



APPENDIX WR3: COMPREHNSIVE SANITARY SEWER PLAN

Comprehensive Sanitary Sewer Plan

Sanitary Sewer System

Projected Flows

Projected flows for the sanitary sewer system shown below uses data from the City’s System Statement prepared in 2015 and linear projections to estimate future flows. The projections were estimated based on historical flow data and project sewered housing and employment data. In 2018 the City’s average sanitary sewer flow measured by MCES was recorded as 1.77 million gallons per day (MGD). Table SS-1 provides projected flows for the City.

Table SS-1 – Projected Wastewater Flows (2018-2040)						
	2015	2020	2025	2030	2035	2040
Sewered Population	19,227	18,900	19,250	19,600	19,850	20,100
Sewered Households	8,770	9,300	9,550	9,800	9,950	10,100
Sewered Employment	15,177	14,700	15,100	15,500	15,850	16,200
Average Annual Wastewater Flow (MGD)	1.63	1.67	1.67	1.66	1.66	1.66
Allowable Peak Hourly Flow (MGD)		4.84		4.81		4.81

Sanitary Sewer System Inventory

Sanitary Sewer Collection System

The City of Hopkins sanitary sewer system includes approximately 231,000 LF of sewer pipe, some areas of the system have been in service in excess of 60 years. The system includes DIP, PVC, RCP, VCP pipe material and range in size from 4 to 33 inches. Seven lift stations are owned and maintained by the City of Hopkins. Existing sanitary sewer system facilities are illustrated on Figure SS-1.

The City’s sanitary sewer collection system generally collects and conveys wastewater to the 33-inch trunk sewer located in Excelsior Boulevard west of Highway 169. At Highway 169 the alignment of the trunk sewer changes course to the north along the east side of the highway to Lake Street. The trunk sewer then turns east on Lake Street to discharge into the MCES Lift Station at Blake Road North.

The City of Hopkins sends the bulk of its sanitary sewer wastewater to two Metropolitan Council Lift Stations. One of these lift stations (M123) is located on Lake Street, just west of Blake Road. The second (M122) is located along Excelsior Blvd near the easterly city limits. Some of the City’s wastewater, along the westerly and northerly city limits, is discharged to the City of Minnetonka collection system, as shown in Figure SS-1.

Lift Stations

The City owns and operates five sanitary sewer lift stations. All of the stations are outfitted to receive emergency back-up power using a portable generator and are monitored using SCADA technology.

Comprehensive Sanitary Sewer Plan

Lift Station No. 1 (Removed from Service)

This lift station was removed from service in 2010. It was formerly located along 2nd St N at 21st Ave N. The sanitary sewer flow was rerouted to a City of Minnetonka trunk sewer main.

Lift Station No. 2

This lift station is a submersible type duplex lift station, which serves a small area just west of Oakridge Road. This lift station is a steel fabricated “Can” type wet-well and was converted to its current configuration from an air pump system. New ball check valves were installed in 2005. Check valves are located inside the wet-well. Controls were installed in 1990 when the lift station was last rehabilitated.

Lift Station No. 3 (Ownership Transferred)

This lift station is located near Highway 7 and Blake Road and serves two properties. It is a wet-well/dry-well configuration and is in good condition. This lift station was constructed in 1985.

Ownership and maintenance of this lift station was transferred to a private party in 2015. An evaluation is planned to be completed in 2019, as part of the City’s 2019 Street & Utility Improvements Project. The evaluation is intended to investigate the potential to eliminate this lift station with a gravity solution.

Lift Station No. 4

This lift station is located at the south end of Meadowbrook Road in the center of (under) the dead end roadway. It is a submersible type duplex lift station serving a mainly residential area south of Excelsior Boulevard and Blake Road. This station was rehabilitated in 1991 with new pumps and controls.

The lift stations check valves are located in the wet-well. The stations control panel is located at the side of the street. The City considered some improvements to the station in 2010, but they were not completed.

Lift Station No. 5

The lift station is located on Excelsior Boulevard just south of Methodist Hospital in St. Louis Park. This station is housed in a building located off street and has no issues with accessibility. Access to the lift station is provided with a gated concrete driveway. It is a submersible type duplex configuration and services the residential and business areas at the east end of the City. The station was rehabilitated in 1998 when it was reconfigured from a wet-well/dry-well system. The MCES metering is located at this site. A fixed emergency back-up power generator is located in the building.

Lift Station No. 6

This lift station is located at 8546 Excelsior Boulevard near the Blake Road intersection. It is located in the parking lot on the North side of Excelsior Boulevard. It is a submersible type lift station that was reconstructed in 2000 as part of the Excelsior Boulevard reconstruction project.

This station’s lag pump on is also the alarm level. This is due to the elevation of an apartment building to the east. Once the alarm level is tripped the City has approximately 30 minutes before the apartment building surcharges.

Lift Station No. 7

This lift station is located at 6th Avenue South and 8th Street South. This station is housed in a building

Comprehensive Sanitary Sewer Plan

located off street and has no issues with accessibility. Access to the lift station is provided with a bituminous trail. It is a wet-well/dry-well configuration and services the residential and business areas south of Excelsior Boulevard and West of Highway 169. The lift station was rehabilitated in 2005 with new controls, piping, and an emergency power generator.

Table 5 – Lift Station Inventory					
Lift Station Number					
	2	4	5	6	7
Date Originally Installed	1959	1954	Rebuilt 1961		1970
Year of Rehabilitation	1990	1991	1998	2000	2005
Type	Duplex	Duplex	Duplex	Duplex	Duplex
Configuration	W	W	W	W	W/D
Pump Horsepower	5	10	10	10	50
Wet-well Diameter (ft)	5	6	6	8	14 x 8
Forcemain	4 in	6 in.	10 in.	8 in.	14 in.
Emergency Power	Portable	Portable	Fixed	Portable	Fixed
Notes:	W-Wet-well configuration, W/D wet-well/dry-well configuration.				

Gravity Collection System

The existing gravity sanitary sewer collection system is shown in Figure SS-1. An evaluation of gravity sanitary sewer pipe capacity was completed as part of the 2008 Comprehensive Planning process. At that time, no areas were identified to have pipe capacity (a function of pipe size, material, and slope) under that of demands placed on it. The evaluation included some assumptions for redevelopment in east end of Downtown.

Hopkins Public Works has a significant amount of experience working with its sanitary sewer system and has addressed known capacity issues. The City of Hopkins is fully developed and added sewer flows in the future will primarily be due to redevelopments. As areas are identified for likely redevelopment it is recommended a sanitary sewer capacity analysis be completed to confirm capacity of downstream sewers, particularly in areas where Hopkins Public Works is aware sewer flow demand is approaching pipe capacity.

Due to the age of the sanitary sewer system, the City, as part of their street reconstruction program, televises the sanitary sewer to incorporate any sewer lining or reconstruction deemed appropriate based on the televised inspection. Specific defects in the sewer system that would warrant reconstruction include sags of 1/2 the pipe diameter or greater, offset joints, and deteriorated pipe segments. Manholes are also assessed at the same time. A citywide televising effort is also underway to identify areas to be lined under a separate project or added to the area of street and utility improvements.

Comprehensive Sanitary Sewer Plan

The current sanitary sewer mapping is incomplete or missing entirely in some areas of the mapping. The City is currently updating mapping to provide for more accurate inventories and better recordkeeping. The City should continue this effort as this is one of the initial steps towards a functional Geographic Information System (GIS).

Table 6 – Trunk Sanitary Sewer Inventory	
Trunk Main	Lake Street Trunk
Design Flows	5.15
Capacity (MGD)	11.3
Main Size at Downstream End	33 in

Lift Stations

Maintenance for the City’s lift stations will be required on an ongoing basis. The City should plan to replace each well pump every fifteen (15) years for budgeting purposes. The City should initiate a preventative maintenance program for the lift stations that would include annual inspections and cleaning. The performance of routine and preventative maintenance can minimize replacement and repair costs and can help reduce the number of breakdowns and other problems. The following should be included in a preventative maintenance program:

- Wet-wells should be pumped down and cleaned twice annually, or more often as required to prevent solids and grease buildup. Buildup of solids can create odor problems and damage the pumps.
- Inspection of submersible pumps should be performed twice annually. Inspection of the impellor should be done at this time or when pump motor hours are more than 10% of each other. The inspections are to make sure debris is not clogging the impellor.
- Inspect check valves twice annually.
- Clean and inspect floats twice annually to assure proper operation.

Private subsurface treatment Systems

According to *City Ordinance No. 92-710 705.07. Toilets Required. Subdivision 6. Abandonment of Private Systems.* When a public sewer becomes available to a property served by a sewage disposal system and a direct connection is made to the public sewer in compliance with this Section, any septic tanks, cesspools, and similar individual sewage disposal system shall be abandoned and filled with suitable material.

With the entire city being built out and served by a public sanitary sewer system, it is required that all properties be connected to the city’s sanitary sewer system. If a private system is identified they will be handled on a case by case basis. Preferably, the property will be required to connect to the City’s sanitary sewer system and properly abandon/remove the private treatment system.

Infiltration and Inflow

Infiltration and Inflow (I&I) is external water entering the sanitary sewer system through either ground water (Infiltration) or direct flow (Inflow) such as sump pumps. This excess volume of clean water adds considerable cost to the overall Metropolitan Disposal System (MDS) for both conveyance and

Comprehensive Sanitary Sewer Plan

treatment. Many times this cost is then passed onto users through city sanitary sewer and water rates.

Inflow in a sanitary system is normally from two items: illegal sump pump connection to a property's sanitary sewer service inside the residence and from direct connections between the city's storm sewer and sanitary sewer system. Section 705.09 of the City Code prohibits the connection of sump pumps, roof drainage, yard drainage or any substance other than sanitary sewage into the sanitary collection system.

705.09. Connection to Sanitary Sewer. Subdivision 1. Prohibited Discharges. No person shall discharge or cause to be discharged any stormwater, groundwater, roof runoff, yard drainage, yard fountain, pond overflow, or any substance other than sanitary sewage into the sanitary collection system. Use of a sump pump discharge for these purposes is illegal.

- a) No roof runoff, sump, subsurface or surface water drainage shall be connected to the sanitary sewer system and no building shall hereafter be constructed nor shall any existing buildings be hereafter altered in such a manner that the roof drainage or any other source of discharge or drainage other than sanitary sewer shall connect with the sanitary sewer system inside or outside the building.*

The City will continue to enforce the existing ordinance to minimize illegal connections to the system and will also continue to share educational material about infiltration and inflow with the public. These combined actions will minimize illegal connections resulting in infiltration and inflow in the system. To weed out any accidental connection between the sanitary sewer and the storm sewer the city recently went through a rigorous mapping of the city's utility system using GIS, involving review of numerous record drawings, and creation a web application to display information such as material, as-built information, flow direction, lift station locations, etc. No direct connections between the sanitary sewer and storm sewer systems was identified during mapping.

The second method unwanted water can enter the city's sanitary sewer system is infiltration through cracked or unsealed joints in the sanitary sewer most commonly found in older vitrified clay pipes. The City of Hopkins currently has approximately 124,000 ft of clay sanitary sewer main. To reduce this source of infiltration in the City's sanitary sewer system, the City is currently in the process of televising all of their sanitary sewer main and manholes over a three year period that began in 2017. With this televising record they will be able to identify areas with a high potential for infiltration and plan for their replacement or maintenance through CIPP lining for pipes or a cementitious lining for manholes. For reference in terms of magnitude of improvements, in 2017 the City of Hopkins replaced 7,000 LF of sanitary sewer main and lined 5,850 LF of 8" – 18" sanitary sewer main through its annual street and utility improvement program.

The sanitary sewer main is not the only part system prone to infiltration. Individual service lines, which are owned by private property owners from the main to the home per Hopkins Code, can be comprised of this same infiltration prone clay pipe. If it is assumed that all of the services on the clay sanitary main are also clay and an average lot width of 70 ft is assumed, it results in approximately 3,600 individual clay services in the City of Hopkins. It is city policy to replace these services with PVC up to the right-of-way when upgrading the sanitary sewer main to PVC through the City's annual street and utility improvement project – over 5,000 LF in 2017. At the time connections are made to service lines at the right-of-way, inspection of the existing sanitary sewer service line also occurs. It is City policy to require replace of all orangeburg pipe and any failed other pipe within 1 year of identification. In such cases, the City coordinates a contractor for either lining or open cut replacement of the service line and offers to finance the work for the property owner through a special assessment.

Comprehensive Sanitary Sewer Plan

To determine the magnitude of the inflow and infiltration in the City's sanitary sewer system an analysis using guidance from the June 2014 EPA "Guide for Estimating Infiltration and inflow" was performed. Hourly flow rates were obtained from January 2012 through December 2017 at Met Council interceptor meter locations M123 and M122. With the assumption that there is no inflow or Infiltration during winter months when the ground is frozen, January 2016 flow data was used to determine a base flow rate (wastewater flow with no I&I) of 1.58 Mgalpd. Inflow and infiltration is the difference between this base sanitary sewer flow and the actual flow recorded at the metering stations as shown in Figure 1.

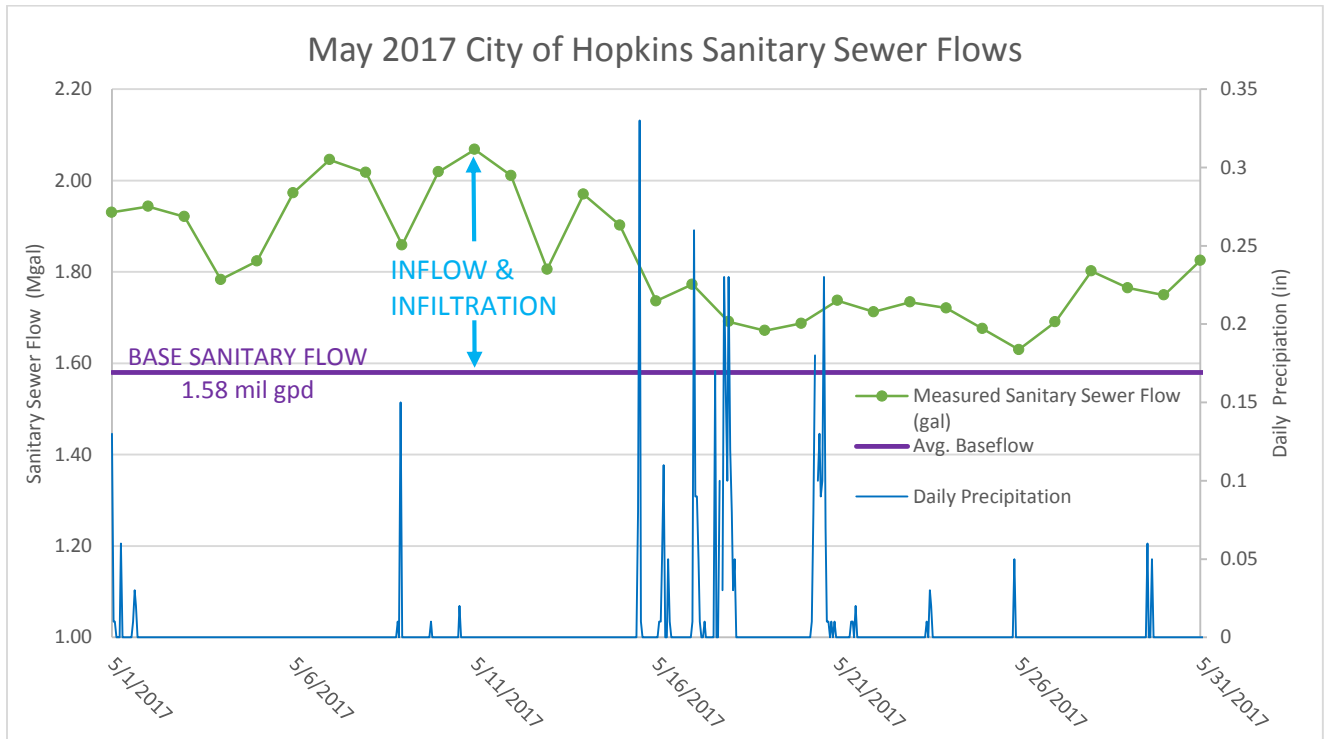
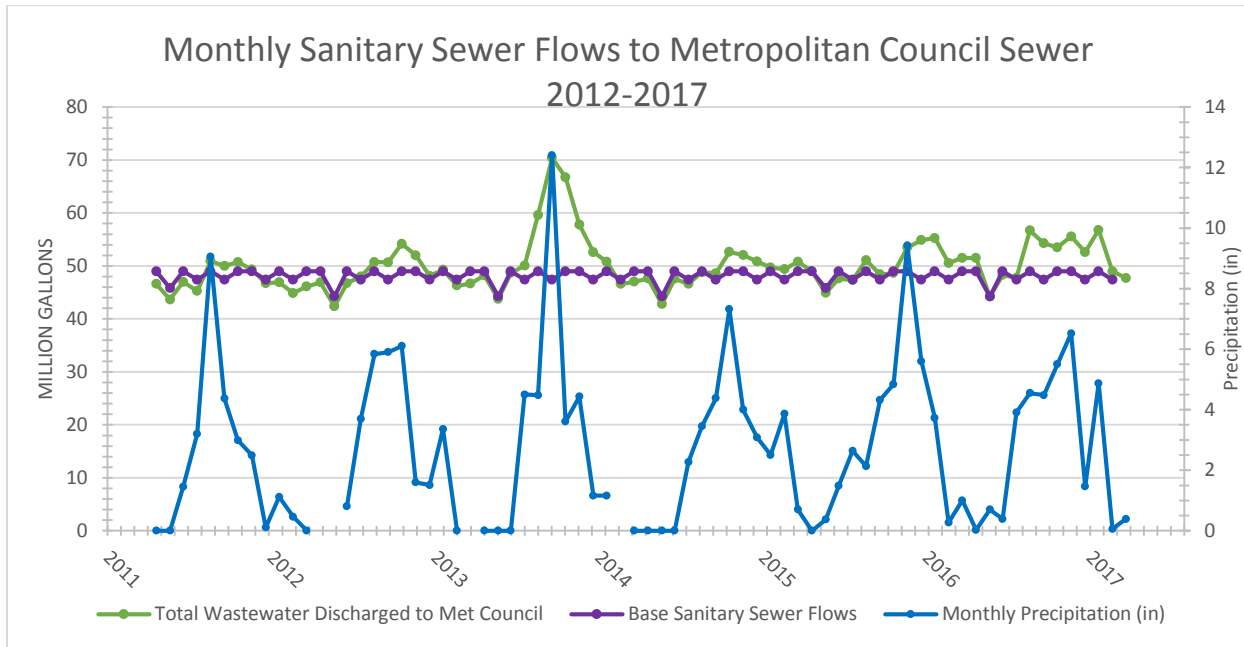


Figure 1: Typical Month Depiction of I&I

It has been found that over the last 5 years the City of Hopkins averages 1.94 million gallons of inflow and infiltration per month.

The true cost of I&I can be may not be accurately determined due to the various ramifications I&I has on the community. I&I can cause additional wear and tear on pipes and pumps, unnecessary upsizing of pipes to meet flow demand, increased pump activity at lift stations during rain and high ground water events, damage to basements from surcharging sewage during a storm, and impacts on the Met Council system resulting in additional charges to Hopkins rate payers are some items that can be factored into the cost to Hopkins. Part of this cost of I&I can be estimated by monetizing the sewer flow via the city's sewer rate. At the current 2018 city sanitary sewer rate of \$5.85/1000 gal, inflow and infiltration costs the city \$134,000 per year, which equates to \$6.99 per person per year. This money is currently being expended to treat what effectively clean groundwater leaching into the City's system.

Comprehensive Sanitary Sewer Plan



The MPCA offers guidelines on determining the severity of this inflow and infiltration. Infiltration is excessive if the quantity of flow (domestic base flow and infiltration) is greater than 120 gallons per capita per day (gpcd). The quantity of flow was determined using the annual average residential and commercial flow over the past five (5) years, and the 2015 population of 19,227.

$$1,693,000 \text{ gpd} / 19,227 \text{ people} = 88 \text{ gpcd} < 120 \text{ ACCEPTABLE}$$

Inflow is excessive if the quantity of flow during storm events that results in chronic operational problems related to the hydraulic overloading of the treatment system or that results in a total flow of more than 275 gpcd (domestic base flow plus infiltration and inflow). The flow during storm events was determined using the maximum residential and commercial flow over the past five (5) years, and the same 2015 population.

$$3,800,000 \text{ gpd} / 19,227 \text{ people} = 197 \text{ gpcd} < 275 \text{ ACCEPTABLE}$$

Using these guidelines inflow and infiltration in the City of Hopkins are determined not to be excessive.

Wastewater Goals

- Provide reliable and affordable sanitary sewer service to all residents within the City of Hopkins
- Use non-invasive methods to identify and reduce all feasible forms of inflow and infiltration within the City's sanitary sewer system
- Continue the current sewer cleaning program to reduce backups and maximize the capacity of the sanitary sewer system
- Develop a program to identify private sources of Inflow & infiltration into the City's Sanitary system
- Maintain the City's annual street & utility reconstruction program with sanitary sewer lining improvements