000	Cost per Acre	$555,556	$394,957	1.89	$15,449,313.00
34	047	E 28th to 29th St, 33rd to 34th Av S	Kelly MacIntyre	2. Design 100%	2009	1-MN-346	M005	M101 A&B	2.75	0.45	1.2375	39.95	69.7%	$688,000	Cost per Acre	$555,960	$364,474	1.89	$16,137,313.00
35	056	24th Av SE & Elm St SE	Kelly Moriarity	1. Project Development	2010	1-MN-301	NE	None	13.47	0.85	11.4495	51.39	89.7%	$975,000		$85,157	$3,372,154	0.29	$17,112,313.00
36	007	Sheridan Av N & 29th Av N	Dan Cazanacli	1. Project Development	2010	1-MN-310	M020	05	5.20	0.44	2.2880	53.68	93.7%	$1,300,000	Cost per Acre	$568,182	$673,871	1.93	$18,412,313.00
37	120	Grand St NE & 28th Av NE	Spurrier	1. Project Development	2010	1-MN-300	NE	None	1.54	0.40	0.6160	54.30	94.8%	$385,000	Cost per Acre	$625,000	$181,427	2.12	$18,797,313.00
38	075	Grand St NE, 26th to 27th Av NE	Spurrier	1. Project Development	2010	1-MN-330	NE	209E	1.48	0.40	0.5920	54.89	95.8%	$370,000	Cost per Acre	$625,000	$174,358	2.12	$19,167,313.00
39	095	33rd Av NE, Tyler to Polk St NE	Dan Cazanacli	1. Project Development	2010	1-MN-303	NE	None	1.47	0.40	0.5880	55.48	96.8%	$368,000	Cost per Acre	$625,850	$173,180	2.12	$19,535,313.00
40	108	36th Av NE & Polk St NE (*emergency overflow*)	Dan Cazanacli	1. Project Development	2010	1-MN-303	NE	None	4.04	0.36	1.4544	56.93	99.4%	$1,010,000	Cost per Acre	$694,444	$428,356	2.36	$20,545,313.00
41	125	Fillmore St NE, 34th to 35th Av NE	Dan Cazanacli	1. Project Development	2010	1-MN-303	NE	None	0.67	0.36	0.2412	57.17	99.8%	$168,000	Cost per Acre	$696,517	$71,039	2.36	$20,713,313.00
42	097	Lowry St NE, Jackson to Central Av NE	Spurrier	1. Project Development	2011	1-MN-300	NE	None	0.14	0.90	0.1260	57.30	100.0%	$84,000	Preliminary	$666,667	$37,110	2.26	$20,797,313.00
									107.73		57.30			$20,797,313					

2007 Projects =	$0
2008 Projects =	$9,822,313
2009 Projects =	$4,704,000
2010 Projects =	$4,576,000
2011 Projects =	$84,000

Total funding approved by the Minneapolis City Council is $10,000,000 (2003-2007)

Project Under Construction

Project Status

1. Project Development
2. Design
3. Pre-Construction
4. Construction
5. Finalization

1 *Runoff coefficient was altered if CSO area was located Downtown or in a commercial or industrial area.*

2 *Cost per Acre estimates are based on $250,000 per acre removed from the sanitary system.*

Total Estimated Excess Flow (Gal)	103,300,000	***20,660,000***	
Total Surcharge for Excess Flow	$36,600,000		
Total Surcharge per MGD of Excess Flow (D73/D72)	$354,308		
Peak Rainfall Intensity (in/24 hour)	5.90		
43560*7.4805195/12	27,154.29		**9,180,081**
Total Estimated CSO Flow (Gal) (M62*D75*D76)	9,180,081		**27396000**
Total Estimated CSO Flow/Total Estimated Excess Flow (D77/D720)	0.088868165		**36,576,081**
Total Surcharge for CSO Flow (D78*D73)	$3,252,575		**66,723,919**
Annual Precipitation (in)	29.41		
Estimated CSO Wastewater Per Year (Gal) (D80*M62*D76)	45,760,372		**0**
Treatment Cost per 10,000 Gal	$150.00		
Estimated CSO Wastewater Treatment Rate Per Year ((D81/10000)*D82)	$686,406		
of 100 Years of Wastewater Treatment @ 5% (PV(0.05,100,D83)+D83*100)	$13,623,716		
Total Cost of CSO Flow	$16,876,291		
Cost per V.I.	$294,524		

FIGURE 8

7/31/2008

APPENDICES

APPENDIX A:
City of Minneapolis Sewage Flow Projections for years 2010, 2015, 2020, 2025 & 2030 by Interceptor Service Area

City of Minneapolis Sewage Flow Projections for years 2010, 2015, 2020, 2025 & 2030 by Interceptor Service Area

Introduction and Methodology

See **Section III, Projection of Wastewater Flows** on page 15 of the main document.

Process Overview

Base Data:
- 2007 annual Citywide sewage flow volumes for residential and commercial customers (source: Public Works, Water Treatment & Distribution Division)
- Interceptor Service Area land use breakdown by type and acreage (source: Minneapolis GIS Business Services)
- Polygon layer of Minneapolis parcel data (source: Minneapolis GIS Business Services)
- Population and employment projections by Transporation Analysis Zone (TAZ) for Minneapolis for years 2000, 2010, 2020, & 2030. (source: Metropolitan Council)
- Polygon shape file of TAZ areas for metropolitan area (source: Metropolitan Council)
- Polygon shape file of sewersheds for City of Minneapolis (source: Metropolitan Council)

Part One, Major Steps:
1. Citywide sewage flow totals for residential and commercial customers (2007) were apportioned to each interceptor service area on the basis of land use.
2. Calculated the average number of residents per residential parcel and household, and the average number of employees per non-residential parcel, for the 138 TAZ areas.
3. Dissolved polygon layer of the 138 TAZ areas in Minneapolis with population, household and employment projections to create 270 sub-areas apportioned to the 25 Interceptor Service Areas.
4. Calculated revised population, household and employment projections for the 270 sub-areas based on the averages derived from Step 2.

Part One, Results:
- A shapefile of 270 TAZ sub-areas divided by Interceptor Service Area, containing population, household and employment estimates to year 2030. Data attributes include the original TAZ area identifier, Interceptor Service Area identifier, and population, household and employment estimates per sub-area for each year in the time series (2000, 2005, 2007, 2010, 2015, 2020, 2025 and 2030).
- A shapefile for Minneapolis Interceptor Service Areas containing residential and commercial flow estimates for 2007 (Interceptor shape file, 25 polygons). Data attributes include area of interceptor service area, and annual residential and commercial sewage flows per interceptor area.

Part Two, Major Steps:
- Data from the 270 TAZ sub-areas was totaled to arrive at population, household and employment projections for the 25 Interceptor Service Areas for each year in the time series. These totals were then joined to the attributes of the 25 Interceptor Service Areas.
- Changes in population, households and employment by Interceptor Service Area for each future year of the time series were calculated as a percentage of the 2007 value.
- The 2007 base year flows were then multiplied by this percentage value to arrive at projected flow volumes for the future years in the time series.

Part Two, Results:
- Polygon layer and attribute tables containing base sewage flow for years 2000, 2005 & 2007 and projected flows for each future year in the time series thru 2030.

CITY OF MINNEAPOLIS TOTAL SEWAGE FLOW 2000 - 2030

(MILLIONS OF GALLONS PER YEAR AND PERCENTAGE CHANGE)

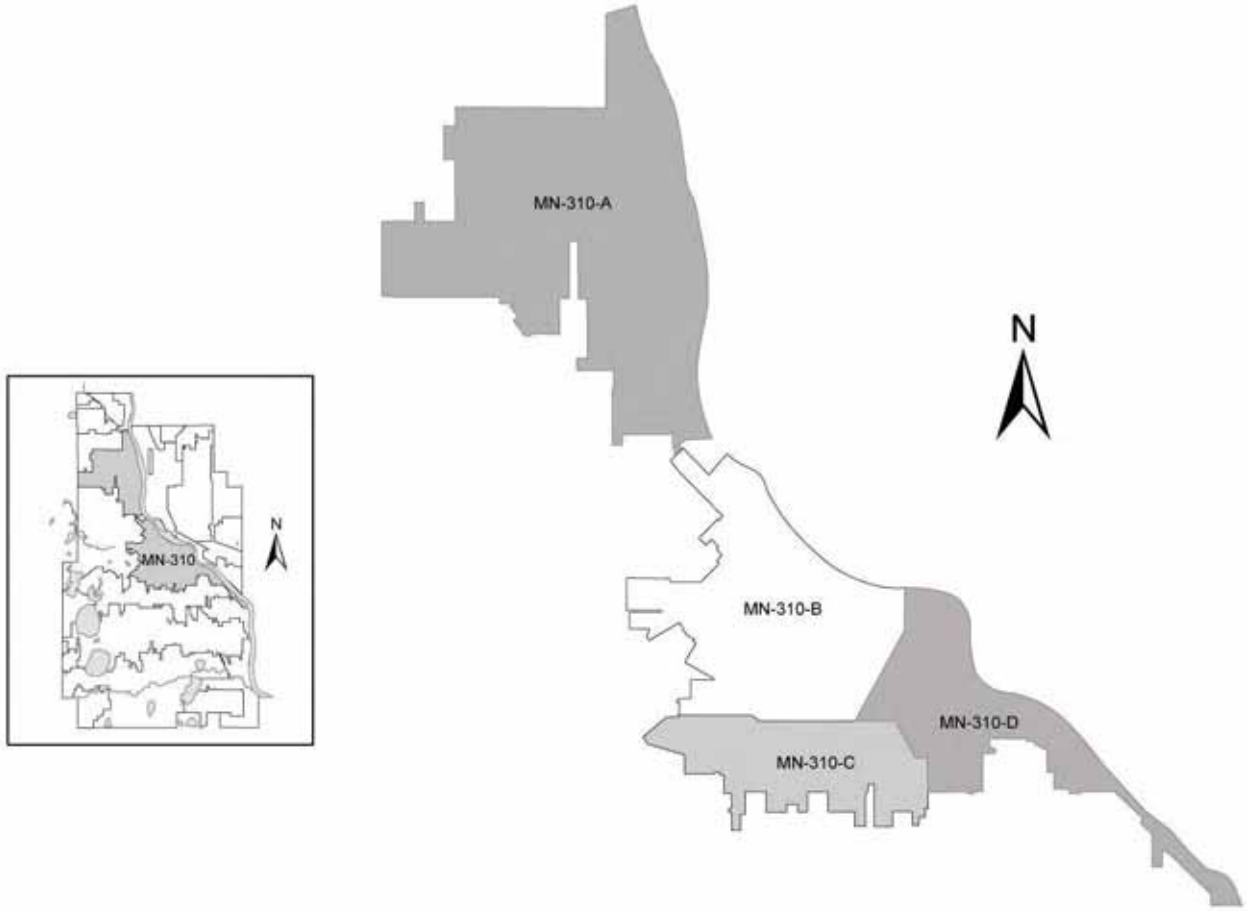
INTERCEPTOR SERVICE AREA	2000 TOTAL SEWAGE FLOW	2005 TOTAL SEWAGE FLOW	PERCENT CHANGE 2000-2005	2007 TOTAL SEWAGE FLOW (BASELINE)	PERCENT CHANGE 2005-2007	2010 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2007-2010
7026	101,698,393	98,597,842	-3.05%	97,357,621	-1.26%	95,497,290	-1.91%
8255	863,086,998	889,889,711	3.11%	900,610,797	1.20%	916,692,424	1.79%
8754	23,857,072	21,201,039	-11.13%	20,138,626	-5.01%	18,545,006	-7.91%
MN-300	902,767,912	889,359,216	-1.49%	883,995,737	-0.60%	875,950,519	-0.91%
MN301	150,435,008	173,910,269	15.60%	183,300,373	5.40%	197,385,530	7.68%
MN302	999,126,412	978,689,425	-2.05%	970,514,629	-0.84%	958,252,437	-1.26%
MN-303	80,146,139	109,016,029	36.02%	120,563,985	10.59%	137,885,919	14.37%
MN305	675,301	702,698	4.06%	712,463	1.39%	727,111	2.06%
MN-306	26,696,308	26,771,403	0.28%	26,801,441	0.11%	26,846,499	0.17%
MN-310*	5,559,111,607	5,599,963,183	0.73%	5,616,303,814	0.29%	5,640,814,759	0.44%
MN-311	34,275,151	44,233,258	29.05%	48,216,501	9.01%	54,191,365	12.39%
MN-312	94,600,376	107,508,543	13.64%	112,671,810	4.80%	120,416,711	6.87%
MN-313	22,168,841	23,641,872	6.64%	24,231,084	2.49%	25,114,902	3.65%
MN-314	19,035,585	20,774,050	9.13%	21,469,435	3.35%	22,512,514	4.86%
MN-315	110,629,327	108,430,488	-1.99%	107,550,952	-0.81%	106,231,649	-1.23%
MN-316	179,379,393	174,218,416	-2.88%	172,154,025	-1.18%	169,057,438	-1.80%
MN-320*	1,340,953,934	1,394,876,400	4.02%	1,416,445,387	1.55%	1,448,798,866	2.28%
MN-330*	1,494,699,054	1,560,905,772	4.43%	1,587,388,459	1.70%	1,627,112,490	2.50%
MN-340* **	361,090,927	373,558,129	3.45%	378,545,010	1.33%	386,025,331	1.98%
MN-341*	1,601,670,789	1,634,889,934	2.07%	1,648,177,593	0.81%	1,668,109,080	1.21%
MN-342	11,248,993	11,682,410	3.85%	11,855,777	1.48%	12,115,828	2.19%
MN-343	58,055,195	57,792,956	-0.45%	57,688,061	-0.18%	57,530,717	-0.27%
MN-344*	1,206,856,402	1,236,187,244	2.43%	1,247,919,581	0.95%	1,265,518,086	1.41%
MN-345	165,020,522	170,465,264	3.30%	172,643,160	1.28%	175,910,005	1.89%
MN-346	199,624,063	205,333,515	2.86%	207,617,295	1.11%	211,042,966	1.65%
TOTALS	**15,606,909,702**	**15,912,599,066**	**1.96%**	**16,034,873,617**	**0.77%**	**16,218,285,445**	**1.14%**

INTERCEPTOR SERVICE AREA	2015 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2010-2015	2020 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2015-2020	2025 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2020-2025	2030 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2025-2030
7026	89,418,098	-6.37%	83,338,907	-6.80%	84,561,085	1.47%	85,783,264	1.45%
8255	898,066,199	-2.03%	879,439,973	-2.07%	892,528,248	1.49%	905,616,524	1.47%
8754	17,886,295	-3.55%	17,227,585	-3.68%	17,439,486	1.23%	17,651,387	1.22%
MN-300	850,090,837	-2.95%	824,231,155	-3.04%	837,115,953	1.56%	850,000,751	1.54%
MN301	222,850,560	12.90%	248,315,589	11.43%	253,030,273	1.90%	257,744,957	1.86%
MN302	954,040,203	-0.44%	949,827,970	-0.44%	979,785,946	3.15%	1,009,743,923	3.06%
MN-303	123,847,158	-10.18%	109,808,397	-11.34%	111,380,443	1.43%	112,952,488	1.41%
MN305	702,582	-3.37%	673,461	-4.14%	689,029	2.31%	699,783	1.56%
MN-306	26,383,503	-1.72%	25,920,507	-1.75%	26,274,024	1.36%	26,627,540	1.35%
MN-310*	6,104,046,222	8.21%	6,567,277,684	7.59%	6,698,601,135	2.00%	6,829,924,586	1.96%
MN-311	47,890,662	-11.63%	41,589,958	-13.16%	42,222,730	1.52%	42,855,502	1.50%
MN-312	119,587,145	-0.69%	118,757,578	-0.69%	120,338,022	1.33%	121,918,466	1.31%
MN-313	25,649,654	2.13%	26,184,406	2.08%	26,506,023	1.23%	26,827,641	1.21%
MN-314	22,923,200	1.82%	23,333,885	1.79%	23,642,115	1.32%	23,950,345	1.30%
MN-315	108,015,418	1.68%	109,799,187	1.65%	111,362,078	1.42%	112,924,969	1.40%
MN-316	171,914,638	1.69%	174,771,838	1.66%	177,026,408	1.29%	179,280,979	1.27%
MN-320*	1,447,575,542	-0.08%	1,446,352,217	-0.08%	1,469,688,704	1.61%	1,493,025,191	1.59%
MN-330*	1,621,921,877	-0.32%	1,616,731,263	-0.32%	1,642,536,033	1.60%	1,668,340,804	1.57%
MN-340* **	385,432,132	-0.15%	384,838,932	-0.15%	390,158,102	1.38%	395,477,272	1.36%
MN-341*	1,661,819,598	-0.38%	1,655,530,117	-0.38%	1,678,350,679	1.38%	1,701,171,241	1.36%
MN-342	12,369,027	2.09%	12,622,227	2.05%	12,773,526	1.20%	12,924,825	1.18%
MN-343	57,605,700	0.13%	57,680,684	0.13%	58,465,046	1.36%	59,249,409	1.34%
MN-344*	1,266,029,364	0.04%	1,266,540,643	0.04%	1,283,467,981	1.34%	1,300,395,319	1.32%
MN-345	176,713,061	0.46%	177,516,116	0.45%	179,746,488	1.26%	181,976,859	1.24%
MN-346	215,102,449	1.92%	219,161,931	1.89%	221,912,645	1.26%	224,663,359	1.24%
TOTALS	**16,627,881,124**	**2.53%**	**17,037,472,211**	**2.46%**	**17,339,602,204**	**1.77%**	**17,641,727,383**	**1.74%**

*** SEE FOLLOWING PAGES FOR FLOW DATA FOR SUBDIVISIONS OF SERVICE AREAS FOR MN-310, 320, 330, 340, 341 & 344**

**** FIGURES FOR MN-340 EXCLUDE FLOWS FOR THE METROPOLITAN AIRPORT COMMISSION, FORT SNEELING AREA ACCOUNTS AND THE VETERAN'S ADMINISTRATION HOSPITAL AS GROWTH PROJECTIONS ARE UNAVAILABLE FOR THESE AREAS. SEE APPENDIX E FOR FLOW DATA FOR 2007.**

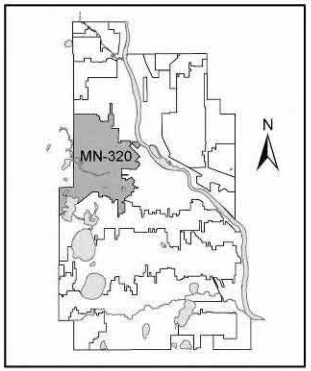
INTERCEPTOR SERVICE AREA MN-310

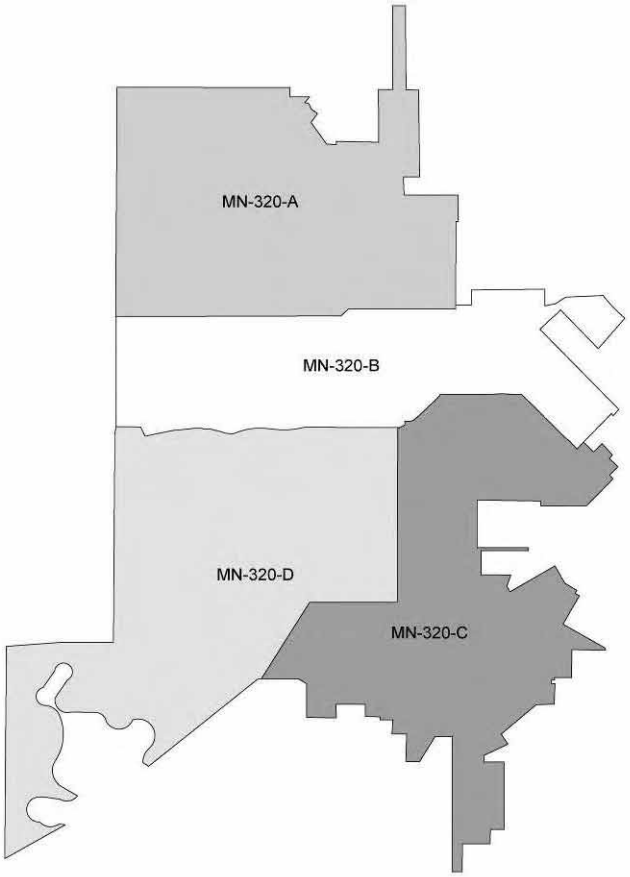


MN-310 SERVICE AREA DIVISIONS - BASE FLOW TOTALS & PROJECTIONS THRU 2030

INTERCEPTOR SERVICE AREA	2000 TOTAL SEWAGE FLOW	PERCENT CHANGE 2000-2005	2005 TOTAL SEWAGE FLOW	PERCENT CHANGE 2005-2007	2007 TOTAL SEWAGE FLOW (BASELINE)	PERCENT CHANGE 2007-2010	2010 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2010-2015	2015 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2015-2020	2020 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2020-2025	2025 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2025-2030	2030 TOTAL SEWAGE FLOW (PROJECTED)
MN-310-A	619,761,872	5.42%	653,347,072	1.81%	665,170,605	3.21%	686,531,506	-0.56%	682,516,846	-0.94%	676,080,469	1.50%	686,199,289	1.47%	696,318,310
MN-310-B	3,924,365,544	0.59%	3,947,493,481	0.27%	3,958,193,077	0.33%	3,971,369,522	12.82%	4,480,310,567	11.57%	4,998,555,588	2.11%	5,103,947,994	2.06%	5,209,338,165
MN-310-C	473,353,890	-0.33%	471,777,656	-0.21%	470,773,431	-0.19%	469,901,363	-3.05%	455,562,896	-3.75%	438,495,220	1.58%	445,417,964	1.55%	452,340,841
MN-310-D	541,628,271	-2.64%	527,343,498	-0.98%	522,164,907	-1.75%	513,012,551	-5.33%	485,654,735	-6.49%	454,147,234	1.96%	463,037,355	1.92%	471,927,560
MN-310 TOTALS	**5,559,109,577**	**0.73%**	**5,599,961,707**	**0.29%**	**5,616,302,021**	**0.44%**	**5,640,814,944**	**8.21%**	**6,104,045,043**	**7.59%**	**6,567,278,531**	**2.00%**	**6,698,602,602**	**1.96%**	**6,829,924,876**

INTERCEPTOR SERVICE AREA MN-320





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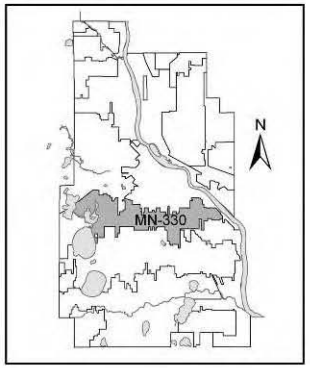
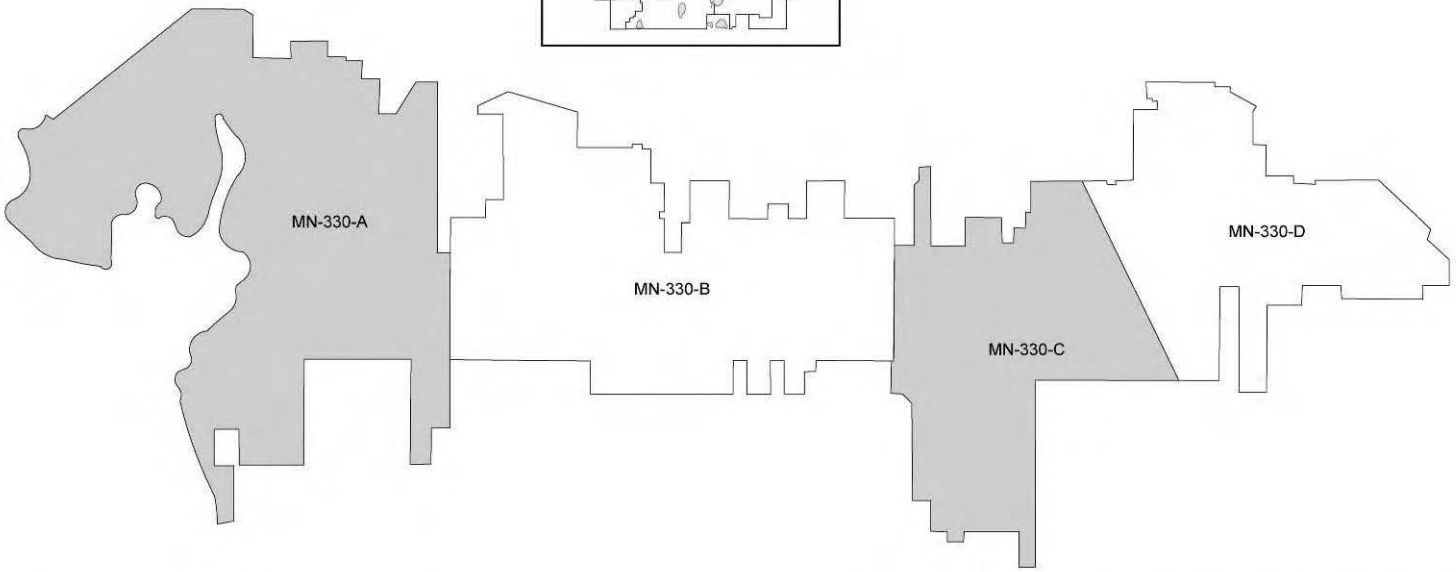
MN-320 SERVICE AREA DIVISIONS - BASE FLOW TOTALS & PROJECTIONS THRU 2030

INTERCEPTOR SERVICE AREA	2000 TOTAL SEWAGE FLOW	PERCENT CHANGE 2000-2005	2005 TOTAL SEWAGE FLOW	PERCENT CHANGE 2005-2007	2007 TOTAL SEWAGE FLOW (BASELINE)	PERCENT CHANGE 2007-2010	2010 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2010-2015	2015 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2015-2020	2020 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2020-2025	2025 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2025-2030	2030 TOTAL SEWAGE FLOW (PROJECTED)
MN-320	1,340,953,934	4.02%	1,394,876,400	1.55%	1,416,445,387	2.28%	1,448,798,866	-0.08%	1,447,575,542	-0.08%	1,446,352,217	1.61%	1,469,688,704	1.59%	1,493,025,191
MN-320-A	316,863,898	-0.08%	316,608,227	-0.03%	316,518,930	-0.70%	314,298,113	-7.84%	289,656,322	11.59%	323,231,065	-0.52%	321,552,455	-1.43%	316,955,071
MN-320-B	252,163,212	7.34%	270,660,909	2.73%	278,045,789	4.17%	289,642,410	1.18%	293,067,782	-3.87%	281,726,851	2.27%	288,109,093	2.47%	295,229,365
MN-320-C	506,439,977	7.88%	546,349,070	2.92%	562,326,377	4.44%	587,287,827	5.28%	618,282,212	-0.53%	615,013,700	2.35%	629,481,397	2.52%	645,371,960
MN-320-D	265,486,847	-1.59%	261,259,299	-0.65%	259,552,546	-0.76%	257,570,517	-4.27%	246,569,885	-8.19%	226,379,803	1.84%	230,546,060	2.14%	235,468,795
MN-320 TOTALS	**1,340,953,934**	**4.02%**	**1,394,877,504**	**1.55%**	**1,416,443,642**	**2.28%**	**1,448,798,866**	**-0.08%**	**1,447,576,201**	**-0.08%**	**1,446,351,419**	**1.61%**	**1,469,689,006**	**1.59%**	**1,493,025,191**

INTERCEPTOR SERVICE AREA MN-330

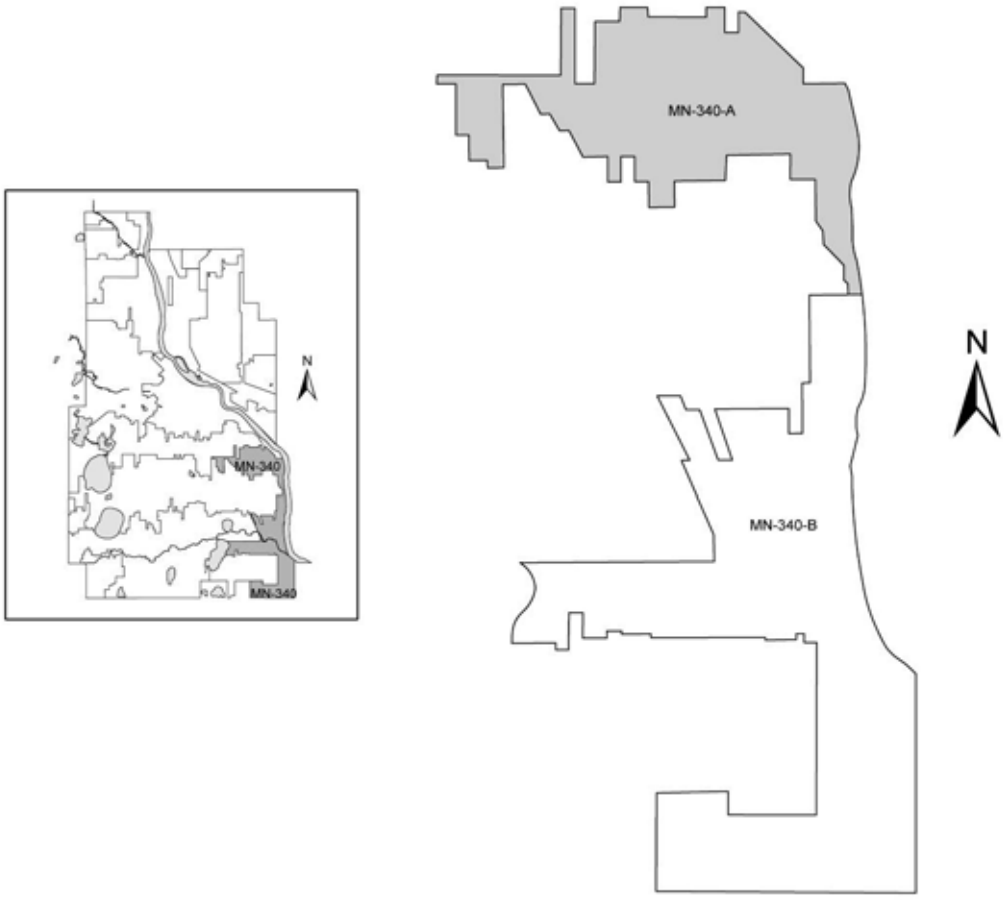




MN-330 SERVICE AREA DIVISIONS - BASE FLOW TOTALS & PROJECTIONS THRU 2030

INTERCEPTOR SERVICE AREA	2000 TOTAL SEWAGE FLOW	PERCENT CHANGE 2000-2005	2005 TOTAL SEWAGE FLOW	PERCENT CHANGE 2005-2007	2007 TOTAL SEWAGE FLOW (BASELINE)	PERCENT CHANGE 2007-2010	2010 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2010-2015	2015 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2015-2020	2020 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2020-2025	2025 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2025-2030	2030 TOTAL SEWAGE FLOW (PROJECTED)
MN-330	1,494,699,054	3.58%	1,548,235,100	2.53%	1,587,388,459	2.50%	1,627,112,490	-0.32%	1,621,921,877	-0.32%	1,616,731,263	1.60%	1,642,536,033	1.57%	1,668,340,804
MN-330-A	439,037,498	4.78%	460,042,378	-0.43%	458,054,121	0.57%	460,670,251	-0.13%	460,060,972	-0.13%	459,467,990	1.47%	466,213,197	1.45%	472,958,365
MN-330-B	674,227,154	6.29%	716,661,099	4.29%	747,424,908	3.32%	772,276,062	-0.72%	766,720,303	-0.72%	761,166,751	1.68%	773,950,714	1.65%	786,734,626
MN-330-C	145,335,082	8.66%	157,919,766	4.13%	164,444,343	3.67%	170,474,620	0.75%	171,746,279	0.74%	173,018,655	1.47%	175,570,604	1.45%	178,122,497
MN-330-D	203,757,056	4.84%	213,611,857	2.55%	219,048,854	2.12%	223,691,557	-0.13%	223,394,323	-0.14%	223,077,719	1.67%	226,801,628	1.64%	230,525,258
MN-330 TOTALS	**1,462,356,789**	**5.87%**	**1,548,235,100**	**2.63%**	**1,588,972,227**	**2.40%**	**1,627,112,490**	**-0.32%**	**1,621,921,877**	**-0.32%**	**1,616,731,114**	**1.60%**	**1,642,536,143**	**1.57%**	**1,668,340,747**

INTERCEPTOR SERVICE AREA MN-340



MN-340 SERVICE AREA DIVISIONS - BASE FLOW TOTALS & PROJECTIONS THRU 2030

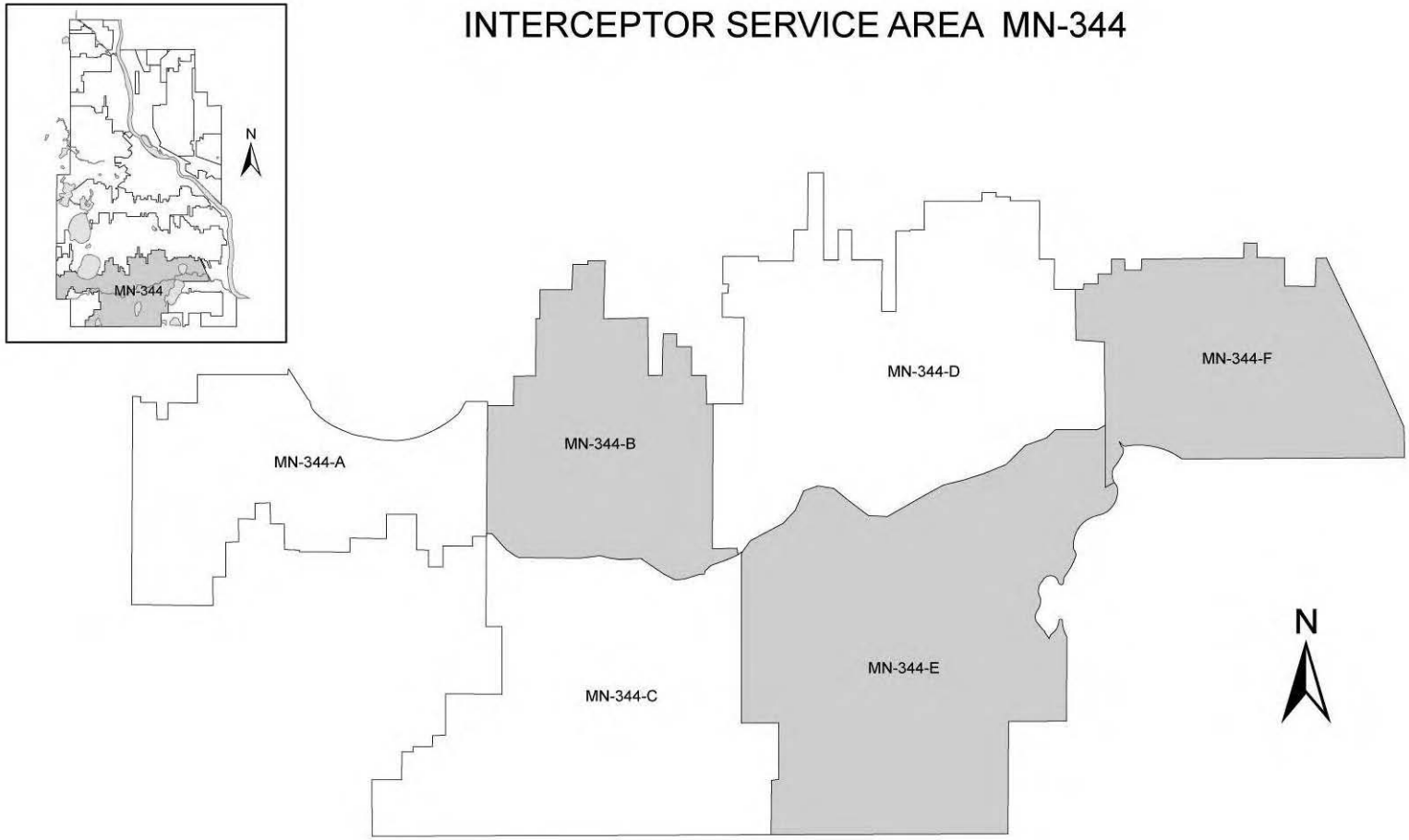
INTERCEPTOR SERVICE AREA	2000 TOTAL SEWAGE FLOW	PERCENT CHANGE 2000-2005	2005 TOTAL SEWAGE FLOW	PERCENT CHANGE 2005-2007	2007 TOTAL SEWAGE FLOW (BASELINE)	PERCENT CHANGE 2007-2010	2010 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2010-2015	2015 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2015-2020	2020 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2020-2025	2025 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2025-2030	2030 TOTAL SEWAGE FLOW (PROJECTED)
MN-340-A	196,622,376	4.57%	205,613,239	2.64%	211,046,396	2.93%	217,228,119	1.48%	220,438,513	1.46%	223,648,906	1.42%	226,830,980	1.40%	230,013,053
MN-340-B	164,468,551	1.80%	167,430,251	0.04%	167,498,614	0.78%	168,797,212	-2.25%	164,993,619	-2.31%	161,190,026	1.33%	163,322,122	1.31%	165,454,219
MN-340 TOTALS	361,090,927	3.31%	373,043,490	1.47%	378,545,010	1.98%	386,025,331	-0.15%	385,432,132	-0.15%	384,838,932	1.38%	390,158,102	1.36%	395,477,272

INTERCEPTOR SERVICE AREA MN - 341

MN-341 SERVICE AREA DIVISIONS - BASE FLOW TOTALS & PROJECTIONS THRU 2030

INTERCEPTOR SERVICE AREA	2000 TOTAL SEWAGE FLOW	PERCENT CHANGE 2000-2005	2005 TOTAL SEWAGE FLOW	PERCENT CHANGE 2005-2007	2007 TOTAL SEWAGE FLOW (BASELINE)	PERCENT CHANGE 2007-2010	2010 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2010-2015	2015 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2015-2020	2020 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2020-2025	2025 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2025-2030	2030 TOTAL SEWAGE FLOW (PROJECTED)
MN-341-A	200,872,435	-2.29%	196,271,802	-3.40%	189,593,156	-2.55%	184,759,180	-1.06%	182,799,966	-1.07%	180,840,752	1.29%	183,173,645	1.27%	185,506,579
MN-341-B	424,947,363	1.40%	430,894,256	2.23%	440,481,870	1.51%	447,139,516	0.86%	450,991,876	0.85%	454,844,235	1.43%	461,330,771	1.41%	467,817,093
MN-341-C	334,426,173	-0.65%	332,243,062	-0.63%	330,152,301	-0.55%	328,320,641	-0.57%	326,449,715	-0.57%	324,578,790	1.30%	328,812,350	1.29%	333,045,732
MN-341-D	184,359,569	6.30%	195,981,960	8.15%	211,962,589	5.58%	223,792,455	-0.63%	222,376,984	-0.64%	220,961,512	1.56%	224,401,004	1.53%	227,840,725
MN-341-E	220,265,067	-0.01%	220,239,742	0.49%	221,325,840	0.21%	221,780,457	-1.61%	218,206,116	-1.64%	214,631,775	1.30%	217,411,408	1.28%	220,191,066
MN-341-F	128,922,165	4.64%	134,899,711	2.20%	137,860,803	2.78%	141,691,648	1.21%	143,407,185	1.20%	145,122,722	1.40%	147,149,883	1.38%	149,177,146
MN-341-G	107,878,016	5.70%	114,022,003	2.44%	116,801,033	3.27%	120,625,182	-2.52%	117,587,757	-2.58%	114,550,332	1.33%	116,071,619	1.31%	117,592,900
MN-341 TOTALS	**1,601,670,789**	**1.43%**	**1,624,552,537**	**1.45%**	**1,648,177,593**	**1.21%**	**1,668,109,080**	**-0.38%**	**1,661,819,598**	**-0.38%**	**1,655,530,117**	**1.38%**	**1,678,350,679**	**1.36%**	**1,701,171,241**

INTERCEPTOR SERVICE AREA MN-344



MN-344 SERVICE AREA DIVISIONS - BASE FLOW TOTALS & PROJECTIONS THRU 2030

INTERCEPTOR SERVICE AREA	2000 TOTAL SEWAGE FLOW	PERCENT CHANGE 2000-2005	2005 TOTAL SEWAGE FLOW	PERCENT CHANGE 2005-2007	2007 TOTAL SEWAGE FLOW (BASELINE)	PERCENT CHANGE 2007-2010	2010 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2010-2015	2015 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2015-2020	2020 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2020-2025	2025 TOTAL SEWAGE FLOW (PROJECTED)	PERCENT CHANGE 2025-2030	2030 TOTAL SEWAGE FLOW (PROJECTED)
MN-344-A	177,351,152	2.21%	181,262,807	0.62%	182,393,474	1.53%	185,192,702	-0.24%	184,755,600	-0.35%	184,107,939	1.40%	186,693,809	1.38%	189,263,249
MN-344-B	157,690,484	2.86%	162,195,811	0.85%	163,577,660	1.91%	166,707,909	0.61%	167,719,662	0.48%	168,532,628	1.36%	170,826,786	1.34%	173,111,404
MN-344-C	234,940,699	1.42%	238,275,003	0.35%	239,109,706	1.05%	241,629,472	-1.30%	238,498,195	-1.42%	235,109,044	1.46%	238,544,194	1.43%	241,948,340
MN-344-D	289,901,765	2.51%	297,181,286	0.73%	299,358,200	1.71%	304,476,248	0.16%	304,958,765	0.04%	305,087,201	1.38%	309,309,916	1.36%	313,510,106
MN-344-E	245,164,395	2.99%	252,487,184	0.90%	254,750,900	1.99%	259,819,550	0.77%	261,829,576	0.65%	263,526,938	1.35%	267,092,095	1.33%	270,644,003
MN-344-F	101,820,613	2.87%	104,742,770	0.86%	105,639,765	1.92%	107,669,260	0.62%	108,340,496	0.50%	108,883,227	1.36%	110,364,497	1.34%	111,839,671
MN-344 TOTALS	**1,206,869,107**	**2.43%**	**1,236,144,860**	**0.70%**	**1,244,829,705**	**1.66%**	**1,265,495,142**	**0.05%**	**1,266,102,294**	**-0.07%**	**1,265,246,977**	**1.39%**	**1,282,831,297**	**1.36%**	**1,300,316,772**

APPENDIX B:

Sanitary Service Areas - Demographic Changes Thru 2030

The following tables provide figures for population, number of households, and employment for each of the 25 service areas of the MCES interceptors within the City of Minneapolis.

These figures were derived from projections of change in population and employment provided by the Metropolitan Council and the Planning Section of the City of Minneapolis Community Planning and Economic Development Department, and are based on the TAZ[1] unit of analysis. For the purposes of this report a polygon layer of the 138 TAZ areas in Minneapolis was dissolved using GIS software to create 270 sub-areas apportioned to the 25 Interceptor Service Areas. Figures are also provided for subdivisions of the services areas for I-MN-310, 320, 330, 340, 341 and 344.

[1] Traffic Analysis Zone (TAZ) is the base unit of analysis for comprehensive planning population and employment projections. There are 138 TAZs in the City of Minneapolis.

CITY OF MINNEAPOLIS
SANITARY SEWER AREAS
BY M.C.E.S. SEWER
DEMOGRAPHIC CHANGES
2000 THRU 2030

POULATION								
SERVICE AREA	**2000**	**2005**	**2007**	**2010**	**2015**	**2020**	**2025**	**2030**
7026	2,681	2,827	2,885	2,973	3,015	3,056	3,159	3,261
8255	27,405	29,176	29,884	30,947	31,594	32,241	32,709	33,176
8754	690	704	710	718	710	702	776	849
MN-300	20,510	21,962	22,542	23,413	23,900	24,386	24,754	25,121
MN-301	2,895	2,921	2,931	2,947	2,987	3,027	3,130	3,233
MN-302	5,548	5,620	5,649	5,692	5,792	5,892	6,639	7,386
MN-303	3,679	3,888	3,971	4,096	4,162	4,227	4,345	4,462
MN-305	9	9	9	9	9	9	9	9
MN-306	1,075	1,052	1,042	1,028	1,027	1,026	1,104	1,181
MN-310*	63,553	64,975	65,544	66,397	69,183	71,968	73,140	74,312
MN-311	1,145	1,281	1,335	1,417	1,425	1,432	1,515	1,597
MN-312	4,273	4,696	4,865	5,119	5,207	5,294	5,425	5,555
MN-313	1,055	1,144	1,179	1,232	1,236	1,239	1,319	1,399
MN-314	806	877	905	948	945	942	1,019	1,095
MN-315	4,458	4,382	4,352	4,306	4,376	4,445	4,566	4,686
MN-316	8,600	8,377	8,288	8,154	8,307	8,460	8,631	8,802
MN-320*	37,104	37,652	37,871	38,200	38,996	39,791	40,331	40,870
MN-330*	44,327	45,768	46,344	47,209	48,246	49,283	49,965	50,646
MN-340*	14,162	14,789	15,039	15,415	15,983	16,550	16,823	17,096
MN-341*	68,012	68,239	68,329	68,465	70,131	71,796	72,763	73,730
MN-342	491	523	536	555	544	532	603	674
MN-343	2,094	2,204	2,248	2,314	2,341	2,367	2,461	2,555
MN-344*	50,256	52,549	53,466	54,841	56,014	57,186	57,965	58,743
MN-345	7,793	8,176	8,329	8,559	8,721	8,882	9,058	9,234
MN-346	9,553	9,964	10,128	10,375	10,720	11,064	11,268	11,471
TOTALS	**382,174**	**393,752**	**398,383**	**405,329**	**415,563**	**425,797**	**433,470**	**441,143**

*** SEE FIGURES BELOW FOR SUBDIVISIONS OF SERVICE AREAS MN-310, 320, 330,340,341 & 344**

POPULATION								
SERVICE AREA	**2,000**	**2,005**	**2007P**	**2010**	**2015**	**2020**	**2025**	**2030**
MN-310-A	24,338	23,758	23,517	23,147	23,620	24,095	24,414	24,732
MN-310-B	14,539	16,962	17,947	19,442	21,241	23,038	23,561	24,085
MN-310-C	14,068	13,541	13,323	12,991	13,255	13,520	13,698	13,877
MN-310-D	10,607	10,714	10,756	10,818	11,066	11,315	11,467	11,618
MN-310 TOTAL	**63,553**	**64,975**	**65,544**	**66,397**	**69,183**	**71,968**	**73,140**	**74,312**
MN-320-A	14,319	13,686	13,430	12,935	13,269	13,480	13,734	13,859
MN-320-B	4,582	5,464	5,819	6,381	6,500	6,649	6,728	6,840
MN-320-C	10,953	11,335	11,488	11,770	11,980	12,247	12,368	12,549
MN-320-D	7,249	7,167	7,134	7,114	7,247	7,415	7,500	7,622
MN-320 TOTAL	**37,104**	**37,652**	**37,871**	**38,200**	**38,996**	**39,791**	**40,331**	**40,870**
MN-330-A	14,606	15,708	16,140	16,789	17,144	17,500	17,742	17,984
MN-330-B	18,430	18,506	18,544	18,599	18,993	19,387	19,655	19,922
MN-330-C	5,981	6,130	6,190	6,280	6,413	6,546	6,637	6,727
MN-330-D	5,309	5,424	5,471	5,541	5,696	5,850	5,931	6,013
MN-330 TOTAL	**44,327**	**45,768**	**46,344**	**47,209**	**48,246**	**49,283**	**49,965**	**50,646**
MN-340-A	7,699	8,040	8,176	8,381	8,708	9,035	9,148	9,262
MN-340-B	6,553	6,832	6,943	7,110	7,376	7,641	7,738	7,834
MN-340 TOTAL	**14,252**	**14,872**	**15,119**	**15,491**	**16,084**	**16,676**	**16,886**	**17,096**
MN-341-A	8,093	8,307	8,393	8,522	8,702	8,882	9,002	9,122
MN-341-B	18,056	17,819	17,724	17,579	17,954	18,329	18,575	18,821
MN-341-C	14,609	14,663	14,685	14,718	15,032	15,345	15,551	15,757
MN-341-D	7,763	7,420	7,282	7,073	7,225	7,376	7,476	7,576
MN-341-E	10,116	10,063	10,042	10,010	10,223	10,437	10,578	10,718
MN-341-F	5,185	5,468	5,582	5,753	5,964	6,175	6,259	6,342
MN-341-G	4,190	4,499	4,623	4,810	5,031	5,252	5,322	5,393
MN-341 TOTAL	**68,012**	**68,239**	**68,329**	**68,465**	**70,131**	**71,796**	**72,763**	**73,730**
MN-344-A	7,155	7,481	7,611	7,807	7,974	8,141	8,252	8,363
MN-344-B	6,975	7,293	7,420	7,611	7,774	7,936	8,044	8,152
MN-344-C	8,361	8,743	8,895	9,124	9,319	9,514	9,644	9,773
MN-344-D	12,219	12,777	13,000	13,334	13,619	13,904	14,094	14,283
MN-344-E	11,035	11,538	11,740	12,042	12,299	12,556	12,727	12,898
MN-344-F	4,511	4,717	4,800	4,923	5,028	5,133	5,203	5,273
MN-344 TOTAL	**50,256**	**52,549**	**53,466**	**54,841**	**56,014**	**57,186**	**57,965**	**58,743**

CITY OF MINNEAPOLIS
SANITARY SEWER AREAS
BY M.C.E.S. SEWER
DEMOGRAPHIC CHANGES
2000 THRU 2030

	HOUSEHOLDS							
SERVICE AREA	**2000**	**2005**	**2007**	**2010**	**2015**	**2020**	**2025**	**2030**
7026	1,547	1,530	1,523	1,513	1,543	1,574	1,605	1,637
8255	12,419	12,791	12,939	13,162	13,427	13,691	13,962	14,233
8754	340	341	342	343	349	356	363	370
MN-300	7,865	8,211	8,349	8,557	8,731	8,905	9,081	9,258
MN-301	1,219	1,186	1,173	1,154	1,176	1,199	1,223	1,247
MN-302	1,721	1,881	1,945	2,040	2,082	2,123	2,300	2,477
MN-303	1,638	1,653	1,658	1,667	1,701	1,735	1,769	1,802
MN-305	4	4	4	4	4	4	4	4
MN-306	474	459	452	443	452	460	470	479
MN-310*	25,038	28,025	29,220	31,013	32,488	33,963	34,679	35,395
MN-311	453	511	535	570	585	601	613	625
MN-312	1,574	1,770	1,848	1,966	2,015	2,064	2,105	2,146
MN-313	393	436	453	479	489	499	509	519
MN-314	308	341	355	375	383	391	398	405
MN-315	1,881	1,904	1,913	1,927	1,965	2,004	2,044	2,084
MN-316	3,120	3,167	3,186	3,214	3,277	3,341	3,408	3,475
MN-320*	15,496	16,041	16,259	16,586	16,921	17,256	17,593	17,930
MN-330*	20,444	21,114	21,381	21,783	22,240	22,697	23,145	23,593
MN-340*	6,490	6,524	6,538	6,558	6,800	7,041	7,181	7,320
MN-341*	28,947	28,735	28,650	28,522	29,186	29,850	30,730	30,908
MN-342	282	282	282	282	288	293	299	305
MN-343	1,061	1,055	1,053	1,049	1,070	1,090	1,112	1,134
MN-344*	21,546	21,633	21,667	21,719	22,160	22,602	23,047	23,493
MN-345	3,566	3,538	3,527	3,510	3,579	3,649	3,720	3,792
MN-346	4,312	4,306	4,304	4,300	4,444	4,588	4,678	4,769
TOTALS	**162,139**	**167,437**	**169,556**	**172,735**	**177,355**	**181,975**	**186,038**	**189,398**

*** SEE FIGURES BELOW FOR SUBDIVISIONS OF SERVICE AREAS MN-310, 320, 330,340,341 & 344**

	HOUSEHOLDS							
SERVICE AREA	**2,000**	**2,005**	**2007P**	**2010**	**2015**	**2020**	**2025**	**2030**
MN-310-A	7,218	8,004	8,301	8,789	8,969	9,149	9,336	9,522
MN-310-B	7,521	9,714	10,876	11,900	12,976	14,052	14,374	14,696
MN-310-C	6,107	6,030	5,822	5,957	6,080	6,202	6,325	6,448
MN-310-D	4,192	4,278	4,221	4,366	4,463	4,559	4,644	4,728
MN-310 TOTAL	**25,038**	**28,025**	**29,220**	**31,013**	**32,488**	**33,963**	**34,679**	**35,395**
MN-320-A	5,980	5,831	5,766	5,616	5,758	5,846	5,991	6,080
MN-320-B	1,914	2,328	2,498	2,771	2,820	2,883	2,935	3,001
MN-320-C	4,575	4,829	4,932	5,110	5,198	5,311	5,395	5,505
MN-320-D	3,028	3,053	3,063	3,089	3,145	3,215	3,272	3,344
MN-320 TOTAL	**15,496**	**16,041**	**16,259**	**16,586**	**16,921**	**17,256**	**17,593**	**17,930**
MN-330-A	6,737	7,247	7,446	7,747	7,903	8,060	8,219	8,378
MN-330-B	8,500	8,537	8,555	8,582	8,755	8,929	9,105	9,281
MN-330-C	2,759	2,828	2,856	2,898	2,956	3,015	3,074	3,134
MN-330-D	2,449	2,502	2,524	2,557	2,626	2,694	2,748	2,801
MN-330 TOTAL	**20,444**	**21,114**	**21,381**	**21,783**	**22,240**	**22,697**	**23,145**	**23,593**
MN-340-A	3,506	3,527	3,535	3,548	3,681	3,815	3,890	3,965
MN-340-B	2,984	2,997	3,002	3,010	3,118	3,226	3,290	3,354
MN-340 TOTAL	**6,490**	**6,524**	**6,538**	**6,558**	**6,800**	**7,041**	**7,181**	**7,320**
MN-341-A	3,444	3,498	3,519	3,550	3,618	3,693	3,802	3,824
MN-341-B	7,685	7,503	7,431	7,323	7,472	7,620	7,845	7,890
MN-341-C	6,218	6,175	6,157	6,131	6,256	6,380	6,568	6,605
MN-341-D	3,304	3,124	3,053	2,947	3,007	3,067	3,157	3,176
MN-341-E	4,305	4,237	4,210	4,170	4,255	4,339	4,467	4,493
MN-341-F	2,207	2,303	2,340	2,397	2,482	2,567	2,643	2,659
MN-341-G	1,783	1,894	1,938	2,004	2,094	2,183	2,248	2,261
MN-341 TOTAL	**28,947**	**28,735**	**28,650**	**28,522**	**29,182**	**29,850**	**30,730**	**30,908**
MN-344-A	3,068	3,080	3,084	3,092	3,155	3,218	3,281	3,344
MN-344-B	2,990	3,002	3,007	3,014	3,075	3,137	3,199	3,260
MN-344-C	3,585	3,599	3,605	3,613	3,687	3,760	3,834	3,909
MN-344-D	5,239	5,260	5,268	5,281	5,388	5,495	5,604	5,712
MN-344-E	4,731	4,750	4,758	4,769	4,866	4,963	5,061	5,158
MN-344-F	1,934	1,942	1,945	1,950	1,989	2,029	2,069	2,109
MN-344 TOTAL	**21,546**	**21,633**	**21,667**	**21,719**	**22,160**	**22,602**	**23,047**	**23,493**

CITY OF MINNEAPOLIS
SANITARY SEWER AREAS
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DEMOGRAPHIC CHANGES
2000 THRU 2030

EMPLOYMENT								
SERVICE AREA	**2000**	**2005**	**2007**	**2010**	**2015**	**2020**	**2025**	**2030**
7026	1,807	1,601	1,518	1,394	1,118	841	859	877
8255	12,441	12,278	12,212	12,114	10,935	9,757	9,962	10,167
8754	329	227	186	125	88	51	51	52
MN-300	18,956	17,496	16,911	16,035	14,697	13,359	13,628	13,897
MN-301	3,485	4,371	4,726	5,258	6,173	7,088	7,237	7,387
MN-302	33,477	32,729	32,430	31,981	31,734	31,486	32,122	32,759
MN-303	270	1,225	1,607	2,180	1,587	993	1,013	1,034
MN-305	19	20	20	21	20	19	19	20
MN-306	156	184	196	213	179	144	147	150
MN-310*	162,781	163,739	164,122	164,696	180,165	195,633	199,796	203,958
MN-311	390	677	791	963	702	442	452	462
MN-312	381	580	660	780	669	558	569	581
MN-313	0	0	0	0	0	0	0	0
MN-314	63	86	94	108	107	107	109	111
MN-315	849	841	838	834	834	835	852	870
MN-316	419	417	417	416	398	380	388	396
MN-320*	23,353	25,146	25,863	26,938	26,311	25,684	26,225	26,766
MN-330*	23,876	25,508	26,160	27,139	26,191	25,243	25,775	26,307
MN-340*	3,203	3,273	3,301	3,343	2,897	2,451	2,502	2,552
MN-341*	10,650	11,967	12,494	13,284	11,843	10,402	10,622	10,842
MN-342	0	0	0	0	0	0	0	0
MN-343	593	516	485	439	406	372	379	387
MN-344*	8,721	8,343	8,192	7,964	7,136	6,307	6,435	6,563
MN-345	466	424	407	381	280	178	182	185
MN-346	486	439	420	391	281	170	174	177
TOTALS	**307,172**	**312,086**	**314,052**	**317,000**	**324,750**	**332,500**	**339,500**	**346,500**

*** SEE FIGURES BELOW FOR SUBDIVISIONS OF SERVICE AREAS MN-310, 320, 330,340,341 & 344**

EMPLOYMENT								
SERVICE AREA	**2,000**	**2,005**	**2007P**	**2010**	**2015**	**2020**	**2025**	**2030**
MN-310-A	5,563	7,337	7,992	9,116	8,624	8,040	8,210	8,379
MN-310-B	137,032	136,398	136,190	135,760	153,662	171,919	175,535	179,150
MN-310-C	7,546	7,927	8,069	8,309	7,578	6,743	6,885	7,028
MN-310-D	12,640	12,077	11,871	11,512	10,301	8,933	9,167	9,401
MN-310 TOTAL	**162,781**	**163,739**	**164,122**	**164,696**	**180,165**	**195,633**	**199,796**	**203,958**
MN-320-A	1,465	1,966	2,167	2,469	1,296	2,408	2,179	1,932
MN-320-B	6,140	6,220	6,251	6,297	6,340	5,803	5,995	6,191
MN-320-C	11,054	12,334	12,847	13,617	14,633	14,314	14,788	15,273
MN-320-D	4,694	4,626	4,598	4,555	4,043	3,158	3,263	3,370
MN-320 TOTAL	**23,353**	**25,146**	**25,863**	**26,938**	**26,311**	**25,684**	**26,225**	**26,766**
MN-330-A	6,270	6,015	5,525	5,199	4,919	4,638	4,736	4,834
MN-330-B	12,397	13,795	14,667	15,645	15,149	14,653	14,963	15,272
MN-330-C	1,282	1,518	1,697	1,876	1,827	1,778	1,816	1,854
MN-330-D	3,927	4,180	4,272	4,420	4,296	4,173	4,260	4,348
MN-330 TOTAL	**23,876**	**25,508**	**26,160**	**27,139**	**26,191**	**25,243**	**25,775**	**26,307**
MN-340-A	1,789	1,919	2,024	2,125	2,012	1,899	1,939	1,978
MN-340-B	1,414	1,354	1,277	1,218	885	551	563	575
MN-340 TOTAL	**3,203**	**3,273**	**3,301**	**3,343**	**2,897**	**2,451**	**2,502**	**2,552**
MN-341-A	1,654	1,399	1,050	790	586	382	391	399
MN-341-B	2,816	3,385	3,730	4,121	3,996	3,871	3,952	4,034
MN-341-C	1,925	1,915	1,778	1,713	1,416	1,119	1,142	1,165
MN-341-D	1,273	2,055	2,701	3,314	3,151	2,989	3,052	3,116
MN-341-E	908	1,012	1,048	1,108	819	530	541	553
MN-341-F	1,067	1,143	1,142	1,174	1,086	998	1,019	1,040
MN-341-G	1,007	1,059	1,045	1,063	788	514	524	535
MN-341 TOTAL	**10,650**	**11,967**	**12,494**	**13,284**	**11,843**	**10,402**	**10,622**	**10,842**
MN-344-A	1,448	1,387	1,361	1,324	1,186	1,048	1,070	1,091
MN-344-B	838	805	790	769	689	609	621	633
MN-344-C	2,736	2,617	2,569	2,498	2,238	1,978	2,019	2,059
MN-344-D	1,985	1,901	1,866	1,815	1,626	1,437	1,466	1,496
MN-344-E	1,172	1,118	1,098	1,067	956	845	863	880
MN-344-F	543	514	507	492	441	389	397	405
MN-344 TOTAL	**8,721**	**8,343**	**8,192**	**7,964**	**7,136**	**6,307**	**6,435**	**6,563**

Appendix C

Sanitary Service Area Characteristics for 2007

The following pages provide figures for population, number of households, land use and areas for each of the service areas of the Metropolitan Council Environment Services (MCES) interceptors within the City of Minneapolis.

There are 25 separate service areas ranging in size from MN-305 at 3.38 acres serving four residential properties and one commercial property, to the largest MN-344 at 5,244 acres, serving over sixteen thousand single-family homes in addition to a large number of multi-family residential and commercial properties.

Sanitary Sewer Service Area
7026

POPULATION

2000 CENSUS	HOUSEHOLDS
2759	1635

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
22,631,314.72	587	519.54

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	1,043,989.15	4.97%	14	2.13%
BUSINESS RETAIL	1,394,967.72	6.63%	13	1.98%
INSTITUTUTIONAL	0.00	0.00%	0	0.00%
GROUP RESIDENCE	0.00	0.00%	0	0.00%
CONDO - APARTMENT	1,265,246.03	6.02%	41	6.25%
DUPLEX	275,495.23	1.31%	34	5.18%
TOWN HOME - CO	185,569.71	0.88%	68	10.37%
SINGLE FAMILY HOME	3,710,332.35	17.66%	426	64.94%
PARKS - RECREATIONAL	9,065,671.63	43.15%	17	2.59%
VACANT OR MISC	4,068,960.19	19.37%	43	6.55%
TOTALS	**21,010,232.02**	**99.99%**	**656**	**100.00%**

Sanitary Sewer Service Area
8255

POPULATION

2000 CENSUS	HOUSEHOLDS
27374	13125

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
105,714,549.01	7,155	2,426.87

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	17,136,906.49	23.01%	292	3.93%
BUSINESS RETAIL	4,421,710.68	7.87%	119	1.60%
INSTITUTUTIONAL	2,032,461.29	2.73%	40	0.54%
GROUP RESIDENCE	815,651.12	1.10%	82	1.10%
CONDO - APARTMENT	3,948,170.51	5.30%	308	4.14%
DUPLEX	8,904,197.38	11.95%	1558	20.96%
TOWN HOME - CO	462,575.96	0.62%	70	0.94%
SINGLE FAMILY HOME	26,304,828.88	35.32%	4633	62.33%
PARKS - RECREATIONAL	5,025,975.23	6.75%	28	0.38%
VACANT OR MISC	3,986,000.01	5.35%	264	3.55%
TOTALS	**74,481,676.22**	**100.00%**	**7433**	**100.00%**

Sanitary Sewer Service Area
8754

POPULATION

2000 CENSUS	HOUSEHOLDS
777	359

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
2,899,864.69	293	66.57

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	47,919.10	3.14%	5	1.89%
BUSINESS RETAIL	23,158.60	1.52%	4	1.51%
INSTITUTUTIONAL	0.00	0.00%	0	0.00%
GROUP RESIDENCE	0.00	0.00%	0	0.00%
CONDO - APARTMENT	10,182.77	0.67%	1	0.38%
DUPLEX	366,434.66	23.98%	66	24.91%
TOWN HOME - CO	8,068.64	0.53%	2	0.75%
SINGLE FAMILY HOME	1,033,878.04	67.65%	180	67.92%
PARKS - RECREATIONAL	0.00	0.00%	0	0.00%
VACANT OR MISC	38,530.72	2.52%	7	2.64%
TOTALS	**1,528,172.53**	**100.00%**	**265**	**100.00%**

Sanitary Sewer Service Area

MN-300

POPULATION

2000 CENSUS	HOUSEHOLDS
20509	8312

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
103,951,971.47	4,142	2,386.41

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	37,057,770.54	38.73%	296	6.19%
BUSINESS RETAIL	5,097,673.64	5.33%	174	3.64%
INSTITUTUTIONAL	6,256,110.11	6.54%	40	0.84%
GROUP RESIDENCE	1,304,204.93	1.36%	15	0.31%
CONDO - APARTMENT	2,621,516.09	2.74%	175	3.66%
DUPLEX	7,793,956.12	8.15%	1252	26.17%
TOWN HOME - CO	582,361.19	0.61%	58	1.21%
SINGLE FAMILY HOME	15,701,718.11	16.41%	2446	51.13%
PARKS - RECREATIONAL	13,543,563.80	14.16%	62	1.29%
VACANT OR MISC	5,718,557.99	5.98%	266	5.56%
TOTALS	**95,677,432.51**	**100.00%**	**4784**	**100.00%**

Sanitary Sewer Service Area
MN-301

POPULATION

2000 CENSUS	HOUSEHOLDS
2972	1288

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
23,086,784.69	719	530.00

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	12,470,000.23	73.05%	67	9.42%
BUSINESS RETAIL	60,591.03	0.35%	6	0.84%
INSTITUTUTIONAL	0.00	0.00%	0	0.00%
GROUP RESIDENCE	739,786.17	4.33%	2	0.28%
CONDO - APARTMENT	129,355.72	0.76%	5	0.70%
DUPLEX	732,920.14	4.29%	132	18.57%
TOWN HOME - CO	0.00	0.00%	0	0.00%
SINGLE FAMILY HOME	2,601,807.62	15.24%	470	66.10%
PARKS - RECREATIONAL	0.00	0.00%	0	0.00%
VACANT OR MISC	336,724.01	1.97%	29	4.08%
TOTALS	**17,071,184.92**	**100.00%**	**711**	**100.00%**

Sanitary Sewer Service Area

MN-302

POPULATION

2000 CENSUS	HOUSEHOLDS
5613	1819

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
61,971,526.81	1,239	1,422.67

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	22,471,879.89	53.35%	186	13.63%
BUSINESS RETAIL	3,354,183.96	7.96%	71	5.20%
INSTITUTUTIONAL	718,227.88	1.71%	16	1.17%
GROUP RESIDENCE	174,221.82	0.41%	22	1.61%
CONDO - APARTMENT	1,030,697.56	2.45%	38	2.78%
DUPLEX	674,888.09	1.60%	109	7.99%
TOWN HOME - CO	99,791.32	0.24%	5	0.37%
SINGLE FAMILY HOME	5,015,645.61	11.91%	802	58.75%
PARKS - RECREATIONAL	5,563,076.73	13.21%	6	0.44%
VACANT OR MISC	3,022,898.44	7.18%	110	8.06%
TOTALS	**42,125,511.31**	**100.00%**	**1365**	**100.00%**

Sanitary Sewer Service Area
MN-303

POPULATION

2000 CENSUS	HOUSEHOLDS
3752	1731

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
26,792,513.62	1,498	615.07

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	1,820,552.52	12.81%	12	0.76%
BUSINESS RETAIL	130,757.46	0.92%	13	0.64%
INSTITUTUTIONAL	325,952.30	2.29%	3	0.19%
GROUP RESIDENCE	18,288.90	0.13%	1	0.06%
CONDO - APARTMENT	86,451.42	0.61%	5	0.32%
DUPLEX	267,669.50	1.88%	39	2.48%
TOWN HOME - CO	0.00	0.00%	0	0.00%
SINGLE FAMILY HOME	9,524,664.72	67.04%	1480	94.27%
PARKS - RECREATIONAL	1,688,218.63	11.88%	5	0.32%
VACANT OR MISC	345,134.76	2.43%	15	0.96%
TOTALS	**14,207,690.20**	**100.00%**	**1570**	**100.00%**

Sanitary Sewer Service Area

MN-305

POPULATION

2000 CENSUS	HOUSEHOLDS
9	4

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
147,340.60	4	3.38

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	0.00	0.00%	0	0.00%
BUSINESS RETAIL	18,684.77	10.00%	1	10.00%
INSTITUTUTIONAL	0.00	0.00%	0	0.00%
GROUP RESIDENCE	0.00	0.00%	0	0.00%
CONDO - APARTMENT	0.00	0.00%	0	0.00%
DUPLEX	0.00	0.00%	0	0.00%
TOWN HOME - CO	0.00	0.00%	0	0.00%
SINGLE FAMILY HOME	17,423.09	20.25%	4	40.00%
PARKS - RECREATIONAL	0.00	0.00%	0	0.00%
VACANT OR MISC	53,838.85	62.50%	5	50.00%
TOTALS	**86,031.39**	**100.00%**	**10**	**100.00%**

Sanitary Sewer Service Area
MN-306

POPULATION

2000 CENSUS	HOUSEHOLDS
1160	501

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
9,406,789.29	377	215.95

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	1,693,611.87	33.59%	12	3.03%
BUSINESS RETAIL	28,247.96	0.56%	2	0.51%
INSTITUTUTIONAL	0.00	0.00%	0	0.00%
GROUP RESIDENCE	0.00	0.00%	0	0.00%
CONDO - APARTMENT	0.00	0.00%	0	0.00%
DUPLEX	323,059.98	6.41%	37	9.34%
TOWN HOME - CO	0.00	0.00%	0	0.00%
SINGLE FAMILY HOME	2,611,832.37	51.80%	334	84.34%
PARKS - RECREATIONAL	17,634.83	0.35%	1	0.25%
VACANT OR MISC	367,694.80	7.29%	10	2.53%
TOTALS	**5,042,081.81**	**100.00%**	**396**	**100.00%**

Sanitary Sewer Service Area
MN-310

POPULATION

2000 CENSUS	HOUSEHOLDS
63363	26461

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
189,427,458.44	8,834	4,348.66

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	20,823,690.68	16.60%	481	4.63%
BUSINESS RETAIL	13,535,238.21	10.79%	514	4.95%
INSTITUTUTIONAL	8,542,813.44	6.81%	149	1.43%
GROUP RESIDENCE	1,356,573.87	1.08%	58	0.56%
CONDO - APARTMENT	8,228,584.73	6.56%	473	4.56%
DUPLEX	7,084,673.21	5.65%	1214	11.69%
TOWN HOME - CO	1,267,457.40	1.01%	243	2.34%
SINGLE FAMILY HOME	34,905,973.73	27.83%	6217	59.87%
PARKS - RECREATIONAL	15,846,140.01	12.63%	181	1.74%
VACANT OR MISC	11,664,985.95	9.30%	795	7.66%
TOTALS	**125,427,502.59**	**98.27%**	**10384**	**100.00%**

Sanitary Sewer Service Area

MN-311

POPULATION

2000 CENSUS	HOUSEHOLDS
1230	478

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
10,632,947.96	456	244.10

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	1,163,346.14	17.31%	17	3.60%
BUSINESS RETAIL	146,466.75	2.18%	9	1.91%
INSTITUTUTIONAL	5,540.70	8.25%	1	0.21%
GROUP RESIDENCE	13,639.59	0.20%	1	0.21%
CONDO - APARTMENT	0.00	0.00%	0	0.00%
DUPLEX	114,525.60	1.70%	16	3.39%
TOWN HOME - CO	12,427.05	0.19%	4	0.85%
SINGLE FAMILY HOME	2,411,008.88	35.88%	381	80.72%
PARKS - RECREATIONAL	2,589,586.21	38.54%	31	6.57%
VACANT OR MISC	262,473.88	3.91%	12	2.54%
TOTALS	**6,719,014.79**	**108.16%**	**472**	**100.00%**

Sanitary Sewer Service Area
MN-312

POPULATION

2000 CENSUS	HOUSEHOLDS
4344	1664

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
18,608,460.57	1,637	427.19

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	3,286,829.94	19.18%	16	0.87%
BUSINESS RETAIL	108,052.15	0.63%	6	0.33%
INSTITUTUTIONAL	772,271.48	4.51%	5	0.27%
GROUP RESIDENCE	278,763.06	1.63%	5	0.27%
CONDO - APARTMENT	191,828.30	1.12%	9	0.49%
DUPLEX	387,085.38	2.26%	57	3.09%
TOWN HOME - CO	413,663.19	2.41%	113	6.12%
SINGLE FAMILY HOME	8,304,741.37	48.45%	1459	79.08%
PARKS - RECREATIONAL	2,673,611.94	15.60%	31	1.68%
VACANT OR MISC	724,217.79	4.23%	144	7.80%
TOTALS	**17,141,064.61**	**100.00%**	**1845**	**100.00%**

Sanitary Sewer Service Area
MN-313

POPULATION

2000 CENSUS	HOUSEHOLDS
1140	415

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
4,797,599.93	423	110.14

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	0.00	0.00%	0	0.00%
BUSINESS RETAIL	0.00	0.00%	0	0.00%
INSTITUTUTIONAL	0.00	0.00%	0	0.00%
GROUP RESIDENCE	0.00	0.00%	0	0.00%
CONDO - APARTMENT	0.00	0.00%	0	0.00%
DUPLEX	91,955.80	2.33%	12	2.72%
TOWN HOME - CO	0.00	0.00%	0	0.00%
SINGLE FAMILY HOME	2,488,339.49	63.15%	413	93.65%
PARKS - RECREATIONAL	598,332.02	15.19%	5	1.13%
VACANT OR MISC	761,651.08	19.33%	11	2.49%
TOTALS	**3,940,278.38**	**100.00%**	**441**	**100.00%**

Sanitary Sewer Service Area
MN-314

POPULATION

2000 CENSUS	HOUSEHOLDS
892	325

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
4,066,875.90	334	93.36

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	0.00	0.00%	0	0.00%
BUSINESS RETAIL	9,851.22	0.39%	1	0.30%
INSTITUTUTIONAL	167,395.84	6.65%	1	0.30%
GROUP RESIDENCE	0.00	0.00%	0	0.00%
CONDO - APARTMENT	0.00	0.00%	0	0.00%
DUPLEX	64,202.86	2.55%	7	2.06%
TOWN HOME - CO	0.00	0.00%	0	0.00%
SINGLE FAMILY HOME	2,198,936.01	87.34%	325	95.87%
PARKS - RECREATIONAL	0.00	0.00%	0	0.00%
VACANT OR MISC	77,348.55	3.07%	5	1.47%
TOTALS	**2,517,734.48**	**100.00%**	**339**	**100.00%**

Sanitary Sewer Service Area
MN-315

POPULATION

2000 CENSUS	HOUSEHOLDS
4528	1988

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
25,548,551.42	1,528	586.51

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	4,888,295.96	32.31%	36	2.33%
BUSINESS RETAIL	188,630.62	1.25%	19	1.23%
INSTITUTUTIONAL	487,200.88	3.22%	6	0.39%
GROUP RESIDENCE	6,493.71	0.04%	1	0.06%
CONDO - APARTMENT	264,600.74	1.75%	16	1.04%
DUPLEX	296,616.82	1.96%	48	3.11%
TOWN HOME - CO	0.00	0.00%	0	0.00%
SINGLE FAMILY HOME	8,100,299.94	53.54%	1393	90.22%
PARKS - RECREATIONAL	17,253.18	0.11%	2	0.13%
VACANT OR MISC	881,137.94	5.82%	23	1.49%
TOTALS	**15,130,529.80**	**100.00%**	**1544**	**100.00%**

Sanitary Sewer Service Area
MN-316

POPULATION

2000 CENSUS	HOUSEHOLDS
8652	3298

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
32,822,422.65	3,098	753.50

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	91,443.65	0.36%	10	0.31%
BUSINESS RETAIL	488,463.49	1.91%	42	1.31%
INSTITUTUTIONAL	635,887.47	2.49%	11	0.34%
GROUP RESIDENCE	14,796.89	0.06%	1	0.03%
CONDO - APARTMENT	203,150.54	0.79%	25	0.78%
DUPLEX	1,089,289.74	4.26%	164	5.12%
TOWN HOME - CO	21,349.46	0.08%	6	0.19%
SINGLE FAMILY HOME	16,131,707.19	63.04%	2919	91.16%
PARKS - RECREATIONAL	6,607,014.45	25.82%	4	0.12%
VACANT OR MISC	304,751.16	1.19%	20	0.62%
TOTALS	**25,587,854.01**	**100.00%**	**3202**	**100.00%**

Sanitary Sewer Service Area
MN-320

POPULATION

2000 CENSUS	HOUSEHOLDS
37030	16377

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
151,144,544.93	7,213	3,469.80

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	13,730,694.44	13.61%	256	3.26%
BUSINESS RETAIL	7,285,011.25	7.22%	241	3.07%
INSTITUTUTIONAL	6,619,313.37	6.56%	77	0.98%
GROUP RESIDENCE	775,363.43	0.77%	28	0.36%
CONDO - APARTMENT	4,857,985.26	4.82%	253	3.22%
DUPLEX	6,728,914.88	6.67%	1049	13.35%
TOWN HOME - CO	445,750.69	0.44%	227	2.89%
SINGLE FAMILY HOME	33,287,037.77	33.00%	5138	65.41%
PARKS - RECREATIONAL	17,591,093.61	17.44%	79	1.01%
VACANT OR MISC	3,817,273.88	3.78%	193	2.46%
TOTALS	**100,884,774.24**	**100.00%**	**7855**	**100.00%**

Sanitary Sewer Service Area
MN-330

POPULATION

2000 CENSUS	HOUSEHOLDS
44222	21606

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
108,855,630.26	6,839	2,498.98

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	9,712,118.72	12.77%	300	3.97%
BUSINESS RETAIL	7,719,205.24	10.15%	422	5.58%
INSTITUTUTIONAL	3,140,186.42	4.13%	59	0.78%
GROUP RESIDENCE	669,669.27	0.88%	50	0.66%
CONDO - APARTMENT	7,104,241.92	9.34%	710	9.39%
DUPLEX	10,038,413.23	13.19%	1745	23.07%
TOWN HOME - CO	530,173.99	0.70%	89	1.18%
SINGLE FAMILY HOME	23,517,210.87	30.91%	3759	49.70%
PARKS - RECREATIONAL	6,699,370.85	8.81%	35	0.46%
VACANT OR MISC	6,949,404.53	9.13%	394	5.21%
TOTALS	**76,079,995.03**	**100.00%**	**7563**	**100.00%**

Sanitary Sewer Service Area
MN-340

POPULATION

2000 CENSUS	HOUSEHOLDS
14189	6859

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
95,987,963.36	5,316	2,203.58

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	1,383,400.46	2.66%	62	1.20%
BUSINESS RETAIL	1,432,877.57	2.75%	116	2.24%
INSTITUTUTIONAL	2,603,035.20	5.00%	21	0.41%
GROUP RESIDENCE	1,914,748.92	3.68%	5	0.10%
CONDO - APARTMENT	654,362.49	1.26%	67	1.30%
DUPLEX	2,569,345.70	4.94%	407	7.87%
TOWN HOME - CO	7,740.15	0.01%	2	0.04%
SINGLE FAMILY HOME	26,308,319.14	50.54%	4379	84.70%
PARKS - RECREATIONAL	12,257,259.16	23.55%	32	0.62%
VACANT OR MISC	2,922,525.17	5.61%	79	1.53%
TOTALS	**52,053,613.96**	**100.00%**	**5170**	**100.00%**

Sanitary Sewer Service Area
MN-341

POPULATION

2000 CENSUS	HOUSEHOLDS
67802	21606

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
207,098,116.54	18,537	4,754.32

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	6,144,693.52	4.24%	267	1.38%
BUSINESS RETAIL	4,478,885.13	3.09%	412	2.13%
INSTITUTUTIONAL	4,396,016.00	3.04%	91	0.47%
GROUP RESIDENCE	772,359.94	0.53%	40	0.21%
CONDO - APARTMENT	6,789,161.96	4.69%	789	4.07%
DUPLEX	14,376,323.32	9.93%	2542	13.12%
TOWN HOME - CO	254,758.06	0.18%	76	0.39%
SINGLE FAMILY HOME	82,806,748.55	57.19%	14763	76.19%
PARKS - RECREATIONAL	21,008,130.75	14.51%	55	0.28%
VACANT OR MISC	3,772,304.71	2.61%	341	1.76%
TOTALS	**144,799,381.94**	**100.00%**	**19376**	**100.00%**

Sanitary Sewer Service Area
MN-342

POPULATION

2000 CENSUS	HOUSEHOLDS
578	298

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
2,033,220.46	227	46.68

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	0.00	0.00%	0	0.00%
BUSINESS RETAIL	0.00	0.00%	0	0.00%
INSTITUTUTIONAL	0.00	0.00%	0	0.00%
GROUP RESIDENCE	0.00	0.00%	0	0.00%
CONDO - APARTMENT	0.00	0.00%	0	0.00%
DUPLEX	90,934.94	7.51%	15	7.35%
TOWN HOME - CO	7,145.75	0.59%	7	3.43%
SINGLE FAMILY HOME	1,079,968.82	89.21%	177	86.76%
PARKS - RECREATIONAL	0.00	0.00%	0	0.00%
VACANT OR MISC	32,523.27	2.69%	5	2.45%
TOTALS	**1,210,572.78**	**100.00%**	**204**	**100.00%**

Sanitary Sewer Service Area
MN-343

POPULATION

2000 CENSUS	HOUSEHOLDS
2174	1121

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
10,004,997.84	926	229.68

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	49,893.68	0.75%	7	0.80%
BUSINESS RETAIL	291,442.00	4.38%	17	1.95%
INSTITUTUTIONAL	395,330.88	5.94%	4	0.46%
GROUP RESIDENCE	0.00	0.00%	0	0.00%
CONDO - APARTMENT	265,335.16	3.99%	15	1.72%
DUPLEX	496,209.20	7.46%	76	8.72%
TOWN HOME - CO	10,880.17	0.16%	8	0.92%
SINGLE FAMILY HOME	4,539,619.60	68.21%	729	83.60%
PARKS - RECREATIONAL	434,167.67	6.52%	2	0.23%
VACANT OR MISC	172,749.65	2.60%	14	1.61%
TOTALS	**6,655,628.00**	**100.00%**	**872**	**100.00%**

Sanitary Sewer Service Area
MN-344

POPULATION

2000 CENSUS	HOUSEHOLDS
50136	22771

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
228,432,864.35	19,130	5,244.10

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	4,567,187.12	3.09%	105	0.56%
BUSINESS RETAIL	2,647,753.21	1.79%	191	1.03%
INSTITUTUTIONAL	4,206,660.43	2.85%	60	0.32%
GROUP RESIDENCE	716,668.62	0.49%	16	0.09%
CONDO - APARTMENT	1,911,907.00	1.30%	118	0.63%
DUPLEX	6,655,051.86	4.51%	1034	5.56%
TOWN HOME - CO	254,150.80	0.17%	153	0.82%
SINGLE FAMILY HOME	104,171,814.10	70.58%	16729	89.96%
PARKS - RECREATIONAL	19,680,334.41	13.33%	48	0.26%
VACANT OR MISC	2,789,082.41	1.89%	142	0.76%
TOTALS	**147,600,609.96**	**100.00%**	**18596**	**100.00%**

Sanitary Sewer Service Area
MN-345

POPULATION

2000 CENSUS	HOUSEHOLDS
7848	3768

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
32,419,367.13	3,213	744.25

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	57,927.70	0.24%	4	0.12%
BUSINESS RETAIL	101,329.83	0.42%	12	0.36%
INSTITUTUTIONAL	356,626.55	1.49%	3	0.09%
GROUP RESIDENCE	8,178.93	0.03%	1	0.03%
CONDO - APARTMENT	92,666.88	0.39%	5	0.15%
DUPLEX	1,026,758.13	4.29%	147	4.41%
TOWN HOME - CO	113,556.53	0.47%	25	0.75%
SINGLE FAMILY HOME	20,274,667.41	84.67%	3107	93.25%
PARKS - RECREATIONAL	1,278,199.92	5.34%	10	0.30%
VACANT OR MISC	635,359.67	2.65%	18	0.54%
TOTALS	**23,945,271.54**	**100.00%**	**3332**	**100.00%**

Sanitary Sewer Service Area
MN-346

POPULATION

2000 CENSUS	HOUSEHOLDS
9601	4558

AREA

(INCLUDES PUBLIC R.O.W.)

SQUARE FT.	SANITARY CONNECTIONS	Acres
41,504,116.65	3,909	952.80

LAND USE

TYPE	AREA- SQUARE FT.	PERCENT OF AREAS	NUMBER OF PARCELS	PERCENT OF PARCELS
COMM.- INDUSTRIAL	2,791,687.11	8.93%	9	0.22%
BUSINESS RETAIL	267,976.73	0.86%	13	0.32%
INSTITUTUTIONAL	875,864.77	2.80%	7	0.17%
GROUP RESIDENCE	27,354.60	0.09%	4	0.10%
CONDO - APARTMENT	816,169.59	2.61%	44	1.08%
DUPLEX	627,631.33	2.01%	102	2.51%
TOWN HOME - CO	7,655.72	0.02%	2	0.05%
SINGLE FAMILY HOME	21,931,934.49	70.16%	3841	94.63%
PARKS - RECREATIONAL	3,792,270.86	12.13%	8	0.20%
VACANT OR MISC	119,390.26	0.38%	29	0.71%
TOTALS	**31,257,935.43**	**100.00%**	**4059**	**100.00%**

APPENDIX D:

MINNEAPOLIS CODE OF ORDINANCES

CHAPTER 56

PROHIBITED DISCHARGES TO SANITARY OR COMBINED SEWER

CHAPTER 56. PROHIBITED DISCHARGES TO SANITARY OR COMBINED SEWER

56.10. Purpose. The City of Minneapolis has been pursuing an aggressive campaign of separating its sanitary sewer system from its stormwater drainage system to reduce the number of combined sewer overflows (CSO). However, some rainleaders and other components, which handle stormwater, are still connected to the sanitary sewer system. During rain events, infiltration and inflow from buildings and parking lots with rainleaders and area drains connected to the sanitary sewer system, cause its Capacity to be exceeded resulting in overflows to adjacent storm drains. This overflow ends up discharging sewage and stormwater into the Mississippi River. Rooftop drains (rainleaders) that are connected to the sanitary sewer system are one (1) of the major causes of combined sewer overflows. Residential and commercial buildings, usually built before 1961, sometimes have pipes that lead underground directly into the sanitary sewer system, rather than through gutters to lawns or the stormwater drainage system. To protect the environment and prevent these overflows as well as preventing the possibility of sewage backing up into homes and businesses, rainleaders and other connections which deliver stormwater into the sanitary system rather than the stormwater drainage system or to pervious surfaces need to be disconnected. State and federal environmental mandates require us to work to eliminate combined sewer overflows. The City and metropolitan council have conducted studies that determined the main contributor to these overflows is rainleader connections. The purpose of this chapter is to define regulations that will aid the City in limiting inflow of rainwater to the sanitary sewer system. The ordinance will help to minimize the overflow problem resulting from the lack of Capacity of the sanitary system to handle large amounts of rainwater. Rainwater runoff will be more appropriately handled through natural filtration and/or the stormwater drainage system. The net result will be a cleaner Mississippi River and a more efficient waste treatment system. (2003-Or-053, § 1, 5-2-03)

56.20. Definitions. For the purpose of this Code, the following terms shall have the meaning indicated in this part. No attempt is made to define ordinary words that are used in accordance with their established dictionary meaning except where it is necessary to define their meaning as used in this Code to avoid misunderstanding. Certain provisions of this Code contain other definitions. In case of any conflict between such other definitions the definitions in section 56.20 shall apply to Chapter 56.

Area drain is a receptacle designed to collect and convey surface or stormwater to the drainage system.

Clearwater is any surface flow, runoff, and drainage that does not contain any hazardous substance or sewage. This includes but is not limited to NPDES permitted discharges, stormwater and water from foundation and footing drains and basement sump pumps.

Combined sewer is a sewer that must handle flow of both sanitary wastewater and stormwater in a single pipeline.

Combined sewer overflow (CSO) occurs when excessive amounts of rainfall enter a sanitary sewer system. The result is a volume of rainwater and sanitary wastewater, which exceeds the system's Capacity. Combined rainwater and sewage is forced to overflow into area streams and rivers through outfalls.

Hazardous substances are material which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to, a substantial

present or potential hazard to human health, safety, property, or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Liquid waste means the discharge from any fixture, appliance, or appurtenance that does not receive fecal matter.

Owner, for the purposes of this chapter, shall mean the person who is listed as the contact person on the current rental licensing application on file with the City, if any, or if none, the person listed as owner by the City assessor on the homestead record, or if none, the taxpayer as shown by the records of the City assessor.

Rainleader, for the purposes of this chapter, shall be defined as any conduit that conveys stormwater from a rooftop to a point of discharge.

Runoff is precipitation and other surface drainage that is not infiltrated into or otherwise retained by the soil, concrete, asphalt, or other surface upon which it falls.

Sanitary sewer system means pipelines, pumping stations, force mains, and all other constructions, devices, and appliances appurtenant thereto, used for conveying sewage or industrial waste or other wastes to a point of ultimate disposal.

Separator is a device designed and installed so as to separate and retain deleterious, hazardous, or undesirable matter including but not limited to oil, grease and flammable wastes from normal wastes while permitting normal sewage or liquid wastes to discharge into the drainage system by gravity.

Sewage means the water carried waste from residences, buildings, institutions or any mobile source, including the excrementitious or other discharge from bodies of humans beings or animals, together with such ground water infiltration and surface water as may be present.

Stormwater is any surface flow, runoff, and drainage consisting entirely of water from any form of natural precipitation. (2003-Or-053, § 1, 5-2-03)

56.30. Compliance with other codes and laws. Compliance with the provisions of this chapter does not release a person from any responsibility to comply with any other law or regulation, whether federal, state, or local. (2003-Or-053, § 1, 5-2-03)

56.40. Conflict. (a) Conflict. In the event that the provisions of this chapter shall conflict with any Minnesota Statute or any federal statute, the Minnesota Statute or federal statute shall govern to the extent of any direct conflict.

(b) Conflict in orders. In the event of a conflict between an order of the City and a valid order of a federal or state agency, the order of the federal or state agency shall govern to the extent of the conflict.

(c) Conflict in permitted activity. In the event that any conduct prohibited by this chapter is affirmatively and specifically authorized by a valid permit issued by a duly authorized official of the State of Minnesota or a duly authorized official of the United States of America, then the affirmative and specific authority granted in such permit shall govern to the extent of any direct conflict with this chapter. (2003-Or-053, § 1, 5-2-03)

56.50. Violations. (a) Violations of this Code. Any person who violates any provision of this chapter shall be guilty of an ordinance violation and subject to the punishment and penalties of section 1.30(a), 1.40 and Chapter 2 of this Code.

(b) License revocation. Any owner of land, buildings, or structures who possesses a City license to conduct business, in addition to the fine, may have his or her license revoked for failure to comply with this chapter. (2003-Or-053, § 1, 5-2-03; 2006-Or-134, § 1, 11-17-06)

56.60. Authority to administer. The authority to administer and enforce the provisions of this chapter of the Minneapolis Code of Ordinances on behalf of the City is vested in the Minneapolis Watershed Management Authority located in the Environmental Management section of the Department of Operations and Regulatory Services. The Minneapolis Watershed Management Authority, hereafter referred to as the "authority," shall have full authority to administer this chapter in addition to all authority given to it pursuant to section 48.70 and other sections of this Code. (2003-Or-053, § 1, 5-2-03)

56.70. Prohibited connections. (a) Connections not permitted. Rainwater pipes, rainleaders, area drains or other connections used for conveying stormwater and clearwater from any building, structure, ground or premises shall be not connected or reconnected with any sanitary sewer system.

(b) Exceptions for new parking ramps. Drains from an uncovered top deck of a new parking ramp shall not be connected to the sanitary sewer system. Ramp drains on all other floors shall be discharged to the sanitary sewer system via a separator. (2003-Or-053, § 1, 5-2-03)

56.80. Previously allowed connections. (a) Existing connections not permitted. Rainwater pipes, rainleaders, area drains and other connections used for conveying stormwater and clearwater from any building, structure, ground or premises which were legally connected to the sanitary sewer system prior to 1961 or those which were connected later by City permission shall be disconnected from the sanitary sewer system pursuant to 56.140 of this Code or by January 1, 2005, whichever occurs first.

(b) Exceptions for existing parking ramps. Drains from an uncovered top deck of an existing parking ramp shall not be connected to the sanitary sewer system. Ramp drains on all other floors shall be permitted to discharge as existing in so far as the discharge is not in conflict with state and federal requirements and other Minneapolis Codes. (2003-Or-053, § 1, 5-2-03)

56.90 Downspout placement. Except as provided herein, all rainleader downspouts shall be placed so that drainage is to the back and/or to the front of the property. Downspouts shall be allowed in the existing side yards where adjacent structures are separated by more than ten (10) feet and where the downspout discharge point is no closer than ten (10) feet from an adjoining structure. The owner is responsible for the arranging drainage in a manner that complies with the law. Rainwater from downspouts shall be drained so as not to cause flooding of or dampness in walls, ceilings or floors in any portion of the building or in any adjacent building, structure or property. Downspout placement shall not be prohibited so long as no conflicts exist with this section and section 56.40 of this Code or any other applicable City Codes. For example, a building downspout shall not be prohibited from discharging to the building's property lot or common alleyway unless an applicable law, regulation or City Code prohibits it. (2003-Or-053, § 1, 5-2-03)

56.100. Disconnection permit requirement. (a) Permit required. No person shall perform a disconnection of any rainwater pipe, rainleader, area drain or other connections used for

conveying stormwater and clearwater from any building, grounds or premises from the sanitary sewer system without first having obtained a disconnection permit from the authority.

(b) Permit expiration. Permits issued under Chapter 56 shall be valid for the period during which the proposed activity takes place or is scheduled to take place, which ever is shorter, but in no event shall a permit be valid for more than one (1) year. (2003-Or-053, § 1, 5-2-03)

56.110. Permit fee. The fee for obtaining a disconnection permit shall be established in the director's fee schedule pursuant to section 91.70. (2003-Or-053, § 1, 5-2-03; 2006-Or-134, § 2, 11-17-06)

56.120. Requests for inspection. The contractor or permit holder shall make a request for inspection with the authority before any work of the contractor or permit holder is covered up or concealed and shall file this request within forty-eight (48) hours after the completion of any work done by said contractor or permit holder. (2003-Or-053, § 1, 5-2-03; 2006-Or-134, § 3, 11-17-06)

56.130. Manner of disconnection. The disconnection shall be accomplished by a complete and permanent method and performed in a competent manner. Any disconnection, plugging, capping, rerouting, altering, or modifying must be done in accordance with all applicable state rules and Minneapolis ordinances. (2003-Or-053, § 1, 5-2-03)

56.140. Disconnection required. (a) Notification. For all properties identified by the authority as having rainwater pipes, rainleaders, area drains or other connections used for conveying stormwater and clearwater from any building, structure, ground or premises to any sanitary sewer system the authority shall provide written notification to the owner informing the owner that they are required to disconnect from the sanitary sewer system as specified in the notice. As required by the official notification the property owner must obtain a rainleader disconnection permit and complete the disconnection prior to expiration of the permit, or request a time extension to the requirement of disconnection by the noted due date. In case the owner fails to make the disconnection as ordered, the City may elect to make the disconnection, or any part thereof, as it shall deem appropriate, and assess the cost against the property in the same manner as provided by Section 5, Chapter 9 of the City Charter. The owner shall continue to have the responsibility to do any additional work required to complete the disconnection from the City's sanitary sewer and direct the water for surface drainage in a manner that complies with all local, state and federal laws. The City shall take any steps that are legally required in order to gain entry to the property.

(b) Order to connect to storm sewer. If the authority determines based on the nature of the property that there is no reasonable way to disconnect rainwater pipes, rainleaders, area drains or other connections used for conveying stormwater and clearwater from any building, structure, ground or premises other than by connecting them to the City's storm sewer system, then the authority may, if the City engineer concurs, order the owner in a reasonable period of time of not less than thirty (30) days to disconnect from the sanitary sewer system by connecting to the City's storm sewer system as specified by the City engineer in a permit issued by the City engineer. The owner shall be responsible for the design and construction of the connecting line or lines within the terms of the permit and shall be responsible for all costs associated with the connection to the City's storm sewer system. The owner shall be responsible for all costs of maintenance, repair and replacement of the connection. In case the owner shall fail to make the connection as ordered, the City may elect to install the connection, or any part thereof, as it shall deem appropriate, and assess the cost thereof against the property in the same manner as provided by Section 5, Chapter 9 of the City Charter. The owner shall continue to have the responsibility to do any additional work required to complete the connection to the City's storm sewer and complete the disconnection from the City's sanitary sewer. The City shall take any steps that are legally required in order to gain entry to the property.

(c) Request to City engineer to connect to storm sewer. The owner of any property that needs to disconnect from the sanitary sewer and desires to connect to the storm sewer may, voluntarily and without an order pursuant to paragraph (b), request and authorize the City, on forms prescribed by the City engineer, to make the connection or hire a private contractor to make the connection. Such connection shall be made at the discretion of the City engineer and upon such terms as the City engineer shall determine. Such authorization by the owner to the City shall constitute, and such authorization form shall provide for, the right to enter upon the premises as may be necessary to make such connection; a waiver and release by the owner of any and all claims and damages against the City arising out of the making of such connection; and the consent of the owner to any unpaid charges for such work to be collected as a special assessment against the property as provided herein. The City engineer, upon receiving such authorization from the owner, may cause the connection of the property's stormwater line to be done by City forces or by a contractor as it shall direct. The costs of this connection shall be initially provided for by an advance of funds from the sewer rental fund or other fund as shall be determined by a council resolution or such other council action as they shall determine as appropriate, to be reimbursed from the collection of such charges. The City engineer, upon completion of any such repairs or replacement work, shall notify such owner of the amount of the charges for such work which the owner may pay to the City on or before July first, without penalty added thereto. If the charges or any part thereof for any such work is unpaid by July first, the City engineer shall prepare a proposed assessment roll listing the amount of charges unpaid and the benefited property which shall be filed with the City clerk. The City council shall assess and levy and cause to be collected the amount of such costs as a special assessment upon and against the property benefited in the manner provided by Minnesota Statutes, Sections 429.061, 429.071 and 429.081. Such costs so assessed shall be payable in a single installment except that the City council may provide that the costs so assessed may be paid in not to exceed ten (10) equal annual installments. Such assessments may include a penalty not to exceed ten (10) per cent of the amount thereof, as the council may determine, and shall bear interest at eight (8) per cent per annum or at such lesser rate as the council shall direct consistent with the City Charter. The owner shall continue to have the responsibility to do any additional work required to complete the connection to the City's storm sewer and complete the disconnection from the City's sanitary sewer.

(d) Failure to respond. Failure to obtain a permit and disconnect or obtain a time extension pursuant to the terms of any official notification or order shall subject the property owner to penalties as provided by sections 56.50, 1.30(a), 1.40, and Chapter 2 of this Code. (2003-Or-053, § 1, 5-2-03; 2006-Or-134, § 4, 11-17-06)

56.150. Time extension. (a) Time extension for compliance. An owner may request a time extension to comply with a notification to disconnect. A time extension for one (1), two (2) or three (3) years may be requested and renewed prior to expiration as provided for in subsection (d). A request for a time extension must be submitted on a form provided by the authority with payment of a twenty-five dollar ($25.00) filing fee to cover review, administration and handling costs.

(b) Time extension approval. A request for a time extension will be approved only in those cases in which the facts presented to the authority and City engineer demonstrate to the reasonable satisfaction and professional judgement of the authority and City engineer that timely disconnection would not be safe, prudent, or feasible and that a delay in disconnection is consistent with plans for the area's public infrastructure. For example, a disconnection that when performed would pose an increased risk to public health, or a disconnection that when performed would contribute to localized flooding would not be safe, prudent, or feasible. A time extension shall not be for a period longer than the period necessary to reasonably plan for and achieve compliance consistent with plans for the area's public infrastructure and keeping in mind the City's overriding interest in limiting inflow of stormwater into the City's sanitary sewer system consistent with the purposes set forth in section 56.10.

(c) Conditions of a time extension granted. Issuance of a time extension means that the authority does not require disconnection at this time. The authority and the City engineer reserve the right to require minimization of the continued inflow, prohibit expansion of the inflow and impose other reasonable conditions based upon the facts in each case. The time extension may be reopened to require additional work if previously undisclosed or unknown information or changing regulatory requirements makes additional work necessary.

The fee for obtaining a time extension shall be waived for time extensions acquired prior to January 1, 2007. On or after January 1, 2007, the owner must at that time pay a fee for buildings or premises as calculated by the authority based on the following formula: The current sewer utility rate multiplied by the square footage of the area contributing rainwater to the sanitary sewer system multiplied by the average annual rainfall in the Minneapolis/St. Paul area from 1990 to 2000 as determined by the National Weather Service (twenty-six (26) inches, two and seventeen hundredths (2.17) feet).

Sample calculation: Current Sewer Rate in 2002--$3.16 per 100 ft3; Average Rainfall--2.17 ft

TABLE INSET:

($3.16) (2000 ft2)(2.17 ft)-$137.14

100 ft3

(d) Time extension renewal. Prior to the expiration of an existing time extension, the owner may request an extension on a form provided by the authority pursuant to subsection (a).

(e) Time extension disapproved. If a time extension to disconnection is not approved, or is approved upon conditions that the applicant finds objectionable, the applicant may appeal pursuant to the procedures provided in sections 56.300 to 56.330 of this Code or their successor provisions. If the time extension is denied, or approved on conditions the applicant finds unacceptable, the obligation to disconnect or comply with the conditions of the time extension shall be stayed pending the specified appeal period and during the pendency of any appeal of the decision pursuant to sections 56.300 to 56.330 of this Code or their successor provisions. If there is no appeal or following the conclusion of the appeal procedures, the property owner shall disconnect or alternatively comply with any time extension granted on the conditions specified. Any failure to meet these obligations shall subject the property owner to penalties as provided by sections 56.50, 1.30(a), 1.40, and Chapter 2 of this Code. (2003-Or-053, § 1, 5-2-03; 2006-Or-134, § 5, 11-17-06)

56.160. Disclaimer. The City in no way guarantees or implies that areas will be free from flooding or flood damages. The City does not assume a specific duty as to individual property owners to enforce this ordinance, but is enacting this chapter as a general regulation. This chapter is not intended for reliance by individual property owners. This chapter shall not create liability on the part of the City or its officers or employees for any flood damage that may result from the failure to comply with any portion of this chapter or any administrative decisions made pursuant thereto, whatever the cause. (2003-Or-053, § 1, 5-2-03)

56.170. Effective date. This chapter shall become effective on August 1, 2003. (2003-Or-053, § 1, 5-2-03)

56.180. Rainleader disconnection appeals panel. A rainleader disconnection appeals panel is hereby established to hear appeals related only to rainleader disconnection time extension decisions. The panel shall consist of the following three (3) members:

(1) Director of operations, licenses and environmental services or designee;

(2) City engineer or designee;

(3) Director of inspections or designee.

The director of operations, licenses and environmental services or their designee shall provide a secretary to the panel who will serve in a nonvoting Capacity. The panel shall adopt its own rules for procedures which are not in conflict with applicable ordinances. (2006-Or-134, § 6, 11-17-06)

56.190. Duties and responsibilities of the panel. The panel shall hear appeals from rainleader disconnection time extension decisions as specifically provided in section 56.150 of this Code. The panel may modify, sustain, or quash all or any portion of any order, interpretation, requirement, decision, or other determination made in matters relative only to rainleader disconnection time extension requests as specifically provided in section 56.150 of this Code. (2006-Or-134, § 7, 11-17-06)

56.200. Right to appeal; procedure. (a) If a time extension to disconnection is not approved, or is approved upon conditions that the applicant finds objectionable, the applicant may, either personally or through his/her authorized agent, make an appeal to the panel. Such appeal shall be filed on a form provided by the rainleader disconnect program within fourteen (14) days from the date of the adverse determination. The appellant shall file any and all documents and/or affidavits that support the appeal. The payment of a fee in the amount of one hundred dollars ($100.00) must accompany the submission of the appeal to cover administrative and handling costs.

(b) The appeals panel shall render its decision based upon the evidence submitted, unless the panel believes that a hearing is necessary in order to reach its decision. If a hearing is determined to be necessary, the director of operations, licenses and environmental services or designee shall schedule a hearing. Written notice of the time and place of the hearing shall be given at least ten (10) days prior to the date of the hearing to the appellant by mail, addressed to the appellant at his/her address shown on the appeal. (2006-Or-134, § 8, 11-17-06)

56.210. Hearings and decisions of the panel. (a) All hearings before the panel shall be public. A record of the entire proceedings shall be made by tape recording. A transcript of the proceedings shall be made available to all parties upon request and upon payment of the fee prescribed therefore. Such fees may be established by the panel, but shall in no event, be greater than the cost involved. The panel may grant continuances for good cause shown.

(b) The panel shall make specific findings of fact and/or conclusions in connection with any decision upon any appeal. For those appeals without a hearing, a decision shall be made within sixty (60) days of the date of appeal. For those appeals with a hearing, a decision on any appeal shall be made at the hearing in which the appeal is heard, unless the appeal is continued to a subsequent meeting. Any decision by the panel shall be made by a majority of the quorum. All decisions by the panel shall be a final decision and shall become final when signed by the director of operations, licenses and environmental services or their designee chair, and shall become effective and enforceable at such time or at such alternative time as is specified therein. (2006-Or-134, § 9, 11-17-06)

APPENDIX E
FORT SNELLING AREA SANITARY SEWER ACCOUNTS

FORT SNELLING AREA SANITARY SEWER ACCOUNTS

AGENCY	ADDRESS	2007 FLOW / Gal.
Metropolitan Airport Comm	6019 28th Avenue South	237,672,690
MN Air National Guard	5891 46th Avenue South	3,840,488
US Naval Reserve	5905 34th Avenue South	340,363
US Naval Reserve	6400 Bloomington Rd	211,698
Veterans Medical Center	5005 54th St E	13,126,781
Veterans Medical Center	5633 46th Avenue South	46,085,116
Veterans Medical Center	400 Bloomington Rd	47,875
Veterans Admin B-89	6001 Minnehaha Avenue	1,138,532
Fort Snelling Park	530 Fort Snelling Dr	318,669
Henry Whipple Bldg/GSA	5821 46th Avenue South	6,183,381
MN Dept of Natural Resources	600 Fort Snelling Dr	80,789
MN Dept of Natural Resources	900 Fort Snelling Dr	403,947
MN Dot	6000 Minnehaha Avenue	366,545
934th MSG/CERU	4122 59th St E	13,063,197
2007 Total Gallons		**322,880,071**

APPENDIX F

Outside Minneapolis Sanitary Sewer Accounts for Individual Properties

The tables on the following pages enumerate sanitary sewer accounts for properties bordering on the City of Minneapolis that are served by the Minneapolis sanitary sewer system.

Outside Minneapolis Sanitary Sewer Accounts- May 2008

PROPERTY ID No.	ACCOUNT No.	STREET ADDRESS	CITY
1011821110002	6160193400	5145 XERXES	Brooklyn Center
1011821110003	6010191400	5139 XERXES	Brooklyn Center
1011821110004	6010190401	5133 XERXES	Brooklyn Center
1011821110005	2030727400	5123 XERXES	Brooklyn Center
1011821110006	2030726401	5117 XERXES	Brooklyn Center
1011821110007	2030725402	5109 XERXES	Brooklyn Center
1011821110012	6010193400	5243 XERXES	Brooklyn Center
1011821110013	2030732400	5233 XERXES	Brooklyn Center
1011821110014	2030731402	5223 XERXES	Brooklyn Center
1011821110016	2030729400	5209 XERXES	Brooklyn Center
1011821110017	2030728400	5207 XERXES	Brooklyn Center
1011821110021	2030724404	5101 XERXES	Brooklyn Center
1011821110022	2030730401	5211 XERXES	Brooklyn Center
1011821110023	6010192404	5201 XERXES	Brooklyn Center
1011821140014	730523401	3001 51ST AV	Brooklyn Center
1011821410020	6010189400	4821 XERXES	Brooklyn Center
702824440137	611278400	4530 FRANCE	Edina
702824440141	611281404	4544 FRANCE	Edina
1802824110004	611287400	4634 FRANCE	Edina
1802824110008	611291401	4650 FRANCE	Edina
1802824110077	6160187401	4620 FRANCE	Edina
1802824110080	611285400	4624 FRANCE	Edina
1802824110082	6160186401	4612 FRANCE	Edina
1802824110083	611284401	4610 FRANCE	Edina
1802824110084	611283402	4608 FRANCE	Edina
1802824110085	6160185400	4606 FRANCE	Edina
1802824110086	6160184400	4604 FRANCE	Edina
1802824110087	6160183400	4602 FRANCE	Edina
1802824110088	6160182400	4600 FRANCE	Edina
1802824140004	6160189402	4800 FRANCE	Edina
1802824140005	611298406	4804 FRANCE	Edina
1802824140009	611302401	4830 FRANCE	Edina
2002824240001	2011410400	5624 XERXES	Edina
2002824240002	2011411400	5628 XERXES	Edina
2002824240005	2011412402	5700 XERXES	Edina
2002824240006	2011413401	5704 XERXES	Edina
2002824240008	2011414401	5712 XERXES	Edina
2002824240009	2011415401	5716 XERXES	Edina
2002824240010	2011416400	5720 XERXES	Edina
2002824240011	2011417402	5724 XERXES	Edina
2002824240012	2011418402	5728 XERXES	Edina
2002824210065	2011398402	5528 XERXES	Edina
2002824240107	2011405401	5600 XERXES	Edina
2002824240108	2011406400	5604 XERXES	Edina
2002824240109	2011407401	5608 XERXES	Edina
2002824240110	2011408401	5612 XERXES	Edina
2002824340060	2011441400	6100 XERXES	Edina
2002824340061	2011442400	6104 XERXES	Edina
2002824340062	2011443402	6108 XERXES	Edina
2002824210007	2011389403	5412 XERXES	Edina
2002824210010	6160195402	5432 XERXES	Edina

Outside Minneapolis Sanitary Sewer Accounts- May 2008

PROPERTY ID No.	ACCOUNT No.	STREET ADDRESS	CITY
2002824210134	511817403	3301 54TH ST	Edina
2002824210146	6160265402	5420 XERXES	Edina
2002824210099	6160211401	5411 ABBOTT	Edina
2002824210102	6160212401	5419 ABBOTT	Edina
2002824220017	6160274400	3517 54TH ST	Edina
2002824340121	2011444401	6116 XERXES	Edina
2002824240013	2011419401	5732 XERXES	Edina
2002824240014	2011420401	5736 XERXES	Edina
2002824240015	2011421401	5740 XERXES	Edina
2002824240112	2011409402	5620 XERXES	Edina
2002824340004	2011434400	6016 XERXES	Edina
2002824340005	2011435403	6020 XERXES	Edina
2002824340006	2011436401	6026 XERXES	Edina
2002824340007	2011437401	6030 XERXES	Edina
2002824340008	2011439401	6036 XERXES	Edina
2002824340009	2011445400	6124 XERXES	Edina
2002824340010	2011446402	6128 XERXES	Edina
2002824340011	2011447400	6132 XERXES	Edina
2002824340031	2011438401	6032 XERXES	Edina
2002824340032	2011440400	6040 XERXES	Edina
2002824310001	6160202403	5800 XERXES	Edina
2002824310002	6160203401	5808 XERXES	Edina
2002824310007	2011425400	5832 XERXES	Edina
2002824310008	2011426401	5836 XERXES	Edina
2002824310009	2011427400	5844 XERXES	Edina
2002824310010	2011428400	5848 XERXES	Edina
2002824310161	6160205401	5900 XERXES	Edina
2002824310162	2011429400	5904 XERXES	Edina
2002824310163	6160206401	5908 XERXES	Edina
2002824310164	2011430401	5912 XERXES	Edina
2002824310165	2011431404	5916 XERXES	Edina
2002824310166	6160207400	5920 XERXES	Edina
2002824310169	2011433404	5932 XERXES	Edina
2002824210089	111818402	5410 ABBOTT	Edina
1702924240022	1911826400	1911 XERXES	Golden Valley
1702924240023	1911827400	1915 XERXES	Golden Valley
1702924240025	1911829402	1931 XERXES	Golden Valley
1702924240026	1911830400	1933 XERXES	Golden Valley
1702924240027	1911831401	1935 XERXES	Golden Valley
1702924240028	1911832400	1949 XERXES	Golden Valley
1702924310003	1911823400	1701 XERXES	Golden Valley
1702924310004	1911824401	1707 XERXES	Golden Valley
1702924310005	6040318401	1711 XERXES	Golden Valley
1702924310006	6020303400	1715 XERXES	Golden Valley
1702924310008	1911825400	1725 XERXES	Golden Valley
1702924310035	1911841400	1611 XERXES	Golden Valley
1702924310036	1911820400	1633 XERXES	Golden Valley
1702924310037	6020302402	1635 XERXES	Golden Valley
1702924310038	1911821401	1639 XERXES	Golden Valley
1702924310039	1911822400	1645 XERXES	Golden Valley
1702924310044	1911819400	1617 XERXES	Golden Valley
1702924340002	1911818400	1541 XERXES	Golden Valley

Outside Minneapolis Sanitary Sewer Accounts- May 2008

PROPERTY ID No.	ACCOUNT No.	STREET ADDRESS	CITY
1702924340003	1911817401	1511 XERXES	Golden Valley
1702924340004	1911816402	1501 XERXES	Golden Valley
1011821440036	6010188401	4623 XERXES	Robbinsdale
1011821440037	2030723400	4627 XERXES	Robbinsdale
1011821440038	6010187404	4617 XERXES	Robbinsdale
1011821440039	2030722400	4615 XERXES	Robbinsdale
602923220014	1431279400	3505 STINSON	St Anthony
602923220015	6030456401	3509 STINSON	St Anthony
602923220021	6030457401	3553 STINSON	St Anthony
602923220127	1431281402	3601 STINSON	St Anthony
602923230020	1431278401	3433 STINSON	St Anthony
602923230022	6030455400	3429 STINSON	St Anthony
602923230024	1431276402	3421 STINSON	St Anthony
602923230025	6030454400	3417 STINSON	St Anthony
602923230026	6030453402	3415 STINSON	St Anthony
602923230027	1431275404	3413 STINSON	St Anthony
602923230029	1431274401	3401 STINSON	St Anthony
602923320001	1431265401	3117 STINSON	St Anthony
602923320030	1431268401	3201 STINSON	St Anthony
602923320031	1431269404	3207 STINSON	St Anthony
602923320033	1431271400	3213 STINSON	St Anthony
602923320034	6030449400	3219 STINSON	St Anthony
602923320035	6030450401	3239 STINSON	St Anthony
602923320036	1431272400	3241 STINSON	St Anthony
602923320037	6030451403	3245 STINSON	St Anthony
602923320039	1431273404	3259 STINSON	St Anthony
602923320056	6030448401	3141 STINSON	St Anthony
602923320057	1431266401	3137 STINSON	St Anthony
602923320058	6030447402	3127 STINSON	St Anthony
602923320059	1431267401	3149 STINSON	St Anthony
702923220001	6030446400	2727 STINSON	St Anthony
702923230001	4260221400	2551 STINSON	St Anthony
702923230002	1031638400	2401 LOWRY A	St Anthony
3102924110069	6100017402	2240 DREW AV	St Louis Park
3102924140024	730591404	2505 5TH AVE	St Louis Park

APPENDIX G:

ACKNOWLEDGEMENTS

The following staff of the City of Minneapolis contributed to the preparation of this report:

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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.

Rhonda Rae

Rhonda Rae, PE
Date 6/30/2008 Registration No.25390

Minneapolis Local Surface Water Management Plan

Final

MINNEAPOLIS, MINNESOTA

OCTOBER
2006

City of Minneapolis, Minnesota

Local Surface Water Management Plan

October 1, 2006

Acknowledgements

In order to arrive at a LSWMP that adequately addresses surface water related issues, the emphasis has been to work with stakeholders to identify important issues through review and meetings. City staff has participated in collecting data, providing feedback, and contributing knowledge of local systems to aid in developing a strategy that encompasses water quality and quantity issues. The Department of Public Works is the organizer and author of this document, with assistance from:

- Department of Regulatory Services
- Community Planning and Economic Development
- Minneapolis Park and Recreation Board
- Camp Dresser & McKee, Inc.

Information was contributed from the following organizations:

- Bassett Creek Watershed Management Commission
- Metropolitan Council
- Minneapolis Park and Recreation Board
- Minnehaha Creek Watershed District
- Mississippi Watershed Management Organization
- Shingle Creek Watershed Management Commission
- Bonestroo, Rosene Anderlik and Associates, Inc.

Final Report

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Executive Summary

Since its founding in 1846, Minneapolis has been defined by its surface waters. The City became the gateway to the upper Great Plains through the navigation provided by the Mississippi River and power supplied by St. Anthony Falls. Its many lakes formed a grand vision of integrated parks, boulevards and residential space. This vision continues to support the City's ongoing vitality, life style, and economic growth.

In the past, Minneapolis has managed its sanitary sewers, storm drains and surface waters as separate systems. Through watershed management and compliance with stormwater mandates, Minneapolis has merged the management of the storm drainage and surface water systems. Many of the decisions and actions by the policy makers, administrators, and field staff are based in the knowledge of how stormwater runoff affects the surface water quality of a lake or creek. Yet decisions and actions related to management of the sanitary sewer system are made independent of potential impact on the storm drainage system. Minneapolis is operating under two mandates to continue its efforts to remove clear water sources from the sanitary sewers, one from the USEPA/MPCA and one from the Metropolitan Council. Often the only solution is to redirect clear water connections (such as a sump drain) from the sanitary sewer to a nearby storm drain. With this Local Surface Water Management Plan, Minneapolis proposes to fully integrate all decisions and activities that affect water resources by including consideration of the impact that sanitary sewer activities have on the storm drainage and surface water systems of the City.

Today, Minneapolis seeks to renew its commitment to an urban lifestyle framed by its surface waters. This Local Surface Water Management Plan (LSWMP) establishes integrated approaches seeking to maintain the quality of life of the City's residents, support the City's continued economic prosperity, and address emerging and existing regulatory challenges. Its integrated water resources management approach

Minneapolis is defined by its water resources. The LSWMP helps the City manage water resources and maintain them for the future.

recognizes that the health and vitality of the City's lakes and urban streams are linked to how each resident manages their property as well as how the City manages its system of storm drains and sanitary sewers. It defines a future free from the dangers of flooding and water quality degradation that is achieved through integrated efforts on a watershed scale, both within the City and among its neighboring communities.

Purpose

The Minneapolis Local Surface Water Management Plan (LSWMP) has been prepared to guide the City in conserving, protecting, and managing its surface water resources. The purpose of the LSWMP is to bring together all water resources issues and activities, and to identify improvements, gaps or overlaps which will help to better manage the city's water resources and attain overall goals. The content of the LSWMP is in large part determined by Minnesota Statute 103B and Rules 8410. Specifically, statute 103B.235 states:

The LSWMP will arm the City with the knowledge needed to prioritize projects that improve the quality of Minneapolis' surface water while meeting other City goals.

After the watershed plan is approved and adopted, or amended, pursuant to section 103B.231, the local government units having land use planning and regulatory responsibility for territory within the watershed shall prepare or cause to be prepared a local water management plan, capital improvement program, and official controls as necessary to bring local water management into conformance with the watershed plan…

The intent of this plan is twofold: to meet the requirements of Minnesota Statute 103B and to provide a resource for city staff. As a reference document, this plan has been structured to provide the reader with basic information and to provide sources where additional information can be found. To include all possible Minneapolis water resources information would be prohibitive; replicating information maintained by other organizations does not allow the user to have the most current information available. Web links have been provided for the electronic user to access the wealth of local water resources information available on the Internet.

Contributors

To comprehensively address Minneapolis surface water related issues, development of this LSWMP involved input from stakeholders who could identify important issues. City staff have participated in collecting data, providing feedback, and contributing knowledge of local systems to aid in developing a strategy for water quality and quantity issues. The Department of Public Works is the organizer and author of this document, with assistance from numerous organizations, including the Department of Regulatory Services, Community Planning and Economic Development, the Minneapolis Park and Recreation Board, and Camp Dresser & McKee Inc.

Stakeholders provided critical information to the LSWMP, through data gathering and identification of critical project issues.

The following organizations also contributed information: Bassett Creek Watershed Management Commission, Metropolitan Council Environmental Services, Minnehaha Creek Watershed District, Mississippi Watershed Management Organization, Shingle Creek Watershed Management Commission, and Bonestroo Rosene Anderlik and Associates, Inc.

Contents

This report is organized into five sections, which include 18 figures, and 16 appendices. The figures and appendices are organized in a way to allow easy changes in the future as programs are implemented and as improvements progress.

Introduction – Section 1

The introduction has four distinct sections: history, system overview, regulatory influences and cooperative agreements. The history of Minneapolis has a focus of how the City grew and how water resources management evolved. The overview describes the purpose of this Local Surface Water Management Plan and its administration. The regulatory section focuses on the strong water resources regulatory structure that exists in Minnesota. It also contains a list of active agreements between Minneapolis and partners that lay out responsibilities for water resources management.

Goals and Policies – Section 2

The goals set forth in The Minneapolis Plan are tied to the City's water resources objectives and sustainability indicators. Section 2 develops a set of guiding principles that provides direction to accomplish these goals.

City of Minneapolis' Water Resources Guiding Principles

- ✓ Protect people, property, and the environment
- ✓ Maintain and enhance infrastructure
- ✓ Provide cost-effective services in a sustainable manner
- ✓ Meet or surpass regulatory requirements
- ✓ Educate and engage the public and stakeholders
- ✓ Enhance livability and safety

Section 2 also details how Minneapolis intends to accomplish City goals while carefully considering limitations, changes to regulations, and the needs of aging infrastructure.

Land and Water Resources Assessment – Section 3

The physical environment of Minneapolis is described in Section 3, with a focus on the wealth of water resources that defines the City. Climate is relatively similar throughout the City, but soils are highly altered and unique to each parcel of land. Each lake, stream, or river has defining characteristics. The condition of the water bodies in Minneapolis is described, an overview of the organizations that oversee their well-being is provided, and current ongoing monitoring efforts are discussed.

Routine inspection and maintenance of sewer systems helps ensure the systems' adequacy in handling stormwater and sewer flows.

System Inventory and Related Activities – Section 4

The management of the stormwater drainage and sanitary sewers has evolved with the City. The City began as a one-sewer city and now is supported by more than 830 miles of sanitary sewers and 550 miles of storm drains. The City routinely inspects and maintains the sanitary sewer and storm drainage systems to maintain service and has implemented Best Management Practices that serve to improve the quality of runoff. But other City features – such as roadways and vegetation – also impact surface water quality by the amount and quality of water they permit to divert to the storm drain system. Section 4 describes the City's infrastructure, and discusses associated capital improvement activities. It also includes descriptions of other activities that are integral to water resources management, including infrastructure maintenance, regulatory activities, and public education/engagement.

Planning and Implementation – Section 5

Minneapolis has successfully implemented stormwater Best Management Practices and has seen improvement in the quality of surface waters. For example, the quality of the Mississippi River has improved as a direct result of the CSO program. And Chain of Lakes Clean Water Partnership activities saw Lake Calhoun improve from euthrophic conditions in the early 1990s to nearly pre-settlement quality today. While Minneapolis has made progress in improving the quality of stormwater and reducing the occurrence of CSOs, additional activities are identified that will continue this trend of water quality improvement. This section discusses these activities and presents a framework for assessing, planning and implementing new activities relevant to water resources management.

Section 1
Introduction

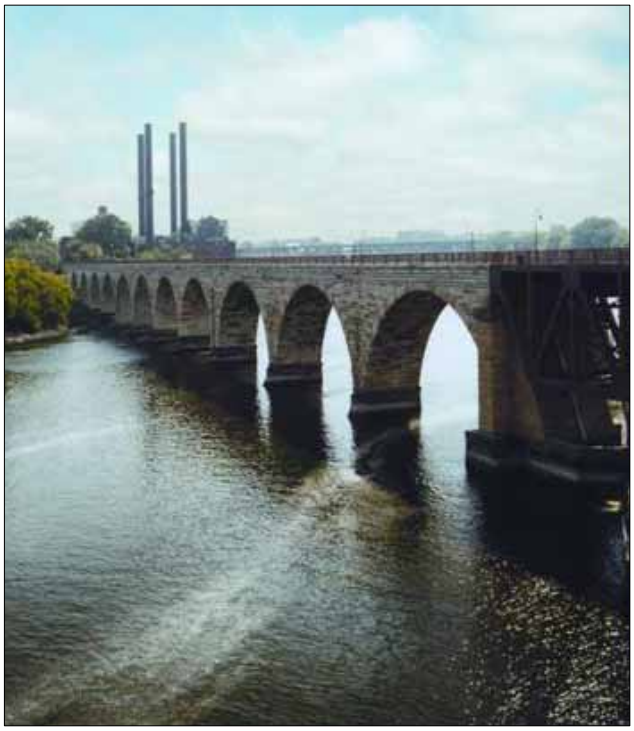
The Minneapolis Local Surface Water Management Plan (LSWMP) is a living document that provides the background and guidance needed for the City of Minneapolis to proactively manage its water resources. The purpose of the LSWMP is to bring together all water resources issues and activities, and to identify improvements, gaps or overlaps that will help the City to better manage its water resources. In the past the City managed its sanitary sewers, storm drains and surface waters as separate systems. With this LSWMP the City proposes to fully integrate all decisions and activities that affect water resources.

The LSWMP is a comprehensive planning document that will be used to guide the City in conserving, protecting, and managing its surface water resources.

History

Minneapolis has been defined by its water resources since its founding in 1846. The Mississippi River, as we know it now, has existed since the last ice age about 12,000 years ago.

Before the middle of the nineteenth century, the Dakota tribe occupied the area now known as Minneapolis. The other dominant Native American tribe in the area was the Ojibwe. In 1829, a Dakota Mdewakanton village existed on the west shore of Mde Maka Ska (White Earth Lake), now known as Lake Calhoun. Dakota names for the water bodies within the present boundaries of the City of Minneapolis are documented in Where the Waters Gather and the Rivers Meet: an Atlas of the Eastern Sioux by Paul Durand (Prior Lake, 1994). The names of some well-known lakes, creeks and falls are documented in Table 1-1.



Stone Arch Bridge on the Mississippi River in Minneapolis. (Source: John Kuhne)

The town of Minneapolis was incorporated in 1856 and the first town council organized in 1858. In 1867, the town was upgraded to a city and residents elected Dorilus Morrison as the first mayor. St. Anthony and Minneapolis merged in 1872 under the name Minneapolis.

In 1857, Edward Murphy donated land for the City's first park, which was appropriately named Murphy Square. On Feb. 27, 1883, the Legislature authorized an independent Board of Park Commissioners for the City of Minneapolis. Using a model that was largely based on connecting surface water features in the City, and drawing on Frederick Olmsted's planning principles; the Board of Park

Commissioners pursued a grand vision for an integrated park, boulevard and residential space.

Table 1-1. Local Lakes, Creeks, and Falls

Dakota Name	Translation	English Name
Haha Wakpa	Falls River	Mississippi River
Haha Wakpadan	Little Falls River	Bassett Creek
Mde Maka Ska	White Earth Lake	Lake Calhoun
Mde Uma	Other Lake	Lake Harriet
Mdote Minisota	Mouth of the Minnesota (Clouded Water) River	Mendota
Mini Haha	"Curling Water" or "the Waterfall"	Minnehaha Falls
Omnina Wakan Wakpadan	Spirit Refuge Creek	Shingle Creek
Owamniyomni	The Whirlpool	St. Anthony Falls
Wakpa Cistinna	Little River	Minnehaha Creek
Wanagi Wita	Spirit or Ghost Island	Spirit Island (no longer exists)
Wita Tomna	Four Islands (Lake)	Lake of the Isles

(Source: Minneapolis Public Library)

The City's infrastructure grew by leaps and bounds in the last 20 years of the 19th century, as shown in Figure 1-1. In 1889 and 1890, the City constructed 145 miles of sidewalk, and by 1908 there were about 125 miles of paved streets. Work began on the City's sewer system as early as 1871, and by the early 1900s there were 225 miles of City sewers.

In 1884, the City occupied 24 square miles; in 1889, the boundaries expanded to cover 53.5 square miles, and with the last major annexation of land in 1927, the total land area of the City totaled 58.7 square miles. The population of Minneapolis exceeded 300,000 by 1910.

Nearly all of the Minneapolis lakes were physically altered in the late 1800s to early 1900s. The lakes were dredged, shorelines filled, islands lost and rebuilt, springs buried, creeks rerouted, ponds built, and swamps drained. This was done mainly for functional and aesthetic purposes.

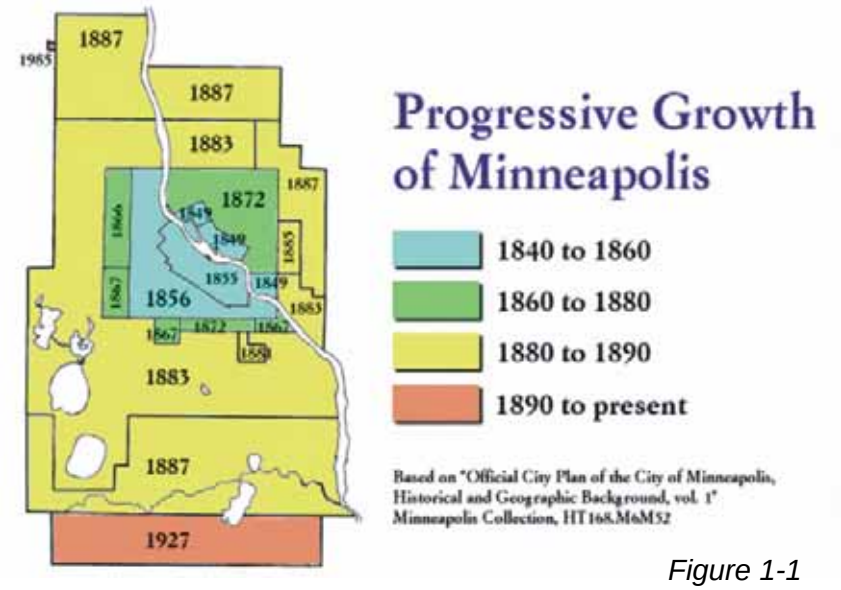


Figure 1-1

Lake Harriet had fairly extensive dredging and filling on the northwest portion to eliminate marshland and create a more beautiful landscape. The northern edge of the lake was drained and turned into a meadow for picnics. The entire shoreline of Lake Calhoun received some degree of dredge fill to support parkway construction, and extensive dredging took place on Lake of the Isles. Two islands were eliminated on Lake of the Isles; the north arm was dredged to a uniform depth, and 4.5 acres of shoreline was constructed along the swampy east shore. Because of these alterations, these lakes cannot be managed in the same manner as lakes that have not been altered.

Powderhorn Park, 1905. (Source: MPRB)

To support the growing community, Minneapolis and St. Paul created a joint sewer board, which built a sewer system to collect and convey sanitary sewage to a treatment facility during dry weather.

Through the 1920s, virtually the entire City of Minneapolis was served by a combined sewer system that collected sanitary sewage, and street and property drainage, and conveyed it to the Mississippi River. Combined sewers were a major public health advancement at the time, but it is now recognized that combined sewers simply relocated health and environmental problems to the Mississippi River.

In the early 1930s, the cities of Minneapolis and St. Paul created the Minneapolis St. Paul Sewer Board, which constructed a system of interceptor sewers to collect sanitary sewage during dry weather conditions and convey it to a treatment facility in St. Paul. Areas of the city constructed in the 1930s and later were served with separate sanitary and storm drainage systems. During this period there was little effort to separate the stormwater from the sanitary sewers in the older portions of the City.

The movement to separate sanitary and stormwater systems gained momentum during the 1960s, when the City began a 40-year program of residential street reconstruction. The City aimed to completely separate the street runoff from the sanitary sewers by 2005. In the late 1970s, the U.S. Environmental Protection Agency (EPA) and the Minnesota Pollution Control Agency (MPCA) worked with Minneapolis to accelerate the separation project. At that time the City determined that the sewer separation project could be completed by the mid-1990s. It was also determined that adequate capacity existed in the sanitary sewers to allow private sources of inflow, such as roof rainleaders and foundation drains, to remain connected to the sanitary system.

To date, sewer separation has been largely achieved in most City areas, although several pockets of combined and partially separate sewers remain. Wet weather overflows still occur. A 2002 study conducted jointly by the Metropolitan Council Environmental Services and the City of Minneapolis identified areas with high levels

of storm inflow to sanitary sewers, identified areas with high levels of groundwater infiltration, identified remaining locations where public drainage systems connect to sanitary sewers, evaluated in-system storage and conveyance options, and recommended City ordinances require rain leaders to be disconnected from sanitary sewers. The result of this study is the City's Combined Sewer Overflow (CSO) Phase I program and Rain Leader ordinance. (See Section 2)

the river, the creeks, the lakes, and the land forms

Minneapolis got its name from the abundance of creeks, rivers, lakes, ponds, and wetlands found within its boundaries. Since the city's first settlement, and the work of the original parks designers, the lakes in particular proved to be an important identifying feature for the city. Early in the city's history, Minneapolis became well known as the "City of Lakes" and the lakes of South Minneapolis have always been a favorite destination. The lakes provide a beautiful amenity for all city residents and recent partnership projects undertaken by the Minneapolis Clean Water Partnership since 1994 maintain the environmental quality of the Chain of Lakes by developing concerted efforts to improve watershed quality. The Chain of Lakes has assumed an important place in the city's identity.

The Mississippi River, which connects the entire city from Camden community in the north to the Nokomis and Longfellow neighborhoods at Minnehaha Falls, has played a lesser role in shaping the city's identity as the main modes of transportation and economic growth have shifted from river travel to freeway travel. Access to the river and its [sic] recreational uses varies considerably, based primarily on historic patterns of urban development. Since the city's early settlement, the Upper River was the site of first timber milling and later railroad and open storage yards. This section of the Mississippi River corridor has traditionally been seen as the domain of industry, crisscrossed by rail networks and host to the power generating plants and raw materials production essential to manufacturing and heavy industry.

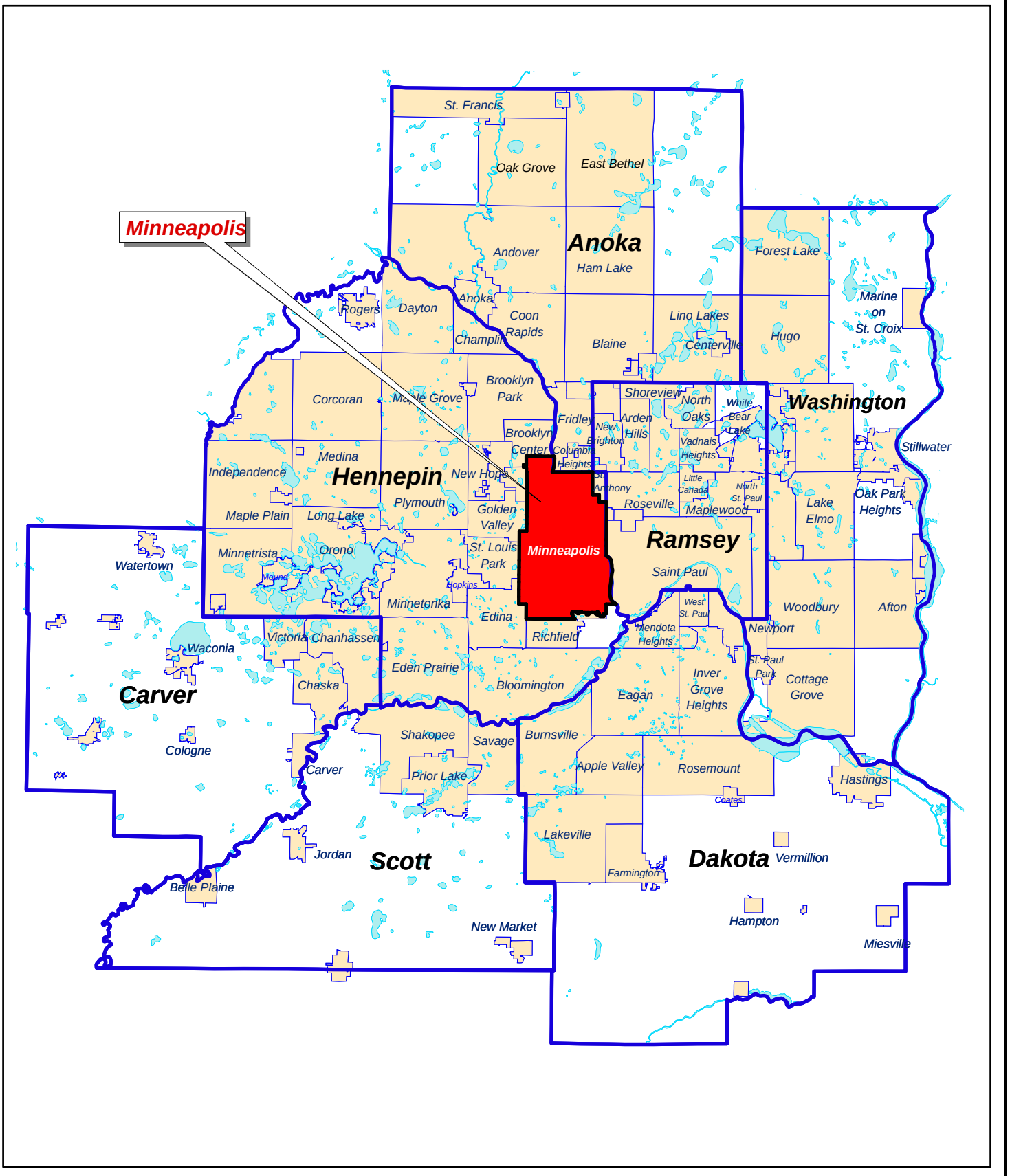
– From Minneapolis Plan
Minneapolis Plan, Chapter 9 City Form

As of 2005, the City is served by 830 miles of sanitary sewer with more than 29,000 manholes, nearly 560 miles of storm drains with more than 18,000 manholes, and an estimated 50,000 catch basins connected to the storm drains by 151 miles of catch basin runs. Located at the heart of the Twin Cities Metropolitan Area, Minneapolis is fully developed with a relatively stable population of 383,000. (See Figure 1-2)

Trends in Water Resources Management

In the past, Minneapolis has managed its sanitary sewers, storm drains and surface waters as separate resources. Through watershed management and compliance with stormwater mandates, Minneapolis has begun to manage the storm drainage and surface water systems in a more integrated fashion. With this Local Surface Water Management Plan, Minneapolis proposes to fully integrate all activities that affect water resources, including sanitary sewer issues of Inflow/Infiltration (I/I), and CSOs.

In the future, the City anticipates a need to balance two important concerns: aging infrastructure and regulatory mandates to improve water resources quality.



City of Minneapolis

Location Map

Local Surface Water Management Plan

Figure 1-2

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County Boundary
Metro Municipality
Lake/River

Maintaining the condition and capacity of the infrastructure will require additional resources as the system continues to age. Concurrently, regulatory mandates are anticipated as Total Maximum Daily Load (TMDL) studies (see Section 3) create recommendations to construct improvements to public infrastructure. In anticipation of these demands on limited resources, the City has begun a policy of comprehensively addressing all water resources issues with each infrastructure improvement project. For example, private inflow sources are identified for disconnection from the sanitary sewers as part of street reconstruction projects. The City expects that this strategy will allow water quality improvements concurrently with investments that will maintain the condition and capacity of the systems.

The City is also committed to managing its water resources using emerging techniques and technologies. Preservation of natural resources, disconnection of impervious surfaces and reduction in impervious area are all practices that will encourage stormwater infiltration and serve to reduce the volume of stormwater runoff. This will benefit both the City's infrastructure and ultimately the water resources in the following ways:

- Improved capacity of stormwater drainage system
- Reduced frequency, severity, and duration of localized street/intersection flooding
- Increased recharge of groundwater
- Reduced pollutant loading to surface waters
- Reduced velocity of flow in local streams, which leads to stabilized streambanks and improved wildlife habitat

According to Chapter 4 of the Minnesota Stormwater Manual, Better Site Design Techniques, every ten acres of impervious surface removed will result in an annual reduction of runoff of 8 million gallons. These benefits are part of the reason why Minneapolis adopted its Sustainability Initiatives, including the targets for permeable surfaces and surface water quality. In the future, the City will continue to track progress towards these targets and will continue to seek opportunities to further reduce the area of impervious surfaces.

Categorization of Minneapolis Water Resources Systems

Sanitary Sewer System

For purposes of this LSWMP, components of the sanitary system are limited to those structures that either allow inflow (rain leaders, catch basins), infiltration (pipes), or overflow to enter either a storm drain (diversion structure) or the Mississippi River (regulator).

Storm Drainage System

The storm drainage system includes all components of stormwater management, including both structural components, and non-structural Best Management Practices (BMPs). Structural components include: street gutters, catch basins, manholes, pipes, tunnels, pumps, grit chambers, detention ponds, public ditches and outfalls. Non-structural BMPs include road maintenance, emergency preparedness, education, erosion protection on construction sites, and stormwater management requirements for new developments.

Shingle Creek regional stormwater pond. (Source: City of Minneapolis Public Works)

Public Ditches

Minnesota Statutes 103E allows for a water management authority to construct and maintain public ditch systems. These public ditches are integral to the Minneapolis storm drainage system, but are owned and operated by other public agencies. Two agencies have responsibility for certain ditches in Minneapolis: Hennepin County and Minnehaha Creek Watershed District. Additional information can be found in Section 4 of this plan.

Surface Waters

Surface waters include all waters of the state that are within the Minneapolis city or park boundaries, and those outside the City that receive runoff from areas of Minneapolis. Public Waters are as defined by the Minnesota Department of Natural Resources. Although a segment of Shingle Creek through Minneapolis is a Judicial Ditch, and regulated by Minnesota Ditch Law, it is managed as surface water for purposes of this document.

Private Systems

Generally the proper operation and maintenance of private systems is the responsibility of the private property owner. In Minneapolis this includes the entire length of a lateral connection, including the segment of the private connection that is within the public right-of-way. Activities detailed in this report include those in which Minneapolis has implemented public oversight of the private systems, as necessary, to ensure compliance with City ordinances and other legal requirements.

Regulations, Regulatory Organizations and Regulatory Programs

This Minneapolis LSWMP was created to meet the requirements of Minnesota Statute 103B.235 and Minnesota Rules 8410.0160 (Local Water Management Plans) and the local requirements of each watershed district/organization with jurisdiction in Minneapolis. The scope of this LSWMP has been expanded to incorporate all goals and requirements that influence Minneapolis water resources management policies and activities. Many of the activities described in Sections 3 (Land and Water

Regulatory Agencies Influencing Minneapolis Surface Water Systems

- U.S. Environmental Protection Agency
- U.S. Army Corps of Engineers
- Federal Emergency Management Agency
- Minnesota Pollution Control Agency
- Minnesota Department of Natural Resources
- Minnesota Board of Water and Soil Resources
- Watershed Districts and Management Organizations

Resources Assessment) and 4 (System Inventory and Related Activities) comply with multiple regulatory requirements. Water resources management, including stormwater regulation, involves numerous agencies at every level of government. Listed on the following pages are entities that Minneapolis interacts with as it manages its surface water system. Appendix A provides more detailed information on each of the watershed districts and management organizations that have jurisdiction in Minneapolis.

Federal

Clean Water Act (Environmental Protection Agency - Clean Water Act)

The federal Clean Water Act governs the discharge of pollutants into waters of the United States. This act gave the USEPA the authority to create federal regulations and permit programs related to CSO, Sanitary Sewer Overflow (SSO), Municipal Separate Storm Sewer Systems (MS4), and activities affecting wetlands. In Minnesota, the authority to issue National Pollution Discharge Elimination System (NPDES) permits has been delegated to the MPCA. Wetland permits are issued by the US Army Corps of Engineers (USACE). Total Maximum Daily Load (TMDL) limits, a new initiative mandated by the EPA, also stem from the EPA's role as steward of the Clean Water Act.

NPDES CSO Program (EPA Combined Sewer Overflows)

Combined sewer systems are sewers that are designed to collect rainwater runoff, domestic sewage, and industrial wastewater in the same pipe. Most of the time, combined sewer systems transport all of their wastewater to a sewage treatment plant, where it is treated and then discharged to a water body. During periods of heavy rainfall or snowmelt, however, the wastewater volume in a combined sewer system can exceed the capacity of the sewer system or treatment plant. For this reason, combined sewer systems are designed to occasionally overflow and discharge excess wastewater directly to nearby streams, rivers, or other water bodies. These overflows contain not only stormwater but also untreated human and industrial waste, toxic materials, and debris. They are a major water pollution concern for cities that have combined sewer systems.

Minneapolis proactively began a sewer separation program to provide adequate system capacity and minimize overflows. Source: City of Minneapolis Public Works

Eight CSO outfalls throughout Minneapolis are regulated in NPDES/SDS Permit No. MN0046744 (Appendix K). This permit was reissued in 1997 and expired in 2001. The City of Minneapolis and the Metropolitan Council Environmental Services (MCES)

are co-permittees. Outfalls are points of discharge for CSOs to the Mississippi River during rainfall and snowmelt events. Conditions of the expired permit govern until a new permit is issued.

NPDES Stormwater Program (EPA Stormwater Program)

Stormwater discharges are generated by runoff from land and impervious areas such as paved streets, parking lots, and building rooftops during rainfall and snow melt events. They often contain pollutants in quantities that can adversely affect water quality. Most stormwater discharges are considered point sources and require coverage by an NPDES permit. The primary method to control stormwater discharges is through the use of best management practices.

Best management practices are utilized to control stormwater discharges in Minneapolis.

In Minnesota the NPDES stormwater program is delegated to the Minnesota Pollution Control Agency. Municipal stormwater discharges are permitted by the City and the Minneapolis Park and Recreation Board's NPDES/SDS Permit No. MN0061018 (Appendix L), issued on December 1, 2000 and expired on December 1, 2003. This permit protects water quality in accordance with Minnesota and US statutes and rules, including Minn. Stat. chs. 115 and 116, Minn. R. chs. 7001, 7050, and the Clean Water Act. The permit lists 400 public discharge points throughout the City. The receiving waters within Minneapolis that have the most discharge points are Minnehaha Creek (115 points) and the Mississippi River (72 points). Conditions of the expired permit govern until a new permit is issued.

EPA Sanitary Sewer Overflow Program (EPA Sanitary Sewer Overflows)

SSOs, occasional unintentional discharges of raw sewage from municipal sanitary sewers, occur in almost every system and have a variety of causes. These causes may include severe weather, improper system operation and maintenance, and vandalism. EPA estimates that there are at least 40,000 national SSOs each year. The untreated sewage from these overflows can contaminate our waters, causing serious water quality problems. It can also back up into basements, causing property damage and threatening public health.

Section 404 Wetland Permits (Section 404 fact sheet) (USACE Section 404 Permits)

Section 404 of the Clean Water Act establishes a program that regulates the discharge of dredged or fill material into waters of the United States, including wetlands. Activities regulated under this program include fill for development, water resources projects, infrastructure development, and mining projects. Section 404 requires a permit before dredge or fill material may be discharged into waters of the United States. Certain farming and forestry activities are exempt from Section 404 regulation.

National Flood Insurance Program (FEMA NFIP Program)

Flood insurance is available only to property owners who own property within a municipality that participates in the NFIP. To enroll in the program, municipalities must implement ordinances and other local controls that manage land use within

designated flood zones. The City enrolled in this program in 1981. In Minnesota, the MNDNR oversees the implementation of this program. Copies of Minneapolis Flood Insurance maps are maintained by the Minneapolis Department of Community Planning and Economic Development (CPED).

Navigation (USACE Navigation Responsibilities)

The USACE is responsible for maintaining the navigation channel of the Mississippi River. Although there are no permitting requirements, any activity that the City undertakes along the Mississippi River must be coordinated with the USACE. For example, construction of a new or enlarged storm drain outfall along the navigation channel may be subject to design considerations set by the USACE.

State

Local Surface Water Management (Minnesota Board of Water and Soil Resources / Water Management) (Minnesota Statutes 2005 Chapter 103B) (Minnesota Rules Chapter 8410)

The Minnesota Board of Soil and Water Resources oversees local surface water management. The powers and duties of this Minnesota state agency include:

- Coordination of water and soil resources planning among counties, watersheds, and local units of government.
- Facilitation of communication among state agencies in cooperation with the Environmental Quality Board.
- Approval of watershed management plans.

Protected Waters and Wetlands – MNDNR (Minnesota Water Statutes and Rules - Division of Waters: Minnesota DNR) (Floodplain Management Program - Division of Waters: Minnesota DNR) (Shoreland Management Program - Division of Waters: Minnesota DNR) (Water permits: Minnesota DNR)

Any activity within a public water requires a permit from the DNR, including appropriation of groundwater, construction of stream crossings, construction of storm drain outfalls, wetland alterations, dredging, etc. Their jurisdiction is generally the area below the Ordinary High Water level. The MNDNR area hydrologist will coordinate review among other public agencies which also have a role in permitting.

Other programs managed by the MNDNR which affect Minneapolis include the Flood Damage Reduction Grant Program, National Flood Insurance Programs, Floodplain Management Program, Shoreland Management Program, Mississippi River Critical Area Program, and the Mississippi River Management Navigation Program.

Wetlands (Minnesota Board of Water and Soil Resources / Wetland Conservation Act) (MN Wetland Conservation Act Rules) (Wetlands Conservation Program - Division of Waters: Minnesota DNR) (Clean Water Act Section 401 Water Quality Certifications - MPCA)

Minneapolis is designated as the Local Government Unit for wetlands within its corporate boundaries, including the SENA wetland. (Source: MPRB)

Under the Minnesota Wetland Conservation Act (WCA), Local Government Units (LGU) may oversee wetland management according to specific guidelines established by state agencies. Minneapolis is designated as the LGU for wetlands within its corporate boundaries.

WCA protected wetlands are not protected under MNDNR's public waters permit program and provide no net loss of Minnesota's remaining wetlands. Local government units – cities, counties, watershed management organizations, soil and water conservation districts, and townships – implement the act locally. The Minnesota Board of Water and Soil Resources administers the act statewide, and the Department of Natural Resources enforces it.

NPDES Permits (Overview - MPCA Stormwater Program) (Stormwater Program for Construction Activity - MPCA) (Stormwater Program for Industrial Activity - MPCA) (Stormwater Program for Municipal Separate Storm Sewer Systems - MPCA) (Wastewater Permits - MPCA)

The USEPA has delegated responsibility for issuing NPDES permits to the MPCA.

Impaired Waters and Water Quality Standards (Minnesota's Impaired Waters and Total Maximum Daily Loads - MPCA) (Water Quality Standards - MPCA) (Minnesota Rules Chapter 7050) (2006 Final List of Impaired Waters - MPCA)

The Clean Water Act requires states to adopt water quality standards for public waters. These standards are used to determine if a water body has degraded to the point of meeting the definition of impaired waters as defined in Minnesota Rule Chapter 7050. Each water body on the impaired waters list will eventually be assessed in a TMDL study. The MPCA is considering incorporating the recommendations of the TMDL studies into future NPDES stormwater permits, effectively using the Clean Water Act to mandate that stormwater permittees implement the recommendations of each TMDL study. In Minneapolis, this will affect the stormwater runoff discharging to the list of waters currently on the Final 2006 Impaired Waters List shown in Table 1-2. More detailed information on the Final 2006 Impaired Waters List is included in Section 3.

Additional water bodies may be added to future impaired waters lists if monitoring shows impairment according to standards set in Minnesota Rule Chapter 7050.

Table 1-2. Waters on the Final 2006 Impaired Waters List

■ Mississippi River ■ Bassett Creek ■ Minnehaha Creek ■ Shingle Creek ■ Brownie Lake ■ Cedar Lake ■ Crystal Lake (Robbinsdale – receives stormwater discharge from Minneapolis) ■ Diamond Lake	■ Lake Calhoun ■ Lake Harriet ■ Lake Hiawatha ■ Lake of the Isles ■ Lake Nokomis ■ Wirth Lake (Golden Valley – located in MPRB Wirth Park) ■ Powderhorn Lake ■ Ryan Lake

Regional

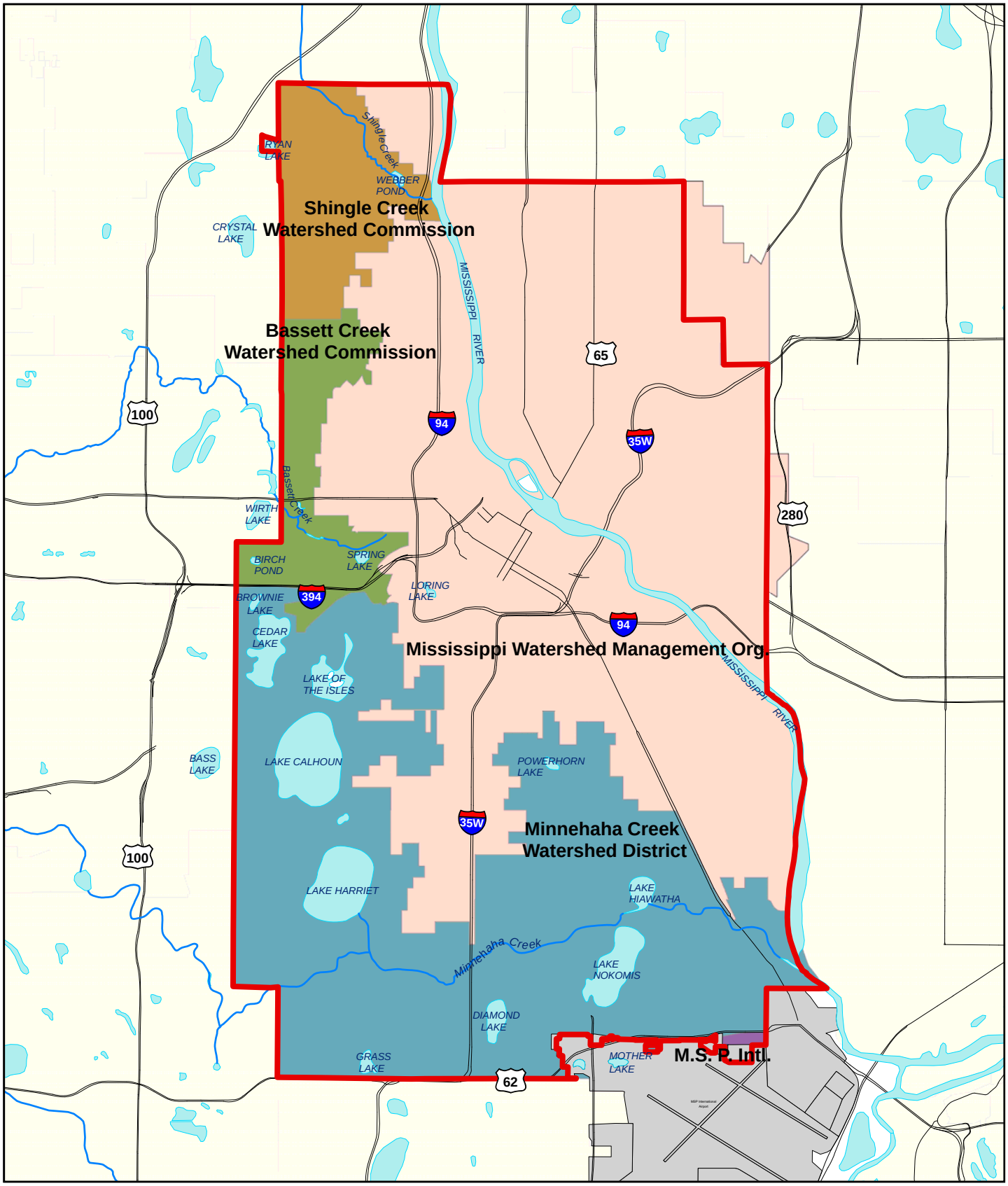
Watershed District and Watershed Management Organizations (BCWMC: Bassett Creek Watershed Management Commission) (MCWD: Minnehaha Creek Watershed District) (MWMO: Mississippi Watershed Management Organization) (SCWMC: Shingle Creek Watershed Management Commission)

Four watershed district/organizations are represented within the Minneapolis boundaries. Jurisdictional boundaries of each of the four watershed management organizations within the City of Minneapolis are shown in Figure 1-3. The powers and duties of these Minnesota statutory authorities include:

- Approval authority over local water management plans.
- Ability to determine a budget and raise revenue for the purpose of covering administrative and capital improvement costs.
- Regulation of land use and development when one or more of the following apply:
    1. The City does not have an approved local water management plan in place
    2. The City is in violation of its approved local plan

Hennepin County

Hennepin County's Groundwater Plan received state approval in March 1994. Although the county has not formally adopted the plan, the county is proceeding with implementation of many aspects of the plan. Plan goals for cities include management according to geographic location and hazard potential, delineation of wellhead protection areas around public supply wells, applying existing zoning authority to protect groundwater, ranking and management of hazardous land use activities according to risk, using a GIS system to manage groundwater information, location of abandoned wells, and adoption of contingency plans for groundwater.



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City of Minneapolis

Watershed Authorities

Local Surface Water Management Plan

Figure 1-3

General City Boundary
River/Stream
Lake

Wastewater Conveyance and Treatment - Metropolitan Council Environmental Services (MCES - Metropolitan Council Environmental Services, St Paul - Minneapolis, Minnesota) (MCES - Water Resource Management Plan) (MCES - I/I Surcharge Program)

MCES is required to review this Local Surface Water Management Plan to ensure that municipalities manage runoff in a manner that does not affect the regional disposal system. In addition, the recent adoption of the Inflow/Infiltration Surcharge Program will ultimately affect water resources decisions made by the City of Minneapolis. As owner and operator of the regional sanitary sewer interceptor system, MCES has been a co-permittee with the City of Minneapolis in the CSO NPDES permit (Appendix K).

Regulatory Controls

Responsibility for water resources management in Minneapolis is split between the City of Minneapolis and the Minneapolis Park and Recreation Board. The City of Minneapolis is responsible for the public infrastructure and land use on non-MPRB properties. Authority for lake, beach and shoreland management is delegated to the MPRB in Minneapolis City Charter Chapter 16, Section 11:

> 'Whenever the title shall have been acquired for the purpose of this chapter, to the land constituting the shore or shores of any stream of water, lake or pond, said Board may regulate and control the use of such shore or shores and the water contiguous thereto, and in case such ownership should embrace the entire shore or any such lake or pond, said Board is hereby empowered to take any and have exclusive charge and control of the waters of said lake, and may in all things regulate and govern the use of such waters and may prescribe penalties for the violation of such rules and ordinances as it may adopt for that purpose; provided, that said Board shall not prohibit the use of sail or rowboats on such waters.'

Both organizations have adopted ordinances that influence water resources management, including:

- Title 3, Chapter 48 — Minneapolis Watershed Management Authority
- Title 3, Chapter 50 — Minneapolis Waste Control and Discharge Rules
- Title 3, Chapter 52 — Erosion and Sediment Control for Land Disturbance Activities
- Title 3, Chapter 54 — Stormwater Management for New Developments
- Title 3, Chapter 56 — Prohibited Discharges to Sanitary or Combined Sewers
- Title 3, Chapter 57 — Mercury Ordinance
- Title 19, Chapter 510 — Stormwater Management System
- Title 19, Chapter 511 — Sewers and Sewage Disposal

- Title 20, Chapter 551 Protection of Natural Features
- Title 20, Chapter 551 Shoreland Overlay District
- Title 20, Chapter 551 Floodplain Overlay District
- Title 20, Chapter 551 Mississippi River Critical Overlay District

The Minneapolis Park and Recreation Board regulates projects in its designated parklands through its own ordinances and state law. For areas within City limits that also include a watershed district or watershed organization, regulatory authority is shared between the watershed and the City. Ordinances adopted by the MPRB include:

- Chapter 3 Bathing and Beaches
- Chapter 4 Boating
- Chapter 12 Environmental Protection, Shoreland and Floodplain Preservation

A full list of all Minneapolis ordinances that affect water resources management is contained in Appendix B. Full versions of all City of Minneapolis and Minneapolis Park and Recreation Board Ordinances are available at Minneapolis Code of Ordinances.

Administrative Responsibility

Staffs from many City departments and the MPRB work cooperatively to ensure that water resources programs are properly managed and that ordinances and laws are regulated. Departments with the greatest involvement include: Community Planning and Economic Development (CPED), Public Works – Engineering Services (PW/ES), Public Works – Field Services (PW/FS), Regulatory Services – Environmental Management (RS/EM). Specific functions of each department include:

CPED

- Comprehensive planning/land use planning
- Zoning Code
- Site plan review for compliance with requirements of Zoning Code – including floodplain, shoreland, and Mississippi River Critical Area ordinances

MPRB

- Lake management
- Natural resources management for MPRB owned properties
- Shoreline and beach management for MPRB owned properties

- Vegetation management for stormwater basins on MPRB properties
- Stormwater monitoring (under agreement with City)
- TMDL study coordination
- Wetland Health Evaluation Project (under agreement with Hennepin County)
- Water quality education (mostly under agreement with City)
- Planning, design and implementation of stormwater management practices that manage runoff from MPRB property
- Maintenance of most water control structures on MPRB properties

PW/ES

- Planning, design and funding for sanitary sewer and stormwater drainage infrastructure projects
- Coordination with watershed district/organizations
- Overall coordination of NPDES permit activities
- TMDL study coordination
- Site plan review for compliance with stormwater management and erosion/sediment control requirements
- Administration of Wetland Conservation Act
- Technical support for floodplain management
- Public Education and Public Engagement
- Administer and enforce Stormwater Utility Ordinance
- Coordination of Local Surface Water Management Plan

PW/FS

- Construction, repair and rehabilitation of infrastructure improvement projects
- Street maintenance
- Condition assessments of pipe and pump stations
- Operation and maintenance of sanitary sewer system
- Operation and maintenance of storm drainage system:
  - Overall operation and maintenance of all stormwater basins

- Vegetation management of stormwater basins not located on MPRB properties
- Inspection and cleaning of underground chambers

- Emergency response
- Gopher State One-Call
- Rat, Rodent & Insect Control
- Inspection for illicit connections to storm drains

RS/ES

- Permitting:
  - Erosion and sediment control permits
  - Construction, sealing and maintenance of wells
  - Installation, removal and abandonment of oil/ water separators and sediment traps
  - On-site treatment systems
  - Storage of contaminated soil
  - Discharges to the sanitary and storm drain system
  - Facilities storing regulated materials
  - Pollution control devices
  - Rain leader, roof drains and area drain disconnections from the sanitary sewer
- Inspection on private and public property for compliance with City ordinances and codes:
  - Inspection of above permitted activity
  - Erosion and sediment control permits for residential construction and demolition sites and for permanent operations
  - Building inspection for rainleader and foundation drain connections to sanitary sewers
  - MPCA NPDES, SDS and General Permits
  - Suspected or reported illegal connections, discharges and dumping
  - Chemical and other regulated material storage
- Monitoring for illicit connections to storm drains in MWMO watershed
- Emergency response cleanup coordination on land and water

- Coordination with watershed district/organizations
- Sustainability program

Minneapolis shares responsibility for water resources management with other public agencies, as outlined in Table 1-3.

Table 1-3. Regulatory Responsibilities for Water Resources Management and Related Issues in the City of Minneapolis

Regulation	City	MPRB[b]	BCWMC	MCWD	MWMO[d]	SCWMC	Met Council	State	Federal
Land use (zoning, subdivision approval, etc.)[a]	X	X	X				X		
Grading	X	X		X				X	
Wetlands[c]	X	X						X	X
Stormwater rate control	X		X	X		X		X	
Stormwater quality treatment Source: NPDES	X		X	X		X		X	
Stormwater infiltration						X			
Fertilizer	X							X	
Erosion and sediment control	X		X	X		X		X	
Illegal discharges to storm drainage system	X		X	X				X	
Shoreland management Source: DNR	X	X		X				X	
Floodplain	X	X	X	X		X		X	X
Dredging	X			X				X	X
Stream crossings	X		X	X		X		X	
Combined Sewer Overflows	X						X	X	X
Sanitary Sewer Overflows	X						X	X	X
Impaired Waters/TMDL								X	
Mercury Reduction	X							X	

Notes:
[a] SCWMC requires that land use changes that significantly impact the land use assumptions of the watershed hydrologic model are to be reviewed and commented on by the SCWMC
[b] Jurisdiction on MPRB lands only
[c] Minneapolis is the LGU for WCA projects
[d] MWMO has authority to regulate, however chooses not to issue permits

Water Resources Related Agreements

The City of Minneapolis is party to a number of water resources related cooperative agreements. Copies of current agreements are on file and available from Minneapolis Public Works – Engineering Services. Following is a list of the agreements in effect in 2006:

- Interagency agreements between Minneapolis and the MCES detailing each entity's responsibilities in the CSO program
- Joint powers agreements for the establishment of the following watershed organizations: Bassett Creek Watershed Management Commission, Mississippi Watershed Management Organization, and Shingle Creek Watershed Management Commission
- Interagency agreement between the City of Minneapolis and the MPRB outlining responsibility for BMPs required in the City's NPDES Stormwater Permit
- Cooperative agreements for the maintenance of County State Aid Highways (Hennepin County) and State Trunk Highways (Minnesota Department of Transportation). Includes provisions for City routine maintenance of storm drains associated with these roadways
- Watershed Boundary Change interagency agreement between the Bassett Creek Watershed Management Commission, the Mississippi Watershed Management Organization (then called Middle Mississippi River Watershed Management Organization) and the City of Minneapolis
- Interagency agreement for construction, maintenance, and operation of Bassett Creek Flood Control Tunnel between Minneapolis and the US Army Corps of Engineers.
- Cooperative agreements between the Minneapolis Park and Recreation Board and the Minnehaha Creek Watershed District for maintenance of stormwater management ponds which are located on MPRB owned property
- General maintenance agreements between City of Minneapolis and private property owners requiring maintenance of stormwater controls for purpose of qualifying for credit against the City's stormwater utility fee
- Interagency agreement between MCES and MPRB for WOMP stations
- Interagency agreement between Hennepin County Environmental Services and MPRB for WHEP program
- Interagency agreement between MWMO and Minneapolis for water monitoring and laboratory services

Minneapolis Local Surface Water Management Plan

Purpose

Minneapolis has prepared this LSWMP as a comprehensive planning document that will be used to guide the City in conserving, protecting, and managing its surface water resources. The LSWMP meets requirements as established in Minnesota Rules 8410.

Participation of state, regional and watershed organizations in LSWMP development will help the City to integrate local and regional expectations into City actions.

In a three-part process, the LSWMP does the following:

1. Collects and compiles efforts of agencies and organizations, including various departments of the City of Minneapolis, and the Minneapolis Park and Recreation Board. This includes past reports and studies, management plans, monitoring studies, and proposed improvement projects.

2. Reviews the current state of the City's surface water resources in the context of goals and policies, ordinances, operations and maintenance, flood mitigation, and achievement of targeted water quality levels in surface water bodies.

3. Establishes reasonable, achievable and affordable goals, and supports a strong regulatory and management culture. Develops an implementation plan that assesses, plans and implements projects and processes that derive from a thorough assessment of current City problem areas and current City stormwater regulations and controls.

The content of the LSWMP is in large part determined by Minnesota Statute 103B and Rules 8410. Specifically, statute 103B.235 states:

> 'After the watershed plan is approved and adopted, or amended, pursuant to section 103B.231, the local government units having land use planning and regulatory responsibility for territory within the watershed shall prepare or cause to be prepared a local water management plan, capital improvement program, and official controls as necessary to bring local water management into conformance with the watershed plan...'

Information Contained in LSWMP

Water resources management in Minneapolis is growing. Monitoring information is updated annually, improvements are constructed in the infrastructure, and watershed based programs are implemented. Because of this ever-changing character of water resources management in Minneapolis, this plan has been developed with the philosophy of referencing, and not duplicating, information developed by others. As a result, specific information, especially information that is subject to frequent change, is either contained in an appendix to this plan, or referenced to another organization. Where information is contained on a web page, electronic links are provided. Readers

are encouraged to go to the original source for the most current and accurate information available.

LSWMP Management and Adoption

Minneapolis is committed to managing its water resources in the most efficient and up-to-date manner feasible. The goal of this plan is to be in compliance with requirements of Minnesota Rule 8410.0160, which states "(e)ach local plan shall be adopted within two years of the board's approval of the last organization plan that affects local units of government." Once the LSWMP is final, the focus will be to implement the recommended programs and to continue the updating of practices and policies as mandates develop or as new technologies emerge. This approach will allow Minneapolis the flexibility necessary to respond to the layers of regulations that affect the City. It would be a burden to update the LSWMP each and every time a NPDES permit is reissued, each time one of the four watersheds revises its watershed management plan, or each time a TMDL implementation plan is approved. Minneapolis prefers to dedicate limited resources to actual practices such as inspection for erosion control and targeted education efforts. This LSWMP will be used as the guide to ensure that new practices meet the stated goals and guiding principles. A renewal cycle that triggers a LSWMP update after all Third Generation Plans are complete, or some other major change to water resources management affecting Minneapolis occurs, which ever is first, is in compliance with Minnesota Rules and allows a balance between managing water resources and reassessment of the overall direction that the LSWMP provides. Approval, adoption and revisions to this plan will follow the format detailed below.

Council Consideration

The City Council will accept the draft document for review concurrent with submittal to the Metropolitan Council and Watershed District/Organizations. Prior to City Council acceptance and adoption, the MPRB staff will have an opportunity to review the draft document for consistency with MPRB activities.

Metropolitan Council, Watershed District and WMO Review

After acceptance of the draft document, City staff will submit the LSWMP for agency review, in accordance with procedures set in Minnesota Statute 103B.235 and Minnesota Rule Chapter 8410.0170. Comments from reviewing agencies will be considered for inclusion in the revised LSWMP.

Public Review

Public input will be sought through a series of formal and informal communications with the public. City staff will make the draft document available for review and will solicit comments. Public comments will be considered for inclusion in the revised LSWMP. The final revised LSWMP will be presented to the Transportation and Public Works Committee of the Minneapolis City Council prior to adoption by the full City Council.

City Adoption

Final adoption will be considered by the Minneapolis City Council and Mayor following approval by the Watershed District/Organizations, public review and public hearing.

Amendment

On occasion, amendments to the LSWMP will be necessary. The process for amending the LSWMP will follow the steps set for adoption of the report. City staff will determine if an amendment is necessary, either based on a formal written request or based on changes to water resources management goals and objectives. The request shall outline the need for the amendment as well as additional materials that the City will need to consider before making its decision.

Annual Report

To satisfy the annual report requirement of the watersheds, the City will forward informational copies of its Combined Sewer Overflow Annual Report, NPDES Stormwater Annual Report, Lake Monitoring Annual Report and Sustainability Indicator Annual Report to the watersheds by June 1 of each year.

Section 2
Goals and Policies

City Goals

In 2006, the City Council and Mayor worked together to establish new goals for the City of Minneapolis. Their work resulted in the six following City Goals:

A Safe Place to Call Home

One Minneapolis

Lifelong Learning Second to None

Connected Communities

Enriched Environment

A Premier Destination

Each of these goals influences surface water management. Elimination of sewage overflows and flood prevention will improve the health and **safety** of the City. Runoff from even the most remote neighborhoods is connected to our surface waters; all citizens must **unite** to protect these waters. All citizens impact the surface waters; through **lifelong learning** and education we can change our behaviors in a way that will benefit our water resources. We are **connected** from Shingle Creek to Minnehaha Falls by the Minneapolis parks and parkways that surround our surface waters. Proper management of our stormwater runoff drainage system will protect, **enrich** and sustain Minneapolis waters. With the achievement of these goals, Minneapolis will continue to be a **premier destination**.

Minnehaha Creek downstream of Lake Nokomis. (Source: MPRB)

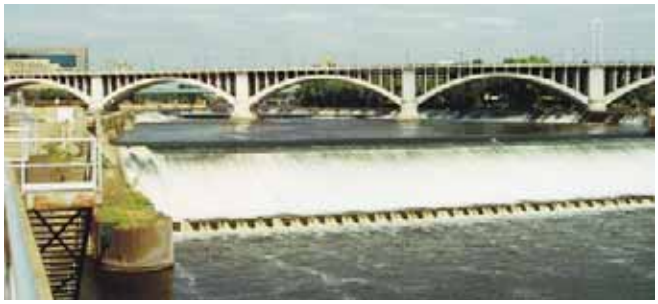
Each of the City Goals has a role in water resources management, but the most applicable City Goal is: We have an **Enriched Environment.**

Water Resources Management Policies

Other City initiatives have also produced city-wide goals that tie to water resources management. These targets and goals are an extension of the City's vision for the future and tie to Minneapolis' long-term objective to be a livable city with an exceptional quality of life.

Water resources management goals are also defined in the City's comprehensive plan, The Minneapolis Plan, adopted by the City Council and Mayor on March 24, 2000. This plan serves the needs of the City and meets the conditions of the Metropolitan Land Planning Act. Chapter 7: Natural Ecology lists actions the City will take to protect the natural environment, including water resources. Seven of the 12 policies relate to water resources management, including:

7.2 Manage the use of the City's environmental resources to meet present needs while considering future concerns.
Lakes, creeks, and the Mississippi River are among the most valuable environmental resources that exist within the boundaries of Minneapolis. These must be managed to restore, preserve and protect the water quality and ecosystems for both present use and future value.



The Mississippi River is one of the many valuable environmental resources within Minneapolis' boundaries. Mississippi River in Minneapolis. (Source: John Kuhne)

7.4 Encourage the planting and preservation of trees and other vegetation.
Increased area of total tree canopy in the City will increase transpiration and decrease the rate and volume of stormwater runoff.

7.5 Protect and sustain water resources.
All surface water management activities are based on this goal.

7.6 Take measures to reduce water consumption and encourage water conservation.
Reduction of water consumption for the purpose of limiting demand on water treatment facilities will also reduce the amount of sewage that is conveyed by the sanitary sewers. This will help reduce the frequency and duration of wet weather CSOs. It has a secondary benefit of reduced fees paid to Metropolitan Council Environmental Services for wastewater treatment and increasing the service life of the Metro Wastewater Treatment Plant.

7.8 Support pollution prevention programs as an important first step in maintaining a healthy physical environment.
The most effective means of preventing degradation of water bodies is to manage the pollutants at the source. Non-structural BMPs, such as street sweeping, construction erosion control, and emergency spill response procedures contain pollutants at the source and prevent the need to mitigate the pollutants from the surface waters down

Erosion control on construction sites will help keep pollution from entering surface waters. (Source: Jennifer Hildebrand)

stream of Minneapolis. Each ounce of pollutant that is prevented from contacting stormwater runoff is an ounce of pollutant that does not need to be removed from the Gulf of Mexico.

7.10 Enhance the safety and appearance of our built environment through education, inspection and enforcement.
Stormwater picks up pollutants on both private properties and from public areas. Therefore, BMPs practiced by the City will prevent a portion of the pollutants from coming into contact with the stormwater runoff. Private property owners must also practice source control of pollutants. For example, rooftop connections to the sanitary sewer are a major contributor of CSOs. Education, inspection and enforcement of City ordinances are a necessary component of total stormwater management and water resources protection.

7.12 Play a leadership role in setting up examples and pilot projects.
Water resources improvements can be included in neighborhood projects that incorporate economic development, transportation enhancement, quality of life, and environmental stewardship.

Sustainability Initiatives

The philosophy of sustainability was further defined in April 2005 when the City Council created Sustainability Initiatives, directing staff to develop targets for each indicator. Five of the 24 indicators relate to the City's water resources management. These indicators, along with their respective targets, are presented on the following pages:

The Local Surface Water Management Plan carefully considers the City goals and regulatory requirements that influence water resources management.

Urban Tree Canopy

Increasing the total area of tree canopy will increase transpiration and decrease the rate and volume of stormwater runoff.

1. No net loss of tree canopy cover (26.4 percent) thru 2015.
2. Plant at least 2,500 trees on public land every year through 2015.

Permeable Surface

Increasing the total area of permeable surfaces through reduction of impervious surfaces, construction of green rooftops, and installation of stormwater infiltration systems will decrease the rate and volume of stormwater runoff.

1. If and when it becomes feasible to measure the City's actual stormwater outflow, either across the City or within a pilot area, baseline data will be collected and targets will be set for reduced outflow.

2. By 2015, increase the number of Large Area Stormwater Amenities to 30. These are ponds, wetlands and rain gardens that treat large areas/many sources ("regional" facilities, generally public).

3. By 2015, increase the number of Small Area Stormwater Amenities to 500. These are ponds, wetlands and rain gardens that treat small areas/single sources (generally private).

4. By 2015, increase the number of Large Area Underground Stormwater Treatment Chambers to 150. Also known as grit chambers, these devices treat large areas/many sources, generally public.

5. By 2015, increase the number of Small Area Underground Stormwater Treatment Chambers to 100. Also known as grit chambers, these devices treat small areas/single sources, generally private.

6. By 2015, increase the number of Green Roofs in the City to 100.

Combined Sewer Overflow

Elimination of CSOs will improve the quality of the Mississippi River. Reduction in the volume of groundwater that infiltrates into sanitary sewer pipes and stormwater runoff that inflows into the sanitary sewers will reduce the frequency of CSOs, and will reduce the total volume of sewage being treated at the Metro Wastewater Treatment Plant.

1. By 2014, eliminate CSOs

Water Quality of Lakes, Streams, and the Mississippi River

Numerous studies have connected the continued degradation of surface water quality to the increased pollutants being transported by stormwater runoff. Improving the quality and reducing the quantity of stormwater runoff will sustain the quality of Minneapolis' unique surface waters.

Reducing stormwater runoff will help improve the quality of Minneapolis' surface waters, including Lake Calhoun. (Source: MPRB, Maurice Schultz)

1. Consistently maintain low Trophic State Index (TSI) levels by 2014:

Brownie	55 TSI
Calhoun	47 TSI

Cedar	47 TSI
Harriet	47 TSI
Lake of the Isles	57 TSI

Other water bodies pending further studies.

Air Quality

The air always smells fresh and clean immediately after a rainstorm. This is partially due to the washing of the air by the rain. Particulates that are suspended in the air are washed into the runoff and transported to the City's surface waters. Improving air quality is a pollution prevention technique that will also improve the quality of the City's stormwater runoff.

1. Fewer than 35 moderately unhealthy days per year in the Minneapolis area by 2015 with further reductions thereafter.

2. Reduce levels of all monitored air toxics to levels lower than applicable health benchmarks by 2015.

Water Resources Management Guiding Principles

Minneapolis intends to accomplish its City goals and policies while carefully considering budget limitations, changes to regulations, and the needs of aging infrastructure. Therefore, the City developed six water resources guiding principles that provide the direction needed to accomplish these multiple goals. The guiding principles are:

The CSO program has dramatically reduced the discharge of sewage into the Mississippi River.

1. Protect People, Property and the Environment

Two significant programs that Minneapolis has implemented have a common goal of protecting the health and safety of the people of Minneapolis. The CSO program has dramatically reduced the discharge of sewage into the Mississippi River. The Flood Mitigation Program aims to protect property from the damages incurred by severe and/or regular flooding. Protecting people, property and the environment means that:

- Overflows from sanitary sewers are eliminated (except during extreme events as defined in NPDES CSO permit)
- Structures are protected from flooding from both sewers and surface waters during the 100-year storm
- Roadway flooding that impacts public safety and/or commerce is prevented
- Structures and infrastructure are protected from the detrimental effects of soil erosion and sedimentation

- Public health threats related to water resources are prevented
- Aquatic and riparian habitat is enhanced to manage water quality
- Damage due to water main breaks is minimized
- Water resources, including groundwater, are managed to accomplish pertinent public safety objectives

2. Maintain and Enhance Infrastructure

The most effective stormwater BMPs are based on pollution prevention activities, including maintenance of public infrastructure. Critical maintenance practices undertaken by the City of Minneapolis include street and public parking lot sweeping, sediment/debris removal from stormwater treatment chambers, construction site erosion control and vegetation management. Maintaining and enhancing infrastructure requires the City to:

The most effective stormwater Best Management Practices (BMPs) are based on pollution prevention activities, including maintenance of public infrastructure.

- Routinely assess the condition of the sanitary sewer and storm drains
- Identify sanitary sewer and storm drain capacities throughout the systems
- Plan service needs to minimize life-cycle costs
- Plan, schedule and conduct maintenance activities to optimize pollution control
- Apply efficient and effective work methods
- Accurately match staffing levels and equipment/materials availability with work requirements

3. Provide Cost-Effective Services in a Sustainable Manner

Whenever the City must select between two alternatives that meet the same goal, the City will opt for the most cost-effective solution. Minneapolis will consider all life cycle costs in a cost effective analysis, including planning/design, construction, operation, and maintenance. Providing cost-effective services in a sustainable manner requires that:

- Both short- and long-term lifecycle analyses will be conducted to adequately assess all project/program costs
- Lifecycle analyses will include all costs (city and non-city)
- Multi-objective strategies for water resources management are incorporated in all projects and programs

- The capabilities and capacities of existing water resources systems are optimized
- Source water is protected to improve water treatment efficiency
- Multi-functional capital and development-related projects are collaborative

4. Meet or Surpass Regulatory Requirements

At a minimum, all water resources management activities must meet regulatory requirements. However, Minneapolis residents have voiced the expectation that surface water quality should surpass minimum requirements. Therefore, Minneapolis activities often are aimed at surpassing regulatory requirements. Meeting or surpassing regulatory requirements requires that the City:

- Anticipate regulatory trends and implement projects/programs before a regulation is finalized
- Achieve regulatory compliance effectively and efficiently
- Apply standard Maximum Extent Practicable (MEP) to control of pollutants in stormwater
- Employ resources without regard to jurisdiction and organization

5. Educate and Engage the Public and Stakeholders

Minneapolis has long involved the public in the development of public improvements and programs. A portion of the budget for all projects includes funds to engage the public and stakeholders during development of a project/program, and educate the public and stakeholders once the project/program is implemented. For example, the City has provided ongoing water quality education efforts related to compliance with requirements in the Minneapolis NPDES Stormwater Permit.

Engaging stakeholders in project activities will enable the City to obtain more successful project results that consider public expectations.

Educating and engaging the public and stakeholders requires that:

- The public's role in water resources management is established and understood
- The stakeholders in each project/program are identified and engaged early in the project/programs development
- The service needs and expectations of the public are understood and dictate education and engagement
- The public's and stakeholder's responsibility, accountability, creativity, and innovation is promoted

- Employee leadership of citizen engagement activities is the norm and results in effective projects and programs
- Engagement and education processes facilitate incorporation of regional goals and strategies in water resources management programs/projects

6. Enhance Livability and Safety

Residents judge the quality of their neighborhood according to standards of livability and safety. The quality of Minneapolis parks, including the quality of the surface waters within each park, is directly tied to the success of livability in Minneapolis. Enhancing livability and safety require that:

- Water resources are integral to the fabric of the City
- Water is valued as an asset
- Water resources are managed to contribute to the fulfillment of quality of life expectations

As previously noted, the Water Resources Management Guiding Principles provide the direction needed to allow water resources management activities to meet multiple goals – no single principle can be tied to a single goal. Table 2-1 shows which of the City's goals and policies are supported by each Water Resources Management Guiding Principle. Appendix C inventories the existing activities that are accomplished in support of the Guiding Principles.

Progress Towards Goals

Minneapolis has set up internal monitoring activities that track progress towards certain goals, including water resources management goals, which are reported in the following annual reports:

- NPDES Annual Report Documents tracks stormwater management activities and goals set by NPDES stormwater permit
- Minneapolis Park & Recreation Board - 2004 Water Resources Report tracks water quality trends in lakes plus other MPRB water resources management activities
- CSO Annual Report tracks CSO management activities and goals set by NPDES CSO permit
- Sustainability Initiatives tracks sustainability targets

Table 2-1. City Goals Supported by Water Resources Guiding Principles	Water Resources Principles					
	Maintain and Enhance Infrastructure	Provide Cost-effective Services	Meet or Surpass Regulatory Requirements	Protect People, Property and the Environment	Educate and Engage the Public and Stakeholders	Enhance Livability and Safety
2006 Goals Established by Mayor and City Council						
1. A Safe Place to Call Home	X	X		X		X
2. One United Minneapolis					X	X
3. Lifelong Learning is Second to None			X		X	
4. Connected Communities						X
5. Enriched Environment	X	X	X	X	X	
6. A Premier Destination					X	X
Minneapolis Plan Policies						
7.2 Manage the use of the City's environmental resources to meet present needs while considering future concerns.	X	X	X	X	X	X
7.4 Encourage the planting and preservation of trees and other vegetation.	X				X	X
7.5 Protect and sustain water resources	X		X	X	X	X
7.6 Take measures to reduce water consumption and encourage water conservation	X	X	X	X	X	
7.8 Support pollution prevention programs as an important first step in maintaining a healthy physical environment.	X	X	X	X	X	X
7.10 Enhance the safety and appearance of our built environment through education, inspection and enforcement.	X		X	X	X	
7.12 Play a leadership role in setting up examples and pilot projects.			X		X	
Sustainability Initiatives						
Number of newly planted trees	X			X		X
Acres/percent of permeable surface	X	X	X	X		X
Combined Sewer Overflows	X		X	X	X	
Water quality of lakes, streams, rivers	X	X	X	X	X	X
Air quality			X	X		

Section 3
Land and Water Resources Assessment

Overview

This section of the Minneapolis Local Surface Water Management Plan focuses on the physical characteristics of the City. Detailed information is provided for each water resource that is listed as a public water by the Minnesota Department of Natural Resources (also termed protected water). Summaries of water quality monitoring studies are provided; with detailed information contained in Appendix H. Detailed copies of the figures are available from Minneapolis Public Works – Engineering Services (612-673-2405).

Population and Land Area

Minneapolis is the largest city in Minnesota and the county seat of Hennepin County. The 2000 census noted a total population of 383,000, which is spread over 81 neighborhoods (Figure 3-1). The City has 19 lakes and about 151 parks that are wholly or partially within MPRB property, comprising a total of 10 square miles out of a total City area of 59 square miles (Figure 3-2). The Mississippi River and approximately 13 miles of creek (Bassett, Minnehaha, and Shingle) wind through the City.

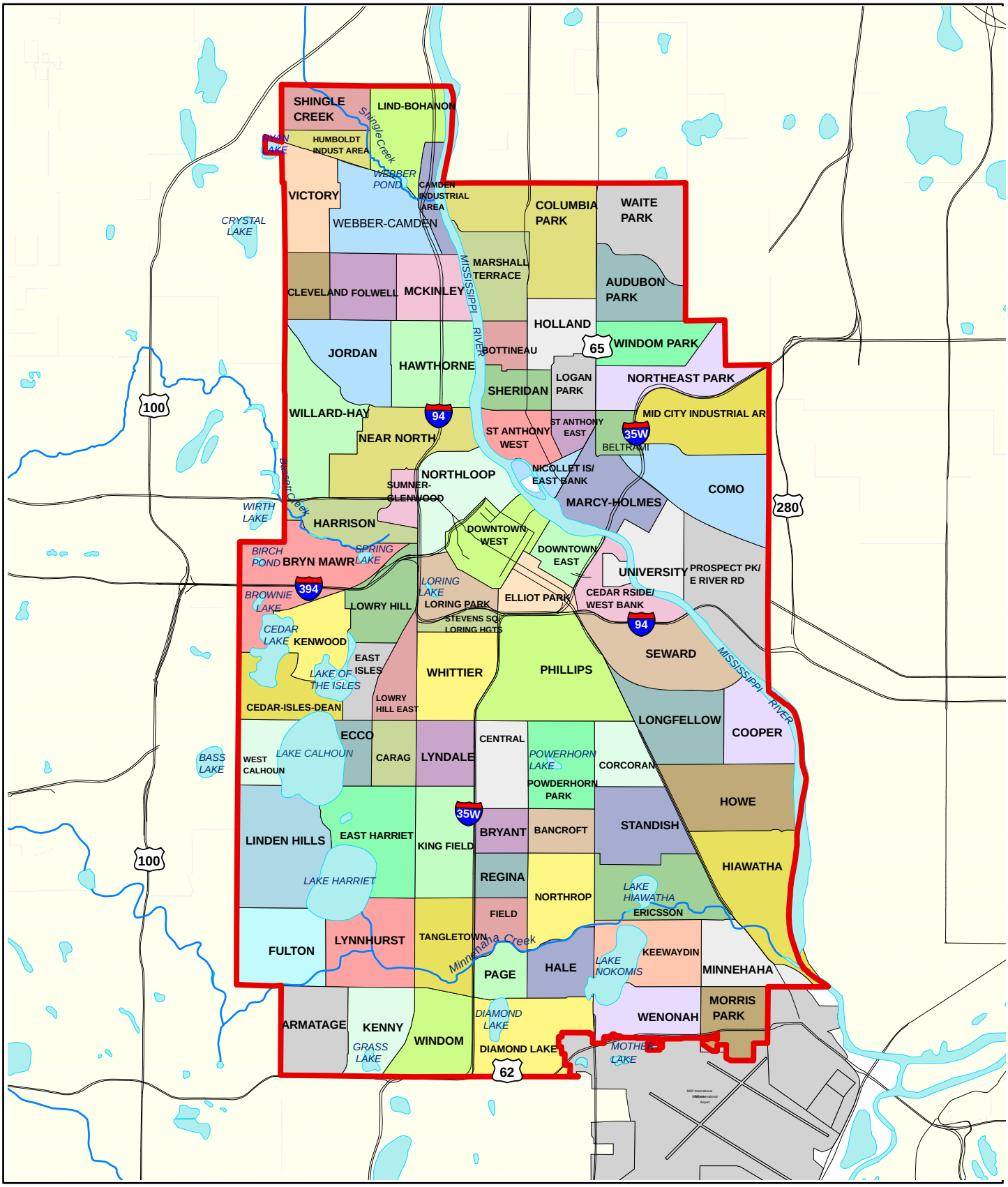
Soils

Minneapolis surface soils are highly variable and altered, which is typical of urban cities. According to the University of Minnesota Department of Soil, Water, Climate and Land Management, underlying soils in Minneapolis can be broadly classified as two main soil types: sandy/loamy or silty. Figure 3-3 shows the general location of these two classifications in the City. More detailed soil information is contained in the Soil Survey of Hennepin County, available from the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS). Recent trends in stormwater management are an increasing use of infiltration or filtration techniques. The information contained in this LSWMP is not of sufficient detail to determine if a site is suited for stormwater infiltration. Designers should conduct on-site soil investigations to ensure proper design, construction and operation of a soil based stormwater management practice.

Climate

Precipitation

Minneapolis has a continental climate, strongly influenced in the summer months by weather systems that originate in the Gulf of Mexico and the Pacific Ocean. Average annual temperatures and precipitation are listed in Table 3-1. Precipitation in the form of snowfall is included in these values and is described in terms of water equivalent. Growing season (May-September) precipitation averages 17.6 inches, or about 60 percent of the annual precipitation.



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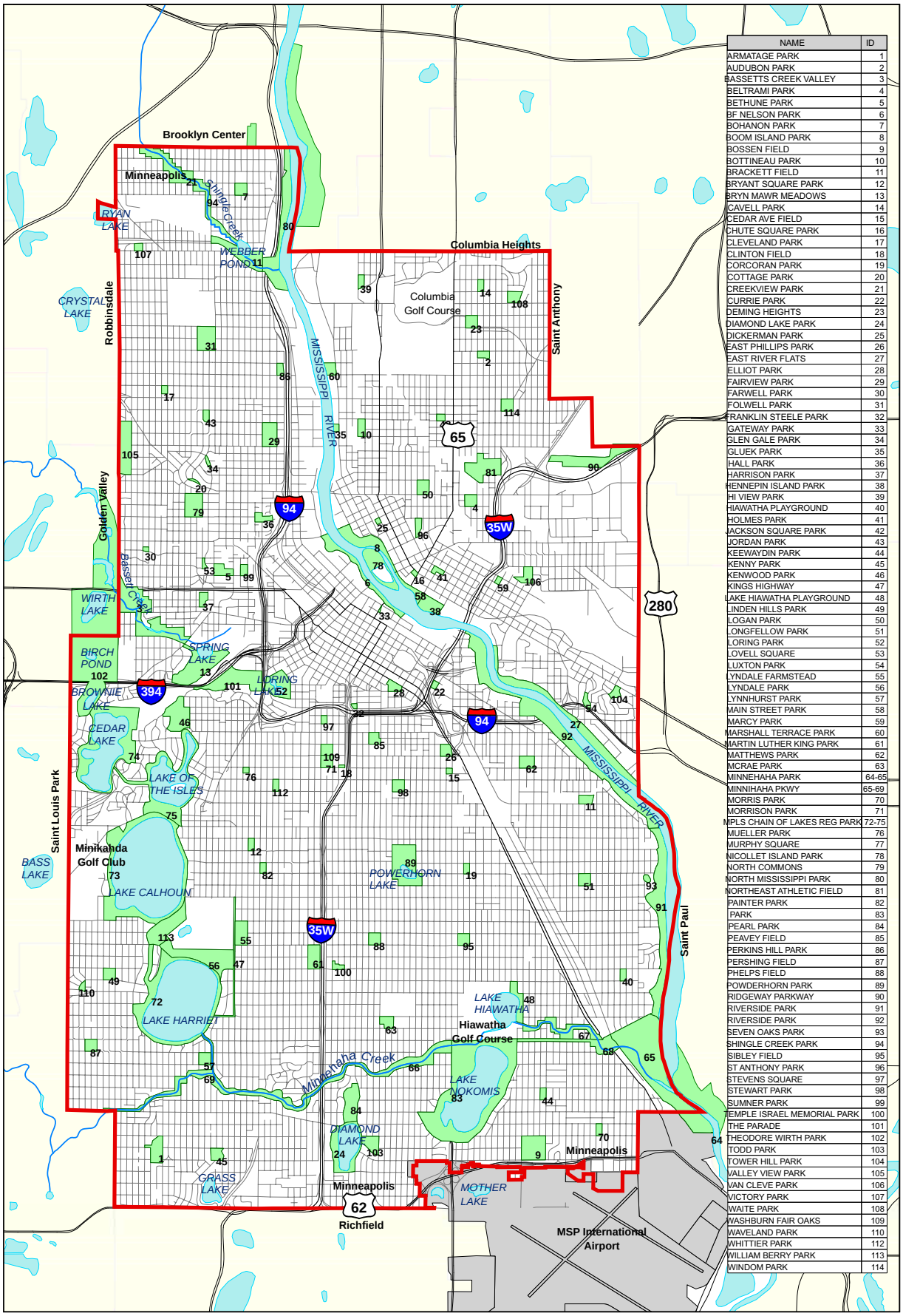
City of Minneapolis

Neighborhoods

Local Surface Water Management Plan

Figure 3-1

Genearl City Boundary
River/Stream
Lake



NAME	ID
ARMATAGE PARK	1
AUDUBON PARK	2
BASSETTS CREEK VALLEY	3
BELTRAMI PARK	4
BETHUNE PARK	5
BF NELSON PARK	6
BOHANON PARK	7
BOOM ISLAND PARK	8
BOSSEN FIELD	9
BOTTINEAU PARK	10
BRACKETT FIELD	11
BRYANT SQUARE PARK	12
BRYN MAWR MEADOWS	13
CAVELL PARK	14
CEDAR AVE FIELD	15
CHUTE SQUARE PARK	16
CLEVELAND PARK	17
CLINTON FIELD	18
CORCORAN PARK	19
COTTAGE PARK	20
CREEKVIEW PARK	21
CURRIE PARK	22
DEMING HEIGHTS	23
DIAMOND LAKE PARK	24
DICKERMAN PARK	25
EAST PHILLIPS PARK	26
EAST RIVER FLATS	27
ELLIOT PARK	28
FAIRVIEW PARK	29
FARWELL PARK	30
FOLWELL PARK	31
FRANKLIN STEELE PARK	32
GATEWAY PARK	33
GLEN GALE PARK	34
GLUEK PARK	35
HALL PARK	36
HARRISON PARK	37
HENNEPIN ISLAND PARK	38
HI VIEW PARK	39
HIAWATHA PLAYGROUND	40
HOLMES PARK	41
JACKSON SQUARE PARK	42
JORDAN PARK	43
KEEWAYDIN PARK	44
KENNY PARK	45
KENWOOD PARK	46
KINGS HIGHWAY	47
LAKE HIAWATHA PLAYGROUND	48
LINDEN HILLS PARK	49
LOGAN PARK	50
LONGFELLOW PARK	51
LORING PARK	52
LOVELL SQUARE	53
LUXTON PARK	54
LYNDALE FARMSTEAD	55
LYNDALE PARK	56
LYNNHURST PARK	57
MAIN STREET PARK	58
MARCY PARK	59
MARSHALL TERRACE PARK	60
MARTIN LUTHER KING PARK	61
MATTHEWS PARK	62
MCRAE PARK	63
MINNEHAHA PARK	64-65
MINNIHAHA PKWY	65-69
MORRIS PARK	70
MORRISON PARK	71
MPLS CHAIN OF LAKES REG PARK	72-75
MUELLER PARK	76
MURPHY SQUARE	77
NICOLLET ISLAND PARK	78
NORTH COMMONS	79
NORTH MISSISSIPPI PARK	80
NORTHEAST ATHLETIC FIELD	81
PAINTER PARK	82
PARK	83
PEARL PARK	84
PEAVEY FIELD	85
PERKINS HILL PARK	86
PERSHING FIELD	87
PHELPS FIELD	88
POWDERHORN PARK	89
RIDGEWAY PARKWAY	90
RIVERSIDE PARK	91
RIVERSIDE PARK	92
SEVEN OAKS PARK	93
SHINGLE CREEK PARK	94
SIBLEY FIELD	95
ST ANTHONY PARK	96
STEVENS SQUARE	97
STEWART PARK	98
SUMNER PARK	99
TEMPLE ISRAEL MEMORIAL PARK	100
THE PARADE	101
THEODORE WIRTH PARK	102
TODD PARK	103
TOWER HILL PARK	104
VALLEY VIEW PARK	105
VAN CLEVE PARK	106
VICTORY PARK	107
WAITE PARK	108
WASHBURN FAIR OAKS	109
WAVELAND PARK	110
WHITTIER PARK	112
WILLIAM BERRY PARK	113
WINDOM PARK	114

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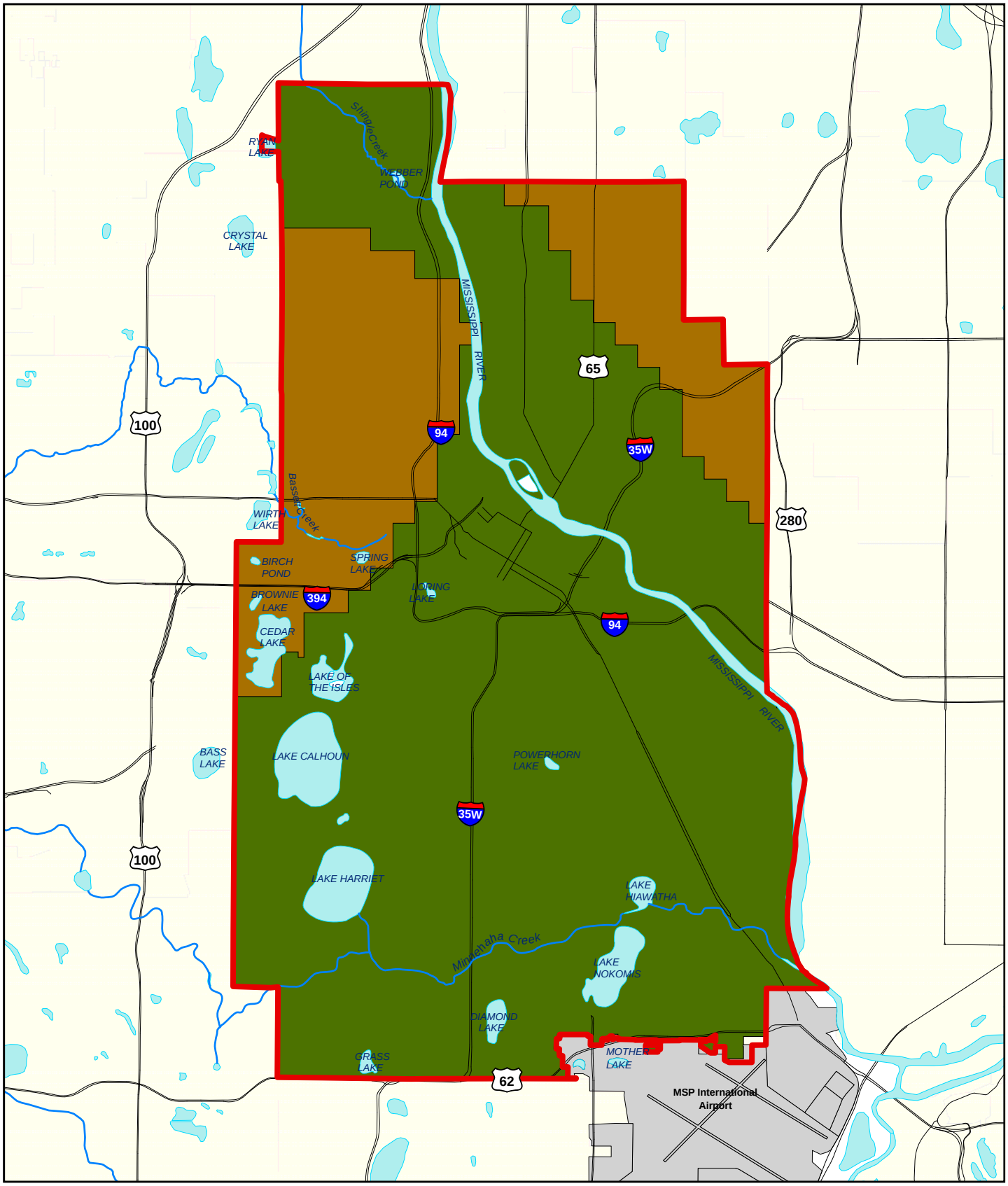
City of Minneapolis

Minneapolis Lakes Streams and Parks

Local Surface Water Management Plan

Figure 3-2

General City Boundary
River/Stream
Lake
Park



City of Minneapolis

Soil Classification

Local Surface Water Management Plan

Figure 3-3

Source: University of Minnesota Department of Soil, Water, Climate, and Land Management

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General City Boundary
River/Stream
Lake
Sandy Soil
Loamy or Silty Soil

Table 3-1. Temperature and Precipitation Monthly Averages

Measure	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Mean Temperature (degrees Fahrenheit)	49.6	33.0	19.5	13.5	17.7	30.3	46.2	58.2	68.0	73.2	70.7	61.6	N/A
Mean Precipitation (inches)	2.07	1.47	0.92	0.86	0.84	1.61	2.21	3.43	4.22	3.62	3.43	2.91	27.58

(Source: University of Minnesota, Department of Soil, Water and Climate, 1981 – 2005)

Snowfall and Snowmelt

In the winter months (November - March), snow predominates in Minneapolis. Table 3-2 lists average monthly snowfalls for the city. Snowfall occurs throughout the winter in small, low-flow events and generally does not affect surface water management. The spring snowmelt, on the other hand, can be the single largest water event of the year. The spring snowmelt occurs over a comparatively short period of time (e.g., approximately two weeks) in March, or April. The Minnesota Stormwater Manual recommends that the stormwater management practices be designed to accommodate the full volume of this snowmelt. The average annual snowmelt can be computed by multiplying the average snow water equivalent by the average depth of snow during the last two weeks of March, less the depth of snow that is expected to infiltrate through the thawing soils. Additional information on the annual volume of snow melt can be found at Analysis of Snow Climatology.

Table 3-2. Snowfall Monthly Averages

Measure	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Season Total
Mean Snowfall (inches)	0.6	6.2	8.8	10.0	7.8	9.4	3.6	0.2	0.0	0.0	0.0	0	45.8

(Source: University of Minnesota, Department of Soil, Water and Climate, 1884 – 2005)

Topography

The Minnesota landscape is a product of the continental glaciers that covered it. It consists of gently rolling and steep hills, numerous marshes and lakes, and extensive outwash plains. The City of Minneapolis has a relatively flat topography resulting from outwash deposited 14,000 years ago by the Des Moines Lobe of the late Wisconsin glaciations.

Bedrock, examples of which can be seen exposed along the Mississippi River bluffs, is not continuous beneath the glacial drift (gravelly material deposited by glaciers). For example, the Chain of Lakes exists where valleys filled with glacial drift and buried the bedrock. Glacial drift deposits are up to 300 feet thick under Lakes Calhoun and

Harriet. In contrast, at Minnehaha Falls along the Mississippi River, glacial drift is completely eroded, exposing the bedrock underneath.

The Mississippi River has a distinct geologic stratigraphy with a layer of glacial till and river deposits overlying oceanic limestone, shale and sandstone bedrock. Under Minneapolis, groundwater is primarily located in unconsolidated deposits and bedrock formations from the surface down to about 300 feet. Most groundwater under Minneapolis makes its way to the Mississippi River and its tributaries.

Topography divides Minneapolis into four main watersheds: Mississippi River, Bassett Creek, Minnehaha Creek, and Shingle Creek. About 51 percent of the land area in Minneapolis falls within the MWMO boundary, 36 percent is within the MCWD and approximately 13 percent falls within the BCWMC and SCWMC boundaries. Figure 1-3 and Table 3-3 depict the jurisdictional watershed boundaries within Minneapolis.

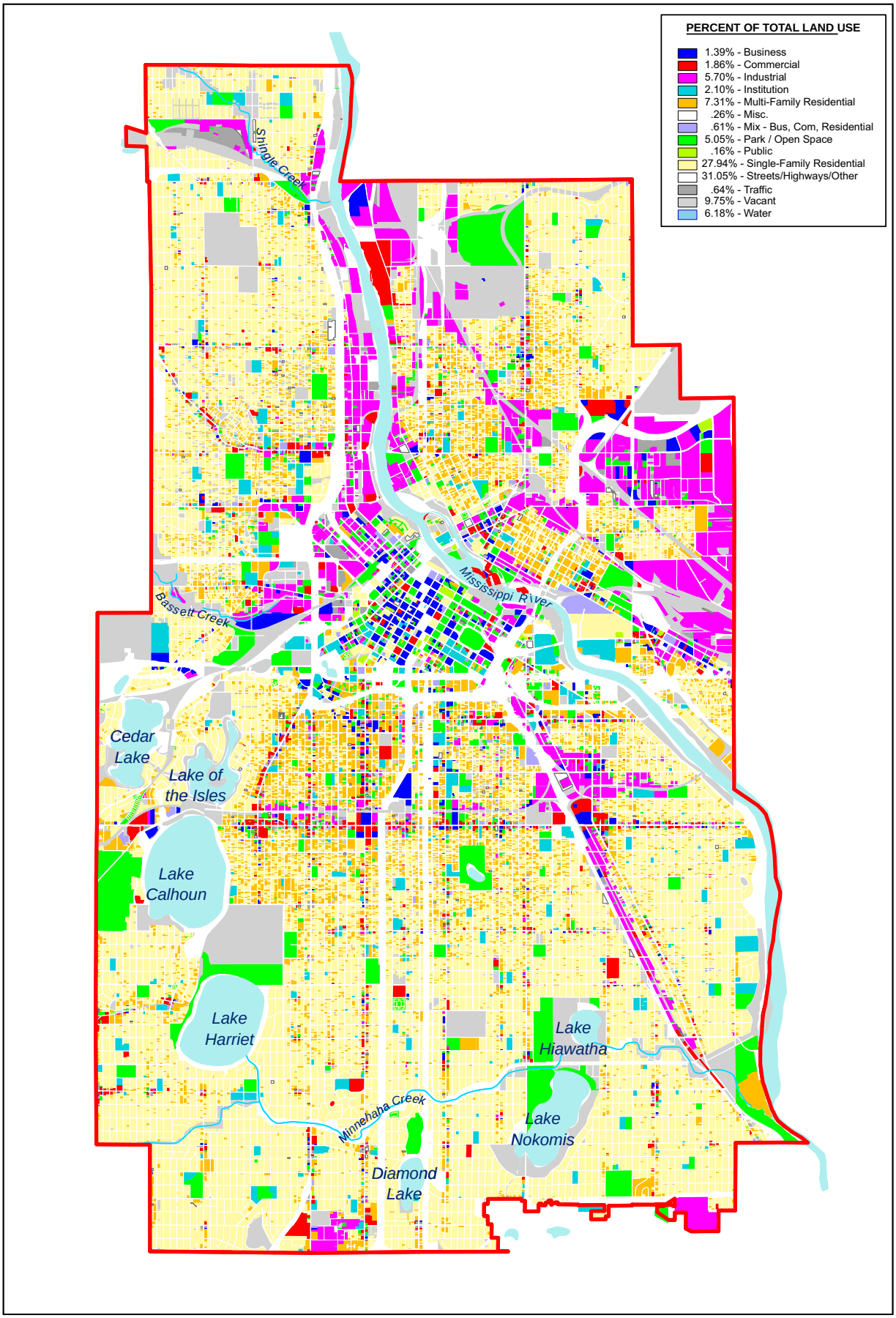
Table 3-3. Area of the City Within Each of the Major Jurisdictional Watersheds

Watershed	Area	% of City	% of Watershed
Bassett Creek WMC	1,800 acres	5	7
Minnehaha Creek WD	13,400 acres	36	9
Mississippi WMO	19,900 acres	54	94
Shingle Creek WMC	2,000 acres	5	7

Note: Percentages are rounded. (Source: City of Minneapolis)

Land Use

Minneapolis is a fully developed City with more than 50 percent of its total area residential. Public and recreational usage represents the next highest area at 16 percent, followed by industrial land use. Highways constitute about 3 percent of the City's land area. About one square mile of vacant land remains scattered throughout the City (State of the City Report, 2001). Figure 3-4 shows the City's land use distinguished by the categories mentioned in this paragraph, as well as additional minor categories. Future land use maps are being revised and are not available as of the publication date of this report.



City of Minneapolis

Land Use

Local Surface Water Management Plan

Figure 3-4

Land Use data obtained from City of Minneapolis

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Business
Commercial
Industrial
Institution
Multi-Family Residential
Misc.
Mix - Bus, Com, Residenti
Park / Open Space
Public
Single-Family Residential
Streets/Highways
Traffic
Vacant
Water

Non-residential land use dominates the north central and northeast portions of the City. Notable within these areas are downtown, the industrial corridor that abuts the river north of downtown, and the industrial area in the eastern part of the City that is tucked between I-35 West and the Mississippi River. Distinct commercial/industrial corridors include:

- Lake Street
- Hiawatha Avenue
- West Broadway
- University Avenue
- Washington Avenue

Multifamily residential is concentrated around the downtown core and thins out into single family residential toward the periphery of the City.

Minneapolis has 770 square feet of parkland for every resident. There is a park within six blocks of every Minneapolis resident. In total, the Minneapolis Park System consists of about 151 parks and 170 park properties that encompass nearly 6,400 acres of land and water. The MPRB has about 24 miles of shoreline along lakes and 14 miles of shoreline along the Mississippi River (Figure 3-2).

Land use in the Upper Mississippi River corridor has been in a state of constant flux for the last 125 years. This has provided opportunities for the City to implement policies that encourage light industrial and park development to coexist with some of the more traditional warehousing and industrial uses. Riverfront living has become popular and residential development is replacing industrial uses along the river.

Pollutant Sources

Minneapolis has established a Contaminated Sites Working Group within the Department of Regulatory Services – Environmental Management. This group maintains information on brownfield sites, Superfund sites and other contaminated properties. The most current information on pollutant sites in Minneapolis can be found at Environmental Management - Land.

Industrial Discharges

Wastewater - Industrial sites that discharge wastewater into City sanitary sewers are required to meet the pre-treatment requirements of the Metropolitan Council Environmental Services (MCES). The most current information on permit requirements and permits issued in Minneapolis can be found at MCES - Standard Industrial Discharge Permits. Industrial sites that discharge treated wastewater directly into surface waters are required to obtain an NPDES permit from the Minnesota Pollution Control Agency. Current holders of NPDES industrial permits should be obtained directly from the MPCA.

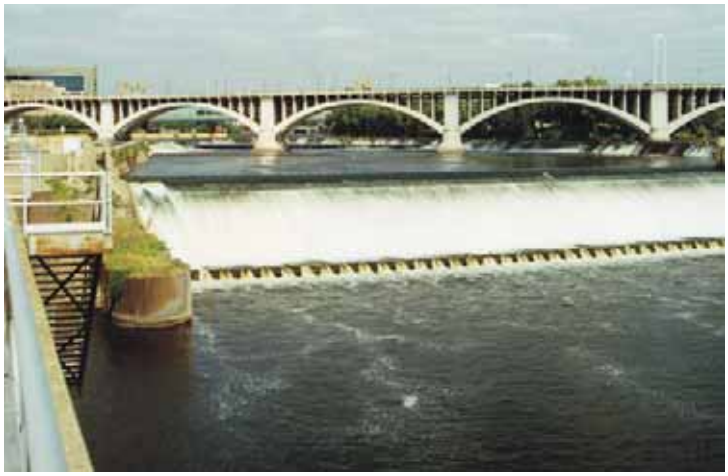
Stormwater – Certain industrial sites that discharge stormwater are required to obtain a NPDES Industrial Stormwater Discharge Permit from the MPCA. Permits are required regardless of whether the discharge is to the City stormwater drainage system or directly to surface waters. Information on industries that are required to be permitted and how to obtain a permit is available from the Stormwater Program for Industrial Activity - MPCA. Current holders of NPDES industrial permits should be obtained directly from the MPCA.

Minneapolis Waterbodies and Watersheds

Minneapolis is defined by its extensive system of surface waters. These water resources are vital to the health, safety, and welfare of the City's citizens and visitors. A brief description of the surface waters (rivers, streams, lakes, and wetlands) serving Minneapolis follows.

River

The Mississippi River has historically been the City's source of commerce, recreation, and drinking water. Approximately 12.2 miles of the Mississippi, with a local drainage area of 19,900 acres, flows from northwest to southeast through the City. Maintaining good water quality in the Mississippi is vital to providing the City's primary drinking water supply, protecting the health of citizens who use the river for recreation, and maintaining the natural habitat of the river.



The Corps of Engineers operates Upper St. Anthony Lock & Dam on the Mississippi River. (Source: John Kuhne)

The Upper Mississippi River watershed comprises 189,000 square miles of land in five states: Illinois, Iowa, Minnesota, Missouri, and Wisconsin. The upper river extends 750 miles from the river's headwaters in northern Minnesota to its confluence with the Ohio River in southern Illinois. The Upper Mississippi River above St. Paul has a drainage area of about 12 million acres.

The Upper Mississippi provides recreational opportunities for people who live in the Twin Cities Metropolitan Area. Its numerous riverside parks and trails are popular destinations for hiking, biking, fishing, and bird watching. Numerous cities draw drinking water from the river.

The City's location at the upper extent of the navigational system, built and maintained by the USACE, has been a significant driver for the City's commerce. The Corps also maintains a flood protection system along the Mississippi River. The St. Paul District of the USACE operates and maintains 13 locks and dams on the river, beginning at Upper St. Anthony Falls in downtown Minneapolis and ending at Lock

and Dam 10 in Guttenberg, Iowa. Each dam represents a critical step in the "stairway of water" that makes navigation possible between Minneapolis and St. Louis.

The Upper St. Anthony Dam is also located on the River at mile 854. The dam consists of a horseshoe dam with a chord dam downstream of the horseshoe and a concrete overflow spillway. The lock is also 56 feet wide by 400 feet long. Both the upper and lower dams were constructed and became operational in September 1963.

Lower St. Anthony Falls Dam is located on the Mississippi River mile 853.9 in Minneapolis. The dam consists of a concrete spillway 275 feet long with four Tainter Gates. The lock is 56 feet wide by 400 feet long.

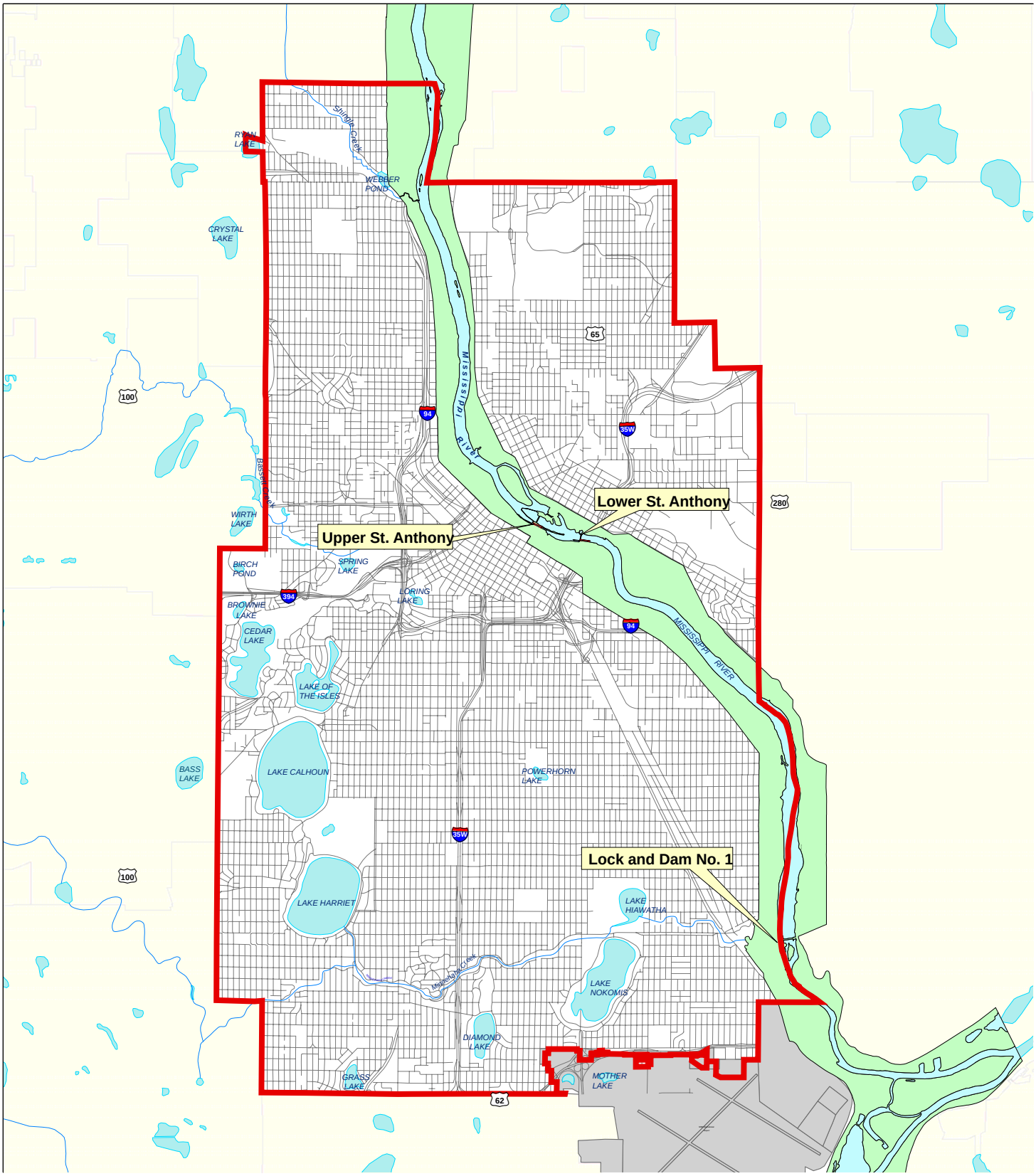
Although water quality in the Upper Mississippi has improved tremendously in the last 25 years, parts are still considered impaired for aquatic consumption and recreation.

Lock and Dam 1 is located on the Mississippi River at mile 847.9 in Minneapolis. It was constructed in 1917. Major reconstruction took place in 1929, 1932 and 1978-1983. Figure 3-5 shows the locations of these locks and dams.

The Metropolitan Council, the USACE, the United States Geological Survey (USGS), the MPCA and the Minnesota Department of Health (MDH) are involved in monitoring the Mississippi River. Water quality in the Upper Mississippi has improved tremendously in the last 25 years, increasing the ability of the riverine ecosystem to recover from stressors. Mayflies demonstrated a dramatic recovery and submerged aquatic vegetation recovered after a drought in the 1980s. The MPCA's 2006 Impaired Waters List identifies the Mississippi River as impaired for aquatic consumption, aquatic life and aquatic recreation (Appendix F). The pollutants that are listed include fecal coliform, mercury and PCBs.

Minnesota Rule 7050 classifies the beneficial use of the segment of the Mississippi River through Minneapolis as Class 2Bd (north City limits to St. Anthony Falls), Class B (St. Anthony Falls to Lock and Dam #1), and Class 1C (below Lock and Dam #1). The Minnesota Pollution Control Agency, in its 305.B Assessment of Stream Conditions, categorizes the quality of this segment through Minneapolis as 5A. It is listed as 5A, meaning that it is impaired or threatened by multiple pollutants with no completed TMDL plans. Segments of the river designated as impaired are listed in Appendix F.

Mississippi River TMDL studies are at initial stages of development. Two water quality efforts which will likely affect Minneapolis include the Lake Pepin TMDL Study and the Upper Mississippi River Basin Water Quality Plan.



City of Minneapolis

Mississippi River Locks and Dams

Local Surface Water Management Plan

Figure 3-5

Source: USACE

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Major Freeways/Highways
River/Stream
City Boundary
Lock and Dam
Lake

The area of Minneapolis that drains to the Mississippi River has been organized into the Mississippi Watershed Management Organization. Other members include the MPRB, the City of Lauderdale, the City of St. Anthony, and the City of St. Paul. In 2001 the organization became the first joint powers watershed organization to obtain Special Taxing District designation from the Minnesota Legislature (MS 276.066). This allowed the MWMO to hire full time staff and implement new programs. Significant programs include:

- Capital improvement grants for stormwater management and combined sewer overflow corrections
- Non-point source education programs
- Stewardship grants
- Monitoring and research
- Land acquisition

Very little remains of the native landscape in the Twin Cities, and what remains can be found mostly along the Mississippi River. Among a number of plans for improvement in and along the river is the USACE Environmental Pool Plan. The Pool Plans have been developed with the view of establishing common habitat goals and objectives for the Upper Mississippi River and serve as a guide toward a sustainable ecosystem (see Appendix D).

Streams

Three tributaries to the Mississippi River – Bassett Creek, Minnehaha Creek, and Shingle Creek – originate in communities west of the City and flow through Minneapolis to the Mississippi River (Figure 3-2). Bassett Creek meanders westerly from Medicine Lake, through the municipalities of Plymouth and Golden Valley and through Theodore Wirth Park. Near Irving Ave. N. in Minneapolis, Bassett Creek flows into a tunnel system completed by the USACE in 1990. The original Bassett Creek connected to the Mississippi River just south of Plymouth Avenue North. After construction of the tunnel project, the Creek now discharges to the River downstream of St. Anthony Falls. The main stem of Shingle Creek begins in Brooklyn Park in northwestern Hennepin County and flows generally southeast to its confluence with the Mississippi River in Minneapolis. Minnehaha Creek flows from Lake Minnetonka and meanders easterly and southeasterly through Minnetonka, Hopkins, St. Louis Park, Edina and Minneapolis. Brownie, Cedar, Lake of the Isles, Calhoun, Harriet and Hiawatha flow into Minnehaha Creek. Over the years, these streams have been altered to improve drainage, enhance recreation, facilitate transportation, and support development. Table 3-4 summarizes the physical information for the Minneapolis segments of each of these streams.

Table 3-4. Key Streams and Relative Data

Name	Drainage Area		Length within Minneapolis (miles)
	Total	Percent of City	
Bassett Creek	1,800 acres	5	3.0
Minnehaha Creek	13,400 acres	36	7.7
Mississippi River	19,900 acres	54	12.2
Shingle Creek	2,000 acres	5	2.2

Bassett Creek

Bassett Creek was named after Joel B. Bassett, one of the earliest settlers in North Minneapolis. It flows 12 miles from Medicine Lake to the Mississippi River.

Development has drastically altered the creek and its watershed. Wet, swampy banks were filled and trees were cut to accommodate development. Early development, consisting mostly of sawmills and railroads, led to the influx of more industrial and commercial development. Inexpensive homes were constructed on small lots to accommodate the influx of immigrants.

The City is preparing a master plan to improve Bassett Creek, which has been heavily impacted by development. (Source: BCWMC)

In the late 20th century, as part of a number of flood control projects, Bassett Creek was channelized and the last few miles diverted into underground pipes that empty into the Mississippi River. The creek has problems with phosphorus and sedimentation that are typical of urban streams in watersheds with high percentages of impervious surfaces.

In 1969, the nine communities in the watershed formed the Bassett Creek Flood Control Commission. In 1982, in accordance with the Metropolitan Surface Water Management Act, the Bassett Creek Water Management Commission was created. Its mission is to control flooding and to maintain and enhance the quality of the surface and ground water resources in the watershed.

The Bassett Creek watershed is nearly 40 square miles in area and is divided into four major subwatersheds. The City of Minneapolis lies in the main stem subwatershed.

Bassett Creek was added to the MPCA's list of impaired waters in 2004 (Appendix F) for impaired aquatic life.

The City is currently preparing the Bassett Creek Valley Master Plan to provide guidance for restoring some of the creek's natural features. The general goals of the master plan are to improve water quality, control erosion, restore native vegetation,

and integrate the creek into the park system through a corridor to the Mississippi River.

Stream monitoring is performed in cooperation with the Metropolitan Council Environmental Services, the MPRB and BCWMC as part of the Watershed Outlet Monitoring Program (WOMP). The WOMP2 station on Bassett Creek is located approximately ¼ mile upstream of where the creek enters the City of Minneapolis storm drainage system. The Bassett Creek Watershed Management Commission has, through its Capital Improvement Plan, identified water quality improvements throughout the creek's watershed.

The BCWMC maintains a list of capital improvement projects aimed at improving the water quality of the main stem of Bassett Creek. There are no projects located within Minneapolis, or which would manage runoff from Minneapolis, in the current 5-year CIP. Two stormwater basin projects which would manage runoff from Minneapolis drainage areas are identified for future funding by the BCWMC. One is located in Bryn Mawr Meadows Park, near the intersection of Laurel Ave and Morgan Ave S. The second is in Golden Valley/Theodore Wirth Park westerly of the intersection of Xerxes Ave N and 14th Ave N.

Minnehaha Creek

Minnehaha Creek originates at the mouth of Lake Minnetonka (Gray's Bay Dam) located in the City of Minnetonka. The Creek flows 22 miles through the cities of Minnetonka, Hopkins, St. Louis Park, Edina and Minneapolis and ends at the confluence with the Mississippi River in south Minneapolis. Just upstream of the Mississippi River is Minnehaha Falls, a 53-foot waterfall made famous by the 1855 publication of the poem *The Song of Hiawatha* by Henry Wadsworth Longfellow.

Streambank stabilization is a main stakeholder concern for Minnehaha Creek; many residents use this creek for recreation. (Source: John Kuhne)

The MCWD monitors Minnehaha Creek as part of their Annual Hydrologic Data monitoring program. Water quality and flow in the creek are monitored at eight locations. Phosphorus and total suspended solids (TSS) concentrations in Minnehaha Creek are comparable to the North Central Hardwood Forest ecoregion mean, which is generally a result of the good quality of water discharged into the creek from Lake Minnetonka. Simply explained, nutrient and sediment loads increase upstream to downstream, although the impoundments at the major grade controls impact those concentrations. While the flow-weighted average chloride concentrations in the creek were lower than the state chronic standards of 230 ug/L,

several individual grab samples did exceed that standard. None exceeded the acute standard of 830 ug/L.

Grab samples from seven sites in the creek were tested for the presence of *E. coli* bacteria. While the acute standard was not violated in 2004, the 30-day geometric mean standard was violated at five sites on the lower creek for the months of September and October 2004. In 2005, the MCWD expanded the creek monitoring to additional sites and adjusted sampling frequency to identify the source or sources of *E. coli*. Samples are also being analyzed for traces of caffeine, which may indicate that human waste is one of the sources of *E. coli*. Results are pending.

Dissolved oxygen was measured at eight locations and generally maintained levels greater than the 5 mg/L State of Minnesota standard for class 2B waters. Measurements did dip below the 5 mg/L standard periodically, depending on flow in the creek and on location relative to large riparian wetland complexes. Minnehaha Creek was added to the MPCA's list of Impaired Waters in 2006 (Appendix F) for impaired aquatic life.

Biologic Integrity. Minnehaha Creek is listed on the State of Minnesota's 303(d) list of Impaired Waters for impaired biotic integrity. The most limiting factor for the ecology of Minnehaha Creek is its variability of flow, which ranges from intensive periods of high volume and velocity flow to periods of low or no flow. During those latter periods, much of the channel runs dry, leaving few pools or backwaters to serve as refuge for fish and macroinvertebrates. The creek also has a lack of physical complexity. The channel is mostly of relatively constant dimensions, has very small amounts of woody debris, and little variation in depth and slope. These factors severely limit opportunities for aquatic life to sustain viable populations.

Stakeholders focused on improving aquatic life and enhancing erosion control at Minnehaha Creek.

Creek Visioning. In 2005 the MCWD undertook a joint partnership with the USACE to develop a large-scale, long-term vision for Minnehaha Creek to serve as guidance for organizations that share creek corridor management responsibilities. A Citizen Advisory Committee of community representatives and a Technical Advisory Committee of agency representatives developed a common vision and management recommendations through a stakeholder input process.

The 2005 MCWD Minnehaha Creek Visioning Partnership Final Report presents the results of that process and summarizes the Partnership's recommendations for future creek management. Erosion control and support of aquatic life were overall the highest ranked priorities for improvement. However, when considered reach by reach, support and maintenance of recreation were the highest priority for the reaches upstream of the Browndale dam, followed by improvement of aquatic life and erosion control. Erosion control and streambank stabilization were the highest priorities for the reach downstream of the Browndale dam. The Partnership recommended the

MCWD consider bioengineered stabilization techniques over hard armoring where possible, and that habitat improvement be focused on the management of riparian vegetation and retention of large woody debris rather than in-stream habitat management. The Partnership also recommended that water quality be improved through the reduction of peak stormwater flows, pretreatment of discharges, application of BMPs and good housekeeping practices in the subwatershed, and repair of existing erosion.

An important part of the visioning process was the discussion of several streamflow management scenarios developed by the Corps to model what would happen with changes to the operation of the Grays Bay dam. The dam is managed to discharge water from Lake Minnetonka into Minnehaha Creek only when the DNR-established runout elevation of the lake is exceeded. During dry periods the lake level falls and there is minimal discharge; flow in the creek falls to minimal flow-related aquatic habitat conditions and canoeing is not possible. The Corps developed a number of scenarios that would provide targeted releases for recreation or habitat purposes, and then modeled the resulting impact on water level in Lake Minnetonka; the percent of time creek flow fell within optimal conditions for aquatic habitat and recreation; the percent of time potentially erosive flows could be expected; and resulting estimated water quality. Each scenario attempted to balance these often competing interests. The Partnership ultimately recommended that further study be completed to find a way to optimize and balance year round minimum flows and moderate extreme flows with recreational and lake uses.

Shingle Creek

Shingle Creek flows through the northern edge of Minneapolis. The main stem of Shingle Creek begins in Brooklyn Park in northwestern Hennepin County and flows southeast to its confluence with the Mississippi River in Minneapolis. Shingle Creek is formed at the junction of Bass Creek and Eagle Creek, two of the minor tributaries in the watershed. The creek historically flowed into Webber Pond before discharging to the river, but it now bypasses the pond. The creek is approximately 11 miles long and drops approximately 66 feet from its source to its mouth.

Sampling in Shingle Creek at Queen Avenue has revealed that the creek is a warm water fishery, mainly home to white sucker fish. (Source: SCWMC)

Presettlement vegetation in the watershed consisted of oak-savannah, prairie, and maple-basswood communities. Urban development has left little of the original vegetation. In 1997, the 2,000 acres of Shingle Creek Watershed within the City of Minneapolis consisted of the following land use proportions:

- 50 percent residential
- 22 percent parks and vacant
- 12 percent commercial and industrial
- 16 percent open water, right-of-way, other uses

Several cities, including Minneapolis, work cooperatively to manage recreational parks and trails within the vicinity of Shingle Creek.

Shingle Creek is classified as a warm water fishery from the analysis of fish samples taken at two sites in Minneapolis (Queen and Zane Avenue). White sucker dominates, though representatives of all feeding groups were present. Shingle Creek is isolated from the Mississippi River by a waterfall in Webber Park that prevents any migration of fish upstream.

In 1999, a hydrologic study of the Shingle Creek watershed by the SCWMC was completed using the HydroCAD computer model. The model was used to refine maximum discharge rates established in the First Generation Watershed Management Plan, prepared by the SCWMC. That plan determined a maximum allowable discharge of 1310 cubic feet per second [cfs] for Minneapolis and also set a target of reducing this discharge to 810 cfs by the year 2020.

There are two monitoring sites on Shingle Creek within the City of Minneapolis. An outlet monitoring site is located on Shingle Creek at 45th Avenue. Cumulative drainage area at this point is about 40.6 square miles, or 92 percent of the watershed. Stream stage is continuously recorded, and a range of events are sampled and analyzed for total phosphorus (TP), dissolved phosphorus (DP), total suspended solids (TSS), volatile suspended solids (VSS), Nitrate+Nitrite, and chloride. The site has been monitored since 1997.

The second site is on Shingle Creek at Queen Avenue near the border between Minneapolis and Brooklyn Center. Cumulative drainage area at this point is about 30.9 square miles, or 70 percent of the watershed. This site was maintained by the USGS as part of their National Water Quality Assessment (NAWQA) Program. Water quality monitoring was discontinued in 1999. However, flow is still being monitored by the USGS at this site.

Shingle Creek is listed on the 2006 MPCA list of impaired waters for chloride, low oxygen and impaired aquatic life (Appendix F).

Lakes

Nineteen lakes exist partially or wholly within the City with most integrated into the City's parks as shown in Figure 3-2. These lakes are the focus of the City's park system, providing residents with numerous opportunities for land and water based recreation. Table 3-5 provides details of the City's lakes and wetlands which are listed

by the DNR as a public water. As property owner of record for much of the shoreline in the City, the MPRB is responsible for maintaining the shoreline, and has created an effective program of lake management, further detailed at Minneapolis Park & Recreation Board - Water Quality.

Table 3-5. Lakes and Wetlands on DNR Public Waters List

Watershed	Water Resource	DNR Lake ID	Watershed Area (acres) in City	Surface Area (acres)	Watershed to Lake Area Ratio	Mean Depth (feet)	Max. Depth (feet)
BCWMC	Bassett's Pond*	27-0036		0.3			
	Birch Pond	27-0653	31	4	7.8	-	-
	Spring Lake	27-0654	45	3	15	10	28
	Wirth Lake*	27-0037	348	40	8.7	12	25
MCWD	Brownie Lake	27-0038	34	11	3.1	22	50
	Cedar Lake	27-0039	224	172	1.3	20	51
	Lake of the Isles	27-0040	760	111	6.8	9	31
	Lake Calhoun	27-0031	1,249	421	73.0	30	90
	Cemetery Lake	27-0017	205	11	18.6	na	na
	Sanctuary Marsh	27-0665	68	3	22.7	na	na
	Lake Harriet	27-0016	863	342	2.5	29	82
	Diamond Lake	27-0022	685	55	12.5	3	7
	Lake Nokomis	27-0019	620	206	3	14	33
	Lake Hiawatha	27-0018	1,008	55	18.3	16	31
	Powderhorn Lake	27-0014	286	12	23.8	4	20
	Grass Lake	27-0681	386	26	14.8	2	5
	Taft Lake*	27-0683	100	14	7.1	-	-
	Mother Lake*	27-0023	49	48	1	2	5
	Legion Lake	27-0024	49	71	0.7	-	-
MWMO	Loring Pond	27-0655	24	7	3	4.9	17
SCWMC	Webber Pond	27-1118	2	3	0.7	3	7
	Ryan Lake	27-0058	49	29	1.7	15	33
	Crystal Lake*	07-0034	470	5	na	na	na

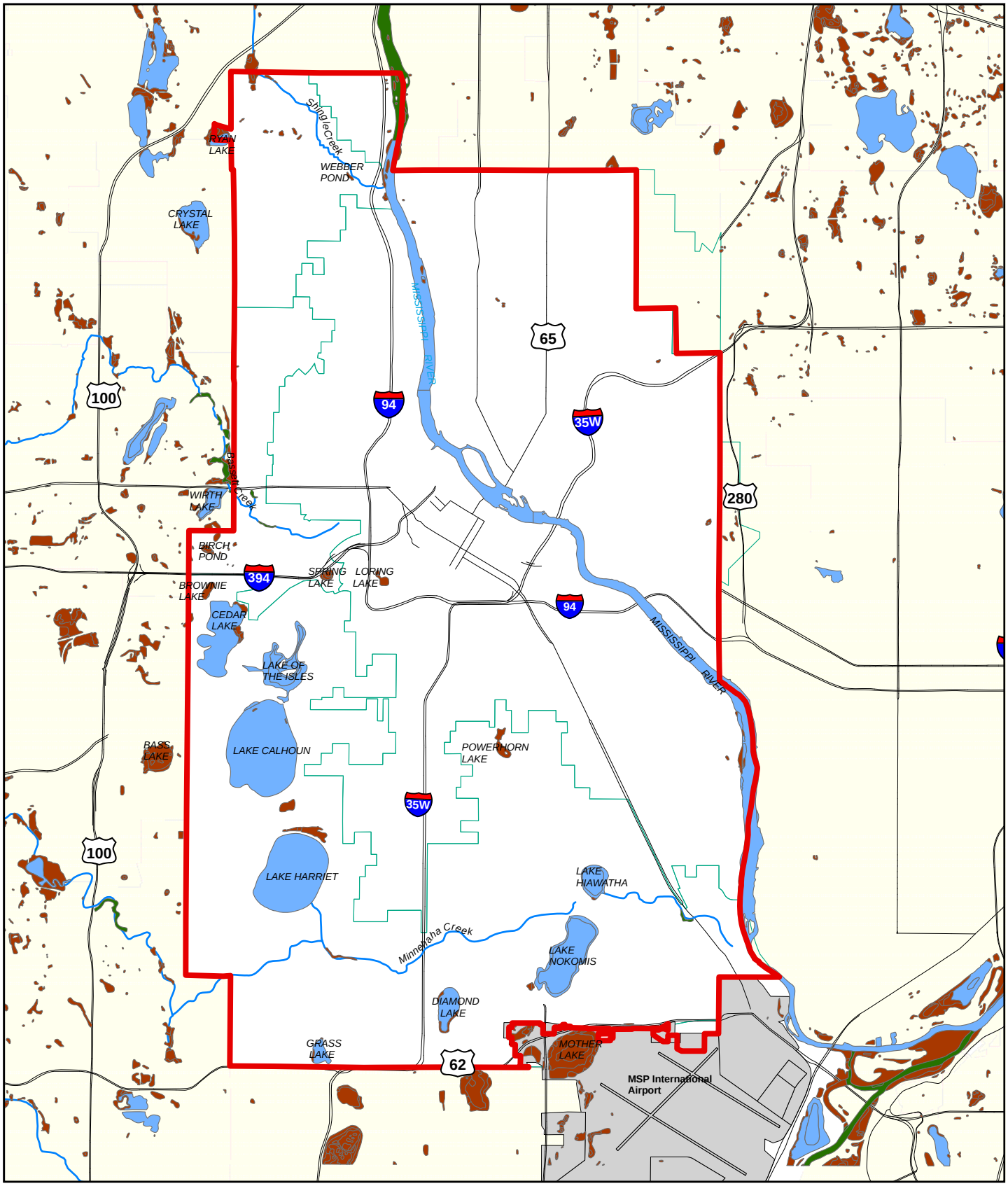
* Lakes outside corporate limits of Minneapolis that receive discharge of stormwater runoff from areas within the City.

Wetlands

Minneapolis has several wetlands within its boundaries, as shown on Figure 3-6. None of the City's wetlands remain in a natural state, though some of the wetlands in Theodore Wirth Park and T.S. Roberts Bird Sanctuary may come close. The Hennepin County Wetland Health Evaluation Project (WHEP) is an ongoing wetland monitoring program that uses an MPCA-developed approach to measure vegetation and invertebrate diversity. To date, this monitoring program has monitored wetlands contained in Table 3-6.

Table 3-6. WHEP Monitoring Program

	2002	2003	2004	2005
Amelia Pond		X	X	
Cedar Meadows				X
Diamond Lake	X			X
Grass Lake		X	X	
Roberts		X	X	X
Solomon Park Wetland				X
Wirth Golf Course	X	X	X	



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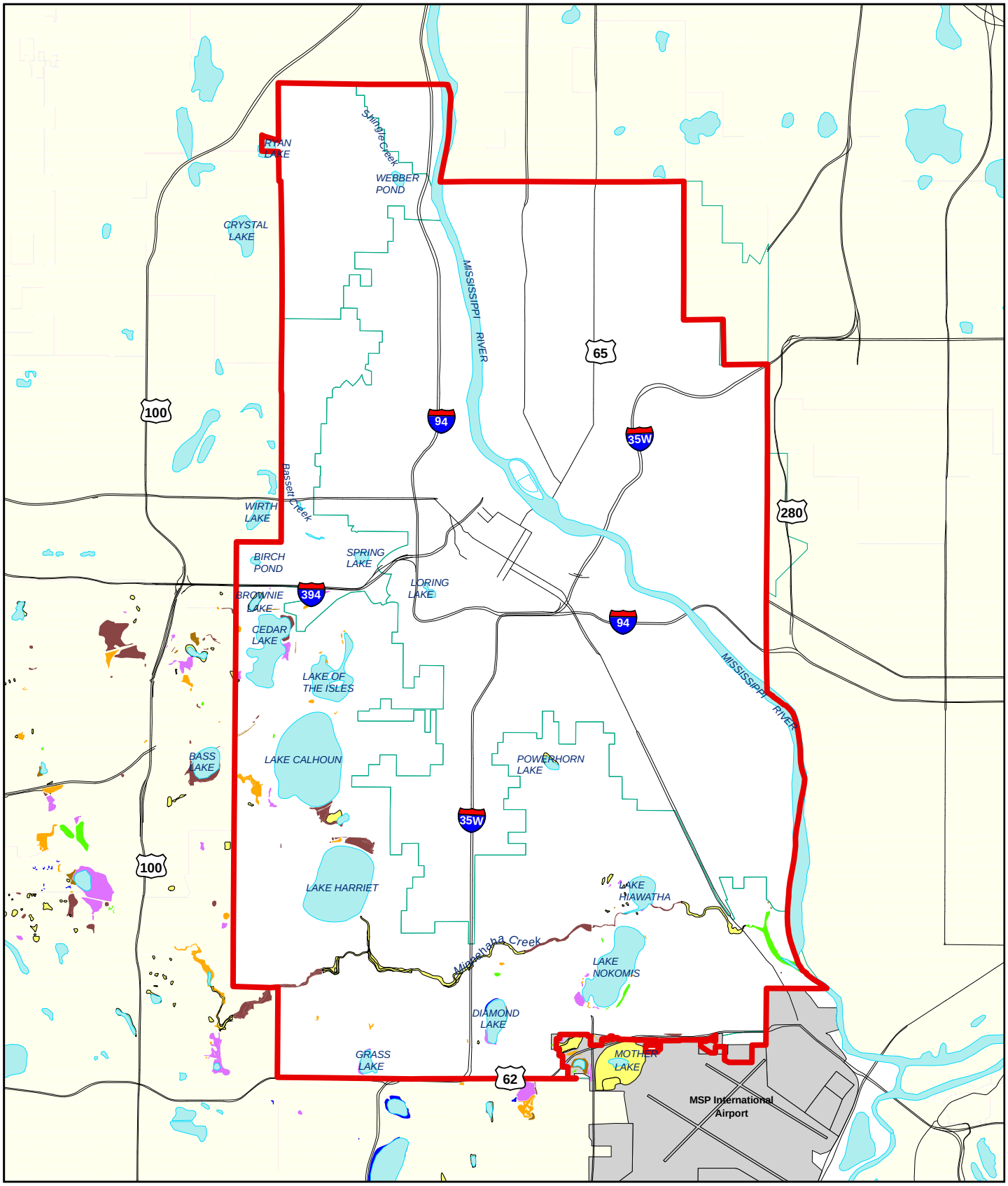
City of Minneapolis

NWI Wetlands

Local Surface Water Management Plan

Figure 3-6

Watershed Boundary
Highway
Lacustrine Wetland
Palustrine Wetland
Riverine Wetland



City of Minneapolis

MCWD Function and Value Assessment

Local Surface Water Management Plan

Figure 3-7

N
W E
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Miles

1 0 1

Watershed Boundary
Highway
Type 1
Type 2
Type 3
Type 4
Type 5
Type 6
Type 7
Type 8

Monitoring results indicate that all of these wetlands have suffered negative consequences from their watersheds being fully developed. According to the report, the wetlands appeared to have both poor vegetation and poor invertebrate species richness and diversity, which would likely benefit from restoration efforts.

In 2003, the MCWD completed a Function and Values Assessment of wetlands within their jurisdiction. Figure 3-7 presents the wetland locations identified in that effort. Neither the NWI coverage provided in Figure 3-6 nor the MCWD mapping reflected in Figure 3-7 should be used in place of actual wetland delineations. Each is merely a planning tool to aid in stormwater management decisions.

Groundwater

There is no single source for groundwater data in Minneapolis. Information is available from the following sources:

- The Minneapolis Department of Regulatory Services – Environmental Management maintains permits for construction or sealing of wells.
- The MPRB monitors groundwater levels at wells located on park property. Locations of MPRB wells are contained in the MPRB 2004 Water Resources Report.
- The Minnesota Department of Natural Resources issues groundwater appropriation permits, and maintains ground water resources data at Ground water: Minnesota DNR.
- The USGS maintains a nationwide inventory of groundwater data, which can be found at USGS Ground-Water Data for the Nation. There are no sites in Minneapolis currently being monitored by the USGS.
- The MPCA collects information on the quality of groundwater in Minnesota.

The Minnehaha Creek Watershed District has been monitoring the groundwater levels in an area of southwestern Minneapolis that contributes to Coldwater Springs (located outside the municipal limits of Minneapolis). Although not currently in effect, the MCWD is considering future implementation of groundwater protection measures in the area of influence for this spring.

Unique Features/Fish &Wildlife Habitat/Scenic Areas

Maps noting unique features, fish habitat, wildlife habitat, and scenic areas of Minneapolis which are contained in the Watershed Management Plans of BCWMC, MCWD, MWMO & SCWMC are included in this LSWMP by reference.

Existing Land and Water Resources Management Activities

City of Minneapolis and Minneapolis Park and Recreation Board

At the time that the City adopted Chapter 54 into the Code of Ordinances, the City also approved a set of pollutant reduction goals for new developments. These goals were based on the most current water quality studies during 2001. These reduction goals will be maintained by the City until new goals for any water resource through formal goal establishment, such as an approved TMDL Plan or an approved Water Resources Management Plan.

The City of Minneapolis and the MPRB jointly implement stormwater and surface water monitoring activities, which are summarized in Appendix G and in their annual reports, NPDES Stormwater Annual Report and MPRB 2004 Water Resources Report.

In 2006, the City of Minneapolis and the MWMO implemented a joint program to monitor the outfalls to the Mississippi River. The Mississippi Watershed Management Organization's Monitoring Program was established to provide a scientific basis for identifying and evaluating water quality and quantity issues and implementing solutions to improve water quality and reestablish natural water regimes in the watershed. The MWMO currently monitors water quality at six locations in the Mississippi River, five stormwater outfalls to the Mississippi River and Loring Pond (the only lake in the watershed). Fecal coliform and *E. coli* data are collected from the River to assess pollutants listed on the Minnesota "Polluted Waters" list for the Total Maximum Daily Load (TMDL) process. Data are collected from the stormwater outfalls to assess the volume and rate of water movement in the watershed and to develop a record of baseline data to characterize water quality in the watershed and identify pollutants that exceed water quality standards. Data collected include the physical, chemical and biological constituents: temperature, transparency, specific conductivity, pH, dissolved oxygen, bacteria, nutrients, sediment, inorganic compounds, organic compounds and metals. Fecal coliform and *E. coli* data are collected from Loring Pond. The MWMO also monitors Best Management Practices (BMPs) to determine their effectiveness on reducing water loss and improving water quality. More information about the MWMO Monitoring Program can be found at www.mwmo.org.

Watersheds

Each watershed district/organization in Minneapolis has implemented programs to improve the quality of surface waters. Programs include monitoring activities, education programs, standards for new and re-developments and structural stormwater BMPs. A list of all monitoring activities in Minneapolis is contained in Appendix G. Reports and studies are contained in Appendix H. The most current information is available directly from each watershed district/organization. Contact information is contained in Appendix A, and at the following websites:

Bassett Creek Watershed Management Commission (www.bassettcreekwmo.org)

Minnehaha Creek Watershed District (www.minnehahacreek.org)

Mississippi Watershed Management Organization (www.mwmo.org)

Shingle Creek Watershed Management Commission (www.shinglecreek.org)

Existing Assessment Studies

Impaired Waters

Lake assessments are prepared for the U.S. Congress under Section 305(b) of the Clean Water Act to estimate the extent to which Minnesota water bodies meet the goals of the Clean Water Act. The MPCA 305(b) Report includes information about waters of the state: healthy, threatened, and impaired. This information is intended to be shared with planners, citizens and other partners in basin planning and watershed management activities. The lakes in Minneapolis on the 305(b) Report are shown in Table 3-7.

Table 3-7. 305(b) Assessments of Lake Conditions in Minneapolis

Lake	Swimming		Trophic State
	Use	Data	
Brownie	PS	M	Eutr
Calhoun	ST	M	Eutr
Cedar	ST	M	Eutr
Diamond	NS	M	Hyper
Harriet	FS	M	Meso
Hiawatha	NS	M	Eutr
Isles	NS	M	Hyper
Loring (S. Bay)	PS	M	Eutr
Nokomis	NS	M	Eutr
Powderhorn	NS	M	Hyper
Ryan	NS	E	Hyper
Webber	PS	M	Eutr
Wirth	NS	M	Eutr

Use: PS=Partial support; NS=Not supporting; ST=Supporting but threatened
Data: M=Monitored (current); E=Evaluated
Trophic State: Eutr=Eutrophic; Hyper=Hypereutrophic; Meso= Mesotrophic

The 305(b) list includes only those waters that are either threatened or impaired. If monitoring and assessment indicate that a water body segment is impaired by one or more pollutants, it is placed on the 303(d) list and then a strategy needs to be developed that would lead to the attainment of the state Water Quality Standard (WQS) contained in Minnesota Rule 7050. The TMDL process involves four phases:

- Assessment and listing
- TMDL study
- Implementation plan development and implementation
- Effectiveness monitoring

A number of surface waterbodies in Minneapolis, including segments of the Mississippi River, are listed in the state impaired waters list (303(d) list). Impaired waters are those streams, rivers and lakes that currently do not meet their designated use and associated WQS. Appendices E and F list all the City's surface waters on the State's 2006 305(b) and 303(d) list.

Current TMDL Studies (2006)

In cooperation with the Minnesota Pollution Control Agency (MPCA), the Shingle Creek Watershed Management Commission and the Minnehaha Creek Watershed District have begun the monitoring and implementation plan development phases of the TMDL process for waterbodies in their jurisdictions which are listed on the MPCA 303(d) report. This site also includes a document that lists the overall status of each TMDL study underway in the State. The following summarizes the status of the active TMDL projects which affect Minneapolis:

Crystal Lake

Although not in Minneapolis, runoff from a 470 acre area drains to Crystal Lake. The SCWMC has initiated a TMDL project, which is currently in a monitoring phase. Recommendations from the TMDL Implementation Plan could affect Minneapolis. Results of the Crystal Lake TMDL study are not yet available.

Ryan Lake

In August 2005, the Shingle Creek Watershed Management Commission released the first phase of Ryan Lake TMDL Study in conjunction with their study of Twin Lakes in Robbinsdale. The report includes information on the monitoring, but does not yet include allocation of sources of pollutants or implementation recommendations.

Nine Lakes

The Minnehaha Creek Watershed District has begun a TMDL study of nine lakes within their watershed. Six of those lakes are within Minneapolis: Brownie Lake, Diamond Lake, Lake of the Isles, Lake Hiawatha, Lake Nokomis and Powderhorn Lake. The MPCA has put this TMDL project on hold until they finalize new policies on water quality standards that affect lake TMDL projects.

Shingle Creek Chloride

The Shingle Creek Watershed Management Commission has completed a TMDL study and draft implementation plan for mitigation of chloride impairment of Shingle Creek. Implementation activities are being coordinated by the Minnesota Pollution Control Agency. Detailed discussion of Minneapolis winter street maintenance activities, including revised activities based on the results of this study, are contained in Section 4, System Inventory and Related Activities.

Mississippi River - Lake Pepin

The Minnesota Pollution Control Agency is coordinating a turbidity and lake eutrophication TMDL project for Lake Pepin on the Mississippi River. The tributary area for Lake Pepin includes the entire watersheds of the Minnesota River, St. Croix River and upper Mississippi River. The upper Mississippi River watershed includes the entire City of Minneapolis. The most recent timeline schedules monitoring and modeling activities through 2007, analysis of scenarios in 2008 and completion of an

implementation plan in 2009. It is possible that recommendations of the implementation plan will affect Minneapolis.

Minneapolis Park and Recreation Board

The Environmental Operations Section of the Minneapolis Park and Recreation Board (MPRB) implemented a lake water quality monitoring program in 1991 as part of a diagnostic study for the Chain of Lakes Clean Water Partnership. The Chain of Lakes includes Brownie, Cedar, Isles, Calhoun and Harriet. The monitoring program was expanded in 1992 to include Hiawatha, Nokomis, Diamond, Powderhorn, Loring, Webber and Wirth lakes. Spring Lake was added on a limited basis in 1993. Grass and Ryan lakes were added on a limited basis in 2002.

Rehabilitation efforts have returned Lakes Calhoun and Harriet to pre-European settlement conditions.

The MPRB uses the Trophic State Index (TSI) as a benchmark for comparison of water quality across all lakes in the City. TSI is calculated from water transparency, chlorophyll-a values and surface phosphorus values to produce a score from 0-100. Historical TSI scores from 1991 to 2004 for the monitored lakes (Appendix E) are used to calculate trophic state trends.

The water quality of Lake Calhoun and Lake Harriet has improved to pre-European settlement conditions. Rehabilitation efforts have helped these urban lakes tremendously.

The other assessments and monitoring that MPRB performs are:

- Phytoplankton and Zooplankton Monitoring
- Lake Aesthetic and User Recreation Index
- Exotic Aquatic Plant Management
- Lake Levels and Ice dates
- Winter Ice Cover
- Aquatic Plants
- Fish Kills
- MPRB Monitoring
- Watersheds Outlet Monitoring Program Monitoring
- Public Beach Monitoring
- NPDES Monitoring
- Stormwater BMP Monitoring

For detailed information, refer to MPRB Annual Water Resources Report

Lake Assessment Studies by Watershed Districts and Organizations

In addition to the ongoing lake monitoring by the Minneapolis Park and Recreation Board, monitoring is performed by each of the Minneapolis watershed districts/organizations. Tables summarizing the most recent monitoring efforts can be

found in the annual assessment completed by the Minneapolis Park and Recreation Board and in Appendix G.

Completed and Ongoing Water Quality Related Efforts

To improve water quality and/or prevent degradation of the existing water quality, many public agencies have completed a number of monitoring programs, surveys and water quality improvement projects. See Appendix H.

Green Report

In July 1993, a group known as the Water Quality Management Citizen Advisory Committee presented Mayor Sharon Sayles Belton with the Green Report, which evaluated the Chain of Lakes and recommended strong measures for preserving and improving them. The committee urged the City and MPRB to proceed with similar evaluations and water quality improvement projects for the other waters in the City that were not covered in the Green Report.

The Green Report outlined measures to improve and preserve major water resources.

Funded by a Clean Water Partnership grant and made up of members of the MPRB, City Council, neighborhood groups, and community organizations, the committee developed a report that moved quickly from an assessment of the Chain of Lakes to goals, recommendations, and implementation steps. With support from their technical staff, the committee reported on the state of the Chain of Lakes. Their findings for each lake were:

Cedar Lake: The technical data showed Cedar Lake to be eutrophic. Furthermore, Secchi disk TSI values increased rapidly through the 1960s. In fact, the water quality of Cedar Lake was found to be worse than predicted by water quality modeling, suggesting that internal loading played a significant role.

Improvement efforts have improved Lake Calhoun's conditions to better than mesotrophic (Source: MPRB)

Lake of the Isles: Lake of the Isles was found to be eutrophic and had the highest measured total phosphorus concentrations in the entire chain. Algal blooms were frequent. Water quality in the lake was actually better than predicted by modeling likely due to the presence of milfoil, a plant that utilizes phosphorus from the water.

Lake Calhoun: Like Cedar Lake and Lake of the Isles, the committee found in 1993 that Lake Calhoun was eutrophic. Another concern identified at Lake Calhoun was the fish consumption advisory issued by the MPCA in May 1993 due to elevated levels of mercury found in fish pulled from the lake.

Lake Harriet: Lake Harriet was the only lake of the four that was mesotrophic – indicating a significantly lower total phosphorus concentration than the other lakes.

The committee considered Lake Harriet as a model for what might be accomplished at Cedar Lake and Lake Calhoun. One of the key indicators of Lake Harriet's good water quality was the persistence of daphnia, a zooplankton, throughout the year. As noted for the other lakes, the persistence of daphnia occurs when algal blooms are limited.

The LSWMP goals echo many of the goals identified in the Green Report. Both the Green Report and the LSWMP emphasize public education and protecting public health. Specifically, the plans address protection of swimmers from bacteria and protection and warning to consumers of the lakes' fish. Both the Green Report and the LSWMP share goals for reduction of in-lake pollutants – primarily phosphorus – and implementation of BMPs.

The committee indicated some mean TSI goals in the five- to 10-year timeframe. At present, the City, MPRB, and MCWD have implemented sufficient BMPs that these TSI goals are now being met at Cedar, Calhoun, and Harriet, and are nearly being met at Isles. Finally, the Green Report had a goal to improve government management of water quality issues. This involves coordination among different agencies and jurisdictions as well as improvement of management within MPRB and the City.

Blue Water Commission

In May 1998, another citizen group, the Blue Water Commission, presented its findings to the residents of Minneapolis. Their recommendations for improving the water quality of Lake Nokomis and Lake Hiawatha echoed the earlier work done for the Chain of Lakes. The Blue Water Commission was primarily made up of MPRB members and neighborhood representatives. Also represented were the City of Minneapolis, Hennepin County, MCWD, the City of Richfield, and the Metropolitan Airports Commission. Much of the information that the commission weighed was provided by a diagnostic study funded by MCWD.

The Blue Water Commission findings were similar to those summarized in the Green Report for the Chain of Lakes – namely that Hiawatha and Nokomis are eutrophic and that the process of eutrophication was continuing. The commission also identified fecal contamination and fish kills as primary among the many other concerns associated with the lakes. The commission organized their concerns around central themes such as:

- ***Swimability*** - interference by algae and weeds, fecal contamination, and swimmer's itch
- ***Fishability*** – safety of fish consumption, fish kills, and weeds impeding fishing
- ***Aesthetics*** – odor, clarity, algal blooms and shoreline aesthetics
- ***Plant Diversity and Wildlife*** – namely reduction in exotic species
- ***Shoreline Environment*** – vegetation restoration and elimination of sediment deltas

These concerns led the Blue Water Commission to recommend implementation steps. These recommendations included a strong emphasis on reducing phosphorus inputs into both lakes. Since the commission's report, the City, MPRB, and MCWD have implemented several projects that follow directly from the report recommendations.

Modifications to the Lake Nokomis outlet structure were made to reduce phosphorus inputs from the creek into the lake. Grit chambers were installed on the east side of Lake Nokomis, carp were removed, and treatment wetlands were constructed on the west side of Nokomis. Additionally, the City banned the use of phosphorus in fertilizer, a ban that was subsequently followed by the statewide ban.

Surface Water Quality Monitoring Task Force

Minneapolis set a water protection trend by banning the use of phosphorous in fertilizer; the state followed suit.

A Water Monitoring Task Force was created by the City Council resolution on July 15, 2003. The purpose of this task force is to:

- Oversee existing water quality monitoring data in Minneapolis
- Improve the coordination of water quality monitoring data and protocols
- Establish public health standards
- Develop strategies to reduce water quality problems identified through monitoring efforts

Public Works and the MPRB are jointly responsible for direction and coordination of the task force. The task force included representatives from Minneapolis Regulatory Services, Minneapolis Health & Family Support, as well as the watershed organizations within City boundaries.

Task force objectives include:

1. Evaluate existing monitoring – the task force will consider which parameters are the most important for monitoring and discuss methods for standardizing the use of monitoring data.
2. Coordinate monitoring standards and data sharing – the task force will consider ways to improve data sharing both among agencies and with the public.
3. Develop strategies to reduce water quality problems – the task force will review findings from previous reports and use recent monitoring to look ahead to future improvements.
4. Develop standards and policies across watersheds to ensure public health.
5. Recommend policy changes for the evaluation of standards.

One of the first items to come out of the task force meetings is a revised classification system for the City's lakes, called the Minneapolis Lakes Recreational/Aesthetic Indicator (Appendix J).

Minneapolis Lakes Recreational/Aesthetic Indicator Development

To provide clarity to management decisions, the task force has developed a different classification system. The report that summarizes this system is included as Appendix J. This system is presently being used by the MPRB. The proposed system considers four aspects of water quality:

- Environmental quality
- Public health
- Aesthetic considerations
- Recreational interferences

The indicator for the environmental quality measure is the trophic state index used widely in Minnesota. High TSI numbers indicate euthrophication of a water body as manifested in algal blooms during the summer.

The second measure is public health, and the indicator for this is *E. coli*. High levels of this bacterium result from fecal contamination and lead to beach closings. As it most directly impacts swimming, this indicator is of primary importance only on lakes with beaches.

The third measure takes into account aesthetic considerations. These are subjective measures that include odor, water color, and the presence of debris. Assessment of these indicators will focus on areas where people come into close contact with the lake, like piers, docks, landings and beaches.

The final measure is recreational interference and the indicator is the extent to which weeds and other aquatic vegetation interfere with boating and swimming.

The classification system consists of value rankings for each indicator, ultimately creating a score for each of the four measures. Annual reporting of these scores would be a benchmark of overall lake condition.

Source Water Assessment

In 1996, amendments to the Safe Water Drinking Act required source water assessments to be prepared for public water systems. Minneapolis' own assessment, completed in 2001, meets the requirement by providing information on:

- The area which supplies drinking water to the Minneapolis Water Works
- An overview of why this source is susceptible to potential contamination
- A description of the contaminants of concern

- The source of the contaminants of concern, as possible

Minneapolis obtains its drinking water from the Mississippi River and the Minneapolis Water Works intake is in Fridley. On average, the Water Works takes 65 million gallons per day of the estimated 3.9 billion gallons of daily flow. The susceptibility of the supply to contaminants is generally dependent on the proximity of the source to the intake. This geographic variability leads to a three-layer approach to describing vulnerability.

The Source Water Protection Project focuses on improving water supplies for communities along the river.

The area most directly connected to the supply and the area over which a spill or contamination could quickly reach the intake is termed the "inner emergency response area." This area includes subwatersheds immediately adjacent to the river from the intake upstream to Elk River – a distance along the river of 26 miles. The "outer source water management area" is conceived as an area where protection against chronic sources of contamination is emphasized or where periodic low levels of contamination occur. This management area consists of those subwatersheds immediately adjacent to the river from Elk River to St. Cloud. Notably, the furthest extent of the Minneapolis "outer source water management area" generally coincides with the downstream portion of the City of St. Cloud's "inner emergency response area." The final assessment area is the entire Mississippi watershed, above the Twin Cities, approximately 19,000 square miles.

The Source Water Assessment document lists potential contamination sources. These sources are derived from a number of state and federal databases. The overall intent of the assessment is to provide public information. In the document's own words, "The assessment provides the community with a significant amount of information regarding where your drinking water comes from (the source) and what the risks are to the quality of that source."

Upper Mississippi River Source Water Protection Project (UMRSWPP)

In 2001, the City of St. Cloud (as primary sponsor) partnered with Minneapolis Water Works, St. Paul Water Utility, Minnesota Department of Health and Metropolitan Council to implement the Upper Mississippi River Source Water Protection Project (UMRSWPP). Source assessments were completed in 2001 and are available from the MN Department of Health. As of 2005, the cities were collaborating to prepare source water protection plans using Federal Clean water Act Section 319 funding. Major elements of the project include:

- Delineation of protection areas
- Time of travel estimates
- Inventory of potential contaminant sources
- Investigation of areas of surface/ground water interaction

- Development of a process to formally designate source water protection areas
- Education and outreach
- Communication to wellhead protection teams
- Identification and accommodation of high priority land uses

Section 4
System Inventory and Related Activities

Overview

This section of the Minneapolis LSWMP focuses on the built system of stormwater drainage and sanitary sewers which have an impact on the water resources of Minneapolis. The City of Minneapolis has created a system of sanitary sewers and storm drains that are predominantly independent systems. Components of the stormwater management system include conveyance (gutters, catch basins, pipes, channels and county ditches), water quality/flood retention basins, and water quality treatment structures (grit chambers). Cross connections between the storm drainage and sanitary sewer systems still exist. This interconnection of the stormwater drainage and sanitary sewer collection systems is most evident during and immediately after large summer rainstorms. Excessive stormwater finds pathways to the sanitary sewers, and excessive sanitary flows find routes to surface waters. During extreme storm events, the overwhelmed sanitary sewers will overflow raw sewage to the Mississippi River at regulator sites, or will backflow raw sewage into basements. Therefore, this inventory of the systems that affect the water resources in Minneapolis includes the storm drainage system and cross connections with the sanitary sewer system.

Separate storm drains and a City-wide repaving program reduced strains on the wastewater treatment facilities.

Minneapolis' sewer system was established in 1870 with the construction of combined sewers that collected sanitary and stormwater flows and discharged directly to the Mississippi River. Starting in 1922, a dedicated stormwater system was constructed around the lakes and within areas of new development; however, the existing combined sewers were still used. After 1938, regulators were installed in combined sewers to direct average daily flows to interceptors and then to the newly-constructed wastewater treatment facility. Flows in excess of the interceptor capacity, as experienced during rain events, would overflow and then be discharged to the Mississippi River.

The combined sewer flows were a burden to the wastewater treatment facility and placed a capacity limitation on the sewer system and treatment facilities. What is now the Metropolitan Council Environmental Services (MCES) took responsibility for the interceptors and regulators in the mid-1960s. In 1960, the City banned rainwater drainage to the sanitary sewer (City Code 1960, As Amend., § 614.010); all sewers constructed after 1960 were dedicated to either sanitary or storm flows. Also in the 1960s, the City began to construct separate storm drains in conjunction with a city-wide street repaving program. Beginning in 1985, the City accelerated construction of separate storm drains to be in compliance with a schedule set in the City's NPDES CSO permit (Appendix K), which resulted in decreased occurrence of overflows to the Mississippi River.

Minneapolis currently operates two systems which are not fully separated. Both systems contain constructed pollution control devices in conjunction with institutional controls and best management practices (BMPs) to protect its water resources.

Infrastructure Inventory

The City of Minneapolis maintains a sewer system that is more than 130 years old. Sewers are constantly being improved to meet the development, quality of life and environmental stewardship goals set in The Minneapolis Plan as described in Section 1. This system inventory provides a summary of the sanitary and storm sewer systems in 2006. Inventory data was collected from recent reports and from the City's geographic information system (GIS) database.

Sanitary Sewer System

The City of Minneapolis owns and maintains a sanitary sewer collection system of shallow sewer and deep tunnels which is a total of 837.5 miles in length. These sewers drain into the regional MCES interceptors that convey the sewage to the Metropolitan Treatment Facility in St. Paul. Figure 4-1 shows both the Minneapolis and MCES sewer system. It also notes the location of the remaining regulators where excessive flows are directed to the Mississippi River during extreme storm events. Tables 4-1 and 4-2 provide summaries of the Minneapolis sanitary sewer system.

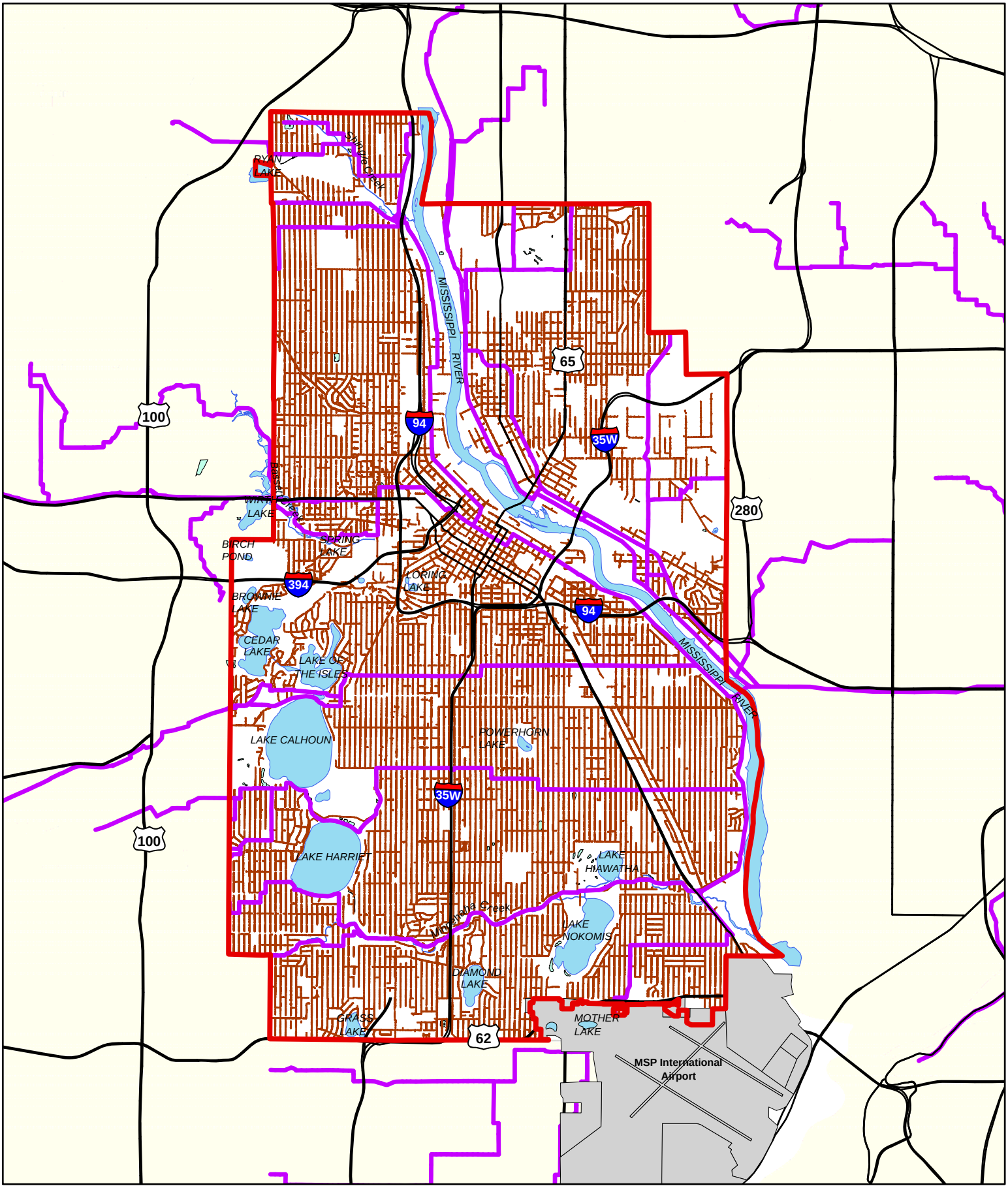
Table 4-1. Summary of Sanitary System

Material	Size	Year Constructed	% of System
Clay	8" - 36"	1888 to present	80
Brick	24" - 96"	1870 to 1930	10
Cement	12" - 24"	1882 to 1884	3
Concrete	12" - 102"	1927 to present	4
Other	6" -30"	1931 to present	3

Table 4-2. Sanitary Sewer System Infrastructure Inventory – City Owned

Component	Quantity
Pipes	
• Tunnels	5.5 Miles
• Trunk and Local Sewers	832 Miles
Manholes	29,000
Pump Stations	10
Regulators	8

Non-wastewater enters the sanitary sewers in the form of inflow or infiltration. This extraneous water can result in overflows at the seven remaining CSO locations. In addition, excessive inflow and infiltration (I/I) which does not overflow reaches MCES interceptors and is treated at the Metro Wastewater Treatment Plant. Excessive extraneous flows have caused MCES to create an incentive/penalty program to encourage municipalities to remove these non-wastewater flows. This I/I Surcharge Program will have a major impact on Minneapolis stormwater drainage systems, because much of the I/I flows will be redirected to the storm system.



City of Minneapolis

Sanitary Sewer System

Local Surface Water Management Plan

Figure 4-1

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City Sanitary Sewer
MCES Interceptors
Highways
Lakes

Since the mid-1980s, the focus of the City's CSO program was to expand the storm drainage system to locations where street and alley catch basins were connected to the sanitary sewer. It was estimated in 1986 that 4651.3 acres of runoff from street inflow connections were served by combined sewers. By 2000, 4582.5 acres of street drainage (98.52 percent) were separated, leaving 68.8 acres that are still served by combined sewers.

A major source of inflow in Minneapolis is rainwater from roof drains. Minneapolis ordinances require property owners to disconnect rainleaders and then enable City staff to inspect for compliance. A field survey in 1985 found that of the 99,900 buildings in the City, it was estimated that between 5,280 and 5,380 (5 percent) had rainleader connections. The City re-initiated its inspections of private properties in 2002, and has found 4,181 rain leader violations (see Combined Sewer Overflow – A Minneapolis Solution). Since the 2002 rain leader inspection program began, 760 properties (18 percent of violations) have disconnected rainleaders from the sanitary sewer. Inspection will continue in 2006. An additional 21,312 parcels are scheduled to be inspected in 2006.

The success of City programs and policy aimed at eliminating combined sewers connections and inflow can be seen by observing the change in total overflow volumes at the remaining CSO locations (see 2004 CSO Annual Report). Figure 4-2 shows total annual overflow volumes since 1984. Total annual overflow volume was reduced by 99% from 1984 to 2001.

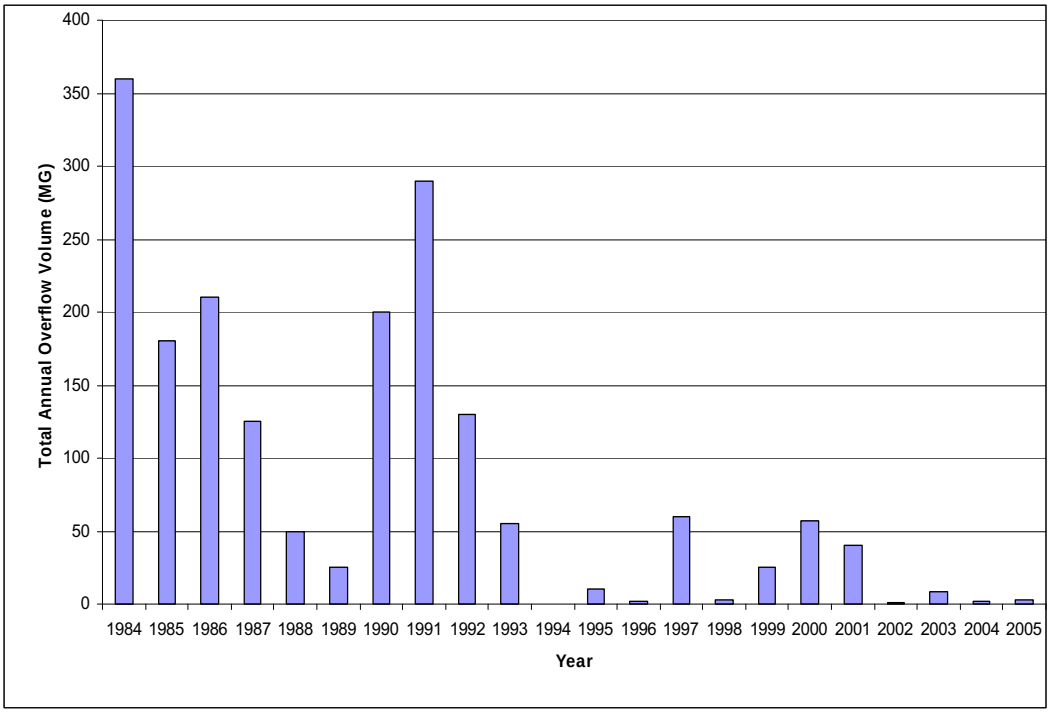


Figure 4-2. Annual Overflow Volume at CSO Locations

Minneapolis Storm Drainage System

The storm drainage system of Minneapolis is newer than the sanitary sewer system.

Table 4-3 provides a quick look at its history. In the period between 1938 and 1960, storm drains were constructed in developing areas of the city, but the older combined sewers still conveyed both sanitary and storm flows. Since the 1960s, the city has dramatically increased the mileage of storm drains either as part of road reconstruction projects or in efforts to separate the combined sewers. Currently, the Minneapolis stormwater system handles approximately 50 square miles, with the following major City owned components:

Table 4-3. Storm Drainage

Year Built	% of Storm Sewer System by Length
Pre-1900	0.1%
1901 – 1910	0.3%
1911 – 1920	0.5%
1921 – 1930	2.7%
1931 – 1940	27.0%
1941 – 1950	7.5%
1951 – 1960	8.8%
1961 - 1970	16.8%
1971 – 1980	17.1%
1981 – 1990	14.3%
1991 – 2000	4.7%
2001 - 2006	0.1%

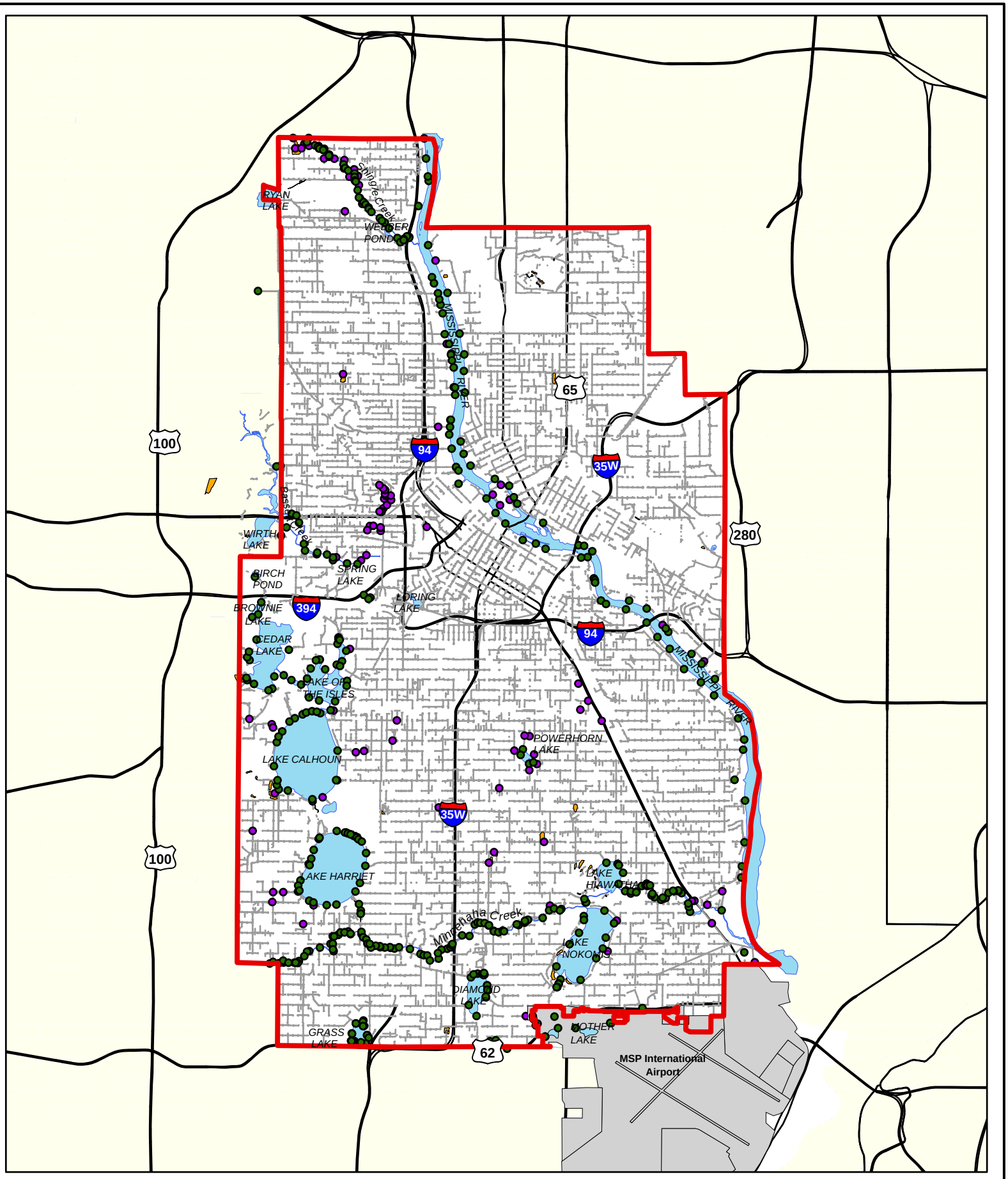
- Water quantity detention facilities to control localized flooding.
- Water quality treatment facilities including stormwater ponds and grit chambers.
- Drainage system, including surface water, drainage ways and storm drains; and,
- Deep tunnels which convey stormwater to the Mississippi River.

Table 4-4 and Figure 4-3 summarize the storm drainage system owned and operated by the City of Minneapolis. This inventory includes the storm drainage system that was transferred to the City of Minneapolis from the Minneapolis Park and Recreation Board in 2000.

Table 4-4 Storm Drainage System Infrastructure Inventory

Component	Quantity	
Pipes	556	Miles
Storm tunnels	16.7	Miles
Manholes	18,200 +	
Catch Basins / Inlets	25,000 +	
Detention Facilities (Public)	16	Ponds
Grit Chambers / Quality Controls	127	
Pump stations	25	
Outfalls	387	

Figure 4-4 illustrates the individual catchment areas served by the Minneapolis drainage system. This figure also shows how the jurisdictional boundaries of the watershed district/organizations overlay onto the catchment areas.



City of Minneapolis

Stormwater Drainage System

Local Surface Water Management Plan

Figure 4-3

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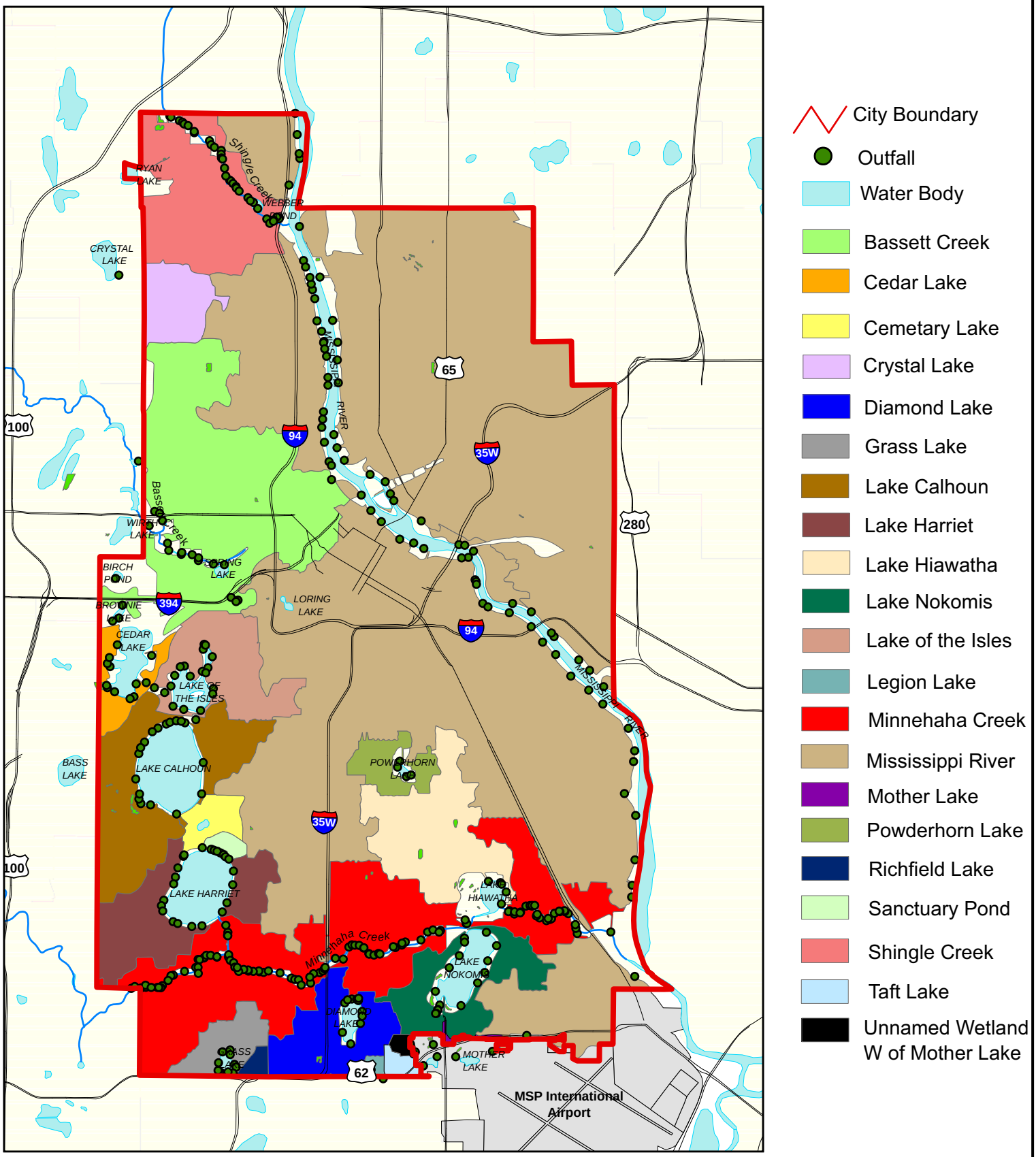
City Storm Sewer
Highways
Grit Chambers
Outfalls
Stormwater Basins



City of Minneapolis

Stormwater Drainage Areas

Local Surface Water Management Plan

Figure 4-4

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Miles

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Non-Minneapolis Storm Drainage System

Interconnected with the Minneapolis storm drainage system are networks owned and operated by other public agencies. Cooperative agreements that govern the construction, operation and maintenance are contained in Section 1, Introduction. Non-Minneapolis storm drainage systems are described below, and are not included in the inventories of this LSWMP:

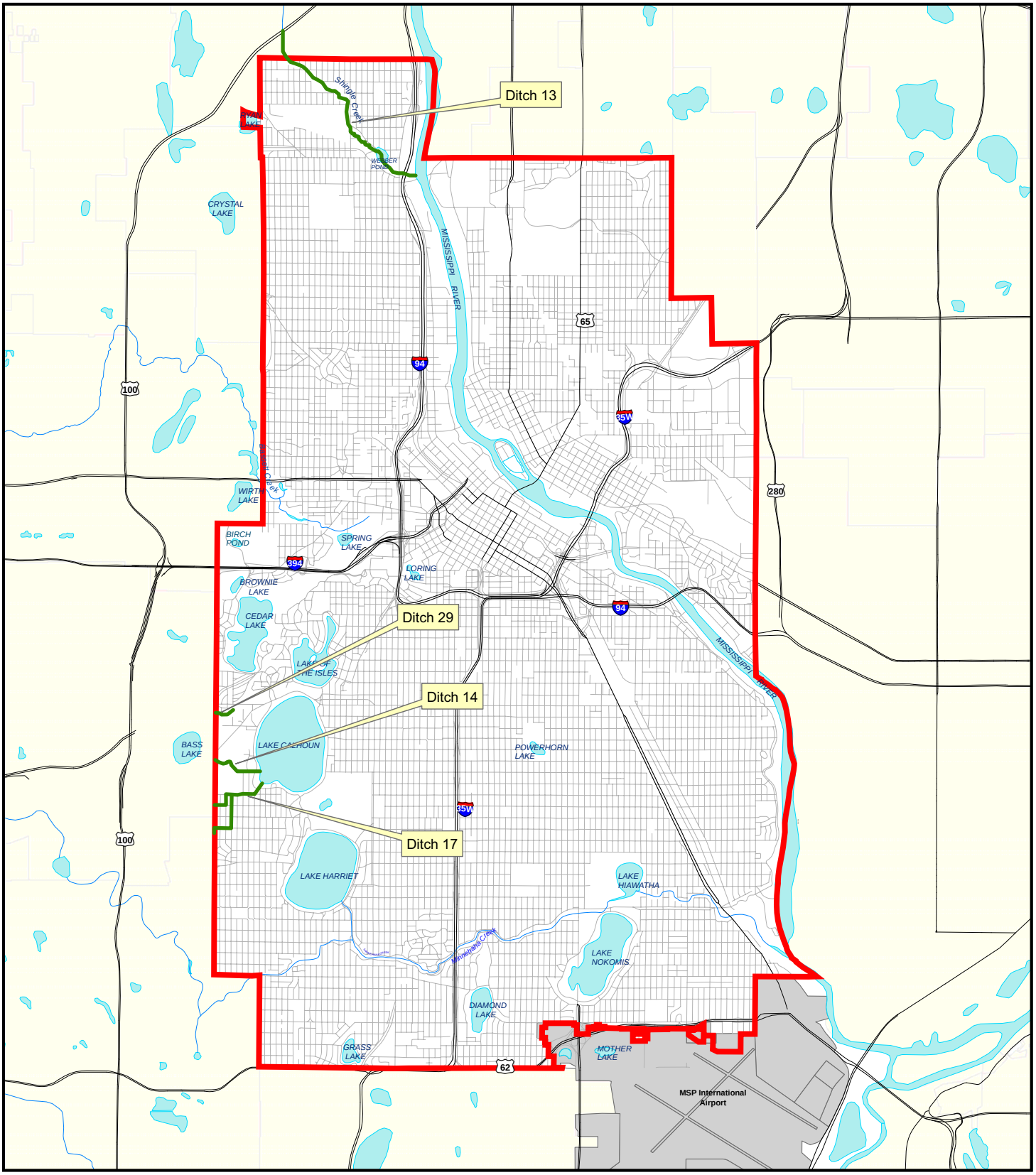
- **University of Minnesota** owns a surface drainage and deep tunnel storm drainage network that discharges directly to the Mississippi River. This system serves the original campus area of the University, primarily southeasterly of University Avenue and 15th Street SE. The newer campus areas drain to the Minneapolis system. As owner of a storm drainage system, the University of Minnesota is subject to MS4 permitting requirements of the USEPA stormwater regulations.

- **Minnesota Department of Transportation** owns surface drains and deep tunnels that serve the interstate highway system. Areas of the Minneapolis system drain into this MN/DOT system. The reverse is generally true for the Trunk Highway system, where the MN/DOT system drains into the Minneapolis system. This is a general description of the ownership for MN/DOT; exceptions should be researched on a case-by-case basis.

- **Hennepin County** is responsible for County Ditch 13 – which is also known as Shingle Creek. The section of Shingle Creek from the city border with Brooklyn Center to approximately Humboldt Ave N is designated as this county ditch (Figure 4-5). For purposes of water quality improvements considered in this LSWMP, this section is considered a public water. However, the Minnesota Department of Natural Resources does not have any jurisdiction to issue permits or otherwise approve any improvements. Permission to connect to or construct improvements along this ditch must be obtained from the County. As owner of the ditch, Hennepin County is subject to MS4 permitting requirements of the USEPA stormwater regulations.

- **Minnehaha Creek Watershed District** serves as the ditch authority for all county or judicial ditches that exist within the area of their jurisdiction. Ditches number 29, 14, and 17 all drain from the west into Lake Calhoun (Figure 4-5). Each of these has been constructed as an underground storm drain, and is interconnected with the Minneapolis system. As owner of these ditches, the MCWD is subject to MS4 permitting requirements of the USEPA stormwater regulations.

- **Bassett Creek Watershed Management Organization** shares the responsibility for the operation, maintenance and repair of the Bassett Creek tunnel system with the City and MN/DOT. Although Minneapolis owns both the old and new sections of the tunnel, Section 5.2.2.1 of the BCWMC 2004 Watershed Management Plan notes that BCWMC accepts responsibility for inspection, maintenance and repair of the new tunnel. This plan also requires that cities obtain approval from the BCWMC prior to altering the physical structure or altering the hydrology of the area tributary to the new tunnel.



City of Minneapolis

Ditches in Minneapolis

Local Surface Water Management Plan

Figure 4-5

N
W E
S

Miles

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Major Freeways/Highways
River/Stream
General City Boundary
Drainage Ditch
Lake

System Operation and Maintenance Activities

System Maintenance

Public Works Field Services Division, Sewer Maintenance Section routinely inspects and maintains the sanitary sewer and storm drainage systems as needed to ensure the system properly functions. Frequency of inspections and maintenance are often event-driven and based on experience and inspection results history. Sewer maintenance staff have developed a formal inspection, cleaning and repair schedule in response to NPDES Phase I requirements. The following periodic inspection and maintenance procedures are followed:

- Street maintenance staff annually inspect and clean basin grates on street sweeping routes during the summer.
- Catch basin and manhole castings are inspected, cleaned and replaced as necessary.
- Catch basin and manhole rings are inspected and replaced and/or regrouted as necessary.
- Catch basin and manhole structures are inspected and are repaired or replaced as needed. Pipe inverts, benches, steps (verifying integrity for safety), and walls are checked. Cracked, deteriorated, and spalled areas are grouted, patched, or replaced.
- Storm sewer piping is inspected either manually or by television to assess pipe condition. Items looked for include root damage, deteriorated joints, leaky joints, excessive spalling, and sediment buildup. The piping system is programmed for cleaning, repair, or replacement as needed to ensure the integrity of the system.

During summer street sweeping, City staff typically inspect and clean basin grates

Specific information on the annual maintenance activities for the stormwater drainage system is detailed in the City's NPDES Annual Report.

In 2000, the City and the MPRB created an inventory of the entire public infrastructure owned and managed by each. During subsequent negotiations, the City and the MPRB assumed either maintenance or ownership certain components of each others infrastructure. As part of this agreement, the MPRB transferred ownership of their entire stormwater drainage system to the City. Since that time, Public Works has increased inspection of these storm drains in order to create a current inventory, determine the condition, and determine the need for additional maintenance.

Storm Drain Catch Basins

The City maintains a storm drains spatial database to assist with planning.

To fully utilize storm sewer capacity, catch basins (also called inlet structures) are kept operational to allow runoff to easily flow into the underground storm drains. All efforts are made to keep catch basins and other inlets free of debris and sediments so as not to restrict flow and cause localized flood damage. Leaf and lawn litter are the most frequent cause of inlet obstructions. On a routine basis, City staff visually inspect catch basins to ensure they are operational.

Piping System

The City spends approximately $1 million each year rehabilitating and repairing sanitary sewers. CCTV inspections are used to select specific areas in need of lining. Rehabilitation is recommended where sewers are either structurally failing, have excessive infiltration of groundwater, or have excessive root intrusion. Inspections, rehab or repair of the storm drains are conducted on an as-needed basis.

Over the past several years the City has made an extensive effort to update its storm drains spatial database. Almost all of the storm drain system has been digitized with attribute information attached. Most recently the storm drain network newly transferred from the MPRB was incorporated into the database. This information will be used for lifecycle modeling and budget projections.

Open Channels and County Ditches

Open ditches and vegetated channels are a minor part of the Minneapolis stormwater drainage system. Vegetated channels are periodically inspected and maintained, as high flows can create erosion within the channels.

Pump Stations

Pump stations are periodically inspected and monitored based on performance factors and specified pump maintenance schedules. An annual check-up is conducted for each pump station.

Grit Chambers, Sump Manholes and Sump Catch Basins

Grit chambers, sump manholes and sump catch basins are included in storm drainage systems to collect sediments before they are transported to downstream water bodies. Once sediments are transported to a lake or pond, they become much more expensive to remove. Sediments originate primarily from road sanding operations, construction activity and soil erosion.

As of 2005, there are 127 grit chambers distributed across the City, with more being planned. These structures are designed to collect these sediments and are inspected at least once a year, and cleaned as necessary, to provide capacity for future sedimentation. Suction vacuum equipment is typically used to clean these grit chambers. Sediment quantity removed, floatable amounts, presence of oil, and date

cleaned are recorded and maintained in a database. Removed substances are screened for visual or olfactory indications of contamination. If contamination is suspected, the material is sent for analysis and subsequently disposed of appropriately.

Stormwater Basins

Stormwater flood control and water quality basins represent a sizable investment in City's drainage system. General maintenance of these facilities helps ensure proper performance and reduces the need for major repairs. Periodic inspections are performed to identify possible problems in and around the basin. Inspection and maintenance is conducted for basin outlets, basin inlets, side slopes and sediment buildup.

Basin Outlets

The City maintains stormwater basins by conducting the following activities:

- The area around outlets is kept free and clear of debris, litter, and heavy vegetation.
- Trash guards are installed and maintained over all outlets to prevent clogging of the downstream storm sewer. Trash guards are inspected at least once a year, typically in the spring, to remove debris that may clog the outlet. Problem areas are addressed more frequently, as required.
- Emergency overflow outlets are provided for all ponds when possible. These are kept clear of debris and other materials and properly protected against erosion.

Basin Inlets

Inspection and maintenance of basin inlets address the following:

- Inlets are inspected for erosion. Where erosion occurs near an inlet, energy dissipaters or riprap is installed.
- Inlets are inspected for sediment deposits, which can form at the inlets due to upstream erosion. Sediment deposits are removed to ensure that design capacities of storm drains entering the basin are maintained.

Vegetation keeps side slopes from eroding or depositing sedimentation into basins.

Side Slopes

Inspection and maintenance of basin side slopes address the following:

- Side slopes are kept well-vegetated to prevent erosion and sediment deposition into the basin. Severe erosion along side slopes can reduce the quality of water discharging from the basin and require dredging of sediments from the basin.
- Noxious weeds are periodically removed from around basins.

- Some basins in highly developed areas require mowing. If mowing is performed, a buffer strip of 20 feet or more adjacent to the normal water level is typically maintained. This provides filtration of runoff and provides wildlife habitat.

Sediment Buildup

Inspection and maintenance of sediment buildup in basins address the following:

- Basins are inspected to determine if sediment buildup is causing significant loss of storage capacity. Excessive sediment buildup significantly reduces the stormwater treatment efficiency of water quality ponds. Inspections occur after significant rainfalls.

- Sediment removal is performed where excessive sediment buildup has occurred. As a general guideline, ponds require dredging every 15 to 20 years.

Road Maintenance

According to regulations enacted by the USEPA, the gutters of urban streets are also considered part of the storm drainage system. Therefore, maintenance activities conducted for the roadways are integral to maintenance of the storm drainage and surface water systems.

Winter Street Management Practices

Minnesota receives an average of 40 inches of snow during a typical year. This requires a large amount of deicing chemicals (primarily salt) to be applied to roads and sidewalks each winter. Studies indicate that an estimated 80 percent of the environmental damage caused from de-icing chemicals is a result of improper storage and handling of the material (MPCA 1989). Improper storage and overuse of salt increases the risk of high chloride concentrations in runoff and groundwater. High chloride concentrations can be toxic to fish, wildlife, and vegetation.

The City owns a number of storage facilities designed according to MNDOT specifications for runoff control. All salt stockpiles are stored under cover at these locations, to minimize potential for groundwater contamination and runoff. Plans are underway to build a larger facility with better runoff collection systems in place.

The City will continue to use and improve the procedures it has established for efficient application of de-icing materials to reduce cost and minimize environmental damage. Good accounting of materials applied during a season is in place. Street conditions are assessed for each individual event and ice control material application is adjusted accordingly. Equipment is maintained in good working condition and is properly calibrated to prevent excessive application. Maintenance supervisors receive training at the Local Road Research Board.

The Shingle Creek Chloride TMDL study found that the primary source of chloride in the stream was from the use of deicing chemicals on impervious surfaces. The analysis in this study concluded that a 71 percent reduction in chloride use would be

necessary to reduce the chloride levels in Shingle Creek to water quality standards. The Shingle Creek Chloride TMDL Implementation Plan contains recommendations for member cities to implement:

- Incorporate chloride management BMPs into NPDES Stormwater Pollution Prevention Plans (SWPPP)
- Develop and maintain a salt management plan
- Create chloride reduction requirements for individual commercial properties seeking site plan approval
- Improve application equipment and decisions:
    - Calibrate spreaders annually
    - Use MN/DOT Road Weather Information System to improve application decisions
    - Evaluate new technologies such as pre-wetting and anti-icing on annual basis
    - Investigate and adopt new products where feasible and cost effective
- Maintain good housekeeping practices at storage sites
- Conduct annual training for supervisors and operators
- Stockpile snow away from sensitive areas
- Sweep streets as soon as possible in later winter
- Integrate chloride management BMPs into NPDES permit and annual report

The primary mission still remains to provide the best snow and ice control with the resources available. In response to the recommendations contained in the Shingle Creek Chloride TMDL Implementation Plan, the City of Minneapolis has started the process to change the equipment used in the Shingle Creek Watershed area of Minneapolis. Changes being considered are to transition from manually controlled sanding equipment to fully automated sanding equipment. This will give the City the ability to improve tracking of material use. It is believed that the use of the pre-wet system and ground speed control, will achieve a reduction of up to 30% of the materials used with little change in the level of service. With electronic tracking/data storage, the ability to most closely tailor response to the storm event will be possible as data is acquired and results of our efforts are analyzed. They have added anti-icing activities as a method to get ahead of the storm event and reduce the amount of material that may be needed to de-ice after the event.

Street sweeping reduces the volume of sediment that enters the drainage system and water bodies. Source: City of Minneapolis

Street Sweeping

Street sweeping is an integral part of the City's surface water management system. It greatly reduces the volume of sediment that has to be cleaned out of sump structures and downstream water bodies. The City will continue to practice a minimum of two sweeping operations a year, in spring and fall. All City streets are swept, aided by enforcement of temporary parking bans. Special methods are employed to address seasonal conditions and to optimize cleaning. Pressurized water is applied to push sediment and leaves to the gutters. Street sweepers follow and clean the gutters. Tandem sweeping takes place with air regenerative sweepers following mechanical sweepers. High traffic commercial areas and priority areas are swept more frequently.

In the fall, leaves are bunched into piles and picked up and sent to a composting facility for disposal. This greatly reduces inlet blockages and protects the water quality of downstream water bodies. Street sweeping and leaf litter pickup minimizes impacts to City surface waters from leaf litter, sand, salt and other debris.

Capital Improvement Activities

Design: Assessments and Standards

Water Quantity Assessment Standards

The City has initiated a practice of modeling the storm drainage system in coordination with developing a solution to a problem, such as street flooding. Often this modeling will lead to development of a capital improvement project. To ensure consistency of modeling efforts, the City created modeling guidance, which can be found in Appendix M.

Water Quantity and Water Quality Design Standards

The City of Minneapolis has developed standards for design, performance and management of its stormwater systems. The City intends this guidance to ensure that all hydrologic, hydraulic and water quality analyses will be prepared in a manner consistent with City requirements. Water quantity standards are intended to ensure the system is adequately sized for future flows, to prevent flooding and to ensure all design allows for economical maintenance. Hydrologic and hydraulic design standards are contained in the City's modeling guidance (Appendix M). In 2000, the City formally adopted the MPCA Manual Protecting Water Quality in Urban Areas, Best Management Practices for Minnesota, October, 1989, as design standards for stormwater best management practices. The recently released Minnesota Stormwater

Manual is being reviewed by Public Works staff for use as guidance on structural BMP design and maintenance procedures, including stormwater infiltration systems.

Capital Improvement Program (CIP)

Minneapolis invests in water resources management within the framework of its current capital and operating budgets of the City. Both are approved on an annual basis. Future CIP projects are listed, but are subject to considerable change. In any given year City departments may need to use water resources management funds to match a MNDOT project or to solve a new flooding problem or to implement a recommendation of a TMDL study. The City's annual CIP budget is developed in a very open process that starts with City department proposals which are reviewed in detail by a citizen's committee (CLIC – Capital Long Range Improvement Committee) and the Mayor. Finally, the City Council holds public hearings before final budget adoption. Creation of a more specific capital improvement budget is not feasible; it would not allow adjustments for new priorities, nor would it be able to adapt to citizen based priorities. Funding established in the City's 2006 Capital Improvement Program identifies all the water resources related projects anticipated by the City in 2006. Specific projects designated in the current 2006 – 2011 CIP are described in Section 5. The following pages detail the funding programs that have been established by the City.

The City has established funding for storm and tunnel reconstruction and rehabilitation, such as this project at Bassett Creek. (Source BCWMC).

Storm and Sanitary Tunnel and Sewer Rehabilitation

These funds are used to rehabilitate and repair storm drain tunnels, sanitary sewer tunnels, and sanitary sewers. The program establishes annual funding to permit repair and rehabilitation activities to be completed as needed to the storm drain and sanitary sewer system as prioritized by the Minneapolis Public Works Field Services Division.

The Public Works Department recently completed a comprehensive condition rating report (Tunnel Management Plan), which outlines identified deficiencies and repair priorities. Based on assessment completed to date on the storm drain tunnels, typical problems include voids above or below the tunnel structure, cracking due to pressurization, erosion of the tunnel floor, and infiltration of ground water. Currently the Public Works Department is conducting repairs on those most in danger of collapse or those for which failure has been identified such as the 2nd Avenue Storm

Tunnel and the Hennepin Avenue Storm Tunnel, (4th Street North Drift). The cost to repair these tunnels varies with the magnitude of the problems.

Miscellaneous Storm Drains

This program provides for infrastructure repairs or improvements to solve small drainage and flooding issues. Funds are utilized to create minor improvement to the storm drainage system, especially those improvements where it is unfeasible to wait for available capital improvement funding. Typical projects include minor improvements necessary to accommodate a redevelopment project, or minor repairs that need immediate attention.

Implementation of US EPA Stormwater Regulations

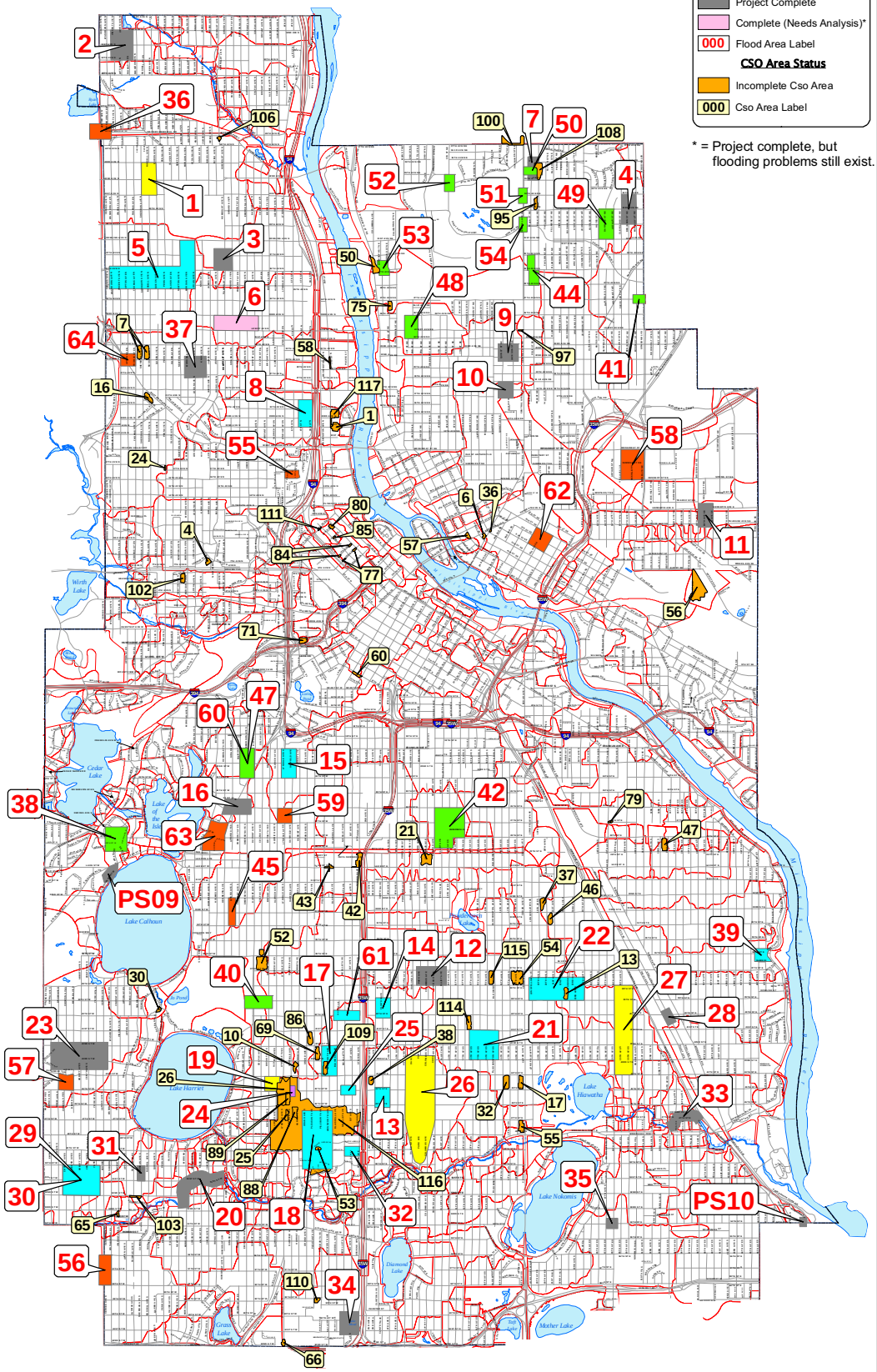
Funds from this program are used to implement structural BMPs. The programs are a combination of capital improvement projects, maintenance activities, ordinances, stormwater monitoring and public education which, in total, will improve the runoff being discharged to the lakes, and streams in the City of Minneapolis. The net benefit of the overall program is improved water quality in our receiving waters and compliance with US EPA regulations.

Combined Sewer Overflow Improvements

The primary focus of this program is to remove City-owned inflow of stormwater from the sanitary sewer system, and redirect this flow to the storm drain system. Originally established in the mid-1980s, these funds have been used to relocate street and alley drains from the sanitary sewers to the storm drainage system. To date over 99% of the projects have been completed. Project areas designated for future funding in this program are shown on Figure 4-6. In 2006, the City added City-owned buildings with roof drain inflow connections to the list of projects funded by this program.

Elimination of overflow events is mandated by a NPDES permit issued jointly to the City of Minneapolis and MCES. The current NPDES permit (expired in 2001) required elimination of CSOs within that permit's timeframe. The MPCA has communicated to staff at the City and MCES that a plan for elimination of CSOs must be submitted before a new permit can be issued. The City is currently following recommendations from a CSO study jointly conducted by the City and MCES, completed in April 2002. MCES approved the Minneapolis Tier II Comprehensive Sewer Plan on Jan. 29, 2003, which documents the City's implementation plan for CSO improvements based on this joint study. If the City fails to complete this commitment, the Met Council could withhold development funding to the City. In addition, failure to meet permit mandates could be subject the City to Clear Water Act, such as citizens' lawsuits with fines up to $25,000 per violation per day.

According to the 2002 joint study, this CSO program requires all components to be implemented to meet the goal of effectively eliminating Combined Sewer Overflows, except under extreme conditions. This includes the removal of both public and private stormwater inflows to the sanitary sewer system. In addition, the effectiveness



FA#	LOCATION	OUTFALL	STATUS
PS09	Excelsior Blvd & Lake Calhoun	04-170	Project Complete
PS10	Lyndale Ave S Storm Drain	10-720A	Project Complete
1	42nd Ave N & Russell Av N	20-210B	Under Construction
2	51st Ave N & Vincent Ave N	20-010	Project Complete
3	37th Ave N & Humboldt Ave N	10-110	Project Complete
4	33rd Ave NE and Benjamin St NE	10-100	Project Complete
5	Crystal Lake	63-010	Engineers Report Complete
6	33rd Ave N Storm Drain	10-120	Complete(Needs Analysis)
7	35th Ave NE and Polk St NE	10-130	Project Complete
8	3rd St N at 23rd Ave N	10-230	Engineers Report Complete
9	Holland Neighborhood Flood Basin	10-180	Project Complete
10	18th Ave NE & Quincy St NE	10-320	Project Complete
11	Talmage St & Hoover St NE	10-460G	Project Complete
12	37th & 38th St E & Columbus Av S	76-010	Project Complete
13	Clinton Ave S - 45th to 46 St E	70-330	Engineers Report Complete
14	Clinton Av E & 38th St E	10-430R	Engineers Report Complete
15	22nd St W & Garfield Av S	10-430J	Engineers Report Complete
16	Jefferson Elementary School	63-130	Project Complete
17	43rd St W & Wentworth Ave S	10-430J	Engineers Report Complete
18	50th St W & Washburn Ave S	10-430U	Engineers Report Complete
19	Aldrich Ave S & 44th St W	57-020	Under Construction
20	Minnehaha Creek - Humboldt to Newton Ave S	70-110, 120, 130, 145	Project Complete
21	Hiawatha Golf Course Flood Pond	76-010	Engineers Report Complete
22	Sibley Field	76-010	Engineers Report Complete
23	43rd St W & Abbott Ave S	04-080A/B/C	Project Complete
24	45th St W & Lyndale Ave S	10-430U	Design Complete
25	45th St W - Nicollet to 1st Ave S	10-430U	Engineers Report Complete
26	43rd St E & Park Av S	70-350	Under Construction
27	44th St E to 29th Ave S	70-475	Under Construction
28	40th St E and Snelling Ave S	57-100A/B	Project Complete
29	50th to 51st St W & York to Zenith Ave S	57-100	Engineers Report Complete
30	51st St W & Abbott Ave S	57-100	Engineers Report Complete
31	Sheridan Ave S - 50th to 51st St W	57-070	Project Complete
32	46th St E & Stevens Ave S	70-330	Engineers Report Complete
33	Minnehaha Creek - 34th to 38th Ave S	70-535,545,555	Project Complete
34	60th St W - Nicollet to Stevens Ave S	71-070	Project Complete
35	54th St E & 28th Ave S	10-720F	Project Complete
36	Victory Mem Pkwy & Xerxes Ave N	63-010	Problem Identified
37	29th & Logan Ave N	40-010	Project Complete
38	Dean Parkway	04-170	Preliminary H & H Analysis
39	46th Ave S - 36th to 37th St E	10-670	Engineers Report Complete
40	28th St W & Kings Highway	10-430T	Preliminary H & H Analysis
41	27th Ave NE & Stinson Blvd NE	10-440E	Preliminary H & H Analysis
42	Abbott Hospital - E 38th St & 19th Ave S	10-430Y	Preliminary H & H Analysis
44	29th Ave NE & Tyler St NE	3-100	Preliminary H & H Analysis
45	33rd St W & Girard Ave S	54-040	Problem Identified
47	22nd St W & Emerson Ave S	53-130	Preliminary H & H Analysis
48	Lowry Ave NE & 2nd St NE	10-190	Preliminary H & H Analysis
49	52nd Ave NE & Garfield Ave NE	0-100	Preliminary H & H Analysis
50	Polk St NE & Tyler St NE (Alley)	3-100	Preliminary H & H Analysis
51	54th Ave NE & Central Ave NE	3-100	Preliminary H & H Analysis
52	5th St NE & 35th St NE	10-100	Preliminary H & H Analysis
53	Randolph St NE & 29th Ave NE	10-100	Preliminary H & H Analysis
54	St. Anthony Pkwy. W of Central Ave	3-100	Preliminary H & H Analysis
55	Lyn Park Av & Lyn Park Lane N	10-430C	Problem Identified
56	Xerxes Av S & 37th St W	70-655	Problem Identified
57	Chowen Av S & 45th St W	54-080	Problem Identified
58	Summer St NE & Mckinley Pl S	10-450L	Problem Identified
59	Lyndale Ave S - 28th to 27th St W	10-430J	Problem Identified
60	8129 Emerson Ave S	53-120	Problem Identified
61	40th St E - Van Nest Ave to I-35W	10-430U	Engineers Report Complete
62	8th Ave SE & 7th St SE	10-450A	Problem Identified
63	28th St W & Humboldt Ave S	53-160	Problem Identified
64	Upton Ave N & 29th Ave N	40-101	Problem Identified

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CSO_ID	LOCATION	OUTFALL
1	4 CBs E of 2nd St N on 22nd Av N	10-220
4	2 CBs on Elwood Av & James Av N	40-240
6	CB N of 4th St SE btw Central Av & E Hennepin	10-350
7	CBs in 2 alley near Sheridan Av N & 29th Av N	40-010
10	CB in alley S of 43rd St btw Harriet & Garfield Av S	10-430J
13	CB in alley btw 22nd & Blaisdell Av S; 38th to 39th St E	76-010
16	CB in alley near Sheridan Av N & 24th Av N	40-010
17	CB in alley N of E 45th St, btw Cedar & 18th Av S	76-010
20	2 CBs on Oakland Av, N of Lake St E	10-830U
21	2 alley drains N of Lake St E, E & W of Columbus Av S	10-630U
24	CB at Penn Av N & 17th Av N	40-010
25	CB in alley btw Lyndale & Garfield Av S; 46th to 47th St W	10-430J
28	15 CBs at 45th St W & Lyndale, also E to Garfield Av S	10-430U
30	2 CBs at Queen Av S & Wm Berry Pkwy	54-060
32	CB in alley btw 16th & 17th Av S; 44th to E 45th St	76-010
36	CB at E Hennepin Av & Central Av NE	10-450A
37	CB in alley btw 19th & 20 Av S; 3 of E 32nd St	76-010
38	CB in alley S of 44th St E, btw 2nd & 3rd Av S	70-330
42	3 CBs & SD @ E Lake St & Stevens Av S	10-430M
43	2 CBs at Blaisdell Av & W Lake St	10-430M
46	CB in alley N of 34th St E, btw 26th & 21st Av	10-660
47	CB in alley N of 29th St E btw 33rd to 34th Av S	10-630C
50	2 CBs at Marshall St NE & 29th Av NE	10-100
52	2 alley CBs & 4 CBs - 36th to 37th St W, Bryant to Dupont Av S	10-430V
53	CB in alley near 49th St W btw Pleasant & Rustic Lodge Av	70-330
54	2 alley CBs, 4 CBs W of 18th to Cedar Av S, 37th to 38th St E	76-010
56	CB in alley N of E Minnehaha Pkwy btw 18th & Cedar Av S	72-130
58	4 CBs & SD on 24th Av SE, S of Elm St SE	10-460Q
57	CB on University Av NE btw 1st Av NE & Hennepin Av E	40-350
58	CB at 2nd St N & 26th Av N	10-130
59	2 CBs S of E Lake St, on 15th Av S	10-430Q
60	CB on 12th St S @ Nicollet Mall	10-410E
65	CB on Vincent Av S & Brookwood Terrace	70-050
68	2 CBs on Lyndale Av S, N of Crosstown Hwy 62	71-070
69	CB in alley N of 43rd St W, btw Pillsbury & Pleasant Av S	10-430U
71	2 CBs at Linden Av & 16th St N, also CB in pkg lot	41-020
75	2 CBs on Grand St NE, 26th to 27th Av NE	10-030
77	CBs on 6th Av N, btw 4th St N & Washington Av N	40-340
79	2 CBs at 27th Av S & E 27th St	10-630L
80	CB on 6th Av N, Washington Av N to 3rd St N	40-360
84	2 pairs of CBs on 7th Av N, Washington Av N to 4th St N	40-340
85	2 CBs on 8th Av N, Washington Av N to 3rd St N	40-360
86	CB in alley N of 42nd St W, btw Grand & Pleasant Av S	10-430T
87	Sewer trunk line near Morgan Av S & Laurel Av W	40-140
88	CB in alley S of 46th St W, btw Garfield to Harriet Av S	10-430U
89	CB in alley N of 46th St W, btw Lyndale & Garfield Av S	10-430U
95	CB in alley N of 33rd Av NE, btw Tyler & Polk St NE	10-100
97	CB on Lowry St NE, btw Jackson and Central Av NE	10-450J
100	4 CBs at 37th Av NE & Van Buren St NE	10-100
102	CB in alley N of 5th Av N, btw Newton & Morgan Av N	40-220
103	CB at Upton Av S & W 52nd St	57-010
106	2 CBs at Humboldt Av N & 45th Av N	20-210A
108	Emergency overflow at 38th Av NE & Polk St NE	10-100
109	CB in alley S of 43rd St W, btw Pillsbury & Wentworth Av	10-430U
110	CB in alley N of Pleasant Av btw 59th & 59+1/2 St W	71-070
111	CB on S side of 10th Av N, 3rd to 4th St N	40-330
114	CB in alley N of 41st St E, btw 13th & 14th Av S	76-010
115	CB in alley N of 38th St E, btw 15th & Bloomington Av S	76-010
116	Temporary connections of E 47th St & Stevens Ave S	70-330
117	5 CBs on E side of 2nd St N & 23rd Av N	10-230

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City of Minneapolis

Flood Areas and Future CSO Projects

Local Surface Water Management Plan

Figure 4-6

of ongoing property inspections to identify and remove illegal connections to sanitary sewers will be reduced if supporting capital improvement projects are not funded. CIP projects will be needed to provide additional storm drains for redirected stormwater connections, or add capacity to prevent flooding.

Flood Mitigation and Alternative Stormwater Management Strategies

The City established the Flood Mitigation Program in response to severe building flooding that occurred in the summer of 1997. In a report titled *Flood '97*, the Department of Public Works identified 39 areas of flooding that could be mitigated through improvements to the storm drainage system. Five areas were identified with the worst recurring flooding and immediate funding was established to purchase the houses and relocate the residents, in preparation for construction of stormwater holding basins or ponds. The logic of starting the program with property acquisition was based on the principle of removing residents from the harm of future flooding, if a severe storm occurred before the future basins were in-place.

The program included construction of six stormwater retention basins (or ponds) plus 20 major storm drain construction projects. Originally the scope of the program was to spend $63 million over nine years (1998 through 2006). The City has taken specific steps to incorporate flood mitigation in the annual capital improvement program. Several flood mitigation projects were proposed in 2004 to the Capital Long-Range Improvement Committee (CLIC). CLIC is a committee comprised of citizens and business people that consider the projects proposed for the City's Five Year Capital Improvement Program. In reviewing the flood mitigation program proposals for the 2005-2009 in July, 2004, the committee noted that the mitigation program "represent a large capital expenditure for perhaps a relatively small number of homes" and made the recommendation that the "City take a "big picture" look at gradually returning many of these (flooded) home sites to their earlier nature, as wetlands, natural holding ponds and parklands." As a result of that direction, no other flood area mitigation projects have been submitted. Flood control measures are now programmed under a new activity, Alternative Storm Water Management Strategies.

Regulatory Activities

CSO Program

The NPDES CSO permit (Appendix K) mandates that Minneapolis and MCES submit an annual report to the MPCA on the City's CSO program. The program's current goal is to eliminate CSOs at the eight remaining regulator sites in the city or at a minimum to meet or exceed the EPA's current sewer overflow policy. The annual report summarizes yearly rainleader disconnection activities and sewer separation work. The report also details maintenance activities; sewer cleaning, storm drain inspections, and grit chamber inspections.

As part of The Minneapolis Plan approved by the MCES, the City entered into a Memorandum of Understanding that included both parties funding a CSO evaluation study. Accordingly, the City and the Met Council jointly hired a consultant to study the sanitary sewer system in order to determine the source of clean water draining into the system. This extraneous water is the cause of ongoing overflows of untreated sewage mixed with stormwater to the Mississippi River during severe rainstorms called "Combined Sewer Overflows." The study concluded that multiple actions are necessary to further reduce the occurrence of CSOs. Even with 100% removal of inflow sources, CSOs would still occur. Recommendations include a combination of inflow reduction, regulator modifications, and in-line storage.

The City instituted a program to reduce stormwater inflow through redirection of rooftop rainleaders to side yards and storm drains.

The City has responded to these recommendations with a program to remove both public and private sources of stormwater inflow to the sanitary sewer system. A new ordinance was approved effective Aug, 1, 2003: Chapter 56, Prohibited Discharges to Sanitary Sewer System. It requires property owners to redirect rooftop rainleaders and private surface area drainage either to side yards or to the public storm drain system. Property inspections are being conducted to identify illegal connections to sanitary sewers, and then notifications are sent of the work needed to comply with the new ordinance. This CIP program funds the addition of storm drains where not available for storm connections, and separation of current storm connections from the sanitary sewer.

Stormwater Management Program

The NPDES Stormwater Permit (Appendix L) mandates that the City submit an annual stormwater management program report by June 1 of each year. The Minneapolis Stormwater Management Program and Report summarizes system maintenance during the previous year, identifies areas for program improvement, defines responsibilities of various City departments, and defines a work plan through the next year.

Standards for Stormwater Management for New Construction

The City of Minneapolis and the Minneapolis Park and Recreation Board have adopted ordinances that influence stormwater management for new construction projects (see Sect ion 1, Introduction). Specific ordinances and the departments responsible for oversight are listed in Section 1 of this LSWMP. New construction projects that propose to alter wetlands must comply with provisions of the Minnesota Wetland Conservation Act. The City of Minneapolis, Department of Public Works, is designated as the Local Government Unit by the Minnesota Board of Soil and Water Resources. As LGU the City is responsible for ensuring the provisions of the WCA are implemented in Minneapolis.

Stormwater management requirements established by Minneapolis overlap with the standards established by the watershed district/organizations with jurisdiction in the

City. These also overlap with stormwater management requirements set by the Minnesota Pollution Control Agency in their General Permit for Construction Activities. Table 4-5 cross-references the minimum sized site that is required to meet specific activities (erosion control, rate control, stormwater infiltration, floodplain management, water quality management, buffer strips and wetland conservation) for each of these organizations. Areas in the table that are highlighted note the most restrictive requirement for each activity. In most circumstances, the Minneapolis requirements apply to the smallest sites and therefore are the most comprehensive.

Illicit Dumping and Illegal Discharges into the Storm Sewer System

The Regulatory Services Environmental Management Division of the City provides education and regulation for unauthorized and non-stormwater discharges in the storm drains. The current system is complaint-based inspection and investigation.

The City's NPDES Stormwater Permit requires that 20% of the City's outfalls are inspected annually on a rotating basis. The locations of all existing major outfalls are identified in the field and indicated on the City's storm drain base map. If dry weather flows are detected and illicit connections could be the source of the flow, a grab sample is collected for analysis to determine if pollutants are present. Inspectors work with Public Works Field Services to discover the source of the illicit flows.

The Mississippi Watershed Management Organization (MWMO) and the City of Minneapolis Environmental Services are developing a cohesive water monitoring program that will identify a series of baseline chemical, physical and biological parameters discharging from a watershed-wide storm drainage system (primarily through outfall monitoring) that is also designed to detect illicit discharges entering into water bodies in the City. The sample results will track the water quality changes at the outfalls identifying points of potential illegal discharges, sewer cross connections, an assessment of outfalls and their drainage areas for non-point source pollutants.

Typically, storm water flows to area catch basins which are typically located on city streets. From the catch basins the storm water flows through underground pipes and discharges through outfalls to the lakes, streams or the Mississippi River in Minneapolis. There are over 105 storm drain outfalls on the Mississippi River within the City limits alone. The sampling and monitoring effort is currently focusing on those outfalls and drainage areas to the Mississippi River.

Illicit discharges include both intentional dumping of wastes and accidental spills of chemicals/liquids in the City's storm drain system. Intentional discharges would include dumping of oil/paint or other regulated wastes into catch basins. Motor vehicle collisions and electrical transformer overloads are examples of accidental releases that enter area storm drains. The result is untreated waste and hazardous materials that contribute to high levels of pollutants, including heavy metals, toxics and solvents. Environmental Services is responsible for illicit discharge detection and

Table 4-5. Comparison of Minimum Size Sites	Minneapolis	BCWMC	MCWD	MWMO	SCWMC	MPCA
Erosion Control						
Minimum site area	5000 sf	10000 sf	5000 sf	adopts requirements of member cities	15 ac[a]	1 ac
Minimum volume of stockpile or grading	500 cy	200 cy	50 cy		5ac[b]	
Other triggers for water management requirements					▪ within floodplain ▪ adj to waterbody	
Rate Control						
Minimum site area: single family subdivision - new	1 acre	required for all sites tributary to culvert or tunnel - no minimum site area	8 acres	adopts requirements of member cities	required for all projects requiring project review	required for all projects which create 1 acre of new impervious surface
Minimum site area: multi family subdivision	1 acre		5 acres			
Minimum site area: commercial/industrial/institutional	1acre		0.5 acre			
Minimum site area: roads/streets/highways w/o added imp. surface	exempt		none			
Minimum site area: roads/streets/highways w/ 1 ac. added imp. surface	all projects		all projects			
Stormwater Infiltration						
Minimum site area: single family subdivision - new					required for all projects requiring project review	
Minimum site area: multi family subdivision						
Minimum site area: commercial/industrial/institutional						
Minimum site area: roads/streets/highways w/o added imp. surface						
Minimum site area: roads/streets/highways w/ 1 ac. added imp. surface						
Floodplain alteration						
Floodway alteration	prohibited			adopts requirements of member cities		
Floodfringe alteration - permit required for fill	25 cy					
Floodfringe alteration - other	permit required					
Floodplain alteration	n.a.	permit required	permit required		permit required	
Water Quality						
Minimum site area: single family subdivision	1 acre	2 acres[c]	20 acres	adopts requirements of member cities	required for all projects requiring project review	required for all projects which create 1 acre of new impervious surface
Minimum site area: multi family subdivision	1 acre	2 acres[c]	8 acres			
Minimum site area - residential redevelopment	1 acre	10 acres[cd]				
Minimum site area: commercial/industrial/institutional	1 acre	0.5 acre	8 acres			
Minimum site area - commercial/industrial/institutional redevelopment	1 acre	5 acres[d]				
Minimum site area: roads/streets/highways w/o added imp. surface	exempt	1 acre	none			
Minimum site area: roads/streets/highways w/ 1 ac. added imp. surface	1 acre	1 acre	5 acres			
Buffer strips						
Buffer required for sites adjacent to wetlands and water bodies			required		required	
Wetland						
Minimum site area for wetland alteration	no minimum	not LGU	not LGU	not LGU	not LGU	

[a] single family residential

[b] all other land uses

[c] and must contain 4 or more proposed units

[d] all redevelopment projects in BCWMC must meet non-degradation requirement (no increase in phosphorus load) for all projects that increase impervious surface

highlight represents most restrictive requirement

elimination by City Ordinance. Activities include development of baseline information, identification of problem areas, investigation and determination of sources, documentation and requiring corrective action.

Additional efforts to eliminate illicit discharges to the sanitary sewers include public education, and direct response to notifications received from the community, other city departments and government agencies. At the present time Environmental Services addresses complaints of materials being discharged to the Minneapolis storm drainage system whether they are permitted discharges or not. Environmental Services also reviews compliance with NPDES, SDS, and general storm water permit requirements for businesses as needed. Staffing and priorities are being reviewed as part of the Regulatory Services Business Plan and the Minneapolis Sustainability Plan for conducting regular facility inspections which can include site inspection, review and compliance with MPCA and MCES permits (air, NPDES, and industrial permit), TRI efforts, and the businesses spill response and prevention plan and mechanical integrity plan.

Emergency Preparedness

Spill Response

The City of Minneapolis has a written statement of policies and procedures to be followed in the event of a spill. Both the MPCA Duty Officer and the Minnesota Department of Public Safety are informed of the spill if it exceeds a specified volumetric threshold. First responders to emergency spills are typically environmental management and/or fire department personnel. Measures are taken for spill containment, source elimination and recovery. After the event, the sewers are completely serviced; street maintenance and/or environmental management staff coordinate the final clean up and disposal. Environmental and others continue to be involved in site monitoring. The event is concluded with a follow-up as to how the event occurred and what measures need to be taken to prevent future incidences.

Flood Response

In the event of a flood, the City is prepared to follow the City's Emergency Plan.

Rainleader Inspections

Minneapolis is in the process of separating sanitary sewers from storm drains. This separation effort works to reduce the number of combined sewer overflows. It has been determined that a major source of clear water in the sewer system comes from rainleaders, which are connected to the sewers. The added flow from rooftop connections can significantly contribute to the occurrence of overflows of the sewer system.

The City has passed an ordinance (Title 3, Chapter 56), which requires property owners to disconnect rainleaders connected to the sanitary sewer system. The rainleader ordinance gives the City authority to identify sources of prohibited stormwater discharge to the sanitary system by performing property inspections.

If a prohibited stormwater discharge is identified, property owners will receive a disconnection notice. The notice will give the property owner a deadline to complete the disconnection work. Property owners can request a time extension to the deadline by filing a request form and paying a processing fee. If the prohibited stormwater discharge is not disconnected by the deadline, the property owner must pay a fine up to $700, face imprisonment, and/or have any City licenses revoked.

Education

Education plays an important role in any effort to implement a stormwater management program. The objectives of an education effort differ based on the target audience. In general, the target audiences include policy makers, City staff, residents, businesses and the development community.

Policy Makers

Ultimately, the important stormwater management decisions are made by the City's policy makers like the City Council and Park and Recreation Board. The sheer volume of decisions the Council and Board make means that stormwater information must be presented clearly and consistently.

City Staff

City and Minneapolis Park and Recreation Board staff have a wide range of responsibilities in the implementation of the LSWMP are trained to have a basic understanding of water resources management, including:

- A description of the major stormwater management issues (including known stormwater management problem areas, stormwater management expectations for new and redevelopment projects, incorporation of stormwater mitigation into capital improvement projects, and regulatory jurisdiction).
- The objectives of the LSWMP, and the general approach outlined in the LSWMP for resolution of outstanding issues.
- The responsibilities of the different work units in implementing the LSWMP.

Public

Successful management of the City's surface waters requires positive support and action from the public. In order to engage City residents and gain their active support and participation it is vital to inform City residents about basic stormwater management issues, flood mitigation and water quality concepts, and policies and recommendations in the LSWMP.

The City of Minneapolis keeps its residents informed through its web page. Information is provided on specific projects, and periodic updates on the progress of the listed projects are made available. Press releases to local papers and journals are

also good methods by which this information is disseminated. Public meetings are held to invite public input on certain issues.

Starting in 2006, the Department of Public Works will begin an education program that focuses on partnering with the Minneapolis Blooms Program, the Committee on Urban Environment (CUE), Friends of the Mississippi River, the Green Institute, and the Minneapolis Park and Recreation Board (MPRB) for its Stormwater Education and Outreach Program. The following is a summary of those partnering efforts:

- The Minneapolis Park and Recreation Board: MPRB naturalist staff provides stormwater information at neighborhood events, park events, local festivals and parades, and outdoor concerts.

- Minneapolis Blooms Program: Rain Garden Workshops, including workshop facilitation, rainwater garden design, program funding, facilities for the rainwater garden events, and providing stormwater education. The MWMO has provided funding for this program since 2003.

- Friends of the Mississippi River coordinate the City's Catch Basin Stenciling Program. Volunteers stencil storm drains, distribute education door hangers to residences and business in the stenciled neighborhoods, provide classroom visits, and reach out to non-English speaking communities with multilingual materials. Water quality education programs and materials would target non-English speaking households. MWMO contributes funding.

- The city-wide storm drain stenciling program was implemented by the City of Minneapolis in 1995. At that time, volunteer activities were coordinated by the League of Women Voters through an annual contract with the City. Later, the City contracted the volunteer coordination to the Friends of the Mississippi River. Volunteers stencil storm drains and distribute door hangers to residences and businesses in the stenciled neighborhoods. In 2004, the MWMO provided partial funding for activities in the MWMO jurisdictional area.

- The City of Minneapolis and the MWMO jointly fund a program to increase water awareness and education in multicultural communities. The program is coordinated by the City's Office of Multicultural Affairs. In 2006 the program initiated an assessment and planning for education in the Hmong community.

- The "Water down the Drain Interactive Multimedia Kiosk" was initiated by the MCWD in partnership with the City, MPRB, MWMO, and Hamline University College for Global Education. The kiosk is a stand-alone, self-directed education tool with modules in English, Spanish, or Hmong that helps users understand the urban water cycle.

- The Green Institute coordinates Stormwater Education pilot projects that would target both business and neighborhood organizations.

Public Engagement

When implementing a new activity or developing a capital improvement project the City of Minneapolis actively seeks to engage the public in the process of decision making. The City of Minneapolis is committed to incorporating community engagement activities into decision making for all activities undertaken by City departments. To standardize the process and to manage the expectations of citizens, The City of Minneapolis Communications Department prepared a guidebook for use by all departments.

Coordination with Other Government Agencies

The City of Minneapolis goals and policies outlined in this LSWMP are consistent with those of the City's four watershed district/organizations.

The City takes the lead in infrastructure management and construction.

At present, the City of Minneapolis is not proposing any change in the current system of approvals and permits necessary for land disturbing activities in the City. Table 2.2 in Section 2 (Goals and Policies) outlines the regulatory responsibilities of the City, four watersheds, and the MPRB. This Plan's impact on other units of government will be to foster more collaborative efforts—where each entity does what it does best without another entity duplicating those efforts. In this vein, the City will assume the lead in infrastructure management and construction; MPRB the lead in water quality monitoring, and management of park lands; and the watersheds the lead in water quality implementation and assessment.

The LSWMP envisions the City of Minneapolis and its watershed management organizations continuing to:

- Perform a joint review of construction projects before permits are issued
- Review and approve any new outfalls (where stormwater is emptied into surface water)
- Cooperate to enforce regulations and ordinances, including erosion control, stormwater management and floodplain alteration
- Share the costs for constructing regional water quality controls that use Best Management Practices (BMPs)

Watershed management district/ organizations help coordinate the efforts of multiple agencies.

Hennepin County has jurisdiction over 83.5 miles of roads within Minneapolis. In the past, the City and County have worked together to identify retrofitting opportunities on County road projects. Lake Street is a recent example of this cooperation, where the project will include installation of water quality devices.

The Minnesota Department of Transportation (MNDOT), with jurisdiction over 46.3 miles of the roadway within the City, is frequently involved in cooperative agreements with Minneapolis for construction of new stormwater facilities—particularly new storm drains. While MNDOT and the City maintain separate storm drain systems, runoff water from each travels into the other's system—necessitating a high level of coordination.

Drainage does not conform to municipal boundaries, which is the primary reason watershed districts were created. The City of Minneapolis cooperates with and coordinates efforts with neighboring cities when managing common drainage areas. Most coordination is accomplished through the structure of the watershed management organizations, though some cooperative projects have been accomplished outside of this structure, including:

- Establishing responsibilities for mutually agreed upon BMPs protecting common surface waters by adopting cooperative agreements
- Monitoring water quality for common receiving waters
- Working together to fund and complete water quality projects

The City of Minneapolis and MCES cooperate on the CSO program, controlling private discharges to the storm and sanitary systems and billing for sewer service. These cooperative efforts will continue.

Existing Assessment Studies

Condition and Capacity Assessments

Deep Tunnel System

In early 2004, the City completed its Storm Tunnel System Management Plan. Creation of the Management Plan involved the inspection of approximately 14.7 miles of City-owned deep storm tunnels to determine their structural condition. Each tunnel's structural condition is the primary factor used to determine whether a tunnel can continue to function as originally intended. This survey did not include the non-City owned tunnels nor the Basset Creek Tunnel, which is inspected as a culvert by bridge inspectors.

In addition to conducting the inspections and evaluating tunnel condition, hydrologic and hydraulic modeling was performed to determine the hydraulic loading to each tunnel system. The modeling used a simulated 100-year, 24-hour, 6-inch rainfall event over the area tributary to each tunnel system. The results were evaluated and correlated to structural conditions encountered in the inspections.

The hydraulic analysis showed that the majority of tunnels operate under surcharge. Based on this hydrologic and hydraulic analysis, it was determined that only four of the tunnel systems operate with no surcharge for the 100-year event. These four

tunnel systems operate without surcharge because they are relatively short, have large cross sections, and serve small drainage areas. The rest of the tunnel systems pressurize for the 100-year event. The effect this has on individual tunnels varies and depends on the tunnel's structural condition.

By linking hydraulic results with structural conditions and action levels, the overall condition of each of the tunnel systems is determined. The tunnel systems that need the most maintenance and rehabilitation are the 10th Avenue Southeast, St. Mary's, and East 38th Street tunnel systems.

Stormwater Monitoring and Calibration Project

In 2003, the City hired Bonestroo, Rosene, Anderlik & Associates to install flow monitors in three areas of the City to collect volume and water quality during peak flows. The monitored areas had already been modeled by the City for flood mitigation projects, therefore modeled results and monitored data could be compared. The purpose of making these comparisons is to determine standard hydraulic and hydrologic modeling parameters for use in future citywide modeling efforts.

Monitoring was performed to assist in calibration of stormwater models. (Source MPRB)

The calibration report concluded that additional flow monitoring is needed before modeling parameters can be determined. General recommendations included:

1. Use subcatchment width and slope to obtain the desired time of concentration and thus peak flow off the drainage area. Given that the citywide modeling will consistently use drainage areas as small as two to five acres, reasonable variations in width and slope will not have a dramatic effect on the timing and magnitude of drainage area flow peaks.

2. Runoff volume should be calibrated using impervious percentage first, then other parameters later. In all cases, a review of aerial photographs is required to determine the total percent impervious. From this, the connected portion can be calculated from some assumptions outlined in the calibration report.

3. Green-Ampt equations are the recommended method for calibrating infiltration on the pervious portion of the drainage. The calibration report is based on monitoring data from 2003. The scarcity of large events that season meant limited occasions where runoff was actually generated off the pervious surface. For this reason it was not possible to calibrate Green-Ampt parameters to the actual data.

In lieu of a calibration, a sensitivity analysis was prepared to illustrate the relative impact of each of the three Green-Ampt parameters.

4. Depression storage and catch basin inlet capacity are two parameters that also affect flow and volume. Depression storage, both off the pervious and impervious surfaces, helps determine how much runoff is intercepted before it can become runoff. In this way it affects volume calculations. It also affects peak flow calculations to a lesser degree. Catch basin inlet capacity can affect both volume and peak. If the inlet capacity causes bypass of the catch basin and flow into another drainage area then the inlet capacity will affect flow volume. If the inlet capacity does not cause discharge into another drainage area, the limit on the amount of water that can enter the pipe system will strongly affect the peak flow in that system.

SWMM Calibration and Standards Study

In August through October, 2004, SRF Engineering monitored pipe flow and water quality data and rainfall in an area of south Minneapolis as part of a modeling calibration study conducted for the City. Information was used to study the I-35W tunnel, calibrate hydrologic and hydraulic parameters, and calibrate water quality parameters. One goal is to establish standards for future modeling efforts in the City such that all models can eventually be integrated together. This will result in a higher level of model accuracy and greater confidence in the results. One product of this effort was a *Development Manual for SWMM Users* that is contained in Appendix M.

Section 5
Planning and Implementation

Overview

The City of Minneapolis has well established programs that have been created to protect, maintain and improve surface water quality. The intent of the implementation plan in this LSWMP is to continue these programs and to supplement with additional activities, as needed, to fill gaps identified for each program.

Additional Activities Needed to Meet Water Resources Goals

Minneapolis water resources management activities were compared against current City goals, watershed district/organization requirements, and other regulatory mandates to identify additional activities necessary to maintain or improve the quality of Minneapolis surface waters. Generally, the existing City programs exceed, fully meet, or partially meet existing regulatory requirements. Some programs are in need of additional activities to make the programs fully consistent with requirements. City staff identified service gaps and additional activities that will help meet existing and impending regulatory demands and meet the City's water resources management goals. The details of this analysis are summarized in detail in Appendix N. Additional activities which will supplement the City's water resources management activities and help to meet the City's long-term goals of sustainable water resources are identified and described in the following pages. A schedule to implement these activities is contained in Table 5-1.

Protect People, Property and the Environment (Guiding Principle #1)

Construct improvements to sanitary sewers and storm drainage systems that provide protection

1. Implement capital improvement projects which create integrated solutions to multiple wet weather problems of excessive infiltration, inflow, flood mitigation and/or stormwater quality. Evaluate green initiative techniques for stormwater runoff volume control as alternative to flood mitigation projects recommended in Flood '97 report.

2. Update prioritization system for capital improvement projects that incorporates life-cycle considerations, multiple objectives, and cooperating partnerships.

3. Expand existing hydraulic and water quality models, including tunnel model and MCWD H&H model to create predictable backbone model that establishes baseline flow rates, and is linked to sanitary model. Model should be able to be expanded to assess impact of specific proposed improvement, and measure baseline stormwater volumes for sustainability targets.

4. Work with BCWMC and MCWD to resolve differences between Minneapolis Floodplain Ordinance and watershed rules.

5. Accelerate program to inspect for and remove rainleader and foundation drain connections to sanitary sewers to meet requirements of MCES I/I Surcharge Program.

6. Investigate feasibility of redesign or limiting access to manholes subject to frequent surcharging during storm events that exceed design capacity of storm drain.

Maintain and Enhance Infrastructure (Guiding Principle #2)

Maintain condition of sanitary sewer and storm drainage systems

1. Expand sanitary sewer preventive maintenance inspections to storm drainage system. Consider inspection schedules recommended in 2005 Minnesota Stormwater Manual.

2. Increase length of sanitary sewers that are visually inspected to locate areas of excessive infiltration in order to meet requirements of MCES I/I Surcharge Program.

3. Renegotiate and amend cooperative agreements between Minneapolis, MN/DOT and BCWMC that govern the operation, maintenance and repair of Bassett Creek Tunnel and Culvert to be consistent with current policies of BCWMC.

Maintain capacity of sanitary sewer and storm drainage systems

1. Expand existing hydraulic and water quality models, including tunnel model and MCWD H&H model to create predictable backbone model that establishes baseline flow rates, and is linked to sanitary model. Model should be able to be expanded to assess impact of specific proposed improvement, and measure baseline stormwater volumes for sustainability targets.

2. Define allowable emergency CSO overflow conditions for renewal of NPDES CSO Permit.

3. Investigate use of in-line storage in sanitary sewers to minimize overflows.

4. Continue to assess opportunities to remove excessive infiltration and inflow from sanitary sewers.

5. Institute CMOM (Capacity Management Operation and Maintenance) practices as basis of asset management system.

6. Measure actual stormwater outflow at selected outfalls to determine if sustainability goals are being met.

7. Fully investigate impacts on stormwater drainage system prior to disconnection of inflow sources from sanitary sewers.

8. Investigate techniques and policies to decrease area of impervious surfaces in public construction projects.

9. Formalize design parameters for stormwater infiltration systems.

10. Investigate methods to incorporate stormwater runoff volume controls into Minneapolis Code of Ordinances, Chapter 54 (Stormwater Management) and Title 20 (Minneapolis Zoning Code).

Provide Cost-Effective Services in a Sustainable Manner (Guiding Principle #3)

Optimize enhancements to sanitary sewer and storm drainage systems

1. Implement capital improvement projects that create integrated solutions to multiple wet weather problems of excessive infiltration, inflow, flood mitigation and/or stormwater quality.

2. Update prioritization system for capital improvement projects that incorporates life-cycle considerations, multiple objectives, and cooperating partnerships.

3. Create unified City-wide stormwater runoff hydraulic and water quality design standards that meet regulatory requirements. Work with watersheds, other public agencies, and private property representatives to resolve conflicting standards.

Meet or Surpass Regulatory Requirements (Guiding Principle #4)

Operate and maintain public lands consistent with Best Current Practices and City's NPDES permits

1. Continue funding for removal of inflow sources from public properties.

Staff training on efficient use of snow management practices (Source: Minneapolis Public Works).

2. Investigate whether existing street maintenance practices comply with recommendations of TMDL implementation studies, including the Shingle Creek Chloride TMDL Implementation Plan.

3. Expand sweeping program to include public owned parking lots and parking ramps.

4. Continue to train staff on best current practices such as construction site erosion control and lawn care management.

5. Apply unified stormwater hydraulic and water

quality design standards, erosion and sediment control requirements and stormwater management requirements to all public projects.

6. Use City funds to leverage stormwater BMP improvements on non-City public projects, including Minneapolis School Board & Library Board properties.

Provide ongoing assessments of sanitary sewer and storm drainage systems

1. Create a clearinghouse for all assessment studies conducted in City, including TMDL, lake, stormwater, CSO, and stream monitoring efforts.

2. Establish coordinator as central contact point for all Minneapolis based TMDL projects and other monitoring studies.

3. Consider revisions to water quality standards for new construction projects (Minneapolis City Council Resolution 2000R-042) after new water quality standards are formally approved by a watershed district/organization or after TMDL implementation plans are formally approved.

Implement effective water quality improvement programs

1. Negotiate implementation of TMDL based projects in a manner that is consistent with City goals and objectives.

Enforce required rules and regulations

1. Work with MPCA to negotiate NPDES permits that are consistent with City goals and objectives.

Educate and Engage the Public and Stakeholders (Guiding Principle #5)

Enhance quality and minimize quantity of runoff from redevelopment sites

Stormwater Filtration System on First Street North (Source: Minnesota Stormwater Manual).

1. Require disconnection of sources of inflow to the sanitary sewers as a condition of rehabilitation-type building permits.

2. Investigate incorporation of stormwater runoff volume controls into Chapter 54.

3. Investigate reduction of impervious surface requirements in the Minneapolis Zoning Code.

4. Update stormwater hydraulic design standards to incorporate storage for purposes of flood mitigation and storage of snowmelt.

5. Investigate financial or water quality sizing based credit system for redevelopment projects that preserve natural site characteristics, such as buffers and native vegetation.

6. Improve compliance of Erosion and Sediment Control Ordinance.

7. Track and disseminate results and successes of pilot BMP projects. Use as model for new projects.

8. Update Chapter 54 to revise water quality standards after new standards are formally approved by watershed.

9. Work with BCWMC to ensure that new construction and redevelopment projects in Minneapolis comply with BCWMC non-degradation policy.

Maintain or enhance quality and minimize quantity of runoff from existing private properties

1. Enforce ordinance requirements to eliminate inflow sources from private properties.

2. Investigate financial or water quality sizing credit based system for properties which recreate natural vegetation systems.

3. Investigate additional maintenance requirements for privately owned parking lots, including sweeping and use of deicing chemicals.

4. Educate the public on environmental degradation caused by excessive use of deicing chemicals.

5. Reassess education activities to identify audiences not targeted and to maximize coordination with existing education efforts where feasible. Educate landscape businesses about hazards of improper disposal into curb & gutters and control of stormwater runoff from plant nurseries.

Enhance Livability and Safety (Guiding Principle #6)

Preserve, maintain and enhance the City's natural and recreation resources

1. Complete MPRB inventory of wetlands in City. Initiate inventory of non-MPRB wetlands.

2. Complete MPRB inventory of natural and riparian corridors. Initiate inventory of non-MPRB natural and riparian corridors.

3. Complete comprehensive shoreline and streambank condition assessment for MPRB properties. Initiate inventory of non-MPRB shorelines.

Beach Warning Sign (Source: MPRB).

4. Evaluate need for wetland ordinance for privately owned shoreline.

5. Evaluate need for shoreline stabilization program in cooperation with watershed district/organizations.

Maintain and/or improve the quality of the City's surface waters

1. Include inspection of sediment deltas as part of outfall inspection programs. Remove excessive sediment in accordance with DNR requirements.

2. Establish agreements on responsibilities for surface water systems Operation and Maintenance where none currently exist.

Financial Considerations

As described in Section 2, the Minneapolis budget is current only for the year that it is adopted. Projected budgets are presented for planning purposes, and there is no certainty that future funding will follow the projected budgets. Refer to the actual annual budget, and not to this planning document for the most up-to-date direction of the City. The most current budget for all City programs can be found on the City's web page at Adopted Budget.

The 2006 annual budget for water resources related activities by the City of Minneapolis is approximately $76 million per year. Of this amount, $27 million is paid directly to the Metropolitan Council for wastewater conveyance and treatment and $11.5 million is to pay the debt on sewer bonds. The remaining $37.5 million is spent on a variety of activities, including sewer maintenance, engineering, street cleaning, and capital improvement projects. The City has no plans to increase this budget in the future, other than to accommodate a projected rate of inflation of 3 percent.

The City works to keep all its activities within the limits of available funding. Prioritization is critical to selecting the specific capital improvement project or regulatory activity within current budgetary limits. The following section summarizes the funding sources typically used by the City in all water resources management activities.

Table 5-1. Implementation Plan for Additional Activities

Guiding Principle		Activity	Program: CSO	Program: I/I	Program: Flood Mitigation	Program: Water Quality	Implementation Year: 2006	2007	2008	2009	2010	2011	2012	Priority	Partners
Protect people property and environment															
Construct improvements to sanitary sewer and storm drain system to provide protection															
	1	Implement CIP projects that solve multiple wet weather problems	x	x	x	x	←	—	—	—	—	—	→	H	MPRB
	2	Update prioritization system	x	x	x	x	↔							H	MPRB
	3	Expand existing H&H models	x	x	x	x		←	—	—	→			M	All watersheds
	4	Resolve differences in floodplain requirements			x					←	→			M	MCWD and BCWMC
	5	Accelerate rainleader and foundation drain disconnections	x	x			←	—	→					H	MCES, MPCA
	6	Investigate feasibility of redesign of manholes subject to frequent surcharging							←	→				M	MNDOT
Maintain and enhance infrastructure															
Maintain condition of sanitary sewer and storm drainage systems															
	1	Expand sanitary sewer preventive maintenance schedule to include storm drainage system			x	x				←	→			M	MN/DOT, Hennepin County
	2	Increase annual length of sanitary sewers visually inspected	x	x			←	—	→					H	
	3	Amend Bassett Creek Tunnel maintenance agreement with MN/DOT and BCWMC to be consistent with BCWMC policies							←	→				M	BCWMC, MN/DOT
Maintain capacity of sanitary sewer and storm drainage systems															
	1	Expand existing H&H models	x	x	x	x		←	—	—	→			M	All watersheds
	2	Define emergency CSO conditions	x	x			↔							H	MPCA
	3	Investigate use of in-line storage for sanitary peak flow control	x	x				←	→					H	MCES
	4	Continue to assess opportunities to remove I/I	x	x			←	—	→					H	MCES
	5	Institute CMOM	x	x	x				←	—	→			M	MCES
	6	Measure actual volumes of stormwater runoff			x	x			←	→				M	MPRB
	7	Investigate impacts on stormwater system for each CSO project	x	x	x	x	←	—	—	—	→			H	All watersheds
	8	Investigate techniques to decrease impervious surface on public construction projects			x	x			←	—	→			M	MNDOT, Hennepin County
	9	Formalize design parameters for stormwater infiltration systems		x	x	x			←	→				M	All watersheds
	10	Investigate methods to incorporate runoff volume controls into Code of Ordinances							←	→				M	
Provide cost effective services															
Optimize enhancements to sanitary sewer and stormwater drainage systems															
	1	Implement CIP projects that solve multiple wet weather problems	x	x	x	x	←	—	—	—	—	—	→	H	
	2	Update prioritization system	x	x	x	x	↔							H	
	3	Create unified design standards for stormwater BMPs			x	x			←	→				M	All watersheds
Meet or surpass regulatory requirements															
Operate and maintain public lands consistent with best current practices and with permit requirements															
	1	Continue funding for removal of inflow sources from public buildings	x	x			←	—	→					H	
	2	Implement recommendations of Shingle Creek Chloride TMDL Implementation Plan				x		↔						M	SCWMC
	3	Expand sweeping program to include public owned parking areas				x			←	→				M	
	4	Continue staff training on best current practices	x	x	x	x	←	—	—	—	—	—	→	M	
	5	Unify stormwater hydraulic and BMP design standards to be consistent with private requirements			x	x			←	→				M	All watersheds
	6	Leverage BMP improvements on non-City public facilities using City funds				x			←	→				M	
Provide ongoing assessments of sanitary sewer and stormwater drainage systems															
	1	Create clearinghouse for all water resource assessment studies	x	x	x	x						←	→	L	All watersheds, MPRB
	2	Establish central Mpls coordinator for TMDL projects				x	↔							H	
	3	Revise water quality standards after new standards are formally approved by watershed				x			←	→				M	All watersheds
Implement ongoing assessments of sanitary sewer and stormwater drainage systems															
	1	Negotiate TMDL implementation activities in a manner that is consistent with City goals and objectives	x	x	x	x		←	—	—	—	—	→	H	All watersheds and MPCA, MPRB
Enforce existing rules and regulations															
	1	Negotiate NPDES permits that are consistent with City goals and objectives	x	x	x	x	←	→						H	MPCA, MPRB
Educate and engage the public															
Enhance quality of runoff from redevelopment sites															
	1	Require separation of inflow sources as condition of rehabilitation building permit	x	x			←	—	→					H	
	2	Investigate methods to incorporate runoff volume controls into Chapter 54			x	x			←	→				M	
	3	Investigate methods to reduce impervious surface requirements in Zoning Code			x	x			←	→				M	
	4	Update stormwater hydraulic design standards to incorporate storage for flood mitigation and snowmelt			x	x				←	→			M	
	5	Investigate financial or water quality sizing credits for redevelopment projects that preserve natural characteristics				x						←	→	L	All watersheds
	6	Improve compliance with Erosion and Sediment Control Ordinance (Chapter 52)				x			←	—	—	—	→	H	All watersheds and MPCA
	7	Track success of BMP pilot projects for dissemination and use as model in new projects.			x	x						←	→	M	All watersheds
	8	Revise water quality standards after new standards are formally approved by watershed				x			←	→				M	All watersheds
	9	Work with BCWMC to clarify non-degradation policy for new impervious surface and incorporate into site requirements				x			←	→				M	BCWMC
Maintain or enhance quality of runoff from existing private properties															
	1	Enforce ordinance requirements to eliminate inflow sources from private properties	x	x				←	→					H	
	2	Investigate financial or water quality sizing credits for sites that preserve natural characteristics			x	x						←	→	L	All watersheds
	3	Investigate additional maintenance requirements for privately owned parking lots				x			←	→				M	
	4	Educate public on environmental degradation caused by excessive use of deicing chemicals				x				←	→			H	MPRB, All watersheds
	5	Reassess education activities to identify audiences not targets and to maximize coordination with other effo	x	x	x	x			←	→				H	All watersheds
Enhance livability and safety															
Preserve, maintain and enhance the City's natural and recreational corridors															
	1	Complete inventories of MPRB and privately owned wetlands				x						←	→	L	MPRB
	2	Complete inventories of MPRB and privately owned natural and riparian corridors				x						←	→	L	MPRB
	3	Complete condition assessment of MPRB and privately owned shorelines				x						←	→	L	MPRB
	4	Evaluate opportunities to expand Audubon Society practices to all golf courses				x						←	→	L	MPRB
	5	Evaluate need for wetland buffer ordinance for privately owned shoreline				x						←	→	L	All watersheds
	6	Evaluate need for shoreline stabilization program in cooperation with watersheds				x						←	→	L	All watersheds
Maintain and/or improve the quality of the City's surface waters															
	1	Inspect sediment deltas as part of outfall inspection programs				x		←	—	—	—	→		M	
	2	Establish agreements on responsibilities for O&M of surface waters				x				←	→			M	MPRB, all watersheds

Funding Mechanisms

***General Fund*:** Property taxes spread capital, operations, and maintenance costs of the surface water system over the entire city. General fund revenues are not a major source of funding for water resources projects or programs in Minneapolis. However, these funds may pay for a storm drainage improvement that is part of a larger capital improvement project, such as a highway reconstruction project. General funds are also used to fund some activities of the Minneapolis Park and Recreation Board.

Stormwater Utility Funds: In 2005, Minneapolis implemented a stormwater utility. Revenue from this fee is used for stormwater activities. Implementation of this fee did not create new revenue, but instead changed how each property was billed for stormwater services. The stormwater utility fee is similar to other fees the City charges its residents for services provided, such as a sanitary sewer fee and garbage disposal fee. Stormwater utility rates are based on an estimate of runoff generated and discharged to the City's system from a particular property. The revenues collected are dedicated to water resources management activities.

Sewer Fund: Minneapolis utilizes revenue from the sewer fund to pay MCES for wastewater conveyance and treatment. This is also the major source of funding for CSO related projects and sanitary sewer maintenance activities.

Sewer Bonds: In certain years, the City may decide to issue sewer bonds to raise money to pay for infrastructure upgrading and replacement. The debt service on these bonds is typically paid for by the sewer fund or by the stormwater utility.

***Special Assessments*:** Assessments against benefiting or responsible properties could be used to finance surface water improvements. Historically, Minneapolis has opted to use more general funding sources for water resources improvements which spread the cost across either the City as a whole or some smaller area of the City.

***Area and Connection Charges*:** These are fees charged to developments and redevelopments on an area (cost per acre) and/or connection (cost per unit) basis. These charges are frequently used in communities to ensure that proposed development pays for facilities required to serve it. Minneapolis has not used this funding approach. Future assessments of revenue sources by the budget department may include this approach as a new funding source.

***Grants*:** Though subject to budgetary constraints, a number of state and other grant programs are available for surface water management programs. Grants are a good way to supplement locally available resources, but are not very dependable as a sole source of funding and can be scarce when the City needs them most. Most recently, Minneapolis has received water resources funding from the following grant programs:

- Metropolitan Council Parks and Open Space
- Metropolitan Council Metro Environment Program

- Legislative Committee on Minnesota Resources
- Mississippi Watershed Management Organization
- MNDNR Flood Mitigation
- MNDNR Shoreland Habitat
- Direct appropriation of state bonds by Minnesota Legislature
- Bassett Creek Watershed Management Commission
- Minnehaha Creek Watershed District

Financial Impacts – Capital Improvement Program

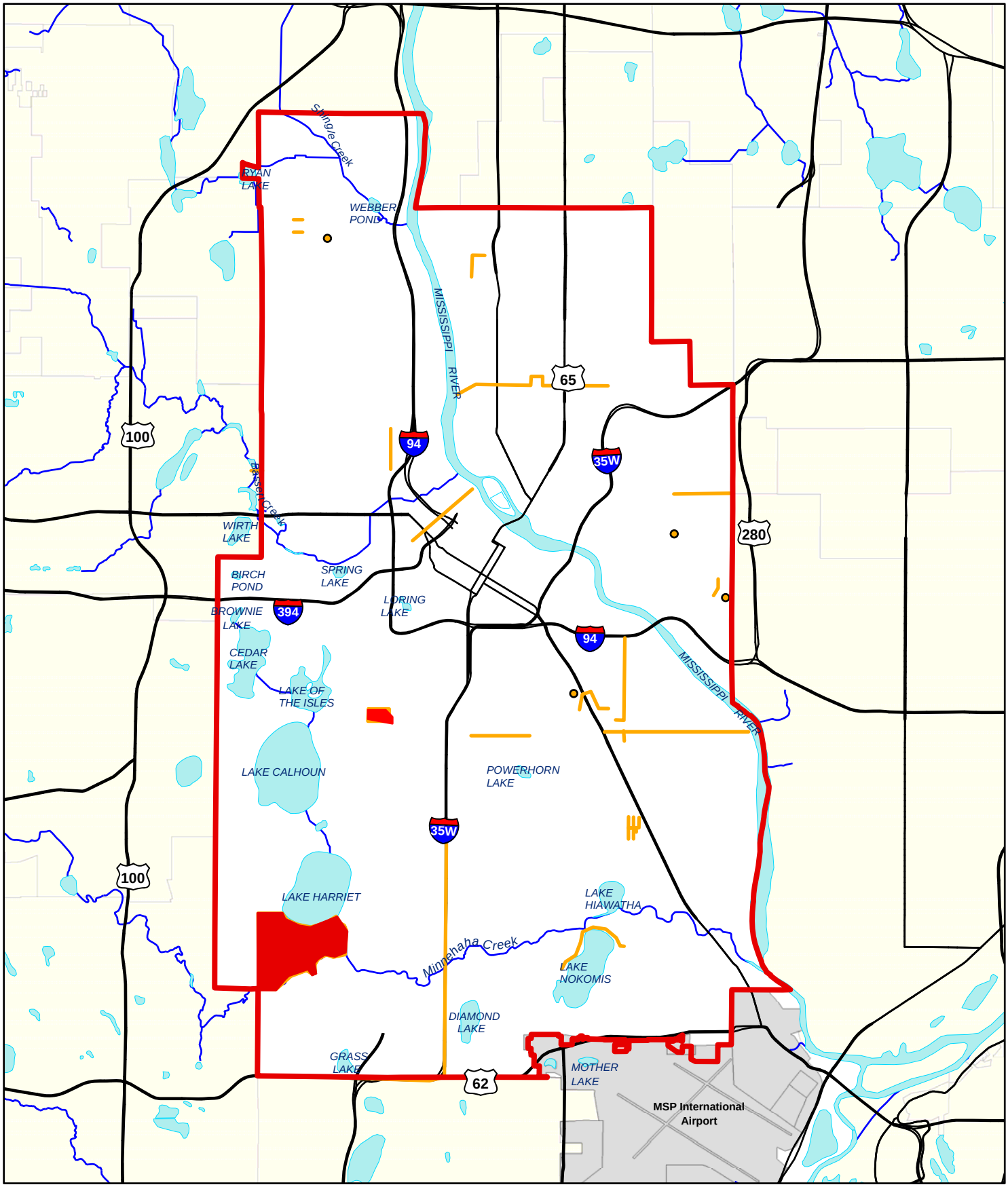
Figure 5-1 and Table 5-2 show the water resources capital improvement projects listed in the 2006 budget. The funding for 2006 is set; the remaining years are projected for planning purposes. The final budget for each of these future years will likely be adjusted to meet the specific needs of that year. Funding for these projects is a combination of sewer bonds, sewer revenue, stormwater utility revenue, and other minor sources.

In 2006, the City and the Minneapolis School Board jointly funded construction of five water resources management projects located on school sites:

- Folwell Middle School
- Longfellow Elementary School
- Sanford Elementary School
- Ramsey International Fine Arts School
- Washburn High School

These facilities provide for flood mitigation, improve water quality and provide an environmental education curriculum and stormwater awareness education. The City used the Alternative Stormwater Strategy Funds for its share of this jointly funded project.

In addition to the water resources funding in Table 5-1, the City implements water quality improvements, where feasible, in street reconstruction projects. Richfield Road is an example where three structural units, costing $135,000, were installed in 2005. The City is also working with Hennepin County to incorporate at least five units in the Lake Street reconstruction project. MN/DOT has agreed to install a treatment system on one of its Diamond Lake outfalls in conjunction with the Interstate 35W and Trunk Highway 62 reconstruction project.



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City of Minneapolis

Capital Improvement Plan Projects

Local Surface Water Management Plan

Figure 5-1

- Water Resources Projects
- Water Resources & Street Combination Projects
- Water Resources & Street Combination Project Areas
- General City Boundary
- Highways

Other smaller scale water quality projects include the rain garden filtration strips at the 3rd Precinct, pervious pavement at the animal control facility, and a green roof at the Fridley Maintenance Center.

Table 5-2. Water Resources Capital Improvement Projects

Project/Program	2006 Minneapolis Water Resources Capital Improvement Funding (in $1,000)					
	2006	2007	2008	2009	2010	Total
Storm and Sanitary Tunnel and Sewer Rehabilitation	2,500	2,500	2,800	4,000	2,500	14,300
Misc. Storm Drains	220	220	220	220	220	1,100
Stormwater Regulations	150	150	150	150	150	750
CSO Improvements	0	4,000	0	0	0	4,000
CSO Separation – facilities	400	0	0	0	0	400
Diamond Lake/35W Water Quality Improvements	497	0	0	0	0	497
Alternative Stormwater Strategies	700	500	500	500	500	2,700
Lake Hiawatha – Blue Water Partnership	700	800	1,000	0	0	2,500
I-35W Tunnel Reconstruction	0	0	7,938	7,938	3,175	19,051
Heritage Park	250	250	0	0	0	500
Street Renovation	115	115	115	115	0	460
University Research Park	495	0	0	0	0	495
27th Ave S	666	0	0	0	0	666
Lyndale Ave N	249	0	0	0	0	249
Chicago Ave S	0	0	95	0	0	95
LaSalle Ave S	0	0	0	0	424	424

Source: City of Minneapolis 2006 Adopted Budget

Financial Impacts – Non-CIP

The City's budget for all other water resources activities can be found in Section 5, Financial Plans of the City's annual budget. Table 5-3 summarizes the sanitary sewer fund and stormwater utility fund information contained in the 2006 budget. The 2006 column is the final approved budget; future funding is presented as a forecast which is subject to future change prior to annual adoption.

Table 5-3. Non-capital Water Resources Management Activity Budgets

Activity	2006 Minneapolis Sewer and Storm Funding (in $1,000)			
	2006	2007	2008	2009
Maintenance – Sanitary	9,200	10,000	11,000	12,000
Maintenance – Sweeping	6,100	6,300	6,600	6,700
Maintenance – Storm	7,700	7,900	8,200	8,400

The total annual budget for the Public Works activities is limited by the amount raised by the sewer rate fee and stormwater utility fee. Total revenue collected from these fees is not expected to increase, other than modest adjustments based on inflation. The amount budgeted to specific activities is likely to adjust, based on future changes in priorities or regulatory requirements. Table 5-4 details the sewer and stormwater utility rates charged to City users.

Table 5-4. Sewer and Stormwater Utility Rates and Projected Revenue

Year	Sewer Rate (per 100 cubic feet)	Projected Sewer Revenue	Stormwater Rate (per Equivalent Stormwater Unit)	Projected Stormwater Revenue
2006	2.10	$36,300,000	9.17	$30,500,000
2007	2.19	$37,900,000	9.57	$31,900,000
2008	2.26	$39,000,000	9.91	$33,000,000
2009	2.32	$40,100,000	9.91	$33,000,000

Implementation

Implementation Framework

The City has created a framework for life-cycle management of systems and programs that is the basis for decision making with respect to water resources management. A specific activity begins because of a specific need or regulation, an assessment of the condition is made, planning for improvement is initiated, and then the improvement is implemented. A new structure/program/activity is operated/maintained/ inspected until a new need or regulation triggers another change. Figure 5-2 illustrates this implementation framework.

The life-cycle of water resources management activities include three principal phases: assessment, planning and implementation. Components of each include:

Assessment

Assessment involves an array of techniques to validate if water resources management practices and infrastructure meet critical City efficiency objectives, such as structural integrity, ability to relieve impacts to health, safety, property, infrastructure, and aquatic life, and regulatory compliance. Activities include inspection, monitoring, routine record-keeping and emergency response readiness:

Figure 5-2. City Goals and Regulations Implementation Framework

- System condition inspection and assessment
- System capacity inspection and assessment
- Regulatory compliance – assessment activities
- Problem identification and definition
- Regulatory administrative responsibilities
- Identification of gaps in regulatory controls and programs
- Surface water monitoring – sampling protocols, data analysis and reporting

Planning

Planning uses the finding from the assessment phase to identify capital, operational, regulatory, and administrative measures to cost-effectively address critical impacts. Planning activities are initiated once a problem has been identified in the assessment phase or when a new regulation is being promulgated by a public agency. Typical activities include:

- Creation of specific land use controls
- Financial management of programs and projects
- Financial impact analyses
- Implementation plans
- Public engagement
- Prioritization

- Scheduling
- Design standards
- Regulatory compliance, including reports and permitting
- Future updates to Minneapolis Local Surface Water Management Plan

Implementation

Implementation puts plans to action by constructing the capital improvements, conducting the maintenance activities, and enforcing the regulations. Activities include:

- Design and construction of prioritized capital improvements
- Operation and maintenance
- Start-up and continuation of new regulatory activities
- Ongoing regulatory compliance activities
- Permitting and enforcement

Additional Activities and the Implementation Framework

The additional activities needed to meet water resources management goals will add increased value to activities that are already in place. These additional services will be developed under the auspices of the implementation framework. For each proposed activity, stakeholders will be consulted, the scope will be developed, budgets proposed, and authorization to proceed with the activity will be at the will of the Mayor and City Council. As an activity receives prioritization and funding, an assessment of conditions will be made, planning for implementation will be conducted, and the activity will be implemented.

Prioritization

One of the additional activities identified during development of this plan is for the City to develop an updated system of prioritization for new/improved water resources activities. To meet the intent of this LSWMP, the new system could be set to give preference to activities that meet multiple water resources management objectives. For example, a capital improvement project which removes inflow sources plus adds water quality improvement for runoff that drains to an impaired lake could be given greater preference than a project that only adds a water quality improvement. A quantitative method that assigns points based on water resources objectives could also be created. Points could be assigned based on relative health and safety benefits, number of objectives accomplished, cooperating partners, and other such considerations. Since funding for new programs is limited, available funding could be directed toward the projects or new programs that receive the highest points under the City-adopted priority ranking system.

Appendix A
Watershed District and Watershed Management Organizations

The City of Minneapolis falls under the jurisdiction of four watershed management organizations. They are the Bassett Creek Watershed Management Commission (BCWMC), the Minnehaha Creek Watershed District (MCWD), the Mississippi Watershed Management Organization (MWMO), and the Shingle Creek Water Management Commission (SCWMC). The geographical extent of each organization's jurisdiction within the City of Minneapolis is shown in Figure 2. A general overview of the requirements of each organization is presented below, but readers are encouraged to contact each organization directly to obtain the most up-to-date information on their goals, policies, and programs. Contact information is current as of September, 2006.

Bassett Creek Watershed Management Commission

c/o Barr Engineering Co.
4700 West 77th Street,
Minneapolis 55435-4803
Ph: 952-832-2600
Fax: 952-832-2601
http://www.bassettcreekwmo.org

The Bassett Creek watershed, nearly 40 square miles, is divided into four major subwatersheds. The nine municipalities represented by the BCWMC include: Plymouth, Medicine Lake, Golden Valley, Robbinsdale, Crystal, New Hope, Minnetonka, St. Louis Park, and Minneapolis.

The BCWMC adopted its first Watershed Management Plan in February 1972. The Commission released its Second Generation Plan (draft) for public review in July of 2003, which was subsequently approved by BWSR in August 2004 and adopted by the BCWMC in September, 2004. The BCWMC Plan sets the vision and guidelines for managing surface water within the boundaries of the BCWMC.

Summary of Goals

Water resources management goals developed by the BCWMC are included in Table A-1.

Table A-1 BCWMC Goals

Goal	Description
GOAL 1	**Manage the water resources of the watershed, with input from the public, so that the beneficial uses of wetlands, lakes and streams remain available to the community. Improve the quality of stormwater runoff reaching the Mississippi River by reducing non-point source pollution (including sediment) carried as stormwater runoff. Protect and enhance fish and wildlife habitat and maintain shoreland integrity.**

Goal	Description
GOAL 2	Reduce flooding along the Bassett Creek trunk system. Protect human life, property, and surface water systems that could be damaged by flood events. Regulate stormwater runoff discharges and volumes to minimize flood problems, flood damages and the future costs of stormwater management systems. Provide leadership and assist member cities with coordination of intercommunity stormwater runoff planning and design.
GOAL 3	Prevent erosion and sedimentation to the greatest extent possible to protect the BCWMC's water resources from increased sediment loading and associated water quality problems. Implement soil protection and sedimentation controls whenever necessary to maintain health, safety, and welfare.
GOAL 4	Implement stream restoration measures whenever necessary to maintain health, safety, and welfare. Maintain or enhance the natural beauty and wildlife habitat value of Bassett Creek.
GOAL 5	Achieve no net loss of wetlands in the BCWMC, in conformance with the Minnesota Wetland Conservation Act and associated rules (Minnesota Rules 8420).
GOAL 6	Protect the quantity and quality of groundwater resources.
GOAL 7	Manage public ditches in a manner that recognizes their current use as urban drainage systems.
GOAL 8	A. Raise awareness of the watershed's existence and the role that the BCWMC plays in protecting water quality and preserving the watershed's health and aesthetics. B. Enable the target audiences to have confidence in the BCWMC's expertise and participate in a meaningful way in the planning process and ongoing projects conducted by the BCWMC. C. Raise awareness of the impact that individuals, businesses and organizations have upon water quality and motivate these audiences to change personal/corporate behavior that has a negative impact on water quality and the watershed.

(Source: BCWMC)

Policies

Chapter 4 of the BCWMC Watershed Management establishes water quality policies in the areas of Lake and Stream Management, Stormwater Runoff Management, Fish and Wildlife Habitat and Shoreland Management, and Administration of Water Quality Management Standards. Specific policies include:

Policies Relating to Lake and Stream Management

A. Waterbodies are classified into one of four management categories.

B. Each member city will classify water bodies in local water management plans.

C. BCWMC will work with stakeholders to manage water bodies.

D. BCWMC and member cities will implement capital improvement projects listed in Table 12-2 of the BCWMC Watershed Management Plan.

E. BCWMC will give high priority to projects that include non-structural measures and education.

F. BCWMC will fund 100% of cost for water quality improvement projects that are listed in their 10-year CIP.

G. BCWMC will cooperate with member cities, MPCA and other stakeholders in preparation of TMDL studies.

H. BCWMC will continue to identify opportunities to maintain or improve excellent water quality in Twin Lake.

I. BCWMC will monitor, or coordinate with others to monitor, the water quality of lakes and streams in the watershed on a regular basis.

J. BCWMC will add projects from Table 12-3 of Watershed Management Plan to 10-year CIP using minor plan amendment process.

K. BCWMC will initiate in-stream chloride monitoring when appropriate.

L. BCWMC will compile water quality report for every sampling year that monitoring is conducted.

Policies Relating to Stormwater Runoff Management

A. BCWMC requires that all regulated stormwater be treated to Level I standards.

B. BCWMC will continue to participate in MCES Watershed Outlet Monitoring Program (WOMP).

C. Each city shall adopt an ordinance that enforces the Minnesota State Law limiting the use of lawn fertilizers that contain phosphorus.

D. BCWMC requires developers to consider/evaluate the use of BMPs in accordance with requirements of Appendix F of the BCWMC Watershed Management Plan.

Policies Relating to Fish and Wildlife Habitat and Shoreland Management

A. BCWMC requires that local water management plans contain buffer policies.

B. BCWMC will react to recommendation of other agencies, as the BCWMC deems appropriate.

C. BCWMC will collect, or coordinate with others to collect, macroinvertebrate monitoring data.

D. BCWMC will promote and encourage protection of non-disturbed shoreland areas and restoration of disturbed shoreland areas.

E. BCWMC will encourage preservation of streambank and lakeshore vegetation during and after construction.

F. BCWMC will encourage creation of buffer zone along shorelines.

G. Member cities are required to maintain control and responsibility for shoreland regulation.

Policies Relating to Administration of BCWMC Water Quality Management Standards

A. BCWMC will review projects and developments to evaluate compliance with BCWMC standards.

B. BCWMC will continue to work with other public agencies to gain compliance with BCWMC water quality management standards.

C. BCWMC will review local surface water management plans for compliance with BCWMC Watershed Management Plan goals and policies.

Summary of Rules

A synopsis of BCWMC rules is presented below. The letter system conforms to that used by the BCWMC.

Rule C. Floodplain Regulations

The following policies regarding floodplain regulation within the Bassett Creek watershed have been adopted:

1. The floodplain of Bassett Creek is defined as that area lying below the 100-year flood elevations as shown in the Water Management Plan of the BCWMC, or as subsequently revised due to channel improvement, storage site development, or requirements established by appropriate state or federal governmental agencies.
2. No land use of a type which would be damaged by flood waters is permitted within the floodplain.
3. Allowable types of land use which are consistent with the floodplain, such as recreation areas, parking lots, excavations and storage areas, agriculture, and other open space uses, would be allowed only to the extent that they would not increase flooding. Permanent storage piles, fences, and other obstructions, which would collect debris or provide restriction to flood flows are not allowed.
4. Filling will generally not be allowed within that floodplain established in the Water Management Plan of the BCWMC. If any municipality desires to fill within the established floodplain, such filling will require the approval of the BCWMC and require provisions for compensating storage and/or channel improvement so that the flood level shall not be increased at any point along the channel due to the fill.

5. Expansion of existing non-conforming land uses within the floodplain will be prohibited unless they are fully floodproofed in accordance with existing codes and regulations.

Rule D. Water Resources

Water Quality Management

The lakes, rivers, ponds, streams, and wetlands of the Bassett Creek watershed are an important community asset. These resources supply aesthetic and recreational benefits, in addition to providing wildlife habitat and refuge. The BCWMC recognizes a need to ensure adequate water quality in the water bodies in its jurisdiction, and has taken steps to protect these resources. The Water Quality Management Policy was adopted to protect, preserve, and manage the water resources in the Bassett Creek watershed.

Control of Streambank Erosion and Streambed Degradation

Streambank erosion and streambed degradation control measures must:

1. Be employed whenever the net sediment transport for a reach of stream is greater than zero or whenever the stream's natural tendency to form meanders directly threatens damage to structures, utilities or natural amenities in public areas.
2. Include effective energy dissipation devices or stilling basins to prevent streambank or channel erosion at all stormwater outfalls.
3. Specify riprap consisting of natural angular stone suitably graded by weight for the anticipated velocities.
4. Provide riprap to an adequate depth below the channel grade and to a height above the outfall or channel bottom so as to ensure that the riprap will not be undermined by scour or rendered ineffective by displacement.
5. Specify that riprap be placed over a suitably graded filter material or filter fabric to ensure that soil particles do not migrate through the riprap and reduce its stability.
6. Require that streambank stabilization and streambed degradation control structures be submitted for review by the BCWMC. The review will consider the need for the work, the adequacy of design, unique or special site conditions, energy dissipation, the potential for adverse effects, contributing factors, preservation of natural processes, and aesthetics.

Grit Chambers

Grit chambers for presettlement of stormwater must:

1. Be designed and sized to provide theoretical settlement of a 0.3-mm grit particle in still water at 10°C (based on Stokes Law).
2. Be designed to provide sufficient storage volume for the settled particles consistent with the maintenance schedule.

3. Include a device to diffuse inflow and provide a relatively uniform distribution of flow over the cross section of the chamber.
4. Provide convenient access for equipment and maintenance personnel to the chamber site and into the chamber itself.
5. Be inspected at least three times a year (spring, summer and fall) to determine the volume of stored grit, and be cleaned immediately whenever significant grit has accumulated or there is likelihood that the chamber will be full of grit before the next scheduled inspection

Regional Detention Basins
Regional detention basins must:

1. Conform to municipalities' stormwater runoff criteria.
2. Have water quality features designed based on Level I management classification as set forth in the water quality management policy.

Sediment Collection and Nutrient Entrapment
Wetlands used for sediment collection and nutrient entrapment must conform to the criteria for on-site or regional detention basins (whichever are appropriate). In addition, these wetlands and detention basins must:

1. Detain stormwater runoff in the first 1 1/2 feet of stormwater storage depth for an average period of no less than 48 hours.
2. Provide an outlet structure capable of draining the wetland or basin substantially dry to permit harvesting of wetland vegetation and removal of sediment.
3. Be harvested every fall (usually before October 15) by cutting the vegetation and removing the cuttings to an approved disposal site.

Sediment Control
In order to protect the water resources of the Bassett Creek watershed from increased sediment and associated water quality problems, the BCWMC has established the following policies to encourage land use planning and development that minimizes sediment yield:

1. The use of on-site settling ponds and/or filter fabric (silt fence) to control the sediment in runoff from construction sites, land clearing, or grading operations is required on all projects.
2. The sedimentation ponds will be cleaned on a regular interval determined by calculating the sediment yield expected from the tributary watershed and comparing it to the capacity of the pond.
3. Preservation and improvement of marsh areas for sediment removal by natural filtration is recommended as long as the natural intrinsic value of the wetland is not adversely affected.

4. The design of storm sewer, stream channel improvements, and channel crossings must consider temporary erosion control and sediment reduction measures to be implemented during construction and permanent measures to eliminate erosion and reduce sediment production during operations.

Minnehaha Creek Watershed District

18202 Minnetonka Blvd.
Deephaven, MN 55391
Ph: 952-471-0590
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http://www.minnehahacreek.org

The MCWD covers approximately 181 square miles and is home to eight major creeks, 129 lakes and thousands of wetlands. The MCWD includes all or part of 27 cities and three townships in Hennepin and Carver Counties. The MCWD "seeks to conserve the natural resources of the Minnehaha Creek watershed principally through analysis of the causes of harmful impacts on the water resources, public information and education, regulation of land use, regulation of the use of waterbodies and their beds, and capital improvement projects". The MCWD's Water Resources Management Plan was adopted in January of 1997. It outlines the MCWD's mission, goals and policies, and implementation plan.

Summary of Goals

Water resources management goals developed by the MCWD are included in Table A-2.

Table A-2. MCWD Goals

Goal	Description
GOAL 1	Reduce the severity and frequency of flooding and high water, and improve the chemical and physical quality of surface water.
GOAL 2	Control temporary sources of sediment resulting from construction and land development activities, and identify, minimize, and correct the effects of sedimentation from erosion-prone areas.
GOAL 3	Preserve existing water storage capacity below flood elevations on all water bodies in the watershed to minimize the frequency and severity of high water.
GOAL 4	Preserve the natural appearance of shoreline areas and minimize degradation of surface water quality which can result from dredging operations.
GOAL 5	Maintain the hydraulic capacity of and minimize obstructions to navigation in watercourses and preserve the water quality and aesthetic appearance of shoreland areas.
GOAL 6	Improve water quality by promoting best management practices (BMPs), requiring their adoption in local management plans, and requiring their implementation on development sites.

Goal	Description
GOAL 7	Protect the recreational opportunities associated with water resources by improving water quality and enhancing fish and wildlife resources.
GOAL 8	Enhance public participation in MCWD activities and provide informational and educational material to municipalities, community groups, businesses, schools, developers, contractors, and individuals.
GOAL 9	Maintain public ditch systems within the MCWD as required under ditch authority jurisdiction.
GOAL 10	Support efforts to provide for the protection of groundwater and regulate its use to preserve it for beneficial purposes.
GOAL 11	Protect existing wetlands and restore diminished or drained wetlands.

(Source: MCWD)

Summary of Rules

MCWD rules seek to:

- Protect public health and welfare and the natural resources by reasonable regulation of the modification or alteration of lands and waters of the MCWD
- Reduce the severity and frequency of flooding and high water
- Preserve floodplains and wetlands
- Improve the chemical and physical quality of surface water
- Reduce sedimentation
- Preserve hydraulic and navigational capacity of waterbodies
- Preserve natural shoreland features
- Minimize public expenditures to avoid or correct such problems in the future

A synopsis of the MCWD rules is presented below. The lettering systems conform to that used by the MCWD.

Rule B. Stormwater Management Plan

The MCWD attains its policies for stormwater management through Rule B: Stormwater Management Plans for Individual Projects. Rule B covers developments of land for residential, commercial, industrial, institutional or public roadway uses. It also covers redevelopment and additions to existing development. It directs permit applicants to apply for a permit and prepare a local stormwater management plan for the individual project. It also directs them to prepare an erosion control plan for construction and land development activities. The MCWD Board of Managers will

transfer permit and review authority to communities that have approved stormwater management plans. An approved stormwater management plan will conform to Rule B and implement equal or equivalent design criteria for stormwater quantity and quality and require equal or equivalent exhibits. The MCWD Board of Managers will consider any variance requested from these local stormwater management plans.

Rule B. Erosion and Sedimentation Control Plan

The MCWD Board of Managers requires cities to adopt the MPCA best management practices and put these into their local surface water management plan (SWMP). These best management practices will meet the MCWD Board of Managers' Erosion and Sedimentation Control policies. MCWD approval of individual local SWMPs will require cities to take responsibility for enforcing erosion and sedimentation control plans for all development and redevelopment sites through their normal permitting procedures. This includes erosion control provisions for small sites associated with building permits, driveway permits, and grading permits.

Local SWMPs must also require documentation that the project has received a National Pollutant Discharge Elimination System (NPDES) Stormwater Permit from the MPCA (if required by the MPCA). The MCWD Board of Managers policy requires landowners proposing to develop land to prepare an erosion and sediment control plan for all construction activities that remove or disturb existing protective cover. The developer must have city approval of this plan before starting any construction. The SWMP must address sediment containment. The local SWMP must also require establishing permanent vegetative cover as soon as construction is done. The erosion and sediment control plan must outline the direction of all site runoff and the location of erosion control measures. Structural methods for erosion control may include, but are not limited to, silt fences, hay-bale barriers, diversion dikes, and sedimentation basins. The local SWMP shall also require installation of structural measures in accordance with the manufacturers' specifications and accepted MPCA guidelines. Non-structural methods include, but are not limited to, natural plant barriers, phased development practices, and grading practices that minimize slopes. Local SWMPs must require employing these methods in accordance with accepted engineering standards and in accordance with MPCA BMPs.

The erosion control plan must temporarily and permanently replace plant cover. These practices include, but are not limited to, seeding, mulching, and sodding. Local SWMPs must require proper care of all structural and nonstructural erosion control measures that must remain in place until the establishment of permanent plant cover. The MCWD Board of Managers recommends that local units of government obtain a surety to make sure that the developer adequately carries out the plan.

Rule C. Floodplain Alteration

The MCWD's Rule C applies to floodplain alterations. That rule states that it is the MCWD Board of Managers' policy to:

- Preserve existing water storage capacity below the 100-year flood levels on all water bodies in the watershed to minimize the frequency and severity of high water

- Minimize development in the 100-year floodplain that will unduly restrict flood flows or make known high-water problems worse

The MCWD Board of Managers will conduct the floodplain management program and review all projects proposed within the 100-year floodplain. Rule C criteria will guide the Board of Managers' review of developments and redevelopments within the floodplain. Local SWMPs must include floodplain management strategies. The Board of Managers will review these floodplain management strategies for conformity with Rule C and will transfer permitting authority for floodplain alterations if local floodplain ordinances conform to MCWD Rule C.

Rule D. Wetland Protection

The U.S. Army Corps of Engineers (USACE) potentially has jurisdiction over all wetlands in Minnesota. The Minnesota Department of Natural Resources (DNR) through a USACE/DNR general permit currently has authority to preserve protected waters and wetlands. The wetlands under the DNR's jurisdiction include most types 3, 4, and 5 wetlands as defined in the U.S. Fish and Wildlife Circular No. 39. The DNR requires a permit for changes to a protected water or wetland. BWSR provides administrative guidance over implementation of the Wetland Conservation Act (WCA) of 1991.

The MCWD serves as the local governmental unit (LGU) for implementing the WCA where LGU authority has not been obtained by a municipality. MCWD Rule D applies to types 1, 2, 3, 4, 5, 6, 7, and 8 wetlands. It also includes requirements for wetland buffers, restrictions for excavation in wetlands and for locating replacement wetlands. Local SWMPs must incorporate the requirements of Rule D or continue to allow the MCWD to regulate wetland protection. In addition, cities shall assess functions and values by utilizing one of a number of methodologies listed in the Wetland Conservation Act Rules. Cities issuing permits for work in and around wetlands will inform the permittee that these activities may also need DNR and USACE permits prior to approval of the local permit.

Rule F. Shoreline and Streambank Improvements

The MCWD Board of Managers encourages cities to adopt and carry out ordinances to protect shoreland. These shoreland ordinances shall address the control of shoreland development as identified in the 1989 DNR "Statewide Standards for Management of Shoreland Areas". The cities have the responsibility to administer and enforce these shoreline management regulations. MCWD Rule F applies to shoreline and streambank improvements. The MCWD Board of Managers may delegate permitting authority for shoreline improvements to cities if the Board of Managers decides that cities have either made Rule F part of their local shoreline ordinance or their ordinance does the same thing.

Rule G. Stream and Lake Crossings

MCWD Rule G discourages the use of lake beds and beds of waterbodies for the placement of roads, highways and utilities. The rule further lists criteria, which stream and lake crossing projects must meet. Local SWMPs will be reviewed for conformity to Rule G.

Mississippi Watershed Management Organization

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Boundaries of the MWMO include the Mississippi River as it runs through Minneapolis, as well as the land that drains to the river. The MWMO contains portions of the cities of Lauderdale, Minneapolis, St. Anthony, and St. Paul. The final member of the MWMO is the Minneapolis Park and Recreation Board. The MWMO provides for the long-term management of its water and associated land resources through the development and implementation of projects, programs, and policies that respect ecosystem principles and reflect changing community values. The MWMO assists and cooperates with member cities, other units of government, non-profit agencies, and a variety of groups in managing its water resources to achieve this vision.

The MWMO adopted its Water Resources Management Plan in 2000. The MWMO Plan presents the organization's missions; its goals and policies, and its priorities for implementation.

The primary purpose of the MWMO Plan is to provide for the wise, long-term management of the water and associated natural resources within the watershed through implementation measures that realize multiple objectives, respect ecosystem principles, and reflect community values.

Summary of Goals

Water resources management goals developed by the MWMO are included in Table A-3.

Table A-3. MWMO Goals

Goal	Description
GOAL 1	**Prevent the flooding of streets and structures from surface water runoff caused by the insufficient capacity of the stormdrain system and/or lack of detention basins and wetlands**
GOAL 2	**Mitigate the effects of drought that are caused due to lack of detention basins and wetlands coupled with a high percentage of impervious surfaces that reduces the landscape's ability to store water and promotes evaporation thereby increasing the effects of drought**

Goal	Description
GOAL 3	Protect and enhance surface water quality such that the water leaving the watershed is at least no more degraded than when it entered the watershed
GOAL 4	Reduce non-point sources of pollution by setting target levels for specific contaminants based on monitoring and working with members to achieve these targets
GOAL 5	Work with other organizations to improve surface water quality across watershed boundaries
GOAL 6	Provide opportunities for public outdoor recreation in a way that preserves and enhances the environment
GOAL 7	Create a continuous river corridor that would enhance the recreational and ecological value of the river
GOAL 8	Enhance public participation in MWMO activities
GOAL 9	Educate MWMO communities about environmental impacts to the Mississippi River, especially non-point sources of pollution
GOAL 10	Educate MWMO communities about redevelopment plans impacting the Mississippi River
GOAL 11	Protect and preserve groundwater quality and quantity by encouraging brownfield redevelopment, well sealing, watershed education campaigns, and projects that promote infiltration of unpolluted water
GOAL 12	Protect and restore wetland resources
GOAL 13	Control loss of soil due to erosion
GOAL 14	Preserve, minimize impact to, and restore natural habitat; especially shorelines and habitat corridors
GOAL 15	To preserve and interpret cultural resources that relate to the history of the Mississippi River and its watershed

(Source: MWMO)

Summary of Rules

The MWMO does not issue permits or provide approval letters for construction projects. Instead, it relies on the existing permitting and enforcement bodies of its member communities. The MWMO Board reserves the right to review and comment on plans that affect the quality and quantity of water within and across its watershed and subwatershed boundaries. Local governments are responsible for:

- Maintaining existing and proposed storm drain conveyance systems, including stormwater detention ponds, sewers, inlet and outlet drainage structures
- Issuing building and grading permits
- Performing inspections to ensure compliance during construction.

The MWMO maintains oversight responsibility to monitor local SWMP implementation. If member cities do not follow their approved SWMPs, the MWMO will enforce its standards and rules.

Erosion and Sediment Control

The member communities of the MWMO shall adopt and implement erosion and sediment control standards or ordinances to reduce erosion and sedimentation. Member communities shall also follow the best management practices described in the MPCA document, Protecting Water Quality in Urban Areas, or other such documents created by member cities to achieve no adverse impact to receiving water bodies. Construction activities, including redevelopment, utility installation, and road construction, are required to obtain an NPDES Construction Permit from the MPCA in addition to local permitting requirements.

Shoreline and Floodplain

The MWMO requires its member cities to have on file both a DNR approved Floodplain Ordinance and a DNR approved Shoreline Ordinance. Where no ordinance is applicable, MWMO requires there be no encroachment on floodways that reduces capacities or expedites flood flows. It is also MWMO policy to allow in the flood zone only those structures that have been protected from high water, either through floodproofing or by other construction techniques recognized and accepted by the MWMO Board.

Land Use

Although specific zoning and land use planning remains with the individual cities, the MWMO urges its member communities to regulate any activities that may cause contamination of surface and groundwater through restrictive permitting, zoning, and licensing.

Stormwater and Drainage Design Performance

The MWMO requires all its member cities to develop stormwater management ordinances that address the following requirements:

- Reduce runoff through coordinated efforts of state and local agencies
- Update development and enforcement standards for major new construction and redevelopment projects
- Promote increased stormwater retention in new construction and redevelopment projects

Shingle Creek Watershed Management Commission

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The Shingle Creek/West Mississippi Watershed covers about 67 square miles in east-central Hennepin County. There are ten cities in this watershed, and they jointly manage the water resources in this area through the Shingle Creek and West Mississippi Watershed Management Commissions. The Commissions work jointly for those communities that are members of both the Shingle Creek Watershed Management Commission and the West Mississippi Watershed Management Commission. The goal of the Commissions is to enhance the water quality of the water resources within their watersheds through public education, analysis of the causes of harmful impacts, regulation of the use of water bodies, regulation of land use and capital improvement projects.

The Commissions adopted their First Generation management plans in 1990. The Second Generation Plan was developed between May 2001 and August 2002, and describes how both Commissions will address activities in their respective watersheds over the period 2003-2012. Several citizen, agency, and Commission meetings were held throughout the planning process whereby input was actively solicited from those with an interest in the watershed. The plan was formally adopted by the SCWMC in May 2004.

The SCWMC includes an updated land and water resources inventory; goals and policies in eight specific areas; an assessment of problems and identification of corrective actions; an implementation program; and a process for amending the Plan. It describes how the Shingle Creek and West Mississippi Watershed Management Commissions (SCWMC) will address activities in the two watersheds in the ten-year period 2003-2012.

Summary of Goals

Water resources management goals developed by the SCWMC are included in Table A-4.

Table A-4 SCWMC Goals

Goal	Description
GOAL 1	**Maintain the existing 100-year flood profile throughout the watersheds**
GOAL 2	**Protect and improve water quality based on practical use**
GOAL 3	**Strive to provide water quality that supports recreation, fish and wildlife based on practical use**

Goal	Description
GOAL 4	Establish an education and public outreach program
GOAL 5	Develop an appropriate management strategy for Hennepin County Ditch #13
GOAL 6	Protect and improve groundwater quality and promote groundwater recharge
GOAL 7	Protect and improve wetlands
GOAL 8	Reduce erosion and sedimentation

(Source: SCWMC)

Summary of Rules

SCWMC rules and standards protect the public health, welfare, and natural resources of the watershed by regulating the improvement or alteration of land and waters in the watershed to:

- Reduce the severity and frequency of high water
- Preserve floodplain and wetland storage capacity
- Improve the chemical and physical quality of surface waters
- Reduce sedimentation
- Preserve the hydraulic and navigational capacities of waterbodies
- Promote and preserve natural infiltration areas
- Preserve natural shoreline features

In addition to protecting natural resources, these rules and standards are intended to minimize future public expenditures on problems caused by the improvement or land and water alterations. A synopsis of SCWMC rules is presented below. The lettering system conforms to that used by the SCWMC.

Rule C. General Standards

1. All land-disturbing activities, whether requiring a project review under SCWMC rules or otherwise, shall be undertaken in conformance with BMPs and in compliance with the standards and criteria in the SCWMC rules.
2. Project reviews are required of: any single family detached housing project 15 acres or larger in size; projects in any other land use such as commercial/industrial/institutional 5 acres or larger in size; and any land disturbing activity requested by a member city to be reviewed regardless of project size.

3. No person shall conduct land-disturbing activities without protecting adjacent property and waterbodies from erosion, sedimentation, flooding, or other damage.

4. Development shall be planned and conducted to minimize the extent of disturbed area, runoff velocities, and erosion potential, and to reduce and delay runoff volumes. Disturbed areas shall be stabilized and protected as soon as possible and facilities or methods used to retain sediment on-site.

5. When possible, existing natural watercourses and vegetated soil surfaces shall be used to convey, store, filter, and retain runoff before discharge into public waters or a stormwater conveyance system.

6. When possible, runoff from roof gutter systems shall discharge onto lawns or other pervious surfaces to promote infiltration.

7. Use of fertilizers and pesticides in the shoreland protection zone shall be done so as to minimize runoff into public waters by the use of earth material, vegetation, or both. No phosphorus fertilizer shall be used unless a soil nutrient analysis shows a need for phosphorus or in the establishment of new turf.

8. When development density, topographic features, and soil and vegetation conditions are not sufficient to adequately handle runoff using natural features and vegetation, various types of constructed facilities such as diversions, settling basins, skimming devices, dikes, waterways, and ponds may be used. The SCWMC encourages designs using surface drainage, vegetation and infiltration rather than buried pipes and man-made materials and facilities.

9. Whenever the SCWMC determines that any land-disturbing activity has become a hazard to any person, endangers the property of another, adversely affects water quality of any waterbody, increases flooding, or otherwise violates SCWMC rules, the SCWMC shall notify the member city where the problem occurs and the member city shall require the owner of the land upon which the land-disturbing activity is located, or other person or agent in control of such land, to repair or eliminate such condition within the time period specified therein. The owner of the land upon which a land disturbing activity is located shall be responsible for the cleanup and any damages from sediment that has eroded from such land. The SCWMC may require the owner to submit a project review application under SCWMC rules before undertaking any repairs or restoration.

Rule D. Stormwater Management

No person or political subdivision shall commence a land-disturbing activity or the development or redevelopment of land for the following types of projects without first submitting to and obtaining approval of a project review from the SCWMC that incorporates a stormwater management plan for the activity, development, or redevelopment:

1. Plans of any land development or site development of 15 acres or larger for single family detached housing use and 5 acres or larger for all other land uses.

2. Plans of any land development or individual site development adjacent to or within a lake, wetland, or a natural or altered watercourse, as listed in the final inventory of Protected Waters and Wetlands for Hennepin County, as prepared by the DNR.
3. Plans for any land development or site development within the 100-year floodplain, as defined by the Flood Insurance Study for the member city.
4. Plans of any land development or site development regardless of size, if such review is requested by a member city.
5. Single-family developments of more than 15 acres that drain to more than one watershed, for that portion of the site draining into the Shingle Creek/West Mississippi Watershed.

Rule E. Erosion and Sediment Control

No person or political subdivision shall commence a land-disturbing activity or the development or redevelopment of land for: any single family detached housing project 15 acres or larger in size; projects in any other land use such as commercial/ industrial/institutional 5 acres or larger in size; or any land-disturbing activity requested by a member city to be reviewed regardless of project size without first submitting to and obtaining approval of a project review from the SCWMC that incorporates an erosion and sediment control plan for the activity, development, or redevelopment.

Rule F. Floodplain Alteration

No person or political subdivision shall alter or fill land below the 100-year critical flood elevation of any public waters, public waters wetland or other wetland without first obtaining an approved project review from the SWMC.

Rule G. Wetland Alteration

No person or political subdivision shall drain, fill, excavate or otherwise alter a wetland without first obtaining the approval of a wetland replacement plan from the local government unit with jurisdiction over the activity.

Rule H. Bridge and Culvert Crossings

No person or political subdivision shall construct or improve a road or utility crossing across Shingle Creek or any watercourse with a tributary area in excess of 100 acres without first submitting to the SCWMC and receiving approval of a project review.

Rule I. Buffer Strips

No person or political subdivision shall commence a land-disturbing activity or the development or redevelopment of land for: any single family detached housing project 15 acres or larger in size; projects in any other land use such as commercial/industrial/institutional 5 acres or larger in size; or any land-disturbing activity requested by a member city to be reviewed regardless of project size; on land that contains or is adjacent to a watercourse or wetland without first submitting to

and obtaining approval of a project review from the SWMC that incorporates a vegetated buffer strip between the development or redevelopment and the watercourse or wetland.

Appendix B
Minneapolis Ordinances

Summary

Table B-2 contains a summary of Minneapolis ordinances that help protect water resources in the City. The table also references related ordinances and state laws.

Topic	Chapter	Section	Referenced Ordinances or State Law	Summary
Solid and Hazardous Waste	46	40 - 60	Minn. R. Ch. 7045; Minn. State.Ch. 116	• Outlines the permitting and fee requirements for any person storing, handling or processing hazardous waste
Minneapolis Watershed Management Authority	48	All	Minn. R. Ch. 4715, 4717, 4725, 7035, 7037, 7041, 7042, 7044, 7045, 7048, 7050, 7056, 7060, 7080, 7100, 7105, 7150, 7151. Minn. Stat. 115.061; Minn. Stat. 435.193 to 435.195; Minn Stat Ch 115C; Minn Stat Ch 1115B; Minn Stat 1031.05	• Establishes the Minneapolis Watershed Management Authority within the Environmental Management Section of the Department of Operations and Regulatory Services with authority to regulate and control watershed pollution. The unit is responsible for administering and enforcing all laws related to the quality of the City's water and land resources. The ordinance addresses storage of regulated substances, investigation of environmental contamination and remediation of contaminated sites.
Aboveground Storage Tanks For Regulated Substances	48	120	2002-Or-169, Section 6, 11/8/02	• Reasonable protection from spills and leaks reaching the stormwater sewer, sanitary sewer, or waters of the state are required.
Investigation of Environmental Contamination	48	190	2000-Or-017, Section 1, 4/7/00 and 2002-Or-169, Section 5, 11/8/02	• The MPCA can ask organizations that own, operate or manage devices that have leaked hazardous materials in the past to provide records and data to help identify the constituents or quantity of hazardous waste in a stormwater sewer, sanitary sewer, or surface waters.
Registration to Discharge to the Sewer System	50	40	Minn. Stat. Ch. 473; 82-Or-225, Section 1, 11/12/82; 85-Or-015, Section 1, 1/25/85; 86-Or-167, Section 1, 7/25/86; Pet. No. 250650, Section 14, 10/27/89; 90-Or-074, Section 1, 3/16/90; 92-Or-157, Section 1, 11/20/92; 2002-Or-170, Section 4, 11/8/02	• It is illegal for any non-dwelling discharger to discharge domestic waste into the Minneapolis sewer system without first registering with the City and paying an annual fee.
Industrial Waste Discharge Registration	50	50	Minn. Stat. Ch. 473; 82-Or-225, Section 1, 11/12/82; 85-Or-015, Section 2, 1/25/85; 86-Or-167, Section 2, 7/25/86; 90-Or-074, Section 2, 3/16/90; 92-Or-157, Section 2, 11/20/92; 2002-Or-170, Section 5-6, 11/8/02	• It is illegal to discharge industrial waste to the sanitary sewer system without first filing an industrial waste discharge registration and paying the annual fee.
Direct Storm Drain Discharge Registration	50	60	82-Or-225, Section 1, 11/12/82; 2002-Or-170, Section 7-8, 11/8/02	• It is illegal to discharge water used in a process (including cooling water) into the storm drain without first filing a direct storm drain discharge registration and paying the annual fee.
Erosion Control and Sediment Control Performance Standards	52	70	Minn. Stat. Ch. 40; Minn. Wetland Conservation Act of 1991, 96-Or-042, Section 1, 5/10/96	• Construction activities must have provisions to prevent soil from being deposited on other properties, in the right of way, in a public storm drainage system, wetlands, or watercourses. • Design, testing, and use of erosion control must adhere to Chapter 52 ordinances.
Erosion and Sediment Control Plan	52	100	Minn. Stat. Ch. 40; Minn. Wetland Conservation Act of 1991.	• An erosion/sediment control plan and permit are needed if a project disturbs over 5,000 ft2 of ground or 500 yd3 of soil. • An acceptable plan must allow for temporary stabilization along the perimeter of all dikes, swales, ditches, perimeter slopes, slopes greater than 3:1, embankments of ponds, basins and traps.
Lubricating and Motor Oil Discharge Control	53	20	Minn. Stat. 325 E310 et seq.; 77-Or-190, Section 1, 9/9/77	• The City has found many occasions where oils fall to the ground, contaminate runoff, and then be conveyed to surface waters and stormwater sewer systems. • Designated oil collection points shall be set up and disposal of oil to those points only will be enforced.
Oil Collection Station Requirements	53	40	Minn. Stat. 325 E310 et seq.; 77-Or-190, Section 1, 9/9/77 and 79-Or-248, Section 1, 12/14/79	• No one shall dispose of used oil anywhere in the City except for a city-operated station or privately maintained service station. • It is then the station operators' responsibility to prevent the oil from being released.
Applicability of a Stormwater Management System	54	50	Minn. Stat. Ch. 103B; Minn. Stat. Ch. 462; Minn. Stat. 103G.005; Minn. R. Ch. 8410; Minn. R. Ch. 8420; 99-Or-156, Section 1, 11/24/99	• A construction project requires a stormwater management system if the site is greater than 1 ac.
Stormwater Management Standards	54	70	Minn. Stat. Ch. 103B; Minn. Stat. Ch. 462; Minn. Stat. 103G.005; Minn. R. Ch. 8410; Minn. R. Ch. 8420; 99-Or-156, Section 1, 11/24/99	• The Stormwater Design Manual sets stormwater management standards which include: o A reduction in suspended solids concentration discharged into the Mississippi o Controlled rate of discharge into streams o A reduction in nutrients in stormwater draining into lakes and wetlands o Minimum requirements for nutrient removal

Topic	Chapter	Section	Referenced Ordinances or State Law	Summary
Ways to Manage Stormwater Runoff	54	70	Minn. Stat. Ch. 103B; Minn. Stat. Ch. 462; Minn. Stat. 103G.005; Minn. R. Ch. 8410; Minn. R. Ch. 8420; 99-Or-156, Section 1, 11/24/99	• If development density, topographic features, or soil/vegetative conditions can not handle storm water runoff then the Stormwater Design Manual suggests one uses natural features, vegetation and constructed facilities to control runoff: o Facilities include: wetlands, wet-ponds, detention ponds, pocket ponds, multiple-pond systems, settling basins, infiltration basins and trenches, filter systems, bioretention systems, swales, grass channels, waterways, rooftop detention, skimming devices, grit chambers, sweeping or diversions.
Planning of Ground Disturbances During Construction	54	70	Minn. Stat. Ch. 103B; Minn. Stat. Ch. 462; Minn. Stat. 103G.005; Minn. R. Ch. 8410; Minn. R. Ch. 8420; 99-Or-156, Section 1, 11/24/99	• Development must be planned to minimize: o Ground disturbances o Runoff velocity o Erosion potential • Development should reduce or delay the volume of runoff
Maximizing Infiltration to Minimize Stormwater Runoff	54	70	Minn. Stat. Ch. 103B; Minn. Stat. Ch. 462; Minn. Stat. 103G.005; Minn. R. Ch. 8410; Minn. R. Ch. 8420; 99-Or-156, Section 1, 11/24/99	• Natural drainage ways and vegetative soil surfaces should be used to convey, store, filter, and retain stormwater before it is discharged into the public storm system. Ways to maximize infiltration include: o Minimizing impervious surfaces on the property. o Directing runoff from impervious surfaces (such as roofs) to lawns or other pervious areas.
General Regulations on Fertilizer Application	55	40	2001-Or-113, Section 1, 9/28/01 and 2002-Or-068, Section 4, 7/26/02	• Commercial and non-commercial applicators shall not apply fertilizer at times when excess runoff is likely including: o When the ground is frozen o When heavy rain is in the forecast • Except for the exceptions in Chapter 55.50, all fertilizer can not contain phosphorous. • Fertilizers can not be applied to impervious surfaces
Phosphorous-Containing Fertilizer Exemptions	55	50	2001-Or-113, Section 1, 9/28/01 and 2002-Or-068, Section 4, 7/26/02	• The following can apply fertilizers containing phosphorous: o On new lawns during the first growing season o Soils in which a test has been performed in the past three years demonstrating that phosphorous-containing soils will promote healthy turf growth. o On golf courses and under the direction of a licensed and certified person or by an approved organization with an ongoing training course.
Application of Phosphorous Containing Fertilizers	55	60	2002-Or-068, Section 6, 7/26/02	• On properties permitted to apply phosphorous-containing fertilizers (Chapter 55.50) the applier must: o Apply at a rate that does not exceed the rate recommended by the University of Minnesota's Extension Service and approved by the Commissioner of Agriculture. o Fertilizer must be watered so it is immobilized and protected from loss by runoff.
Sale of Fertilizers Containing Phosphorous	55	70	2001-Or-113, Section 1, 9/28/01 and 2002-Or-068, Section 7, 7/26/02	• When selling fertilizers, retailers must: o Not display phosphorous-containing fertilizers in or outside of their store. o Should post usage restrictions in accordance to Chapter 55 o At the time of purchase, make available to the buyer a copy of Chapter 55 or a summary prepared by a regulatory agency.
Prohibited Connections to the Sanitary Sewer	56	70	2003-Or-053, Section 1, 5/2/03	• At one time, some stormwater drains were allowed to connect to the sanitary sewer system. In an effort to minimize sanitary sewer overflows, the following are prohibited from being connected to the sanitary sewer system: o Rainwater pipes, rainleaders, and area drains for conveying stormwater/clearwater from any building, structure, ground or premises o Drains from the uncovered top decks of parking garages can not be connected to the sanitary sewer system. ▪ Drains from covered parking garage decks can be connected to the sanitary sewer system via a separator
Disconnection of Previously Allowed Connected	56	80	2003-Or-053, Section 1, 5/2/03	• All building connections (rainwater pipes, rainleaders, area drains and other connections used for conveying stormwater and Clearwater from any building, structure, ground or premises) installed before 1961 or allowed after 1961 must be disconnected by January 1, 2005.
Disconnection of Stormwater Drains	56	100	2003-Or-053, Section 1, 5/2/03	• No one can perform a disconnection of a rainwater pipe, rain leader, area drain or connection conveying rainwater from a building without first obtaining a disconnection permit.
Diseased, injured or dead animals	72	all		• Prohibits the possession of dead animals, unless in the care of a licensed veterinarian. The ordinance also regulates the abandonment, care and disposal of diseased and dead animals. • The disposal rules can protect water resources from prohibiting the disposal of animals to the sanitary sewer.
Polluted Water Wells	215	10 – 55	Code 1960, As Amend., Section 789.010; Petition Number 251060, Section 1, 12/15/89	• The use of a contaminated water well is prohibited. • This code gives rules on testing polluted wells. • Allows the commissioner of health to test the water of any well in the City upon cause and to order any polluted wells to be tagged as impure.
Water Well Construction	216	15 - 150	Minn. Stat. Ch. 1031; Minn. Laws 1991, Ch. 355; Minn. R. Ch. 4725; 91-Or-155, Section 1, 8/9/91	• Gives rules for constructing and sealing water wells.
Pesticide Licensing	230	20	87-Or-078, Section 1, 5/8/87	• Anyone in the business of handling or applying pesticides must be licensed by the State.

Topic	Chapter	Section	Referenced Ordinances or State Law	Summary
Creation of a Stormwater Utility	510	20	2004-Or-132, Section 1, 11/5/04	• The City Council establishes a stormwater management system (pumping station, sewers, wetlands, ditches, flood control facilities, etc.) and stormwater utility. • The Council intends to operate, construct, maintain, repair, and replace the stormwater management system
Stormwater System Findings	510	30	2004-Or-132, Section 1, 11/5/04	• The stormwater management system has been found to benefit the entire City.
Powers of the Stormwater Utility	510	40	2004-Or-132, Section 1, 11/5/04	• The stormwater utility has the power to: o Administer the design, construction, maintenance, and operation of the stormwater management system. o Prepare regulations to implement Chapter 510. Regulations will then be presented to the City Council. o Administer the ordinances in Chapter 510 and all adopted regulations and guidelines including: ▪ Advising the City Council on stormwater management ▪ Develop plans on design of the sewer system and make recommendations to the City Council ▪ Inspect private systems for compliance ▪ Make recommendations to the City Council on ordinances and regulations to protect water quality in the stormwater system ▪ Analyze the cost of service and the structure of fees of the system at least once per year ▪ Make recommendations to the City Council on the Cost of service and structure of fees ▪ Analyze appropriateness of providing credits against stormwater charges for properties that use best management practices to minimize the quantity or improve quality of runoff ▪ Administer programs that provide credit to reduce stormwater charges imposes against properties
Operating Budget for the Stormwater Utility	510	50	2004-Or-132, Section 1, 11/5/04	• The City will adopt an annual operating budget for the following fiscal year. The first budget is from January 1, 2005 to December 31, 2005.
Stormwater Charges for Single Family Properties, Residential Developed Properties, Non-Residential Developed Properties, and Vacant Properties	510	60	2004-Or-132, Section 1, 11/5/04	• This Chapter sets up the charge structure for each type of property. Single Family Residential Properties can be adjusted (as shown in Chapter 510.60) based on acres of impervious land on the property.
Credit to Stormwater Charges	510	60	2004-Or-132, Section 1, 11/5/04	• Stormwater charge credits can be given to properties that use best management practices to reduce the quantity or improve quality of stormwater runoff. • The City Engineer Director can set propose rules and provide guidance to award credits. The City Council will approve of these rules.
Procedure to Appeal Stormwater Charges	510	70	2004-Or-132, Section 1, 11/5/04	• Owners of a property can appeal: o The property class in which a single-family residence was placed when assigning a stormwater charge o The calculation of a stormwater charge o If a property is benefited by the stormwater utility o Whether a property is entitled to a stormwater credit • The person overseeing the hearing will be appointed by the City Engineer Director and is someone who is not regularly assigned to utility billing or the stormwater utility. • The burden of proof in the hearing is placed on the appellant. • The appellant can appeal to the City Council if they believe the decision is wrong. • If money is owed to the appellant then a check will be mailed within 10 days of the decision.
Collection of Stormwater Charges	510	80	2004-Or-132, Section 1, 11/5/04	• Stormwater charges will be billed and collected by the City.
Use of stormwater charges	510	90	2004-Or-132, Section 1, 11/5/04	• Stormwater charges will be put into an account called the 'Stormwater Fund'. The fund will be used for capital improvements, administration of the stormwater utility, O&M on the stormwater utility and debt service.
Equivalent Stormwater User Rate	510	100	2004-Or-132, Section 1, 11/5/04	• The ESU rate that will be charged is set in an ordinance adopted by the City Council and will be amended as needed.
Rainwater draining into sanitary sewers	511	10	Code1960, As Amended., Section 614.010	• No rainwater pipes, leaders or conductors from any building, grounds or premises shall be connected with any sewer, sewer pipe, sewer connection in any sewer district in which sewers are provided for disposal of sewage alone.
Discharging sewage into a watercourse	511	20	Code1960, As Amended., Section 614.020	• It is illegal to discharge sewage or commercial or industrial waste into the Mississippi River or any stream within or adjacent to the City boundaries.
Discharging unpolluted water to a watercourse	511	30	Code 1960, As Amended, Section 614.030	• It is illegal to build or repair a ditch, lay or repair a pipe or a conduit to discharge storm, surface, cooling or condenser water into the Mississippi River or stream within or adjacent to the City boundaries.
Disposing wastes from outside the City	511	40	Code 1960, As Amended, Section 614.040	• It is illegal to bring septage from containers located outside of the City into sewers of the city.
Removal of manhole covers	511	50	Code 1960, As Amended, Section 614.040	• It is illegal to remove manhole covers without a permit from the City Engineer.

Topic	Chapter	Section	Referenced Ordinances or State Law	Summary
Fish in sewers	511	60	Code 1960, As Amended, Section 583.115, Ord of 6/14/74, Section 1	• No one can put live fish into the sewer
Substances prohibited from the sewers	511	130	Code 1960, As Amended, Section 611.250	• It is illegal to deposit butchers' waste, garbage, dead animals, ashes, shavings, gas drippings or solid waste
Discharge of solids into the sanitary sewer	511	230	Code 1960, As Amended, Section 615.070	• No one can dispose of glass, metal, crockery, sand, gravel, clay, concrete, shellfish shells, wood or plastic down a garbage disposal drain.
Development Guidelines to Protect Waters in the City	535	300	None referenced	• Areas that are within 50 ft. of protected waters that are governed by SH Shoreland (1,000 ft from the highwater mark of a lake, pond, wetland or flowage; or 300 ft from a river or streams floodplain extend – whichever is greater) and MR Mississippi River Critical Area (300 ft from the Mississippi River) Overlay Districts shall remain undeveloped.
Development Guidelines to Protect Wetlands	535	300	None referenced	• No development, grading or alterations are allowed within 50 ft. of a wetland
Development Guidelines to protect shoreland areas	535	300	None referenced	• Areas within the SH Shoreland Overlay District (1,000 ft from the highwater mark of a lake, pond, wetland or flowage; or 300 ft from a river or streams floodplain extend – whichever is greater) shall avoid placements of parking lots, structures or other impervious structures.
Development Guidelines for the SH Shoreland Overlay District	551	440 – 530	2000-Or-048, Section 2 - 7, 5-19-2000	• The SH Shoreland Overlay district is defined as 1,000 ft from the highwater mark of a lake, pond, wetland or flowage; or 300 ft from a river or streams floodplain extend – whichever is greater • Development will not be within 500 ft of the highwater mark of any protected water except when approved by a conditional use permit. • Development will not be on of a steep slope or bluff (slope greater than 18% and bluff taller than 10 ft) or within 40 ft of the top of a steep slope or bluff. • If vegetation is removed during construction it is to be replaced to minimize surface runoff, provide screening, and minimize surface erosion. • All development will comply with regulations to govern stormwater management. • Development will employ best management practices to: o Minimize off-site runoff o Maximize overland flow distances across vegetative areas o Increase on-site filtration, o Replicate pre-development hydrologic conditions • Minimize off site discharge of pollutants.
Development Guidelines for the MR Mississippi Overlay District	551	660 - 720	2000-Or-048, Section 8 - 10, 5-19-2000	• The Mississippi River Overlay District is defined as the Mississippi River and Mississippi River Corridor (Executive Order 79-19). • The regulations for the SH Shoreland Overlay District (Chapter 551.440-530) shall apply to the Mississippi River Overlay District located within 300 ft of the river or the Mississippi River's landward extent of the floodplain. • The Mississippi River is assumed to be a protected water. • Development will not be on a bluff or within 40 ft from the top of a bluff.

Appendix C
Water Resource Management Guiding Principles – Existing Activity Inventory

1. Protect people, property and the environment

Construct improvements to sanitary sewer and storm drainage systems that provide protection

- Construct projects to mitigate flooding caused by inadequate capacity of storm drainage system

  The City will continue to pursue a policy aimed at reducing flood potential through either land use changes or structural measures, as it deems appropriate. The City may employ any or all of the following means:

  1. Review plans to ensure development proposals include adequate rate control
  2. Construct dry detention basins
  3. Construct stormwater ponds
  4. Use design standards that reduce the probability of flooding in problem areas during critical periods
  5. Consider all development, redevelopment and rehabilitation projects in light of potential downstream impacts, particularly in downstream areas with known flooding problems
  6. Upgrade existing storm sewers in areas known to have flooding problems
  7. Provide more inlet capacity by replacing grates with higher capacity models
  8. Construct more catch basins
  9. Provide backup generators for pump stations
  10. Floodproof or acquire properties deemed vulnerable to repeated flooding
  11. Increase inspections and maintenance of inlets and drains located in flood-sensitive areas
  12. Reduce sewer backups by removing cross-connections between storm and sanitary systems, reducing infiltration and inflow, and replacing existing sanitary manhole covers with watertight covers

13. Consider aesthetics as well as design standards in new development, redevelopment or flood mitigation projects

- Construct projects to mitigate sewer backups into buildings by hydraulic deficiencies in sanitary sewers

- Cooperate with public and private partners towards creation of multipurpose stormwater quality and quantity structures

  On-site management to achieve stormwater standards will be incorporated on all sites to the greatest extent possible. When development density, topographic features, soil, or vegetation conditions prohibit this, full or partial participation in existing regional stormwater facilities within the drainage area of the same receiving body may be permitted with the City's prior approval.

  At its discretion, the City will allow shared or joint use of stormwater facilities in new developments and redevelopments, including public or private stormwater basins.

  The City will continue to coordinate with government entities such as watershed management organizations, the Minnesota Department of Natural Resources (MNDNR), the Minnesota Pollution Control Agency (MPCA), highway departments, neighboring cities, Hennepin County, and the Metropolitan Council.

- Monitor Beaches

2. Maintain and enhance infrastructure

Maintain condition of sanitary sewer and stormwater drainage systems

- Ensure adequate funding for maintenance activities

  The estimated replacement cost of Minneapolis' stormwater drainage infrastructure, based on recent studies by the City, is $860 million.

  Industry standards recommend that 1% of the infrastructure value should be spent annually to rehabilitate and maintain the system. This equates to a minimum of $8.6 million per year for just the storm drainage system. This amount is simply to maintain the existing level of service and does not include money necessary to improve the level of service like money spent on flood mitigation. Other studies have identified non-routine maintenance improvements, which would increase the base figure of $8.6 million per year. These include rehabilitation of storm drains on MPRB lands, tunnel rehabilitation (estimated at $12,000,000) and maintenance and rehabilitation of stormwater pumping stations, grit chambers, and storm ponds.

- Ensure a dedicated source of revenue for maintenance activities

With the implementation of the City's stormwater utility there will now be a revenue source dedicated solely to the stormwater program.

- Maintain infrastructure in accordance with NPDES CSO and Stormwater permits

Maintain capacity of sanitary sewer and stormwater drainage systems

- Limit peak flow rates to prevent surcharging or flooding of downstream storm drains, basements, CSO regulators, or surface waters

  The City has eliminated a large number of known CSOs to the Mississippi River. It continues to work in a systematic manner through a special program designed to eliminate all known CSOs in the City. The City has written ordinances to support the elimination of CSOs (Chapter 56 of the City of Minneapolis Ordinances) and to eliminate rainwater leader connection to the City's sewage system (Chapter 511.10 of the City of Minneapolis Ordinances). The City has also committed $10 million over the next five years toward CSO elimination.

  For new construction and other activities associated with new development or redevelopment, computed post-development peak flow rates will not exceed computed existing peak flow rates. Computations will be based on accepted engineering practice and/or modeling assumptions for the 2-year (2.8 inches in 24 hours) event, 10-year (4.2 inches in 24 hours), or 100-year (5.9 inches in 24 hours) storm events.

  As opportunities for new development and redevelopment arise, the City will continue to use plan review, and modeling techniques to identify existing deficiencies and potential flooding problems. If plan review and modeling indicate increased flooding potential for downstream areas, the City will require the developer to incorporate such practices as are necessary to resolve a proportionate share of the problems to mitigate the downstream impact of such development. These standards are intended to preserve the integrity of downstream conveyance facilities and detention areas.

- Limit Volume of stormwater runoff where feasible to meet goals of City's sustainability plan

  Where soil conditions permit, and it is feasible, infiltration is strongly encouraged in new development and redevelopment in sites. See Appendix O. Where infiltration is not possible, the City encourages the use of alternative BMPs, particularly reduction of impervious area, conducive with existing site conditions and in compliance with the design and performance standards for Best Management Practices (BMPs) as outlined in the 2005 Minnesota Stormwater Manual. This infiltration policy is consistent with the City's Stormwater Management Ordinance and the 2005 Minnesota Stormwater Manual. When infiltration is considered and rejected by a project proposer the reasons for rejecting the infiltration shall be part of the project submittal.

The City encourages reduction of, or minimizing increases in, the amount of impervious surface created as a result of land development or redevelopment activities through the following:

1. The development plan review process and engagement by developers with staff on designing with less impervious surface.

2. Review and consideration of modifications to City code so that less parking is required of development and redevelopment sites.

3. Determining future stormwater utility fees, in part, on a given parcel's percent impervious area.

- Maximize stormwater storage in existing and future stormwater quality controls

  Freeboard requirements will be implemented to provide new structures flood protection from any immediately adjacent surface waterbody, wetland or stormwater basin. Additional protection may be required for new structures adjacent to landlocked basins with no identifiable overflow route.

  The City will maintain a policy of "no net loss of storage capacity" in designated stormwater basin ponding areas, and of at least maintaining the existing level of flood protection for all areas within a given watershed.

  Compensatory storage will be required to mitigate fill within wetlands, ponds, and other similar runoff storage sites. Compensatory storage will be provided for flood storage lost below the City's calculated high water level plus free board. This requirement applies to all development and redevelopment activities, regardless of size. It should be emphasized that this policy applies to storage areas that serve sites and not to the large contiguous flood plain attached to the City's lakes, creeks, and the Mississippi River. The floodplains are regulated in the City's floodplain ordinance (Chapter 551 Articles VI and VII). Chapter 12, Article 1 of MPRB ordinances provides for shoreland and floodplain preservation over MPRB lands.

  The City will attempt to establish and maintain overflow routes, including pond overflows where feasible to provide relief from storms which exceed design conditions, provided that downstream areas would not flood due to the overflow operation.

- Line sanitary sewers to seal out extraneous groundwater infiltration

  The City conducts visual inspections of sanitary sewers each year to determine if the sewers have structural problems, root intrusion and/or excessive groundwater infiltration. Areas determined to have one or more of these problems are lined.

- Investigate source of inflow connections from public and private buildings

The Regulatory Services Department began a building by building inspection for sources of rooftop connections to the sanitary sewer. Inspections are scheduled to be complete in 2007.

3. Provide cost-effective services in a sustainable manner

Optimize enhancements to sanitary sewer and stormwater drainage systems

- Life cycle costs are analyzed for all capital improvement projects

  Understanding that portions of the City's stormwater system have historically been designed according to different standards, newly constructed conveyance facilities will be designed to convey the 10-year storm event (based on standard engineering practices) without surcharging. This will be true except in designated flood areas where the goal will be to design new storm sewer and other conveyance to prevent boulevard flooding for the critical 100-year storm:

  1. The 100-year, 24-hour storm event (5.9 inches in 24 hours) Source: SCS NEH

  2. The 100-year, 1-hour storm event (3.0 inches in 1 hour) Source: U.S. Weather Service T.P. 40

- Inspect stormwater management facilities during construction and periodically after construction to determine that facilities are functioning properly.

- Priority is given to projects which are multi-functional or which solve multiple problems

- Priority is given to cooperative projects with multiple funding partners

4. Meet or surpass regulatory requirements

Operate and maintain public lands consistent with best current practices and City's NPDES permits

- Maintain system in accordance with NPDES permits

  The City will continue to be actively engaged in stormwater inspection, operation and maintenance, and repair of the stormwater system on a day-to-day basis. The City will follow a formal inspection, cleaning, and repair schedule. Frequency of maintenance is event-based and driven by experience and inspection history. Practice good housekeeping on City-owned land

- The City will follow best management practices and environmental friendly approaches in managing and maintaining City-owned land and property in accordance with NPDES permit requirements.

- The City has dedicated one full time inspector to inspect street construction sites and to ensure the projects are in compliance with erosion and sediment control

requirements. The City will continue to prevent erosion and sedimentation from all City-owned construction projects.

- Roadways are maintained in a manner that prevents wash-off of pollutants during rainfall and snowmelt

  Every year, in the spring and the fall, there is a city-wide comprehensive street sweeping program, in which parking restrictions are put into place and the entire city is swept, curb to curb, over a 3-4 week period. The Fall Sweep this year will be starting on October 25th. Various watersheds in the City (examples being around the Chain of Lakes, Minnehaha Creek, Shingle Creek, Bassett Creek, Mississippi River, etc.) are on a more frequent sweeping cycles, since debris in the street has a direct route to these water bodies. Averaged throughout the "sweeping" year, these areas are swept at an average frequency of approximately every 20 - 30 days. Each street maintenance district has on average 1 sweeper operating in their district throughout the "sweeping" year. These sweepers are assigned to sweep areas on an "as-need" basis. There are many other sweeping schedules that exist throughout the city. Examples being major commercial nodes, the Downtown Central Business District, Warehouse District, day sweepers, night sweepers, State Trunk Highway Routes, etc.

  Minneapolis implemented Best Management Practices (BMPs) and advanced technology for snow and ice control such as introducing "smart spreaders", and a pilot anti-icing and alternative de-icing program to more effectively treat streets and reduce chloride release/salt release to the water bodies. When applying sand and salt to City roadways, efficient application methods will be used. Maintenance supervisors will continue to receive training at the Local Road Research Board on application rates, techniques, and spreader calibration. Reasonable precautions will be taken to minimize salt and sand runoff in storage areas.

- Maintain emergency preparedness, including spill response and flood response capabilities

  The City will continue to have a hierarchical spill response capability based on size and hazardous/non-hazardous category of the spill. Spills meeting the specified volumetric criteria will be reported to both the Duty Officer at the Minnesota Department of Public Safety and the MPCA.

  The response program will focus on containing, neutralizing, and properly disposing of spilled material. It will extend to include preventing the discharge of spilled toxic or hazardous materials into the storm drainage system. Appropriate spill kits will be available to prevent spills from entering the storm drain system.

  A number of City departments will coordinate the work, including Emergency Communications, Regulatory Services, Environmental Management, Fire Department, Sewer Maintenance and Street Maintenance Departments.

Procedures will continue to be documented, and response guidelines strictly followed. City staff will have a readily available supply of response materials, including containment booms, absorbent pads, and buckets of sand for immediate response to small spills. A proper procedure for disposal of containment material will continue to be used.

- Eliminate inflow sources from public properties

  The City has designated funds in the Capital Improvement Program to pay for removal of inflow sources from City-owned properties.

- Use Integrated Pest Management practice on Park properties

  The MPRB has an Integrated Pest Management (IPM) Policy as part of its General Operating Procedures that guides a logical and stepwise method of solving pest infestations. The MPRB uses these procedures on their land. MPRB staff is involved in seeking better and more innovative solutions to solving vegetation management problems through education, training and pilot projects.

Provide on-going assessments of sanitary sewer and storm drainage systems

- Monitor stormwater runoff and BMP effectiveness in accordance with NPDES Stormwater Permit

  Monitoring set up as part of the NPDES Phase I Permit will continue as per Permit requirements. The data will be used to evaluate changes in the runoff quality over time.

- Monitor sanitary sewers in accordance with NPDES CSO permit

- Monitor lakes and beaches

- Coordinate monitoring efforts with public agencies

  The City will continue stormwater monitoring. In particular, the City of Minneapolis will continue to assist other agencies, especially the watersheds, in their monitoring efforts and work together to avoid duplication.

- Cooperate with TMDL studies on Minneapolis surface waters.

5. Educate, engage the public and stakeholders and improve compliance and use of BMPs

Enhance quality of runoff from redevelopment

- Inspect redevelopment projects for sources of inflow

- Maintain stormwater management requirements

The City has implemented stormwater ordinances (Chapter 54 of the City Ordinances) to guide stormwater management in the City. The City will continue its efforts to implement these ordinances to the best of its ability. Stormwater quantity and quality design standards will continue to be enforced for redevelopment of existing sites that have substandard or no on-site stormwater facilities. The City will encourage and promote stormwater management in redevelopment and new developments to include:

1. A reduction in impervious area; or
2. The implementation of stormwater best management practices; or
3. A combination of both (1.) and (2.); and
4. Total load reductions and discharge requirements.

The City will limit phosphorus levels in runoff by regulating all new developments and redevelopment over one acre in accordance with Minneapolis Code of Ordinances, Chapter 54, developed by the City for all receiving waterbodies within its jurisdiction. The City has developed these targets based upon the destination water resource. Wherever feasible, the City will implement these reductions as land comes up for development or redevelopment. The standards are determined in relation to percent reductions over the benchmark of existing conditions. Once a property has redeveloped under this standard this is memorialized in their permit so that if the property were to redevelop again the current treatment level, if preserved, would be a credit toward the load reduction.

- Maintain erosion and sediment control requirements

  The City has an erosion and sediment control ordinance, Chapter 52, Erosion and Sediment Control for Land Disturbance, that is supported by a site inspection program as well as enforcement capability. Best management practices to be used on-site are outlined in this ordinance. Information is detailed in the City's Storm and Surface Water Management web page.

  Additional guidance should be obtained from the MPCA (October 1989) publication entitled Protecting Water Quality in Urban Areas: Best Management Practices and the Met Council's Minnesota Urban Small Sites BMP Manual.

- Educate developers and contractors

  The City has a pesticide control ordinance (Chapter 230 of the City of Minneapolis Ordinances) that outlines licensing and signage requirements.

- Encourage use of natural site characteristics

- Provide financial credits in stormwater utility for projects that incorporate quality and quantity controls

Maintain or enhance quality of runoff from existing private properties

- Inspect private properties for sources of inflow
- Educate homeowners about organic waste in gutters and other practices
- Provide financial credits in stormwater utility fee for projects that incorporate quality and quantity controls
- Encourage retrofit of stormwater quality and quantity controls on private properties
- Engage the public in advising on aspects of water resource programs and projects
- Inspect and enforce illicit discharge ordinance

  In keeping with NPDES requirements, the City prohibits by ordinance (Chapters 511 and 53 of the Minneapolis Ordinances) the dumping of foreign material into the stormwater management system, including petroleum based products, antifreeze, paint, solvents, herbicides/pesticides, yard debris, animal waste and other material that may be harmful to the environment. The City will continue to inspect and investigate on a complaint basis.

- Inspect and enforce mercury ordinance

6. Enhance Livability and Safety

Preserve, maintain and enhance the City's natural and recreational resources

- Maintain shoreline buffers
- Preserve or create riparian corridor connections

  The City will make river/stream corridor connectivity a priority through land use and planning. Wherever possible, the City will attempt to preserve, maintain and create green space along riparian corridors for the benefit and enjoyment of both wildlife and people. This will promote habitat connectivity for wildlife as well as present opportunities for introduction of linear sports such as biking, hiking, inline skating, and cross-country skiing. The City will work with various watershed management organizations that have land acquisition programs to achieve this goal.

- Protect floodplains in accordance with Floodplain Overlay District requirements of the Minneapolis Zoning Code

- Protect shoreland zones in accordance with Shoreland Overlay District requirements of the Minneapolis Zoning Code.

  The City and MPRB will continue to protect shoreland and floodplain (in accordance with FEMA floodplain and shoreland management rules, Minnesota Rule Chapter 6120) through the use of structural and vegetative techniques as well as regulatory measures, as stated in Chapter 551 of the City Ordinances and Park Board Chapters 12 and 13 (PB12 and PB13). The City and MPRB will introduce native vegetation wherever feasible.

- Administer requirements of the Minnesota Wetland Conservation Act

  The City acts as the local government unit for protection of wetlands and administration and enforcement of WCA within the City's limits.

- Conserve and stabilize shorelines, streambanks and steep slopes from damaging erosion

  The City and MPRB will continue to engage in bank and slope stabilization for priority waterbodies through their respective Capital Improvement Programs. Wherever possible, natural appearance of a shoreline will be preserved. And where repairs are necessary, the City will encourage the use of bioengineering, landscaping and preservation of natural vegetation as a means of stabilizing the shoreline.

  1. The City will continue to participate in bank and slope stabilization.
  2. Funding mechanisms may vary by project and partners.
  3. Responsibilities may vary based on cooperative agreements with watersheds for maintaining slopes and banks.

- Examine opportunities to optimize buffers as component of Park planning efforts

Maintain and/or improve the quality of the City's surface waters

- Use innovative lake management approaches (e.g., barley straw, in-lake wetland planting of deltas)
- Inspect stormwater outfalls for erosion and repair in accordance with NPDES Stormwater Permit
- Inspect bridges for scour
- Cooperative with other water resource public agencies

Appendix D
Environmental Pool Plans for the Mississippi River

The Environmental Pool Plans are a result of cooperative efforts among state and federal agencies and the public to help develop common habitat goals and objectives for the Upper Mississippi River. They are intended to serve as a guide to habitat management sequencing in the St. Paul District of the Corps of Engineers and a way to reverse negative trends in habitat quality toward a sustainable ecosystem.

Though Pool Plans are available for Pools 1-10 from Minneapolis to Guttenberg Iowa, only Pool 1 and 2 are discussed here due to their relevance to the City of Minneapolis. Included in this discussion is a summary of the descriptions of Pool Areas 1 and 2 and actions proposed to meet desired future goals.

Opportunities and Visions

Just as awareness of the recreational, aesthetic and habitat potential of the Upper Mississippi is on the rise, extensive redevelopment opportunities in Minneapolis seem to be increasing. Stormwater treatment, improved water quality and habitat restoration and protection are some of the priorities that are emerging.

Regional parks as well as private ownership are recognizing the importance of natural shoreline and native vegetation. As a result, a number of strategies, including short-term drawdown to expose the buried rapids or construction of a parallel channel to mimic the once existing rapids, are being considered.

Existing commercial navigation is a constraint around which a number of possible management strategies are being considered. Elimination of commercial navigation would allow for permanent drawdown and increase opportunities for the establishment of fringe flora and fauna communities. However, this would be unlikely in the foreseeable future due to additional impacts on hydroelectric power generation as well as concerns about the fate of the large amounts of exposed sediment.

Pool 1

Pool 1 results from an impoundment of the Mississippi River about 2 miles upstream of Fort Snelling, at river mile 847.6. Lock and Dam 1, also known as the Ford Dam and originally as the Twin Cities Dam, includes the reach of river from Coon Rapids, at river mile 866.2, to Lock and Dam 1. The reach includes two other locks and dams, the Upper and Lower St. Anthony Falls at river miles 854 and 853.9, respectively. The drainage area to Pool 1 includes about 1,500 acres, of which Minneapolis occupies a large part.

Pool 1 is entirely within Minneapolis/St. Paul and has a large corridor of open space and habitat for both aquatic and terrestrial plant and animal communities. A large portion of the corridor is publicly owned and forms a large north-south wildlife corridor. Much of the area is parkland and managed by the respective park boards of the two cities.

Two of the three distinct areas defined within Pool 1 are located within City boundaries:

- **I-694 Bridge to Upper St. Anthony Falls Lock and Dam** upstream portion is characterized by a wooded shoreline, lawns and high banks. Land use downstream is mostly industrial, commercial and residential with significantly more impervious surface than the upstream segment. Shingle Creek is the significant tributary entering the river in this segment. The City of Minneapolis water intake structure and treatment plant are located here and serve about 500,000 people.

- **Mississippi Gorge** extends from Upper St. Anthony Falls to Lock and Dam 1. Along this stretch, the river drops 73.6 feet, the steepest drop found on the entire length of the Mississippi. Originally, rapids that provided critical spawning grounds for fish dominated this segment of the river. These rapids are now submerged and covered by sand deposition upstream of the Ford Dam. Bassett Creek enters the Mississippi just below the Upper St. Anthony Falls via an underground tunnel. The gorge area is bordered on either side by steep, wooded slopes and rock cliffs. Water extends from shore to shore with very little room on either side for wildlife species or human recreation.

Pool 2

Pool 2 results from the impoundment of the river by Lock and Dam 2 at Hastings. This is the most engineered section of the river in the St. Paul District. Pool 2 extends from Lock and Dam 1 at river mile 847.6 to Lock and Dam 2 at river mile 815.2. A large number of communities are located along this stretch of river, including Minneapolis. The Pool 2 drainage area encompasses about 9,652 acres.

Pool 2 represents a significant corridor of open space, aquatic areas and floodplain forests that offer unique habitat for both plants and animals. The Minnesota River is the only significant tributary to the Mississippi within the Pool 2 area that has a strong influence on the size and water quality of the Mississippi. Smaller tributary creeks that contribute are: Minnehaha, Phalen, Fish and Battle Creeks.

Significant floodplain lakes exist along the Minnesota and Mississippi Rivers in this segment.

Two of the five distinct areas defined within Pool 2 are partially located within Minneapolis:

- The first sub-area known as the **Minnesota River Valley** includes the Minnesota River upstream from Savage to its confluence with the Mississippi River. The segment includes the Black Dog Power Plant, Fort Snelling State Park and the Minnesota Valley National Wildlife Refuge.

- The second sub-area, known as the **Gorge Area,** begins from Lock and Dam 1 to the confluence of the Minnesota and the Mississippi Rivers. This is a continuation of the Gorge area in Pool 1. The river flows through a steep sided gorge over once existing rapids. A former flowing channel of the Minnesota River now called Snelling Lake enters at the upstream end of Pike Island. Bluffs along the gorge provide habitat for migratory birds.

Potential Actions to Achieve Future Goals

Implementation of the Environmental Pool Plans for Pools 1 and 2 will bring the Mississippi River's ecosystem to a sustainable state by reestablishing the desired flow regime and habitat structure.

Planning guidelines to be considered through the process are:

1. Locks and dams will exist for the life of this plan
2. Public involvement and awareness are critical components for implementation of the plan
3. Implementation is dependent on adequate funding and personnel
4. The reach and pool plans will continue to be revised and updated
5. Social values and issues will affect habitat management decisions

The **goals** identified in the Pool Plans are as follows:

1. Improve water quality
2. Reduce erosion, sediment and nutrient impacts
3. Restore natural floodplain to allow for more habitat diversity
4. Provide for seasonal flood pulses and periodic low flow conditions
5. Restore backwater channel connectivity
6. Manage side channels; create islands, shoals and sandbars
7. Manage channel maintenance and dredged material placement
8. Sever pathways for exotic species
9. Provide native fish passage at dams

In order to meet the nine goals that have been identified in the Pool Plans, five **primary tasks** are required:

1. Promote watershed management programs on tributary streams
2. Manage for more natural water levels by restoring or mimicking the natural range of variations that would occur seasonally
3. Restore native plant communities along the riparian corridor
4. Modify or remove non-essential infrastructure
5. Further improve the quality of effluents discharged into the river upstream

Local Level Action

The goals listed in the Environmental Pool Plans can be achieved through committed cooperation from the municipalities, watershed management organizations, and neighborhood and non-profit groups interested in working toward a responsible and sustainable riparian urban corridor. Some actions that, if taken at the municipal and watershed level, will help further these goals are:

- Freeing the floodplain of manmade encumbrances and restoring floodplain through acquisition or conservation easements
- Increasing diversity and abundance of floodplain vegetation
- Reducing sediment and nutrient input to the Mississippi River through both structural and non-structural best management practices (BMPs)
- Providing shoreline protection both at the river and tributary/creek level
- Making land use changes where appropriate
- Protecting, managing and developing prairie and wet meadow communities
- Managing floodplain plant communities to eradicate exotic species
- Implementing management recommendations to stop the spread of aquatic exotics

Appendix E
Lake Assessments

Bassett Creek Water Management Commission

In addition to Bassett Creek, the other water bodies in Minneapolis that fall within the Bassett Creek watershed are Spring Lake, Birch Pond and Wirth Lake (see Table 4.21). The City of Minneapolis recently designed, funded and constructed a large flood control pond at 29th and Logan Avenue North that serves both a flood control and water quality purpose.

Current Status: TSI for lakes in the Bassett Creek Watershed are presented in Table E-1. Spring Lake is a type 5 wetland affected by highway salt runoff. Limited water quality data is available for Spring Lake. Birch Pond is not included in the MPRB monitoring program.

Table E-1 Trophic State Index Trends for Lakes in the Bassett Creek Watershed

Water Body	1998	1999	2000	2001	2002	2003	2004
Spring Lake	ID	ID	ID	ID	76	68	ID
Birch Pond	NS	NS	NS	NS	NS	NS	NS
Wirth Lake[1]	61	60	58	57	55	55	56

Note: Wirth Lake is monitored by MPRB (it is not within the City of Minneapolis)

NS = Not sampled

ID = Insufficient Data

(Source: MPRB)

Assessment Methodology and Standards: The BCWMC conducts routine monitoring of its water resources. Due to distinctions between use and expectation for various water bodies, the BCWMC classifies water bodies according to their expected use and corresponding water quality necessary to support that use. Table E-2 outlines the desired uses. Level I water bodies require the highest water quality. Levels II, III and IV require successively lower water quality to support their intended uses.

Table E-2 Definition of Management Classification According to Desired Uses

Level	Definition
Level I	Water-based recreational activities including swimming, scuba diving and snorkeling fully supported
Level II	Appropriate for all recreational uses, such as sailboating, water skiing, canoeing, wind surfing and jet skiing except full body contact activities
Level III	Supports fishing, aesthetic viewing and observing wildlife
Level IV	Generally intended for runoff management and has no significant recreational value

(Source: BCWMC)

Table E-3 - Management Classification of Major Water bodies in the Bassett Creek Watershed.

Table E-3 Definition of Management Classification According to Desired Uses

Waterbody	Management Classification
Birch Pond	Level III
Wirth Lake	Level I
Bassett Creek (Mississippi River to Medicine Lake)	Level III

(Source: BCWMC)

In addition to classifying water bodies according to their intended use, the BCWMC has set specific water quality goals for each lake or stream. In order to meet these goals, the watershed considers development review a major component of its management strategy. The watershed's development review policy is seen as a way of controlling the amount of phosphorus and suspended sediment that may enter a waterbody through runoff.

Minnehaha Creek Watershed District

With the exception of Lake of the Isles, the rest of the lakes that form the Minneapolis Chain of Lakes (i.e., Cedar, Brownie, Calhoun and Harriet) have maintained good water quality over the last five years. In general the Chain of Lakes shows a general trend of increasing transparency over recent years. Among the lower watershed lakes, Lake Nokomis shows improvement in concentration of total phosphorus and Chlorophyll-a. Included among lakes of poorer water quality is Diamond Lake. The water quality in Diamond Lake results from its shallowness and wetland tendencies. Lake and watershed management and water quality improvements have either improved water quality or arrested further deterioration in most cases.

A summary of diagnostic studies carried out on the Chain of Lakes since the 1980s is the Minneapolis Chain of Lakes Phase I – Diagnostic Report (MPRB, 1991-1993). It provides detailed information on monitoring efforts carried out by the MPRB as well as various consultants over time. According to the report, watershed areas of lakes are typically 40-45% impervious, and 14% of rainfall over a Chain of Lakes watershed ends up as runoff. In the Phase I diagnostic study, loading rates were estimated as shown in Table E-4.

Table E-4 Loading Rates (kg/ha/year) for Chain of Lakes Watershed

Land Use	Total Nitrogen	Total Phosphorus	Ortho-phosphorus
Residential	2.52	0.54	0.22
Green Space	1.59	0.13	0.03
Commercial/Mixed	2.61	0.41	0.15

(Source: MPRB)

Assessment Methodology and Standards: A number of goals and recommendations have been developed to protect water quality in the Chain of Lakes. They are presented in Table E-5.

Table E-5 Goals for Chain of Lakes Watershed

Goal #	Identified Goal
Goal 1	Increase public awareness of water quality issues
Goal 2	Protect public health and safety
Goal 3	Reduce in-lake pollutants
Goal 4	Reduce pollutant loadings through implementation of best management practices
Goal 5	Improve government management
Goal 6	Monitor lake water quality and management practices effectively

(Source: MPRB)

MPRB calculates trends in average TSI over time for all the lakes. Based on this, the lakes were placed in three categories:

- Lakes showing water quality improvement
- Lakes showing stable water quality
- Lakes showing water quality degradation

The classifications are presented in Table E-6.

Table E-6 Trophic State Index Trends for Lakes in the Minnehaha Creek Watershed

Lakes Showing Water Quality Improvement	Lakes with Stable Water Quality	Lakes Showing Water Quality Degradation
Cedar Lake	Brownie Lake	—
Lake Calhoun	Lake Hiawatha	—
Lake Harriet	Lake of the Isles	—
—	Lake Nokomis	—
—	Powderhorn Lake	—

Note: Brownie Lake has too few data points for long term trend analysis. *(Source: MPRB)*

As part of the 1993 Minneapolis Chain of Lakes Phase I – Diagnostic Report (MPRB, 1991-1993), both short term and long term goals were developed for some of the water bodies in the Chain of Lakes (Table E-7):

Table E-7 Short and Long Term Goals for Some of the Water Bodies in the Chain of Lakes

Lake	Mean Summer TP (ug/L)		Mean Summer Secchi (m)		Mean TSI Value	
	Short term (3-5 years)	*Long term (5-10 years)*	*Short term (3-5 years)*	*Long term (5-10 years)*	*Short term (3-5 years)*	*Long term (5-10 years)*
Brownie	35	35	1.4	1.4	55	55
Cedar	30	25	1.6	1.9	53	51
Isles	45	40	1.1	1.2	59	57
Calhoun	30	25	1.6	1.9	53	51
Harriet	22	20	2.2	2.4	49	47

(Source: MPRB)

Similar to the MPRB system of assigning a TSI to every lake, the MCWD has established a system of assigning lake grades to show how a lake measures compared with other area lakes (see table E-8.) The method was developed by the Met Council, and combines the same three water quality measurements used to estimate the TSI: total phosphorus, chlorophyll-a, and Secchi disk transparency. In addition, the grades consider what is average or normal for lakes in a given area, making lakes within the seven-county metro area comparable in terms of the grades assigned.

Table E-8 Lake Water Quality Report Card Grade Ranges and Descriptions

Grade	Percentile	Description
A	Top 10%	Crystal clear, beautiful. Exceptional and are enjoyed recreationally without hesitation.
B	10-30%	Generally good water quality but algae may limit swimming toward the end of summer.
C	70-90%	Average quality. Swimming, boating and fishing may be undesirable relatively early in the season.
D	Lowest 10%	Severe algae problems. No interest in recreational use.
F		Not enjoyable. Severe limitations to recreational use.

(Source: MCWD)

Lake grades for the Minneapolis Lakes in the MCWD for 2002 are listed in Table E-9.

Table E-9 Water Quality Grades for Lakes in the Minnehaha Creek Watershed

Lake	2002 Grade	2005 Grade
Brownie Lake	————	————
Lake Calhoun	A	A
Cedar Lake	B+	B+
Lake Harriet	A	A
Lake of the Isles	C	B-
Lake Hiawatha	C+	B-
Lake Nokomis	C	C+

(Source: MCWD)

Due to the strong correlation of depth with water quality, the MCWD sorted the lakes into three major groups according to maximum depth. The MCWD then developed generalized goals for the lakes based on lake depth as follows:

Lake Depth (meters)	Target Phosphorus Concentrations (ug/L)
>20	30
5-20	50
<5	90

With non-degradation as the goal for lakes that currently have higher water quality than the generalized goals presented above, specific target in-lake phosphorus concentrations have been developed. The MCWD does not have a lake management classification system based on use as some of the other watershed management organizations do. Target in-lake phosphorus concentrations are updated as necessary through a fairly in-depth process of citizen input and waterbody assessment. The most recently updated target phosphorus concentrations are listed in Table E-10.

Table E-10 Target Phosphorus Concentrations for Lakes in the Minnehaha Creek Watershed

Lake	Target phosphorus concentration[2] (ug/L)	Long-term mean phosphorus concentration[1] (ug/L)	Meets target phosphorus concentration (Y/N)
Brownie Lake	35	90	N
Lake Calhoun	25	30	Y
Cedar Lake	25	25	Y
Lake Harriet	20	20	Y
Lake Hiawatha	50	147	N
Lake of the Isles	40	57	N
Lake Nokomis	50	67	N
Powderhorn Lake	120	150	N
Diamond Lake	90	174	N

[1] 1980-1990 data from City of Minneapolis NPDES Permit Application for MS4s
[2] Data from MCWD 2003

MCWD identified Diamond Lake as being of poorer quality than most due to its shallowness and due to the fact that it is a wetland. According to the MNDNR, nearly all basins in the watershed have problems related to urbanization. The MCWD has addressed this concern by setting restrictive water quality standards for development and developing a capital improvement program that emphasizes improving water quality in a number of high priority lakes.

Mississippi River Watershed Organization

Loring Pond is a shallow (maximum depth is 4 meters) euthrophic lake that primarily receives overland flow from adjacent park areas. It is composed of two basins, with the northerly originally a wetland. In 1997, a number of water quality improvements were undertaken at Loring Pond. In 1997 the pond was drained and lined with bentonite to reduce the loss of water. The pond shoreline and island were well seeded with native vegetation species. In 1998, a lake aeration system was installed and native shoreline vegetation was restored. The pond has consistently maintained high algal levels over the monitoring period as seen from the TSI shown in Table E-11. The primary stormwater input into Loring Pond is local runoff.

Table E-11 Trophic State Index Trends for Lakes in the Mississippi Watershed

Water Body	1998	1999	2000	2001	2002	2004
Loring Pond	63	71	73	71	70	65

(Source: MPRB)

Bridal Veil Creek and Kasota Pond are located at the eastern edge of the City within the MWMO. Most of Bridal Veil Creek runs underground through culverts. Kasota Pond and adjacent land are polluted from chemical runoff due to adjacent industrial activities. The site is listed as hazardous and is designated for remediation in the near future.

Shingle Creek Watershed Management Commission

Shingle Creek's July 2004 draft Water Quality Plan includes no changes to the classification system described above. The Plan does state that upon creation of management plans for each lake, that specific BMPs would be revised to that lake's specific management goals.

The SCWMC Watershed Management Plan sets specific numeric goals for Total Phosphorus, Chlorophyll-a, and Secchi depth. For Ryan Lake the goal for TP is 35-45ppb, Chl-a is 10-18 ppb, and Secchi depth is 1.1 to 1.4 meters. Webber Pond is not one of the lakes recognized by the SCWMC.

Table E-12 presents data collected by the MPRB for Webber pond. Webber Pond is a shallow pond (maximum depth is 2 meters) adjacent to Shingle Creek. It receives runoff from surrounding park areas and has achieved stable water quality over time.

Ryan Lake was only recently added to the MPRB monitoring program. Ryan Lake was monitored by the Citizen's Assisted Monitoring Program (CAMP) run by the MCES in 2003.

Table E-12 Trophic State Index Trends for Lakes in the Shingle Creek Watershed, Based on MPRB Monitoring

Water Body	1998	1999	2000	2001	2002	2004
Webber Pond	51	46	56	61	62	67
Ryan Lake	ID	ID	ID	ID	ID	ID

Note ID = insufficient data. Ryan Lake is only partially within Minneapolis (eastern shore). It was included in MPRB monitoring as of 2002. A limited number of water quality parameters were sampled. A TSI is not available for Ryan Lake at this time. *(Source: MPRB)*

Information on the MPRB monitoring program can be obtained in the annual MPRB Water Resources Report.

The SCWMC's First Generation Management Plan identified the following classification scheme (Table E-13) for water bodies within the City of Minneapolis:

Table E-13 Classification Scheme for Water Bodies in Minneapolis Under the Jurisdiction of SCWMC

Recreational Group	Aesthetic Group	Runoff Management Group
Ryan Lake	DNR Protected Waters	- Judicial ditches - County ditches - All wetlands including DNR Protected Wetlands and all water bodies other than DNR Protected Waters
Webber Pond	DNR Protected Waters	- Judicial ditches - County ditches - All wetlands including DNR Protected Wetlands and all water bodies other than DNR Protected Waters

(Source: SCWMC)

The classification scheme was used to designate appropriate BMPs for those water resources. These BMPs include:

- Recreational Group: Inflow treated with BMPs, including removal of fine sands and sediment, skimming of oil and floatable materials, and nutrient removal.
- Aesthetic Group: Same BMPs as above except for nutrient removal. Waters may be used for runoff management as long as state water quality standards are not violated and flow and elevations are controlled.
- Runoff Management Group: Managed as stormwater storage and conveyance components. BMPs implemented where reasonable and prudent.
- Special Purpose Group: Treatment as necessary to maintain the characteristics necessary to support the special purpose. No special purpose areas were designated.

Summary Tables

Table E-14 303(d) List of Impaired Lakes in Minneapolis

Lake	DNR Lake #	Affected Use	Pollutant or Stressor	Target Start// Completion	Category[1]
Powderhorn	27-0014	Aquatic recreation	Excess nutrients	2003//2006	5A
Powderhorn	27-0014	Aquatic consumption	Mercury1FCA	2006//2021	5A
Harriet	27-0016	Aquatic consumption	Mercury1FCA	1999//2011	5C
Hiawatha	27-0018	Aquatic recreation	Excess nutrients	2003//2006	5C
Nokomis	27-0019	Aquatic recreation	Excess nutrients	2003//2006	5A
Nokomis	27-0019	Aquatic consumption	Mercury1FCA	1999//2011	5A
Nokomis	27-0019	Aquatic consumption	PCB FCA	2002//2015	5A
Diamond	27-0022	Aquatic recreation	Excess nutrients	2003//2006	5C
Calhoun	27-0031	Aquatic consumption	Mercury1FCA	1999//2011	5C
Crystal	07-0034	Aquatic Recreation	Excess Nutrient	2006/2007	5C
Wirth	27-0037	Aquatic recreation	Excess nutrients	2011//2016	5A
Wirth	27-0037	Aquatic consumption	Mercury1FCA	1999//2011	5A
Brownie	27-0038	Aquatic recreation	Excess nutrients	2003//2006	5A
Brownie	27-0038	Aquatic consumption	Mercury1FCA	1999//2011	5A
Cedar	27-0039	Aquatic consumption	Mercury1FCA	1999//2011	5C
Lake of the Isles	27-0040	Aquatic recreation	Excess nutrients	2003//2006	5A
Lake of the Isles	27-0040	Aquatic consumption	Mercury1FCA	1999//2011	5A
Ryan	27-0058	Aquatic recreation	Excess nutrients	2003//2005	5C

Note: The absence of a waterbody from the 303d List does not necessarily mean the reach is meeting its designated uses. It may be that the reach has either not been sampled or there are not enough data to make an impairment determination.

[1]*Category 1: all designated uses are meeting water quality standards*

Category 2: some uses are meeting water quality standards and there are insufficient data to assess other uses

Category 3: there are insufficient data to assess any uses

Category 4: at least one use is impaired, but a TMDL is not required

4A: Impaired, but a TMDL study has been approved by EPA

4B: Impaired, but a TMDL study is not required because water quality standards are expected to be met in the near future

4C: Impaired, but a TMDL study is not required because the impairment is not caused by a pollutant

4D: An assessment unit is impaired or threatened but doesn't require a TMDL because the impairment is due to natural conditions with only insignificant anthropogenic influence. To be considered "insignificant", the elimination of the anthropogenic influence would not lead to the attainment of water quality standards and it would not be included in formal pollution reduction goal-setting activities. A reach-specific water quality standard based on local natural conditions has yet to be determined. Upon determination, the assessment unit will be considered non-impaired for the natural conditions and re-categorized to an appropriate category

Category 5: at least one use is impaired and a TMDL is required. These become the List of impaired waters

5A: Impaired by multiple pollutants and no TMDL study plans are approved by EPA

5B: Impaired by multiple pollutants and some TMDL study plans are approved by EPA

5C: Impaired by one pollutant and no TMDL study plan is approved by EPA

FCA: Fish Consumption Advisory

Table E-15 Trophic State Index Ranges

TSI	Trophic State	Description
> 55	Eutrophic	Highly fertile or productive, abundance of algae and high phosphorus levels, low clarity
40–55	Mesotrophic	Less productive due to lower nutrient availability, less algal growth and clearer water
< 40	Oligotrophic	Least productive of the lakes, least algae and clearest water

(Source: MPRB)

Table E-16 Average Carlson Trophic State Index Scores (TSI) for Minneapolis lakes.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Brownie	NS	NS	55	55	55	56	58	ID	ID	ID	ID	58	NS	58
Calhoun	54	59	50	46	48	47	43	48	47	46	46	43	43	40
Cedar	54	54	62	52	58	51	45	43	45	47	48	48	49	47
Diamond	NS	67	59	66	71	60	68	73	67	71	68	60	71	73
Grass	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	77	80	61
Harriet	47	50	45	47	51	52	43	47	49	48	45	44	45	43
Hiawatha	NS	58	58	57	59	59	58	58	59	65	58	59	58	60
Isles	55	64	65	58	59	55	52	56	56	53	58	59	62	58
Loring	NS	60	59	61	65	65	NS	63	71	73	71	70	69	65
Nokomis	NS	65	57	60	58	61	60	58	60	61	60	57	57	64
Powderhorn	NS	66	68	66	68	69	75	73	73	75	72	70	63	68
Spring	NS	NS	NS	62	64	67	76	ID	ID	ID	ID	76	69	NS
Webber	NS	58	57	58	58	59	49	51	46	56	61	62	67	67
Wirth	NS	63	63	64	61	57	59	61	60	58	57	55	55	57

ID = insufficient data; NS = not sampled *(Source: MPRB)*

Appendix F
Impaired River and Streams

TableF-1 303(d) List of Impaired Rivers and Streams in Minneapolis

Reach	River Assessment ID	Affected Use	Pollutant or Stressor	Target Start// Completion	Category[1]
Bassett Creek; Medicine Lake to Mississippi River	07010206-538	Aquatic Life	Fish IBI	20006//2009	5C
Minnehaha Creek; Lake Minnetonka to Mississippi River	07010206-539	Aquatic Life	Fish IBI	2005//2007	5C
Mississippi River; Coon Cr to Upper St. Anthony Falls	07010206-509	Aquatic consumption	Fecal Coliform	2008//2011	5A
Mississippi River; Coon Cr to Upper St. Anthony Falls	07010206-509	Aquatic consumption	Mercury[1]FCA	1999//2011	5A
Mississippi River; Coon Cr to Upper St. Anthony Falls	07010206-509	Aquatic consumption	PCB FCA	2002//2011	5A
Mississippi River; Upper St. Anthony Falls to Lower St. Anthony Falls	07010206-513	Aquatic consumption	Mercury[1]FCA	1999//2011	5A
Mississippi River; Upper St. Anthony Falls to Lower St. Anthony Falls	07010206-513	Aquatic consumption	PCB FCA	2002//2015	5A
Mississippi River; Lower St. Anthony Falls to Lock & Dam #1 (RM 853.3 to RM 847.6)	07010206-503	Aquatic recreation	Fecal coliform	2008//2015	5A
Mississippi River; Lower St. Anthony Falls to Lock & Dam #1 (RM 853.3 to RM 847.6)	07010206-503	Aquatic consumption	Mercury[1]FCA	1999//2011	5A
Mississippi River; Lock & Dam #1 to Minnesota R	07010206-514	Aquatic consumption	Mercury[1]FCA	1999//2011	5A
Mississippi River; Lock & Dam #1 to Minnesota R	07010206-514	Aquatic consumption	PCB FCA	2002//2015	5A
Shingle Creek (County Ditch 13); Headwaters to Mississippi R	07010206-506	Aquatic life	Chloride	2002//2006	5A
Shingle Creek (County Ditch 13); Headwaters to Mississippi R	07010206-506	Aquatic life	Invertebrate IBI	2013//2015	5A
Shingle Creek; Headwaters to Mississippi R Shingle Creek (County Ditch 13); Headwaters to Mississippi R	07010206-506	Aquatic life	Low Oxygen[2,5]	2004//2006	5A

Note: The absence of a water body from the 303d List does not necessarily mean the reach is meeting its designated uses. It may be that the reach has either not been sampled or there are not enough data to make an impairment determination.

Source: MPCA Draft List of Impaired Waters, 2006

[1]*Category 1: all designated uses are meeting water quality standards*

Category 2: some uses are meeting water quality standards and there are insufficient data to assess other uses

Category 3: there are insufficient data to assess any uses

Category 4: at least one use is impaired, but a TMDL is not required
- *4A: Impaired, but a TMDL study has been approved by EPA*
- *4B: Impaired, but a TMDL study is not required because water quality standards are expected to be met in the near future*
- *4C: Impaired, but a TMDL study is not required because the impairment is not caused by a pollutant*
- *4D: An assessment unit is impaired or threatened but doesn't require a TMDL because the impairment is due to natural conditions with only insignificant anthropogenic influence. To be considered "insignificant", the elimination of the anthropogenic influence would not lead to the attainment of water quality standards and it would not be included in formal pollution reduction goal-setting activities. A reach-specific water quality standard based on local natural conditions has yet to be determined. Upon determination, the assessment unit will be considered non-impaired for the natural conditions and re-categorized to an appropriate category*

Category 5: at least one use is impaired and a TMDL is required. These become the List of impaired waters
- *5A: Impaired by multiple pollutants and no TMDL study plans are approved by EPA*
- *5B: Impaired by multiple pollutants and some TMDL study plans are approved by EPA*
- *5C: Impaired by one pollutant and no TMDL study plan is approved by EPA*

FCA: Fish Consumption Advisory

Appendix G
Monitoring Activities

Type of Work	Date	Responsible	Description
Monitoring			
Audubon Cooperative Sanctuary (ACS) Golf Course Certification Monitoring	Ongoing	MPRB	Water quality monitoring of select water bodies; vegetation monitoring at Wirth and Meadowbrook golf courses
Wetland Health Evaluation Monitoring (WHEP)	2003-ongoing	MPRB/MPW	Plant and invertebrate species diversity at: - Theodore Wirth Golf Course Site - Amelia Pond at Lake Nokomis - Roberts Bird Sanctuary - Grass Lake
Stormwater BMP Monitoring	2002-ongoing	MPRB/MPW	Inlet and outlet pipe discharge monitoring for TP, TKN, TDP, TDS, TSS among others
Wetland Health Evaluation Monitoring (WHEP)	2002-ongoing	WHEP/MPRB	Plant and invertebrate species diversity at various sites
NPDES Monitoring	2000-ongoing	MPRB/MPW	- Outfall monitoring - Runoff and water quality monitoring for different land uses
Constructed Wetlands Monitoring for Pollutant Removal and Performance Assessment	1999-2001	MPRB/MCES	- Cedar Meadows - SENA wetland - Lake Harriet subsurface flow wetland
Watershed Outlet Monitoring	1998-ongoing	MPRB/MCES/ MCWD/BCWMC	Flow monitoring and water quality sampling at Minnehaha Creek and Bassett Creek
Mississippi Watershed Management Organization Monitoring Program	ongoing	MWMO	Monitoring at 6 locations along the Mississippi River, 5 stormwater outfalls and Loring Pond. Monitors for fecal coliform, and *E. coli* at all points. Also monitors various physical and chemical parameters at the stormwater outfalls.
Survey and Assessment			
Macroinvertebrate Surveys on Bassett Creek, Minnehaha Creek, Shingle Creek	ongoing	River Watch/ VSMP/BCWMC/ MCWD/SCWMC	Completed by trained volunteers
Nine Lakes TMDL Study	2006	MCWD	Six of those lakes are within Minneapolis: Brownie Lake, Diamond Lake, Lake of Isles, Lake Hiawatha, Lake Nokomis and Powderhorn Lake; Study includes monitoring information of the lakes, allocation of sources of pollutants, in-lake modeling, and TMDL determination.
Ryan Lake TMDL Study	2005	SCWMC	Monitoring information of the Ryan Lake
Shingle Creek Chloride	2005	SCWMC	Spatial extent, persistence, and severity of chloride exceedances, identification and quantification of the sources of chloride in Shingle creek including point and nonpoint sources, allocation of Shingle Creek's assimilative capacity to both point and nonpoint sources and development of safety margins protective of State water quality standards
Function and Value Assessment of all Wetlands in District	2003	MCWD	Complete assessment of all wetlands within the Minnehaha Creek Watershed
Hydrologic and Hydraulic Study	2000	MCWD	Assessment of loading (water volume as well as nutrient/pollutant loading) to Minnehaha Creek , inadequate definition of floodplain

Type of Work	Date	Responsible	Description
			zones, and the direction of the District's regulatory system
Land Cover Classification and Management Plan for Theodore Wirth Park and Minnehaha Creek Corridor	2000	MPRB/DNR	Inventory of existing land cover at Wirth Park and Minnehaha Creek Corridor
Above the Falls: A Master Plan for the Upper River in Minneapolis	1999	MPRB/Hennepin County/Mpls Planning/MCDA	Master land use plan, includes restoration of natural areas
Powderhorn Park Restoration Project (Diagnostic Study and Implementation Plan)	1999	MPRB/MPW	Assessment of lake and development of a work plan that led to many of the Powderhorn Lake improvements
Minneapolis Chain of Lakes Clean Water Partnership	1994-2001	MPRB/MCWD/ Minneapolis/St. Louis Park/MPCA	Comprehensive watershed study of the Minneapolis Chain of Lakes
Diamond Lake Vegetation Survey	1994 – recur (2)	MPRB	Documentation of plant species and their area extent to evaluate plant species diversity
Vegetation Management			
Eurasian Milfoil harvesting at Calhoun, Cedar, Harriet and Isles	ongoing	MPRB	Top 2 meters of milfoil plants removed
Purple Loosestrife control in problem areas of the park system: Wirth and Birch (2001) Calhoun, Cedar, Harriet and Isles (2002)	ongoing	MPRB/DNR	- Spraying and biological control: Introduction and monitoring of leaf-feeding beetles as a bio-control for purple loosestrife control - Spraying selected problem areas in the park system
Buckthorn, Mulberry, Garlic Mustard, Poison Ivy and Honeysuckle control	1998-ongoing	MPRB	Management through education and removal in park system problem areas of park system
Shingle Creek Natural Area Management Plan	2002	MPRB	Land cover classification priority areas and creek erosion assessment
Improvements			
Powderhorn Lake Barley Straw Treatments	2004-2006	MPRB	Treatments to improve water clarity
Powderhorn Lake Alum	2003	MPRB	Injection of a specified amount of Al_2SO_4 in the lake
Powderhorn Lake Restoration	2002	MPRB/MPW	- Installation of 5 CDS units - Sluiceways along the sides replaced with storm drains - Shoreline plantings - Replacement and stabilization of walkway on eastern shore
Powderhorn Lake Aeration System Installed	2002	MPRB	Summer aeration in addition to winter aeration for better oxygenation of water and to help control release of phosphorus from bottom sediment
Powderhorn Lake Retaining Wall	2002	MPRB	Retaining wall restored
Inflatable Weir at Lake Nokomis	2002	MCWD	An inflatable weir was installed between Lake Nokomis and Minnehaha Creek to prevent flow from entering the lake from the creek during low flows
Lake Nokomis Wetlands	2001	MPRB	Construction of the wetlands to capture contaminated runoff prior to its entry into Lake Nokomis and downstream waters
Minnehaha Creek Shoreline Restoration	2001	MPRB/MCWD	A stretch of creek was converted to a natural meander with an adjacent wet pond
Lake Nokomis North Shoreline Restoration	2001	MPRB	Tree cover thinned, placement of wave protection barriers in lake, installation of emergent aquatic vegetation in littoral zone, planting of prairie

Type of Work	Date	Responsible	Description
Minnehaha Creek Trail Corridor	2001	MPRB	Shoreline erosion repairs, construction of channel meander and adjacent wetland, placement of vortex treatment structures upstream of wetland at Cedar Avenue
Lake Hiawatha Shoreline and Littoral Area Revegetation	2001	MPRB	Two shoreline and littoral areas at the lake were revegetated, littoral emergent plants and upland wet-to-dry prairie plants introduced
Cedar Meadows Structure Maintenance	2001	MCWD	Structure maintenance
Wirth Lake Aerator	2001	MPRB/DNR	Temporary baffle aerator replaced with permanent pump and baffle aerator
Lake Harriet and Lake Calhoun Alum Treatment	2001	MPRB/U of M/ MCWD/ MPCA	381 tons of Al_2SO_4 placed in Lake Harriet and 1575 tons of alum placed in Lake Calhoun to limit algae growth by reducing available phosphorus
Lake Nokomis Carp Removal	2001	MCWD	Removal of carp to limit phosphorus
Lake Nokomis/Hiawatha Blue Water Partnership	2000-2001	MPRB/MPW/ MCWD	- Construction and planting of three wetlands/ponds at Lake Nokomis, installation of new lake outlet structure, and placement of two vortex treatment units in watershed - Construction of detention basins/wetlands within the major subwatersheds to Lake Hiawatha
Lake Calhoun and Lake of the Isles Grit Chambers	1999	MPRB/MPW	Grit chambers have been installed and will continue being installed until 2004
Lake Harriet Delta Shoreline Improvement	1999	MPRB	Sediment reworked to create a delta and 3 small islands that act as a micropool that slows down stormwater runoff entering the lake and provides habitat for birds
Southwest Calhoun Wetlands	1999	MPRB/MCWD	Construction of wet detention basins/wetlands within the major subwatersheds of the lake
Cedar Lake and Lake of the Isles Goose Removal	1998-ongoing	MPRB/U of M	Goose removal program to limit phosphorus started with Clean Water Partnership project
Lake of the Isles and Lake Calhoun Shoreline Repair	1998-1999	MPRB	Shoreline repairs to prevent erosion; native plantings
Minnehaha Creek Channel Modifications/Erosion Management	1998	MCWD	Hydrologic modeling of creek flows in the lower basin of MCWD under severe runoff conditions. Identification of reaches of creek with severe erosion problems. Channel modification plan
Regional Wetland Restoration	1998	MCWD	Restoration of significant acres of drained wetlands on multiple sites
SENA Wetland	1997	MPRB	Wetlands constructed to remove nutrients and debris from runoff entering Minnehaha Creek
Lake Harriet Subsurface Flow Wetland	1997	MPRB	Wetland constructed to treat stormwater runoff before it enters Lake Harriet
Regional Water Quality Detention Storage	1997-2000	MCWD	Construction of regional wet detention basins/wetlands, expansion of existing storage areas to remove sediment, phosphorus, and other pollutants
Cedar Lake and Lake of the Isles Alum Treatment	1996-1997	MPRB	Alum treatment to limit algae growth by reducing available phosphorus
Cedar Meadows Wetland	1995	MCWD	Wetlands constructed to improve water quality in Cedar Lake

Appendix H
Studies and Reports Inventory

Over 100 plans and studies have been written that inventory, monitor, analyze, and/or set policy that affect water resources in Minneapolis. Table H-1 is an index to the reports that are listed in the remainder of this Appendix.

Table H-1 Index to Minneapolis Water Resource Studies and Reports

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Regional Recreation Open Space Policy Plan	H-5	Metropolitan Council
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SCWMC Annual Report	H-6	Shingle Creek Watershed Management Commission
SCWMC Second Generation Management Plan Draft (2003)	H-6	Shingle Creek Watershed Management Commission
BCWMC Annual Report	H-7	Bassett Creek Watershed Management Commission
BCWMC Second Generation Management Plan Draft (2004)	H-7	Bassett Creek Watershed Management Commission
Wirth Lake Watershed and Lake Management Plan (1996)	H-7	Bassett Creek Watershed Management Commission
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Shingle Creek TMDL (1996)	H-11	United States Geographical Survey

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Management Plans

Metropolitan Council (Met Council)

Water Resources Management Policy Plan (2005, periodically updated)

Coverage: Twin Cities Metro Area
http://www.metrocouncil.org/planning/environment/WRMPP/WRMPP2005.htm

The Plan presents the Met Council's water resources strategy with regard to issues of water quality, wastewater service and water supply. It outlines the Met Council's reliance on a watershed focus to control pollution from point (specific) and non-point (diffuse) sources, bringing together agencies and organizations in partnerships for collaborative planning and implementation. This document outlines the Met Council's intent to develop a program of baseline data and measures to mark the progress in meeting water quality objectives. It lists collaborative goal-setting, joint action and coordination as the strategy to achieve water quality efforts through region-wide partnerships.

Regional Recreation Open Space Policy Plan (2001, periodically updated)

Coverage: Twin Cities Metro Area
http://www.metrocouncil.org/planning/parks/2005/2030RegionalParksPolicyPlan.pdf

The Open Space Policy Plan discusses existing issues facing the regional system and others that may come up in the future if preventive actions are not taken now. The policies and directives it contains are specific actions that should be taken as a response to the issues. Taken as a group, the policies express the Met Council's most basic views as to what the regional recreation open space system should be, now and in the future. Significant policy changes and additions are: siting and acquisition; finance; recreation activities and facilities; planning and system protection. A five-year capital improvement program (CIP) is included as an integral part of an adopted *Regional Recreation Open Space Policy Plan*.

Metropolitan Council Blueprint 2030 (2002)

Coverage: Twin Cities Metropolitan Area
http://www.metrocouncil.org/planning/blueprint2030/documents.htm

The Blueprint lays out a framework for growth that reduces stress on the natural environment, improves commutes and strengthens communities in addition to saving tax dollars. Blueprint 2030 emphasizes on growth near transit corridors, mixed land uses, population responsive housing stock, protection of natural areas, reinvesting in the urban core, preservation of rural character and collaboration to achieve these goals.

Minnehaha Creek Watershed District (MCWD)

MCWD Water Resources Management Plan (509 Plan, 1997)

Coverage: Minnehaha Creek WD Water Resources Management Plan *(509 Plan*)

The Water Resources Management Plan, also known as the 509 plan was developed as required by rules and policies promulgated by the Board of Water and Soil Resources (Minnesota Rules Chapter 8410). It includes an inventory of land and water and biological resources and land use patterns within the District. The Plan looks at surface water systems and ground water in general, and at lakes within the District and associated water quality issues. Also discussed are the results of modeling done by the District on two distinct hydrologic basins within the watershed. The first, or "Upper Basin", consists of that part of the watershed from Gray's Bay dam on Lake Minnetonka to the western boundary of the District. The second, or "Lower Basin", includes the area east of Gray's Bay dam that is drained by Minnehaha Creek to the Mississippi River. Each basin was analyzed to define overall watershed response to individual storms and help quantify runoff rates and volumes on a District-wide basis. The Plan discusses flooding issues as well as stormwater quantity and quality issues faced within the District. In the implementation part of the Plan, solutions, standards, controls and priorities are considered. The District also outlines its goals and policies and lays out the regulatory authority structure of the District and the Municipalities. A Capital Improvement Program is included at the end with projects following a prioritization ranking.

Shingle Creek Watershed Management Commission (SCWMC)

Annual report (Published annually, synopsis not available)

Coverage: SCWMWMC area of jurisdiction
http://www.shinglecreek.org/waterquality.pdf

Second Generation Management Plan Draft (2003)

Coverage: Shingle Creek WMO area of jurisdiction
http://www.shinglecreek.org/mgmtplan.shtml

The Plan, adopted in May 2004, describes how the Shingle Creek and the West Mississippi Watershed Management Commissions will address activities in the two

watersheds during a 10-year period from 2003-2012. It includes an updated land and water resources inventory, a detailed description of the hydrologic system for Districts, as well as water quantity and quality modeling results. Management issues, and goals for the period from 2003-2012 are identified for both Districts, as well as priorities and strategies are outlined. An estimated budget and Capital Improvement Plan are included at the end.

Bassett Creek Watershed Management Commission (BCWMC)

Annual Report (Published annually)

Coverage: Bassett Creek WMO area of jurisdiction
http://www.bassettcreekwmo.org/2004%20Annual%20Report/2004%20cover%20page.htm

The report is in accordance with the Annual Reporting Requirements as set forth in the Minnesota Rules Chapter 8410.0150. The report consists of a description of goals and activities in 2004 and work plan for 2005. Water quality monitoring data and information on capital improvements is included in the appendix.

Second Generation Management Plan (2004)

Coverage: Bassett Creek WMO area of jurisdiction
http://www.bassettcreekwmo.org/2nd%20Generation%20Plan/bcwmc%202nd%20generation%20plan/Contents.htm

The Bassett Creek Water Management Commission (BCWMC) Watershed Management Plan (Plan) sets the vision and guidelines for managing surface water within the boundaries of the BCWMC. It covers the location, history, goals, policies and implementation tasks of the BCWMC.

Wirth Lake Watershed and Lake Management Plan (1996, synopsis not available)

Coverage: Wirth Lake
http://www.bassettcreekwmo.org/Wirth%20Lake%20Feasibility%20report.pdf

Bassett Creek Main Stem Watershed Management Plan (2004, synopsis not available)

Coverage: Bassett Creek
http://www.bassettcreekwmo.org/2nd%20Generation%20Plan/Final%20Plan%20September%202004/TOC.htm

Bassett Creek Park Pond Watershed Management Plan (2004, synopsis not available)

Coverage: Bassett Creek
Not online at this time

Mississippi Watershed Management Organization (MWMO)

Watershed Management Plan *(2000)*
Coverage: MRWO area of jurisdiction
http://www.mwmo.org/plan.pdf

The MWMO (the Plan) is intended to meet and, whenever possible, exceed the water resource protection requirements under 33 Minnesota Statutes 103A through 103G in conformance with Minnesota Rules Chapters 8410 and 8420. The document includes a land and water resources inventory with description of important lakes, ponds and wetlands. This is followed by assessment of water quality, water quantity and erosion and sedimentation problems. The plan elaborates on the mission of the MWMO and its goals. The implementation plan focuses on three approaches: policies and standards, projects, and programs. Included at the end is a 10-yr capital plan for proposed improvements.

Minneapolis Park and Recreation Board (MPRB)

Shingle Creek Natural Area Management Plan (July, 2002)

Coverage: Shingle Creek *Corridor*

The Minneapolis Park and Recreation Board completed an ecological inventory, stream analysis and trails and interpretive opportunities assessment for the Shingle Creek Corridor, Humboldt Greenway and parts of the North Mississippi Regional Park. Potential areas for recreation and management strategies were identified and recommendations made for stream and trail improvements.

Minneapolis Chain of Lakes Implementation Plan: Clean Water Partnership Phase I Project (1993)

Coverage: Minneapolis
Not Available Online

The Phase I project had three goals. The first goal was to investigate the impact of surface water runoff on the Chain of Lakes. Next, the project analyzed the storm water loads of fifteen sub watersheds that contribute to Lake Harrier. Finally, the plan assessed the impact of storm water on the Chain of Lakes water quality. The study found that the quality of the lakes degraded form 1950 to 1960 but has remained stable since the 1960's.

Citizen's Advisory Committee

Water Quality Management Citizens Advisory Committee Report and Recommendations (1993)

Coverage: Minneapolis
Not Available Online

The Citizen's Advisory Committee made recommendations on how the City of Minneapolis could improve water quality. The recommendations included public education suggestions, and a monitoring and action program. The report set water

quality goals for lakes. The goals were intended to be obtainable and would also restore lake quality to pre-build conditions.

Monitoring and Assessment Reports

Metropolitan Council (Met Council)

Metropolitan Council Aquatic Resource Assessment (2003)

Coverage: Twin Cities Metro Area
http://www.metrocouncil.org/planning/environment/ara_report.pdf

The report consists of a GIS-based assessment used to evaluate selected physical, biological, and cultural indicators for surface water resources in the Twin Cities Metropolitan Area (TCMA). The results from this assessment are relative rankings of the regional importance of the region's surface water resources for various purposes (i.e. water supply, recreation, ecological). This represents an important platform from which policy and management issues can be discussed.

Watershed Outlet Monitoring Program (WOMP 2)

Coverage: Minnehaha Creek and Bassett Creek and Shingle Creek
http://www.metrocouncil.org/environment/RiversLakes/Streams/StreamResults.htm

The Metropolitan Area Watershed Outlet Monitoring Program (WOMP) was implemented in early 1998. The new WOMP program expanded the existing MCES stream-monitoring network in the metro area. Seven new watershed outlet monitoring sites were established in seven watersheds. These included both the Minnehaha Creek monitoring station, (located at 32nd Avenue South and Minnehaha Parkway) and the Bassett's Creek monitoring station, (located at 100 Irving Avenue North, near the Minneapolis Impound Lot). The Minnehaha Creek and Bassett's Creek WOMP stations are used to continually monitor the discharge level and water chemistry of the creeks over time. This data can be used to assess the effects of stormwater runoff from the surrounding watershed. It also allows natural resource managers to track changes in each creek through long term data collection, as well as document differences between creeks in the metro area with varying watershed characteristics. Details of the 2001 monitoring can be found in this report.

Metropolitan Council Environmental Services (MCES) 2001 Stream Monitoring Report

Coverage: Twin Cities Metropolitan Area
http://www.metrocouncil.org/environment/RiversLakes/Streams/Reports/CoverIntroFormat.pdf

This report presents results from monitoring conducted by the MCES and its partners at 28 stations on 26 streams in the Twin Cities Metro Area (TCMA) and in the vicinity of Mankato. The purpose of the monitoring is to determine the extent of non-point source pollutant loading from tributaries to the Mississippi, Minnesota, and St. Croix

Rivers. This would provide the information necessary for the development of target pollutant loads for these tributary watersheds, and to evaluate the effectiveness of watershed best management practices for reducing non-point source pollution and improving water quality in streams and rivers. The streams are monitored during significant runoff events, such as snowmelt and heavy rainfalls, and during base flow conditions, to help determine the sources and extent of non-point sources of pollution.

Bassett Creek Monitoring (2001)

Coverage: Bassett Creek in Minneapolis
http://www.metrocouncil.org/environment/RiversLakes/Streams/Reports/Bassett.pdf

The report is the result of a partnership between MCES, the Minneapolis Park and Recreation Board and the Bassett Creek Watershed Management Commission. Stream flow and precipitation on the site were monitored, and water samples collected and analyzed for a number of variables including nitrate, total phosphorus (TP), zinc, cadmium, total dissolved solids (TDS), total suspended solids (TSS) and volatile suspended solids (VSS). Loadings and flow weighted mean concentrations for TSS, TP, dissolved phosphorus and nitrate are included in the report.

Minnehaha Creek Monitoring Information (2001)

Coverage: Minnehaha Creek in Minneapolis
http://www.metrocouncil.org/environment/RiversLakes/Streams/Reports/Minnehaha.pdf

MCES supported water quality monitoring at Minnehaha Creek has been taking place since 1999. The monitoring station is located in Minneapolis, 1.7 miles upstream from the creek confluence with the Mississippi River near Fort Snelling. Stream flow and macro-invertebrate populations were monitored. Water samples were collected and analyzed for a number of variables including nitrate, total phosphorus (TP), zinc, cadmium, total dissolved solids (TDS), total suspended solids (TSS) and volatile suspended solids (VSS). Loadings and flow weighted mean concentrations for TSS, TP, dissolved phosphorus and nitrate are included in the report.

Study of Lake Water Quality of the 145 Metropolitan Lakes (1980- present)

Coverage: Twin Cities Metro Area
http://www.metrocouncil.org/environment/RiversLakes/Lakes/04FullREPORT.pdf
http://www.metrocouncil.org/environment/RiversLakes/Lakes/04ExecSum.pdf

This report is the latest in a continuing series of reports summarizing results of the Metropolitan Council's "Citizen-Assisted Monitoring Program" (CAMP). Since 1980, volunteers have collected surface water samples from area lakes on a biweekly basis from mid-April to mid-October. The samples are analyzed for total phosphorus, total kjeldahl nitrogen, and chlorophyll-a. Lakes are assigned water quality grades based on the results of the sampling (List of lake samples may change every year, list for

2004 is available, Ryan Lake which is partially in Minneapolis has been monitored in 1996, 1998 and 2000 through this program).

United States Geological Survey (USGS)

Upper Mississippi *(1994-present)*
Coverage: Upper Mississippi River from Itasca to Lake Pepin
http://mn.usgs.gov/umis/index.html

Studies have been conducted by the USGS since 1994 in the Upper Mississippi River Basin from Itasca to the outlet at Lake Pepin. Nutrients, sediment, major ions, organic carbon, pesticides, trace metals, semi-volatile organic compounds, and volatile organic compounds are routinely monitored. The goal is to describe the status of, and trends in, the quality of the nation's streams and rivers. Surface water, ground water and aquatic biology studies are included under this program. Special studies, data, publications and maps are available at the web site.

Shingle Creek TMDL (1996)

Coverage: Shingle Creek
http://water.usgs.gov/nawqa/informing/tmdls.html

USGS collected chemical and biological samples in Shingle Creek as part of the national Water-Quality Assessment (NAWQA) Program. The assessment surfaced a chloride problem that led to the inclusion of Shingle Creek in the state list of impaired waters.

United State Army Corps of Engineers (USACE)

Environmental Pool Plans – Mississippi River Pools 1-10(2004)

http://www.mvp.usace.army.mil/rrf/eppfinal.pdf

The Environmental Pool Plans are a result of cooperative efforts among state and federal agencies and the public to help develop common habitat goals and objectives for the Upper Mississippi River. They are intended to serve as a guide to habitat management sequencing in the St. Paul District of the Corps of Engineers and a way to reverse negative trends in habitat quality toward a sustainable ecosystem. The project area includes 11 pools (Pools 1 through 10, and 5A) within the Upper Mississippi River System from Minneapolis, Minnesota, to just south of Guttenberg, Iowa; the lower 14.7 miles of the Minnesota River; and the St. Croix River upstream to Stillwater, Minnesota.

Minnesota Department of Transportation

Diamond Lake Watershed Monitoring and Modeling Projects: 2005

Coverage: Diamond Lake
Not available Online

The MNDOT is planning on constructing I-35W/Crosstown Commons Improvements. This goal of the Diamond Lake Report was to evaluate the pollutant loading to Diamond Lake from current land users in the watershed. Then, a water quality model of the area was developed. Finally, the report evaluated lake protection scenarios that may be implemented during the MNDOT project. The lake protection scenarios include diverting some flows from Diamond Lake to a new treatment pond, installing a series of treatment manhole structures, and routing flow to Lake Mead for treatment.

Minnesota Pollution Control Pollution Control Agency (MPCA)

Citizens Lake Monitoring Program (1996 - present)

Coverage: Twin Cities Metro and surrounding area
http://www.pca.state.mn.us/water/clmp-publications.html

The MPCA's Citizen Lake-Monitoring Program (CLMP) is ongoing since 1973. Lakes are monitored through voluntary participation of citizens residing on or near lakes or those who are frequent lake users. Weekly transparency measurements are recorded and archived in a STORET database. This information is used to deduce water quality of a lake and to estimate the amount of algae (chlorophyll a) and nutrient (phosphorus) status of a lake. Reports from all years can be found at the website.

Citizen Stream-Monitoring Program (1998-2003)

Coverage: Twin Cities Metro and surrounding area
http://www.pca.state.mn.us/water/csmp-reports.html

The MPCA's Citizen Stream-Monitoring Program (CSMP) began in 1998. Reports from all years are available at the website and include transparency readings as well as recreational suitability rankings.

Environmental Data Access

http://www.pca.state.mn.us/data/eda

The EDA initiative was created by the Minnesota Legislature in 2001 to address those deficiencies in the availability of surface water quality data from MPCA and others. In 2003, EDA went online providing access to water quality data through a map-based system. Air quality data becomes available in 2004. Ground water data will also be available through the EDA system in 2005.

305b Assessments of Stream Conditions in Minnesota's Major River Basins (1998– 2001)

Coverage: All of Minnesota
http://www.pca.state.mn.us/water/basins/305briver.html

Stream assessments were prepared, by the Minnesota Pollution Control Agency (MPCA) under Section 305b of the Clean Water Act to estimate the extent to which Minnesota waterbodies meet the goals of the Clean Water Act (CWA) and attain state

water quality standards, and share this information with planners, citizens and other partners in basin planning and watershed management activities. Under each river/stream, information is available on the uses, indicators of impairment and suspected pollutant sources.

305b lake listings (2000-2002)

Coverage: All of Minnesota
http://www.pca.state.mn.us/water/basins/305blake.html

Lake assessments are prepared under Section 305b of the Clean Water Act to estimate the extent to which Minnesota waterbodies meet the goals of the CWA and attain state water quality standards, and share this information with planners, citizens and other partners in basin planning and watershed management activities. Under each lake, information is available on the uses, indicators of impairment and suspected pollutant sources. Lakes are also assessed for the swimmable goal of the CWA.

Water Quality Reconstruction from Fossil Diatonics Applications for Trend Assessment, Model Verification and Development of the Nutrient Criteria for Lakes in Minnesota (September 2002)

Coverage: All of Minnesota
http://www.pca.state.mn.us/publications/reports/lakes-wqdiatoms.pdf

This study conducted a diatom reconstruction of historical phosphorous and chloride concentrations and sediment accumulation rate, based on sediment cores from 55 lakes in MN. The historical data used sediment cores from 1995 – 1998 and section data from as early as 1750. The data provides an opportunity for examining temporal and spatial trends in eutrophication, validating eutrophication models, and providing historical perspective for developing nutrient criteria.

Department of Natural Resources (DNR)

Regionally Significant Ecological Areas (RSEA) (2003)

Coverage: Seven county metro area
http://www.dnr.state.mn.us/rsea/metro_assessment.html

The DNR Central Region conducted a landscape-scale assessment of the seven-county metro area to identify ecologically significant terrestrial and wetland areas

Minnehaha Creek Watershed District

Functional Assessment of Wetlands (FAW) (2003)

Coverage: Minnehaha Creek Watershed District
Not available online at this time

Functional Assessment of Wetlands within the MCWD was developed to provide a comprehensive inventory and assessment of existing wetland functions within the MCWD. The project also provides comprehensive wetland resource data to improve wetland management throughout the District. The plan includes:

- A field inventory of all wetlands greater than 0.25 acres in size
- A functional assessment of all wetlands greater than 0.25 acres in size
- A digital photograph of each wetland greater than 0.25 acres in size
- The establishment of reference wetlands within the entire watershed, each major subwatershed, and each municipality
- Identification and evaluation of potential wetland restoration opportunities
- Identification of critical wetland resources
- Management of all wetland functional assessment data in a Microsoft Access© database
- Development of a GIS wetland data management system
- Recommendations for classifying wetland management standards and criteria

Calhoun Wetland Pond: 1999 Performance Report

Coverage: Calhoun Wetland Pond
Not available online at this time

The Calhoun Wetland Pond Performance Report monitored flow in Lake Calhoun and three tributary ponds. The report was intended to document the success of pollutant removal from Lake Calhoun. The report compared modeled removal results against actual measured impact and concluded that the actual impact exceeded the modeled report results by 66%.

Shingle Creek Watershed Management Commission

Stream monitoring program (Conducted annually)

Coverage: Shingle Creek
http://www.shinglecreek.org/waterquality.pdf

Monitoring has been taking place on Shingle Creek since 1996. The program comprises of monitoring at the upper watershed and the outlet. The outlet monitoring site is located at 45th Ave. and Shingle Creek. Stream stage is recorded and samples are collected at regular intervals from March to November. Samples are analyzed for: TP, DP, VSS, COD and chloride. Estimates for pollutant loading are available for the period sampled.

Macroinvertebrate Monitoring (conducted annually since 1996)

Coverage: Shingle Creek
http://www.minneapolisparks.org/documents/caring/WQ_Annual_2002/2002WR_8.pdf

A macroinvertebrate survey was chosen to assess the health of Shingle Creek. The study is important to understand the effects of changes in the urban environment both on Shingle Creek and the Mississippi River. Three sites are currently monitored on Shingle Creek, with one in Minneapolis. The macroinvertebrate sampling was done twice on Shingle Creek in 2002; results of this monitoring are reported on the MPRB website.

Rapid Bioassessment Sampling (1996, updated in 1997 {fish sampling not included})

Coverage: Two reaches of Shingle Creek
http://www.shinglecreek.org/waterquality.pdf

Biological sampling and habitat assessment was conducted in the Shingle Creek to analyze invertebrate (i.e., insects, mollusks, and crustaceans) community composition and diversity. The information obtained has been used to compare existing conditions to historical conditions within the creek and the watershed, and for documenting potential water quality and biological problems. Three sites were sampled including Queen Ave. (in Minneapolis) for abundance and diversity of invertebrate and fish species. Stream habitat and biologic diversity were also evaluated.

Shingle Creek Channel Profile Survey (1998, synopsis not available)

Coverage: Shingle Creek
http://www.shinglecreek.org/waterquality.pdf

A profile survey and an inspection of Shingle Creek was performed, noting erosion, blockages, bank failures, and the need for repairs as well as the conveyance capacity of the channel. Local communities constructed improvements where necessary

Bassett Creek Water Management Commission

Bassett 1992 Stormwater Monitoring Study *(Synopsis not available)*

A Biotic Index Evaluation of Bassett and Plymouth Creeks: 1995 *(Synopsis not available)*

2005 Lake Water Quality Study *(Synopsis not available)*

http://www.bassettcreekwmo.org/2005%20Bassett's%20Lakes%20Report.pdf

A Biotic Index Evaluation of Bassett Creek and Plymouth Creek: 2000 *(Synopsis not available)*

http://www.bassettcreekwmo.org/2000%20Biotic%20Index%20Figure.pdf

Wirth Lake Watershed and Lake Management Plan: 1996

(not available on-line)

2003 and 2004 Water Quality Study of Wirth Lake (MPRB) and Bassett Creek

http://www.bassettcreekwmo.org/Wirth%20Lake%20Feasibility%20report.pdf

Minneapolis Park and Recreation Board

Powderhorn Park Restoration Plan: 1999

(not available on-line)

Theodore Wirth Park and Minnehaha Creek Corridor Land Cover Classification and Management Plan: 2000

(not available on-line)

2003 and 2004 Lake Water Quality (1991-present)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=922

The report contains data and results resulting from lake monitoring undertaken by Minneapolis Park and Recreation, wherein, scientists monitored 13 of the city's lakes. The data collected were used to estimate the fertility, or trophic state, of the lakes. Trophic State Index (TSI) numbers are calculated using lake water transparency, chlorophyll-a levels and phosphorus levels. Using this information, changes in lake water quality can be tracked as well as used by lake managers to assess improvement or degradation in water quality. Data from the studies can be used to predict problems likely to occur and decide management strategies most effective for improving the recreational quality and ecological health of the lakes. Lakes monitored include: Brownie, Calhoun, Cedar, Diamond, Harriet, Hiawatha, Isles, Loring, Nokomis, Powderhorn, Spring, Webber, Wirth.

According to recent reports, Calhoun, Cedar and Wirth Lakes showed strong water quality improvement trends, Lake of the Isles and Webber Pond also showed an improvement in water quality over the last 11 years, but it was a weaker trend; Hiawatha showed a decline in water quality, but it was a weak trend; Powderhorn Lake showed a strong decline in water quality. Due to insufficient data, trend in water quality for Spring Lake and Brownie Lake could not be determined

Minneapolis Chain of Lakes Project. Minnesota Clean Water Partnership Program Project Implementation Grant 941-2-059-27 (1997-2000)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/documents/caring/Chain_Water_Pro.pdf

The report is a culmination of multi-lateral effort involving the City, watersheds, neighboring cities, and agencies known as The Minneapolis Chain of Lakes Clean Water Partnership project. The project is focused on developing a plan for improving and preserving four lakes: Cedar Lake, Lake of the Isles, Lake Calhoun, and Lake

Harriet. Water quality, especially nutrient loading and algal blooms, is a concern due to the extensive use of these lakes for recreation.

The report describes the process used to assess lake water quality through monitoring, diagnostic studies, as well as user perception. A large part of the report is dedicated to results from the monitoring done by the Minneapolis Parks and Recreation Board. Overall goals and objectives are described in detail along with a description of the implementation plan and recommended BMPs to improve water quality. The report list a chronological summary of project activities by program element at the end.

Minneapolis Storm Water Wetlands Monitoring Report Twin Cities Water Quality Initiative (1991-2001)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/documents/caring/WQ_Annual_2001/7%20Wetlands%20Monitoring%20Report.pdf

The Minneapolis Park & Recreation Board received a grant from the Metropolitan Council of the Twin Cities to monitor the effectiveness of constructed wetlands (1991-2002).

This report is the culmination of that work, providing an overview of the project and results. This study documents the effectiveness of three wetland systems, namely Cedar Meadows, SENA and the Lake Harriet Subsurface Flow (SSF) wetland for treating storm water runoff in Minneapolis.

These constructed systems were monitored to determine their treatment efficiencies and flow characteristics. Sections in the document are segmented into annual work product results and project summarization.

2003 and 2004 Water Quality Projects (annual report)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

The report provides a description of water quality projects completed by the City of Minneapolis and the Minneapolis Park and Recreation Board. Some of the projects listed are: shoreline restoration at Lake Nokomis and Bassett Creek near Fruen's Mill; shoreline and littoral vegetative restoration at Lake Hiawatha; installation of an aerator and baffle at Lake Wirth; the Chain of Lakes Clean Water Partnership Project which included alum treatments at Lakes Harriet and Calhoun; installation of grit chambers at Powderhorn Lake; construction of wetland at Lake Nokomis and installation of the new lake outlet structure, placement of two vortex treatment manholes in the watershed and removal of unwanted species of fish; biological control of purple loosestrife at selected sites in the City and milfoil harvesting on Calhoun, Cedar, Harriet and Isles in 2001.

2003 and 2004 Lake Trophic State Report (annual report)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

From 1999-2004 the Minneapolis Park and Recreation Board monitored 13 City's lakes. Transparency, chlorophyll-a and phosphorus data was collected and used along with a mathematical formula to estimate the trophic state of the lake. It was found that all the lakes in the City fell into either the mesotrophic or eutrophic category as is expected of lakes in fully developed areas. Calhoun, Cedar and Harriet are ` mesotrophic whereas Isles, Weber, Wirth, Hiawatha, Nokomis, Powderhorn and Loring are eutrophic and have higher levels of algae.

2003 and 2004 Phytoplankton-Zooplankton Monitoring (annual report)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

As part of the Chain of Lakes study covering Brownie, Cedar, Isles, Calhoun, Harriet, Hiawatha, Nokomis, Diamond, Powderhorn, Loring, Webber and Wirth, biological parameters were routinely measured. Phytoplankton and zooplankton are the two most common biological parameters collected because they form the base of aquatic food web and influence lake clarity and fish production. The study gives insight into the occurrence of algal blooms of late summer and early autumn that impedes recreational uses. Powderhorn was found to have the greatest chlorophyll-a concentrations over the 2001 growing season, Loring and Spring Lake followed in second and third position. Brownie, Calhoun, Cedar, Harriet and the Isles typically had the least.

2003 and 2004 Beach Monitoring (annual report)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

The Division of Environmental Health Services at the City of Minneapolis collects samples twice a week from public beaches in the City from June through mid-September. The samples are analyzed for non-pathogenic indicator bacteria to determine if a health risk was present for swimmers. Total coliform bacteria, fecal coliform and fecal streptococcus levels are monitored. Decisions on beach closures are made based on the monitoring results and EPA recommendations. The majority of Minneapolis public beaches were within acceptable limits for body-contact recreation for most of the time the beaches were open.

2003 and 2004 Lake Levels (annual report)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

Lake levels are recorded weekly for Calhoun, Cedar, Brownie, Harriet, Hiawatha, Nokomis, Loring, Powderhorn and Wirth lakes from ice out to ice in. The lake level for the Upper Chain of Lakes is taken at Lake Calhoun. Since the lakes are connected, this gives the lake level for Brownie, Cedar, Isles and Calhoun. Lake levels can vary from year to year depending on the amount of rainfall received in spring.

2003 and 2004 Ice out - Ice on dates (annual report)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

Ice in, ice out data tracks the date a lake freezes up in the fall and the date it thaws in spring. Ice freezing and thawing affects migration and breeding patterns of birds, food supply of fish and animals and water chemistry. The historical records are not complete and the coverage varies by lake, Lake Calhoun with the most data and Diamond Lake with the least.

2003 and 2004 Summary of NPDES Monitoring

Coverage: City of Minneapolis (*some sites in St. Paul*)
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

Five sites in Minneapolis and St. Paul were monitored for runoff and water quality between March and November as part of the NPDES Phase I requirements. Samples were analyzed for a large number of parameters including: TSS, TDS, TKN, TN and trace metals. Event mean concentrations were calculated using FLUX and P8. Sampled data, compared with NURP standards as well from the literature, was found to be fairly typical of urban storm water data.

2003 and 2004 Grit Chamber Monitoring

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

As of 2003, the City of Minneapolis had installed 96 grit chambers to improve water quality of downstream waterbodies. In order to determine the effectiveness of grit chambers, the City monitored the grit chamber that drains to Bassett Creek in Wirth Park in 1998 and 2001.Chemical parameters analyzed were total phosphorus (TP), soluble reactive phosphorus (SRP) , total nitrogen (TN), total kjeldahl nitrogen (TKN, total suspended solids (TSS), total dissolved solids(TDS) as well as trace metals.

The study indicated concentrations leaving the chamber were higher than those coming in. These results suggest that more frequent cleaning of the chamber might be

needed to prevent solubilization of pollutants from the sediments trapped in the chamber.

2003 and 2004 Weather Summary (annual report)

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

The Minneapolis Parks and Recreation Board (MPRB) records data from 3 tipping buckets rain gages in Minneapolis. In 2001, the MPRB used four of the Ramsey County Soil and Water Conservation District (RCSWCD) manual rain gages and recorded rainfall data with the help of volunteers. Precipitation amounts can vary greatly within a city and recording rainfall data at various sites helps better understand the pattern of rainfall.

2003 and 2004 Fish Stocking Information (annual report)

Coverage: State of Minnesota
http://www.minneapolisparks.org/default.asp?PageID=891

http://www.minneapolisparks.org/default.asp?PageID=922

Fish stocking information for Minneapolis lakes is maintained by the Department of Natural Resources on their website
http:/www.dnr.state.mn.us/lakefind/stocking.html

2004 Wetland Health Evaluation Project (WHEP)

Coverage: Wirth, Diamond and Legion
http://www.minneapolisparks.org/default.asp?PageID=922

http://www.hennepin.us/vgn/portal/internet/hcdetailmaster/0,2300,1273_83222_100256784,00.html

WHEP is a wetland monitoring program coordinated by the Hennepin Conservation District. The program was designed by the MPCA to evaluate wetland health. In 2002, the Minneapolis team (including one MPRB staff member) monitored three wetlands in Minneapolis. The study included vegetation and invertebrate sampling.

Shingle Creek Natural Area Management Plan (2002)

Coverage: Shingle Creek
Not online at this time

The Natural Area management Plan (NAMP) is a collaborative effort involving the MPRB, SCWMC, Hennepin County and City of Minneapolis. The plan presents the results of a natural resource inventory for Shingle Creek corridor and the Humboldt Greenway in Minneapolis. Based on the area assessment recommendations, priority areas for restoration are listed along with management goals.

Minneapolis Chain of Lakes – Phase I Diagnostic Study

Coverage: City of Minneapolis
http://www.minneapolisparks.org/documents/caring/WQ_Annual_2001/1A%20Monitoring%20Program%20Overview.pdf

This study is the largest and most comprehensive attempt to quantify the status of lake water quality and document the impacts of storm water runoff. The ultimate goal of the study was to develop a water quality management plan for the Chain of Lakes that could then be applied to all the surface waters of Minneapolis.

Chain of Lakes Alum-Macrophyte Interaction Assessment

Coverage: City of Minneapolis
Not online at this time

The Chain of Lakes Alum-Macrophyte Interaction Assessment was conducted to investigate and document the efficiency of alum treatment in Lake Calhoun, Lake Harriet, Cedar Lake and the Lake of the Isles. Additional goals of this study were to determine the response of plant community to changes in water quality, determine if any changes affect the internal nutrient loading of the lakes, and to determine if any improvements in clarity will change effectiveness of the watermilfoil biocontrol agent Euhrychiopsis leconetei.

Pesticide Study: Lake Harriet Watershed Site 1 (1992 – 1995)

Coverage: City of Minneapolis
Not online at this time

The Pesticide Study Reports are a collection of data measured at the Lake Harriet Watershed Site 1 from 1992 – 1995. Water and street sweeping samples were taken and analyzed for pesticides. The study also contains hyetographs at Lake Harriet.

City of Minneapolis

Flood Report

Coverage: City of Minneapolis
http://www.ci.minneapolis.mn.us/stormwater/flood-information/index.asp

In response to numerous severe storms experienced by the City of Minneapolis in the summer of 1997, the Department of Public Works studied the resulting flooding and developed a mitigation program. This report presents findings and recommendations of the Minneapolis Public Works, Sewer Design Division for flood mitigation in 39 discrete problem areas of the City.

Standards

Metropolitan Council (Met Council)

Urban Small Sites Best Management Practice Manual

http://www.metrocouncil.org/environment/Watershed/BMP/manual.htm

Minnesota Pollution Control Agency

Protecting Water Quality in Urban Areas

http://www.pca.state.mn.us/water/pubs/sw-bmpmanual.html

Minnesota Lake Water Quality Assessment Data

http://www.pca.state.mn.us/water/lakereport.html

Water Quality Standards

http://www.pca.state.mn.us/water/standards/index.html

Minnesota Stormwater Manual

http://www.pca.state.mn.us/water/stormwater/stormwater-manual.html

Minnehaha Creek Watershed District

Minnehaha Creek WD Rules A-N

Coverage: MCWD
http://www.minnehahacreek.org/rules.php

Any person(s) undertaking any activity for which a permit is required must comply with the District Rules as described on the website.

Shingle Creek Watershed Management Commission

Suggested Guidelines for Stormwater Treatment Pond Design Management

Coverage: Shingle Creek WMO area of jurisdiction
http://www.shinglecreek.org/appendixb.pdf

Standards for New Development, Redevelopments, or additions to Existing Developments

Coverage: Shingle Creek WMO area of jurisdiction
http://www.shinglecreek.org/appendixb.pdf

Bassett Creek Watershed Management Commission

Requirements for Improvements and Development Proposals

Coverage: Bassett Creek Water Management Commission
http://www.bassettcreekwmo.org/require/97reptab.htm

Water Quality Management Policy

Coverage: Bassett Creek Water Management Commission
http://www.bassettcreekwmo.org/require/98policytab.htm

The document sets forth the Water Quality Management Policy of the Commission. Part I explains the rationale and strategy of the Bassett Creek Water Management Commission in establishing its Water Quality Management Policy. Management Levels for various waterbodies are identified, and management requirements for each

classification listed. Part II describes the Commission's review process and its specific standards and requirements for construction activities within the watershed.

Capital Improvements Programs

Metropolitan Council (Met Council)

Regional Parks Capital Improvement Program Proposed Projects

Coverage: Twin Cities Metro Area
http://www.metrocouncil.org/directions/parks/parks_projects.htm

Parks and Open Spaces CIP

Coverage: Twin Cities Metro Area
http://www.metrocouncil.org/directions/parks/ParksCIP_2004_2009.pdf

Minnehaha Creek Watershed District

Capital Plan 2003-07 - Projects (only summary available online)

Coverage: MCWD area of jurisdiction
no longer available

City of Minneapolis

Capital Programs

Coverage: City of Minneapolis
http://www.ci.minneapolis.mn.us/city-budget/2005adopted/index.asp#P55_2603

Minneapolis Park and Recreation Board

Current Projects and Funding

Coverage: City of Minneapolis
http://www.minneapolisparks.org/default.asp?PageID=33

Mississippi Watershed Management Organization

Capital Programs

Coverage: MWMO
http://www.mwmo.org/projects&programs.html

Shingle Creek Watershed Management Commission

2003-2012 Budget (in process)

Coverage: SCWMWMC
http://www.shinglecreek.org/appendixg.pdf

Bassett Creek Watershed Management Commission

CIP Program (in process)

Coverage: BCWMC
http://www.bassettcreekwmo.org/2006_Budget_BCWMC.pdf

Minnehaha Creek Watershed District

Minnehaha Creek Southwest Calhoun Pond Project: A Model Solution

Coverage: Minnehaha Creek area of jurisdiction
http://www.minnehahacreek.org/lake_calhoun.php

Lake Nokomis Wetland Settling Ponds

Coverage: Minnehaha Creek area of jurisdiction
http://www.minnehahacreek.org/lake_nokomis_ponds.php

MCWD H/H Progress

Coverage: Minnehaha Creek area of jurisdiction
http://www.minnehahacreek.org/hh_updates.php

The Blue Water Partnership – History Lakes Cleanup Project History: The Blue Water Commission: Grass Roots Neighborhood Approach

Coverage: Minnehaha Creek area of jurisdiction
http://www.minnehahacreek.org/lake_nokomis_bluewater.php

Chain of Lakes Project

Coverage: Minnehaha Creek area of jurisdiction
http://www.minnehahacreek.org/chain_of_lakes.php

Lake Water Quality

Coverage: Minnehaha Creek area of jurisdiction
http://www.minnehahacreek.org/wq.php

Data

Minneapolis Park and Recreations Board

2001 Minneapolis Lakes Data

Coverage: City of Minneapolis
http://www.minneapolisparks.org/documents/caring/WQ_Annual_2001/Lakes%20Data%20-%202001.pdf

Miscellaneous

Metropolitan Council (Met Council)

Infiltration/Inflow Surcharge

Coverage: Regional
http://www.metrocouncil.org/Environment/ProjectTeams/I-I-Home.htm

CSO Separation Evaluation Report (2002)

Coverage: City of Minneapolis

The purpose for the Combined Sewer Overflow (CSO) Separation Evaluation project was to address concerns of the Metropolitan Council Environmental Services Division

(MCES) and the City of Minneapolis (City): an expiring National Pollution Discharge Elimination System (NPDES) permit for CSOs, an existing national policy for CSOs, pending new regulations for Sanitary Sewer Overflows (SSOs), and the persistence of overflows despite previous efforts to eliminate them.

This project has gathered information relating to the amount of wet weather flow in the sewer system and how the system operates under a variety of wet weather conditions. An intensive study of the flow patterns in the City and the hydraulics of the system completed the investigation. Corrective actions have been developed to reduce overflows at each of the permitted locations based on the findings of this study. The executive summary provides a brief description of the project setting and background, data collection and analysis, objectives and results, and recommendations.

Department of Natural Resources

Water Resources Data

Coverage: State of Minnesota
http://www.dnr.state.mn.us/waters/data/index.html

Water Statutes and Rules

Coverage: State of Minnesota
http://www.dnr.state.mn.us/waters/law.html

Division of Waters Publications

Coverage: State of Minnesota
http://www.dnr.state.mn.us/publications/waters/index.html

Lakes

Coverage: State of Minnesota
http://www.dnr.state.mn.us/ecological_services/lakes.html

Wetlands

Coverage: State of Minnesota
http://www.dnr.state.mn.us/ecological_services/wetlands.html

Rivers and Streams

Coverage: State of Minnesota
http://www.dnr.state.mn.us/ecological_services/rivers.html

Ecological Services Publications

Coverage: State of Minnesota
http://www.dnr.state.mn.us/ecological_services/pubs.html

Shoreland and Floodplain Ordinances

http://www.revisor.leg.state.mn.us/arule/6120/

Shingle Creek Watershed Management Commission

Report on Minneapolis Industrial Park Storm Sewer System for Plymouth, MN (*Not dated, synopsis not available)*

Shingle Creek Inspection Report
Coverage: Shingle Creek

Inspection to identify blockages, bank erosion or other conditions that could potentially cause flooding or water quality problems.

Regional Pond Investigation

Coverage: Shingle Creek Watershed

Identified subwatersheds with little or no water treatment facilities

United States Geological Survey

Shingle Creek Flow and Water Quality Data (NAWQA, 1996-2001)

Coverage: Shingle Creek at Queens Ave. in Minneapolis
http://nwis.waterdata.usgs.gov/usa/nwis/qwdata/?site_no=05288705

Shingle Creek Water Quality Data (NAWQA, 1995)

Coverage: Shingle Creek at 46th Street in Minneapolis
http://nwis.waterdata.usgs.gov/usa/nwis/qwdata/?site_no=05288710

Shingle Creek Water Quality Data (NAWQA, 1996-2001)

Coverage: Shingle Creek

http://nwis.waterdata.usgs.gov/usa/nwis/qwdata/?site_no=450518093201903

Minnesota Board of Water and Soil Resources (BWSR)

Minnesota Wetland Conservation Manual (2003)

http://www.bwsr.state.mn.us/wetlands/wcamanual/wcamanual02.pdf

City of Minneapolis

NPDES Phase I Annual Report (2002)

Coverage: City of Minneapolis

The NPDES annual report provides annual documentation of the City's stormwater management activities designed to meet the requirements of the NPDES Phase I Permit for the current year.

NPDES Phase I Annual Report (2003)

Coverage: City of Minneapolis

The NPDES annual report provides annual documentation of the City's stormwater management activities designed to meet the requirements of the NPDES Phase I Permit for the current year.

2003 Draft Sanitary Sewer Infrastructure Report

Coverage: City of Minneapolis

This is the most up-to-date inventory of the City of Minneapolis sanitary sewer system. The report includes descriptive statistics, conditional ratings and maintenance issues surrounding sanitary sewers. The functionality of the system is discussed as well as system valuation and rehabilitation costs.

2003 Draft Storm Water Sewer Infrastructure Report

Coverage: City of Minneapolis

The report provides descriptive statistics about the status of infrastructure including quantity, age and condition. Financial information on past expenditures, asset valuation, capital improvements and operating budgets is also included. The report also highlights trends and offers policy/programming options and implications.

CSO Annual report (2001)

Coverage: City of Minneapolis

The report details the projects, and activities initiated during the past 2 years in formulating and implementing a long-range plan for total elimination of CSOs in the near future.

CSO Tier II Sewer Plan Update (2002)

Coverage: City of Minneapolis

City of Minneapolis Comprehensive Plan includes as part of the public facility plan requirements, the 1999 Sewer Plan. This document is a sewer policy plan, classified as a Tier II Sewer Plan according to the content requirements in the Met Council's Local Planning Handbook (1998). The plan describes the sanitary sewer system history, features, and current problems; and provides projections of future sewage flows and schedules for improvements. This report updates the Tier II Sewer Plan as well as serves to meet the requirement of the Memorandum of Understanding Relating to Combined Sewer Overflow Elimination Efforts

(MOU) for submittal of an implementation plan for CSO improvements based on the joint study completed in April 2002.

Surface Water Quality Monitoring in the City of Minneapolis

Coverage: City of Minneapolis

This report was prepared jointly by the City of Minneapolis Public Works and the Minneapolis Park and Recreation Board. It gives an overview of surface water monitoring efforts and resulting publications over time in the City of Minneapolis

City of Minneapolis Ordinances

Coverage: City of Minneapolis

http://www.ci.minneapolis.mn.us/cityhall/laws/ordinances/

Minneapolis Park and Recreation Board

Minneapolis Lakes and Parks: Proceedings of a Special Session

Coverage: Minneapolis
Not Available On-Line

This report collected papers form the 16th annual North American Lake Management Society International Symposium on Lake, Reservoir and Watershed Management. Papers included a summary of Minneapolis Parks and Lakes, A summary of MCES monitoring, water quality trends in the City, Watershed-level approaches on lake restoration, a discussion of BMPs, and a discussion on public participation.

Appendix I
Minneapolis Stormwater Management Goals

Adopted. Yeas, 12; Nays none.
Absent - Herron.
Passed February 4, 2000.
Approved February 7, 2000. S. Sayles Belton, Mayor.
Attest: M. Keefe, City Clerk.

T&PW - Your Committee, having under consideration the establishment of stormwater management standards as called for the Stormwater Ordinance, now recommends passage of the accompanying resolution that establishes interim stormwater discharge standards for construction sites of one acre and greater, in accordance with Chapter 54 of the Minneapolis Code of Ordinances (Stormwater Management Ordinance).
Adopted. Yeas, 12; Nays none.
Absent - Herron.
Passed February 4, 2000.
Approved February 7, 2000. S. Sayles Belton, Mayor.
Attest: M. Keefe, City Clerk.

RESOLUTION 2000R-042
By Mead

Establishing interim stormwater discharge standards for construction sites of one acre and greater in accordance with the requirements of Chapter 54 of the Minneapolis Code of Ordinances, Stormwater Management Ordinance.

Resolved by The City Council of The City of Minneapolis:
That the following interim stormwater discharge standards be required for stormwater management on all construction sites greater than 1 acre:

Lake	Stormwater Discharge Goal
Chain of Lakes	
Brownie	10% phosphorus load reduction
Cedar	40% phosphorus load reduction
Lake of the Isles	20% phosphorus load reduction
Calhoun	30% phosphorus load reduction
Harriet	20% phosphorus load reduction
Other Minneapolis Lakes & Wetlands	
Powderhorn	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*	30% phosphorus load reduction
Spring Lake	30% phosphorus load reduction
Crystal Lake**	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

*Wirth Lake is within the Minneapolis Park system but not within the City limits of Minneapolis
**Crystal Lake is in Robbinsdale and receives stormwater drainage from an area of north Minneapolis

Mississippi River	70% removal of total suspended solids
Minneapolis streams	No increase in runoff rate from project site

Be It Further Resolved that projects not able to comply with the on-site stormwater standards shall be allowed to contribute towards construction of a regional stormwater treatment facility at a rate of $15,000 per acre of runoff that is being discharged from the site.

Be It Further Resolved that the design standards for stormwater treatment devices be those recommended in the Minnesota Pollution Control Agency manual titled **Protecting Water Quality in Urban Areas, Best Management Practices for Minnesota, October, 1989,** and future updates of this manual.

Adopted. Yeas, 12; Nays none.
Absent - Herron.
Passed February 4, 2000. J. Cherryhomes, President of Council.
Approved February 7, 2000. S. Sayles Belton, Mayor.
Attest: M. Keefe, City Clerk.

T&PW - Your Committee recommends passage of the accompanying Resolution establishing uniform assessment rates for street construction and street renovation improvements for the 2000 calendar year.

Adopted. Yeas, 12; Nays none.
Absent - Herron.
Passed February 4, 2000.
Approved February 7, 2000. S. Sayles Belton, Mayor.
Attest: M. Keefe, City Clerk.

RESOLUTION 2000R-043
By Mead

Establishing uniform assessment rates for street construction and street renovation improvements for the 2000 calendar year.

Whereas, the City Council adopted a policy on October 31, 1980 establishing yearly uniform assessment rates for similar improvements at various locations; and

Whereas, the City Council adopted assessment policies on May 22, 1998 and June 12, 1998 relating to residential and non-residential properties and relating to Local and Other streets; and

Whereas, the City Engineer has submitted the recommended 2000 Uniform Assessment Rates, all as contained in Petn No 265573 on file in the Office of the City Clerk;

Now, Therefore, Be It Resolved by The City Council of The City of Minneapolis:

That the following rates are hereby established as the 2000 uniform assessment rates and are to be applied in determining the assessments for the benefited parcels for certain types of work ordered by the City Council in the 2000 calendar year:

Construction (street paving, curb and gutter and other street paving related improvements) - appropriate rate is applied to the land area of benefited parcels located within the street influence zone along the improved street:

$0.95/sq ft - Local - Non-Residential;
$0.95/sq ft - Other - Non-Residential;
$0.37/sq ft - Local - Residential;
$0.296/sq ft - Other - Residential.

Renovation (mill and overlay of street surface and selected curb and gutter and street construction as needed) - appropriate rate is applied to the land area of benefited parcels located within the street influence zone along the improved street:

$0.475/sq ft - Local - Non-Residential;
$0.475/sq ft - Other - Non-Residential;
$0.185/sq ft - Local - Residential;
$0.148/sq ft - Other - Residential.

O #11

City of Minneapolis

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David J. Sonnenberg
City Engineer
Director

Brian J. Lokkesmoe
Deputy Director

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Affirmative Action Employer

January 19, 2000

The Honorable Dore' Mead
Chair, Transportation and Public Works Committee
Minneapolis City Council
307 City Hall
Minneapolis, MN 55415

Re: Establishing Interim Stormwater Management Goals

Dear Council Member Mead:

The newly adopted stormwater ordinance (Chapter 54) went into effect on January 1, 2000. The primary purpose of the 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 facilities. Contained in the ordinance are standards and specifications for construction and maintenance of stormwater controls for all construction projects 1 acre and greater in area. The actual standards that site plans must comply with are to be published in a Minneapolis Stormwater Manual. Interim standards are required until the final stormwater manual is published and approved by the City Council.

Stormwater Management Goals

The Minneapolis Stormwater Ordinance specifies that stormwater management standards be set according to the receiving waterbody. The standards are to include (but not be limited to) reductions of suspended solids for the Mississippi River discharges, controlled rate of runoff for discharges to streams, and a reduction in nutrients for stormwater discharging to lakes and wetlands.

a regional facility. It is proposed that the fee be based on the cost for construction of a City facility. Typical components of a project would include property acquisition, excavation, stormwater structures, landscaping and engineering. Using costs developed in the flood mitigation program, it can be estimated that a pond designed to treat runoff from 100 acres would cost approximately $1,500,000 (this does not include the additional costs to create area for flood mitigation). Therefore for each acre of redevelopment the City's typical cost would be $15,000.

It is recommended that the fee for contribution to a regional facility in lieu of onsite treatment be established at $15,000 for January 1 to December 31, 2000.

Minneapolis Stormwater Manual

In an effort to find funding for the Minneapolis Stormwater Manual, staff solicited partnership with the City of St. Paul and the City of Bloomington. After both cities agreed, then a joint application was made to the Metropolitan Council for funding from their stormwater grant program. The Metropolitan Council agreed that this would be an important project for the entire Twin Cities area and agreed to fund the development of the manual. Instead of awarding the grant to Minneapolis they decided to coordinate the creation of the manual and make the final product available to the entire region. It is expected that the manual will be complete in approximately 18 months.

RECOMMENDATION:

It is recommended that the City Council adopt an ordinance that establishes interim standards for stormwater discharges in accordance with the requirements of the newly adopted Minneapolis Stormwater Management Ordinance, Chapter 54.

Sincerely,

David J. Sonnenberg, P.E.
City Engineer - Director of Public Works

By

Ramankutty Kannankutty, P.E.
Director, Engineering Services

RK:JMP:gb

Report prepared by: Jodi Polzin Phone Number: 673-3626

cc: Michael Orange (Planning)
Jeff Lee (Park Board)
Tom Frame (Inspections)
Bill Dunning (City Attorney)

T&PW – Your Committee Recommends adoption of the following resolution that establishes interim stormwater discharge standards for construction sites of 1 acre and greater in accordance with the requirements of Chapter 54 of the Minneapolis Code of Ordinances, Stormwater Management Ordinance.

MEAD

Establishing interim stormwater discharge standards for construction sites of 1 acre and greater in accordance with the requirements of Chapter 54 of the Minneapolis Code of Ordinances, Stormwater Management Ordinance.

Resolved by the City Council of the City of Minneapolis:

That the following interim stormwater discharge standards be required for stormwater management on all construction sites greater than 1 acre:

Lake	Stormwater Discharge Goal
Chain of Lakes	
Brownie	10% phosphorus load reduction
Cedar	40% phosphorus load reduction
Lake of the Isles	20% phosphorus load reduction
Calhoun	30% phosphorus load reduction
Harriet	20% phosphorus load reduction
Other Minneapolis Lakes & Wetlands	
Powderhorn	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*	30% phosphorus load reduction
Spring Lake	30% phosphorus load reduction
Crystal Lake**	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

*Wirth Lake is within the Minneapolis Park system but not within the City limits of Minneapolis

**Crystal Lake is in Robbinsdale and receives stormwater drainage from an area of north Minneapolis

Mississippi River	70% removal of total suspended solids
Minneapolis streams	No increase in rate of runoff from project site

Be it further resolved that projects not able to comply with the on-site stormwater standards shall be allowed to contribute towards construction of a regional stormwater treatment facility at a rate of $15,000 per acre of runoff that is being discharged from the site.

Be it further resolved that the design standards for stormwater treatment devices be those recommended in the Minnesota Pollution Control Agency manual titled Protecting Water Quality in Urban Areas, Best Management Practices for Minnesota, October, 1989, and future updates of this manual.

Appendix J
Minneapolis Lakes Recreational/Aesthetic Indicator Development

Purpose: To develop indicators that can be used to measure and report multiple aspects of the recreational and aesthetic condition of Minneapolis lakes. These indicators were created by the Minneapolis Surface Water Quality Monitoring Task Force.

Environmental Indicators

> ***An indicator is something that points to a problem or condition. Its purpose is to show you how well a system is working. If there is a problem, an indicator can help you determine what direction to take to solve the problem. – Minnesota Planning Environmental Quality Board (2000)***

Environmental indicators are selected parameters or indices that can be used to characterize the overall condition or trend of a resource. Indicators can provide a generalized measure of changes in water quality and the effectiveness of management measures. Indicators are useful in conveying complex environmental monitoring information in an understandable format to policy makers, lake users and the public. Indicators must be scientifically valid, meet practical considerations and consider current and future program needs.

Important considerations in selecting appropriate indicators include cost and cost effectiveness, level of difficulty, measurable and quantifiable metrics, reproducibility from year to year and locations, relevance to the recreational uses and understandability by target audiences. Indicators need to be representative of factors that can change over time. Indicators also need to provide for a meaningful tracking of changes, i.e., water quality or vegetation changes on an annual basis. Indicator measures such as fish community composition that change relatively slowly over time are thus less useful.

The Minneapolis Park and Recreation Board (MPRB) currently monitors water quality through a mixture of monitoring efforts. The monitoring programs measure and report lake trophic status, chemical water quality of streams and lakes, beach bacteria levels, lake vegetation, biological monitoring of lakes and wetlands, lake levels and the quality of stormwater runoff. It is important for managers to be able to clearly communicate the basic findings, conclusions and recommendations of indicator studies to stakeholders and elected officials, and how study results can be used to improve water quality programs. (Bicknell, 2002). The results of the current monitoring efforts have been reported in the annual Water Resources Report (produced by MPRB) and the State of the City Report (produced by the Minneapolis Planning Division) and the annual NPDES stormwater report (produced by the

Minneapolis Public Works Department). As new indicators are developed, it will also be important to develop an effective means of communicating the results of indicator measures. A critical component of that communication effort will be providing the public the background needed to understand the basis for the measurements and the meaning of the environmental indicator results. Policy makers and managers must also be prepared to make suitable changes to management efforts when indicator results point to the need for such modifications.

The trophic state index (TSI) has been used as the primary measure to report and track lake water quality trends over the last 12 years. According to a number of scientists and policy makers, the TSI as measured in the open water area of lakes, appears to incompletely represent the state of lakes with regard to other aspects such as aquatic vegetation, public health concerns, recreational use and aesthetic condition. To the average recreational user, trophic status provides a good indicator of swimming suitability in the middle of the lake. However, other factors such as smell, debris, interference from vegetation, bacteria levels and isolated near-shore problems are not considered by the TSI measurement.

Considerations for Selection of Indicators for Measuring Recreation and Aesthetic Suitability

The development of multi-metric indicators to measure recreational suitability for Minneapolis lakes emphasizes the need to move beyond sole dependence upon chemical water quality and incorporate additional measures reflective of other recreational uses. Another central aspect to the indicator development process was the desire to use existing data gathering efforts, and (as much as possible) limit the addition of new parameters to existing monitoring programs.

The important measures that would/will be included in the overall indicator can generally be categorized as:

- environmental quality
- public health
- aesthetic considerations
- recreational interferences

1. The chosen environmental quality measure is the Carlson's Trophic State Index (TSI), as discussed above. Carlson's TSI quantifies lake trophic status by using three key indicator variables: Secchi disc transparency, total phosphorus concentration, and chlorophyll a concentration. As conceived, the TSI is technically sound and provides an attractive index for the complex series of water quality changes that occur in lakes during eutrophication (aging process by which lakes are fertilized with nutrients). This data is collected as part of the twice

monthly lake water quality sampling program currently underway in Minneapolis.

2. The selected public health measure is the number of *Escherichia coli* (*E. coli*) measurements that exceed the EPA's criteria for swimming beaches over the summer. High levels of indicator bacteria such as *E. coli* demonstrate the presence of fecal pollution in quantities high enough to require limiting body contact to protect recreational bathers. Indicator organisms such as these have long been used to protect bathers from illnesses that may be contracted from surface waters contaminated by fecal pollution. This indicator is applied only to Minneapolis lakes that have primary contact recreation, i.e., swimming beaches.

3. Aesthetic considerations are often qualitative in nature and can elicit highly variable reactions from one person to the next. In an attempt to quantify lake aesthetics, three measures were selected – odor, color of the water and debris. These measures will be assigned numeric values based upon condition descriptors. The aesthetic evaluation will be conducted at selected locations around each lake, such as boat landings, beaches, fishing piers and overlooks. The number of sampling locations will be determined by the relative lake size and public access to the shoreline.

4. Recreational interferences are much more difficult to measure, but in Minneapolis lakes, excessive amounts of Eurasian watermilfoil and other aquatic vegetation can interfere with sailing, boating and swimming. Increased plant growth can reduce algae growth, lead to greater water clarity and provide valuable habitat Nevertheless, the barriers excessive growth creates to full recreational use of a lake often outweighs the water quality benefits. Measures of plant interference with recreational uses will include presence or absence of exotic species (i.e., Eurasian watermilfoil), density of aquatic vegetation, and coverage of the lake by aquatic vegetation. Lake vegetation has been quantitatively sampled on a rotating basis in the past, but was recently cut back due to staffing shortages as a result of budget cuts. Thus the data included in any annual index monitoring will be a qualitative estimation of vegetation coverage and density.

Measurement of the Minneapolis Lake Quality Indicator

The existing Minneapolis monitoring programs and the environmental indicator efforts by other organizations were reviewed. Based upon the results of this review and input from city staff, policy makers and the public, a multi-metric indicator scheme was developed for Minneapolis lakes that incorporate the four measures described above.

Trophic State Index (Environmental Quality)

The TSI scale is a simple way to integrate nutrient concentrations, the algal response to phosphorus and the public perception of the eutrophication process into one indicator measurement. Total phosphorus (TP) is the limiting nutrient; chlorophyll (CHLA) is used to represent algal biomass; and Secchi disc (SD) transparency is

widely recognized by the public as an indicator of "water quality" (Osgood, 2000; Carlson, 1977; MPCA, 2004).

The index represents a logarithmic transformation of the three variables and forces them onto a 0-to-100 scale in which a Secchi disc transparency of 1 meter equals 60. Low TSI values signify good water quality and high TSI values signify poor water quality. Every doubling (or halving) of transparency represents a decrease (or increase) in the index value of 10. The TSI equations are as follows:

$$TSI(TP) = 4.14 + 14.4 \ln(TP)$$
$$TSI(CLA) = 30.6 + 9.81 \ln(CLA)$$
$$TSI(SD) = 60 - 14.4 \ln(SD)$$

where TP and CLA are in µg/L, SD is in meters, and all are seasonal averages (May – September)

In Minneapolis, a TSI value of less than 57 is required for full support of swimming. The MPCA set the TSI threshold for swimmable lakes in the North Central Hardwood Forests ecoregion based upon impairment of swimming from algae and the relationship between phosphorus, chlorophylla and Secchi disc. Minneapolis is in the MPCA's North Central Hardwood Forests ecoregion. MPCA set the phosphorus criteria for this ecoregion as 40 micrograms per liter as the upper threshold for swimmable use. This phosphorus concentration corresponds to a Carlson's TSI value of 57. This threshold ensures that conditions associated with "impaired swimming" would occur during less than ten percent of the summer season. Phosphorus concentrations above the criteria levels would result in greater frequencies of nuisance algal blooms and increase the frequencies of "impaired swimming." (MPCA, 2004).

Escherichia coli (Public Health)

Prior to 1986 the EPA recommended the use of fecal coliforms as the indicator organisms to protect bathers from gastrointestinal illness in recreational waters. The EPA has since conducted epidemiological studies that evaluated the use of several other organisms as indicators. In 1986 the EPA recommended the use of *E. coli* for fresh recreational waters because they were better predictors of acute gastrointestinal illness than fecal coliforms. EPA guidelines for *E. coli* are that a single sample should not exceed 235 organisms per 100 mL of water and the geometric mean of not less than five samples over a 30-day period should not exceed 126 organisms per 100 mL of water. Beaches that exceed these criteria should be closed until such time as the levels of bacteria return to below the thresholds. The number of *E. coli* measurements exceeding EPA criteria in a summer season, expressed as percent of sampling dates, will be the scoring for a 0 – 100 scale. This section of the index will be applied only to Minneapolis lakes that have primary contact recreation, i.e., swimming beaches (US EPA, 2002a; US EPA 2002b; MPCA, 1997).

Odor/Color/Debris (Aesthetic Considerations)

The measurement of aesthetic conditions quantifies lake aesthetics using three measures – odor, color of the water and debris. These qualitative measures will be assigned numeric values based upon condition descriptors listed in the following table J-1. This scheme was originally developed by the Rouge River National Wet Weather Demonstration Project (1998, Wayne County, Michigan). The three measures would be summed (50 possible points) and averaged over the summer to develop an annual rating. The higher the aesthetic condition rating, the "poorer" the overall quality of the lake's aesthetics (Fellows, et al, 1996; Heidtke, 1998, US EPA, 2003).

Table J-1. Aesthetic Conditions Descriptors

Parameter	Descriptor	Value
Color	Clear	0
	Light brown	2
	Green	2
	Bright green	5
	Milky white	8
	Gray/black	10
Odor	None/natural	0
	Musty, faint	1
	Musty, strong	2
	Harsh (sewage/fishy)	
	Faint	5
	Strong	8
	Anaerobic	10
Debris	None	0
	Natural	1
	Foam	2
	Trash, floating	4
	Trash, fixed	5
	Green scum	8
	Oil scum	9
	Sewage solids	10

Plant Growth/Species (Recreational Interferences)

Excessive amounts of Eurasian watermilfoil and other aquatic vegetation can interfere with sailing, boating and swimming, and can be perceived as unsightly by lake users. Qualitative measures of plant interference with recreational uses will include presence or absence of exotic species (i.e., Eurasian watermilfoil), density of aquatic vegetation, and coverage of the lake by aquatic vegetation as shown in Table J-2. Measurements would be made monthly (May – September) and a summer average reported for each lake based upon the rating scale. As with the aesthetic condition measurement, the higher the rating score, the poorer the perceived quality of the lake would be (BDWMO, 2003; Doucette, 2001. USEPA, 2002b).

Table J-2. Qualitative Measures of Plant Interference

Parameter	Descriptor	Value
Exotic Species Present	More than one	10
	One	5
	None	0
Average Macrophyte Density	High	10
	Medium	5
	Low	0
Vegetation Coverage of Lake Surface ≤ 15 N deep	100%	10
	≥ 50%	5
	≤ 50%	0

Index Scoring

Tracking of four components allow for management actions to be taken with regard to issues identified by each of the subparts.

The scoring system is weighted toward environmental status and public health concerns because they are important considerations for lake users and visitors. Following the same indexing as the TSI, the Minneapolis lake index is designed so that a lower value designates better quality.

Lakes with beaches:

- Calhoun
- Cedar
- Harriet
- Hiawatha
- Nokomis
- Wirth

No *E. coli* scores are used as this measurement is collected only at swimming beaches (*E. coli* measurements are not taken at lakes without beaches since those lakes are used for recreation that does not involve direct contact and thus ingestion of water)

Lakes without beaches:

- Brownie
- Diamond
- Grass
- Isles
- Loring
- Powderhorn
- Ryan
- Spring
- Webber

Implementation Issues

Discussion still needs to be completed regarding data collection and reporting of the index.

Current data collection efforts include:

- Lake sampling for TSI every two weeks for the May through September time period
- *E. coli* monitoring at beaches two times per week with two samples per beach for each sampling event over the entire beach season

Collection of the vegetation and aesthetic data will require an additional level of effort beyond current monitoring programs.

Reporting of the index would ideally be used as an annual benchmark, but could also be reported monthly, although there is a three week minimum lag between data collection and data reporting due to the complexity of the laboratory analyses.

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Appendix K
NPDES CSO Permit

Minnesota Pollution Control Agenc

October 1, 1996

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

The Honorable Sharon Sayles Belton
Mayor, City of Minneapolis
350 South Fifth Street
Minneapolis, Minnesota 55415

RE: Draft Reissued NPDES Permit No. MN 0046744
Minneapolis Combined Sewer Overflow Permit

Dear Mayor Belton:

Your National Pollutant Discharge Elimination System (NPDES) Permit Application has been reviewed and a determination has been made to draft the referenced reissued permit for the combined sewer system.

I would like to draw your attention to Part I.E., Schedule of Compliance, which requires that the Joint Permittees eliminate the remaining combined sewer overflow bypass/overflow regulator structures.

Enclosed is a copy of the public notice and reissued draft permit in accordance with Minn. R. 7001.0100.

If you have any questions, please contact Dave Sahli of my staff at (612) 296-8722.

Sincerely,

Russell C. Felt

Russell C. Felt, Supervisor
Point Source Compliance Section
Water Quality Division

RCF:jmg
Enclosure: (1)
cc: Jodi Polzin, Minneapolis Public Works, Engineering Design (w/enclosure)
Jake Burggraf, Minneapolis Public Works, Engineering Design (w/enclosure)

STATE OF MINNESOTA

Minnesota Pollution Control Agency

WATER QUALITY DIVISION

PUBLIC NOTICE OF INTENT TO REISSUE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) AND
STATE DISPOSAL SYSTEM (SDS) PERMIT MN 0046744

Public Comment Period Begins: October 1, 1996
Public Comment Period Ends: October 31, 1996

Current Permit Issued: January 3, 1991
Current Permit Expiration Date: December 31, 1995

Name and Address of Joint Permittees
Minneapolis Department of Public Works
309 Second Avenue South
Third Floor
Minneapolis, MN 55401

Metropolitan Council Environmental Services
230 East Fifth St.
St. Paul, MN 55101

Facility Name and Location
Fifteen (15) Overflow Outfalls
Located Throughout the City of Minneapolis

Receiving Waters: Mississippi River

Description of Permitted Facilities

All wastewater from domestic and industrial sources within the city are normally conveyed to the Metropolitan Council Environmental Services' Metropolitan Wastewater Treatment Plant in St. Paul for treatment. However, with combined sewers, storm water mixed with untreated wastewater overflows to the Mississippi River during rainfall and snowmelt events. Combined sewers carry both wastewater and storm water and the capacity of the pipe can be exceeded during wet weather conditions resulting in an overflow.

The city is in the process of completing the final construction projects in a ten-year program to separate combined sewers and eliminate combined sewer overflows. The separation program consisted of the construction of either a new sanitary sewer system or a new storm sewer system in the combined sewer areas. The separation program has provided separate sanitary and storm sewer systems within the area served by the city.

Petition for Contested Case Hearing

You also may submit a petition for a contested case hearing. A contested case hearing is a formal evidentiary hearing before an administrative law judge. In accordance with Minn. R. 7000.1900, the MPCA will grant a petition to hold a contested case hearing if it finds that: (1) there is a material issue of fact in dispute concerning the application or draft permit; (2) the MPCA has the jurisdiction to make a determination on the disputed material issue of fact; and (3) there is a reasonable basis underlying the disputed material issue of fact or facts such that the holding of the contested case hearing would allow the introduction of information that would aid the MPCA in resolving the disputed facts in making a final decision on the draft permit. A material issue of fact means a fact question, as distinguished from a policy question, whose resolution could have a direct bearing on a final MPCA decision.

A petition for a contested case hearing must include the following information:

1. A statement of reasons or proposed findings supporting the MPCA decision to hold a contested case hearing according to the criteria in Minn. R. 7000.1900, as discussed above; and
2. A statement of the issues proposed to be addressed by a contested case hearing and the specific relief requested or resolution of the matter.

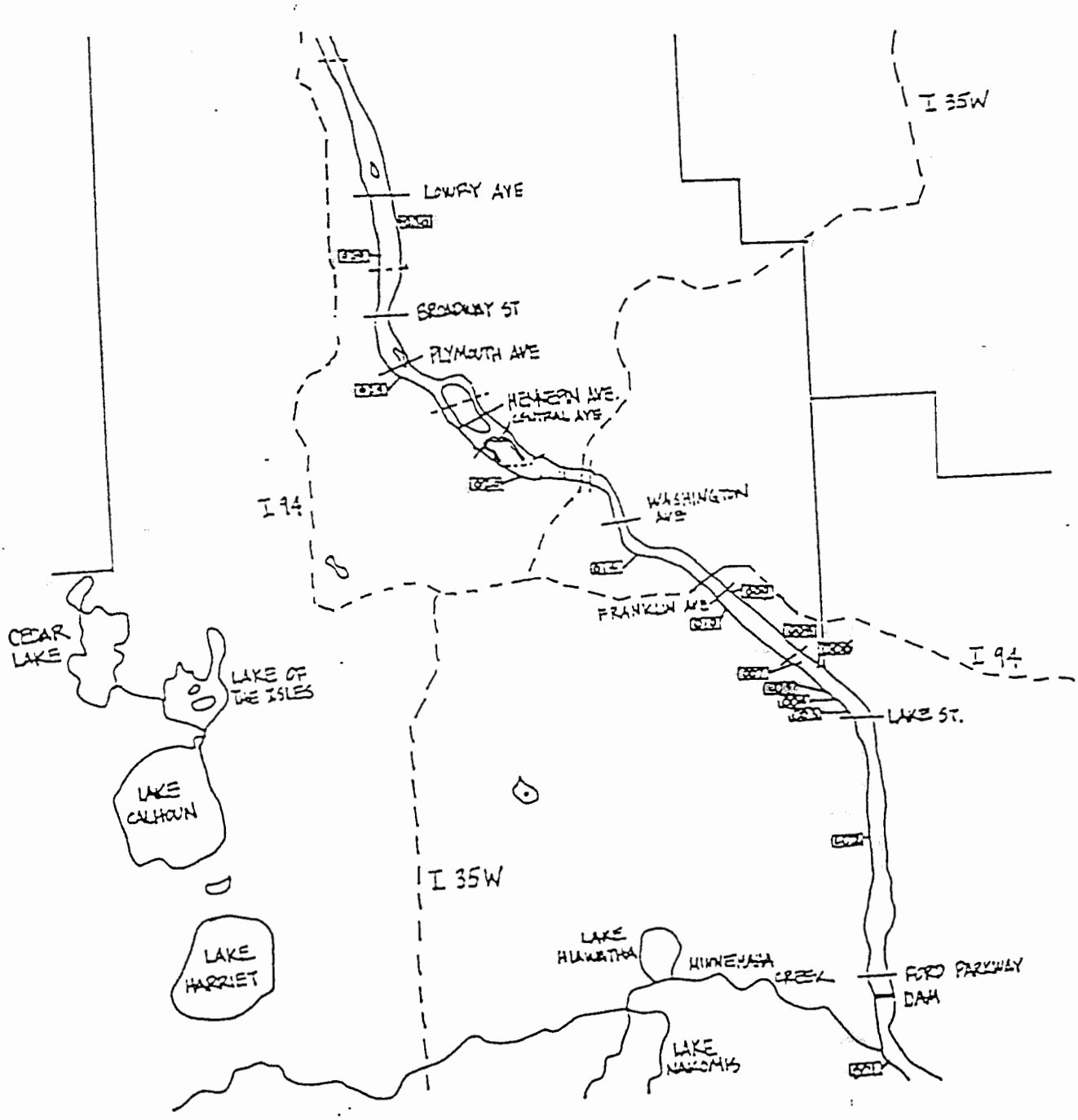
In addition and to the extent known, a petition for a contested case hearing should also include the following information:

1. A proposed list of prospective witnesses to be called, including experts, with a brief description of proposed testimony or summary of evidence to be presented at a contested case hearing;
2. A proposed list of publications, references, or studies to be introduced and relied upon at a contested case hearing; and
3. An estimate of time required for you to present the matter at a contested case hearing.

MPCA Decision

You may submit a petition to the Commissioner requesting that the MPCA Citizens' Board consider the permit issuance. To be considered timely, the petition must be received by the MPCA by 4:30 p.m. on the date the public comment period ends, identified on page 1 of this notice. Under the provisions of Minn. Stat. ch. 116.02, subd 6(4), the decision whether to issue the permit and, if so, under what terms will be presented to the Board for decision if: (1) the Commissioner grants the petition requesting the matter be presented to the Board; (2) one or more Board members request to hear the matter before the time the commissioner makes a final decision on the permit; or (3) a timely request for a contested case hearing is pending. You may participate in the activities of the MPCA Board as provided in Minn. R. 7000.0650.

Facility and Discharge Location



STATE OF MINNESOTA

Minnesota Pollution Control Agency

WATER QUALITY DIVISION

National Pollutant Discharge Elimination System (NPDES) and
State Disposal System (SDS) Permit MN 0046744

PERMITTEE: City of Minneapolis and the Metropolitan Council , Hereinafter "Joint Permittees"

FACILITY NAME: Combined Sewer System

RECEIVING WATER: Mississippi River

CITY OR TOWNSHIP: City of Minneapolis COUNTY: Hennepin

REISSUANCE DATE: EXPIRATION DATE: June 30, 2001

The State of Minnesota, on behalf of its citizens through the Minnesota Pollution Control Agency (MPCA), authorizes the Joint Permittees to operate a combined sewer system and to discharge from the bypass points identified herein, to the receiving water named above, in accordance with the requirements of this permit.

The goal of this permit is to protect water quality in accordance with Minnesota and U.S. statutes and rules, including Minn. Stat. chs. 115 and 116, Minn. R. chs. 7001, 7050, and the U.S. Clean Water Act.

This permit is a reissuance of an existing permit which was issued on January 3, 1991. This reissued permit is effective on the issuance date identified above and supersedes the previous permit issued for this facility.

This permit and the authorization to discharge shall expire June 30, 2001. The Joint Permittees are not authorized to discharge after the above date of expiration. In order to receive authorization to discharge beyond the above date of expiration, the Joint Permittees shall submit such information and forms as are required by the MPCA no later than 180 days prior to the above date of expiration pursuant to Minn. R. 7001.0040.

Signature: _____

Marvin E. Hora, Manager	*for*	Peder A. Larson
Point Source Compliance Section		Acting Commissioner
Water Quality Division		Minnesota Pollution Control Agency

If you have questions on this permit, including the specific permit requirements, permit reporting or permit compliance status, please contact:

Minnesota Pollution Control Agency
Water Quality Division, Point Source Compliance Section
520 Lafayette Road North
St. Paul, MN 55155-4194
Telephone: (612) 296-6300
Fax: (612) 297-8683
Telephone Device for Deaf (TTY): (612) 282-5332

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PART II

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REPORT SUBMITTAL SUMMARY

Telemetered Site Monitoring Reports due by the 21st of the month. (Part I, C.1.)
Agreement Between Joint Permittees within 180 days of permit final issuance. (Part II, A.2.)
Annual Report submitted before April 30 of each year. (Part II, A.3.)

PART I

A. COMBINED SEWER BYPASS AND OVERFLOW POINT IDENTIFICATION

Serial No.	Discharge Identification (Name/Location)
001	Minnehaha Tunnel Outfall
002	East 38th ST Outfall
003	East Lake ST Outfall
004	Southwest Interceptor Outfall
005	Northwest Interceptor Outfall
006	Eastside Interceptor Outfall
007	East 26th ST Outfall
008	Cecil ST Outfall
009	Southeast Franklin AV Outfall
010	East Franklin AV Outfall
014	14th AV S & E 18th ST Storm Outfall
020	Chicago AV S & N MPLS Tunnel Outfall
025	Bassetts Creek Outfall
029	26th AV N Outfall
030	22nd AV NE Outfall

B. DISCHARGE CONDITIONS

During the period beginning on the effective date of this permit and lasting until the expiration date, the Joint Permittees are authorized to discharge combined sewage from the bypass/overflow point(s) identified under Paragraph A of this PART, until the sanitary sewer connection(s) are removed, in accordance with the conditions in this permit.

1. The discharge from any combined sewer system bypass/overflow point by the Joint Permittees is prohibited except:

   a. During periods of hydraulic overload caused by rainfall or snowmelt conditions which exceed the design hydraulic capacity of the conveyance system, only after the maximum amount of flow has been conveyed to the wastewater treatment facility; or

   b. During emergency conditions to include the following:

      i. The bypass is unavoidable to prevent loss of life, endangerment of human health, personal injury, or severe property damage. Endangerment of human health includes basement backups. "Severe property damage" means substantial damage to property of the Joint Permittees' or of others, damage that may cause the combined sewer system to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. "Severe property damage" does not mean economic loss as a result of a delay in production.

      ii. There is no feasible alternative to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or performance of maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance.

2. If a regulator listed in Attachment A with a removal status of A or B continues to bypass sewage following completion of the separation program and scheduled removal dates such bypass is not authorized by this permit notwithstanding PART I, B.1 and may be subject to enforcement action until eliminated. The provisions of PART I, B.1.b. may be raised as an affirmative defense to such enforcement action. The Joint Permittees shall, **within five days of detection**, notify the MPCA in writing of such a bypass and **within 30 days** recommend the additional corrective actions necessary to eliminate future bypasses from the regulator before it is closed. The MPCA shall review the recommendations, and may approve a schedule of compliance to implement the necessary corrective actions. Agency approval of such a schedule does not constitute an authorization under this permit to discharge from that regulator.

3. A regulator listed in Attachment A with a removal status of C or D must be equipped with an overflow monitoring device and such bypass is authorized in accordance with Part I, B.1. For the regulators not eliminated after the area tributary to it is separated according to the Facilities Plan, the Joint Permittees shall: (1) submit **within 90 days of issuance of this permit,** to the MPCA for approval, plans for the final overflow monitoring and proposed inspection frequency of any monitoring device; and (2) **within 90 days after the monitoring plan is approved** by the MPCA the Joint Permittees shall submit a report to the MPCA explaining the need for retaining the regulator.

   The monitoring shall be used to determine the likelihood of sewage being bypassed from separated areas. If it appears probable that a bypass may occur under design conditions the Joint Permittees shall recommend and, upon approval, implement additional measures that may be taken to eliminate the potential for bypassing. A summary of the monitoring results and, if necessary, recommendations for further infiltration and inflow removal and/or capacity increases shall be included in the annual report required by PART II, A.3.

C. REPORTING AND MONITORING REQUIREMENTS FOR DISCHARGE EVENTS

1. Telemetered Site Monitoring Requirements

The Metropolitan Council shall submit a monthly report to the MPCA summarizing precipitation, regulator overflow duration, and regulator overflow volume data collected through its remote telemetry system. Precipitation data shall be summarized from the Council's existing rain gauge network. Precipitation monitoring may be discontinued at all gauge locations during winter months to protect the measurement equipment from the cold weather. Overflow duration and overflow volume shall be reported for each regulator identified by an asterisk on Attachment A. If data is not available an explanation of the reasons why the data is not available, and a discussion of measures to be taken to ensure that the data will be available in the future shall be included with the report.

Each monthly report shall be submitted to the MPCA at the following address and shall be postmarked **no later than the 21st day following the month during which the monitoring was completed:**

Point Source Compliance Section
Water Quality Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

2. Bypass Notification

a. Preliminary bypass notification shall be given immediately to the MPCA (Attn: Point Source Compliance Section, Water Quality Division) when the Joint Permittees believe, based on the information then available, that a bypass to waters of the state from any segment of the combined sewer system may be necessary pursuant to conditions outlined in PART I, B.1.b. Authorized bypasses which result from hydraulic overloading in the combined sewer system are exempt from this notification requirement. The notice shall include, to the extent then available, the reasons therefore, timetables, and appropriate alternatives that may be available to minimize or abate the bypass. Any changes in the foregoing shall be immediately reported to the MPCA. The Joint Permittees shall immediately after giving of said notice implement the planning for appropriate alternatives to minimize or abate the possible bypass. Thereafter, the Joint Permittees shall implement the appropriate, reasonable alternative(s) if any, to minimize or abate the bypass. Appropriate alternatives shall include but not be limited to those alternatives described in paragraph 3 hereinafter following. The failure of the Joint Permittees to properly evaluate or interpret the information available shall not void the Joint Permittees' responsibility to comply with this section.

b. With the exception of a discharge pursuant to PART I, B.1.a., any bypass which is caused by an emergency shall be reported to the Duty Officer, 1-800-422-0798 or 612-649-5451 **within one hour of the discovery of the incident**. The Joint Permittees shall refer to the MPCA "Emergency Notification Guidance for Wastewater Treatment Facilities," dated April 1996, for information to be provided to the Duty Officer.

3. Request for Permission to Bypass for Maintenance or Repair

Scheduled bypasses due to construction and/or normal maintenance are prohibited unless authorized by the MPCA in writing. Existing or temporary collection system facilities shall be used to the maximum extent practical to ensure compliance with permit conditions. The Joint Permittees shall submit a written request for the bypass **at least ten days before the date of the bypass** or as soon as possible under the circumstances. The request shall specify the following:

a. Proposed date and estimated duration of the bypass;

b. Alternatives to bypassing; and

c. Measures to mitigate environmental harm caused by the bypass.

4. Monitoring Requirements in the Event a Bypass is Needed to Conduct Maintenance or Repairs

In the event a discharge from the remaining combined sewer system outfalls results from activities necessary to maintain or repair the combined sewer system a monitoring program as outlined in PART I, C.8. shall be conducted, and a report as required in PART I, C.6. shall be submitted.

A monitoring program that is not in accordance with PART I, C.8. will be accepted if site conditions do not probide for a safely accessible monitoring location.

5. Monitoring Procedures and Reporting Results

a. Samples and measurements required by this permit shall be representative of the monitored activity and shall be analyzed by a laboratory appropriately certified by the Minnesota Department of Health, in accordance with Minn. R. 4740.2040.

b. Test procedures for the analysis of pollutants shall conform to 40 CFR Part 136.

c. All monitoring and analytical instruments used to monitor as required by this permit shall be calibrated and maintained at a frequency necessary to ensure accuracy. The Joint Permittees shall maintain written records of all calibrations and maintenance.

d. The following information shall be recorded for each measurement taken or sample collected:

   i. The exact place, date, and time of the sampling or measurement.
   ii. The dates the analyses were performed.
   iii. The person who performed the analyses, measurement, sample collection or calculation.
   iv. The analytical techniques, procedures and methods used.
   v. The results of the analyses.

e. If a pollutant is monitored more frequently than required by this permit, the results and the frequency of monitoring shall be included in the calculation and reporting of values submitted in the report required by PART I, C.6.

f. All records required by this permit shall be retained by the Joint Permittees for three years, including any calculations or any original recordings from automatic monitoring instrumentation. These retention periods shall be automatically extended during the course of any legal or administrative proceedings or upon request by the MPCA.

g. Monitoring results shall be reported in the units specified in this permit. A report shall be submitted even if no discharge occurred during the reporting period. The Joint Permittees shall report any substantial changes in operational procedures; activities which alter the nature or frequency of the discharge; material factors affecting compliance with the conditions of this permit; and additional information requested by the MPCA.

h. Except for data determined to be confidential, all reports required by this permit shall be available for public inspection at the MPCA St. Paul office. Effluent data shall not be considered confidential. Confidential material shall be submitted according to Minn. R. 7000.1300.

i. All documents and reports submitted to the MPCA by the Joint Permittees, shall be signed by the Joint Permittees or duly authorized representative of the Joint Permittees.

j. Any person knowingly making any false statement on any report, or tampering with any monitoring device or method, is subject to the imposition of criminal and civil penalties.

6. <u>Reporting on a Discharge Event Caused by Maintenance or Repair of the Combined Sewer System</u>

a. In order to maintain an accurate record of a discharge event, its effect upon the receiving waters and the condition of or changes in the combined sewer system pursuant to PART I,C.3., a report shall be submitted to the Agency if a discharge event takes place. The report shall be submitted to the MPCA (Attn: Point Source Compliance Section, Water Quality Division) **no later than sixty (60) days following the cessation** of such a discharge and shall contain at a minimum the following information:

i. results of the sampling and monitoring required in PART I, C.8. These results shall be reported in the units specified in the permit;

ii. a summary of the impact of the discharge(s) upon the receiving waters. This summary shall be based upon water quality, flow volume, and other essential facts which may be documented from past and ongoing monitoring and/or studies, in addition to new data compiled from the sampling and monitoring program required by this permit;

iii. in the event of repairs or construction, the report shall contain a complete description of all repairs or construction completed, including any modifications in the combined sewer system, any substantial changes in the operational or maintenance procedures, and any other significant activities which will alter the nature or frequency of discharges; and

iv. any other material factors affecting compliance with the conditions of this permit and such information as the Agency may reasonably require of the Joint Permittees pursuant to Minn. R. 7001.1090, subp. 1 and Minn. Stat. chs. 115 and 116 as amended.

7. Except for data determined to be confidential under Section 308 of the Act, and Minn. Stat. § 116.075, subd. 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the MPCA. Procedures for submitting such confidential material shall be pursuant to Minn. R. 7000.1300. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report, confidential or otherwise, is subject to the imposition of criminal penalties as provided for in Section 309 of the Act and Minn. Stat. § 115.071, subd. 2 (b).

8. Monitoring Requirements

Each sample collected pursuant to PART I, C.4. above shall be analyzed for the following:

Determination	Units	Frequency	Sample Type	Notes
Discharge Flow	gal	Daily	Volume and Duration	(1)
River Flow	cfs	Daily	Volume	
Biochemical Oxygen Demand	mg/l	Daily	Composite	(1)
Chemical Oxygen Demand	mg/l	Daily	Composite	(1)
Suspended Solids	mg/l	Daily	Composite	(1)
Ammonia Nitrogen	mg/l	Daily	Composite	(1)
Kjeldahl Nitrogen	mg/l	Daily	Composite	(1)
Nitrate Nitrogen	mg/l	Daily	Composite	(1)
Total Phosphorus	mg/l	Daily	Composite	(1)
Total Cadmium	ug/l	Daily	Composite	(1)
Total Chromium	ug/l	Daily	Composite	(1)
Total Copper	ug/l	Daily	Composite	(1)
Total Cyanide	ug/l	Daily	Composite	(1)
Total Iron	ug/l	Daily	Composite	(1)
Total Lead	ug/l	Daily	Composite	(1)
Total Mercury	ug/l	Daily	Composite	(1)
Total Nickel	ug/l	Daily	Composite	(1)
Total Phenols	ug/l	Daily	Composite	(1)
Total Zinc	ug/l	Daily	Composite	(1)

Notes: (1) Representative composite sample to be collected at the discharge point.

Additional monitoring of the discharge or receiving waters may be required at the request of the Agency.

D. OPERATION OF THE COMBINED SEWER SYSTEM

General operation of the combined sewer system shall be in compliance with the following terms and conditions and the operational plan approved on May 11, 1987, and any amendments thereto.

1. Operation of the System for Control of Combined Sewer Losses

The Joint Permittees shall operate the system for control of combined sewer losses (including regulator devices, structures, systems, and programs) as efficiently as possible in order to utilize the system capacity to the maximum extent possible in order to minimize discharges from the combined sewer system.

2. Maintenance of Facilities and Systems

The Joint Permittees shall at all times maintain in good working order and operate as efficiently as possible all facilities or systems of control installed or used in the combined sewer system and shall conduct a regulator elimination program in conformance with the schedule in Attachment A.

3. System Reliability

The Joint Permittees are responsible for maintaining adequate safeguards to minimize the discharge of untreated or inadequately treated wastes at all times. The Joint Permittees are responsible for insuring system reliability.

4. Scheduling of Discharges from the Combined Sewer System for Maintenance or Repairs

Any maintenance or repair of the combined sewer system shall be scheduled as much as possible during periods of high river flow and shall be carried out in a manner approved by the MPCA as outlined in PART I, C.3.

5. Providing an Adequate Maintenance Staff

The Joint Permittees shall provide an adequate staff to carry out the operation, maintenance, repair and testing functions required to insure compliance with the conditions of this permit.

6. Removed Substances

The Joint Permittees shall not deposit sludge or other removed substances from other treatment facilities or any other source into the interceptor system at a time or in a manner that would allow these substances to enter the receiving water as a result of a discharge from bypass/overflow points(s) authorized herein. The Joint Permittees shall dispose of solids, sludges, or other pollutants removed from or resulting from treatment or control of discharges in accordance with all applicable air, water and solid waste Statutes and Rules. When requested by the MPCA, the Joint Permittees shall submit for approval an acceptable plan for such disposal and shall be responsible for obtaining MPCA approval and/or permit of such disposal plans.

7. Storm Water Inflow

No new sources of storm water inflow shall be directly connected to any portion of the sewer system that is designed to carry only sanitary sewage.

E. SCHEDULE OF COMPLIANCE

1. CSO Construction Program

The Joint Permittees shall proceed with elimination of combined sewer bypass/overflows in accordance with the schedule and requirements outlined below. Upon completion of the approved CSO control program there shall be no discharges of sanitary sewage from the separated sewer system.

2. Project Schedules

The Joint Permittees shall proceed with the elimination of regulator structures in accordance with the schedule identified in Attachment A and the provisions of Part I, B. 2, and 3..

3. Elimination of Rainleader Connections

Consistent with Minnesota Statues 116.162, Subp. 7 the city shall continue with an effective rainleader elimination program. A summary of the progress of this program shall be included in the annual report required by PART II, A.3.

4. Operational Plan

The Joint Permittees shall continue implementation of the operational plan approved on May 11, 1987, and any approved amendments thereto that provides for maximum conveyance of wet weather flows to the treatment plant during the implementation phase of the CSO control program.

F. DEFINITIONS

1. "Act" means the Clean Water Act.

2. "Bypass" means an intentional diversion of a waste stream from any portion of the treatment facility.

3. The "City" means the City of Minneapolis.

4. "Combined Sewer" means a sewer that is designed and intended to serve as a sanitary sewer and a storm sewer, or as an industrial sewer and a storm sewer. For the purposes of this permit, the combined sewer system shall include combined sewers and all portions of the separated sewer system which have a connection between the separate sanitary sewer and the separate storm sewer system via a regulator or overflow structure that will allow sanitary sewage to be discharged from the storm sewer.

5. "Combined Sewer Overflow" means a discharge of a combination of storm and sanitary wastewater or storm and industrial wastewater directly or indirectly into the waters of the state, occurring when the volume of wastewater flow exceeds the conveyance or storage capacity of a combined sewer system.

6. "Completion of Separation." For the purposes of interpreting the requirements of Part I, E. of this permit, completion of separation or similar references shall mean completion of construction of all sewer work required for separation, including punch list items followed by an inspection period to identify and correct miscellaneous sources of infiltration and inflow.

7. "Composite Sample" means: a) a series of grab samples collected at least once per hour at equally spaced intervals and proportioned according to flow; or b) grab samples of equal volume each collected after a predetermined volume of flow has passed.

8. "Duty Officer" means the Minnesota Duty Officer, Department of Public Safety, Division of Emergency Management.

9. "Emergency Incident" means all emergency bypasses, spills, or any other environmental emergency as described in the MPCA "Emergency Notification Guidance for Wastewater Treatment Facilities."

10. "Grab Sample" means an individual sample.

11. "Infiltration" means water other than wastewater that enters a sewerage system (including sewer service connections) from the ground through such means as defective pipes, pipe joints, connections, or manholes. Infiltration does not include, and is distinguished from, inflow.

12. "Inflow" means water other than wastewater that enters a sewerage system (including sewer service connections) from sources such as roof leaders, cellar drains, yard drains, area drains, foundation drains, drains from springs and swampy areas, manhole covers, cross connections between storm sewers and sanitary sewers, catch basins, cooling towers, storm waters, surface runoff, street wash waters, or drainage. Inflow does not include, and is distinguished from, infiltration.

13. "MPCA" means the Minnesota Pollution Control Agency as described in Minn. Stat. § 116.02.

PART II

A. MANAGEMENT REQUIREMENTS

1. Street and Collection System Cleaning Program

a. The Joint Permittees shall conduct a collection system cleaning program to reduce the amount of pollutants contributed to the river by CSO and storm water discharges.

b. The city shall conduct a street cleaning program to reduce the amount of pollutants contributed to the river by CSO and storm water discharges.

c. New storm sewer systems shall be designed and constructed to provide for reliable and efficient capture of floatables and other runoff debris, consistent with reliable and efficient conveyance of storm water.

d. A summary of the cleaning program activities shall be included in the annual report required by PART II, A.3.

2. Agreement Between the Joint Permittees Defining Responsibilities to Meet Requirements of the Permit

The Joint Permittees shall either modify the existing Agreement which expired December 31, 1995, or enter into a new Agreement to define the individual responsibilities for meeting the requirements and conditions of this permit. As a part of the above mentioned Agreement the Joint Permittees shall define individual responsibilities to assure that the regulator elimination program as outlined in Attachment A and all other maintenance and operational procedures are properly conducted. The Agreement shall include but is not limited to the following items:

a. A delineation of responsibility to assure that all studies and programs are completed and submitted to the Agency according to the schedules contained in this permit.

b. A delineation of responsibility for the maintenance and repair of the conveyance structure contained in the combined sewer system

c. A delineation of responsibility for the inspection, maintenance and elimination of all regulators, the regulator structure(s) and outfall structures(s) in the event such coordination is needed to carry out the maintenance and elimination program as outlined in Attachment A or any other maintenance or repair.

d. A condition outlining the coordination procedure between the Joint Permittees for the maintenance and elimination of the combined sewer system, regulator(s), regulator structures(s) and outfall structure(s) in the event such coordination is needed to carry out the elimination program as outlined in Attachment A or any other maintenance or repair.

e. A delineation of responsibilities for submittal of the comprehensive report required by PART II,A.3.

f. A delineation of responsibilities for conducting post-separation overflow monitoring in accordance with Part I,B.3.

g. A delineation of responsibilities for implementing the operational plan outlined in PART I, E.4.

A copy of the Agreement shall be submitted to the MPCA **within one hundred eighty (180) days** of the date of issuance of this permit.

3. Annual Report on the Combined Sewer System

The Joint Permittees shall submit an annual report to the MPCA regarding the combined sewer system, the street and collection system cleaning program, the sewer separation program, implementation of the approved operational plan, and the regulator elimination and maintenance program outlined in Attachment A. At a minimum this report shall contain information on progress accomplished pursuant to permit requirements, problems encountered in the system and locations thereof, impact of the problem upon the system, date or dates the problem occurred, past problems of a similar nature, steps taken to correct the problem areas, recommendations for permanent solutions to the problems encountered and any pertinent information that would aid in understanding these problems and the action taken to correct them. This report shall be submitted to the MPCA **before April 30 each year** and shall cover the previous calendar year.

4. Construction

This permit authorizes construction to attain compliance with the limitations and conditions of this permit.

5. Outfall Identification

The Joint Permittees shall maintain identification signs on all authorized outfalls. Such signs shall conform with the specifications outlined in the previously issued permit dated September 25, 1984. Upon elimination of the CSO discharge to an outfall, the Permittee shall remove the identification sign to the outfall and note this activity in the annual report required by PART II, A.3.

B. GENERAL TERMS AND CONDITIONS

The Joint Permittees shall comply with all requirements of 40 CFR 122.41 and 122.42, Minn. R. ch. 7040, and Minn. R. 7001.0150, subp. 3 and 7001.1090, subp. 1, including, but not limited to, the terms and conditions contained in this part.

1. Changes in Discharges from the Combined Sewer System

a. All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any wastewater not consistent with the terms and conditions herein shall constitute a violation of this permit. Such a violation may result in the imposition of civil or criminal penalties as provided for in Section 309 of the Act and Minn. Stat. § 115.071.

b. Combined sewer system modifications, additions, and/or expansions that increase the system capacity shall be reported to the MPCA (Attn: Point Source Compliance Section, Water Quality Division) prior to the changes taking place and this permit may then be modified or reissued to reflect such changes.

c. In no case are any system modifications or significant changes in system operation including regulator adjustments permitted that will cause an increase in volume or duration of overflow events.

C. PERMIT MODIFICATIONS

1. Joint Permittee Initiated

The following changes may require a permit modification and shall be reported to the MPCA for approval prior to the change:

a. anticipated changes in the combined sewer system discharge, including new significant industrial discharges or significant changes in existing industrial discharges to the sanitary sewer system.

b. the permit is not transferable to any person without the express written approval of the MPCA. The new owner must submit a permit application no later than 90 days before the scheduled change in ownership or control.

2. MPCA Initiated

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked for causes including, but not limited to, the following:

a. Violation of any terms or conditions of this permit.

b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts.

c. A change in any condition that requires a change in discharge.

d. The establishment of toxic effluent standards or prohibitions more stringent than any limitations in this permit.

e. Minn. R. 7001.0170 and 7001.0190.

D. INSPECTION AND ENTRY

1. The Joint Permittees shall allow of the MPCA to:

a. Enter the premises where the facility is located or activity conducted.

b. Have access to and copy any records that are required under the conditions of this permit.

c. Inspect any facilities, equipment, practices or operations regulated or required under this permit.

d. Sample or monitor for the purposes of assuring compliance.

2. The Joint Permittees shall furnish to the MPCA, within a reasonable time, any information requested to determine compliance with this permit.

E. LIABILITY EXEMPTION

1. In issuing this permit the state and the MPCA assume no responsibility for damage to persons, property, or the environment caused by the activities of the Joint Permittees in the conduct of actions, including those activities authorized, directed, or undertaken to achieve compliance with this permit. To the extent the state and MPCA may be liable for the activities of its employees, that liability is explicitly limited to that provided in the Tort Claims Act, Minn. Stat. § 3.736.

2. The MPCA's issuance of this permit does not obligate the MPCA to enforce local laws, rules or plans beyond what is authorized by Minnesota statutes.

F. LIABILITIES

1. The MPCA's issuance of this permit does not release the Joint Permittees from any liability, penalty, or duty imposed by Minnesota or federal statutes or rules or local ordinances, except the obligation to obtain the permit.

2. Nothing in this permit shall be construed to preclude the institution of any legal or administrative proceedings or relieve the Joint Permittees from any responsibilities, liabilities, or penalties for violation of effluent and water quality limitations, or other federal regulation or state rules, not included in this permit.

3. The issuance of a permit does not prevent the future adoption of the MPCA of pollution control rules, standards, or orders more stringent than those now in existence and does not prevent the enforcement of these rules, standards, or orders against the Joint Permittees.

4. Noncompliance with the terms and conditions of this permit subjects the Joint Permittees to penalties provided by federal and state law, including monetary penalties, imprisonment or both.

G. PROPERTY RIGHTS

The issuance to this permit does not convey a property right or exclusive privilege, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

H. SEVERABILITY

The provisions of this permit are severable, and if any provisions of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

I. PROHIBITED WASTES

The Joint Permittees shall prohibit the discharge to its combined sewer system of the following specific prohibited pollutants:

1) pollutants which create a fire or explosion hazard, including any discharge with a flash point less than 60 degrees C (140 degrees F),

2) pollutants which will cause corrosive structural damage, but in no case less than pH 5.0,

3) solid or viscous pollutants which will cause obstruction to flow,

4) pollutants which result in the presence of toxic gases, vapors, or fumes that may cause acute worker health and safety problems,

J. COOLING WATER

New discharges into the sanitary or combined sewer system of noncontact cooling water is prohibited, unless there are no cost-effective alternatives.

Existing discharges of non-contact cooling water to the Joint Permittees' combined sewer system shall be eliminated, where elimination is cost-effective, or where an infiltration/inflow analysis and sewer system evaluation survey indicates the need for such removal.

ATTACHMENT A

Regulator Removal Schedule

NPDES Outfall No.	Regulator Code	Name and/or Location	Responsible Party	Rem Stat
001		**Minnehaha Tunnel Outfall**		
	1-37 *	Minnehaha Pkwy & 39th AV S	MCES	B
002		**East 38th ST Outfall**		
	2-35	East 38th ST & 26th AV S	MCES	C
004		**Southwest Interceptor Outfall**		
	4-34 *	Southwest Meters Bypass	MCES	D
005		**Northwest Interceptor Outfall**		
	5-34 *	Northwest Meters Bypass	MCES	D
006		**Eastside Interceptor Outfall**		
	6-48 *	East Meters Bypass	MCES	D
007		**East 26th ST Outfall**		
	7-33 *	East 26th ST & Seabury AV	MCES	D
008		**Cecil ST Outfall**		
	8-31A	East River RD & Cecil ST on E River RD	MCES	B
	8-31B	East River RD & Cecil ST on Cecil ST	MCES	B
009		**Southeast Franklin AV Outfall**		
	9-30A	E River RD & Franklin AV SE on Franklin	MCES	B
	9-30B	E River RD & Franklin AV SE on 27th AV	MCES	B
010		**East Franklin AV Outfall**		
	10-32	E Franklin AV & W River RD	MCES	B
014		**14th AV S & E 18th ST Storm Outfall**		
	14-22½h	E 26th ST & 18th AV S	MCES	B
020		**Chicago AV S & N MPLS Tunnel Outfall**		
	20-17 *	Portland AV S & Washington	MCES	D
025		**Bassetts Creek Outfall**		
	25A-13	Bassetts Creek at 5th ST N	City	B
029		**26th AV N Outfall**		
	29-8	26th AV N & Emerson AV N	MCES	B
030		**22nd AV NE Outfall**		
	30-Q	22nd AV NE at 5th ST NE from N	City	B
	30-R	22nd AV NE at 5th ST NE from S	City	B

* Indicates regulator monitored telemetrically by MCES.

Removal Status for Combined Sewer Overflow Regulators

A: To be eliminated in 1996
B: To be eliminated in 1997
C: Monitoring is required before elimination can be scheduled
D: Additional monitoring is required. May be necessary to remain as an emergency bypass.

Appendix L
NPDES Stormwater Permit

Minnesota Pollution Control Agency

December 1, 2000

Copy 4/3

CERTIFIED MAIL NO. Z 295 023 724
RETURN RECEIPT REQUESTED

Mr. David Sonnenberg
City Engineer, Director of Public Works
350 South 5th Street, Suite 203
Minneapolis, MN 55415

RE: Final NPDES/SDS Permit No. MN 0061018
Municipal Storm Sewer System
Minneapolis, Minnesota

Dear Mr. Sonnenberg:

Enclosed is a copy of the final National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) permit for the Minneapolis Storm Sewer System. All comments submitted in writing during the public notice comment period have been considered in the formulation of the terms and conditions of the permit.

It is the responsibility of the Permittee to maintain compliance with all of the terms and conditions of this permit. Please carefully review the entire permit.

If you have any questions regarding any of the terms and conditions of the permit, please contact Dave Sahli of my staff at (651) 296-8722.

Sincerely,

David Kortan, P.E.
Supervisor, Sector 3
Major Facilities Section
Metro District

DK:lh

Enclosure: Final Permit

cc: Peter Swenson, U.S. Environmental Protection Agency, Chicago (w/final permit)
Jodi Polzin, Minneapolis Public Works Department (w/final permit)
Jeff Lee, Minneapolis Park and Recreation Board (w/final permit)
Janette Brimmer, Minnesota Center for Environmental Advocacy (w/final permit)
Sol Simon, Mississippi River Revival (w/final permit)

STATE OF MINNESOTA

Minnesota Pollution Control Agency

WATER QUALITY DIVISION

National Pollutant Discharge Elimination System (NPDES) and State Disposal System (SDS) Permit MN 0061018

PERMITTEE: City of Minneapolis and the Minneapolis Park and Recreation Board, hereinafter the "Permittee" or "Joint Permittees"

FACILITY NAME: Minneapolis Storm Sewer Drainage Area

RECEIVING WATERS: Water bodies in the City of Minneapolis storm sewer system drainage area as listed in this permit.

CITY OR TOWNSHIP: City of Minneapolis **COUNTY:** Hennepin

ISSUANCE DATE: December 1, 2000 **EXPIRATION DATE:** January 1, 2004

The State of Minnesota, on behalf of its citizens through the Minnesota Pollution Control Agency (MPCA), authorizes the Permittee to operate a municipal separate storm sewer system as named above, and to discharge storm water from this facility to the receiving waters named above, in accordance with the requirements of this permit.

The goal of this permit is to protect water quality in accordance with Minnesota and U.S. statutes and rules, including Minn. Stat. chs. 115 and 116, Minn. R. chs. 7001, 7050, and the U.S. Clean Water Act.

This permit is effective on the issuance date identified above.

The Permittee is not authorized to discharge after the above date of expiration. In order to receive authorization to discharge beyond the above date of expiration, the Permittee shall submit such information and forms as are required by the MPCA no later than 180 days prior to the above date of expiration pursuant to Minn. R. 7001.0040.

Signature: Richard J. Sandberg

Richard J. Sandberg
Program Manager
Major Facilties Section
Metro District

for

Karen A. Studders
Commissioner
Minnesota Pollution Control Agency

If you have questions on this permit, including the specific permit requirements, permit reporting or permit compliance status, please contact:

Minnesota Pollution Control Agency
Metro District, Major Facilities Section
520 Lafayette Road North
St. Paul, MN 55155-4194
Telephone: (612) 296-6300
Fax: (612) 297-8683
Telephone Device for Deaf (TTY): (612) 282-5332
Printed on recycled paper containing at least 10% paper recycled by consumers

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Required Submittals, One-time Submittals

June 1, 2001	Submit a revised storm water monitoring program manual. Chapter 2, 19.2
June 1, 2001	Submit a work plan and schedule for completion of the design manual. Chapter 2, 7.3
June 1, 2001	Submit a proposed work plan and schedule for completion of the pesticides, herbicides, and fertilizers pilot project. Chapter 2, 10.3.
June 1, 2002	Submit the first report regarding coordination with other governmental entities. Chapter 2, 16.2.
June 1, 2003	Submit the second report regarding coordination with other governmental entities. Chapter 2, 16.3
January 1, 2004	Submit a pesticides, herbicides, and fertilizers pilot project final report. Chapter 2, 10.3.

Required Submittals, Annual Submittals

June 1	Submit a proposed Storm Water Management Program for the year. Chapter 2, 3.2.
June 1	Submit a Storm Water Management Annual Report. Chapter 2, 18.1

DESCRIPTION

The municipal separate storm sewer system consists of the storm sewer system and treatment works for the collection, conveyance, treatment, storage, and discharge of storm water in the City of Minneapolis.

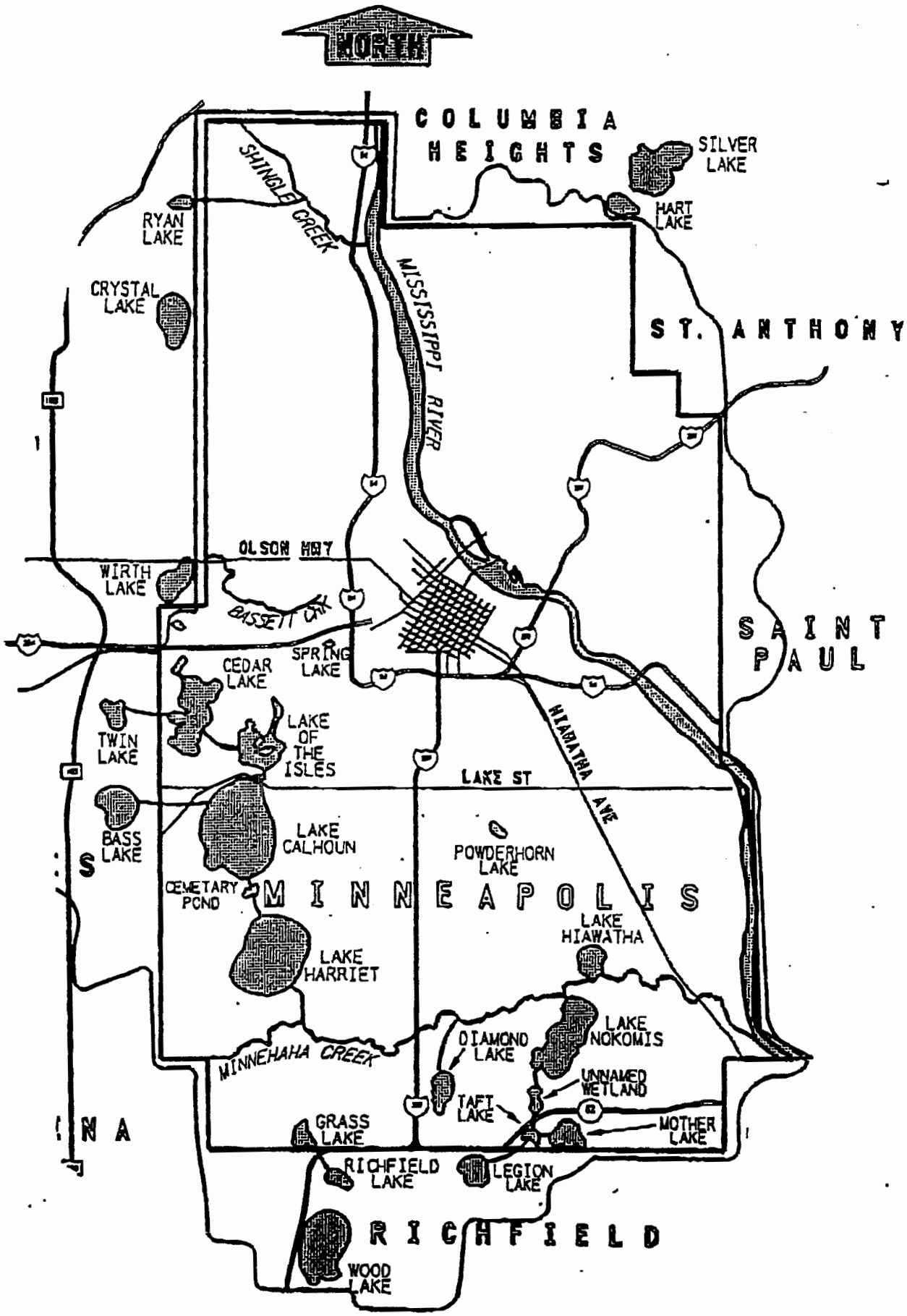
The discharge consists of storm water at a rate dependent upon precipitation and snow melt. All sanitary wastes in the affected area are conveyed to the municipal sanitary sewer or combined sewer system and their discharge is not authorized by this permit.

Storm water from the Permittees' separate storm sewer system is discharged to the following waters of the State:

Receiving Water	Total Discharge Points
Mississippi River	72
Shingle Creek	30
Ryan Lake	1
Minnehaha Creek	115
Bassett Creek	40
Brownie Lake	2
Cedar Lake	13
Lake of the Isles	19
Lake Calhoun	19
Cemetery Lake	1
Sanctuary Pond	1
Lake Harriet	16
Diamond Lake	10
Taft Lake	3
Mother Lake	2
Unnamed Wetland west of Mother Lake	5
Lake Hiawatha	4
Lake Nokomis	16
Birch Pond	1
Powderhorn Lake	4
Grass Lake	11
Legion Lake	7
Richfield Lake	2
Unnamed Wetland at Highway 62 and East 28th St.	1
Unnamed Wetland at Ewing Ave. S. and West 22nd St.	1
Hart Lake (Columbia Hgts.)	1
Silver Lake (New Brighton)	1
Crystal Lake (Robbinsdale)	2
Total Discharge Points	**400**

82
115-83 = 32
130 - 115 = 15

Watershed of Minneapolis and Joint Permittees Separate Storm Sewer System



SD 001, SD 002, SD 003, SD 004, SD 005

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
BOD, 05 Day (20 Deg C)	Monitor Only	mg/L	Single Value	Mar-Oct	Composite	1 x Month	1
Cadmium, Total (as Cd)	Monitor Only	ug/L	Single Value	Mar-Oct	Composite	1 x Month	1
Chloride, Total	Monitor Only	mg/L	Single Value	Mar-Oct	Composite	1 x Month	1
Copper, Total (as Cu)	Monitor Only	ug/L	Single Value	Mar-Oct	Composite	1 x Month	1
Fecal Coliform, MPN or Membrane Filter 44.5C	Monitor Only	#100ml	Single Value	Mar-Oct	Grab	1 x Month	1
Flow	Monitor Only	MG	Calendar Month Total	Mar-Oct	Measurement	1 x Day	1
Flow	Monitor Only	mgd	Daily Average	Mar-Oct	Measurement	1 x Day	1
Lead, Total (as Pb)	Monitor Only	ug/L	Single Value	Mar-Oct	Composite	1 x Month	1
Mercury, Total (as Hg)	Monitor Only	ng/L	Single Value	Mar-Oct	Grab	1 x Month	2
Nitrite Plus Nitrate, Total (as N)	Monitor Only	mg/L	Single Value	Mar-Oct	Composite	1 x Month	1
Nitrogen, Ammonia, Un-ionized (as N)	Monitor Only	mg/L	Single Value	Mar-Oct	Composite	1 x Month	1
Nitrogen, Kjeldahl, Total	Monitor Only	mg/L	Single Value	Mar-Oct	Composite	1 x Month	1
pH	Monitor Only	SU	Single Value	Mar-Oct	Grab	1 x Month	1
Phosphorus, Dissolved	Monitor Only	mg/L	Single Value	Mar-Oct	Composite	1 x Month	1
Phosphorus, Total (as P)	Monitor Only	mg/L	Single Value	Mar-Oct	Composite	1 x Month	1
Precipitation	Monitor Only	in	Single Value	Jan-Dec	Measurement	1 x Day	
Solids, Total Dissolved (TDS)	Monitor Only	mg/L	Single Value	Mar-Oct	Composite	1 x Month	1
Solids, Total Suspended (TSS)	Monitor Only	mg/L	Single Value	Mar-Oct	Composite	1 x Month	1
Zinc, Total (as Zn)	Monitor Only	ug/L	Single Value	Mar-Oct	Composite	1 x Month	1

Notes:
1 -- The March sample shall be of a snow melt event and may be a grab sample.
2 -- Use EPA method 1631 and sampling method 1669. Monitoring will be completed as part of a two-year pilot project as described in Chapter 2, Section 19.9. The March sample shall be of a snow melt event and may be a grab sample

Chapter 1. Surface Discharge Station Requirements - General

1. Sampling Location

1.1 Samples for stations SD001, SD002, SD003, SD004, and SD005 shall be collected from a point in the collection system that is representative of the flow that is discharged.

Sampling will be completed as part of a joint program between the City of Minneapolis and the City of St. Paul as described in Chapter 2, Section 19.7 of this permit.

1.2 The monitoring sites shall be representative of the following land use types:

a. SD001 - Residential
b. SD002 - Residential
c. SD003 - Industrial/Commercial
d. SD004 - Industrial/Commercial
e. SD005 - Mixed or other use type

2. Surface Discharges

2.1 The Permittee shall install and maintain outlet protection measures at all discharge points to prevent erosion.

3. Discharge Monitoring Reports

3.1 The Permittee shall submit monitoring results for discharges in accordance with the limits and monitoring requirements for these stations. If no discharge occurred during the reporting period, the Permittee shall check the "No Discharge" box on the Discharge Monitoring Report (DMR) for that station.

Chapter 2. Municipal Storm Water, NPDES/SDS

1. Authorization

1.1 This permit authorizes the Permittee to discharge municipal storm water in accordance with the provisions in this chapter.

1.2 This permit does not exempt or otherwise preclude the Permittee from complying with the requirements of Watershed Districts, Watershed Management Organizations, the County or any other local, state, or federal rules and regulations.

Chapter 2. Municipal Storm Water, NPDES/SDS

2. Prohibited Discharges

2.1 This permit does not cover discharges other than storm water. Non-storm water discharges may include noncontact cooling water, sewage, wash water, scrubber water, spills, oil, hazardous substances, nor commercial equipment/vehicle cleaning and maintenance wastewaters to ditches, wetlands nor other surface waters of the state. A separate NPDES permit may be required for these discharges. The Permittee has a separate NPDES permit for combined sewer overflow discharges.

2.2 This permit does not cover the discharge of storm water associated with industrial activity or construction activity. A separate NPDES permit may be required for these activities.

2.3 This permit does not cover the discharge of storm water from any other entity located in the drainage area or outside the drainage area. Only the Permittee and the portions of the storm sewer system that are under its jurisdiction are covered by this permit.

3. Storm Water Management Program Requirements

3.1 The management of the municipal storm sewer system shall be in compliance with the Clean Water Act and with the terms and conditions of this permit. The Permittee shall manage, operate, and maintain the storm sewer system and areas drained by the storm sewer system in a manner to reduce the discharge of pollutants to the maximum extent practicable. The management may consist of a combination of Best Management Practices (BMPs), education, other control techniques, system design and engineering methods, and such other provisions as the Permittee and/or MPCA determine as appropriate.

3.2 The Permittee shall develop a Storm Water Management Program (hereinafter "Management Program") to reduce the discharge of pollutants from the storm sewer system. The Permittee shall submit a Management Program by June 1 of each year beginning in 2001 in accordance with the Annual Report requirements, for review and approval by the MPCA.

3.3 The Management Program shall, at a minimum, contain controls that address the reduction of pollutants from the sources and activities listed in this chapter. Each proposed program shall identify which sources and the pollutant that will be targeted for reduction and which category listed in items 4-16 below the program addresses. For each program there shall be a description, responsible department in charge, an estimated annual budget for the next five years and performance measures that can be used to determine the success or benefits of the activity.

4. Structural Controls

4.1 The Permittee shall operate and maintain all storm water structural controls, over which they have jurisdiction, in a manner so as to reduce the discharge of pollutants.

Chapter 2. Municipal Storm Water, NPDES/SDS

4. Structural Controls

4.2 All structural controls such as ponds and grit chambers must be inspected a minimum of two times per year. The Permittee shall keep records of inspection results, date, antecedent weather conditions, sediment storage and capacity remaining, and any maintenance performed or recommended. After two years of inspections, if patterns of maintenance become apparent the frequency of inspections may be adjusted. If maintenance or sediment removal is required as a result of both inspections the frequency of inspection shall be increased to at least three times per year or more frequent if needed to prevent carry-over or washout of pollutants from the structures and maximize pollutant removal. If maintenance or sediment removal is not required as a result of both inspections, the frequency may be reduced to one time per year.

4.3 The Permittee shall inspect 20% of the outfalls on a rotating basin at different locations during the effective period of this permit. If additional erosion protection is necessary based on an outlet inspection the protection project shall be completed during the same year as the inspection or a schedule for completion shall be submitted in the annual report. Results of outlet inspections shall be reported in the annual report and include the dates of inspection and the date of completion of additional erosion protection.

5. Facilities Operation and Quality Control

5.1 All storm water collection, conveyance, treatment, and discharge facilities shall be operated in a manner consistent with the following:

a. Maintenance of the system that results in degradation of effluent quality shall be carried out in a manner that minimizes any adverse impact to waters of the state.

b. The Permittee shall provide an adequate operating staff pursuant to Minn. Rules 7001.0150, subp. 3.F., to carry out the operation, maintenance and testing functions required to insure compliance with the conditions of this permit.

c. The Permittee shall at all times maintain in good working order and operate as efficiently as possible all facilities or systems of control installed or used in the municipal separate storm sewer system.

6. Removed Substances

6.1 The Permittee shall dispose of solids, floatables, dredgings, or other pollutants removed from or resulting from treatment or control of storm water in such a manner so as to prevent any pollutant from such materials from entering waters of the state. The Permittee, in disposing of such materials, shall comply with all applicable statutes and rules.

6.2 The Permittee shall record the quantity of all removed substances. The substances shall be divided into categories of structural controls, type of removed substances (i.e. leaves, sediment, etc.), and when possible, by seasons.

Chapter 2. Municipal Storm Water, NPDES/SDS

7. Areas of New Development or Construction

7.1 The Permittee shall implement a program to reduce the discharge of pollutants from construction sites that disturb one acre of land or more. The program shall include an ordinance or other regulatory mechanism to require erosion and sediment controls and sanctions to ensure compliance. Sanctions may include penalties, fines, bonding, other financial assurances, or permit denial for non-compliance. The program shall include planning, maintenance, and inspections to address potential water quality impacts during construction.

7.2 The Permittee shall utilize a comprehensive planning process to develop, implement, and enforce controls to reduce the discharge of pollutants from areas of new development and significant redevelopment, after construction is completed.

The program shall include requirements for long-term storm water management after construction. Long-term management shall include the use of on-site, off-site, or regional BMPs. The program shall include a process for the review of the impacts to the design capacity of existing structural BMPs from proposals to add additional drainage area to the BMPs. Inspections, maintenance, and reporting requirements must be included for structural BMPs to ensure that they will continue to provide pollutant removal as designed.

7.3 The permittee's existing storm water ordinance passed in 1999 refers to the city's storm water design manual. The design manual is the compilation of design, performance, and review criteria for storm water management practices in the city. Minimum requirements for pollutant removal, including total suspended solids removal, discharge rate control, and nutrient reduction are prescribed in the design manual.

[illegible] MCCC BMP Manual

The ordinance does not contain a schedule for adoption of a Minneapolis Storm Water Management Design Manual. The permittee shall therefore be required to develop a design manual as described in the ordinance and submit it with the permit application for reissuance of this permit.

The Permittee shall submit a workplan and schedule for completion of the design manual in the annual report due on June 1, 2001.

8. Roadways

8.1 The Permittee shall operate and maintain public streets, roads and highways under its jurisdiction in a manner so as to reduce the discharge of pollutants.

8.2 The Permittee shall operate a program of street sweeping in which all streets are swept at least two times per year; once in the spring and once in the fall. The quantity of material removed shall be reported in the annual report. If applicable, seasonal sweepings for spring sand and fall leaves shall be itemized as part of the total quantity.

8.3 The Permittee shall employ measures to ensure that deicing materials and chemicals, sand, or other materials to deice roadways are applied to minimize their runoff.

Chapter 2. Municipal Storm Water, NPDES/SDS

8. Roadways

8.4 The storage of deicing materials, chemicals, and sand shall be done in such a manner to prevent the uncontrolled runoff and discharge of these materials.

8.5 The Permittee shall maintain records of the quantity of deicing materials, chemicals, and sand applied to roadways under its jurisdiction and report the quantities used each year in the annual report. The location and description of all storage facilities shall be identified in the annual report.

9. Flood Control

9.1 The Permittee shall ensure that any flood control projects it undertakes are designed to minimize the impacts on the water quality of the receiving water. When repairs, improvements, or changes are planned for existing flood control devices, the Permittee shall also evaluate the feasibility of retrofitting the existing devices to provide additional pollutant removal from storm water discharges.

9.2 The Permittee shall provide a list of existing flood control detention facilities that are primarily intended for volume control. The Permittee shall also report in each annual report the number and type of flood control projects planned and describe the pollutant removal capabilities associated with the project.

10. Pesticides and Fertilizers

10.1 The Permittee shall implement a program to reduce the discharge of pollutants related to the application of pesticides and fertilizers.

10.2 The Permittee shall implement a city wide education program regarding the proper application of pesticides and fertilizers. If another governmental entity has implemented an education program in a portion of the storm sewer drainage area, the Permittee may work with that entity to share resources and expand the program to all portions of the storm sewer drainage area.

10.3 The Permittee shall perform a pilot project to investigate the use of pesticides and fertilizers on facilities under its jurisdiction. The Permittee shall analyze soil and vegetation types to determine the need for and appropriate types and quantities of pesticides and fertilizers. In the 2001 annual report, the Permittee shall propose a schedule for completion of this project during the effective period of this permit. The Permittee shall include a detailed implementation plan and project proposal in the annual report prior to the initiation of the project.

The final pilot project must be completed with a final report submitted by January 1, 2004.

Chapter 2. Municipal Storm Water, NPDES/SDS

11. Illicit Discharges and Improper Disposal

11.1 The Permittee shall prohibit non-storm water discharges to the storm sewer system. The Permittee shall implement a program to detect, remove, or require to obtain a separate NPDES or other permit, illicit discharges and improper disposal into the storm sewer system under its jurisdiction.

11.2 The Permittee shall implement an ongoing field screening program similar to the program required in the permit application. The program shall be performed annually in 20% of the drainage areas listed in the description on page 3 of this permit.

In the annual report, the number of screening activities, the results, and responses to the results shall be reported.

11.3 The Permittee shall prohibit the discharge or disposal of all used motor vehicle fluids and household chemical wastes into the storm sewer system.

11.4 The Permittee shall take all reasonable steps to minimize any adverse impact to waters of the State resulting from all unauthorized discharges accidental or otherwise, of oil, toxic pollutants or other hazardous substances consistent with Minnesota Statutes Section 115.061 and 40 CFR PART 110 and 116.

The Permittee shall report in each annual report the number of spills and unauthorized discharges that occured and the response to those spills.

The Permittee shall implement an education program for its staff regarding the duty to notify the Department of Public Safety Duty Officer as required in Chapter 3, Section 8 of this permit. The program shall also include a notification protocol for maintenance staff or other department's staff for response and containment of materials.

Chapter 2. Municipal Storm Water, NPDES/SDS

11. Illicit Discharges and Improper Disposal

11.5 Unless identified by the Permittee or the MPCA as significant sources of pollutants to waters of the State, the following non-storm water discharges need not be prohibited from entering the storm sewer system, provided appropriate control measures, if needed, are used to minimize the impacts of such sources on the receiving water are implemented:

a. NPDES permitted non-storm water discharges,
b. dechlorinated water line flushing and other discharges from a potable water distribution system,
c. landscape irrigation and lawn watering,
d. irrigation water,
e. diverted stream flows,
f. rising ground water
g. foundation drains,
h. water from basement sump pumps,
i. air conditioning condensation,
j. springs,
k. individual residential and fund raising car washings,
l. flows from riparian habitats and wetlands,
m. dechlorinated swimming pool discharges,
n. flows from fire fighting.

The Permittee shall recommend appropriate control measures for disposal of these discharges to the storm sewer system and report them in the annual report in accordance with Chapter 2, Section 18.2 of this permit.

11.6 The Permittee shall develop a program to inform residents not to discharge non-storm water substances and that the drain discharges to a lake or stream. An example of such a program is storm drain stenciling.

12. Construction of Storm Sewers

12.1 New storm sewer systems and additions to the existing storm sewer system shall be designed and constructed to provide for reliable and efficient capture of floatables and other runoff debris, consistent with reliable and efficient conveyance of storm water. Designs may include either inlet or outlet control measures, or other BMPs.

13. Public Education Program

13.1 The Permittee shall implement a public education program to promote, publicize, and facilitate the proper management of storm water discharges to the storm sewer system by all the residents under their jurisdiction so as to reduce the discharge of pollutants.

Chapter 2. Municipal Storm Water, NPDES/SDS

13. Public Education Program

13.2 All of the storm water management requirements in this chapter shall include an education component. All education activities do not have to involve efforts to contact all residents, but may be focused to specific groups that are responsible for a management program activity.

13.3 Each year in the annual report, the Permittee shall include copies of educational materials, descriptions of the education activities, and the quantity of material destributed.

14. Public Participation

14.1 The Permittee shall implement a process to allow for public input into the development of priorities and activities necessary to maintain compliance with this permit. The Permittee shall seek input from citizen's groups, advisory groups, or others on each annual report.

14.2 A public hearing or other meeting where the opportunity for public testimoney is available shall be held for the annual report prior to submittal each year. A formal resolution from the Permittee's governing body adopting the report as the annual report as the storm water management plan shall be included with the annual report submittal. A summary of the public input and/or testimony received at the hearing or meeting and a summary of the Permittee's response to it shall be included with the formal resolution.

14.3 A notice of availability of each Storm Water Management Annual Report shall be provided to all governmental entities that have jurisdiction over activities that directly or indirectly relate to storm water management in the drainage area, prior to the date of the scheduled public hearing.

15. Pilot Program for Storm Water Management

15.1 Individual storm water management requirements may be implemented on a pilot project basis in a portion of the drainage area. Pilot programs may be considered in compliance with the management requirements despite the limited application. All pilot programs that are determined to be successful, shall be considered for implementation within the entire drainage area. The evaluation for system wide implementation shall be reported in accordance with the Annual Report requirements.

15.2 Proposals to implement individual storm water management requirements as pilot projects in only a portion of the drainage area must be submitted to the MPCA for approval prior to initiation. Proposals shall include a description of the activities to be completed, the pollutants that will be targetted, a schedule of completion, performance measures that will be used to determine the effectiveness of the project.

15.3 Upon completion of a pilot project an analysis of the project shall be included in the annual report. The analysis shall include a determination of the effectiveness of the project, a cost/benefit analysis for broader implementation, and a schedule for implementation to a large part of the drainage area if the project is determined to be an effective BMP.

Chapter 2. Municipal Storm Water, NPDES/SDS

16. Coordination with Other Governmental Entities

16.1 The Permittee shall cooperate with other city, county, state and local governmental entities in the overall storm water management efforts in the drainage area. Examples of other governmental entities and activities which may directly or indirectly relate to storm water management include the local fire departments, county household hazardous waste collection, Watershed Management Organizations, Watershed Districts, the Metropolitan Council, or the Department of Natural Resources.

16.2 The Permittee shall submit a report listing the other governmental entities that perform storm water management activities in the drainage area. The report shall include a summary of each activity performed by more than one group in a specific area, and how the activity relates to the requirements of the permit. The report shall be submitted by June 1, 2002.

16.3 The Permittee shall submit a report that describes how the different governmental entitities are cooperating and coordinating efforts in managing storm water related activities in the drainage area. The report shall include the goals for each cooperative effort, where and how the activity will be performed, and a schedule for implementing it. The report shall be submitted by June 1, 2003.

16.4 The Permittee shall report the ongoing coordinated activities and status of cooperative efforts in each subsequent Annual Report.

17. Modifications to the Management Program

17.1 The management program may be modified by the Permittee without prior approval of the MPCA provided it is in accordance with the following:

a. a BMP is added, and none subtracted, from the management program; or

b. a BMP identified in the management program has been determined to have failed and is replaced with an alternate BMP. The alternate BMP shall address the same, or similar, concerns as the failed BMP; and

c. The MPCA is notified of the modification in the annual report for the year the modification is made, or in a technical report as needed.

Chapter 2. Municipal Storm Water, NPDES/SDS

17. Modifications to the Management Program

17.2 The MPCA may require the Permittee to modify their management program as needed, in accordance with the following:

a. discharges from the storm sewer system are impacting the quality of receiving waters; or

b. more stringent requirements are necessary to comply with new State or Federal regulations; or

c. additional conditions are deemed necessary to comply with the goals and requirements of the Clean Water Act.

d. modification shall be made in writing, set forth schedules for compliance, and offer the Permittee the opportunity to propose alternative program modifications to meet the objectives of the requested modification. The requirements in Chapter 3, Sections 10 and 11 may also apply.

18. Storm Water Management Annual Report

18.1 The Permittee shall submit an annual report to the Commissioner regarding the status of the storm water management program. The report shall contain information on progress accomplished pursuant to permit requirements. The Permittee shall submit an annual report by June 1 of each year, beginning in 2001. The report shall cover the activities in the previous calendar year and the proposed storm water management for the next calendar year.

18.2 The Annual Report shall include an inventory of new, removed, or relocated outfall locations and the receiving water. The inventory contained in the Part II application shall be expanded upon and include an outfall identification number, size of outfall pipe, size of the drainage area, land use types in drainge area and their distribution, population in drainage area, percent of area that is impervious surfaces, and the number and type of structural controls in the drainage area.

The inventory of structural controls (i.e. ponds, grit chamber, etc.) shall also be identified with the size of the area tributary to it, the land use types and distribution, population, and the design capacity or size of the structure. Catch basins and other storm drain inlets do not have to be identified in the inventory

The inventory shall include a listing of any known industrial, commercial, or institutional facilities that discharge any flow other than storm water to the storm sewer system. The list shall include the name, location, discharge location to the storm sewer system, the receiving water, discharge description, and any permits issued for the discharge.

The inventory shall also include a listing and description of any "storm water hotspots" that have been identified. A "storm water hotshop" as defined in Title 3 of the Minneapolis Code of Ordinances, Chapter 54, is a land use or activity that generates higher concentrations of hydrocarbons, trace metals, or toxicant than are found in typical storm water runoff.

Chapter 2. Municipal Storm Water, NPDES/SDS

18. Storm Water Management Annual Report

18.3 The Annual Report shall include an inventory of all the individual components of the Storm Water Management Program. The inventory shall include a summary of the status of implementing the individual components. In addition to the reporting requirements listed in items 4-16 above, the summary shall include, but not be limited to, a comparison of the goals set in the previous years report to the accomplishments, proposed goals for the following year, operation and maintenance activities, performance, effectiveness, inspections, enforcement activities, and public education activities for each management program.

18.4 The Annual Report shall include a discussion of proposed changes to the Storm Water Management Program and changes made according to the Modifications to the Management Programs requirements. The discussion shall include a description of why the changes are needed. When feasible, this shall include qualitative and/or quantitative data demonstrating the effectiveness of the program elements or identifying impacts on the receiving waters.

18.5 The Annual Report shall include an assessment of the Storm Water Management Program. This shall include a discussion of the overall effectiveness of the program and accomplishment of goals. The assessment shall include an identification of improvements or degradation in storm water runoff quality and receiving water quality if possible.

18.6 The Annual Report shall include a fiscal analysis. This should include, but not be limited to, the annual expenditures for the previous year, the budget for the current year, and the source of funds. The analysis shall include a breakdown of capital, operation, maintenance and staff resource costs of each item in the program.

For individual programs, a cost/benefit analysis shall be completed. The analysis shall include a determination of the cost per unit reduction in pollutants removed, cost per acre, cost per person, or other cost per unit appropriate to describe the program activity.

18.7 The Annual Report shall include an analysis of the monitoring data that was collected during the reporting year. In addition, any changes to the location of a monitoring sites shall be requested. Changes may be necessary to correspond to a proposed pilot project, ease of sampling, safety, or other reason.

The first annual report shall include information acquired since the submittal of Part 2 of the application regarding BMP performance, receiving water quality, or other data available that characterized the quality of storm water discharges.

Chapter 2. Municipal Storm Water, NPDES/SDS

18. Storm Water Management Annual Report

18.8 The Annual Report shall include a calculation of the event mean concentration and the annual and seasonal pollutant loadings from each major outfall and the cumulative discharge of all outfalls to each receiving water. The calculation shall be made for all of the pollutants listed in the Limits and Monitoring Requirements on page 5. A description of the calcution method and calibration of any models used shall be included.

A major outfall as defined in the Code of Federal Regulation, 40 CFR Part 122.26(b)(5) is a discharge from a singe pipe:
a. with an inside diameter of 36 inches or more or its equivalent, or,
b. which is associated with a drainage area of 50 acres or more, or,
c. with an inside diameter of 12 inches or more or its equivalent and receives storm water from an area zoned for industial use, or,
d. which is assiciated with a drainage area of 2 acres or more and receives storm water from an area zoned for industrial use.

18.9 The Annual Report shall include the proposed storm water management program to be implemented for the next year in accordance with the Storm Water Management Program Requirements.

19. Storm Water Monitoring Program Manual

19.1 The Permittee's monitoring program for Part II of the permit application process was described in detail in the document titled, "Minneapolis Storm Water National Point Discharge Elimination System (NPDES), Part II Monitoring; City of Minneapolis Minnesota; Field Quality Assurance Manual," dated March 1992. The Manual contained detailed information about the monitoring program organization and responsibilities, field and laboratory quality assurance, sampling site characteristics, health and safety procedures, and site specific operating procedures.

The Permittee's individual storm water monitoring manual may be replace by the joint document required in Section 19.2.

19.2 The Manual shall be amended, rewritten, or revised to include the monitoring and reporting requirements set forth in the permit and submitted by June 1, 2001. Revisions shall be made as changes occur.

The Manual shall be completed as a joint document that covers the monitoring requirements in the city of Minneapolis and the city of St. Paul and shall be submitted as a single document.

19.3 Storm water monitoring of discharge events shall begin in March 2001.

19.4 All storm water monitoring shall be performed according to the précedures set forth in the monitoring program manual.

Chapter 2. Municipal Storm Water, NPDES/SDS

19. Storm Water Monitoring Program Manual

19.5 In the overall scope of the monitoring program, it is a higher priority to sample the required number of events than to meet all of the seasonal and antecedent condition requirements. If the total number of events for a year cannot be sampled due to lack of precipitation, freezing in the collection system, or other factor beyond the control of the Permittee, the remaining events shall be sampled the following month, or the next year, which ever is sooner.

19.6 After 2-years of monitoring in accordance with this permit, if a direct relationship between the concentration of total suspended solids and other parameters can be demonstrated, a reduction in monitoring frequency and parameters may be considered.

19.7 The city of Minneapolis, the Minneapolis Park and Recreation Board, and the city of St. Paul have agreed to complete the discharge event monitoring requirements of this permit in a joint monitoring program with includes a total of five sites and sampling for eight events. The responsibilities of each of the parties must be defined in an agreement between the parties before beginning the monitoring program. A copy of the agreement shall be submitted to the commissioner.

19.8 The results of the joint monitoring program shall be reported in accordance with the Chapter 2, Section 18.7 requirements for analysis of the monitoring data.

19.9 The city of Minneapolis, the Minneapolis Park and Recreation Board, and the city of St. Paul have agreed to perform a pilot project of mercury sampling at a minimum of two of the sampling locations identified in Chapter 1, Section 1.2 The effective period of the monitoring shall last for two years. The mercury sampling pilot program shall include the analysis of total suspended solids to determine if a relationship exists between the two parameters.

20. Alternative Sources of Monitoring Data

20.1 Alternate sources of monitoring data may be allowed to be substituted for the monitoring requirements specified in this permit. To be considered for substitution the data must be in compliance with the terms and conditions of this permit.

20.2 In-stream monitoring data will be considered for substitution with the monitoring requirements in this permit. In-stream monitoring proposed for substitution must provide information that represents the chemical and/or biological impacts of storm water discharges on the quality of the receiving water.

20.3 The substitution of alternate data sources must be approved by the Commissioner. A request for substitution must include a discussion of how the data will be utilized to demonstrate compliance with this permit and how it will characterize the impacts of storm water discharges.

Chapter 3. Total Facility Requirements

1. Definitions

1.1 "Best Management Practices (BMPs)" means water quality management practices that are the most effective and practicable means of controlling, preventing, and minimizing degradation of surface waters.

1.2 "Flow Composite" sample type is a combination of individual grab samples taken at periodic intervals over a defined time period. Either the time interval between each individual sample or the volume of each individual sample shall be proportional to the flow at the time of sampling or the total flow since the last individual sample. Flow composite samples shall be taken for the entire discharge or for the first three hours of the discharge. The samples may be taken with an automatic sampler or a combination of a minimum of three sample aloquots taken in each hour of discharage with each aloquot being separated by a minimum period of fifteen minutes.

1.3 "Grab" sample type is an individual sample collected from one location at one point in time. Grab samples shall be taken during the first thirty minutes of the discharge, or as soon as practicable thereafter.

1.4 "Municipal separate storm sewer system" means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains) owned or operated by a public body having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as sewer district, flood control district or drainage district, or similar entity; designated or used for collecting or conveying storm water; which is not a combined sewer; and with is not a part of a Publicly Owned Treatment works (POTW) as definded in 40 CFR 122.2.

1.5 "Single Value" is a reported value from a single sample or measurement for which there is no limit.

1.6 "Storm Water" means storm water runoff, snow melt runoff, and surface runoff and drainage.

2. Sampling and Analyses

2.1 Samples and measurements required by this permit shall be representative of the monitored activity and shall be analyzed by a laboratory certified by the Minnesota Department of Health for the applicable permitted parameters. Analyses of dissolved oxygen, pH, temperature and total residual chlorine do not need to be completed by a certified laboratory.

2.2 Sample preservation and test procedures for the analysis of pollutants shall conform to 40 CFR Part 136 and Minnesota Rules, part 7041.3200.

2.3 All monitoring and analytical instruments used to monitor as required by this permit shall be calibrated and maintained at a frequency necessary to ensure accuracy. The Permittee shall measure flows to ensure accuracy within plus or minus ten percent of the true flow values. The Permittee shall maintain written records of all calibrations and maintenance.

Chapter 3. Total Facility Requirements

2. Sampling and Analyses

2.4 The "sample type", "sampling frequency" and "effective period" identified in the Limits and Monitoring section of this permit together designate the minimum required monitoring frequency.

2.5 If a Permittee monitors more frequently than required by this permit, the results and the frequency of monitoring shall be reported on the Discharge Monitoring Report (DMR) or other form for that reporting period.

2.6 For bypasses, upsets, spills or any other discharge that may cause pollution of the waters of the state, the Permittee shall take at least one (1) grab sample for permitted effluent parameters two (2) times per week. If the Permittee believes that measuring these parameters is inappropriate due to known information about the discharge, the monitoring may be modified in consultation with the MPCA. Appropriate sampling shall be determined in consultation with the MPCA. Sanitary sewer overflows and combined sewer overflows may be regulated by other NPDES permits and shall be sampled in accordance with those permits.

3. Reporting

3.1 The Permittee shall report monitoring results for the completed reporting period in the units specified by this permit on a Discharge Monitoring Report (DMR) form or other report form provided by the MPCA.

3.2 The Permittee shall report values less than the level of detection as "<" the value of the level of detection. For example, if a parameter is not detected at a detection level of 0.1 mg/L, the concentration shall be reported as "<0.1 mg/L." "Non-detected", "undetected", "below detection limit" and "zero" are unacceptable reporting results, and are permit reporting violations.

3.3 A Discharge Monitoring Report (DMR) shall be submitted for each station even if no discharge occurred during the reporting period. The Permittee shall report 'No Discharge', 'No Flow' or 'No Materials Generated' on a DMR or other monitoring report form only if no discharge, flow or materials are generated during the entire reporting period. The schedule for reporting can be found on the Submittals Summary section of this permit.

3.4 The Permittee shall report the following information on the Discharge Monitoring Report (DMR):

a. any substantial changes in operational procedures;

b. activities which alter the nature or frequency of the discharge; and

c. material factors affecting compliance with the conditions of this permit.

3.5 The Permittee or the duly authorized representative of the Permittee shall sign the reports and documents submitted to the MPCA by the Permittee. (Minnesota Rules, pt. 7001.0150, subp. 2.D)

Chapter 3. Total Facility Requirements

3. Reporting

3.6 A person who falsifies, tampers with, or knowingly renders inaccurate a monitoring device or method required to be maintained under this permit is subject to penalties provided by federal and state law. (Minnesota Rules, pt. 7001.1090, subp. 1.G)

3.7 The Permittee shall report noncompliance with the permit not reported under Minnesota Rules, part 7001.0150, subpart 3, item K as a part of the next report which the Permittee is required to submit under this permit. If no reports are required within 30 days of the discovery of the noncompliance, the Permittee shall submit the information listed in Minnesota Rules, part 7001.0150, subpart 3, item K within 30 days of the discovery of the noncompliance. (Minnesota Rules, pt. 7001.0150, subp. 3.L)

3.8 A person who knowingly makes a false statement, representation, or certification in a record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance is subject to penalties provided by federal and state law set forth. (Minnesota Rules, pt. 7001.1090, subp. 1.H)

4. Records

4.1 The Permittee shall maintain records for each sample and measurement. The records shall include the following information:

a. the exact place, date and time of the sample or measurement;

b. the date of analysis;

c. the name of the person who performed the sample collection, measurement, analysis, or calculation;

d. the analytical techniques, procedures and methods used; and

e. the results of the analysis.

4.2 The Permittee shall keep the records required by this permit for at least three (3) years, including any calculations, original recordings from automatic monitoring instruments, and laboratory sheets. The Permittee shall extend these record retention periods upon request of the MPCA and/or during the course of an unresolved enforcement action. (Minnesota Rules, pt. 7001.0150, subp. 2.C)

4.3 Except for data determined to be confidential according to Minnesota Statutes, ch. 116.075, subd. 2, all reports required by this permit shall be available for public inspection at the MPCA St. Paul office. Effluent data shall not be considered confidential. Confidential material shall be submitted according to Minnesota Rules, pt. 7000.1300.

Chapter 3. Total Facility Requirements

4. Records

4.4 The Permittee shall, when requested by the commissioner, submit within a reasonable time the information and reports that are relevant to the control of pollution regarding the construction, modification, or operation of the facility covered by the permit or regarding the conduct of the activity covered by the permit. (Minnesota Rules, pt. 7001.0150, subp. 3.H)

5. Compliance Responsibility

5.1 The Permittee shall perform the actions or conduct the activity authorized by the permit in accordance with the plans and reports approved by the agency and in compliance with the conditions of the permit. (Minnesota Rules, pt. 7001.0150, subp. 3.E)

5.2 Whether or not this permit includes effluent limitations for toxic pollutants, the Permittee shall not discharge a toxic pollutant except according to Code of Federal Regulations, title 40, sections 400 to 460 and Minnesota Rules, parts 7050.0100 to 7050.0220 and 7055.0010 to 7055.0120 and any other applicable MPCA rules. (Minnesota Rules, pt. 7001.0190, subp. 1.A)

6. Noncompliance

6.1 Noncompliance with the requirements of this permit subjects the Permittee to penalties provided by federal and state law including monetary penalties, imprisonment, or both. (Minnesota Rules, pt. 7001.1090, subp. 1.B.; U.S.C. title 33, sect. 1319; Minn. Stat. sect. 115.071)

6.2 If the Permittee discovers that noncompliance with a condition of the permit has occurred, the Permittee shall:

a. take all reasonable steps to minimize the adverse impacts to human health, public drinking water supplies, or the environment resulting from a permit violation.

b. notify the Minnesota Department of Public Safety Duty Officer at 1(800)422-0798 or (651)649-5451 within 24 hours of becoming aware of a permit violation that may endanger human health, public drinking water supplies or the environment. The Permittee shall submit a written description of the exceedance to the MPCA within five (5) days of discovery of the exceedance.

Nothing in this requirement relieves the Permittee from immediately notifying the MPCA of any release to surface waters of the state. (Minnesota Rules, pt. 7001.0150, subp. 3. J, K)

Chapter 3. Total Facility Requirements

6. Noncompliance

6.3 The Permittee shall submit a written description of any bypass, spill, upset or permit violation during the reporting period to the MPCA with its Discharge Monitoring Report (DMR). If no DMR is required within 30 days, the Permittee shall submit a written report within 30 days of the discovery of the noncompliance. This description shall include the following information:

a. a description of the event including volume, duration, monitoring results and receiving waters;

b. the cause of the event;

c. the steps taken to reduce, eliminate and prevent reoccurrence of the event;

d. the exact dates and times of the event; and

e. steps taken to reduce any adverse impact resulting from the event. (Minnesota Rules, pt. 7001.0150, subp. 3.K)

7. Upset Defense

7.1 In the event of temporary noncompliance by the Permittee with an applicable effluent limitation resulting from an upset at the Permittee's facility due to factors beyond the control of the Permittee, the Permittee has an affirmative defense to an enforcement action brought by the agency as a result of the noncompliance if the Permittee demonstrates by a preponderance of competent evidence:

a. the specific cause of the upset;

b. that the upset was unintentional;

c. that the upset resulted from factors beyond the control of the Permittee and did not result from operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or increases in production which are beyond the design capability of the treatment facilities;

d. that at the time of the upset the facility was being properly operated;

e. that the Permittee properly notified the commissioner of the upset in accordance with Minnesota Rules, part 7001.0150, subpart 3, item I; and

f. that the Permittee implemented the remedial measures required by Minnesota Rules, part 7001.0150, subpart 3, item J. (Minnesota Rules, pt. 7001.1090, subp. 1.L)

Chapter 3. Total Facility Requirements

8. Duty to Notify and Avoid Water Pollution

8.1 The Permittee shall notify the Minnesota Department of Public Safety Duty Officer at (800)422-0798 or (651)649-5451 immediately of the discharge, accidental or otherwise, of any substance or material under its control which, if not recovered, may cause pollution of waters of the state. Notification is not required for a discharge of five (5) gallons or less of petroleum. (Minnesota Statutes, section 115.061)

8.2 The Permittee shall report to the Duty Officer all pertinent information regarding the discharge. Refer to the MPCA "Emergency Notification Guidance for Wastewater Treatment Systems" for further information.

8.3 The Permittee shall take all reasonable steps to minimize the adverse impacts to human health, public drinking water supplies or to the environment resulting from the discharge. This may include restricting or preventing untreated or partially treated wastewater, plant chemicals or feedlot materials from entering waterways, containing spilled materials, recycling by-passed wastewater through the plant, or using auxiliary treatment methods. (Minnesota Statutes, section 115.061)

8.4 The Permittee shall maintain a plan designed to adequately notify the public of potential health threats due to discharges of untreated or partially treated wastewater. The Permittee shall notify the public in accordance with the plan.

9. Inspection And Entry

9.1 The Permittee shall allow a representative of the MPCA, in accordance with Section 308 of the Act and Minnesota Statutes, section 115.04, (1992), and upon presentation of proper credentials, to:

a. enter the premises where the facility is located or activity conducted;

b. review and copy the records required by this permit;

c. inspect the facilities, systems, equipment, practices or operations regulated or required by this permit;

d. sample or monitor to determine compliance; and

e. bring equipment upon the Permittee's premises necessary to conduct surveys and investigations. (Minnesota Rules, pt. 7001.0150, subp. 3.I)

Chapter 3. Total Facility Requirements

10. Permit Modifications

10.1 Changes to the facility or operation of the facility may require a permit modification. The Permittee shall submit an application describing the changes to the facility or operation to the MPCA and receive a permit modification prior to implementing the changes. The Permittee must submit the permit modification application fee in accordance with Minnesota Rules, part 7002.0250 with the application.

10.2 The procedures as set forth in Minnesota Rules, pt. 7001.0100 through 7001.0130, including public notice, apply to applications for permit modifications, with the following exceptions:

a. Modifications solely as to ownership or control as described in Minnesota Rules, pt. 7001.0190, subp. 2.

b. Minor modifications as described in Minnesota Rules, pt. 7001.0190, subp. 3.

10.3 No permit may be assigned or transferred by the holder without the approval of the MPCA. A person to whom the permit has been transferred shall comply with the conditions of the permit. (Minnesota Rules, pt. 7001.0150, subp. 3.N)

11. Permit Modification, Suspension or Revocation

11.1 This permit may be modified, suspended, or revoked for the following reasons:

a. A violation of permit requirements.

b. Misrepresentation or failure to disclose fully all relevant information to obtain the permit.

c. A change in a condition that alters the discharge.

d. The establishment of a new or amended pollution standard, limitation or effluent guideline that is applicable to the permitted facility or activity.

e. Failure to pay permit fees.

f. Other reasons listed in Minnesota Rules, pt. 7001.0170.

12. Permit Reissuance

12.1 The Permittee shall submit an application for reissuance at least 180 days before permit expiration. (Minnesota Rules, pt. 7001.0040, subp. 3)

Chapter 3. Total Facility Requirements

12. Permit Reissuance

12.2 If the Permittee has submitted a timely application for permit reissuance, the Permittee may continue to conduct the activities authorized by this permit, in compliance with the requirements of this permit, until the MPCA takes final action on the application, unless the MPCA determines one of the following:

a. The Permittee is not in substantial compliance with the requirements of this permit, or with a stipulation agreement or compliance schedule designed to bring the Permittee into compliance with this permit.

b. The MPCA, as a result of an action or failure to act by the Permittee, has been unable to take final action on the application on or before the expiration date of the permit.

c. The Permittee has submitted an application with major deficiencies or has failed to properly supplement the application in a timely manner after being informed of deficiencies. (Minnesota Rules, pt. 7001.0160)

12.3 If the Permittee does not intend to continue the activities authorized by this permit after the expiration date of this permit, the Permittee shall notify the MPCA. The MPCA may require the Permittee to apply for reissuance or a major modification of this permit to authorize facility closure.

13. Property Rights

13.1 The permit does not convey a property right or an exclusive privilege. (Minnesota Rules, pt. 7001.0150, subp. 3.C)

14. Special Requirements

Joint Permittees

14.1 The following entities are Joint Permittees to this permit. The titles " Joint Permittee" and "Permittee" shall be considered to be same and both refer to these entities and are use interchangeably:

a. City of Minneapolis

b. Minneapolis Parks and Recreation Board

Chapter 3. Total Facility Requirements

14. Special Requirements

14.2 Each Joint Permittee is individually liable for:

a. permit compliance for the discharges from portions of the storm sewer system which it is the owner and/or operator;

b. storm water management for discharges from portion of the storm sewer system which it is the owner and/or operator;

14.3 Each Joint Permittee is jointly liable for:

a. compliance with annual reporting requirements;

b. ensuring funding for representative monitoring according to established agreements;

c. ensuring implementation of any system-wide management program elements;

d. compliance on portions of the storm sewer system where operation, maintenance, or other authority has been transferred from one Joint Permittee to another in accordance with legally binding interagency agreements; and

e. compliance on portions of the storm sewer system where the Joint Permittees jointly own or operate the system.

14.4 The Joint Permittees shall enter into and agreement to define the individual responsibilities for meeting the requirements and conditions of this permit. As part of the agreement, the Joint Permittees shall define individual responsibilities to assure that the operation, maintenance, monitoring, and management of this permit are completed. The agreement shall include, but not be limited to the following items:

a. a delineation of an Authorized Representative to serve as the coordinator of the Joint Permittees.

b.a delineation of responsibilities to assure all storm water management programs are implemented and managed according to the conditions of this permit.

c. a deliniation of responsibilities for submittal of the annual report.

14.5 A copy of the Agreement shall be submitted to the Commissioner within one hundred-eighty (180) days of the date of issuance of this permit. Any changes to the agreement shall be submitted to the Commissioner within thirty (30) days of the final execution of the changes.

Chapter 3. Total Facility Requirements

15. Liability Exemption

15.1 In issuing this permit, the state and the MPCA assume no responsibility for damage to persons, property, or the environment caused by the activities of the Permittee in the conduct of actions, including those activities authorized, directed, or undertaken to achieve compliance with this permit. To the extent the state and MPCA may be liable for the activities of its employees, that liability is explicitly limited to that provided in the Tort Claims Act, Minnesota Statutes, section 3.736. (Minnesota Rules, pt. 7001.0150, subp. 3.O)

15.2 The MPCA's issuance of this permit does not obligate the MPCA to enforce local laws, rules or plans beyond what is authorized by Minnesota Statutes. (Minnesota Rules, pt. 7001.0150, subp. 3.D)

16. Liabilities

16.1 The MPCA's issuance of this permit does not release the Permittee from any liability, penalty or duty imposed by Minnesota or federal statutes or rules or local ordinances, except the obligation to obtain the permit. (Minnesota Rules, pt. 7001.0150, subp. 3.A)

16.2 The issuance of a permit does not prevent the future adoption by the MPCA of pollution control rules, standards or orders more stringent than those now in existence and does not prevent the enforcement of these rules, standards or orders against the Permittee. (Minnesota Rules, pt. 7001.0150, subp. 3.B)

17. Severability

17.1 The provisions of this permit are severable, and if any provisions of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

18. Incorporation By Reference

18.1 The Permittee shall comply with the provisions of 40 CFR Parts 122.41 and 122.42, Minnesota Rules, pt. 7001.0150, subp. 3, and pt. 7001.1090, which are incorporated into this permit by reference, and are enforceable parts of this permit.

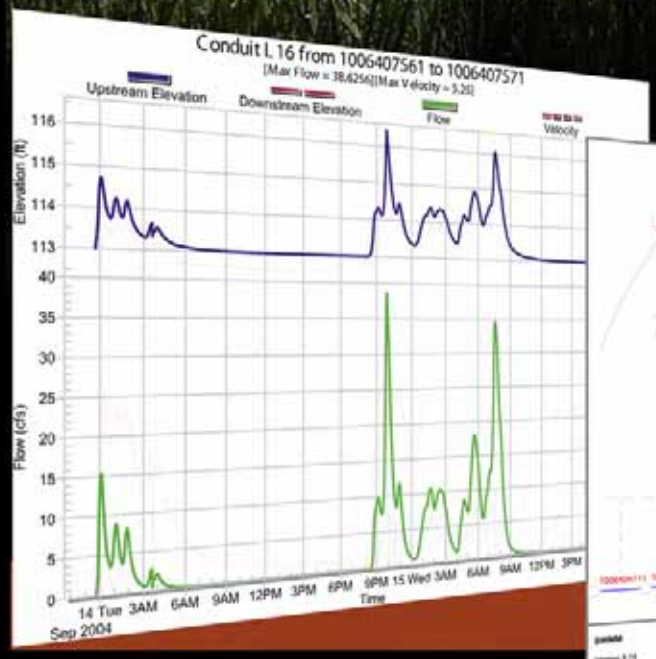
Appendix M
XP-SWMM Modeling Guidance

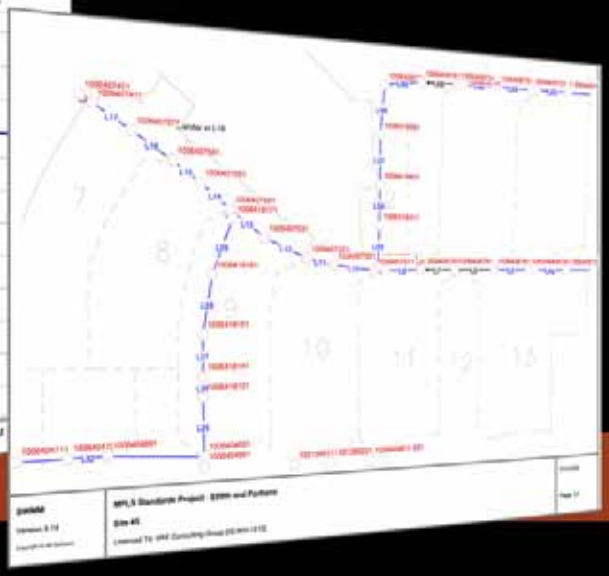
XP-SWMM

Hydrology & Hydraulics

Model Development Guidance Manual

City of Minneapolis – Public Works Department





February 2005

SRF

XP-SWMM Model Development Guidance Manual

I. Introduction

Welcome to the *XP-SWMM Hydrology and Hydraulics Model Development Guidance Manual!* Hydrologic and hydraulic modeling using XP-SWMM can be simple or complex, easy or challenging, quick or time consuming. For all models, however simple or complex, the City of Minneapolis has established basic criteria, standards, and data that should be used to ensure that models developed by a variety of professionals are of the same quality and consistency. Standardizing parameters and reporting model results will greatly assist City staff in reviewing and accepting final hydrologic and hydraulic models.

This manual is intended to provide XP-SWMM modelers with information, data sources and processing requirements, and modeling standards for all SWMM models developed for the City of Minneapolis. The City of Minneapolis Local Surface Water Management Plan should be consulted for more specific design related standards and guidance. (see Appendix E for modeling methods). In addition, Table 5.5 in Appendix E, may be used if lot sizes are known to be consistent. Discrete modeling parameters for one rainfall event (whether synthetic or actual) or perhaps multiple events over a relatively short period of time (typically one week or less) are the focus of this manual.

II. How to Use This Manual

This manual is intended for experienced XP-SWMM modelers who are well versed in the RUNOFF (Runoff and SCS methods) and HYDRAULICS modules and their operation. A great deal of information on specific hydrologic and hydraulic parameters and processes are presented for use by modelers depending on the purpose, site, and product. It is understood that not all parameters or data contained in this manual will be used in any given model. Indeed, some parameters and processes used by modelers may be outside the scope of this manual and will require discussions with City staff as model development proceeds. It is the discretion of the modeler to determine which parameters and data are applicable and should be used.

The manual follows a simple two-step model development procedure:

1. Data collection and model construction
2. Reporting of results

For the data collection and model construction step, relevant tables, figures, and sources of data are presented with recommendations on certain processes. The modeler should follow the development process beginning at data collection and proceed into model construction, importing or entering data as needed until the model is complete. It is left to the modeler to determine model inputs or parameters that are not presented in this manual and, of course, to determine areas, slopes, impervious percentages, and the like that are unique to the specific watersheds or pipesheds being analyzed. Following the process outlined in this manual does not preclude the modeler from carefully checking all specific watershed related hydrologic and hydraulic input data for accuracy before presenting it to the City for review.

III. Overview of XP-SWMM Modeling

Purpose of Modeling

Hydrologic and hydraulic modeling typically falls into two categories:

- Modeling for research or studies that may include data collection and calibration
- Modeling for watershed analysis or design

Determining runoff volumes and mass loading of pollutants associated with surface water runoff is one example of a model developed for analysis purposes. Modeling can also be conducted to determine specific flows from a watershed for design purposes that may include analysis of storm sewer design, combined sewer operation and separation projects or the analysis and design of storm water treatment facilities. This manual addresses both of these modeling scenarios.

Hydrology

Several hydrologic modeling methods are available in XP-SWMM, including the Runoff, SCS, and Rational methods. The City of Minneapolis accepts both the Runoff and SCS methods as their standard for modeling. According to the City of Minneapolis Local Surface Water Management Plan, the Runoff method of hydrograph generation is preferred for hydrologic/hydraulic analysis.

Hydraulics

XP-SWMM contains a great variety of hydraulic conditions that can be modeled from simple pipe networks to complex, multi-staged outlet structures to natural channels. Those commonly used parameters, such as pipe entry and exit loses and pipe Manning's *n*, are easily subject to standardization where more esoteric parameters, such as those related to natural channel geometrics or to weirs and pumps, are more difficult to standardize and will be left to the individual modeler to determine. Only three hydraulic parameters (Manning's *n* as well as exit and entry losses) are subject to standardization.

All other hydraulic parameters, including contraction-expansion loss coefficient, weir coefficients, culvert inlet type, low flow roughness factor, sediment depth, and pipe extension factor, cannot be standardized across all models. Except for the pipe extension factor, these parameters are related to physical characteristics of the pipe system and must either be determined based on system layout and operation or simply left at their default values. These adjustments are the responsibility of the individual modeler to determine and must be based on sound engineering judgment. If the modeler does not find a standard parameter or procedure that relates to the particular model under development in this manual and, furthermore, feels that a default parameter should not be used, she or he should contact City staff to obtain their advice and agreement prior to model finalization.

IV. Data Collection and Model Construction

Overall Standards

All models constructed for the City of Minneapolis must:

- Be georeferenced using the City's GIS database.
- Use the 10-digit "UDI" field as the node naming convention.

- Use a unique, descriptive alpha-numeric with an “L” placed before the number as the link naming convention (10-digit maximum).
- Use street channel overflow sections to provide surface connectivity under flooding conditions.
- Use the Green-Ampt infiltration option with the Runoff method.

Data sources range from the City Engineering Services Department to construction and as-built plan sets, record drawings, and field investigations. The City’s Engineering Services Department has standardized infrastructure data, which is comprised of an extensive GIS database and plat maps of storm sewer and sanitary systems. Appendices B, C, and D of this manual cover how to use the GIS database and the plat maps to build a georeferenced storm sewer network. City contact information is presented in Appendix B.

Non-GIS Infrastructure and Hydraulic Data

While the City is constantly updating the GIS database, there may be links with no invert or top of casting information. However, plat maps have been prepared and converted to electronic format for nearly all existing storm and sanitary sewer within the City. They consist of pipe profiles that contain the following information:

- Pipe invert elevation
- Pipe material
- Top of casting elevation
- Other utilities (if any)
- Pipe diameter

In order to obtain either the required information in the case of small projects or the plat map database and software in the case of larger projects, contact the Engineering Services Department. Elevations shown on City plots are local. In order to adjust for true mean sea level (1929), a factor of 710.3 must be added to the plat elevation.

Rainfall Data

Runoff is generated when rainfall is applied to a watershed or pipeshed. Two methods of generating rainfall—synthetic or actual—are acceptable to the City but depend upon the intent of the model. If a model is being developed for analyzing watershed characteristics or response to various inputs or changes in land use, then actual rainfall may be used. On the other hand, if the model is primarily being developed for design purposes that would include analysis of storm sewer and storm water treatment facilities under large event simulations, synthetic hydrographs based on design events would most likely be used.

Synthetic Hydrograph Method

The City typically uses the following standards for synthetic unit hydrographs for design purposes. Standards for using synthetic hydrographs are outlined in the Design Storm section on page 9.

Actual Rainfall

The City maintains three rain gauges that are located at:

- Top of the City of Lakes building in downtown Minneapolis (309 2nd Avenue South)
- Public Works Sewer Maintenance Yard (1911 26th Street East)
- Minneapolis Parks and Recreation Board Building (3800 Bryant Avenue South)

Rainfall data from these three sites comes in an electronic format and is reported in five-minute intervals. The modeler can obtain rainfall data from the Engineering Services Department for specific time periods, and the data can easily be imported into XP-SWMM. Details on this procedure are presented in Appendix D.

Hydrologic Standards

The following standards were developed from two recent studies and the Local Surface Water Management Plan. The studies were:

- XP-SWMM Calibration and Standards Study (2005)
- I-35W Tunnel Hydrology and Hydraulics Study (2005)

Both study reports can be obtained from Engineering Services.

Runoff Method

Directly Connected Impervious Area (DCIA)
As not all impervious surfaces are directly connected, an adjustment can be made to compensate for the change in hydrologic characteristics associated with indirectly connected impervious surfaces. The term Directly Connected Impervious Area (DCIA) is defined as impervious surfaces that are directly connected to an outlet—either via surface drainage along ditches, streets, and alleys or via storm sewer. Table 1 contains a value for the reduction that can be applied to the total impervious surface area by land use. For example, if the modeler is working with a five-acre single family land use site and measures an impervious surface area of three acres, then 60% of the total area is impervious surface. According to Table 2, a DCIA multiplier of 0.60 (representing a 40% reduction to compensate for the indirectly connected impervious surfaces) can be applied to the 60%. The resulting value of 36% can then be entered directly into XP-SWMM as Imp (%) in the RUNOFF module in the Sub-Catchments data entry window. Both the Runoff and SCS methods use this value.

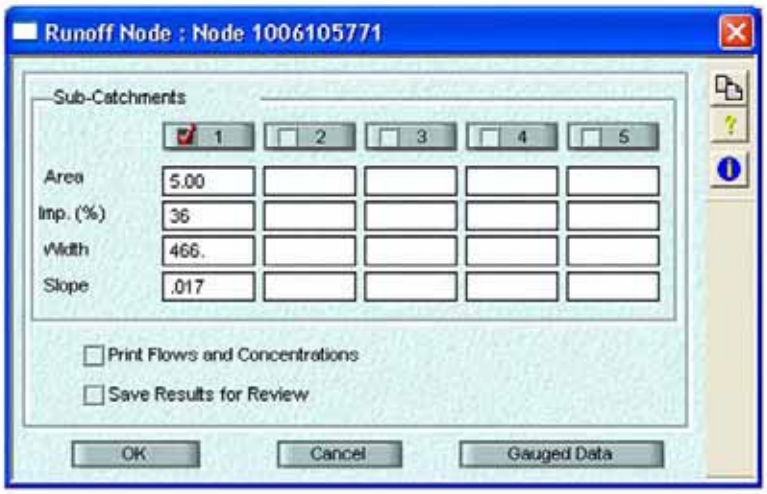


Table 1 – Land Use Consolidation

	Consolidated Land Use	Commercial/ Industrial	Multi-Family Residential	Recreational	Mixed Urban	Single Family Residential	Transportation Related
	Average % Impervious	95%	70%	5%	85%	50%	95%
Land Use	**Class**						
Bar, Restaurant, Club	CBRE				✔		
Common Area	RCMS						✔
Garage or Misc Residential Structure	GMRS		✔		✔ parking ramps		
Group Residence	GRES		✔				
IND Warehouse Factory	IWFW	✔					
Institutions: School, College	CSCH				✔		
Miscellaneous	MISC	Determined on case-by-case basis					
Mixed Office, Retail, Residential	CMXD				✔		
Multi-Family Apartment	MFAP				✔ Incl.high rise		
Multi-Family Residential	MFRS		✔				
Office Structure	COFF	✔					
Public Accommodations	HMTL	✔					
Retail	CRET	✔					
Single-Family Attached	SFAD					✔	
Single-Family Detached	SFDD					✔	
Sport or Recreation Facility	SPRC			✔ see note			
Vacant	VLND	Determined on case-by-case basis					
Vehicle Related Use	CAUT						✔ Streets/Roads
Utility Related Use	CUTL				✔		
Mn/DOT	N/A						✔ Highways

NOTE: Many parking lots within the Land Use database are identified as Sport or Recreation Facilities. Parking lots should be assigned either a 100% impervious cover if paved or a 55% impervious cover if gravel per guidance provided in Table 5.4 of the Local Surface Water Management Plan (See Appendix E). A DCIA multiplier of 1.0 should be used in either case.

The modeler should determine what land uses are being modeled and then find the corresponding consolidated land use in Table 1. Once the consolidated land uses are selected, the modeler should determine percent impervious surface using one of two methods:

- **Preferred Method –** Measure impervious surfaces using a CADD or GIS application.
- **Acceptable Method –** Use the percent impervious values presented in Table 1.

Because the percent impervious values found in Table 1 are averages, the City prefers that modelers measure all impervious surfaces as closely as possible using either CADD or GIS, since this will provide the most accurate value to which the DCIA reduction multiplier can be applied. When using the percent impervious values in Table 1, they become less representative as smaller areas are modeled. Small areas of a few blocks are best modeled using the preferred method. It is left to the modeler and City staff to agree on what method will be used for larger models prior development.

When there are a multiple land uses associated with a particular drainage area, two methods for determining a composite DCIA can be used:

1. **Preferred Method** – Once impervious surfaces have been determined for each land use, apply the DCIA multipliers found in Table 1 to each land use and then determine a composite DCIA that would be entered into the Runoff Node.
2. **Acceptable Method** – Once impervious surfaces have been determined for each land use and if a single land use predominates (say, greater than 80% of the drainage area), the modeler may apply the DCIA multiplier in Table 1 associated with that land use to the entire drainage area.

As noted in Table 1, many parking lots have been assigned to the Sport or Recreation Facility land use, which, if simply taken as such and consolidated into the Recreational land use, would provide a DCIA that is too low. Parking lots should be removed from the Recreational consolidated land use and their respective DCIA applied prior to applying the DCIA multiplier for the remainder of the Recreational land use. Further, if the modeler determines that the assigned land use is not hydrologically appropriate (for example, a high rise apartment building complex that, according to Table 1, would be consolidated into Multi-Family but may better be consolidated into Mixed Urban), then the modeler may use a more appropriate consolidated land use. Great care, however, should be exercised in this regard.

Green-Ampt Infiltration Parameters

Infiltration significantly affects model results when small rainfall events (< 0.5 inches) that are combined with land uses exhibiting high pervious percentages (for example, recreation) are analyzed. The City prefers that soil samples are taken and the soil type is determined so that accurate Green-Ampt parameters can be selected. If soils information is known, then the Green-Ampt values presented in Appendix A should be used instead of the value in Table 2. Where no soils data is available, the values in Table 2 may be used, but with caution. If large rainfall events (> 0.5 inches) are to be analyzed, the affect of infiltration is minimized, and Table 2 parameters can be used.

Other recommended runoff method parameters by land use are also presented in Table 2.

Table 2 – Runoff Method Parameters

Hydrologic Parameter	Consolidated Land Use						
	Commercial/ Industrial	Multi-Family Residential	Recreational	Mixed Urban	Single Family Residential	Transportation Related	Remarks
Percent Impervious	95%	70%	5%	85%	50%	95%	
DCIA Multiplier	1.0	0.6	0.0	0.9	0.6	1.0	
Width	measured or calculated	measured or calculated	measured or calculated	measured or calculated	measured or calculated	measured or calculated	See EPA SWMM Version 4 User's Manual
Impervious Depression Storage	0.094	0.02	0.02	0.02	0.02	0.094	
Pervious Depression Storage	0.1	0.1	0.1	0.1	0.1	0.1	
Impervious Manning's *n*	0.014	0.014	0.014	0.014	0.014	0.014	
Pervious Manning's *n*	0.2	0.35	0.35	0.2	0.2	0.2	
Average Capillary Suction	10	12	7	10	10	10	Use only if soil types are not known. Use Appendix A if soil types are known.
Saturated Hydraulic Conductivity	0.25	0.3	0.08	0.25	0.25	0.25	
Initial Moisture Deficit	0.32	0.32	0.16	0.32	0.32	0.32	
Zero % Detention	25%	60%	100%	100%	25%	25%	

Width

Width may either be measured or computed using the following formula. Refer to SWMM Version 4 documentation provided by the EPA to determine if a skew factor is required.

$W = (2 - Sk)*l$ where:

W = subcatchment width
l = length of main drainage channel

$$Sk = \frac{A2 - A1}{A}$$

Where:

Sk = skew factor, $0 < Sk < 1$,
$A1$ = area to one side of channel,
$A2$ = area to other side of channel
A = total area

SCS Method

Parameters

The recommended SCS method parameters by land use are provided in Table 3.

Table 3 – SCS Method Parameters

Hydrologic Parameter	Consolidated Land Use					
	Commercial/ Industrial	Multi-Family Residential	Recreational	Mixed Urban	Single Family Residential	Transportation Related
Percent Impervious	95%	70%	5%	85%	50%	95%
DCIA Multiplier	1.0	0.6	0.0	0.9	0.6	1.0
Composite Pervious Curve Number	72	69	69	72	69	72
Initial Abstraction (as a fraction)	0.20	0.20	0.10	0.10	0.20	0.10
Shape Factor	484	484	484	484	484	484

Time of Concentration

Time of concentration is defined by the NRCS as "the time it takes for runoff to travel from the hydraulically most distant part of the [drainage] area to the watershed outlet" (NEH Section 4, Chapter 15). The watershed outlet, in this case, is where runoff enters a pipe or channel network. Time of concentration, or T_C, is strictly related to surface flow in an XP-SWMM pipe and channel network modeling situation. The NRCS suggests that T_C can be divided into two surface flow components – overland or sheet flow time (t_O) and channelized flow time (t_T) (TR-55 2nd Edition, 1986). Typically, T_C will be computed for overland sheet flow, which, after 300 feet becomes overland channelized flow, from the most distant point of a drainage area associated with a runoff node to the entrance of a pipe or channel network. Once flow reaches the node, XP-SWMM computes T_C within pipes and channels. Overland flow can be calculated using the following equation (following equation and Table 4 taken from Minnesota Department of Transportation Drainage Manual):

$T_C = t_O + t_T$ where:

$$t_O = \frac{0.42(nL)^{0.8}}{P^{0.5} s^{0.4}}$$

Where: t_O = overland flow time (min)
n = Manning's roughness coefficient (see Table 4)
L = length of flow (ft) $L \leq 300$ ft
P = 2-year, 24-hour storm (2.8 inches)
s = average land slope along flow path (ft/ft)

$$t_T = \frac{L}{60V}$$

Where: t_T = channelized flow time (min)

Table 4 – Roughness Coefficients (Manning's *n*) for Sheet Flow

Surface Description		*n*[1]
Smooth Surfaces (concrete, asphalt, gravel, or bare soil)		0.011
Fallow (no residue)		0.05
Cultivated Soils	Residue cover ≤ 20%	0.06
	Residue cover > 20%	0.17
Grass	Short grass prairie	0.15
	Dense grasses[2]	0.24
	Bermuda grass	0.41
Range (natural)		0.13
Woods[3]	Light underbrush	0.40
	Dense underbrush	0.80

1 The *n* values are a composite of information compiled by Engman (1986).

2 Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass mixtures.

3 When selecting *n*, consider cover to a height of about 0.1 ft, which is the only part of the plant cover that will obstruct sheet flow.

Design Storm

Standards for using synthetic hydrographs for design purposes are as follows:

- Design Storms: Typically 2, 10, 50, and 100 year events (See Local Surface Water Management Plan in Appendix E for application of the various storm events.)
- Storm Duration: 24 hours
- Rainfall Distribution: SCS Type II, either 0.25 or 0.10 time intervals

Table 5 provides design storm event rainfall depth multipliers that should be used when synthetic hydrographs are selected.

Table 5 – Rainfall Frequency Depth (24 hr storm event)

Return Period (Years)	Depth Multiplier (Inches)
1	2.3
2	2.8
5	3.5
10	4.2
25	4.8
50	5.3
100	5.9

Hydraulic Standards

Typically, catch basins or drop inlets are not modeled, because, for hydraulic purposes, a number of inlets (catch basins, drop inlets, etc.) can be modeled as one node. Therefore, inlet capacity is usually not used and all surface water is assumed to get to the storm sewer pipe. If the modeler is modeling actual catch basins or drop inlets and wants to provide inlet capacity values, then she or he must determine what these values would be based on the type of inlet and potential plugging. This parameter can be modified under the node properties in the HYDRAULICS module. It should also be noted that the node must have storage associated with it to provide a way to store and release runoff at the inlet capacity rate. If the Inlet Capacity check box is not selected, XP-SWMM assumes all runoff enters the node unhindered. Recommended hydraulic parameters are presented in Table 6.

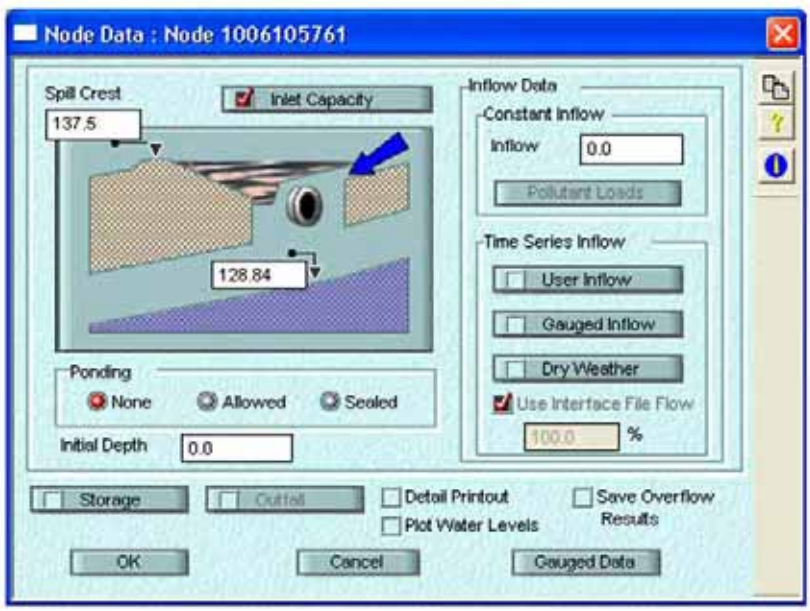


Table 6 – Hydraulic Parameters

Parameter	XP-SWMM Default	Recommended
Entrance Loss Coefficient	0	0.5
Exit Loss Coefficient	0	0.5 for manhole outlet 1.0 for external outlet or outfall
Manning's *n* (conduit roughness)	0.014	0.010 – Smooth wall plastic/HDPE 0.012-0.014 – RCP (typical = 0.013) 0.024 – CMP, CPP

The City prefers modelers use multi-links that represent storm sewer (lower links) and street or overland flow (upper link). Appendix F provides information on using multi-links for to model street flow.

V. Preparing a Model for Review

In this section, the standards and formats are presented for preparing a model for the City to thoroughly review.

Electronic

When submitting a model to the City, provide a CD-ROM with all model runs, including those run for various storm events, if appropriate. All files associated with the model should be provided on the CD-ROM so that City staff do not need to run the model again.

In addition, all files on the CD-ROM should have short but descriptive names as shown in the following examples:

- 14_PARK91404.xp refers to the 14th and Park pipeshed using the September 14, 2004, actual rainfall event.
- 14_PARK10YR.xp refers to the 14th and Park pipeshed with the synthetic 10-year Type II storm simulated.

Print Copies

The City also requires that a drainage area map, including drainage boundaries and pipe networks (both existing and proposed if appropriate), is submitted for review. In addition, all computations of calculated parameters, such as area, weighted curve numbers, times of concentration, and any assumptions used to determine other values (for example, land use related pervious and impervious percentages), are provided.

VI. Final Model Submittal

When submitting the final model to the City, include all documentation used during the review as well as all comments provided by the City and the modeler's responses. Typically, a report is submitted with the model that, at a minimum, should include:

- Details of the modeling process
- Tables of input parameters and assumptions used to determine them
- Tables and hydrographs of results and a discussion of the impacts of the results on downstream conditions
- Recommendations (if appropriate)
- Any correspondence with the City (either by phone, letter, e-mail, or meeting minutes) that supports decisions that were made during the modeling process

Water Supply, Emergency and Conservation Plan

Minneapolis
City of Lakes

City of Minneapolis

Department of Public Works

Minneapolis Water Works

July 2008

Revised August 2009

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INTRODUCTION

This Water Supply, Emergency and Conservation Plan has been prepared to comply with Minnesota Statutes 473.859, which requires a water supply plan as a component of the Public Facilities Plan. The Laws of Minnesota mandated by Chapter 186 of the 1993 Legislative Session requires Public Water Suppliers sewing more than 1,000 persons to submit a Water Supply Plan to the Department of Natural Resources (DNR) for approval in October 2008 (Minn. Statutes 1036.291).

This plan is also submitted to the Metropolitan Council as an amendment to the local comprehensive plan (Minn. Statutes 473.859) for communities with municipal water supplies in the seven-county Twin Cities Metropolitan Area.

The Water Supply Plan for the Minneapolis Water Works / City of Minneapolis is prepared pursuant to Minnesota Statutes 103G. 291, subdivision 3 and is organized in accordance with the guidelines established by the DNR -Division of Waters and the Metropolitan Council.

This Plan is divided into four (4) parts:

PART I: WATER SUPPLY SYSTEM DESCRIPTIONAND EVALUATION: This chapter addresses the adequacy of the existing water sources and supply systems to provide current and projected demands.

PART II: EMERGENCY RESPONSE PROCEDURES: This chapter lists emergency response procedures and develops actions necessary to improve emergency preparedness.

PART III: WATER CONSERVATION PLAN: This chapter identifies programs intended to reduce unnecessary water demand, improve the efficiency in usage and minimize water losses and waste.

PART IV: METROPOLITAN COUNCIL ITEMS: This chapter relates to comprehensive plan requirements that apply to communities in the seven county Twin Cities Metropolitan Area.

System Information:

DNR Water Appropriation Permit Number	1976-6216-1
Name of Water Supplier:	Minneapolis Water Works, City of Minneapolis
Address:	4300 Marshall Street NE Minneapolis, MN 55421
Contact:	Chris Catlin
Title:	Superintendent of Water Plant Operations
Phone:	(612) 661-4904
Fax:	(612) 661-4913
E-mail:	chris.catlin@ci.minneapolis.mn.us

PART I. WATER SUPPLY SYSTEM DESCRIPTION AND EVALUATION

This chapter examines the current status of water demand and supply in order to assess the adequacy of the existing system to sustain current and projected demands.

A. ANALYSIS OF WATER DEMAND

Table 1 on the following page presents the historical water demand from 1998 through 2007.

Water Use Trends

The Minneapolis Water Works uses water from the Mississippi River to supply the City of Minneapolis, Golden Valley, Crystal, New Hope, Columbia Heights, and Hilltop, as well as Edina Morningside and a portion of Bloomington's demand. Minneapolis also supplies the Minneapolis-St. Paul International Airport and the Fort Snelling area. The population of the cities supplied exclusively by Minneapolis Water Works are presented in the table below.

Population of Service Area (2000 Census Data).

	Population	% of Total
Minneapolis	382,618	82.1%
Columbia Heights	18,520	4.0%
Hilltop	766	0.2%
Crystal (Joint Water Commission)	22,698	4.9%
Golden Valley (Joint Water Commission)	20,281	4.4%
New Hope (Joint Water Commission)	20,873	4.5%
Total	465,756	100.0%

Minneapolis Water Works also provides a portion of the water used by Bloomington (population = 85,172) and Edina (population = 46,656).

TABLE 1. Historic Water Demand (1998 – 2007)

	A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*
Year	**Total Population (Population Served)**	**Total Connections**	**Residential Water Sold (MG)**	**C/G/I* Water Sold (MG)**	**Wholesale Deliveries (MG)**	**Total Water Sold (MG)**	**Total Water Pumped (MG)**	**Percent Unmetered Unaccounted**	**Average Demand (MGD)**	**Maximum Demand (MGD)**	**Residential gallons per capita per day**	**Total gallons per capita per day**
	Minneapolis Only	*Minneapolis Only*			*(to Suburbs)*			*(G– F)/G*	*G/365 or (G/366)*		*C / A / 365*	*(G-E)/A/365*
1998	360,591	102,000	9,329	9,526	4,982	23,837	24,829	4.00%	68.02	108.00	70.88	150.80
1999	358,610	102,000	9,039	9,230	4,827	23,097	23,863	3.21%	65.38	105.00	69.06	145.43
2000	382,618	102,000	9,817	11,136	4,931	25,884	26,027	0.55%	71.11	105.25	70.29	151.06
2001	382,446	102,133	9,430	10,549	5,791	25,770	26,058	1.11%	71.39	143.84	67.52	145.12
2002	382,700	102,266	8,737	9,652	4,174	22,563	23,431	3.70%	64.19	103.56	62.56	137.89
2003	382,295	102,399	9,158	8,600	4,728	22,486	23,516	4.38%	64.43	128.29	65.58	134.53
2004	382,400	102,532	8,670	8,555	4,474	21,699	21,929	1.05%	59.91	106.28	62.08	124.99
2005	387,711	102,665	8,337	8,281	4,216	20,834	21,926	4.98%	60.07	113.71	59.70	126.81
2006	387,970	102,753	8,378	8,186	4,764	21,328	22,230	4.06%	60.90	117.15	59.99	125.06
2007	388,020	102,800	8,436	8,170	4,340	20,496	22,283	6.00%	61.05	115.73	59.56	126.69

* C/G/I: Commercial, Government, Industrial.

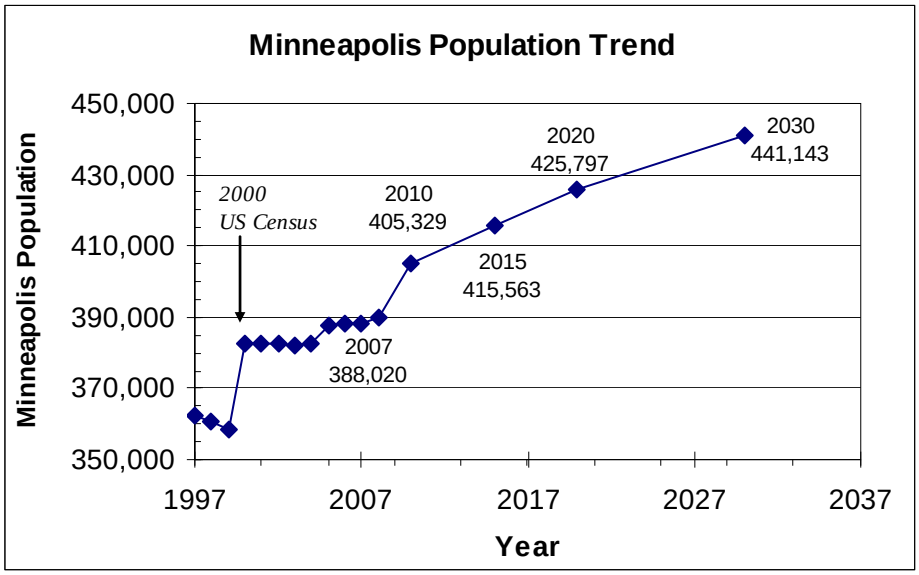
Commercial: Water used by hospitality industry, office buildings, commercial facilities, private hospitals

Government: Police, Fire and other City department use, public universities, County facilities (including HCMC)

Industrial: Power generation, manufacturing, food processing, paper industry, petroleum refining, etc.

Minneapolis population peaked in the 1950's and experienced large losses from 1950 to 1980. The decade population loss in Minneapolis for the period of 1980 to 1990 (Census years) of about 3,000, showed a reduced rate of loss. From 1980 to 1990, the population of Minneapolis increased from 368,383 to 382,618, or 3.9% (US Census Bureau, Decennial census). The Metropolitan System Forecasts predicts an increase in population from 3 to 5% over the next 20 years. Population projections for 2010 and beyond were provided by the Metropolitan Council and the Planning Section of the City of Minneapolis Community Planning and Economic Development Department based on the Traffic Analysis Zone (TAZ) base unit of analysis for comprehensive planning population and employment projections. Figure 1 presents the population trends for Minneapolis.

Figure 1. Minneapolis Population Trend



While population has recently increased, water usage has gone down. As shown in Table 1, both residential and total gallons per capita per day have decreased. This trend is attributable to increased use of water-conserving fixtures and appliances, increased efforts by customers to conserve drinking water as a valuable resource.

Annual demands are affected by weather conditions in a given year. Warmer, drier years such as 2001 result in increased use and increased maximum day demands. New instrumentation on influent flow meters was installed in 2005, resulting in more accurate metering of total water pumped. This contributes to the increase in percent unaccounted for water beginning that year.

Data in Table 1 regarding wholesale deliveries to suburban customers shows three distinct time periods. In 2001, Bloomington constructed major upgrades to double its treatment plant capacity. Minneapolis supplied a larger volume of water to that utility that year since the construction limited the amount of water Bloomington could treat. Since 2002, Bloomington's plant capacity was doubled and its withdrawals declined. From 1997 to 2001, wholesale deliveries averaged 4891 million gallons. From 2002 through 2006, wholesale deliveries averaged 4471 million gallons. This 8.5% decrease is largely attributable to the decrease in Bloomington's demand for Minneapolis water.

Table 2a shows the top 10 largest users of Minneapolis Water for 2007. Table 2b shows the amount of water sold to individual wholesale customers.

TABLE 2a. Large Volume Users (2007) Top 10 Largest Users (non-wholesale).

Customer	Million Gallons per year (2007)	% of total water sold
Metropolitan Airport Commission	370.04	1.73%
Minneapolis Public Housing Authority	285.03	1.34%
Covanta Hennepin Energy Resource Co., L.P. (Hennepin Energy Recovery Center)	223.65	1.05%
Minneapolis Board of Education	125.11	0.59%
Minneapolis Parks and Recreation Board	109.57	0.51%
Riverside Plaza	104.51	0.49%
Inland American Office Management, LLC	103.53	0.49%
Fairview Health Services	92.77	0.43%
Veterans Administration Medical Center	84.21	0.39%

TABLE 2b. Wholesale Customers (2007).

Wholesale Customer	Million Gallons per year (2007)	% of total water sold
Joint Water Commission (Crystal, Golden Valley, and New Hope)	2446	11.5%
Bloomington	1258	5.9%
Columbia Heights	538	2.5%
Edina (Morningside)	71	0.3%
Hilltop	26	0.1%
Total Wholesale	4340	20.3%

B. TREATMENT AND STORAGE CAPACITY.

Treatment and Pumping Facilities

The following table lists all major Minneapolis Water Works treatment and pumping facilities and the year they were built.

FACILITY	YEAR
75 million gallon Softened Water Basin (Columbia Heights)	1897
Pump Station #4	1904
Columbia Heights Filtration Plant (CHFP)	1913
45 million gallon Finished Water Reservoir (Columbia Heights)	1913
Pump Station #5	1927
Fridley Filtration Plant (FFP)	1927
16 million gallon Finished Water Reservoir (Fridley)	1927
Fridley Softening Plant	1940
Pump Station #6	1940
Pump Station #7	1950
16 Million Gallon Finished Water Reservoir (Fridley)	1952
20 Million Gallon Finished Water Reservoir (Hilltop)	1952
20 Million Gallon Finished Water Reservoir (Hilltop)	1954
Dewatering Plant	1973
Pump Stations #1, #2 and #3	1973
10 Million Gallon Finished Water Reservoir (Columbia Heights)	1978
Pump Station #8	1978
Pump Station #9	1991
Lagoon Overflow Treatment Plant (and Permanganate Building)	1995
17 Million Gallon Finished Water Reservoir (Hilltop)	2001
17 Million Gallon Finished Water Reservoir (Hilltop)	2001
Columbia Heights Membrane Filtration Plant	2005

Table 3(A) presents a list of the treatment plants and their production capacities. The overall design capacity of the treatment is the Fridley Softening Plant's capacity of 180 MGD.

TABLE 3(A) Water Treatment Plant Capacity

	Fridley Softening Plant	Fridley Filter Plant	Columbia Heights Filter Plant	Columbia Heights Membrane Plant
Design Capacity (MGD)	180	125	70	70
Average Production (MGD)	65	43	20	20
Firm Capacity (MGD)	165	115	60	70

Treatment Description:

The basic treatment process begins with screening of debris at the raw water, low-lift pumps at Pump Station #5. During times of problematic taste and odors, powdered activated carbon or potassium permanganate may be added to the raw water. The raw water is pumped to the Fridley Softening Plant where lime is added and then a coagulant. The water is softened in twelve precipitators with the lime sludge withdrawn from the bottom of the precipitators and pumped to the Dewatering Plant. Softened water is recarbonated using carbon dioxide gas to adjust the pH. Powdered activated carbon may be added at the head of the recarbonation chambers to address taste and odor. After recarbonation, the water is directed to one of two filtration plants: to the Fridley Filter Plant via Pump Station #6 or to the Columbia Heights Filtration Plant via Pump Station #4. (Pump Station #4 can also serve as a raw water intake pump station). A softened water basin stores water prior to treatment at the Columbia Heights Filter Plant. At the filter plants, the softened water is pre-chlorinated with free chlorine for a short time prior to the addition of ammonia to form combined chloramine. The water is also coagulated with ferric chloride. After settling the water is filtered. At Columbia Heights, the settled water is generally directed to the ultrafiltration membrane plant (with the granular media filters serving as a back-up). At Fridley, the water is filtered by dual granular media filters. Following filtration, the chloramine residual is adjusted to the desired level, fluoride is added, and ortho-polyphosphate (a corrosion inhibitor) is added. Finished water is stored on the treatment complexes in underground reservoirs prior to distribution or transmission to the Hilltop reservoir system. The high-service Pump Station #5, and Pump Stations #7, #8, and #9 are finished water pumping from the finished water reservoirs. Pump Stations #1, #2, #3 serve to direct backwash water residuals or coagulation basin drainage from the filtration plants to the head of softening or the Dewatering Plant. Additionally, there are three booster pump stations in the distribution system to increase system pressures in small areas of high elevation (North High, Kenwood, and Southwest).

The residual solids from the lime softening and coagulation/settling processes are handled at a dewatering facility and on-site lagoons. The residuals are thickened in large gravity settling tanks. The thickener

overflow is recycled back to the softening plant. The thickened underflow is centrifuged. Centrifuge cake is trucked off site and the centrate is directed to seven lime residual lagoons where evaporation dries the solids. The dried solids from the lagoons are then also trucked off site. The solids are used as agricultural soil enhancements. The overall treatment process generates 25,000 to 32,000 tons of dry solids per year hauled away as centrifuge cake or sent to the lagoons. Decant from the lagoons is adjusted for pH, monitored for solids and discharged to the river at the Lagoon Overflow Treatment Plant.

The total treatment capacity has been sufficient to meet the water needs of the City and its suburban customers. The maximum daily treated flow in the past 30 years was 171.1 MGD on June 6, 1988.

Storage Capacity

The City has an uncovered, in-ground storage structure for softened water storage with a design capacity of 75 million gallons. This settling basin has an approximate useable capacity of 60 million gallons in case of an emergency.

Table 3(B) lists the finished water reservoirs and elevated tanks for the City of Minneapolis only.

TABLE 3(B) Storage Capacity

Reservoir (with nominal capacity)	**Capacity*** **(Million gallons)**	**Year Built**
45 million gallon Finished Water Reservoir (Columbia Heights)	26.4	1913
16 million gallon Finished Water Reservoir (Fridley)	10.9	1927
16 million gallon Finished Water Reservoir (Fridley)	10.4	1952
19 Million Gallon Finished Water Reservoir (Hilltop)	16.8	1952
19 Million Gallon Finished Water Reservoir (Hilltop)	16.3	1954
10 Million Gallon Finished Water Reservoir (Columbia Heights)	9.8	1978
17 Million Gallon Finished Water Reservoir (Hilltop)	16.8	2001
17 Million Gallon Finished Water Reservoir (Hilltop)	16.8	2001
Total useable underground finished water storage	124.2 million gallons	
Average system demand (2003 – 2007), based on total water pumped:	61.3 MGD	
Days of storage (average)	2.0	

* Capacity is defined as approximate useable capacity from the overflow level to the minimum operating depth.

C. WATER SOURCES

The Minneapolis Water Works has a single supply source, namely the Mississippi River, with two intake systems in the Fridley Area. The main intakes are at Pump Station #5, which has 10 pumps: Four pumps have a capacity of 30 MGD, four pumps have a capacity of 20 MGD, and two additional pumps are present with capacities of 19 and 6 MGD. The total capacity is thus 219 MGD and the firm capacity (with the largest pump out of service) is 189 MGD.

The alternate intake system at Pump Station #4 is approximately 2 feet lower than the main intakes at P.S. #5. This system could be used during severe lowered elevations of the River. The alternate intakes are located south of P.S. #5. This system was constructed in 1904 with a six pumps (6 to 30 MGD). The total capacity is 119 MGD with a firm capacity of 89 MGD. An upgrade to this station, including an increase in capacity, is planned within the next three years.

The Minneapolis Water Works does not have any wholesale or interconnections with other utilities that can supply water on a regular or emergency basis nor does it have any groundwater sources.

TABLE 4(A) and 4(C): Total Water Source Capacity (All Surface Water)

Total Capacity of Low-Lift Pump Station 5 (Mississippi River)	219 MGD
Total Firm Capacity	189 MGD

Conjunctive Use of Surface and Ground Waters

In 1987, the U.S. Geological Survey (USGS) in cooperation with the City of Minneapolis, began a study to evaluate the ground-water-flow system underlying and near the Minneapolis Water Works treatment plant in Fridley, as an alternate or supplement to the current surface water source. The study examined the effects of ground water withdrawals on flow in the ground water system and the Mississippi River near the plant and, in lesser detail, a part of the seven-county Twin Cities Metropolitan Area. The Water-Resources Investigations Report 90-4165 (1990) describes the construction, calibration and application of a numerical ground-water-flow model that simulates the aquifer system, consisting of Prairie du Chien-Jordan aquifer and overlaying units in the study area. The study concluded that "Contaminated water from areas of known contamination could move towards depressions in the potentiometric surfaces of the confined-drift and the St. Peter aquifers and Prairie du Chien-Jordan aquifers if additional ground water were withdrawn near the Minneapolis Water Works. The presence of the bedrock valley beneath the Minneapolis Water Works and discontinuities in the upper-drift confining unit create the potential for the downward movement of contaminants from the surficial

sand and gravel deposits to the underlying aquifers." The risk of contamination precluded use of groundwater in close proximity of the MWW Fridley treatment campus to supplement Minneapolis' water supply.

Within the City of Minneapolis boundaries, there are no high-capacity wells that could be hooked up to the City water supply system in the event of a water emergency. Even if such wells existed within the Minneapolis city distribution system area, direct injection of high pressure, untreated, un-softened water into water mains would likely cause numerous quality and pressure-related problems.

The Joint Water Commission (JWC), a suburban wholesale customer to the east of Minneapolis comprised of Crystal, Golden Valley and New Hope conducted a groundwater source assessment work in 2003. This study concluded that within the JWC service area up to 21 mgd of groundwater could be pumped from the Prairie du Chien / Jordan aquifer. In the event of supply limitations on the Mississippi River, the conjunctive use of ground water from this source would be considered.

TABLE 4(B) Ground Water Sources – Not Applicable

Interconnections with adjacent communities

Interconnections with adjacent communities have been reviewed for use as an emergency or supplemental water supply. However, supply size, pressure and water quality differences prohibit potential interconnection with all adjacent communities except St. Paul. Minneapolis uses lime softening in their treatment process. All adjacent or non-distant public water suppliers, with the exception of Bloomington and St. Paul do not use softening. Bloomington has low excess capacity. A limited localized supply could be achieved by interconnecting with the City of Bloomington. Supply would be limited by Bloomington's system's lower capacity in comparison to Minneapolis and could only serve an isolated area near the south portion of the Minneapolis. It should be noted that the City's agreement with the Joint Water Commission (JWC) allows the JWC to develop interconnections with its neighbors. The JWC is currently evaluating the efficacy of physical interconnections with its neighbors. Such interconnections would be intended for emergency purposes only.

The idea of an interconnection between Minneapolis and St. Paul has been discussed since the 1930's. Since 2000, the City of Minneapolis, in cooperation with the City of St. Paul, contracted with an engineering consultant to perform a feasibility study to evaluate a possible interconnection between the two city water systems. The study assessed vulnerabilities for the existing systems of both cities, then developed and evaluated alternatives for constructing an interconnection. The interconnection study report served as additional justification for a water system interconnection which will benefit both cities and many suburban

communities. The study outlines construction, usage and maintenance issues identified as a Joint Powers Agreement between the Cities regarding the interconnection construction, operation, maintenance, and cost sharing. The interconnection project includes the design and installation of new pipelines, a new pump station, and modifications to an existing water reservoir. The new pipelines connect the City of Minneapolis water distribution system to a common reservoir in St. Paul. This allows Minneapolis to supply water directly to the City of St. Paul. With the construction and use of a new pump station, St. Paul will also supply water to the City of Minneapolis. The primary goal would be to use the interconnection during emergency situations and for large-scale scheduled repairs, improvements, or maintenance. The Cities will seek state and federal funds for this project.

At the time of this Water Supply plan's revision, planning was underway for water main relocation associated with the Metropolitan Council's new Central Corridor Light Rail Transit project along Washington and University Avenues. It is planned to install a valve vault with two valves, one from Saint Paul and one from Minneapolis each terminating in the vault. In future emergency situations, a spool piece could quickly be installed and the valves opened to enable a limited area of either system to be supplied from the other.

TABLE 4(D) Wholesale or Retail Interconnections – Not Applicable
TABLE 4(E) Emergency Interconnections – Not Applicable

D. DEMAND PROJECTIONS

Demand projections for the next 10 years (2008 – 2017) are presented in Table 5. Projections for 2020, 2030 and ultimate (2037) are also provided in accordance with requirements for metropolitan area public suppliers.

Projection Method

The data in Table 5 was calculated as follows.

Population projection:

The population data from 2004 – 2006 as shown in Table 1 was combined with the population estimates for 2010, 2015, 2020, and 2030 as described in Figure 1. A 2nd order polynomial trend line was fitted to the data (R^2 = 0.9949) and the yearly population calculated from the associated polynomial equation.

Average Day Demand:

The projected annual demand (MGY) was divided by 365 to calculate the average day demand.

TABLE 5. Demand Projections.

Population served is for Minneapolis only. Demands presented include wholesale customers.

Year	**Population Served** *- Minneapolis Only-*	**Average Day Demand (MGD)** *- Including wholesale-*	**Maximum Day Demand (MGD)** *- Including wholesale-*	**Projected Demand (MGY)** *- Including wholesale-*
2008	390,031	61.4	124.4	22,409
2009	399,831	62.3	124.4	22,753
2010	405,329	62.8	124.4	22,925
2011	405,798	62.8	124.4	22,940
2012	408,618	63.1	124.4	23,039
2013	411,329	63.3	124.4	23,112
2014	413,931	63.6	124.4	23,203
2015	415,563	63.7	124.4	23,238
2016	418,807	64.0	124.4	23,352
2017	421,081	64.1	124.4	23,408
2020	425,797	64.6	124.4	23,573
2030	441,143	66.0	124.4	24,087
2037 (ultimate)	443,661	66.2	124.4	24,175

Maximum Day Demand:

The maximum day demand in any given year is primarily dependent on weather conditions (high temperatures and low levels of precipitation) and the use of water for cooling systems and lawn and garden watering. Figure 2 shows the maximum daily summer flow from 1972 – 2007 (the daily peak flow during the months of June, July, and August in each year). From this chart it can be seen that peak flows are variable from year to year. From 1970 – 1997, there seems to be a general trend downward which may be attributable to a reduction in population and improved conservation efforts. However from 1997 to 2007, when population stabilized or increased, there is variability around an approximate average of 120 MGD.

The individual daily summer flows from 1997 – 2007 were analyzed for a probability distribution shown in Figure 3. The data presents the percentage of days daily flows were at or below a specified flow rate. For example, the daily summer flow rate was at or below 75.4 MGD 50% of the time. The flows were at or below 102.4 MGD 90% of the time. For planning projections in Table 5, the 99th percentile value of 124.4 MGD was selected. There is a 1% probability that maximum demands will exceed this value based on the recent 10-year history. This projected peak value assumes population increases will be offset by continued improvements in water-conserving fixtures and increased efficiencies in water cooling systems.

Figure 2. Minneapolis Water Works Maximum Daily Summer Flow, 1972 - 2007

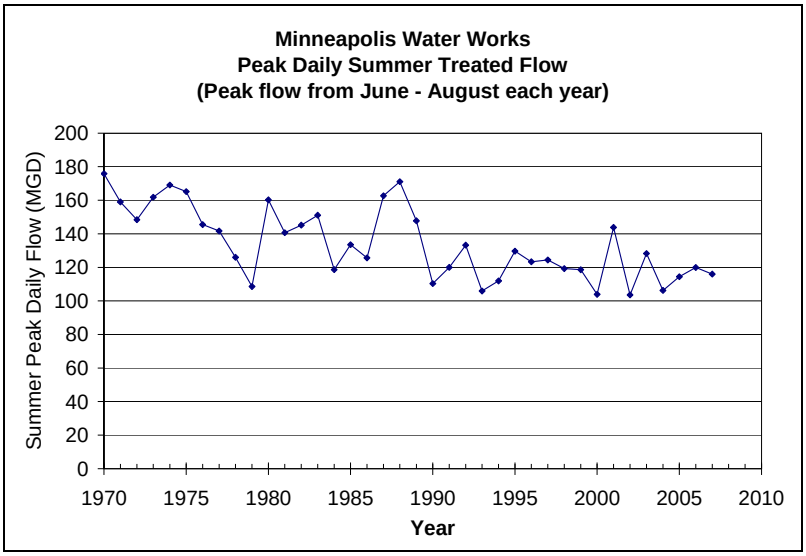
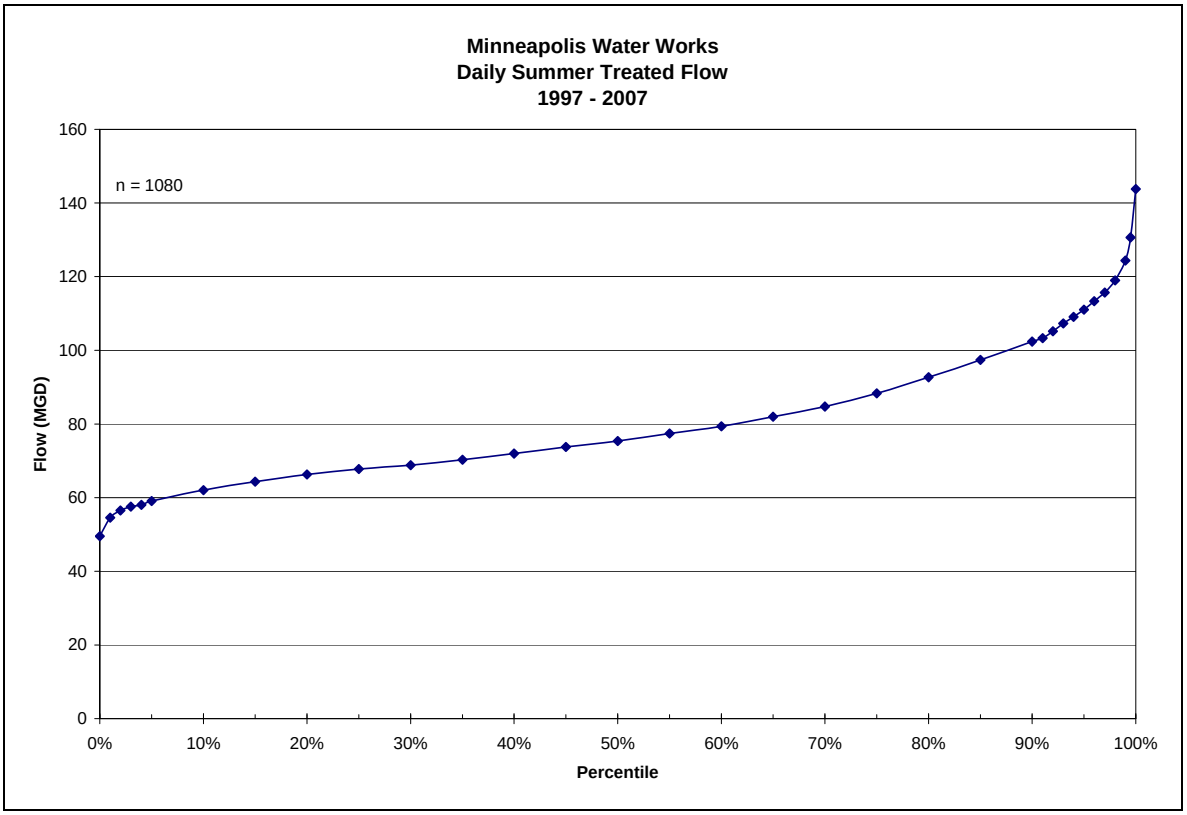


Figure 3. Probability Distribution of Daily Summer Flows, 1997 – 2007.



Projected Demand:

The amount of water demand in future years considered projected population growth, stability in the Commercial/Governmental/Industrial (C/G/I) area, and slight reduction in unaccounted for water. The average data for 2003-2007 presented in Table 1 was used as a baseline. The 2003-2007 average for Residential and Wholesale use was multiplied by the percentage of population growth to calculate the increase in those areas. This assumes the population of neighboring communities to which Minneapolis supplies water will follow the same trend as Minneapolis population. No significant increase in the number of C/G/I users is anticipated and any growth in existing business is assumed to be offset by improved water efficiencies by those users. Therefore, the C/G/I demand was assumed to be constant at 2003 – 2007 average levels. It was assumed that the percentage of unmetered and unaccounted for water would slowly decrease from the 2003 – 2007 average of 4.1% to 3.5% by 2030.

E. RESOURCE SUSTAINABILITY

Sustainable water use: use of water to provide for the needs of society, now and in the future, without unacceptable social, economic, or environmental consequences.

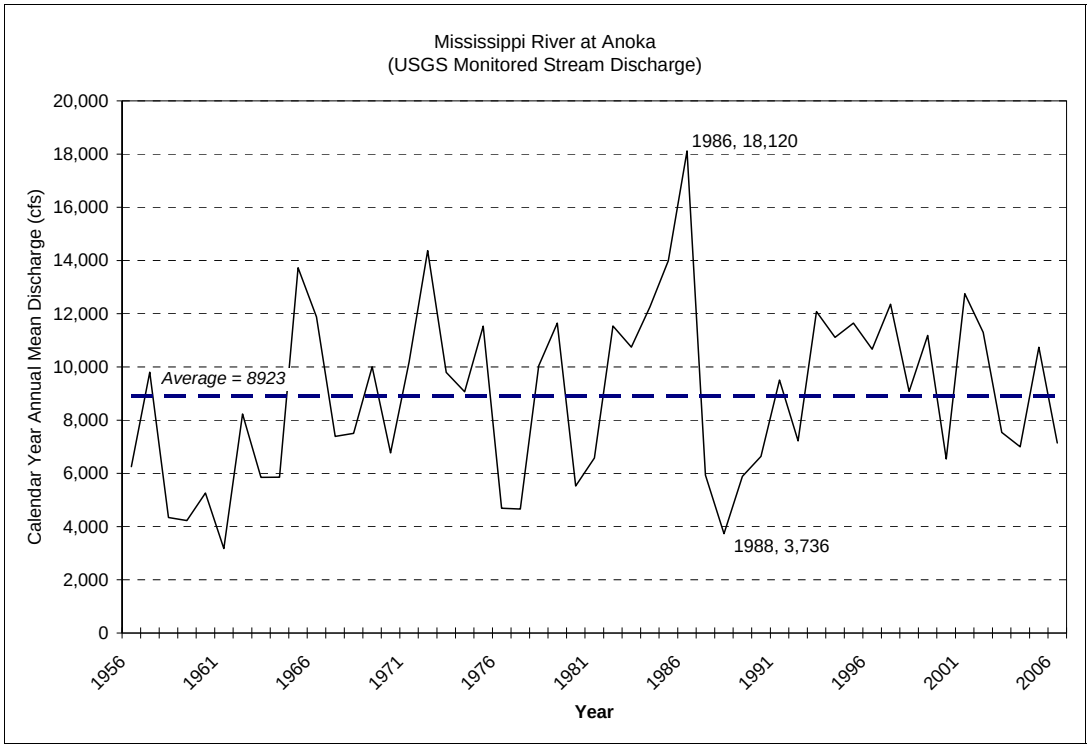
The sole source of supply for the Minneapolis Water Works is the Mississippi River. The River intakes are located in the pool created by the Upper St. Anthony Falls (USAF) Dam. The main intakes are approximately five (5) miles upstream from the USAF Lock. The flow characteristics of the River have been thoroughly documented in the U.S. Army Corps of Engineers' St. Paul District's Reports.

Under extreme emergency conditions (zero flow in the River) the Minneapolis Water Works has an estimated maximum 20-day supply of water, if the alternate intakes at P.S. #4 could be used to withdraw from the pool of the USAF Dam.

The United States Geological Survey has maintained a river monitoring station near Anoka since 1931 (USGS Site ID 5288500). This station is downstream of the Coon Rapids Dam at approximate river mile 865, about 6.5 miles upstream of the Minneapolis intakes. Figure 4 presents the average annual mean flow at that gage for 1956 – 2006. For reference when reviewing the Figure, the Minneapolis average day demand of 61 MGD is about 94 cfs.

Figure 4 shows the variability in total annual flow from year to year. It is also illustrative to look at the statistical record associated with each date throughout the year. Figure 5 shows a compilation of USGS statistical data by calendar date (data from 1956 – 2006).

Figure 4. Average annual mean flow at USGS River Gage 5288500, Mississippi River at Anoka



Legislation enacted in 1990 mandated the Department of Natural Resources (DNR) to prepare a drought plan to provide a framework for preparing for and responding to droughts and to minimize conflicts and negative impacts on Minnesota's natural resources and economy. The plan provides for response in a staged approach related to decreasing levels of flow. The plan was revised in April 2009. The "Minnesota DNR Statewide Drought Plan" specifically discusses Mississippi River flows as measured by the USGS gage near Anoka as a trigger for implementing emergency responses for drought conditions. Part II.D of this plan describes the Drought Plan and triggers in more detail. If the average daily flow at the USGS gage near Anoka is at or below 2000 cfs for five consecutive days a Drought Warning condition is declared. The Minneapolis average day demand of 61 MGD is about 94 cfs while a peak day demand of around 120 MGD is about 186 cfs. In Figure 5, significant time periods of the 5th percentile and 10th percentile data are noted by circles. These time periods are when the percentile data drop below the 2000 cfs trigger for 5 or more days. It may be interpreted that once every 20 years (5th percentile), the Drought Warning condition would be triggered at some time between January 17th and March 3rd or between July 27th and September 2nd. Further, once every 10 years (10th percentile), the Drought Warning condition would be triggered at some time between August 5th and August 25th. However, the 10th percentile data never drops below the Restrictive Phase trigger of 1500 cfs and the 5th percentile value only drops below the Restrictive Phase trigger for six days between August 21st and 26th. Thus, the Mississippi River has ample flow to sustain Minneapolis Water Works demands with

minimal probability of reaching levels triggering drought response actions. During times of drought, conservation measures would be implemented to reduce demand needs in accordance with the procedures described in Section II.D of this plan.

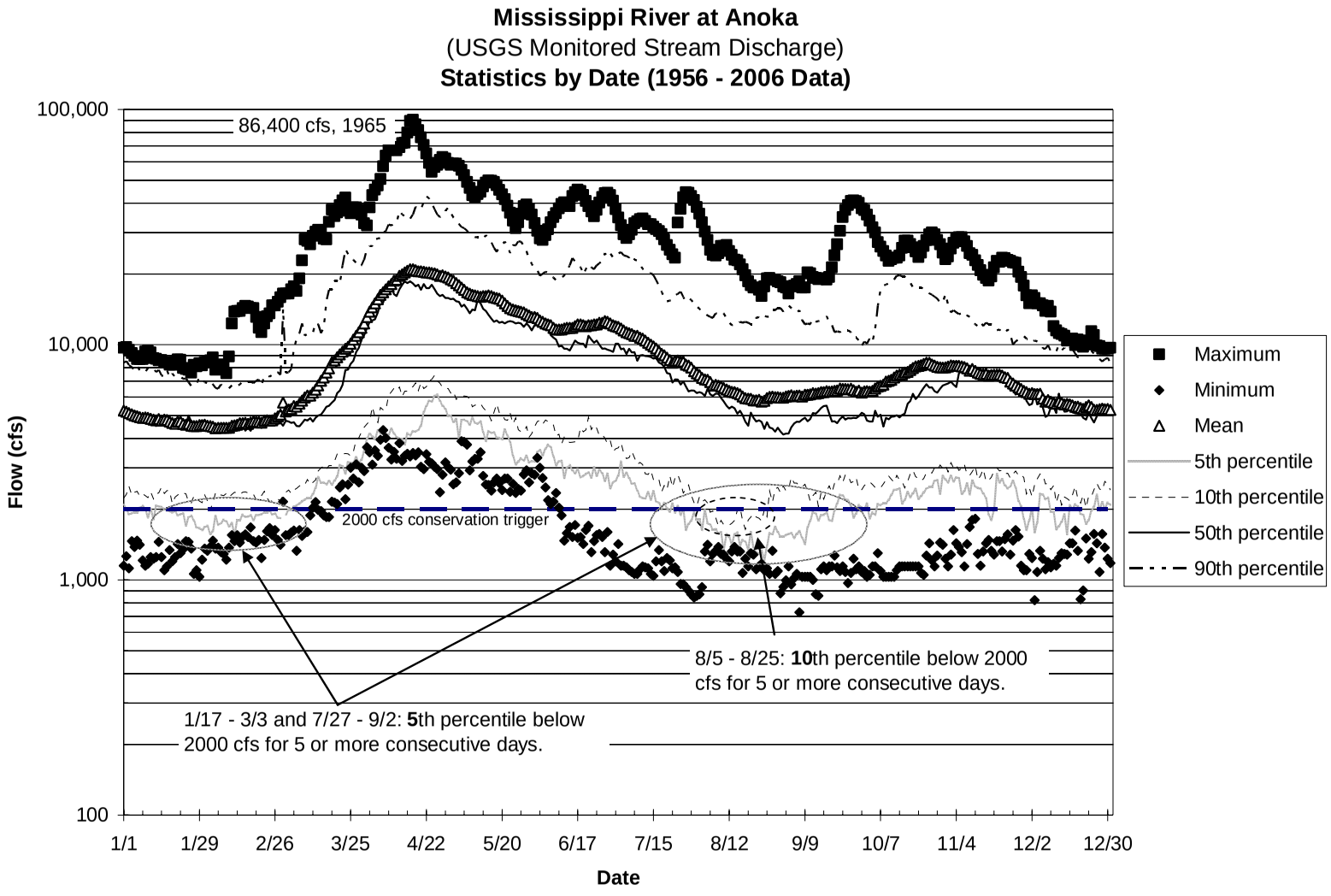
Source Water Protection Plan

The Source Water Protection Plan for the City of Minneapolis, is a result of the 1996 Amendments to the Federal Safe Drinking Water Act, which requires the Minnesota Department of Health to complete source water assessments for public water systems in Minnesota. Although this plan is not mandatory by the 1996 Amendments or State Law, Minneapolis Water Works has decided to proactively protect their drinking water supply, the Mississippi River. The plan also addresses data elements and their assessments; impacts of changes on the public water supply; issues, problems and opportunities; source water protection goals, objectives and action plans; program evaluation; and alternative water supply/contingency strategy. The plan was endorsed by the Minnesota Department of Health in March 2009.

F. CAPITAL IMPROVEMENT PLAN

The existing treatment plants, pump stations, and distribution system of the Minneapolis Water Works are adequate to sustain current and projected demands. As described in Section B, major treatment and pumping facilities are 60 to 100 years old. Various projects are planned to improve system redundancy and robustness and eliminate vulnerabilities identified by the Vulnerability Assessment completed in 2003. Minneapolis also maintains ongoing capital funding to clean and line or replace water mains and repair or replace distribution system valves and hydrants. A major capital improvement project within the 10-year planning horizon is the interconnection with Saint Paul Regional Water System which was discussed in Section C.

Figure 5. Daily flow profile for Mississippi River at Anoka (USGS River Gage 5288500)



PART II. EMERGENCY RESPONSE PROCEDURES

Water emergencies can occur as a result of vandalism, sabotage, accidental contamination, mechanical problems, power failures, drought, flooding, and other natural disasters. The purpose of emergency planning is to develop emergency response procedures and to identify actions needed to improve emergency preparedness. In the case of a municipality, these procedures should be in support of, and part of, an all-hazard emergency operations plan.

Federal Emergency Response Plan

Section 1433(b) of the Safe Drinking Water Act as amended by the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (Public Law 107-188, Title IV – Drinking Water Security and Safety) requires community water suppliers serving over 3,300 people to prepare an Emergency Response Plan. The Minneapolis Water Works completed an update to their Emergency Response Plan to comply with the regulation and submitted the required certification to the U.S. Environmental Protection Agency on September 26, 2003.

Emergency Response Plan	Contact Person	Contact Number
Emergency Response Lead	Shahin Rezania, Director – Water Treatment & Distribution Services	612-673-2418 or 612-799-0718 (cell)
Alternate Emergency Response Lead	Chris Catlin, Superintendent of Treatment Operations	612-661-4904 or 612-916-0546 (cell)
Emergency Response Plan Certification Date	September 26, 2003	

Operational Contingency Plan.

The Minneapolis Water Works operates plant maintenance and distribution maintenance shops with experienced trade personnel on a full-time basis. A full-scale meter shop also maintains, repairs or replaces all water meters within the City of Minneapolis. The plant maintenance shop continuously services, repairs and replaces old equipment and instrumentation to insure proper operation. It also handles all facilities/building maintenance. The distribution office has a preventive maintenance program (exercising valves, flushing

hydrants, detecting leaks, etc.). Distribution system repairs are also performed by full- time crews from this office. All the shops stock supplies and parts to reduce repair time in the event of an emergency.

MWW is continuously working with outside contractors on various construction projects, and as such maintains relationships with these contractors. These contractors can be utilized in emergency situations to supplement MWW forces in dealing with large scale failures.

A. EMERGENCY TELEPHONE LIST

Included in MWW Emergency Response Plan.

B. CURRENT WATER SOURCES AND SERVICE AREAS

Included in MWW Emergency Response Plan.

C. PROCEDURE FOR AUGMENTING WATER SUPPLIES

Included in MWW Emergency Response Plan.

D. ALLOCATION AND DEMAND REDUCTION PROCEDURES.

Demand reduction procedures are prudent to address the sudden loss of water due to line breaks, power failures, sabotage, etc. or a gradual decrease in water supply. During periods of limited water supplies public water suppliers are required to allocate water based on the priorities established in Minnesota Statutes 103G.261:

Water Use Priorities (Minnesota Statutes 103G.261)

First Priority. Domestic water supply, excluding industrial and commercial uses of municipal water supply, and use for power production that meets contingency requirements.

NOTE: Domestic use is defined (MN Rules 6115.0630, Subp. 9), as use for general household purposes for human needs such as cooking, cleaning, drinking, washing, and waste disposal, and uses for on-farm livestock watering excluding commercial livestock operations which use more than 10,000 gallons per day or one million gallons per year.

Second Priority. Water uses involving consumption of less than 10,000 gallons per day.

Third Priority. Agricultural irrigation and processing of agricultural products.

Fourth Priority. Power production in excess of the use provided for in the contingency plan under first priority.

Fifth Priority. Uses, other than agricultural irrigation, processing of agricultural products, and power production.

Sixth Priority. Non-essential uses. These uses are defined by Minnesota Statutes 103G.291 as lawn sprinkling, vehicle washing, golf course and park irrigation, and other non-essential uses.

To estimate demands according to the statutory priorities, data from 2007 were used. The 2007 total for residential, commercial/industrial/institutional, and wholesale uses were within 4% of the 5-year average in each of those categories, indicating it was a reasonably representative year. Data for total 2007 volume delivered to the top 50 non-wholesale users was reviewed for trends between user types (hospitals, hotels, agricultural processing, power industries, etc.). Finally, the total usage of commercial, government, and industrial users whose accounts totaled less than 3.65 million gallons in 2007 (average of 10,000 gpd) was determined to quantify 2nd priority use. The data reviewed was for Minneapolis use only; the priorities and demand reduction potential of individual wholesale suburban customers was not analyzed or assumed.

- First priority use was defined individual residences and multiple dwelling units, institutional use (hospitals, schools, nursing homes and daycare centers), and industrial power production.
- Second priority use was determined by totaling the volume of all commercial, government, and industrial users whose individual accounts totaled less than 3.65 million gallons for the year (less than 10,000 gpd).
- Third priority use was determined by comparing the percentage volume of agricultural processing use to total commercial use in the Top 50 customers. This percentage was then applied to the total Commercial use for 2007.
- Fourth Priority use for non-essential power generation was assumed to be 0.
- The Fifth priority use was determined by subtracting the sum of the first four priority uses from the total average demand.

The sum of the five priority uses equals the average daily demand for the City of Minneapolis. The non-essential, Sixth priority, demand was assumed to be the overall average daily demand subtracted from the overall summer demand. Therefore, non-essential use in each of the first five priorities would be accounted for in the total non-essential use.

Demand Reduction Potential. The demand reduction potential for residential use will typically be the base demand during the winter months when water use for non-essential uses such as lawn watering do not occur. The difference between summer and winter demands typically defines the demand reduction that can be achieved by eliminating non-essential uses. In extreme emergency situations lower priority water uses must be restricted or eliminated to protect first priority domestic water requirements. Short-term demand reduction potential should be based on average day demands for customer categories within each priority class.

Table 8. Water Use Priorities. City of Minneapolis only – Does not include wholesale suburban customers except as noted. Based on 2007 data.

Customer Category	Allocation Priority	Average Day Demand (MGD)	Winter Day Demand (MGD)	Summer Day Demand (MGD)	Short-Term Demand Reduction Potential (MGD)	Non-essential use (MGD)
		A	*B*	*C*	*A-B*	*C - A*
Residential use, hospitals, contingency power production	1st	32	28	40	4	8
Commercial, Government, Industrial Use < 10,000 gallons per day	2nd	4	3	5	1	1
Processing of agricultural products	3rd	1	1	1	0	0
Power production in excess of contingency power	4th	0	0	0	0	0
Other uses	5th	9	7	17	2	8
Total 1st through 5th Priority uses, Minneapolis only		46	39	63	7	17*
Wholesale customers (all uses)		12	8	19	4	7
Total Minneapolis and Wholesale		58	47	82	11	24*

* Total non-essential use (Sixth Priority) for Minneapolis is estimated to average about 17 MGD. Total non-essential use for Minneapolis and its suburban wholesale customers is 24 MGD.

The following triggers may be used for implementing actions to reduce water demand. Table 9 describes the actions associated with each trigger, dependent upon the severity of a given emergency situation.

- Water demand exceeds treatment capacity and reasonable use of storage. This could be due to excessive demands during times of extreme heat or drought exceeding firm treatment capacity. Another possible scenario would be due to critical equipment or water main failure. Depending upon the situation and season, the treatment capacity could vary, so a specific demand flow rate trigger can not be pre-determined.
- Low flows in the Mississippi River would trigger varying levels of demand reduction dependent upon the severity of the drop in flow. Legislation enacted in 1990 mandated the Department of Natural Resources (DNR) to prepare a drought plan to provide a framework for preparing for and responding to droughts and to minimize conflicts and negative impacts on Minnesota's natural resources and economy. The plan provides for response in a staged approach related to decreasing levels of flow. The plan was revised in April 2009. The following table entitled “Minnesota DNR Statewide Drought Plan” outlines the staged approach for implementing drought response actions.
- Security breaches or contamination incidents in the distribution system could result in restriction of water supply in isolated areas. Security breaches or contamination in the river source, treatment plants, or

finished water storage could constitute a severe emergency condition. The supply scenario would vary based on season and situation, so a specific demand flow rate trigger can not be pre-determined.

- A critical water deficiency, defined by the Governor's Executive order, would trigger demand reduction actions, as required by Statute.

Table 9. Demand Reduction Procedures

	Trigger(s)	Action(s)
Stage 1 (Mild)	Informed by State as being in a "Drought Watch" phase in accordance with the Statewide Drought Plan.	Voluntary conservation actions requested of users which may include reducing or eliminating sprinkling, or to reduce residential use (minimize bath use, reduce shower length, wash only full loads of clothes and dishes, etc.)
Stage 2 (Moderate)	Informed by State as being in a "Drought Warning" phase in accordance with the Statewide Drought Plan. When it is anticipated that demand will exceed 100% of available *firm* treatment capacity.	Odd-even watering ban. (In addition to Stage 1 actions).
Stage 3 (Severe)	Informed by State as being in a "Restrictive" phase in accordance with the Statewide Drought Plan. When it is anticipated that demand will exceed 100% of *actual* available treatment capacity and storage reserves.	Total sprinkling ban, car-washing prohibited. Residential users encouraged to use water for only essential domestic purposes (drinking, cooking, basic sanitation).
Critical Water Deficiency **(M.S. 103G.291)**	Informed by State as being in a "Emergency" phase in accordance with the Statewide Drought Plan. Executive Order by Governor. Severe contamination event.	Eliminate 6th priority use and constrain 2nd through 5th priority water allocation.

Note: The potential for water availability problems during the onset of a drought are almost impossible to predict. Significant increases in demand should be balanced with preventative measures to conserve supplies in the event of prolonged drought conditions.

Minnesota DNR Statewide Drought Plan (April 29, 2009)

Condition and Program Phase	State and Federal Actions	Water Users and Suppliers Actions
NON-DROUGHT PHASE A significant portion of the watershed is not under drought conditions according to the U.S. Drought Monitor. The U.S. Drought Monitor is a weekly index depicting the location and intensity of drought conditions using a blend of quantitative and qualitative indicators. Drought conditions referenced in this plan are keyed to the U.S. Drought Monitor http://drought.unl.edu/dm/monitor.html	• Develop precipitation, streamflow, ground water, and water quality monitoring programs. • Conduct state and regional water studies and coordinate actions. • Assist water suppliers and other users in developing conservation measures. • Continue and improve water conservation education.	• Develop/update/implement water supply plans (including drought preparedness and response and water conservation programs). • Adopt conservation rate structures and ordinances • Establish mutual aid agreements, interconnections, conservation education, redundant/alternative supplies, etc. • Minimize water supply system losses and improve water use efficiency.
DROUGHT WATCH PHASE: A significant portion of the watershed is "**Abnormally Dry**" or in a "**Moderate Drought**"	• Inform Drought Task Force of conditions. • Intensify selected monitoring activities. • Initiate public awareness. • Notify water suppliers of moderate drought conditions. • Monitor Mississippi River flows and coordinate with the U.S. Army Corps of Engineers (USACE) and hydropower facility owners	• Monitor potential conflicts and problems and notify DNR of source conflicts. • Public water suppliers provide conservation information and request customers to implement voluntary measures to reduce water use.
DROUGHT WARNING PHASE A significant portion of the watershed is in a "**Severe Drought**", or for public water suppliers using the Mississippi River, the average daily flow at the USGS gage near Anoka is at or below 2000 cfs for five consecutive days.	• Convene Drought Task Force • Increase public drought awareness • Notify water suppliers of severe drought conditions. • Monitor implementation of the Mississippi River System-Wide Low-Flow Management Plan [for Dam operators].	• Public water suppliers implement appropriate water use restrictions contained in their water supply plans. • Other water users implement appropriate conservation measures. • Public water suppliers implement water use reduction actions with a goal of reducing water use to 50% above January levels. • Dam operators implement the Mississippi river System-Wide Low-Flow Management Plan.
RESTRICTIVE PHASE: A significant portion of the watershed is in an "Extreme Drought", or for public water suppliers using the Mississippi River, the average daily flow at the USGS gage near Anoka is at or below 1500 cfs for five consecutive days.	• Notify water suppliers of severe drought conditions. • Closely monitor river flows. • Continue drought awareness efforts to encourage conservation.	• Follow MDNR allocation restrictions. • Public water suppliers implement water use reduction actions with a goal of reducing water use to 25% above January levels. • All appropriators conserve water and minimize non-essential water uses.
EMERGENCY PHASE: A significant portion of the watershed is in an "Exceptional Drought", or highest priority water supply needs are not being met, or there are threatened or actual electricity shortages due to cooling water supply shortages, or for public water suppliers in the Twin Cities, the average daily flow of the Mississippi River USGS gage near Anoka is at or below 1000 cfs for five consecutive days.	• Advise Governor on need for emergency declaration. • Minnesota Division of Homeland Security and Emergency Management implements MN Emergency Operations Plan (MEOP). • Consider request to the USACE for the release of water from the Mississippi River Headwaters Reservoirs.	• Public water suppliers implement mandatory water use reduction actions with a goal of reducing water use to January levels. • Limit water used based on highest priorities defined in **Minnesota Statutes 103G.261** • Implement measures consistent with an emergency declaration. • Provide bottled water, hauled water, and sanitations supplies to users, as needed.

Notification Procedures.
Stage 1 actions can be implemented via City newsletters, City website, utility bill inserts, and press releases to local news media. More severe conditions (Stages 2 through Critical Deficiencies) would utilize the same measures as Stage 1 with greater focus on high-impact announcements through media outlets such as radio and TV. For critical deficiencies, commercial and industrial users would be notified directly by phone or mail and the City's "Swift Reach" notification system could be implemented.

D. Enforcement. Minnesota Statutes require public water supply authorities to adopt and enforce water conservation restrictions during periods of critical water shortages.

Public Water Supply Appropriation During Deficiency.

Minnesota Statutes 103G.291, Subdivision 1.

Declaration and conservation.

(a) If the governor determines and declares by executive order that there is a critical water deficiency, public water supply authorities appropriating water must adopt and enforce water conservation restrictions within their jurisdiction that are consistent with rules adopted by the commissioner.

(b) The restrictions must limit lawn sprinkling, vehicle washing, golf course and park irrigation, and other nonessential uses, and have appropriate penalties for failure to comply with the restrictions.

The City of Minneapolis has ordinances in place that empower the Director of the Water Works or the City Engineer to address critical water deficiencies and provide for penalties for non-compliance. Ordinance 509.1480 authorizes the City Engineer or the appointed representative of the City Engineer to declare an emergency. The following are taken from the City Code of Ordinances:

> **509.960. Shut-off for public interest, misuse, waste or violation.** Any violation of chapter 509 may cause water to be shut off. Water may also be shut off if the director of the waterworks determines that the use, misuse or waste of water adversely affects the health, safety or welfare of the public. No one shall turn water on or off without authority from the city. Whenever water is found on without authority, it may be immediately turned off without further notice. (98-Or-134, § 1, 11-13-98)
>
> **509.1470. Water use limited during emergency period.** No person shall draw or use water from the city water mains or city waterworks

system other than as permitted by the declaration of emergency during any period of emergency caused by shortage of water supply or lowering of water pressure in the water mains of the city. (77-Or-070, § 1, 4-7-77; 98-Or-135, § 38, 11-13-98)

509.1480. Declaration of emergency. The city engineer or the appointed representative of the city engineer shall declare the existence of such an emergency as and when it may become necessary, shall determine the period of such an emergency and the termination thereof, shall decide the daily hours of restriction, the method of restriction, and shall decide upon the proper notification to customers of such restrictions. (77-Or-070, § 2, 4-7-77; Pet. No. 251069, § 26, 12-15-89; 98-Or-135, § 39, 11-13-98)

509.1490. Administrative fee. For a first violation of the declaration of emergency, the occupant of the premises or the owner thereof will receive a warning of the offense. Subsequent violations of the declaration of emergency will result in a turnoff of the water supply to the premises. Written notice posted on the premises at the time of the violation will be considered sufficient notice prior to turnoff of the water supply. No water supply which has been turned off because of a violation of this article shall be turned on until twenty-five dollars ($25.00) has been paid to the Minneapolis waterworks division, together with the regular charge for turning off and on water service. The city engineer may, in the event of demonstrated economic hardship, waive a portion of the twenty-five dollar ($25.00) administrative fee, but not exceeding fifteen dollars ($15.00). The violation may also be subject to the penalties in Chapter 1 of this Code. (77-Or-070, § 3, 4-7-77; 98-Or-135, § 40, 11-13-98)

In the event emergency repairs are necessary, the City also has authority to shut off water:

509.110. City not liable for water shortage; authority to shut off. The city shall not be liable for any deficiency or failure in the supply of water to consumers, whether occasioned by shutting the water off for the purpose of making repairs or connections, or for any other cause whatever. In case of fire or alarm of fire, or in

making repairs, or constructing new works, the superintendent of the waterworks may shut off the water at any time and keep it shut off so long as the superintendent shall deem necessary. (Code 1960, As Amend., § 600.100; Pet. No. 251069, § 11, 12-15-89)

PART III. WATER CONSERVATION PLAN

Water conservation programs are intended to reduce demand for water, improve the efficiency in use and reduce losses and waste of water. Long-term conservation measures that improve overall water use efficiencies can help reduce the need for short-term conservation measures. Water conservation is an important part of water resource management and can also help utility managers satisfy the ever-increasing demands being placed on water resources.

> Minnesota Statutes 103G.291, requires public water suppliers to implement demand reduction measures before seeking approvals to construct new wells or increases in authorized volumes of water. Minnesota Rules 6115.0770, require water users to employ the best available means and practices to promote the efficient use of water. Conservation programs can be cost effective when compared to the generally higher costs of developing new sources of supply or expanding water and/or wastewater treatment plant capacities.

A. CONSERVATION GOALS.

Unaccounted Water

The Minneapolis Water Works unaccounted water has averaged only 4.1% over the last five years (918 million gallons per year). This is substantially below the American Water Works Association recommendation of 10%.

Per Capita Demand

The 5-year Minneapolis residential gallon per capita use has averaged 61 gallons per capita per day (GPCD). This is 19% lower than the 2002 Twin Cities Metropolitan Area average of 75 GPCD. The overall per capita demand (including commercial, industrial, and institutional use) has decreased by an average of about 1.3% per year between 1998 and 2007.

Peak Demands

The average ratio of the maximum day demand to average day demand from 2003 – 2007 was 1.90. This peaking factor indicates a reasonable baseline demand. Higher peaking factors are indicative of high summer use relative to winter use which is not the case in Minneapolis.

B. WATER CONSERVATION PROGRAMS

Six components of a conservation program are described below.

1. **Metering.** *The American Water Works Association (AWWA) recommends that every water utility*

meter all water taken into its system and all water distributed from its system at its customer's point of service. An effective metering program relies upon periodic performance testing, repair, repair and maintenance of all meters. AWWA also recommends that utilities conduct regular water audits to ensure accountability.

The Minneapolis Water Works meters virtually all its customers, including public facilities. There are less than 100 taps which are unmetered – fire standpipe connections and a small number of public fountains in parks. Water meters vary in size from 5/8-inch to 12-inch. The City of Minneapolis believes that its metering program causes the consumers to conserve water. The City provides an account history of past water use habits to all customers in their water bill (i.e. water use during the same period last year).

All of the City of Minneapolis water meters were changed out between 1992 and 2000 as part of the implementation of the automated meter reading program. Each year beginning in 2008 Minneapolis will spot test the oldest residential meters with the largest consumption. Tests with Minneapolis finished water quality indicated that 25 years is a realistic life expectation for 5/8" to 1" meters. On commercial meters 1-1/2" and larger, a 7-year periodic maintenance program is in place. Meters after 7 years of service are replaced, tested, reconditioned, tested again, and re-installed. Field testing is not an option as there are no bypasses.

TABLE 10(A). Customer Meters

	Number of Metered Connections	Meter testing schedule	Average age/meter replacement schedule (years)
Residential	77,074	Select meters annually	Age ~10 years / Replacement TBD, see discussion.
Commercial	8,676	7 years	5 years / 7 years
Industrial	92	7 years	5 years / 7 years
Public Facilities	1,305	7 years	5 years / 7 years
Other	15,399	Select meters annually	Age ~10 years / Replacement TBD, see discussion.
TOTALS	102,546		

The on-going cost of meter replacement and rehabilitation and battery replacement is budgeted in the 10-year capital program. Converting meters from automatic phone transmitters to radio

transmitters is budgeted at approximately $400,000 per year. Battery replacement will be required 8 to 10 years after the meters were initially installed.

The Minneapolis Water Works believes that the combination of metering all customer accounts, and a monthly billing cycle promote wise use of water and contribute positively to conservation.

Water Source Meters

The flow of water withdrawn from the river is measured using four venturi meters at the Fridley Softening Plant. New differential pressure instrumentation was installed on the venturis in 2005 as part of a SCADA upgrade to the softening plant. The instrumentation undergoes all manufacturer-recommended testing and preventative maintenance.

2. **Unaccounted Water.**

The Minneapolis Water Works unaccounted water has averaged only 4.1% over the last five years. This is substantially below the American Water Works Association recommendation of 10%

In the City of Minneapolis, the City owns the water mains and each individual property owner owns their service line from the tap in the water main to their service line. There are approximately 40 – 50 water main breaks (on the 1,000 miles of public main) each year and approximately 300 private service line leaks. Most leaks (both public and private) are identified by the following means:

- Residents experiencing low water pressure / volume.
- Residents noticing water bubbling up out of the ground.
- Residents noticing rumbling noise in their domestic water piping when they are not using any water.
- Workers from other City Public Works divisions noticing water running in a storm drain or catch basin during dry weather.

Since the City is an urban environment with almost no undeveloped land, residents are the best eyes and ears to alert the City about anomalies. There has not been a formal leak survey in recent years, nor is one planned given the low amount of unaccounted for water.

The Minneapolis Water Works has a full-time leak investigator on staff. The leaks reported or detected are investigated and repaired as soon as possible, if the leak is on a City main. If the leak is determined to be on a private service line, the consumer is notified by mail that the leak must be repaired no later than 15 calendar days from the date of the letter. If the leak is not repaired during

this time, the Minneapolis Water Works shall have the necessary repairs made and charge the customer.

Reducing Unaccounted Water. List potential sources and efforts being taken to reduce unaccounted water.
Of the percent unaccounted for water in Table 1, 0.3 to 0.5% is attributable to the residuals underflow from the softening process (influent water exiting the process with lime solids residuals). An additional 0.5% to 1.0% is cleaning residuals from the membrane filtration plant exiting the process. Both these streams are treated and ultimately discharged back to the Mississippi River. Flushing of water mains during repair and use with in the treatment process also accounts for some of the volume. City of Minneapolis maintains and on-going program to clean and line or replace 10 to 15 miles of water main each year. Corrosion due to outside effects (soil, aggressive ground water, etc.) is minimized by a Minneapolis Water Works Comprehensive Corrosion Control Program that is administered by a full-time coordinator on staff. New installation, continuous monitoring, replacement and repair are also done by City personnel. The City's water distribution maintenance yard has several crews to fix leaks and repair gates and hydrants to minimize water losses. The City also maintains a supply of spare parts and piping and accessories (flanges, couplings, joint materials, etc) as well as sleeves, valves, gates and parts, specials (tees, elbows, etc.) and related supplies in order to be able to respond to leaks and water main breaks as soon as they take place or are detected.

3. Conservation Water Rates.

Billing Frequency: Monthly

Volume included in base rate or service charge: None

Uniform rate: Direct customers are billed at the same rate per unit regardless of volume. A unit is 100 cubic feet

Water Rates Evaluated: Every year

Date of last rate change: January 1, 2008

The Minneapolis Water Works believes that the combination of metering all customer accounts, uniform (not declining) block rates and a monthly billing cycle promote wise use of water and contribute positively to conservation. Sewer rental rates are also based on water usage which further promotes water conservation.

The City of Minneapolis has metered all its water customers for years and billed for water based on volume consumed and meter size. The City has an increasing block rate for monthly minimum charges based on meter size (from 5/8-inch to 12-inch) and higher rates for quarterly, non-residential fire protection based also on meter size (from 2-inch to 12-inch).

The volume-based water rates for direct customers are uniform. The 2008 rates for customers inside the City limits is $2.75/billing unit. The billing unit equals 100 cubic feet. The current rate for customers outside the City limits is $2.90/billing unit. There is a minimum charge of $2 even if no usage is measured. Wholesale rates to other public water suppliers vary per contract.

The Minneapolis Water Works believes that the combination of metering all customer accounts, uniform (not declining) block rates and a monthly billing cycle promote wise use of water and contribute positively to conservation. Sewer charges are also based on water usage which further promotes water conservation. Any changes to rate structures as required by *Minnesota Statutes* will be implemented accordingly.

2008 Minneapolis Water Rates

Year	Water Charge per Unit (per 100 cubic feet)	Water Minimum	Outside City Water	Water Tax (%)
2008	$2.75	$2.00	$2.90	7.15%

Meter Size	Monthly Minimum Charge	Fire Line Monthly Charge
5/8”	$2.00	--
¾”	$2.40	--
1”	$4.80	--
1-½”	$8.85	--
2”	$14.00	$2.50
3”	$27.00	$3.00
4”	$50.00	$4.00
6”	$95.00	$6.00
8”	$135.00	$10.00
10”	$191.00	$15.00
12”	$231.00	$25.00

4. **Regulation.**

As indicated in the section discussing enforcement of demand reduction procedures, Minneapolis has ordinances in place for emergency restrictions. The City Engineer or the appointed representative of the City Engineer has the flexibility in the method, timing, and duration of the restrictions used.

State and Federal Regulations (mandated)

The Minneapolis City Council enacts ordinances to regulate construction, maintenance, and remodeling so that the buildings where citizens live, work, and play will be safe. The City uses permits to make sure that the work is done in compliance with those ordinances. The City of Minneapolis enforces national and international codes adopted by the State of Minnesota. It is assumed the State codes include:

☒ Rainfall sensors on landscape irrigation systems. Minnesota Statute 103G.298 requires "All automatically operated landscape irrigation systems shall have furnished and installed technology that inhibits or interrupts operation of the landscape irrigation system during periods of sufficient moisture. The technology must be adjustable either by the end user or the professional practitioner of landscape irrigation services."

☒ Water Efficient Plumbing Fixtures. The 1992 Federal Energy Policy Act established manufacturing standards for water efficient plumbing fixtures, including toilets, urinals, faucets, and aerators.

Enforcement is handled by the Regulatory Services and Emergency Preparedness Division of the City Coordinator's office. Regulatory Services provides the investigation and enforcement of laws and ordinances pertaining building and housing code inspections from plan review through construction.

5. **Education and Information Programs.**

All of Minneapolis Water Works' public education efforts emphasize the inherent value of drinking water and the importance of considering it and conserving it as a valuable resource. Public outreach efforts include:

- Annual (May) distribution of Consumer Confidence Reports. Future reports will provide specific resources for customers to learn more about water conservation.
- Annual (~ January) notices of water billing rates are directly mailed to customers and will provide specific resources for customers to learn about water conservation.
- All customers receiving direct mailings from the Utility billing department receive a brochure prepared by the American Water Works Association entitled "Water Conservation at Home"

which includes information on treating drinking water as a valuable resource and discusses how water is metered and used in the home and ways to reduce that use.

- The Water division's web site on the City's internet site (http://www.ci.minneapolis.mn.us/water/) includes a page of "Water Conservation Resources" providing links to information on water saving tips, water efficient fixtures and use of rain barrels
- Tours given to students from grade-school through college age, educators, citizen groups, etc. on a regular basis emphasize the need to treat drinking water as a valuable resource.
- Media interviews are given as requested.
- Support of theater and art communities' advocacy of water. A 2007-08 example includes support of In the Heart of the Beast Mask and Puppet Theater's "Invigorate the Common Well" series.

The City of Minneapolis is committed to providing sustainable options for metro living. "GREEN" construction is a holistic approach which encompasses healthy air quality, sustainable building materials, conservation of water, energy efficiency and environmentally friendly landscaping. The City's development website (http://www.ci.minneapolis.mn.us/mdr/GreenBuildingOptions_home.asp) provides residents and business owners many options for going 'green' which can help citizens protect the environment, conserve water, and often save money over the lifetime of the investment.

Further, the City of Minneapolis is committed to helping businesses develop an approach to building and remodeling that encompasses healthy air quality, sustainable building materials, water conservation, energy efficiency and environmentally friendly landscaping. The following website describes some of the initiatives: http://www.ci.minneapolis.mn.us/cped/green_development_resources.asp

A packet of conservation tips and information can be obtained by contacting DNR Waters or the Minnesota Rural Water Association (MRWA). The American Water Works Association (AWWA) www.awwa.org or www.waterwiser.org also has excellent materials on water conservation that are available in a number of formats. You can contact the MRWA 800/367-6792, the AWWA bookstore 800/926-7337 or DNR Waters 651/259-5703 for information regarding educational materials and formats that are available.

6. **Retrofitting Programs.**

Education and incentive programs aimed at replacing inefficient plumbing fixtures and appliances can help reduce per capita water use as well as energy costs.

A study by the AWWA Research Foundation (Residential End Uses of Water, 1999) found that the average indoor water use for a non-conserving home is 69.3 gallons per capita per day (gpcd). The average indoor water use in a conserving home is 45.2 gpcd and most of the decrease in water use is related to water efficient plumbing fixtures and appliances that can reduce water, sewer and energy costs. In Minnesota, certain electric and gas providers are required (Minnesota Statute 216B.241) to fund programs that will conserve energy resources and some utilities have distributed water efficient showerheads to customers to help reduce energy demands required to supply hot water.

Retrofitting Programs. Describe any education or incentive programs to encourage the retrofitting of inefficient plumbing fixtures (toilets, showerheads, faucets, and aerators) or appliances (washing machines).

The City's Utility Billing maintains the following website: "Money Saving Tips: Ways to Reduce Your Utility Bill" http://www.ci.minneapolis.mn.us/utility-billing/saving.asp This page includes direct link to the US EPA's "WaterSense" web site which includes a product listing of water-efficient devices.

All customers receiving direct mailings from the Utility billing department receive a brochure prepared by the American Water Works Association entitled "Water Conservation at Home" which includes a section on Water-Saving Devices.

The Minneapolis Development Review, responsible for City building permits, maintains a link on their website to a Green Building Options Checklist, http://www.ci.minneapolis.mn.us/mdr/docs/greenbuildchecklist.pdf, which includes recommendations and information on installation of water efficient fixtures and rain barrels. This checklist also gives links to other green building sites.

The "Water's Off" program contributes to the overall water conservation. The Water's Off event is held each spring with volunteers from Minneapolis/St. Cloud Plumbers Local 15 donating their time to repair plumbing and retrofit old fixtures for the low-income, elderly and disabled homeowners. Contractors donate the use of their service trucks and the material for all the necessary repairs and the work is completely free to homeowners who qualify through Minneapolis community action programs. These programs supply the Water's Off committee with the names of people who meet guidelines to ensure that the people needing the help will receive it.

ADOPTION OF PLAN

On July 11, 2008, the Minneapolis City Council approved submission of *The Minneapolis Plan for Sustainable Growth* to the Metropolitan Council for approval. This *Water Supply, Emergency, and Conservation Plan* is an appendix of that approved comprehensive plan. The overall comprehensive plan and this *Water Supply, Emergency, and Conservation Plan* will be formally adopted by the Minneapolis City Council upon approval by the Metropolitan Council.

A copy of the Council official proceedings approving the submission of the overall comprehensive plan may be found on pages 536 - 540 of the document posted at:

http://www.ci.minneapolis.mn.us/council/archives/proceedings/2008/20080711-proceedings.pdf

Suburban wholesale customers of Columbia Heights, Joint Water Commission (Crystal, Golden Valley, and New Hope), Edina, and Bloomington as well as St. Paul Regional Water Services were notified of the Minneapolis *Water Supply, Emergency, and Conservation Plan's* availability for on-line review from April 22 through June 30, 2008. Comments received after the review period on August 5, 2008 from the Joint Water Commission were incorporated into the revised version of this plan.

PART IV. ITEMS FOR METROPOLITAN AREA PUBLIC SUPPLIERS

Minnesota Statute 473.859 requires water supply plans to be completed for all local units of government in the seven-county Metropolitan Area as part of the local comprehensive planning process. Much of the required information is contained in Parts I-III of these guidelines. However, the following additional information is necessary to make the water supply plans consistent with the Metropolitan Land Use Planning Act upon which local comprehensive plans are based. Communities should use the information collected in the development of their plans to evaluate whether or not their water supplies are being developed consistent with the Council's Water Resources Management Policy Plan.

POLICIES

Minneapolis Water Works' mission is to reliably supply high quality drinking water at affordable rates to its citizens and other customers. We believe that quality begins with treating our supply source, the Mississippi River, as a valuable natural resource.

IMPACT ON THE LOCAL COMPREHENSIVE PLAN

The adoption of this Water Supply Plan, aimed at reducing unnecessary demand, improving efficiency and minimizing water waste and loss, will not have any negative impact on the local comprehensive plan, community growth or economic development.

DEMAND PROJECTIONS

Demand projections for the next 30 years through the ultimate population projected for 2037 were presented in Table 5 of Part I.3. Population projections for 2010, 2020, and 2030 were from forecasts revised by City's Department of Community Planning and Economic Development in consultation with Metropolitan Council. The populations were revised upward by 1 – 1.5% from original Metropolitan System Statement Forecasts.

PLAN SUBMITTAL AND REVIEW OF THE PLAN

The plan will be reviewed by the Council according to the sequence outlined in Minnesota Statutes 473.175. **Prior to submittal to the Council, the plan must be submitted to adjacent governmental units for a 60-day review period.** Following submittal, the Council determines if the plan is complete for review within 15 days. If incomplete, the Council will notify the community and request the necessary information. When complete the Council will complete its review within 60 days or a mutually agreed upon extension. The community officially adopts the plan after the Council provides its comments.

Plans can be submitted electronically to the Council; however, the review process will not begin until the Council receives a paper copy of the materials. Electronic submissions can be via a CD, 3 ½" floppy disk or to the email address below. Metropolitan communities should submit their plans to:

Reviews Coordinator Metropolitan Council 390 Robert St, St. Paul, MN 55101	electronically to: watersupply@metc.state.mn.us