



CHAPTER 8

EXISTING SANITARY SEWER SYSTEM FACILITIES

The sanitary sewer collection system and lift station facilities operated and maintained by the Village of Sister Bay include:

1. Four large sanitary sewer lift stations
2. Four small sanitary sewer grinder stations
3. Force mains associated with lift stations
4. A network of gravity sewer piping and manholes

The general location and layout of the sanitary sewer system facilities is illustrated in Figure 8-1. A schematic of the sewer system is illustrated in Figure 8-2. This chapter presents a summary of the design and operating characteristics of the existing sanitary sewer system and components.

8.1 DESCRIPTION OF SYSTEM

The Sister Bay sanitary sewer collection system was originally constructed in 1972, and is a combination of gravity sewers, lift stations, and force mains. Wastewater is collected in the system and conveyed through piping to the Main Lift Station No. 1 (LS 1), where the flow is pumped to the Wastewater Treatment Plant (WWTP). After the wastewater is treated, it is discharged through an outfall sewer into Sister Bay. The existing service area of the collection system is approximately 1,200 acres in size, and serves approximately 930 connections/customers. Those residents who are not connected to the system are served by private sewage disposal systems or holding tanks.

The Liberty Grove Sanitary District No. 1 is connected to the Village of Sister Bay collection system. Areas on the south side of the Village flow north and east to LS 1, and areas on the north side of the Village and Sanitary District flow south and west to LS 1. The WWTP is located east of Woodcrest Road and south of Scandia Road. LS 1 is located east of Bay Shore Drive and south of Scandia Road.

The gravity collection system piping ranges in size from 6 inch to 12 inch diameter pipe. Some 14 inch pipe also exists on the outfall line between the WWTP and Green Bay. The normal pipe size for a development is typically 8 inch diameter sewer pipe. Larger pipes (10 inch and 12 inch diameter), referred to as collectors, connect different areas of the community and convey the flows downstream. Service laterals which serve individual buildings are typically 4 inch and 6 inch diameter pipes. The system's gravity, force main and outfall sewers are summarized by size in Tables 8-1 and 8-2.

There are four large lift stations and four small lift stations (grinder stations) in the system. The large lift stations include LS 1, Little Sister Lift Station, Fieldcrest Lift Station, and Waters End Lift Station (located within the Sanitary District). The smaller grinder stations (GS) include Forest Lane GS, Sunny Court GS, Crows Nest GS, and Pheasant Court GS. Force mains connect each of the lift stations to the gravity collection system. The force mains range in size from 2 inch diameter for the grinder stations up to 12 inch diameter for LS 1. LS 1 has an 8 inch force main and a 12 inch force main.

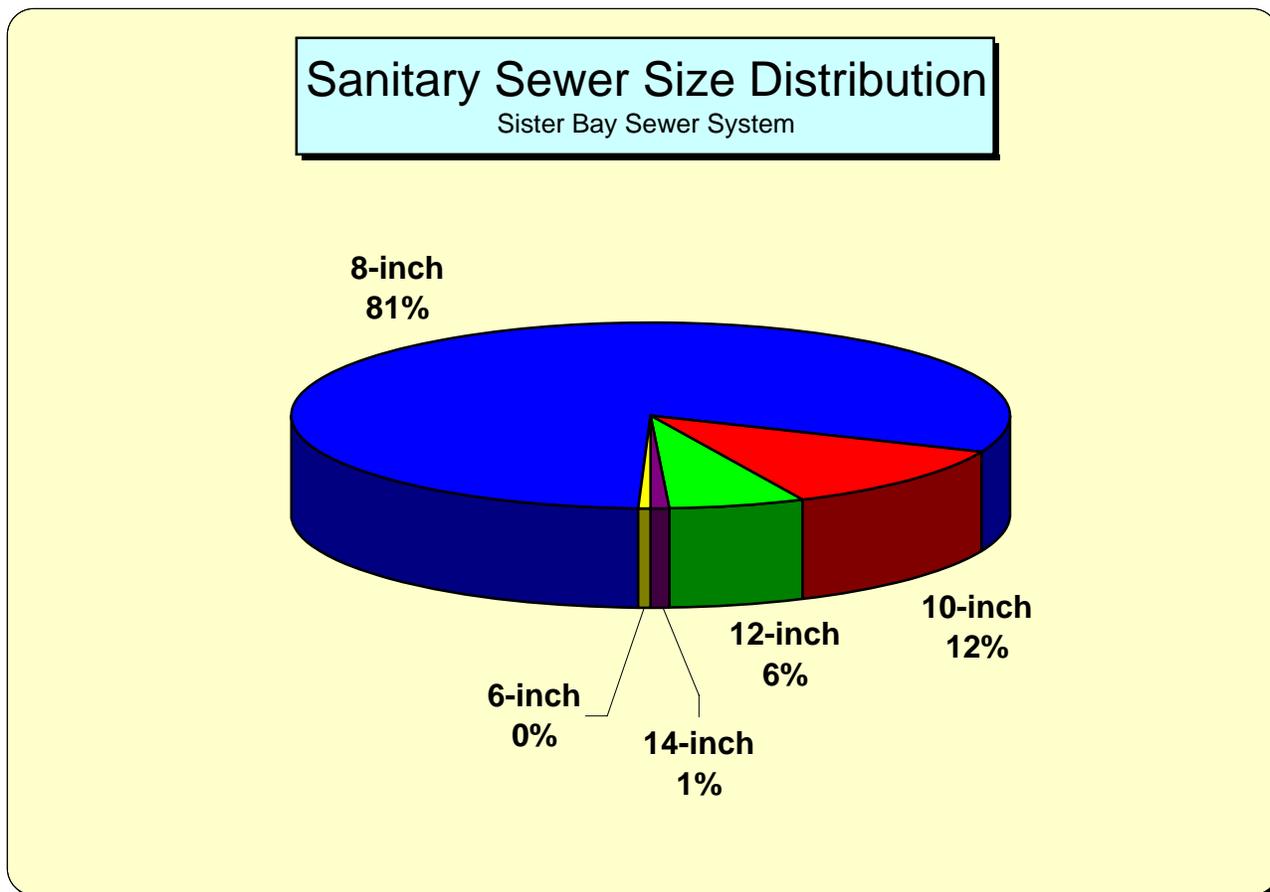
To confirm existing pumping capabilities of each lift station, Village staff conducted test pumping during the fall of 2005. The test pumping process involved manually controlling pump operation and measuring the time duration to pump a specific volume of wastewater. Adjustments were made in the calculations to

TABLE 8-1

SANITARY SEWER SIZE DISTRIBUTION
 SISTER BAY SANITARY SEWER SYSTEM
 VILLAGE OF SISTER BAY, WISCONSIN

Diameter (inches)	Approximate Total Length ¹ (feet)	Percentage of Total
6	364	0.4%
8	65,715	81.0%
10	9,473	11.7%
12	4,956	6.1%
14	<u>590</u>	<u>0.7%</u>
Total	81,099	100.0%

¹ Source: 2005 Sister Bay sanitary sewer system computer model.



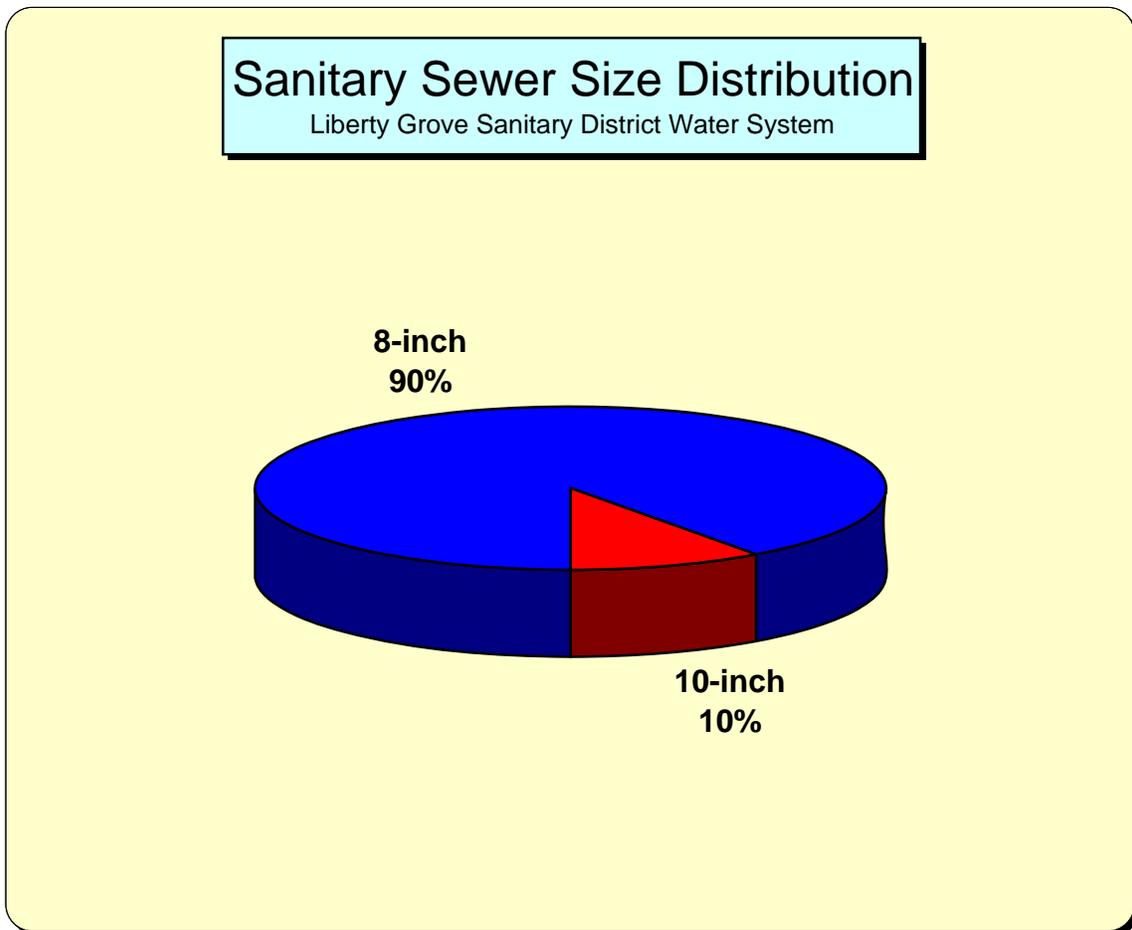
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TABLE 8-2

SANITARY SEWER SIZE DISTRIBUTION
LIBERTY GROVE SANITARY DISTRICT NO. 1
TOWN OF LIBERTY GROVE, WISCONSIN

Diameter (inches)	Approximate Total Length ¹ (feet)	Percentage of Total
8	19,525	89.9%
10	<u>2,193</u>	<u>10.1%</u>
Total	21,718	100.0%

¹ Source: 2005 Sister Bay sanitary sewer system computer model.



C:\Documents and Settings\pplanton\My Documents\Sister Bay copy\[table8-x.xls]Table 8-2



account for any influent discharging into the lift station wetwell during the pump test. The test pump results and other lift station data is summarized in Tables 8-3 and 8-4.

The Village's existing sanitary sewer base map denotes manhole I.D. numbers and sewer pipe sizes, but contains no information on pipe length, invert or rim elevations. To populate the sanitary sewer computer model of the Sister Bay collection system with the necessary information, record drawings of the system were reviewed and the needed information was tabulated. The system information collected was stored in geographic information system (GIS) format using DataView™ software developed by SEH. The DataView software provided a convenient way to collect and store system data in a format that allowed easy retrieval and manipulation.

8.2 CONDITION OF SYSTEM

The original Sister Bay collection system was installed in 1972, and has continued to expand on a regular basis since that time. Most of the sanitary sewers that were installed in the early 1970s were constructed of PVC pipe with glued joints. The larger sewer pipe (10 inch diameter and above) was either RCP or asbestos-cement pipe. By the late 1970s, sewer pipe installed in Sister Bay was constructed of PVC pipe utilizing a gasketed joint system. Sewer manholes are constructed of precast reinforced concrete.

The Village flushes sanitary sewer pipes each year in the spring and fall. Most areas of the system have not been televised recently, so the current condition of the pipe interior is unknown. From the available information that has been reviewed for this study, the general condition of the existing collection system is fair, although several system problems have been identified.

Infiltration and inflow (I/I) is present in the spring due to the elevated water table, snow melt and rainfall events. The WWTP experiences a significant spike in flows during spring months. While it is not readily apparent where the clear water is entering the collection system, it is likely that there are multiple sources. The State Plumbing Code calls for all homes to have floor drains adjacent to water heaters for drainage purposes. In most cases, these floor drains are connected to the sanitary sewer system. In areas of high groundwater, it is possible that building foundation drains and sump pumps are also connected to this floor drain system, and therefore are contributing clear water to the sanitary sewer system.

The area near the current intersection of State Highways 42 and 57 was originally a ravine that was filled prior to development. Some sanitary sewers in this area have reportedly settled, creating flat or negative slopes, and resulting in sewer flow capacity restrictions. The sanitary sewers have been televised in the past, and standing water and a buildup of solids was observed in the sewer pipe. An example of this condition exists between MH 47 and MH 45, where the 10 inch pipe has a visible dip between manholes.

According to Village maintenance staff, there are several areas of the sanitary sewer collection system that are known to have relatively flat slopes. These locations include:

- ◆ Woodcrest Road and Scandia Road area
- ◆ Areas north of Bay Shore Drive and Sister Bluff Drive

Areas north of Bay Shore Drive and Sister Bluff Drive (Sister Bluff Estates) have manholes with sumps. The manhole pipe inverts constructed in this area are the catch basin type that result in solids deposition and which require frequent cleaning. North Spring Road and Pheasant Court also contain these types of manholes.

TABLE 8-3

EXISTING LIFT STATION DATA
 SISTER BAY SANITARY SEWER SYSTEM
 VILLAGE OF SISTER BAY, WISCONSIN

Pump Data	Lift Stations									
	Lift Station No. 1 (Main Lift Station)			Fieldcrest Lift Station		Little Sister Lift Station		LGSD No. 1 Waters End Lift Station		
Type	Wetwell / Drywell			Wetwell / Drywell		Wetwell / Drywell		Submersible		
Pump Manufacturer	Gorman Rupp			Smith & Loveless		Smith & Loveless		Barnes		
Year Installed/Remodeled	1989			1990		1987		1997		
Contractor	Crane Engineering			Energenecs		Energenecs		Energenecs		
Pump Number	1	2	3	1	2	1	2	1	2	
Model No.	T6A3	T8A3	T8A3	4B2B	4B2B	4B3B	4B3B	4SE	4SE	
Force Main Size (inches)	8 & 12			4		6		4		
Rated Pump Capacity (gpm)	300	1000	1000	100	100	300	300	100	100	
Total Dynamic Head (feet)	80	n/a	n/a	48	48	135	135	40	40	
Test Pump Capacity (gpm)	216	526	435	94	94	273	238	74	53	
Test Pump Capacity - Both pumps (gpm)		812		124		335		83		
Motor Data										
Horsepower	30	60	60	5	5	20	20	5	5	
RPM	1765	1775	1775	1170	1170	1760	1760	1750	1750	
Voltage / Phase	460/3			208/3		480/3		230/3		

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TABLE 8-4

EXISTING GRINDER LIFT STATION DATA

SISTER BAY SANITARY SEWER SYSTEM

VILLAGE OF SISTER BAY, WISCONSIN

Grinder Lift Stations								
Pump Data	Forest Lane Grinder Station		Sunny Court Grinder Station		Crows Nest Grinder Station		Pheasant Court Grinder Station	
Type	Grinder		Grinder		Grinder		Grinder	
Pump Manufacturer	Barnes		Barnes		Barnes		Barnes	
Year Installed/Remodeled	2004		2004		2004		2004	
Contractor	Energeneccs		Energeneccs		Energeneccs		Energeneccs	
Pump Number	1	2	1	2	1	2	1	2
Model No.	SGV5002L	SGV5002L	XSGV	XSGV	XSGV	XSGV	XSGV	XSGV
Force Main Size (inches)	2		2		2		2	
Rated Pump Capacity (gpm)	50	50	45	45	40	40	40	40
Total Dynamic Head (feet)	125	125	n/a	n/a	n/a	n/a	n/a	n/a
Test Pump Capacity (gpm)	51	56	43	45	40	43	41	58
Test Pump Capacity - Both pumps (gpm)	77		62		47		85	
Motor Data								
Horsepower	5	5	2	2	2	2	n/a	n/a
RPM	3450	3450	3450	3450	3450	3450	3450	3450
Voltage / Phase	240/1		240/1		240/1		240/1	

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The Utility maintenance crew follows a regularly scheduled computerized plan for maintenance of the lift stations. This plan includes monthly flushing and adding degreaser to all stations. The maintenance plan also includes:

- ◆ Servicing electrodes every two months
- ◆ Servicing air release valves every three months
- ◆ Changing bearing/seal cavity oil every six months
- ◆ Checking and adjusting clearances every six months
- ◆ Greasing motors every two years
- ◆ Grinder station pumps are serviced on an annual basis (using a lift station service firm)

8.3 EXISTING SYSTEM FLOWS

Historical system flow data was collected and reviewed for this study. Average monthly flow recorded at the WWTP was approximately 170,000 gallons per day (gpd) during 2005. The flows have steadily increased over the past 5 years, and have tended to be higher during the summer tourist season. The data also shows significant flow spikes during rainfall or snowmelt events, which is an indication that some level of I/I is present in the collection system during certain periods of the year.

Lowest flows typically occur during the winter months of December, January and February. During 2005, the lowest monthly flow occurred in the month of January with an average flow of 90,000 gpd. The highest 2005 flow reported occurred in the month of July with an average flow of 280,000 gpd.

Daily flows during the maximum month, and hourly flows during the maximum day were also reviewed for 2005. A summary of 2005 flows recorded at the WWTP is summarized in Table 8-5.

A list of the top sanitary sewer flow producers in the community was not available. However, a list of the top water users was reviewed, and was previously summarized in Chapter 4 (Table 4-5). It is common that the largest water users in a community system are also the largest wastewater flow contributors.

TABLE 8-5**SUMMARY OF 2005 FLOWS AT WWTP**
SISTER BAY SANITARY SEWER SYSTEM
VILLAGE OF SISTER BAY, WISCONSIN

Month	Total for Month (MG)	Average Day (MG)	Minimum Day (MG)	Maximum Day (MG)
January	2.784	0.090	0.072	0.152
February	2.514	0.090	0.072	0.118
March	2.840	0.092	0.072	0.132
April	3.901	0.130	0.104	0.183
May	5.310	0.171	0.115	0.269
June	6.471	0.216	0.171	0.261
July	8.683	0.280	0.251	0.344
August	8.255	0.266	0.205	0.311
September	5.876	0.196	0.166	0.298
October	6.589	0.213	0.138	0.323
November	4.082	0.136	0.112	0.175
December	3.727	0.120	0.089	0.189

MG: Million Gallons

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