



ANNUAL REPORT ON 2017 MINNEAPOLIS COMBINED SEWER OVERFLOW PROGRAM & 2016 ACTIVITIES

APRIL 20, 2017

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 event 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 joint permittees

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 drainage 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 included the construction of storm infrastructure to disconnect stormwater runoff from 4,600 acres tributary to the sanitary sewer system. The Phase I program was supported in part by federal and state funds.

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*. The study 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 (storm drain 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

CSO Program - Current Status and Progress

The City of Minneapolis continues efforts to remove inflow at catch basin and roof leader, and unknown sources of Inflow and Infiltration (I & I). Progress has been made, but separation is not complete (see Figures 1 and 2).

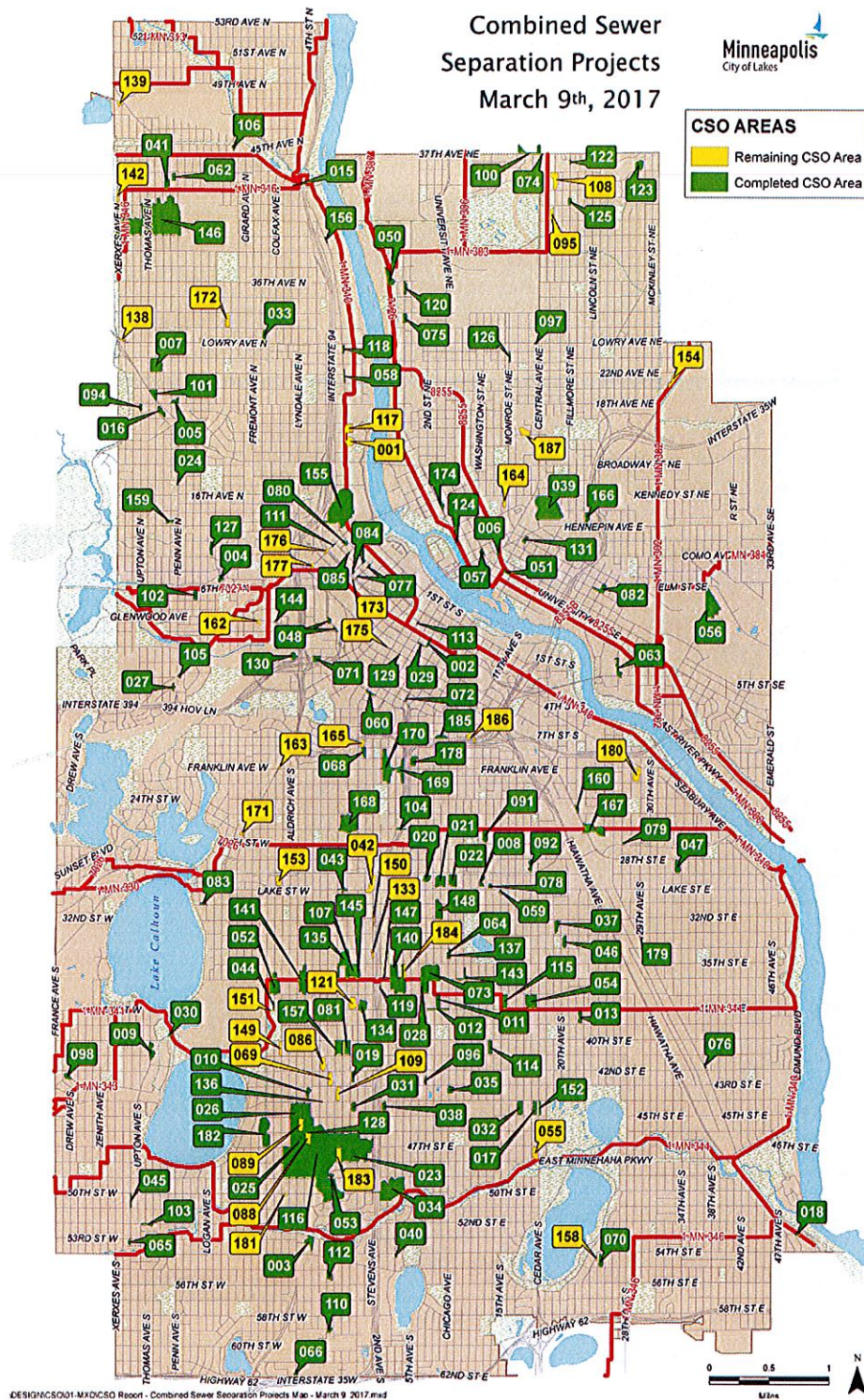


Figure 1 - Combined Sewer Separation Projects

Legend

Connections to Sanitary

- Disconnected - 7,049
- Current Connected - 308

Neighborhoods

Water

Created by Rainleader Disconnect Program Staff 02/24/2017

Figure 2 – Rainleader Disconnection Program Status

Progress has been dramatic throughout both 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.

Minneapolis has had zero CSO events to the Mississippi River in nine of the past ten years (two very small events occurred in 2010). Although combined sewer overflows can still occur, many years of dedicated efforts by Minneapolis Public Works staff have resulted in fewer CSO events. The remaining known connections are the most difficult and complex to resolve.

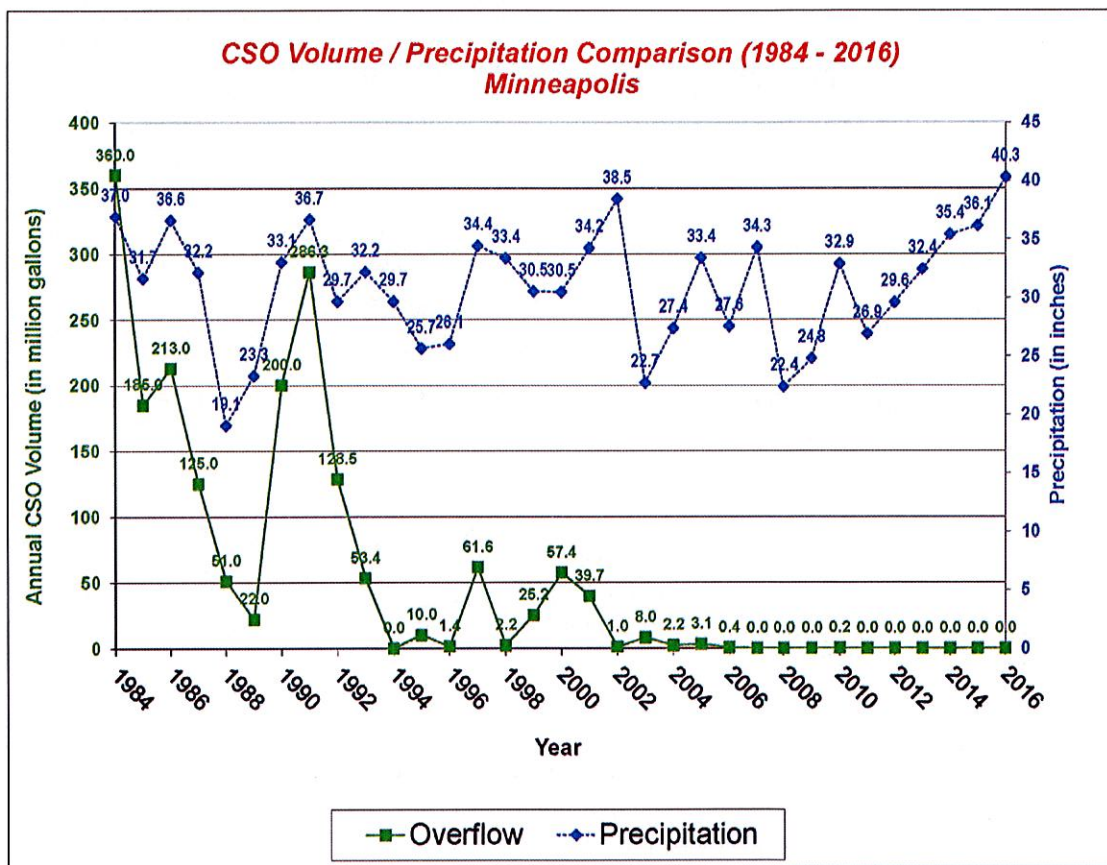


Figure 3 - Annual CSO Volume Precipitation

There are currently seven remaining overflow regulators in Minneapolis at the locations shown in Table 1. 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. Five of the regulators discharge to outfalls on the municipal storm drain system and two of the regulators (Southwest and Northwest meters) are direct outfalls from the MCES sanitary system. MCES is the responsible party for operation and maintenance of the regulators.

Regulator Site Location	Regulator 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
Portland Av & Washington Av S	M020	MCES

Table 1 - CSO Regulators

Since its inception in 2002, Minneapolis Combined Sewer Overflow Program, Phase II, Surface Water & Sewers Division personnel have identified, categorized, and prioritized 186 “CSO areas”, meaning areas in the right-of-way with a known connection of stormwater drainage to the sanitary sewer system. CSO projects are then programmed to separate these areas. Occasionally, new CSO areas are discovered by City 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
- Flow metering and smoke testing programs

2016 Completed CSO Projects (public separation work)

PROJECT NAME	PROJECT LOCATION	DRAINAGE ACRES
CSO56	24th Ave SE & Elm St SE	10.29
CSO159	Queen Ave N & Plymouth Ave N	1.2
CSO173	6th Ave N & 5th St N	0.22
CSO179	Minnehaha Ave S & 29th Ave S	0.11
CSO185	17th St E & Chicago Ave	1.42
Total Drainage Area Removed in 2016		13.24

Table 2- Completed CSO Separation Projects

Minneapolis initiated a program to identify and repair unknown sources of Inflow and Infiltration (I&I). The 2016 I&I program included the following components:

- Flow metering installation – 49 sites
- Smoke testing - 105 miles of smoke testing was completed in 2016. Since 2007 551 miles have been tested.
- CSO Investigations – Potential connections between the storm and sanitary sewer system are identified from record drawings as the City reviews and update the GIS database. 9 CSO investigations were completed in 2016.
- I&I Repairs – repairs to sewers manholes and bulkheads were identified from smoke testing and CSO investigation. 68 I&I repairs were completed in 2016.

Unknown sources of inflow have an effect on the system demonstrated by the following meter data in Figure 4. The graph compares wet weather (black series) and dry weather flow (gray series). The difference between wet weather flow and dry weather flow is inflow (red series). These metering data reveal an immediate reaction of increased flow in the sanitary system after a rainfall event (olive).

This meter depicted by Figure 4 is located on the City's system in Minneapolis on Washington Ave SE & Huron Blvd. This is representative of inflow in a sewershed located in Southeast Minneapolis.

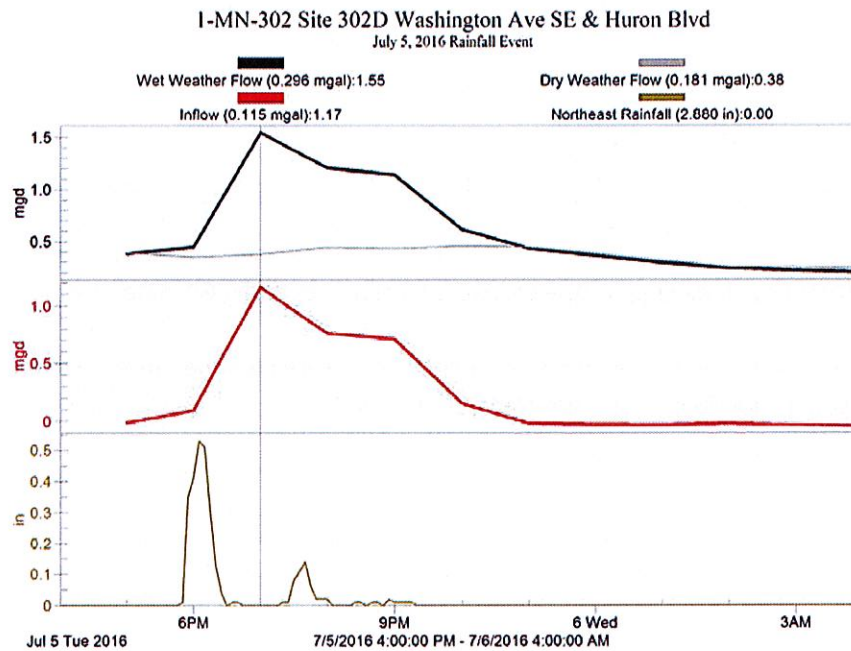


Figure 4 - Flow Metering Data

Additional CSO Program Activities

These activities directly or indirectly benefit the elimination of CSOs:

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.

The Sewer Operations section 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.

Sanitary sewer mains that are smaller than 18" are cleaned on an 8 to 24 month frequency, but occasionally additional cleanings are needed due to fats, oils, grease or pipe condition. The 10 sanitary lift stations in the City are inspected each spring, and then checked on a regular basis to determine if cleaning is needed.

In addition to cleaning, maintenance in 2016 also included:

- 64 major sanitary sewer repairs
- 7.01 miles of sanitary sewer lined with a cured-in-place
- 108 (requested by residents) possible sanitary backups were inspected.
- 36 minor sanitary repairs were addressed
- 254.5 miles of sanitary sewer were jetted with high pressure forced water
- 65 miles of sanitary sewer were televised

The Sewer Division also has invested significant resources in the past few years towards implementation of a computerized asset management system (Maximo) to better track cleaning and maintenance records and to improve overall management of the collection system. This system is planned to go online in 2017.

Storm Drain Collection System

Minneapolis Sewer Operations section 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 145 grit chambers in Minneapolis that are inspected, cleaned and maintained. These grit chambers help to prevent sediment, debris and oil from entering area lakes, rivers and streams. Grit chambers inspection is based on a schedule by Minneapolis Sewer Operation personnel, and cleaned if necessary. Sediment is removed, the presence of floatables is noted, and the grit chamber cleaning dates are logged recorded in a database.

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, 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. Employees from the Public Works division of 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 2016 Storm Drain Maintenance program include:

- 66 major repairs to the storm drain system
- Performed 318 minor repairs to storm drain lines, catch basins or manholes
- Televised and condition assessed 2 miles of storm drain pipe
- Inspected 131 and cleaned 121 grit chambers. A total of 320 cubic yards was removed from the grit chambers.
- Maintained 11 stormwater holding ponds
- Dredged 2 stormwater ponds
- Inspected 133 of 387 known storm drain outfalls. Monitored and maintained 26 pump stations
- 44.6 miles of storm drain were jetted with high pressure forced water

System Challenges

The City of Minneapolis has separated a significant amount of clear water from the sanitary sewer system 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, creating structural and operational risks with the infrastructure. Much of the City's storm system ultimately discharges into storm tunnels. During heavy rain events, pressurization occurs, creating various problems that affect the integrity of the storm tunnels. These problems include fracturing of the tunnel liner, which in turn creates voids in the sandstone surrounding the tunnel. Some of the storm tunnel system needs a significant amount of maintenance and rehabilitation before it is safe to add additional stormwater. The City has identified priority needs in the storm tunnel system and is working actively to 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 across the City with localized flooding. Directing additional clear water to a storm system that is already capacity limited may exacerbate flooding problems. In these situations, we cannot just separate the clear water, but must also respond to the risk of property damage.

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

Removal of I&I from the sanitary system contributes to increasing operating and maintenance costs because when flows are reduced, increased sedimentation occurs in some previously combined pipes. The sedimentation is also causing methane gas build up and increased corrosiveness in the system. This puts added stress on resources necessary to maintain an aging 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.

