



# MINNEAPOLIS COMBINED SEWER OVERFLOW PROGRAM 2010 ANNUAL REPORT

APRIL 20, 2011

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

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## **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 overflow 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 and appropriate operation and maintenance of the system(s).

## **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 Brown & Caldwell study entitled **Combined Sewer Separation Evaluation** that identified inflow, rather than infiltration, as the major contributor to CSOs. The 2002 study recommended that Minneapolis:

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

- Disconnect private sector inflow sources: rainleader connections, area drains, or other clean water discharges
- Study and implement storage and conveyance improvements

### Current Status and Progress

The City of Minneapolis system is a combined system due to the known inflow at catch basin and roof leader connections, and unknown sources of inflow and infiltration (I & I). Progress has been made, but separation is not complete (see Figures 1 and 2).

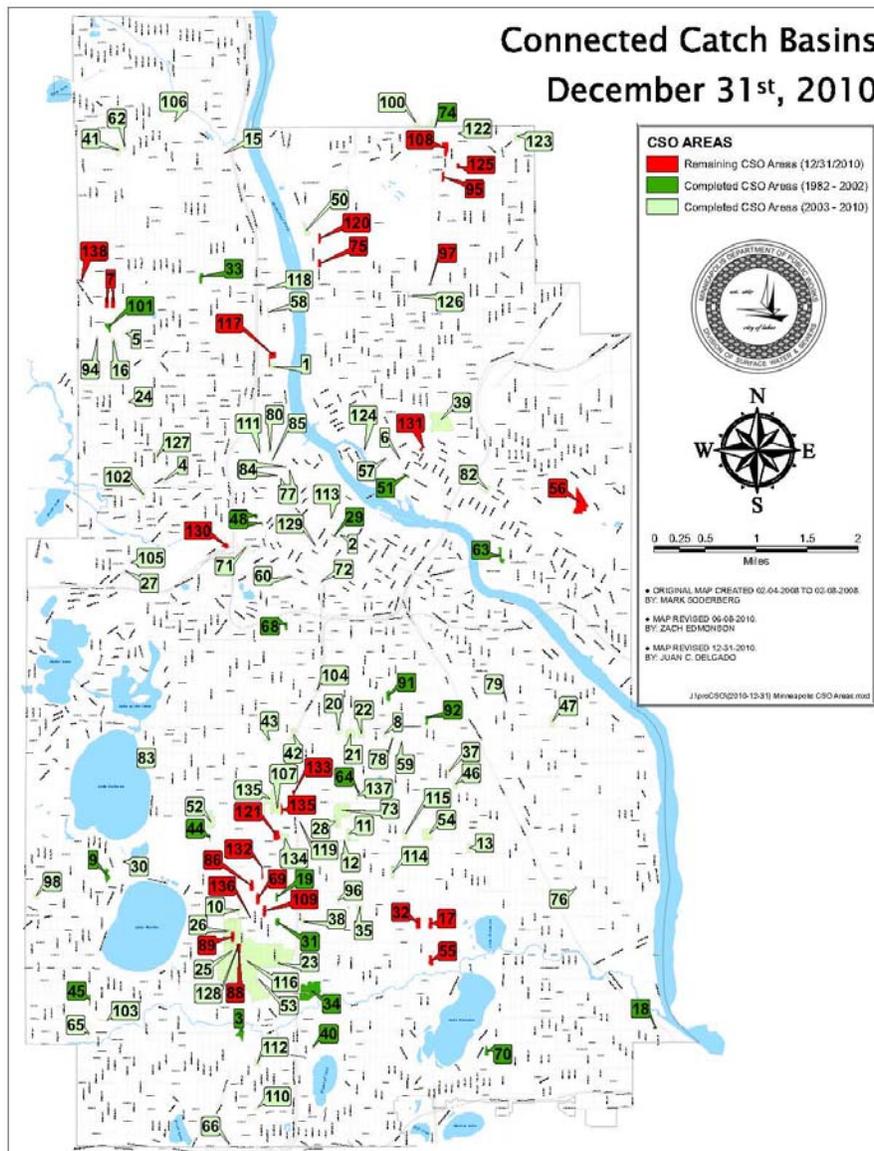


Figure 1

### City Minneapolis - Rainleader Disconnection Program Status as of 03/22/2011

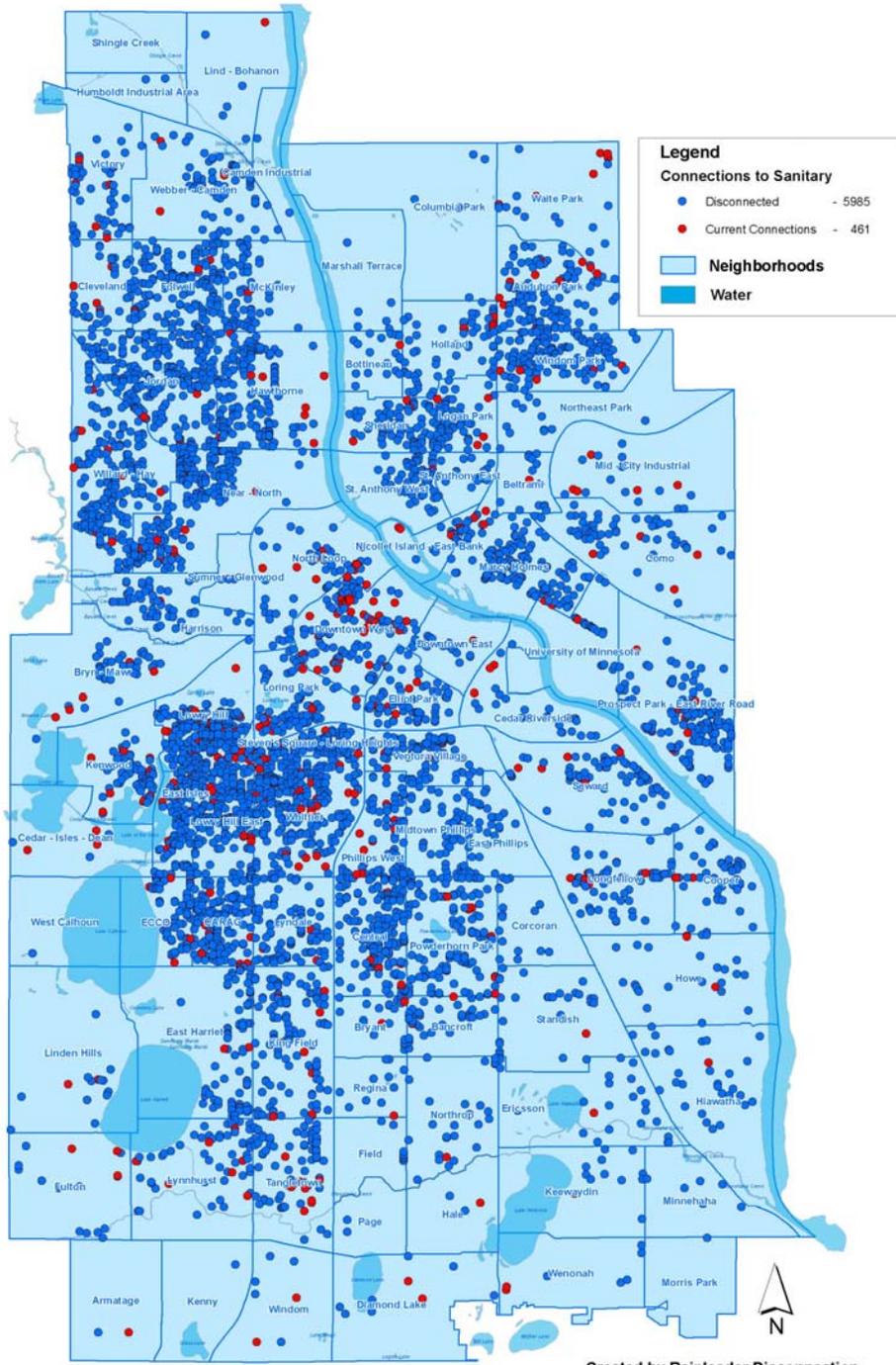


Figure 2

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Progress has been dramatic throughout Phase I and Phase II as upgrades to the system have been carried out (see Figure 3). Figure 3 indicates a very high percent capture since 1984. Frequency and volume of untreated sewage overflowing into the stormwater system during intense rainstorms and discharging into the Mississippi River have steadily diminished. After having no CSO events to the Mississippi River in the past three years, the City of Minneapolis experienced two overflows in 2010 (June and August). This is a reminder that overflows can still occur. The separations that remain are generally the most difficult and complex to locate and resolve.

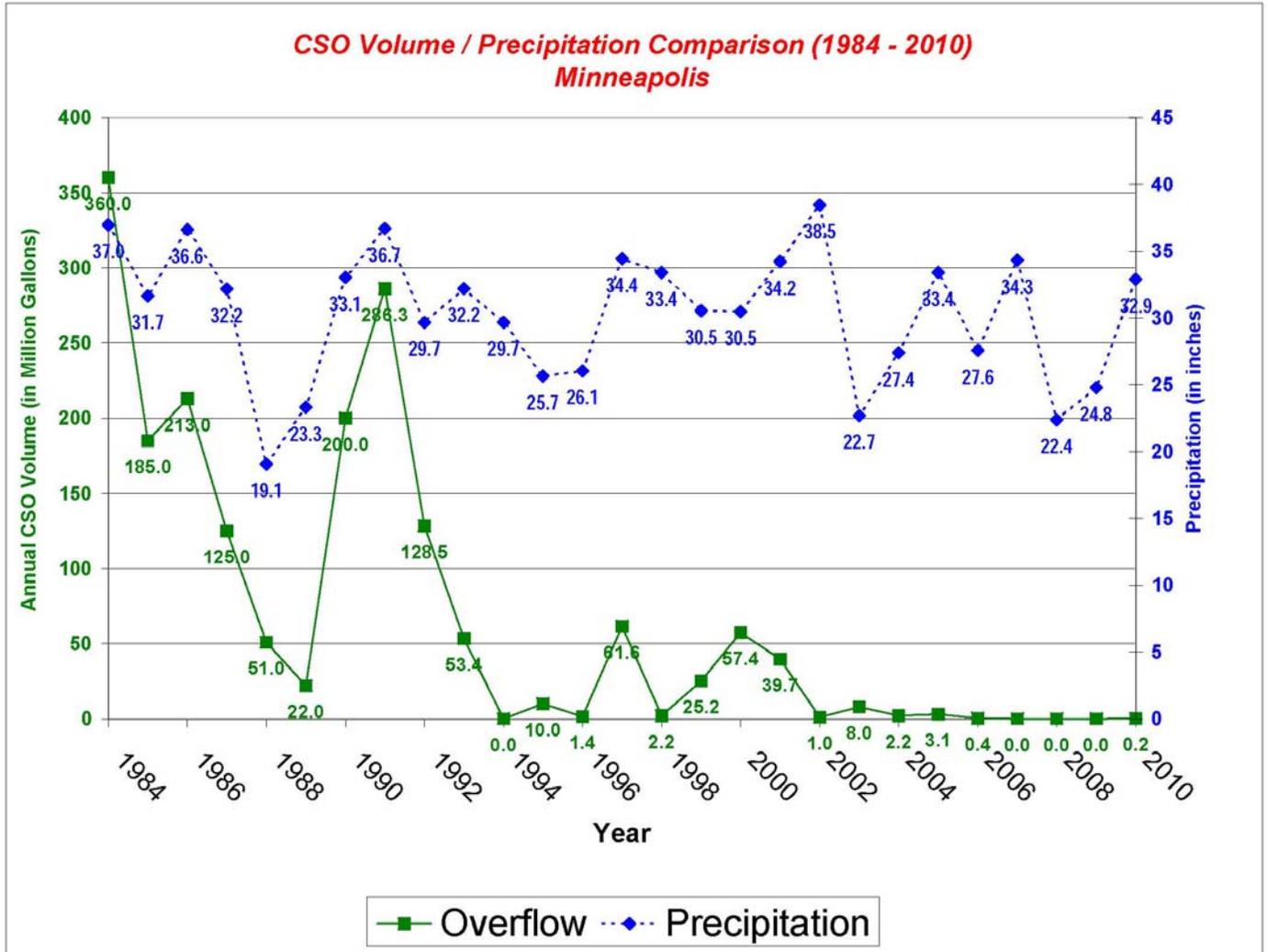


Figure 3

The following table shows information about the eight regulators remaining in Minneapolis:

<b>Regulator Site Location</b>	<b>Regulator Number</b>	<b>Responsible Party</b>
39 <sup>th</sup> Av S & Minnehaha Parkway	M001	MCES
38 <sup>th</sup> St E & 26 <sup>th</sup> Av S	M002	MCES
Southwest Meters	M004	MCES
Northwest Meters	M005	MCES
East Meters	M006	MCES
26 <sup>th</sup> St E & Seabury Av	M007	MCES
Oak St SE & 5 <sup>th</sup> 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.

Since the start of the Phase II Minneapolis Combined Sewer Overflow Program in 2002, Minneapolis Public Works Surface Water & Sewers Division personnel (MPW-SWS) have identified, categorized, and prioritized 138 "CSO areas", meaning areas in the right-of-way with known connection of stormwater drainage to the sanitary sewer system. The CSO Program coordinates with the Minneapolis Capital Improvement Project schedule to address any CSO areas within the 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 CSO areas as part of their current activities
- Continued education of City staff on the importance of identifying and disconnecting CSO areas

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Following is a list of public separation work completed in 2010:

<b>PROJECT NAME</b>	<b>PROJECT LOCATION</b>	<b>ACRES</b>
CSO #038	Alley between 2 <sup>nd</sup> & 3 <sup>rd</sup> Av S to E 44 <sup>th</sup> St E to 5 <sup>th</sup> Av S	1.26
CSO #126	23rd Av NE & Monroe Av NE	2.98
CSO #137	Chicago Av S, mid-block CB's between 34 <sup>th</sup> & 35 <sup>th</sup> Av S	0.99
RLD #010	16 6 <sup>th</sup> St N to 1 <sup>st</sup> Av N	0.10
Storm/Sanitary Tunnel Repair	2nd Ave S – Storm tunnel breach to sanitary system repaired	
<b>Total Area Removed in 2009</b>		<b>5.33</b>

A targeted metering program was initiated in 2008. One of the goals of this investigation is to identify sources of unknown inflow and infiltration. The program has the following components:

- 1) Flow metering installation
- 2) While metering, the metered area is smoke tested
- 3) Manhole covers in the area tributary to the meters are inspected
- 4) The metered area is modeled

The goal of this investigation project is to isolate and identify enough inflow to achieve the goal of eliminating combined sewer overflows.

The unknown sources of inflow have an effect on the system demonstrated by the following meter data in Figure 4. This metering data reveals an immediate reaction of increased flow in the sanitary system after a rainfall event. This meter is located on the City's system in north Minneapolis on 2<sup>nd</sup> St N, just north of 18<sup>th</sup> Ave N and is representative of inflow in the sewer shed north of downtown Minneapolis.

During a routine inspection of the City's downtown tunnel system on July 20, 2010, a breach between the storm system and the sanitary system was identified. This was previously inspected and not visible during a previous inspection in May. Once identified, City staff quickly assembled plans and special provisions and completed this project. Construction started in September 2010 and was completed in January 2011.

### 1-MN-310 Site 310i3 - 2nd St N & 18th Ave N

June 25, 2010 Rainfall Event

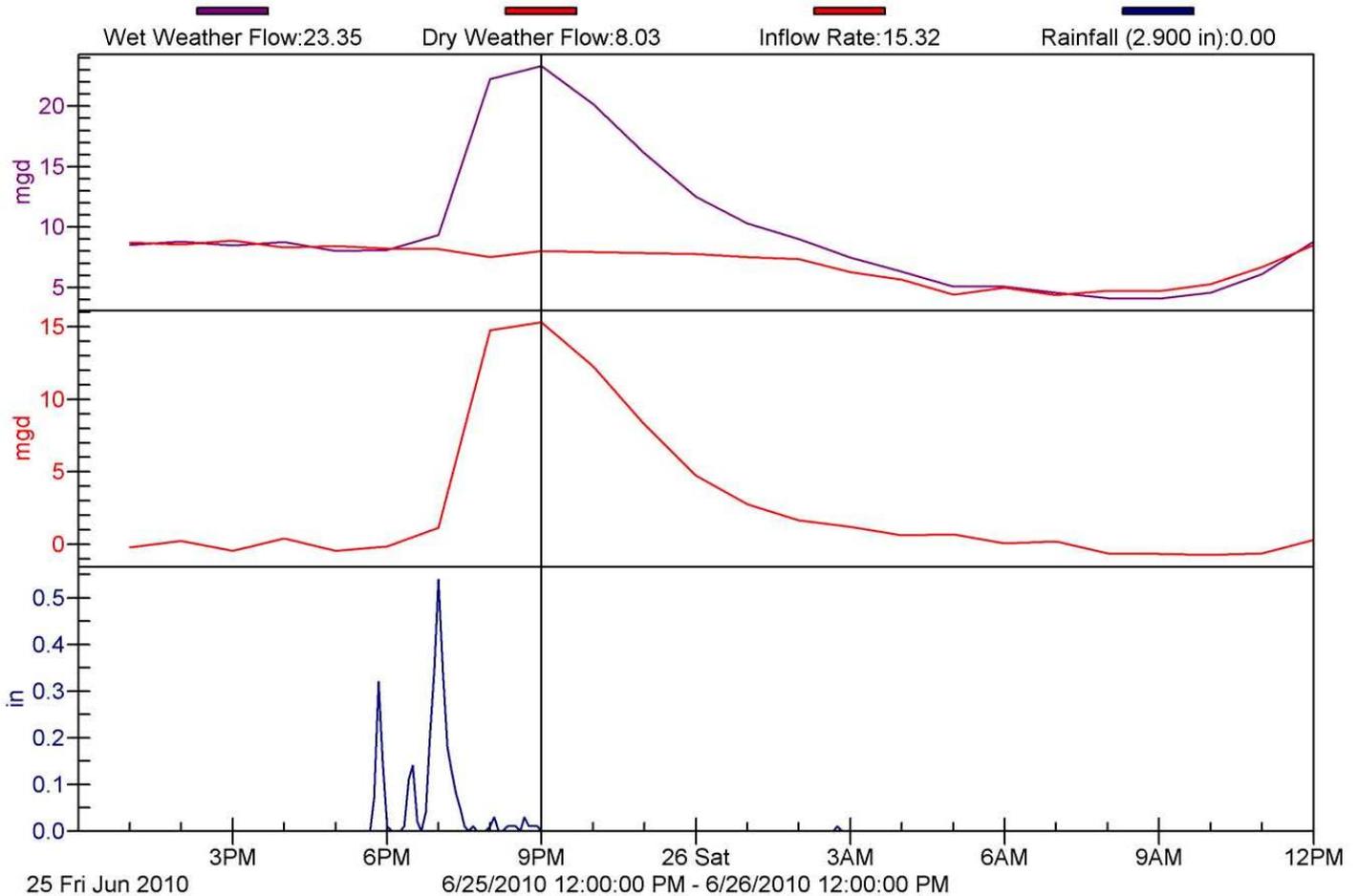


Figure 4: Meter Data

#### **Additional Activities**

These activities directly or indirectly benefit the elimination of CSOs:

#### **Minneapolis Flood Mitigation Program**

Construction of projects from the Flood Mitigation Program has the benefit of reducing inflow and infiltration to the sanitary system.

- Construction for a 45-acre section of Flood Area 5 (Phase 1) began in December 2009, and the new underground storage chambers and surface bioretention cells are scheduled for completion in Fall 2011.
- Street renovation in the Lynnhurst neighborhood also included two locations of sewer improvements to reduce intersection flooding. Catch basins and sewer pipes were constructed to better handle drainage and keep standing

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water out of intersections. This will reduce the stormwater from entering the sanitary system through manhole structures at the surface.

### **Sanitary Sewer Collection System**

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 MCES.

Minneapolis has a program to replace sanitary manhole covers with more than one hole, in areas where there is likely to be standing water during heavy storm events. Approximately 726 covers have been replaced thus far, including 608 in 2010.

The Sewer Operations section of MPW–SWS routinely inspects sanitary infrastructure, and performs needed maintenance to ensure proper operation. 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 inflow and infiltration (I & I). Sewer mains are cleaned by many different methods, which include jetting, discing and 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 are needed.

The 10 sanitary lift 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 2010 also included:

- 6 major sanitary sewer repairs
- A total of 20,298 feet (3.84 miles) of sanitary sewer lined with a cured-in-place liner
- 242 (requested by residents) possible sanitary backups were inspected. Of those 242 possible backups, 15 were found to be plugged & were repaired.
- 5,441 problematic sanitary locations were inspected
- 0 sanitary cave-ins were addressed
- 80 minor sanitary repairs were addressed
- 380 miles of sanitary sewer were jetted with high pressure forced water
- 20.75 miles of sanitary sewer were rodded (cleaned)
- 38.69 miles of sanitary sewer were televised

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## **Storm Drain Collection System**

The Sewer Operations 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 151 grit chambers in Minneapolis that help in sediment, debris, and oil collection. 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 Operations 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. The MPW - Street Maintenance section 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 2010 Storm Drain Maintenance program include:

- Completed 2 major repairs to the storm drain system
- Performed 224 minor repairs to storm drain lines, catch basins or manholes
- Televised and condition assessed 1.56 miles of storm drain pipe
- Inspected 181 and cleaned 137 grit chambers. A total of 468.25 cubic yards was removed from the grit chambers and another 149 cubic yards was removed from a storm tunnel, for a total of 617.25 cubic yards that was removed and properly disposed of.
- Maintained 11 stormwater holding ponds
- Inspected 86 of 387 storm drain outfalls. Of those 86 inspected, 3 needed maintenance or repair.
- Monitored and maintained 26 pump stations
- Inspected 9.63 miles of deep storm tunnels to determine the priority of work needed. The remaining segments will be completed in 2011.
- 3.66 miles of storm drain were jetted with high pressure forced water
- 62 feet of storm drain was lined with cured in place pipe

## **System Challenges**

The City of Minneapolis has separated a significant amount of clear water out of the sanitary sewer system and is moving it to the stormwater system. The remaining sources of inflow pose both technical and financial challenges. The receiving stormwater system is at or above capacity in many locations and creating structural and operational risks with the infrastructure. Much of the system consists of storm tunnels. During rain events, manhole covers throughout the storm system are forced off the casting and create hazards as a result of the pressure in the tunnel and large diameter pipe. Structural deficiencies in the tunnel system include longitudinal cracks, liner failure, groundwater infiltration and voids in the sandstone surrounding the tunnel. The system needs a significant amount of maintenance and rehabilitation prior to adding additional water. The City has identified priority needs in the storm tunnel system and is beginning to actively address structural deficiencies. In addition, there are discussions to identify funding sources to assist with the design and construction of a parallel I-35W South tunnel to provide the necessary capacity in that tunnel system.

There are also known areas with localized flooding. Moving additional clear water to a system that is causing the flooding exacerbates the problem. In these situations, we cannot just separate the clear water, but must also respond to the risk of property damage.

In some instances, removing additional clear water and routing instead to the storm drain system is met by additional challenges from watershed organization rules or impaired water status.

Operating and maintenance costs are also increasing as a result of sedimentation occurring in the pipes due to inadequate velocities in the combined pipe system. The sedimentation is also causing methane gas build up and increase corrosiveness in the system.

## **Future Improvements**

The City of Minneapolis will continue to make further reasonable progress maintaining and rehabilitating the combined sewer system and the storm sewer system, and increase the performance of those systems keeping in mind the goal of being the highest performing CSO system.