



MINNEAPOLIS COMBINED SEWER OVERFLOW PROGRAM 2008 ANNUAL REPORT

APRIL 20, 2009

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

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April 17, 2009

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NPDES/SDS Combined Sewer Overflow Permit

The 1972 amendments to the **Federal Water Pollution Control Act** (also known as the **Clean Water Act**) provided the statutory basis for the **National Pollutant Discharge Elimination System** (NPDES) permit program. The NPDES program is designed to regulate the discharge of pollutants from point sources to waters of the United States. The Minnesota Pollution Control Agency (MPCA) has issued joint NPDES Combined Sewer Overflow (CSO) permits to the City of Minneapolis (City) and Metropolitan Council Environmental Services (MCES) since 1985.

These permits regulate CSOs by defining certain conditions that should be followed if an overflow from the sanitary system occurs, including:

- Keeping detailed records of the number of CSO events
- Maintaining volume data
- Maintaining operation and maintenance data for overflow events and elimination efforts
- Cooperation of both joint permittees is also maintained

A separate inter-agency agreement between the City and MCES details each permittee's responsibilities with respect to operation of the collection system, and notification in the event of a CSO from the sanitary sewer system.

The most recent CSO permit was issued on February 26, 1997 and expired on June 30, 2001 (Permit MN 0046744). The City and MCES applied to renew this permit in December of 2000, and began negotiating with the MPCA regarding the terms for a new permit. The City has continued to operate under the expired permit requirements, and has developed a plan to control CSOs, including an aggressive approach to eliminate connected areas based on prioritizing the remaining connected areas and coordinating with scheduled capital improvement projects in Minneapolis.

Sewer Separation History In Minneapolis

The oldest Minneapolis sewers were built in 1870, and were designed to carry both sewage and stormwater. In 1922, construction started for a separate storm drain system around Minneapolis lakes, as well as newly developing areas. 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**. CSOs 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 2002 study recommended that Minneapolis:

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- Disconnect remaining public sector inflow sources: isolated catch basins (inlets), alley drains, and storm drains
- Disconnect remaining private sector inflow sources: rainleader connections, area drains, or other clean water discharges
- Study and implement storage and conveyance improvements

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. Refer to the MCES portion of this report for the current status of these initiatives.

Progress has been dramatic throughout Phase I and Phase II as upgrades to the system have been carried out (see Figure 1). Frequency and volume of untreated sewage overflowing into the stormwater system during intense rainstorms and discharging into the Mississippi River have steadily diminished. In 2007 and 2008, there were zero CSO events within the City of Minneapolis. The year 2007 was the first since the City of Minneapolis had combined sewers that untreated sewage did not pollute the Mississippi River in Minneapolis. Nevertheless, overflows could still occur and the separations that remain are generally the most difficult and complex to locate and resolve.

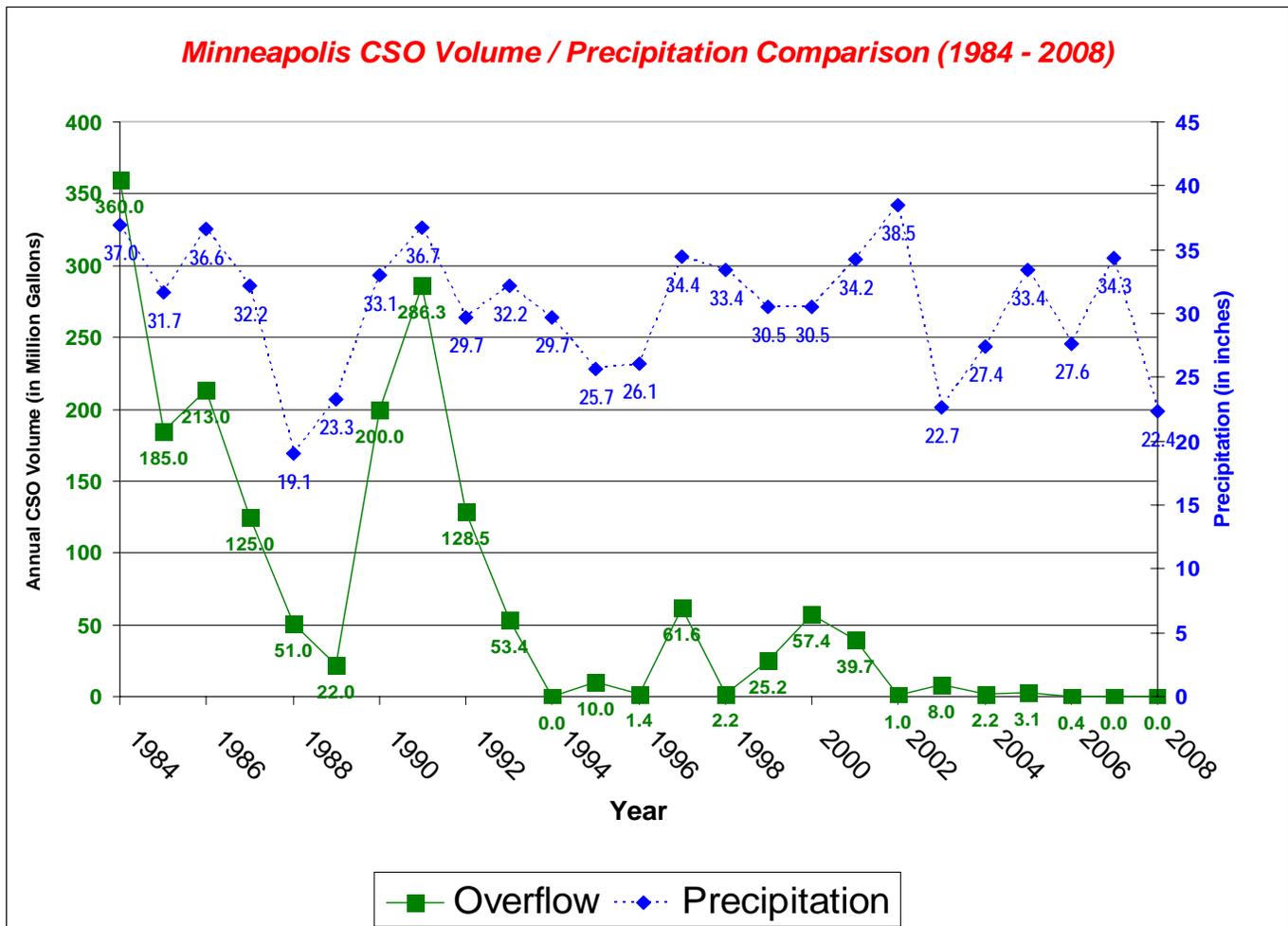


Figure 1

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Goals and Strategies

The goal of Phase II of the CSO Program is to eliminate CSOs at the eight remaining regulators/overflow structures. The following table shows information about these regulators:

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

Program Funding

New in 2007 was funding for Inflow & Infiltration (I & I) capital projects. This program augmented the existing CSO program. The I & I reduction program was implemented to meet goals established by Metropolitan Council Environmental Services (MCES). Infiltration is the seepage of groundwater into sanitary sewer pipes through cracks and joints. Inflow is typically at a structure or device that collects surface water 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. As pertains to the City of Minneapolis, the most significant part of I & I for MCES is the inflow.

MCES has measured the amount of I & I, called Excess Flow, from communities discharging wastewater to the Metropolitan Disposal System. The Excess Flow creates problems in the regional system because it uses pipe capacity and treatment plant capacity planned for growth, and can trigger bypassing of some treatment prior to discharge to public waters.

For the City, this Excess Flow creates problems because (1) if an overflow occurs 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, as described as follows:

In 2007 MCES initiated a surcharge program to compel communities to solve their I & I problems. MCES established I & I goals for all communities discharging into their treatment system, and the communities that exceed their I & I goals are required to

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develop and implement a program to reduce I & I to the established goal by the year 2012. In the surcharge 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 surcharge amount to be \$ 7.9 million for 2007 and subsequent years. As a result of the City of Minneapolis' successful programs in 2007 and 2008, MCES waived the surcharge for both of those years. MCES re-calculated the surcharge amount to be \$4.8 million for 2009 and subsequent years as a result of the City's removal of significant sources of excess flow in 2007. The City has now proposed its program for 2009, which will also qualify for a waiver in 2009. At the termination of the surcharge program, the MCES plans to institute a significant demand charge if there are communities that have not met their Excess Flow reduction goals.

I & I Program Funding for Capital Projects (amounts in \$1,000 increments)

	2007	2008	2009	2010	2011	2012	2013
Approved Budget for Capital Projects	\$5,000	\$5,000	\$5,000				
Future Budget for Capital Projects				\$5,000	\$5,000	\$7,000	\$7,500
Total Program Funding	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$7,000	\$7,500

CSO Program - Phase II Funding for Capital Projects (amounts in \$1,000 increments)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Approved Budget for Capital Projects	\$0	\$2,000	\$2,000	\$2,000	\$0	\$1,000	\$1,375	\$1,500			
Future Budget for Capital Projects (not yet approved)									\$1,500	\$1,500	\$0
Total Program Funding	\$0	\$2,000	\$2,000	\$2,000	\$0	\$1,000	\$1,375	\$1,500	\$1,500	\$1,500	\$0

In addition to capital funds described above, additional expenditures are made for operation and maintenance of the system and for program staff.

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Rainleader Disconnection Program

The objective of the Rainleader Disconnect Program (RDP) is to identify and require disconnection of all private property¹ sources of clear water inflow to the sanitary sewer system in Minneapolis. Minneapolis Regulatory Services, Environmental Management & Safety Division, in coordination with Minneapolis Public Works (MPW), is responsible for managing the RDP.

An ordinance called **Chapter 56: Prohibited Discharges to Sanitary Sewer System** went into effect in August 2003. Previous City ordinances and state plumbing codes affected only new construction, not existing connections. Under the 2003 ordinance, prohibited connections include both new and pre-existing roof drains, area drains, and other clear water connections, such as sump pumps and foundation drains. Revisions to Chapter 56 were approved in 2006 that were designed to accelerate compliance. These included adding Chapter 2 Administrative Citation enforcement and adding the ability to order connection to the City storm drain as the disconnection method.

In 2007 the Rainleader Disconnect Program completed citywide inspections of private property to identify stormwater connections to the sanitary sewer. The citywide inspections took approximately five years to complete. As of March 2009, 6,131 violations had been detected; 4,537 have become compliant, leaving 1,594 still to correct (see Figure 2).

In 2008 the RDP utilized a grant from the Mississippi Watershed Management Organization to provide materials to residential property owners that needed to disconnect downspouts from the sanitary sewer. As a result of this effort 916 properties became compliant. (These 916 properties are included in the 4,537 described in the previous paragraph.)

An increased emphasis on achieving compliance through administrative citations, fines, and hearings was introduced in 2008. If a violation property owner did not complete the required disconnection work within an existing permit, or failed to obtain a permit to complete the work, an administrative citation was issued with a fine of \$750.00. Subsequent citations were issued for continued violations with fines of \$1500.00 and \$2,000.00. During 2008, 113 properties were issued citations.

Public Systems Required for Rainleader Violations

Some properties that are in violation and are required to disconnect stormwater from the sanitary sewer (a) have no areas available on-site to which the stormwater can be re-directed in order to control the discharge rate or reduce the discharge volume, and (b) also lack a public storm drain in close proximity to which a connection can be made. Many of these properties are in commercial areas or downtown. For these properties, municipal storm drain infrastructure is extended to prevent damage from the discharge of rainleader violations. Listed below is the project completed in 2008:

<u>Rainleader Area ID</u>	<u>Location Description</u>	<u>Acres</u>
RLD007	2 nd Ave S and Marquette Ave S	2.24

¹ Private property in this context includes property owned by a governmental agency. The term "private property sources of clear water flow" is meant only to distinguish these sources from those in the public right-of-way.

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Other properties accomplish the stormwater separation in conjunction with City or County street construction projects. In 2008 a number of properties disconnected with the following projects:

- Lake Street Project (CSAH) – 8 properties
- Lyndale Ave S Project (CSAH) 8 properties
- MARQ2 – 4 properties
- SEMI, Malcolm Ave SE – 1 property
- Lowry Ave N (CSAH) – 3 properties

City of Minneapolis - Rainleader Disconnect Program
Violation Status as of February 27, 2009

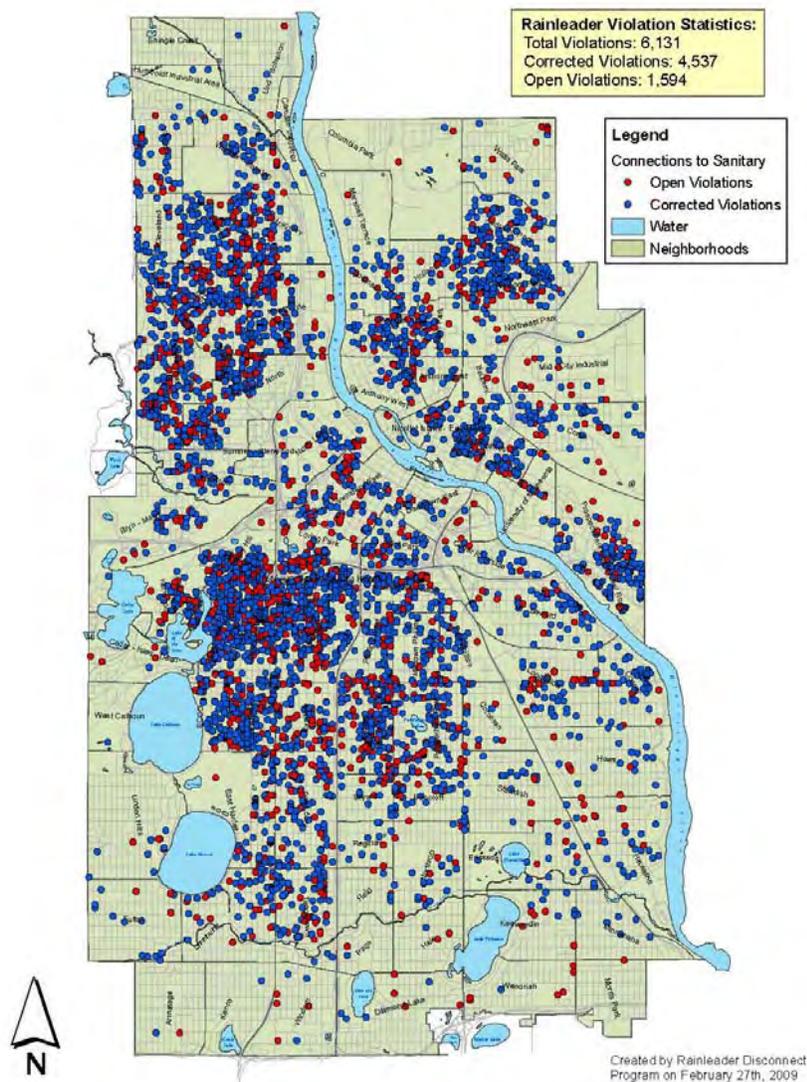


Figure 2

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Capital Improvement Projects and Maintenance Programs

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

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

Following is a list of public separation work completed in 2008:

CSO Area ID	Location Description	Acres
001	22nd Av N & 2nd St N	2.62
042	E Lake St & Stevens Av S	3.13
043	Blaisdell Av & W Lake St	0.87
046	E 34th St, 20th to 21st Av S	2.00
100	37th Av NE, Van Buren to Central Av NE	6.16
010	W 43rd St, Harriet to Garfield Av S	1.80
124	Main St NE & 3rd Av NE	0.33
110	Pleasant St, W 59th to 59th+1/2 Sts	0.90
037	E 32nd St, 19th to 20 Av S	2.10
047	E 28th to 29th St, 33rd to 34th Av S	2.75
TOTAL		22.66

Additional CSO Efforts

These activities directly or indirectly benefit the elimination of CSOs:

Sanitary System Maintenance

- Inspections of infrastructure to determine needed repairs
- The annual pipe rehabilitation program
- Replacement of sanitary manhole covers (with more than one hole) in areas where there is likely to be standing water during heavy storm events. Approximately 800 manholes have been replaced thus far. In 2008, 28 manhole covers were replaced.

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- Repairs and bulkheading of sanitary pipes where an overflow previously existed
- Focus on staff education to help identify I & I sources in the field.

Sanitary System Smoke Testing

Determining the location of structures or devices that permit surface water to enter the sanitary sewer requires numerous techniques. Smoke testing is one of those techniques. In 2007, smoke testing was used in the Bryn Mawr neighborhood, as a follow-up to a pilot metering project that 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 2008, Minneapolis Public Works commenced a comprehensive flow metering program. The program initially proposed to complete flow metering citywide within 30 months by dividing the city into 5 areas served by major interceptors, and metering each area for 6 months using approximately 50 meters. The priority of meter placement depended on the ratio of peak flow to average flow during rainfall events. Due to the characteristics of inflow rates in the city, a minimum precipitation rate of 1.77 inches in 24 hours was determined to be needed in order to locate inflow. This event size mirrors that used by MCES to calculate the City's excess flow. The meters for the first area were placed in August 2008 but there were no precipitation events in 2008 that had the necessary characteristics. The program duration has now been extended due to the lack of sufficient precipitation. For planning purposes, metering duration for each of the five areas has been increased to 12 months. Consequently, the completion of this flow metering may require 60 months. The major inflow is concentrated along three of the major interceptors and therefore the location of the majority of the inflow will be identified within the next 36 months. The meters are intended to converge on the major sources of Inflow so that those sources can be identified and removed. Detailed identification will use smoke testing as described above.

Regulatory CSO Efforts

Minneapolis Regulatory staff assists the CSO Program in locating, investigating and resolving areas through the review of record drawings, or through the Minneapolis Development Review (MDR) process. In 2008 MPW staff continued to require complete separation of all sites that are reviewed by the MDR committee. This included 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.)

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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 2008 estimate of 87.17 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-SWS 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.

Additional Regulatory Initiatives

- The City will continue to review sewer and water connections for possible combined connections before issuing any new or repair permits for those properties.
- City utility and plumbing inspectors continue to identify and report combined systems as part of their current work duties.
- The City will continue education of City staff from MPW, the City's Planning and Zoning sections, and the Regulatory Services Department on the importance of eliminating combined sewer connections.

Regulator Elimination and Maintenance

A regulator is a device installed in combined systems to control the amount of flow into the 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 water quality of the river, 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, however all eight are operated and managed 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.

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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 relief necessitated by extreme storm or flood events, or to minimize damage due to accidents or system failures.

Minneapolis Flood Mitigation Program

Construction of projects from the Flood Mitigation Program has the benefit of reducing I & I to the sanitary system. No specific flood control projects were partially constructed or completed in 2008.

In addition to specific Flood Mitigation Program projects, each CSO project and each rainleader project contains flood mitigation so that the discharge of stormwater removed from the sanitary sewer does not create new localized flooding problems.

Sanitary Sewer Collection System

The Sewer Maintenance section of MPW–SWS routinely inspects sanitary infrastructure, and performs needed maintenance to ensure proper operation. The sanitary sewer system within the City of Minneapolis is 852 miles in length. Of those, 777.2 miles of sewers are owned and maintained by the City, while 74.8 miles are owned and maintained by Metropolitan Council Environmental Services (MCES). Minneapolis Sewer Maintenance staff has divided the City into 100 areas for their sewer main cleaning program. This program is significant to the CSO program because it uncovers and reveals I&I. Sewer mains are cleaned by different methods including jetting, discing or rodding. Annual records are kept that describe the condition, as well as the cleaning that was done for that year. City staff also utilizes GIS to create maps to better track progress.

Each year, sanitary sewers are selected for cleaning on the basis of past experience, pipe size and location (in relation to flood-prone areas and poor soil conditions). Some mains are cleaned annually, but occasionally additional cleanings might be needed.

The 10 sanitary pump stations in the City are cleaned each spring, and then checked weekly to determine if additional cleaning is needed. In addition to cleaning, maintenance in 2008 also included:

- 3 major sanitary sewer repairs
- A total of 14,447 feet (2.7 miles) of sanitary sewer lined with a cured-in-place liner
- 299 (requested by residents) possible sanitary backups were inspected. Of those 299 possible backups, 11 were found to be plugged & were repaired.
- 5,441 problematic sanitary locations were inspected
- 17 sanitary cave-ins were addressed
- 128 minor sanitary repairs were addressed
- 387 miles of sanitary sewer were jetted with high pressure forced water

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- 1.77 miles were jetted and vacuumed
- 10.37miles of sanitary sewer were rodded (cleaned)
- 32.95 miles of sanitary sewer were televised

Storm Drain Collection System

The Sewer Maintenance section also routinely inspects storm drain infrastructure, and performs needed maintenance to ensure proper operation. Inspection and maintenance frequency are event-driven, based on experience and inspection results history.

There are currently 150 grit chambers in Minneapolis that help in sediment, debris, and oil collection. This number has increased each year. These grit chambers are inspected each spring and fall, and cleaned if necessary. Sediment is removed, the presence of floatables is noted, and the grit chamber cleaning dates are logged. This information is then compiled into a database that is maintained by the Sewer Maintenance section of the Surface Water & Sewers Division.

Storm drain outfalls are inspected on a five-year schedule, generating information on:

- Condition of structures
- Significant erosion
- Any necessary repairs

Grit chamber maintenance and repairs are planned within the constraints of resources and budget, as well as the schedules of other operations. Ponds and pump stations are inspected after significant rainfall events; however, other events might require a maintenance response.

Catch basins are cleaned, removing accumulated sediment, trash and debris. This prevents pollution of receiving waters and minimizes flooding problems. Street Maintenance performs annual inspections, during which they clean catch basin grates on summer street sweeping routes, removing debris and sediment from blocked structures.

Statistics from the 2008 Sewer Maintenance program:

- Completed 3 major storm drain repairs
- 26 feet of storm drain was lined with a cured-in-place liner
- Inspected 270 and cleaned 128 grit chambers. A total of 555 cubic yards was removed and properly disposed of.
- Maintained 11 stormwater holding ponds
- Inspected 81 of 387 storm drain outfalls. Of those 81 inspected, 4 needed maintenance or repair.
- Monitored and maintained 25 pump stations