COMPREHENSIVE SANITARY SEWER SYSTEM PLAN

Prepared for:

City of Shakopee
129 Holmes Street
Shakopee, MN 55379

December 8, 2008

Prepared by:

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December 8, 2008

Honorable Mayor and City Council
City of Shakopee
129 Holmes Street
Shakopee, MN 55379

Re: Comprehensive Sanitary Sewer System Plan
City of Shakopee, MN
WSB Project No. 1381-05

Dear Mayor and City Council Members:

Transmitted herewith is the Comprehensive Sanitary Sewer System Plan for the above-referenced project. The report is a planning tool to help the City meet its short-term and long-term sanitary sewer flows.

We would be happy to discuss this report with you at your convenience. Please give us a call at 763-541-4800 if you have any questions.

Sincerely,

WSB & Associates, Inc.

Kevin F. Newman, PE
Project Manager

Enclosure

lh/srb

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly licensed professional engineer under the laws of the State of Minnesota.

Kevin F. Newman, PE

Date: December 8, 2008 Lic. No. 25198

Prepared by:

Joseph C. Ward, PE

Date: December 8, 2008 Lic. No. 45855

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1.0 EXECUTIVE SUMMARY

The Shakopee Comprehensive Sanitary Sewer Plan (plan) is intended to serve as a guide to completing the future sanitary sewer trunk system and as an inventory of the City's existing sanitary sewer facilities. The plan is intended to help the City of Shakopee meet its short-term and long-term sanitary sewer needs.

The ultimate potential sewer service area for the City is divided into 14 major sanitary sewer service areas or districts. Four of these sewer districts include areas of Louisville Township and Jackson Township, which are outside the 2030 planning area. However, these two townships were included in the ultimate potential planning area, because if service is provided to these areas through the City of Shakopee, it would affect the City's future trunk sewer system sizing. For the purpose of sanitary sewer planning, the districts are further divided into sub-districts. Each sub-district contributes wastewater flow to the sanitary sewer collection system. Sanitary sewer service districts are shown in Figure 7-1. Each sub-district contributes wastewater flow to the sanitary sewer collection dependent upon a variety of parameters including land use, population density, wastewater generation rates, development restrictions, wetlands, dedicated green space, etc.

The topography of the undeveloped areas was studied to determine the locations and extent of gravity sewer areas for future trunk facilities. The intention with laying out the future system was to minimize the number of trunk lift stations, while keeping the maximum depth of gravity sewers to less than 40 feet deep. In addition, it is possible that a future wastewater treatment plant may be developed in Louisville Township. To be prudent in planning, the City was required to plan for the possibility of a future Louisville Township wastewater treatment plant. Therefore, two ultimate system layouts were completed shown in Figures 7-2 and 7-3. A third alternative was developed in the event that SMSC purchases isolate a small area in the southern area of the City. This alternative could be developed as a part of Alternative 1 or 2.

Alternative 1, shown in Figure 7-2, plans for flows to be conveyed to the MCES interceptor along US 169. Alternative 2, shown in Figure 7-3, conveys wastewater to a future wastewater treatment plant located in the Southwest Louisville district. Alternative 3 was developed in the event that SMSC continues land acquisition west and would not allow a sanitary sewer to flow through their boundaries. Alternative 3 would require discussions between the City of Shakopee, the City of Prior Lake and MCES to determine if there is available capacity in the Prior Lake interceptor sewer to make this alternative possible.

Because the SMSC currently has its own treatment plant, and because it is understood the SMSC intends to serve any lands it acquires, this study does not include providing service to the SMSC owned/controlled lands, so future land purchases by SMSC may affect the City service area, future flows, and trunk sewer locations.

The system layouts are general in nature and exact routing will be determined by the particular conditions at the time of final design. It is important that the general concept and sizing be adhered to for assurance of an economical and adequate ultimate system.

Construction cost estimates were developed for the completion of the trunk system. These trunk facilities include all gravity sewer mains, lift stations, and force mains for each district. Trunk costs do not include the cost of installing lateral sewers for development. Table 1-1 on the following page shows the estimated system expansion costs.

TABLE 1-1
Capital Improvement Plan Summary by District
For Ultimate Sewer System

District	Alt. 1 Cost	Alt. 2 Cost	Alt. 3 Cost
NWS	$0	$0	
NS	$0	$0	
WS	$0	$0	
NCS	$0	$0	
NES	$976,818	$976,818	
ES	$1,311,103	$1,311,103	
SES	$2,168,467	$2,168,467	
SS	$3,356,078	$2,375,044	$3,408,830
CS	$157,442	$157,442	
JS	$830,049	$830,049	
SLJ	$3,907,898	$4,455,192	
WJ	$3,063,880	$1,323,537	
WLJ	$5,123,870	$3,847,287	
SWL	$4,794,290	$6,941,669	
Total	***$25,689,895***	***$24,386,608***	

Notes:
1. Costs are for budgeting purposes only, and are subject to change as projects are studied, designed, and constructed.
2. Project costs include 10% for construction contingency and 20% indirect costs.
3. Cost estimates are based on 2008 construction costs.
4. Land acquisition costs are not included.

2.0 PURPOSE AND SCOPE

The City of Shakopee has experienced considerable growth in recent years and anticipates similar growth to continue. The purpose of the study is to provide the City with a plan to serve future development and to identify and correct existing system deficiencies in a cost effective manner.

The plan will provide population and flow projections for the City of Shakopee through the year 2030 as well as population and flow projections for the potential ultimate sewer service area, which would include Jackson Township, and Louisville Township. The potential ultimate service area was defined based on the current Land Use plan, prepared for the City's Comprehensive Plan, and identified areas that could be reasonably served by sanitary sewer in the future. Following definition of the potential ultimate service area, sanitary sewer districts were defined and flow rates projected for each of the districts based on the respective land uses in each district. Projected flow rates were used to size the future trunk system and compared to existing system trunk capacity to identify future system improvements.

Future trunk improvements were defined with the intention that the trunk system would serve the ultimate service area. A layout of potential trunk system improvements was provided and an associated engineer's opinion of probable cost. Future improvements were incorporated into a Capital Improvement Program (CIP).

3.0 EXISTING SANITARY SEWER SYSTEM

3.1 Sanitary Sewer Service Area

Sanitary sewer systems consist of two elements; collection and treatment. The existing City sanitary sewer system is a collection system only, Metropolitan Council Environmental Services (MCES) is responsible for treatment. Also, MCES is responsible for major trunk facilities conveying wastewater across City boundaries to treatment facilities. All wastewater flows to the MCES Blue Lake Wastewater Treatment Plant in the northeast area of the City.

A service area is defined as the area from which wastewater flows are collected. The existing serviced area within the City of Shakopee comprises approximately 9,422 gross acres and is shown in Figure 3-1. In addition, there is approximately 373 gross acres recently annexed by the City of Shakopee from Jackson Township. Sanitary sewer districts were developed within the City boundaries, Jackson Township, and Louisville Township based on areas of gravity service. The existing serviced area has been developed within several districts, most of which are not fully developed.

3.2 Gravity Sewers

The existing City of Shakopee sanitary sewer system is comprised of gravity sewers ranging in size from 6-inches in diameter to 24-inches in diameter. The City sanitary sewer mains flow to the MCES interceptors that convey wastewater to the Blue Lake Wastewater Treatment Plant. Currently, MCES interceptors provide service to the Cities of Shakopee, Prior Lake, and Chaska. Figure 3-2 is a map of the existing sanitary sewer system trunk mains (10-inches in diameter and larger) including MCES interceptors.

Construction of the Shakopee sanitary sewer system began in the early 1900's with vitrified clay pipe. The sanitary sewer system has been greatly expanded as the community has grown. Some of the older vitrified clay pipe sanitary sewers have been replaced, but the majority of them remain in service today. The existing sanitary sewer system appears to be in good overall condition. A good indication of this is that infiltration and inflow (I/I) has not been found to be excessive in the City. The City is not currently included in the MCES "List of Communities with Observed Excess I/I, June 30, 2006."

3.3 Lift Stations

The existing sanitary sewer system includes two City of Shakopee lift stations and one MCES lift station. MCES L16 is located near Shakopee's downtown area and ownership will be transferred to the City in the near future, the transfer agreement has been included as Appendix 2. The Wal-Mart lift station and Whispering Oaks lift station are on the east side of the City. Currently, the Whispering Oaks lift station pumps wastewater to the City of Savage from the Whispering Oaks development on the east side of Shakopee.

The existing City lift stations are submersible type lift stations with precast concrete wet wells. The Wal-Mart lift station has a capacity of 1,000 gpm, Whispering Oaks has a capacity of 90 gpm, and MCES L16 has a capacity of 3,700 gpm. Figure 3-2 shows the locations of the existing lift stations.

3.4 On-Site Disposal Systems

There are several areas within the City of Shakopee that are currently on septic systems and are shown in Figure 3-3. The City currently has approximately 787 on-site septic systems. Some of these areas are developed with one or two acre lots that will not be further developed within the time frame of this plan. Oversight of the operation and maintenance of these on-site disposal systems is administered by Scott County.

The City of Shakopee's City Code requires that homeowners connect to the City sanitary sewer system within three years if service is extended to their property, or immediately if the septic system fails.

4.0 LAND USE

4.1 Land Use Breakdown

Figure 4-1 is the current land use plan for the City of Shakopee. This plan was developed by the City, included in the Transportation Plan completed by WSB, and separates the planning area into ten (10) different land use categories. Land use is a critical factor in determining future sanitary sewers because different land uses generate different wastewater flow rates. Because the Comprehensive Plan is intended to take a look at post-2030 development, the City has used the same land use categories for areas that are in Jackson and Louisville Townships to remain consistent with the City's land use assumptions. As stated in other chapters of this Plan, the City does not currently have land use jurisdiction over the township areas and is not seeking approval of the post 2030 elements of the land use analysis. Moreover, the City does not intend to indicate by this analysis that annexation of these areas by the City of Shakopee is a foregone conclusion.

Figure 4-1 does not provide land use planning for the area west of US 169 in Louisville Township. For the area within Louisville Township where no land use planning has been developed, it was assumed that it would be low density residential.

4.2 Existing Developed and Developable Areas

The area within Shakopee's City planning area is approximately 29 square miles or 18,700 acres not including Jackson and Louisville Townships. The areas within the boundaries of Jackson and Louisville Townships are 4,400 acres (6.9 square miles) and 9,300 acres (14.5 square miles), respectively.

The existing area within Shakopee with sewer service is approximately 9,795 gross acres, of which 373 gross acres were recently annexed from Jackson Township. The City of Shakopee and Jackson Township have an orderly annexation agreement. As land is developed within Jackson Township, it is annexed if utility services are extended by the City of Shakopee.

Louisville Township has no sewer service. Therefore, much land is still available for development. For sewer planning purposes, land that is not served by sanitary sewer is considered not developed. Also, not all of this acreage is considered developable. Undevelopable land use categories include open space, water, and the land owned by SMSC.

Existing developed and undevelopable areas were subtracted to obtain developable acreage. Some areas within the existing sewer service area, shown in Figure 3-1, are not developed or contributing flows to the sewer system. Figure 3-1 shows the existing sewer service area and area available for future growth. This is identified as "Gross" Developable Acreage because it includes roads and common or public areas potentially included in developments. Roads, common areas, and parks typically consume 25% to 30% of the gross area within a development.

5.0 GROWTH PROJECTIONS

5.1 Projected Residential Growth

Historical growth data and future projections for the study area from the Minnesota State Demographer's office is shown in Figure 5-1. Shakopee exhibited consistent growth between 1950 and 1990, however it grew approximately 75% between 1990 and 2000, and is estimated to have grown approximately 5-8% annually since 2000. Both Jackson and Louisville Townships do not have consistent historical records, but have a population of approximately 1,350 and growing at approximately 1% per year.

Future population and household projections were made by sewer shed area and are shown on the following page in Table 5-1.

Table 5-2 on page 9 shows the total population and household projections for the City of Shakopee through the year 2030. Population and household projection for 2050 are also included in Table 5-2. It was assumed that as development occurs within the townships, sanitary sewer service will be extended by the City to the new development. New development would then be annexed into the City of Shakopee. This has been noted in Table 5-2.

TABLE 5-1
Population and Household Projections by Sewer District

Sanitary Sewer District	2010		2015		2020		2025		2030		2050	
	Population	Households	Population	Households	Population	Households	Population	Households	Population	Households	Population	Households
Northwest Shakopee (NWS)	10,884	4,133	10,884	4,133	10,884	4,133	10,884	4,133	10,884	4,133	10,884	4.133
North Shakopee (NS)	1,226	466	1,226	466	1,226	466	1,226	465	1,226	465	1,226	466
Northeast Shakopee (NES)	565	215	565	215	565	215	565	215	565	215	565	215
North Central Shakopee (NCS)	0	0	0	0	0	0	0	0	0	0	0	0
West Shakopee (WS)	4,510	1,713	4,510	1,713	4,510	1,713	4,510	1,713	4,510	1,713	4,510	1.713
East Shakopee (ES)	2,431	923	2,431	923	3,083	1,339	3,083	1,339	3,083	1,339	3,083	1.339
Southeast Shakopee (SES)	2,576	978	2,750	1,200	4,068	1,767	4,068	1,767	4,068	1,757	4,068	1.767
South Shakopee (SS)	1,878	713	5,776	2,510	8,400	3,652	9,801	4,281	11,199	5,100	12,268	5.589
Central Shakopee (CS)	5,250	1,994	5,250	1,994	5,250	1,994	5,250	1,994	5,250	1,994	5,250	1.994
Jackson/Shakopee (JS)	6,957	2,642	6,957	2,642	6,957	2,642	6,957	2,642	6,957	2,642	7,013	2.667
South Louisville/Jackson (SLJ)	3,204	1,224	3,382	1,505	3,554	1,580	3,905	1,751	4,258	2,100	11,155	5.522
West Louisville/Jackson (WLJ)											1,267	635
West Jackson (WJ)											5,157	2.245
Southwest Louisville (SWL)											9,771	4.081
Total	**39,500**	**15,000**	**43,800**	**17,300**	**48,500**	**19,500**	**50,300**	**20,300**	**52,000**	**21,500**	**76,218**	**32,365**

TABLE 5-2
Total Population and Household Projections

Year	2005	2010	2015	2020	2025	2030	2050[1]
Population	26,340	39,500	43,800	48,500	50,300	52,000	76,218
Households	10,900	15,000	17,300	19,500	20,300	21,500	32,365
Percent Growth in Population		50%	11%	11%	4%	3%	47%

[1] The 2050 projections include all of the City of Shakopee plus Louisville and Jackson Townships. Growth or development in Louisville and Jackson Townships is likely to occur only if these areas are annexed by the City of Shakopee and/or sewer and water is extended to development.

5.2 Projected Non-Residential Growth

Shakopee is known for its entertainment attractions and has attracted many large commercial and industrial businesses. Valley Fair and Canterbury Park are major attractions in the Twin Cities and greater Minnesota. Major industrial and business park clients include companies such as Certainteed, Seagate Software, and ADC Telecom. In addition, the residential growth has attracted many "big box" retailers such as Target, Kohl's, Wal-Mart, Home Depot, and Lowe's.

Non-residential customers are located in the following land use areas: business park, commercial, commercial entertainment, industrial, mixed use, and public use. Tracking the exact amount of acres developed each year for the preceding land uses is impossible; however, it is possible to track the number non-residential connections based on water use records. Shakopee Public Utilities Commission (SPUC) groups the previously discussed land use categories into two water use types, commercial, and industrial. Since it is not possible to relate land use categories to water use records, the previously listed land use categories have been grouped together as non-residential for determining growth rates.

It is difficult to project future non-residential growth; however, there have been some trends available for observation over the past few years. ***Table 5-3*** illustrates the growth in non-residential water connections over the past five years, and the percentage of non-residential connections relative to residential connections for the Shakopee water system.

TABLE 5-3
Non-Residential Historical Growth

Year	Non-residential connections	Non-residential annual growth	Residential connections	Residential annual growth	Percent non-residential connections
2001	622		6184		10.06%
2002	638	2.57%	7159	15.77%	8.91%
2003	634	-0.63%	7244	1.19%	8.75%
2004	699	10.25%	7980	10.16%	8.76%
2005	727	4.01%	8583	7.56%	8.47%
Average					8.99%

Table 5-3 shows a limited correlation between residential and non-residential growth rates, but there is a strong correlation each year in the ratio of non-residential to residential connections. The ratio has averaged 9% over the last five years and has remained consistent.

Based on a ratio of non-residential to residential connections of 9%, ***Table 5-4*** was developed to project future non-residential connection growth in a similar fashion to ***Table 5-2*** projecting future population. Connections in Louisville and Jackson Townships were not added because the current ratio within Shakopee appears to account for an appropriate number of non-residential connections within the entire potential service area. Therefore, it was assumed the ratio of non-residential to residential would not change based on increased township populations.

TABLE 5-4
Non-Residential Growth Projections

Year	Population	Residential Connections	Non-Residential Connections
2003	24,967	7,878	634
2010	39,500	15,000	1,350
2020	48,500	19,500	1,755
2030	52,000	21,500	1,935

Based on the employment projections by Transportation Area Zone (TAZ), employment projections were separated in the various sewer shed districts. ***Table 5-5*** shows the employment projections in each sewer shed area.

TABLE 5-5
Employment Projections by Sewer District

Sanitary Sewer District	Total Projected Jobs					
	2010	**2015**	**2020**	**2025**	**2030**	**2050**
Northwest Shakopee (NWS)	3,050	3,100	3,200	3,379	3,379	3,379
North Shakopee (NS)	3,920	4,232	4,575	5,710	5,710	5,710
Northeast Shakopee (NES)	2,503	2,700	2,900	3,646	3,646	3,646
North Central Shakopee (NCS)	687	750	815	1,000	1,000	1,000
West Shakopee (WS)	611	668	726	890	890	890
East Shakopee (ES)	2,444	3,321	4,085	5,605	8,154	8,154
Southeast Shakopee (SES)	0	0	0	0	0	0
South Shakopee (SS)	1,400	1,479	1,500	1,875	2,728	2,728
Central Shakopee (CS)	2,275	2,275	2,292	2,635	3,844	3,844
Jackson/Shakopee (JS)	420	459	499	612	612	1,845
South Louisville/Jackson (SLJ)	490	566	708	809	1,058	1,674
West Louisville/Jackson (WLJ)						21,733
West Jackson (WJ)						7,314
Southwest Louisville (SWL)						0
Total	**17,800**	**19,550**	**21,300**	**26,161**	**31,021**	**61,916**

6.0 SANITARY SEWER DESIGN CRITERIA

6.1 Estimated Flow Generation Rates

6.1.1 General

To determine future sanitary flows existing water demand and MCES recommendations were considered. MCES typically estimates 274 gpd/connection or 75 gallons per capita per day (gpcd) for residential estimates and 800 gallons per acre per day (gpad) for non-residential developments.

Since wastewater flows are not measured for individual users, only at the MCES flow meter for the entire city of Shakopee, wastewater flows are not categorized by land use type. However, SPU does collect water demand data. Water demand data by customer type for 2001-2005 is shown below. In addition, it is shown that the average wastewater flow is 72% of the water demand. The difference between water demand and wastewater flow is largely due to lawn watering.

TABLE 6-1
Water Demand by Customer Category

Customer Category	2001	2002	2003	2004	2005	Avg.
Residential (1,000 Gal)	733,466	698,124	891,809	967,524	1,076,463	
Commercial (1,000 Gal)	341,272	405,416	474,185	472,333	456,977	
Industrial (1,000 Gal)	226,602	154,664	165,298	167,480	133,499	
Other (1,000 Gal)	22,123	17,003	19,138	23,176	30,464	
Total (1,000 Gal)	1,323,463	1,275,207	1,550,430	1,630,513	1,697,403	
WW Flow (1,000 Gal)	1,035,400	1,006,500	970,300	1,163,100	1,175,400	
WW % of water	78.23%	78.93%	62.58%	71.33%	69.25%	72.07%
Water Demand (MGD)	3.63	3.49	4.25	4.47	4.65	
WW Flow (MGD)	2.84	2.76	2.66	3.19	3.22	

6.1.2 Residential Flow Rates

To determine the residential flow generation rates in gallons per gross acre, several factors were reviewed and several assumptions made. As discussed previously, MCES typically uses 75 gpcd for estimating residential flow rates. Based on 2003 population and service data, the residential wastewater flow per person for Shakopee was very close to 75 gpcd.

Based on the residential water use from Table 6-1 and assuming the average wastewater flow of 72% Table 6-2 indicates historical residential wastewater flow rates are lower than 75 gpcd, therefore it is a conservative planning tool. Since the future density and location of residential developments will most likely change from the proposed land use plan, development densities were assumed to ensure local trunk sewers were designed adequately. The estimated future flows were based on the projected population for each time period and a flow per person of 75 gpcd.

Table 6-2
Historical Residential Wastewater Flow Rates

Year	Residential Connections	[1]Estimated Population Served	Persons per Connection	Residential Water Use (gal/day)	[2]Estimated Residential WW Flow (gal/day)	Residential WW Flow per Connection (gal/day)	Residential WW Flow per Person (gal/day)
2001	6184	20,725	3.35	2,009,496	1,446,837	234	69.81
2002	7159	22,830	3.19	1,912,668	1,377,121	192	60.32
2003	7244	23,857	3.29	2,443,312	1,759,185	243	73.74
2004	7980	27,309	3.42	2,650,751	1,908,540	239	69.89
2005	8583	29,143	3.40	2,949,213	2,123,433	247	72.86
Average						231.15	69.32

[1]Estimated population served from public water supply inventory, except 2003. 2003 population was based on MCES estimates for each TAZ.

[2]Estimated residential wastewater flow equal to 72% of total water use, not actual data

6.1.3 Non-Residential Flow Rates

Non-residential wastewater generators consist of business park, commercial, commercial entertainment, industrial, mixed use, and public/semi public land uses. As discussed previously in 6.1.2, it is not possible to separate land use areas based on water use records. Therefore, existing wastewater flows were developed based on the location of the large volume water users and allocating the remaining water demand flows to each non-residential acre. Water demand was used because it can be separated by non-residential and residential use based on SPU data.

Flow estimates were based on the 2003 service area because it was the last year for which complete data was available. The total land use for non-residential uses totaled 2,733 acres, of which the large volume users occupied approximately 959 acres. Table 6-3 indicates that typical large volume users contributed 924 gpad, while the remaining users contributed an average of 233 gpad. When combined, all non-residential users contributed approximately 475 gpad. Therefore, the MCES estimate of 800 gpad is acceptable for sizing of trunk sanitary sewers.

It is possible a large user could develop within the system, so some laterals may need to be increased in size at the time of construction. Laterals have not been accounted for as a part of this plan.

Table 6-3
Large Volume Water Users

	Total	**Large Users**	**Remaining Users**
[1]2003 Water Sold (gal/day)	4,247,754	1,329,000	
Estimated WW Flows (gal/day)	3,058,383	956,880	
Less Residential WW Flows (gal/day)	1,759,185	71,280	
Non-Residential WW Flows (gal/day)	1,299,198	885,600	413,598
[2]Non-Residential Area Developed (acres)	2,733	958.5	1,775
Flow/Gross Acre (gal/acre/day)	**475**	**924**	**233**

[1]From Comprehensive Water System Plan
[2]Estimated based on parcel size from County Assessor

6.2 Peak Flow Factors

The sanitary sewer collection system must be capable of handling the anticipated peak flows. These peak flows can be expressed as a variable ratio applied to average flow rates. This variable ratio, called the peak flow factor, has been found to decrease as the average flow increases. The peak flow factors applied in this study were based on typical MCES supplied peaking factors. They are generally considered conservative, and are widely used for planning in municipalities throughout the twin cities metropolitan area. Appendix 1 lists the peaking factors used for this study.

Table 6-4 on the following page shows the existing estimate average day and peak hour flows by Sanitary Sewer District.

Table 6-4
Existing Estimated Wastewater Flows by Sewer District

Sanitary Sewer District	Existing Avg. Day Metered Flow (mgd)	Existing Peak Hour Metered Flow (mgd)	Existing Avg. Day Estimated Flow (mgd)	Existing Peak Hour Estimated Flow (mgd)
Northwest Shakopee (NWS)	1.26	6.81	1.26	3.78
North Shakopee (NS)	1.96		0.70	2.31
Northeast Shakopee (NES)			0.09	0.36
North Central Shakopee (NCS)			0.15	0.59
West Shakopee (WS)			0.39	1.40
East Shakopee (ES)			0.24	0.89
Southeast Shakopee (SES)			0.04	0.16
South Shakopee (SS)			0.05	0.20
Central Shakopee (CS)			0.37	1.33
Jackson/Shakopee (JS)			0.15	0.59
South Louisville/Jackson (SLJ)			0.04	0.16
West Louisville/Jackson (WLJ)	0	0	0.00	0.00
West Jackson (WJ)	0	0	0.00	0.00
Southwest Louisville (SWL)	0	0	0.00	0.00
Total System	3.22	6.81	3.48	

6.3 Infiltration/Inflow

6.3.1 General

Infiltration is water that enters the sanitary sewer system by entering through defects in the sewer pipes, joints, manholes, or service laterals. Water that enters the sewer system from cross connections with storm sewer, sump pumps, roof drains, or manhole covers is considered inflow.

The quantity of I/I entering a wastewater collection system can be estimated utilizing wastewater pumping records, daily rainfall data, and water usage characteristics. Water from inflow and infiltration can consume available capacity in the wastewater collection system and increase the hydraulic load on the treatment facility. In extreme cases, the added hydraulic load can cause bypasses or overflows of raw wastewater. This extra hydraulic load also necessitates larger capacity collection and treatment components, which results in increased capital, operation and maintenance, and replacement costs. As sewer systems age and deteriorate, I/I can become an increasing problem. Therefore, it is imperative that I/I be reduced whenever it is cost effective to do so.

The MCES has established I/I goals for each community discharging wastewater into the Metropolitan Disposal System (MDS). In February 2006, MCES adopted an I/I Surcharge Program which requires communities within their service area to eliminate excessive I/I over a period of time. All communities exceeding their wastewater flow goal for the period of June 1, 2004 through June 30, 2006 were charged at the beginning of 2007. The surcharge is based on an Exceedance Rate of $350,000 per mgd above the MCES goal for the highest single event during the period.

6.3.2 I/I Analysis

Included in the City's System Statement for the 2030 Regional Development Framework adopted by the Metropolitan Council in 2004 was the City's I/I goal. In 2004, the allowable peak hourly flow was 8.28 mgd. In 2004, the peak hourly flow was 5.24 mgd, well below the I/I goal. Therefore, the City has not currently been assessed a financial penalty by MCES.

The I/I goal was established based on the City's average daily flow of 3.18 mgd, and an associated peaking factor of 2.6. Peaking factors are reduced as the average wastewater flow increases. Although it is not certain, the future I/I goal will most likely be equal to the future peak hourly flow included in section 7. Also, a table of current MCES peaking factors has been included in Appendix 1.

6.3.3 Municipal I/I Reduction

The City is not currently on the MCES List of Communities with Observed Excess I/I. One major I/I reduction project recently completed was the replacement of the trunk main along the Minnesota River from the Rahr Malting facility to MCES L16. This trunk main varies in size from 15-inches to 21-inches in diameter.

The City performs maintenance on the sanitary disposal system on a consistent basis. The City annually reconstructs several roads within the City. As a part of street reconstruction projects sanitary sewers are replaced or lined if they are in poor condition.

The City does prohibit the connection of sump pumps, rain leaders, and passive drain tiles to the sanitary sewer system. All development plans are reviewed by the City and construction is inspected to verify construction is in accordance with plans.

The effects of the City's efforts to reduce I/I are seen in Table 6-5 below. It shows a gradual reduction the average daily flow rate to MCES lift station L16. This lift station collects wastewater from the older section of town where sewers have deteriorated. As the City replaces these old sewers, the average flow and peak hour flow have reduced.

Table 6-5
MCES L16 Wastewater Flows

Year	Average Daily Flow (gpd)	Peak Hour Flow (gpd)
2000	1,491,367	3,249,750
2001	(complete or NA)	(Complete or NA)
2002	1,296,188	3,053,437
2003	1,134,783	2,463,143
2004	1,311,157	3,107,179
2005	1,257,641	2,985,826

7.0 FUTURE SANITARY SEWER SYSTEM

7.1 Sanitary Sewer Districts

The future sanitary sewer trunk system is based on dividing up the ultimate potential service area in to major service areas or districts and then dividing those major service districts into sub-districts. Generally the selection of these areas is governed by existing topography and/or other existing features such as roadways. The ultimate potential service area is broken up into fourteen (14) major sanitary sewer districts: Southwest Louisville (SWL), West Louisville/Jackson (WLJ), West Jackson (WJ), South Louisville/Jackson (SLJ), Jackson/Shakopee (JS), Central Shakopee (CS), South Shakopee (SS), Southeast Shakopee (SES), East Shakopee (ES), North Shakopee (NS), North Central Shakopee (NCS), Northeast Shakopee (NES), Northwest Shakopee (NWS), and West Shakopee (WS). Figure 7-1 shows the major sanitary sewer districts. Although each district was broken into sub-districts to verify all areas could be served, sub-districts are not shown in Figure 7-1.

The following is a brief summary of the steps taken to develop the future trunk sanitary sewer system based on the ultimate service area and projected sanitary sewer districts:

1. The ultimate potential service area for the City of Shakopee was determined eliminating large areas not likely to be served in the future.

2. The service area was divided into sanitary sewer sub-districts based on gravity sewer constraints and roadway boundaries. Sanitary sewers were designed by connecting to existing trunk mains and with minimal crossing of US 169.

3. Sanitary sewer flows were generated for each sub-district based on the gross developable acreage and the anticipated land use. The wastewater flow generation rates for each land use is discussed in section 6 and were used to project future wastewater flows.

4. The sanitary sewer system was developed using the existing City trunk sewers which in turn flow to MCES interceptors as outlets in alternative 1. For alternative 2, the sanitary sewer system was developed assuming a wastewater treatment plant would be built in Louisville Township. MCES will coordinate upsizing of their trunks based on Shakopee’s projected wastewater flows. Future trunks were laid out based on existing ground contours which govern how far the gravity trunk sewers can feasibly be extended. All trunk sewers were designed to be no deeper than 40 feet, and no shallower than 8 feet from the existing ground surface.

5. Gravity sewer mains, lift stations, and force mains necessary to accommodate the ultimate build out were then sized for peak sanitary sewer flows from those sub-districts which are tributary to each particular trunk gravity sewer main or lift station.

7.2 Wastewater Flow Projections

Wastewater flow projections were generated for each sanitary sewer district and corresponding sub-districts based on the gross developable acreage available, anticipated land uses, development densities, and wastewater flow generation rates. Trunk sewer design criteria were discussed in section 6 of this report and used to project the future wastewater flows for the service area as shown below in Table 7-1. Appendix 8 includes flow projections in five year increments for each district.

Table 7-1 shows existing average and peak hour metered sanitary sewer flow. Since there is no way to measure existing flow from each district, flows were estimated based on the existing developed acreage, land use, and other design criteria discussed in section 6.

The existing metered average day flow was approximately 0.26 mgd lower than the estimated flow. This discrepancy can be explained for two reasons. First, there is difficulty in estimating the "existing" wastewater flows, since it is a snapshot in time. For instance, average flows are recorded over the course of a year, while estimated flows are determined estimating the number of acres developed, their land use, and assuming all developed acres are contributing their estimated unit flow. However, since Shakopee has grown so quickly, it is possible that some units have been constructed, but not occupied. Therefore, it appears they are developed and contributing flow, but are not. Therefore, estimated future flow results higher flow within the district than is actually occurring.

Further detail regarding flow generation for each district and subdistrict is included in Appendix 3.

Table 7-1
Projected Average Day and Peak Hour Wastewater Flows

Sanitary Sewer District	2010		2015		2020		2025		2030		Ultimate	
	Avg. Day Flow (mgd)	Peak Hour Flow (mgd)	Avg. Day Flow (mgd)	Peak Hour Flow (mgd)	Avg. Day Flow (mgd)	Peak Hour Flow (mgd)	Avg. Day Flow (mgd)	Peak Hour Flow (mgd)	Avg. Day Flow (mgd)	Peak Hour Flow (mgd)	Ultimate Avg. Day Flow (mgd)	Ultimate Peak Hour Flow (mgd)
Northwest Shakopee (NWS)	1.26	3.78	1.26	3.78	1.26	3.78	1.26	3.78	1.26	3.78	1.26	3.78
North Shakopee (NS)	0.74	2.43	0.74	2.43	0.90	2.88	0.90	2.88	0.90	2.88	0.90	2.88
Northeast Shakopee (NES)	0.14	0.54	0.35	1.28	0.45	1.58	0.45	1.58	0.45	1.58	0.45	1.58
North Central Shakopee (NCS)	0.15	0.59	0.15	0.59	0.15	0.59	0.15	0.59	0.15	0.59	0.15	0.59
West Shakopee (WS)	0.47	1.66	0.53	1.81	0.53	1.81	0.53	1.81	0.53	1.81	0.55	1.87
East Shakopee (ES)	0.32	1.14	0.32	1.14	0.58	1.99	0.58	1.99	0.58	1.99	0.60	2.03
Southeast Shakopee (SES)	0.31	1.11	0.33	1.18	0.49	1.70	0.49	1.70	0.49	1.70		1.83
South Shakopee (SS)	0.31	1.10	0.63	2.16	0.85	2.72	0.96	3.06	1.06	3.29	1.37	4.11
Central Shakopee (CS)	0.53	1.81	0.53	1.81	0.53	1.81	0.53	1.81	0.53	1.81	0.55	1.87
Jackson/Shakopee (JS)	0.56	1.91	0.56	1.91	0.56	1.91	0.56	1.91	0.56	1.91	0.60	2.16
South Louisville/Jackson (SLJ)	0.36	1.30	0.41	1.45	0.43	1.49	0.45	1.58	0.48	1.68	1.54	4.48
West Louisville/Jackson (WLJ)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.16	3.60
West Jackson (WJ)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.82	2.62
Southwest Louisville (SWL)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80	5.23
Total System	**5.14**		**5.82**		**6.73**		**6.86**		**6.99**		**12.39**	

7.3 Future Trunk Sanitary Sewer System

There are two alternatives for future service. A wastewater treatment plant may be constructed in Louisville Township; however, it is only a possibility at this time. Therefore, flows from some sewer districts may be routed to the treatment plant. At this time, the City does not have an orderly annexation agreement with Louisville Township, so the Township is responsible for their planning. To be prudent in planning, the City was required to plan for the possibility of a future Louisville Township wastewater treatment plant.

Alternative 1, shown in Figure 7-2, plans for flows to be conveyed to the MCES interceptor along US 169. Alternative 2, shown in Figure 7-3, conveys wastewater to a future wastewater treatment plant located in the Southwest Louisville district. Districts have not been changed, therefore, flow per each district has not been changed, but flows have been routed to the wastewater treatment plant.

Throughout the following discussion references are made to trunk sewer main points, such as I2.1 to I3.4. Please refer to Figures 7-4 and 7-5 for the locations of the referenced trunk mains, and Appendices 4 and 5 for the associated estimated flow in each trunk main.

7.3.1 Northwest Shakopee (NWS)

The Northwest Shakopee district is completely developed within the current service area. The majority of development in this district was completed prior to 1990. Land use within this district is very diverse, including the downtown business district, but the majority of development generating wastewater flows is low-density residential.

Flows from this district are collected by several trunk mains ranging in size from 10-inch to 21-inches in diameter, ultimately collected at MCES lift station L16. MCES L16 and associated force main ownership will be transferred to the City in the near future. The transfer agreement has been included in Appendix 2. The lift station pumps wastewater into a 36/42-inch MCES trunk main running along CR 101 to the Blue Lake wastewater treatment plant.

Increasing future flows in this area would require redevelopment. Redevelopment is not anticipated within the planning time period. Therefore, existing flows are equal to or greater than ultimate flows. The City's annual street reconstruction program inspects and replaces sewers in this area, thus reducing I/I and flow in the sewer. Based on the reduction in flow shown in Table 6-4, sewer replacement is reducing sanitary sewer flows.

The existing and 2030 sanitary sewer flow is 1.26 mgd and 3.78 mgd for average and existing peak hour flows respectively. The 2030 peak hour flows shown in Table 7-1 include an assumed peaking factor that is higher than what is actually occurring. This has been designed in this manner for conservative planning purposes. MCES L16 collects all flows from the district and isolates the district from the remainder of the system, therefore, determining an estimated future flow was not necessary.

Additional trunk sanitary sewer improvements will not be necessary for either of the future system alternatives as shown in Figures 7-2 and 7-3. Appendices 4 and 5, corresponding to Figures 7-4 and 7-5, show where flows exit the district (J1) to the MCES trunk sewer, located in the NS district. The force main from L16 empties into the interceptor at this location.

7.3.2 North Shakopee (NS)

The North Shakopee district is mostly developed with the exception of a few properties. The land use for the district is mostly industrial and commercial entertainment including Valley Fair, Canterbury Park, Certainteed, Seagate, and other large manufacturers. Other land uses within this district do include minimal residential and commercial.

Wastewater in this district is collected by several trunk mains ranging in size from 10-inch to 30-inch, and ultimately by a 36/42-inch MCES trunk main running along CR 101 to the Blue Lake wastewater treatment plant. Ownership of the trunk main will be transferred to the City in the near future.

Since there are no lift stations or flow meters within this district it is not possible to confirm the flow from this district. In addition, some properties are connected directly to the MCES interceptor line, so all flows are not conveyed by the existing City trunk mains. The existing sanitary sewer flows were estimated based on the existing developed area and estimated flow generation rates previously discussed. There are remaining undeveloped properties within the district that are not shown on Figure 3-1 because they are within the existing City service area. Therefore, 2030 average flows are projected to increase from 0.70 to 0.90 mgd as shown in Table 7-1.

Additional trunk sanitary sewer improvements will not be necessary for either of the future system alternatives as shown in Figures 7-2 and 7-3. The properties remaining for development are located near trunk facilities and remaining capacity within the MCES interceptor is sufficient for 2030 peak hour flows. Appendices 4 and 5, corresponding to Figures 7-4 and 7-5, show the connection points (K1-K2) from the existing City trunk mains to the MCES trunk sewer, located along CR 101.

7.3.3 Northeast Shakopee (NES)

The Northeast Shakopee district is entirely within the City's current service area, but only partially developed with a few commercial and industrial properties. The land use for the district is entirely industrial and commercial, however much of the land is undevelopable along the Minnesota River and US 169.

Sanitary sewer flows in this district from existing developed properties are collected by existing MCES trunk mains and a 24-inch diameter main near the Blue Lake Wastewater Treatment Plant. Similar to the majority of Shakopee, there is no lift station within this district, so it is not possible measure existing flows. Based on the acres of land and land use type of development, existing wastewater flows are estimated to be 0.09 mgd and increase to 0.45 mgd by 2030.

Improvements to the sanitary sewer system will be required to provide service to currently undeveloped properties. All of the existing developed properties are located adjacent to MCES trunk facilities, but undeveloped acres are not. Future service requirements include extension of 15-inch diameter trunk main along US 169 (L1.1 to L1.2), construction of a 200 gpm lift station near the intersection of Stagecoach Road and CR 101 (L2.3), and a 4-inch force main along Cretex Avenue to the existing 24-inch trunk main (L2.4). The existing ground elevations along CR 101 eliminate the possibility of gravity service. The 2030 improvements required are the same for alternatives 1 and 2 and are shown in both Figures 7-2 and 7-3. Appendices 4 and 5, corresponding to Figures 7-4 and 7-5, show the connection points to MCES trunk sewer (L1.2 and L2.4).

7.3.4 North Central Shakopee (NCS)

The area within the NCS district has been completely developed. Redevelopment would be required to increase sanitary sewer flows from this district, and are not expected within the study's planning period.

Existing land uses in the district are business park, industrial, and some commercial entertainment. The district has been completed since 2000, and sanitary sewers are not suspected to be subject to large I/I volumes.

Sanitary sewer flows in this district are collected by 10-inch and 12-inch diameter trunk mains, which in turn flow to the Shakopee/Chaska interceptor along US 169. The existing and 2030 flows from the district must be estimated since there are no lift stations or flow meters within the district. These flows are estimated to be 0.15 mgd average.

Additional trunk sanitary sewer improvements will not be necessary for either of the future system alternatives as shown in Figures 7-2 and 7-3. Appendices 4 and 5, corresponding to Figures 7-4 and 7-5, show the connection point (M1) to the MCES trunk sewer, located west of the Prior Lake interceptor along US 169.

7.3.5 West Shakopee (WS)

The West Shakopee district is mostly developed with the exception of a few properties. The majority of land use within this district is low and medium density residential. The other land uses include commercial and public.

Sanitary sewer flows from this district are collected mostly by a trunk main that flows from the west to the east and ranges in size from 10 to 21-inches in diameter. There are branches of the trunk main collecting wastewater flows from the subdistricts that are 10-inches in diameter.

The estimated existing sanitary sewer flow is 0.39 mgd, and 2030 flows are estimated to be 0.53 mgd average. The existing sanitary sewer flows were estimated based on the existing developed area and estimated flow generation rates previously discussed. There are remaining undeveloped properties within the district that are not shown on Figure 3-1 because they are within the existing City service area. The increase in sanitary sewer flows does not require future system improvements, only collection laterals will be extended to future development. Future developers are responsible for the extension of these services.

Additional trunk sanitary sewer improvements will not be necessary for either of the future system alternatives as shown in Figures 7-2 and 7-3. Appendices 4 and 5, corresponding to Figures 7-4 and 7-5, show the connection point (N1) to the MCES trunk sewer, located west of the intersection of US 169 and CR 83.

7.3.6 East Shakopee (ES)

The East Shakopee district is approximately half developed. Land uses include low and medium residential which is mostly developed but not served, and commercial and industrial properties. The majority of industrial properties are not served, but the majority of commercial properties are served.

Existing sanitary sewer flows from this district are estimated to be 0.24 mgd and are collected by a trunk main extending from near the intersection of County Road 18 and Eagle Creek Boulevard northwest along County Road 18 and Southbridge Parkway to the existing MCES Prior Lake Interceptor. The trunk main ranges in size from 10 to 21-inches in diameter. Also, there is a 12 to 15-inch trunk main stub that flows into the CR 18 interceptor extended from the intersection of Southbridge Parkway and Old Carriage Road east along Old Carriage Rd to the east side of the intersection of CR 18 and Old Carriage Road. There is a lift station along the Old Carriage Road that pumps 1,000 gpm. All sanitary sewer flows from this district connect to the MCES Prior Lake interceptor.

Future 2030 sanitary sewer flows are projected to increase to 0.58 mgd and the improvements required to serve the additional flow would be the same regardless of a Louisville Township wastewater treatment plant being constructed. The additional improvements required include an existing 12-inch trunk main extension, a 700 gpm lift station, 8-inch force main, and a new 8 to 10-inch trunk main. All future improvements are shown in Figures 7-2 and 7-3.

The existing trunk mains are adequate in size to provide service to future development, as well as the existing lift station. Some trunk mains would have flows greater than 75% capacity based on the assumed existing flow entry points and estimated future flows. The 12-inch diameter section (I2.1.2 to I2.2), of the existing trunk main from the intersection of Old Carriage Road and CR 18 southwest along Old Carriage Road to the intersection of Old Carriage Road and Southbridge Parkway (I2.1.2 to I.3.4), would be at 91% capacity assuming it currently conveys flow from 20 acres of existing non-residential development and all future flows from I1 and I2 subdistricts. Also, the 18-inch trunk main extending along Southbridge Parkway from the intersection Southbridge Parkway and Old Carriage Road to the MCES Prior Lake Interceptor (I3.4 to Prior Lake Interceptor) would be at 86% capacity assuming all existing and future flows have entered the main prior to the main increasing in size to 21-inches in diameter near the intersection of Southbridge Parkway and Hartley Boulevard.

The extension of the existing 12-inch trunk would be from near the intersection of Old Carriage Road and CR 18 east along Hansen Avenue to the intersection of Hansen Avenue and Stagecoach Road (I2.1 to I2.1.2). Upon full development this trunk main would be flowing at 95% capacity. Typically new trunk mains are sized for 75% capacity, however in this situation, the existing down stream trunk main would be 12-inches in diameter and minimum pipe grades were assumed. If the grade of the trunk main were increased to 0.36% minimum, the new main would meet the 75% capacity requirement.

A lift station would be required near the border with Savage to serve the industrial properties along the eastern border based on the existing ground contours. This lift station would be approximately 700 gpm and pump through an 8-inch force main to the proposed 12-inch trunk main extension (I2.3 to I2.1). A trunk main extending south from the lift station (I2.3) to subdistrict I1 (I1.1) would be required to collect flows from subdistricts I1 and I2. The trunk mains required to collect flows from future development would be 8 to 10-inches in diameter as shown in Figures 7-2 and 7-3.

7.3.7 Southeast Shakopee (SES)

The Southeast Shakopee district has only been partially developed. Existing sanitary sewer flows are estimated to be 0.04 mgd and 2030 projected average flows are 0.49 mgd. Existing sanitary sewer flows are collected by the MCES Prior Lake Interceptor that flows from the south to the north through this district. Some trunk mains have been extended from the Prior Lake interceptor, however the areas served are not currently contributing flow.

The only existing land use types are low density residential and open space. The future land use types will also be exclusively low density residential and open space.

The existing trunk main stubs from the Prior Lake Interceptor are adequate to provide service to future development. One existing trunk main is a 15-inch diameter main running west along “future” Crossings Boulevard from the existing west end of Crossings Boulevard (H4.1) through the proposed Ridge Creek development to the Prior Lake Interceptor just north of the intersection of CR 16 and Pike Lake Road (H5.2). The other existing trunk main is an 8-inch PVC stub from the intersection of “Street A” and Pike Lake Road approximately 300 feet west along “Street A” to the dead end (H8.2).

Additional trunk mains would need to be extended from the Prior Lake Interceptor to provide service to properties located in subdistricts H7, H8, and H9. These trunk mains would be 8-inches in diameter and would be served by gravity mains. Also, the 15-inch Crossings Boulevard trunk would need to be extended to the southeast to collect wastewater generated in the remaining subdistricts. The trunk mains required for future service are shown the same in Figures 7-2 and 7-3. A future Louisville Township wastewater treatment plant would not affect how future development within this district is served.

7.3.8 South Shakopee (SS)

Only a fraction of the South Shakopee district has been developed. Existing sanitary sewer flows are estimated to be 0.05 mgd and 2030 projected average flows are 1.06 mgd. The majority of this development will be low density residential, however some business park and commercial will be developed in the future. The existing land use types include medium and low density residential.

The existing trunk mains include a 18/24-inch diameter trunk main running north along Canterbury Road from the intersection of Canterbury Road and Valley View Road to the intersection of Canterbury Road and US 169, where it ties into the Shakopee/Chaska Interceptor at an 18-inch stub. There is another 12-inch trunk main collecting existing flows from the existing development subdistrict G15.

Development of a future wastewater treatment plant in Louisville Township will affect future sanitary sewer service to the subdistricts with the exception of G15. The differences are shown in alternative 1 (Appendix 4, Figure 7-2) and alternative 2 (Appendix 5, Figure 7-3). Also, future land acquisition by SMSC may cut the district in half, north and south, therefore, an alternative 3 (Appendix 6, Figure 7-6) was developed. Description of the service alternatives describe mains based on the points noted on Figures 7-2, 7-3, and 7-6 since there are limited roads in the southern subdistricts.

The existing 12-inch trunk main (G15.1 to G15.2) serving subdistrict G15 is adequate for existing and future flows, and will not be influenced by whether or not a future wastewater treatment plant is constructed in Louisville Township.

Alternative 1 includes development of a 15 to 18-inch diameter trunk main (G1.1 to G3.1) for service to subdistricts G1, G2, and G3. The trunk main would flow into 1,000-gpm lift station (G3.1) where wastewater would be pumped through a 10-inch force main to an 18-inch trunk main (G3.1.1). To collect flows for subdistricts G4 through G9, the trunk main would then flow and increase to an 18-inch main (G3.1.1) to the existing 18-inch trunk main at the intersection of Canterbury Road and Valley View Road (G9.1). The existing 18-inch trunk main at Canterbury Road and Valley View Road (G9.1) has capacity to serve the future development as planned, but is close to 100% full even though the existing trunk was installed at a slope greater than minimum grade. It was assumed that the future trunk main between G6.1 and G9.1 would be 18-inches in diameter to match existing and the slope increased greater than minimum grade. The City has indicated that future construction will maintain the recommended grade. The grade of each section of trunk main is listed in the appendix so the trunk will flow at 75% capacity. However, the 18-inch connection underneath US 169 may need to have a relief sewer constructed as well. As-builts were not available; therefore, it was assumed the main was laid at minimum grade. Based on the assumed minimum grade, once 0.712 mgd average flow (equivalent to 1,500 acres low density residential or development through subdistrict G7) is generated in the SS district, a relief connection will be necessary.

For alternative 2, flows from subdistricts G1 through G4 would flow west from G3.1 to G1.1 and west to the SLJ district via an 18-inch trunk main, ultimately to the future Louisville Township wastewater treatment plant. The remaining subdistricts would flow north G3.2 to the existing 18-inch trunk sewer at Canterbury Road and Valley View Road (G9.1). In this alternative the existing 18-inch trunk main (G9.1 to G10.2) would have adequate capacity to convey future flows. However, the 18-inch connection underneath US 169 would exceed capacity and require a relief sewer if constructed at minimum grade. The development constraints for installing a relief sewer would be identical for those in alternative 1.

Alternative 3 was developed in the event that SMSC continues land acquisition west and would not allow a sanitary sewer to flow through their boundaries. It would be possible to pump wastewater to the SLJ district, but it would be more cost effective for wastewater to flow to Prior Lake, which would be a shorter distance. The flow distribution would be similar to that of alternative 2, but a greater amount will flow south to the City of Prior Lake. Thus, all existing trunk sewers in the district would have adequate capacity to serve the northern subdistricts. To serve the southern districts, two lift stations (750 gpm and 1,600 gpm), trunk mains ranging in size from 10 to 18-inches diameter, and an additional 1,500 foot extension of 12-inch PVC force main into the City of Prior Lake would be required as shown in Figure 7-6. At this time, the City of Prior Lake has not approved a future connection to their system. The Prior Lake interceptor was not designed with reserve capacity to serve portions of Shakopee through Prior Lake. Additional capacity analysis of the Prior Lake interceptor would be required as well as a joint meeting between the City of Shakopee, the City of Prior Lake, and MCES to determine if this alternative is possible.

7.3.9 Central Shakopee (CS)

More than half of this district has been developed, and existing land uses include commercial, medium density residential, and low density residential. These land uses are estimated to currently generate 0.37 mgd of sanitary sewer flow.

Existing sanitary sewer flows are collected by three different trunk mains, shown in Figure 3-2. The west trunk main is 10-inches in diameter and extends north from the intersection of St. Francis Avenue and Marschall Road (F1.1) to the intersection of US 169 and Marschall Road (F1.2) where it connects to the Chaska/Shakopee Interceptor. The central trunk main extends north from the intersection of Pheasant Run Street and Valley View Road (F2.1) north to Delany Lane where the east trunk flows into it (F3.1), then north to the Shakopee/Chaska Interceptor (F3.2). The central trunk main begins as a 12-inch main and increases to 15-inch where it connects to a 12-inch spur prior to the connection with the east trunk. The east trunk is a 12-inch trunk main that flows north along Independence Avenue from the intersection of Independence Avenue and Valley View Road (F4.1) then west along King Avenue to Delany Lane where it flows into the central trunk (F3.1).

Future sanitary sewer flows are projected to increase to 0.55 mgd and the improvements required to serve the additional flow would be the same regardless of a Louisville Township wastewater treatment plant being constructed. The only additional improvements required are the extensions of the existing trunk mains. All future improvements are shown in Figures 7-2 and 7-3.

The existing trunk mains are adequate in size to provide service to future development. The central trunk main flows are expected to exceed 75% capacity based on the assumed existing flow entry points and estimated future flows. Both the 12-inch diameter section (F2.1 to F3.1) and the 15-inch diameter section (F3.1 to F3.2) are estimated to flow at 82% and 89% capacity respectively. The central trunk would convey flows from subdistrict F2-F, which is the future development south of existing. The west trunk has adequate capacity to serve both existing development in subdistrict F1 and future development to the south in subdistrict F1-F. Subdistrict F1-F is approximately 50 acres in size, and would push the flow of the western trunk to 72% of capacity. Neither of the existing trunk mains need to be extended to open up an area for development. However, as development occurs, the trunk mains will be extended throughout the development.

7.3.10 Jackson/Shakopee (JS)

The Jackson/Shakopee district is somewhat developed with medium density residential, low density residential, and public (high school) land uses. The southern portion of the district is developed, but unsewered. Future land use will be low density residential.

Existing sanitary sewer flows are collected by two trunk mains, a western 12-inch diameter main and an eastern 15/18-inch trunk main. Existing development generates 0.15 mgd of existing average day flow that is conveyed to the Shakopee/Chaska interceptor through the two trunk mains mains. The western 12-inch trunk main extends northeast from the high school (E6.1) to the intersection of Townline Avenue and US 169 (E6.2) where it connects to the Shakopee/Chaska interceptor. The eastern trunk main extends north through development from CR 78 (E5.1) to US 169 (E5.2).

Future sanitary sewer flows are projected to increase to 0.56 mgd by 2030 and 0.64 mgd for the ultimate service area. The improvements required to serve the additional flow would be the same regardless of a Louisville Township wastewater treatment plant being constructed. The only additional improvements required are the extensions of the existing trunk mains. All future improvements are shown in Figures 7-2 and 7-3.

To provide service to future development, both trunk mains would have to be extended south. Both trunk mains are adequate to provide service to future development. The western trunk would be extended from the high school (E6.1) to the east along North Shannon Drive to Townline Drive, then south along Townline Drive to the intersection of Townline Avenue and CR78 (E2.1) as a 8./12-inch diameter trunk main. It would collect flows from subdistricts E2, E5, E6, and existing development. The existing ground elevations do not allow subdistricts E2, E5, and E6 to flow east to the eastern trunk main. The eastern trunk main would be extended west along CR 78 from the current 15-inch stub (E5.1) to the intersection of CR 78 and Barrington Drive (E4.1), then southwest through points E3.1 and E1.1. The trunk main would be extended as 10/12-inches in diameter and collect wastewater generated in subdistricts E1, E3, and E4.

7.3.11 South Louisville/Jackson (SLJ)

The South Louisville/Jackson has a few developed properties near US 169. The existing average day flow is estimated to be 0.04 mgd, and the land use is exclusively low density residential. Developable land uses include commercial, medium density residential, and high density residential. There are some currently developed low density residential areas around Lake O'Dowd that are not sewered.

Existing wastewater flows are collected by a 24-inch trunk main that extends south from the Shakopee/Chaska interceptor along US 169 (D6.1) through the Countryside development along Friesian Street, Jutland Avenue, and ending at Lusitano Street (D5.1.1).

Development of a future wastewater treatment plant in Louisville Township will affect future sanitary sewer service to the subdistricts. The differences are shown

in alternative 1 (Appendix 4, Figure 7-2) and alternative 2 (Appendix 5, Figure 7-3). Description of the service alternatives describe mains based on the points noted on Figures 7-2 and 7-3 since there are limited roads in the southern subdistricts.
For alternative 1, Figure 7-2, wastewater would flow north from Marystown (D1.1) to the Shakopee/Chaska interceptor (D6.1). This main would begin in Marystown (D1.1) as a 15-inch main and gradually increase to 24-inches as it flows north near Marystown Road prior to its connection with the existing 24-inch trunk main at Lusitano Street (D5.1.1). The existing 24-inch trunk main (D5.1.1 to D6.1) has adequate capacity to provide service for future flows. However, future trunk mains will have to be constructed at greater than minimum grade to maintain less than 75% capacity between D4.1.1 and D5.1.1. Existing ground contours are favorable to maintain grade between D5.1 and D5.1.1. If minimum grade is required between D4.1.1 and D5.1, future capacity would be 81% which is acceptable.

Also necessary for alternative 1 would be a 42-inch trunk main near the district border along US 169 (C3.3) flowing east to the Shakopee/Chaska interceptor (D6.2). This trunk main would carry flows from SWL, WLJ, and WJ districts to the Shakopee/Chaska interceptor.

If a wastewater treatment plant is developed in Louisville Township, service to future properties would be as shown in Figure 7-3. The Jackson/Louisville Township boundaries would split the district. Area within Louisville Township would flow from north (D3.1) to south (D1.1) through a 10 to 21-inch diameter main to a 2,300 gpm lift station near the southern Louisville Township boundary. The lift station would pump wastewater west to the future wastewater treatment plant through 15-inch force main. The area within Jackson Township would flow north from Jackson/Louisville border (D3.1) via a 15-inch main that increases to a 24-inch trunk prior to connection with the existing 24-inch trunk main (D5.1.1). The existing 24-inch trunk main would have adequate capacity to serve the future flows in alternative 2.

7.3.12 West Jackson (WJ)

There are no existing developed properties in this district. Future land use is exclusively low density residential. Future land development is projected to increase wastewater flows to 0.82 mgd for average day flows. Future service to the district is dependent upon the development of a Louisville Township wastewater treatment plant.

Figure 7-2 shows service to the district in the absence of a Louisville Township wastewater treatment plant. Wastewater would flow from the south (C1.1), north along US 169 to the Shakopee/Chaska interceptor (C3.3). The trunk would initially be 12-inches in diameter in subdistrict C1, but increase to a 24-inch trunk in district C3.

Construction of a wastewater treatment plant in Louisville Township would change service as shown in Figure 7-3. Subdistricts C1 and C2 would flow west to a trunk mains located in the SWL and WLJ districts via 12 (C1.1 to A5.1) and 15-inch (C2.1 to B1.1) trunk mains. Subdistrict C3 would convey wastewater flows north via a 15-inch trunk main along US 169 and connect to the WLJ district (C3.2 to B4.1). Existing ground elevations dictated that flows from C3 flow north. All sanitary sewer flows would ultimately be conveyed to the Louisville Township wastewater treatment plant.

7.3.13 West Louisville/Jackson (WLJ)

The West Louisville/Jackson has a few developed properties near US 169, but are served either by septic tank or flow north to districts WS and NWS. Therefore, there is no existing flow within the district. Existing land uses are commercial and medium density residential. Developable land uses include commercial, industrial, and low density residential. Ultimate sanitary sewer flows are projected to be 1.16 mgd.

2030 service to the district is shown in Figures 7-2 and 7-3. Figure 7-2 shows future service without a Louisville Township wastewater treatment plant. Wastewater would flow to a 5,400 gpm lift station (B2.1) centrally located within the district, from three trunk mains (south, north, and east). The southern trunk main would convey flows from the SWL district, beginning at the SWL district border (A8.1), north parallel to US 19 to the lift station (B2.1) in 33 to 36-inch trunk main. The northern (B3.1 to B2.1) and eastern (B4.1 to B2.1) trunk mains, each 15-inches in diameter, would convey wastewater to the lift station (B2.1). The lift station would pump flows to the 42-inch SLJ trunk main (C3.3).

Figure 7-3 shows the effect on service if a wastewater treatment plant is constructed in Louisville Township. A 21 to 33-inch trunk main would be extended from subdistrict B4 (B4.1) conveying wastewater from subdistricts B4 and C3 southwest, parallel to US 169, to the southern WLJ border (A8.1). Wastewater from subdistrict B3 would require a 600 gpm lift station because of its low-lying topography to pump flows to the US 169 trunk main. The lift station would pump wastewater through a 6-inch force main to the US 169 trunk main at B2.1. Also, wastewater flows from subdistrict C2 would be connect to the US 169 trunk at B1.1 as discussed in the WJ district section.

7.3.14 Southwest Louisville (SWL)

The Southwest Louisville district has no existing developed properties, and thus no existing sanitary sewer flows. Future land use is exclusively low density residential and is expected to generate approximately 1.80 mgd average day flows.

Future service alternatives for the district are dependent upon the development of a Louisville Township wastewater treatment plant are shown in Figures 7-2 and 7-3.

For alternative 1 (no Louisville Township wastewater treatment plant), wastewater would be collected from the subdistricts through a network of trunk mains ranging in size from 10 to 24-inches in diameter and ultimately flow to a 3,600 gpm lift station (A4.3). The 3,600 gpm lift station would be the central collection point for the district. Subdistrict A6, in the southwest portion of the district, would require an 800 gpm lift station (A6.1) to collect and pump wastewater through a 8-inch force main to the 3,600 gpm lift station. The 3,600 gpm lift station would pump sanitary sewer flows through an 18-inch diameter force main to the West Louisville/Jackson district, where it would eventually connect to the MCES trunk system at point D6.1, as shown in Figure 7-4.

If a Louisville Township wastewater treatment plant were constructed (alternative 2), the service area would not change and wastewater would flow to the same central collection point as in alternative 1 (A4.3). However, this collection point would be a wastewater treatment plant, as opposed to a lift station. The network of trunk mains and 800 gpm lift (A6.1) station would collect sanitary sewer flows from each of the same subdistricts as alternative 1 with the exception of the north (A8.1 to A4.3) and east (A1.1.1 to A4.3) trunk mains.

The north trunk main would carry wastewater from the West Louisville/Jackson district and WJ subdistrict C3 south to the WWTP in a 33 to 36-inch trunk main. The east trunk main would connect to the 15-inch force main from district SLJ at A1.1.1 and would convey sanitary flows from South Shakopee subdistricts D1 through D3, and South Louisville/Jackson subdistricts G1 through G4 ultimately flow to the wastewater treatment plant (A4.3) through a 27 to 33-inch trunk main.

8.0 CAPITAL IMPROVEMENT PROGRAM

8.1 Future System Improvement Costs

The projected sanitary sewer trunk system was broken down into improvements based on flow districts. The overall cost associated with trunk system components is estimated to be approximately $23,900,000 in today's dollars for alternative 1 and $23,700,000 for alternative 2. Table 8-1 summarizes the trunk improvement costs necessary for each district. Detailed cost estimates for each district are available in Appendix 7.

Improvement costs include a 10% construction contingency and 20% overhead (i.e. legal, engineering, and administrative). Street and easement costs and other miscellaneous costs that may be related to final construction are not included.

Table 8-1
2030 Capital Improvement Plan Summary by District

District	Alt. 1 Cost	Alt. 2 Cost	Alt. 3 Cost
NWS	$0	$0	
NS	$0	$0	
WS	$0	$0	
NCS	$0	$0	
NES	$976,818	$976,818	
ES	$1,311,103	$1,311,103	
SES	$2,168,467	$2,168,467	
SS	$3,356,078	$2,375,044	$3,408,830
CS	$157,442	$157,442	
JS	$830,049	$830,049	
SLJ	$3,907,898	$4,455,192	
WJ	$3,063,880	$1,323,537	
WLJ	$5,123,870	$3,847,287	
SWL	$4,794,290	$6,941,669	
Total	***$25,689,895***	***$24,386,608***	

8.2 CIP Policy

The timing of future trunk sanitary sewer improvements will be influenced by several parameters including development pressures in specific areas, failing on-site septic systems, regulatory requirements, availability of funds, etc. As a result it is difficult to accurately predict the timing of future improvements especially those which may occur far into the future. Therefore the Capital Improvement Program is intended to serve as a guide only for future fiscal planning and should be reviewed on a regular basis as more current planning and cost data become available.

9.0 RECOMMENDATIONS

Based on the results and analysis of this study, it is recommended that the City of Shakopee and City Council where applicable:

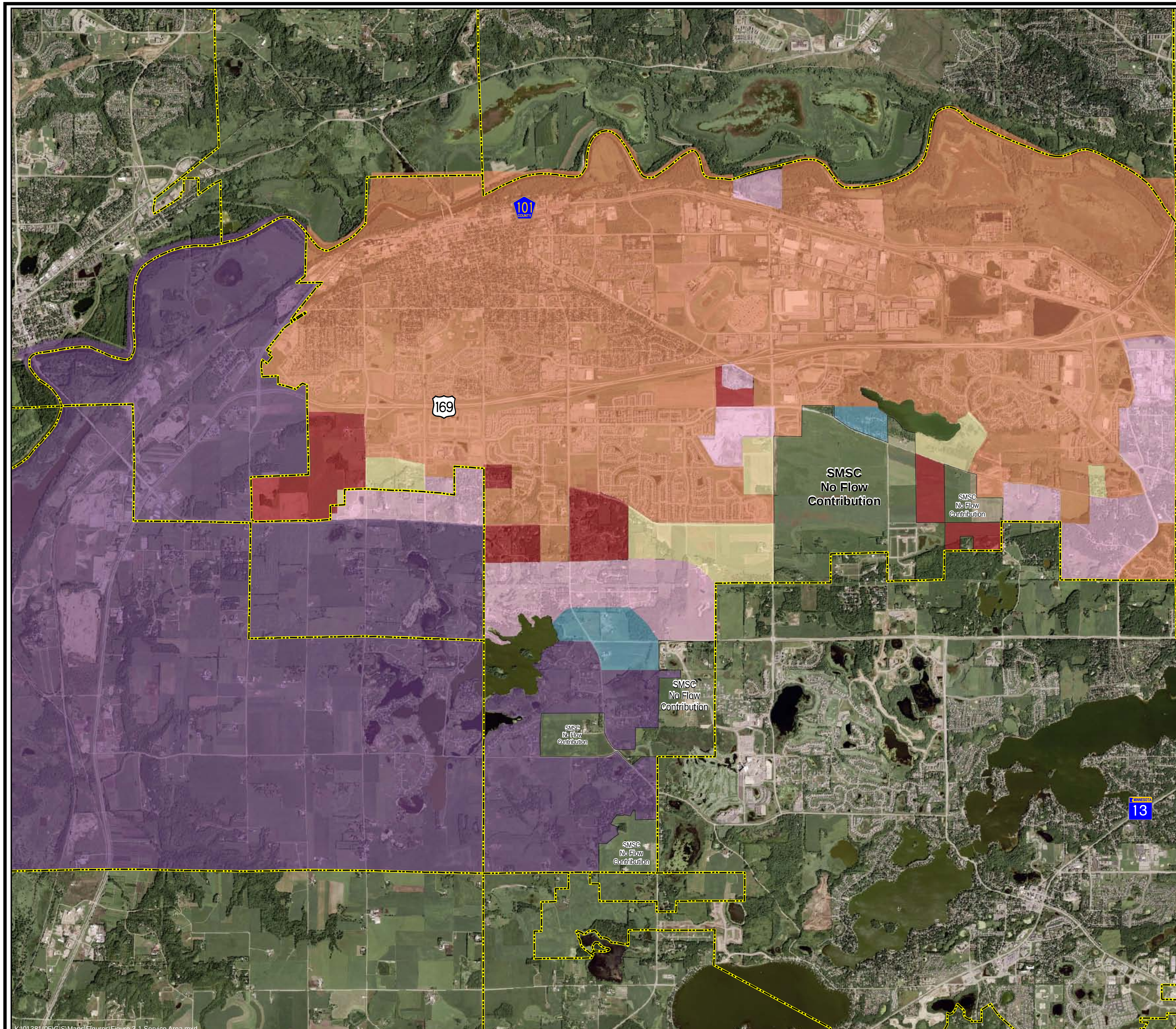
1. Adopt this report as the Comprehensive Sanitary Sewer Plan for the City of Shakopee.

2. Review and update the CIP for trunk sanitary sewer facilities every five years to reflect sewer improvement projects necessary for the next five year period.

3. Proceed with future sanitary sewer improvements in accordance with alternative 1. Future treatment facilities in Louisville Township are speculative, and the City does not have planning authority for Louisville Township.

4. Continue to reduce I/I from the existing collection system and that provisions be maintained for controlling I/I into the sanitary sewer system for new construction.

FIGURES



Comprehensive Sanitary Sewer Plan For the City of

SHAKOPEE

Sewer Service Area

Figure 3-1

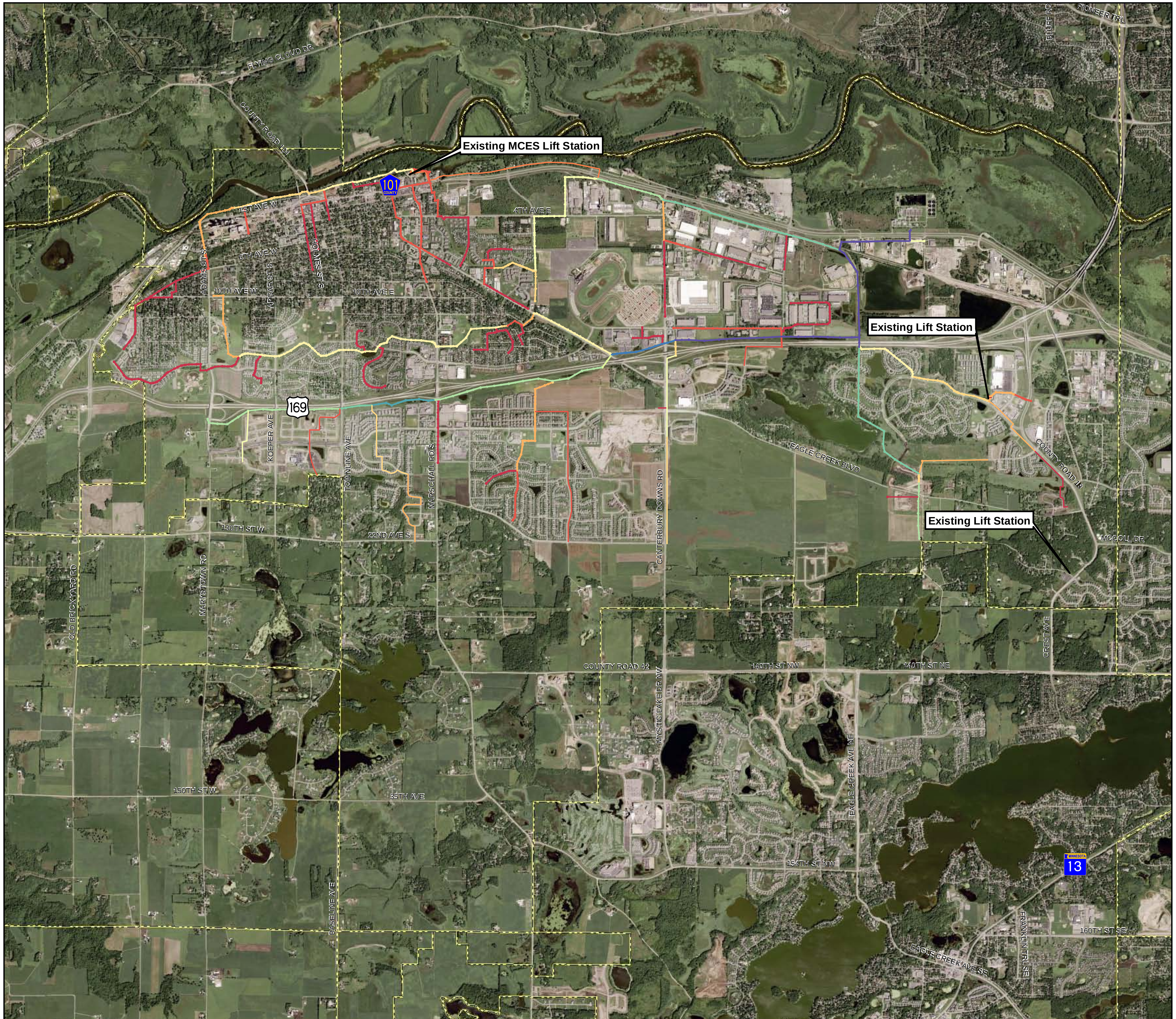
N

0 2,250 4,500 9,000 Feet

Legend

- Corporate Boundary
- Shakopee Mdewakanton Sioux Community
- Current Service Area
- Service Area Added by 2010
- Service Area Added by 2015
- Service Area Added by 2020
- Service Area Added by 2025
- Service Area Added by 2030
- Service Area Added Post 2030

WSB & Associates, Inc.



FILE: K:\01381-05\GIS\MAPS\FIGURES\FIGURE 3-2 SANITARY SYSTEM.MXD, JUL 23, 2007 11:49:46 AM

Comprehensive Sanitary Sewer Plan For the City of

SHAKOPEE

Existing Trunk Sewer System

Figure 3-2

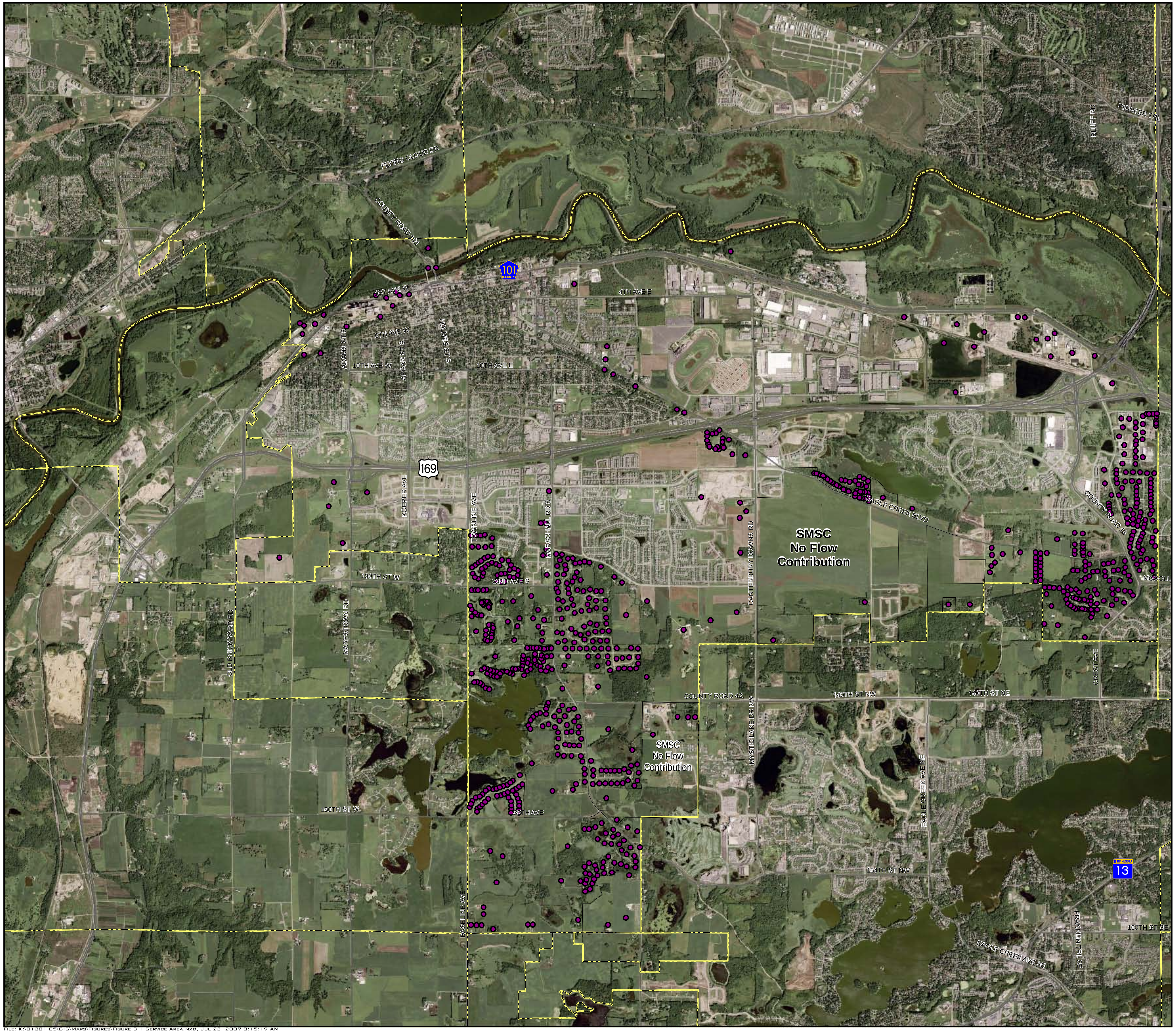
N

0 2,000 4,000 8,000 Feet

Legend

- 4 inch pipe
- 10 inch pipe
- 12 inch pipe
- 14 inch pipe
- 15 inch pipe
- 18 inch pipe
- 21 inch pipe
- 24 inch pipe
- 30 inch pipe
- 36 inch pipe
- 42 inch pipe
- 48 inch pipe
- 66 inch pipe
- 72 inch pipe
- Corporate Boundary

WSB & Associates, Inc.



Comprehensive Sanitary Sewer Plan For the City of

SHAKOPEE

Existing Septic Systems

Figure 3-3

N

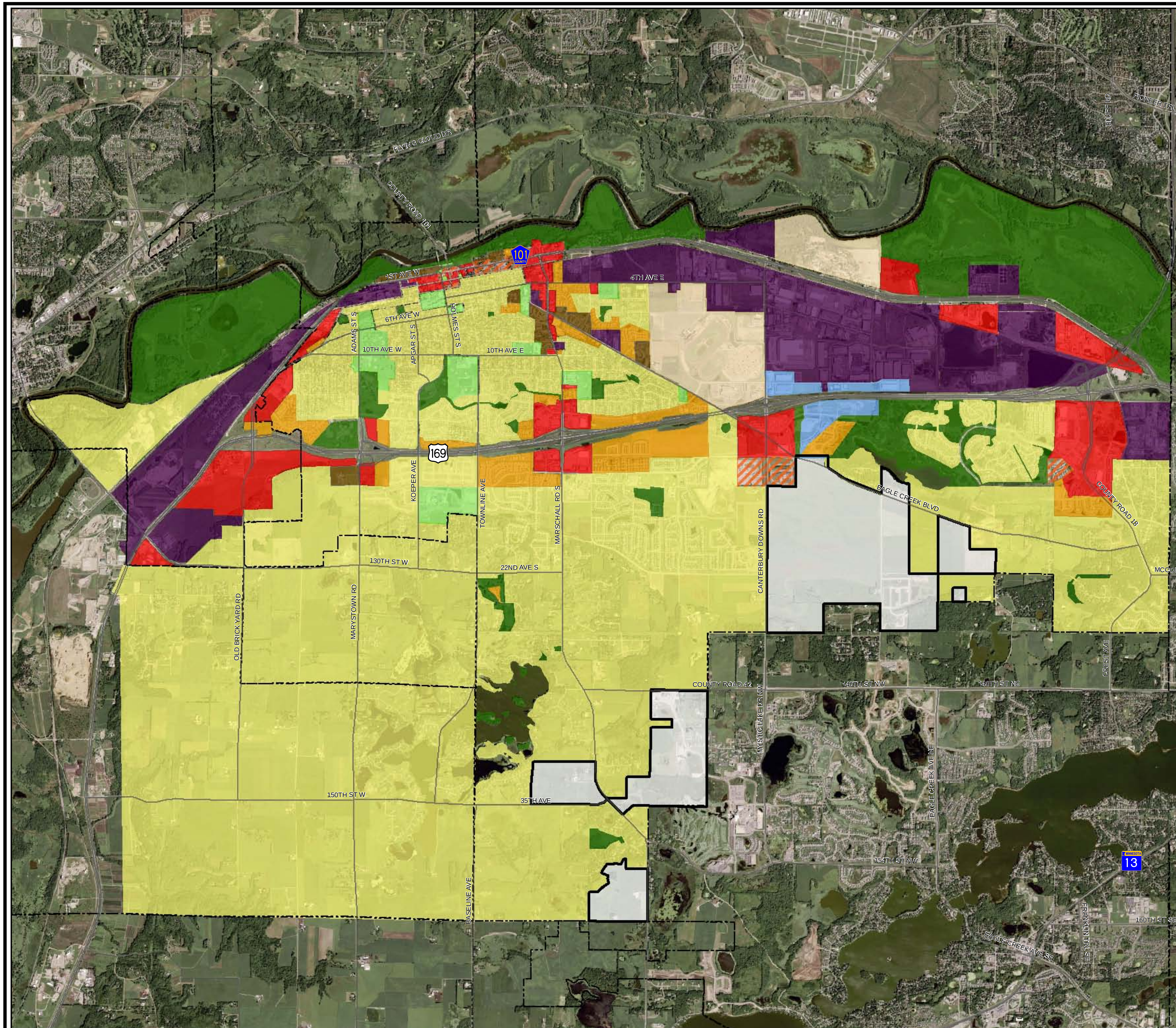
0 2,250 4,500 9,000 Feet

Legend

- Shakopee Septic System
- SMSC
- Corporate Boundary

WSB & Associates, Inc.

FILE: K:\01381-05\GIS\Maps\Figures\Figure 3-1 Service Area.mxd, Jul 23, 2007 8:15:19 AM



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Comprehensive Sanitary Sewer Plan For the City of

SHAKOPEE

Future Land Use

Figure 4-1

N

0 2,250 4,500 9,000 Feet

Legend

- Corporate Boundary
- Business Park
- Commercial
- Commercial Entertainment
- High Density Residential
- Industrial
- Low Density Residential
- Medium Density Residential
- Mdewakanton
- Mixed Use
- Open Space
- Public / Semi Public

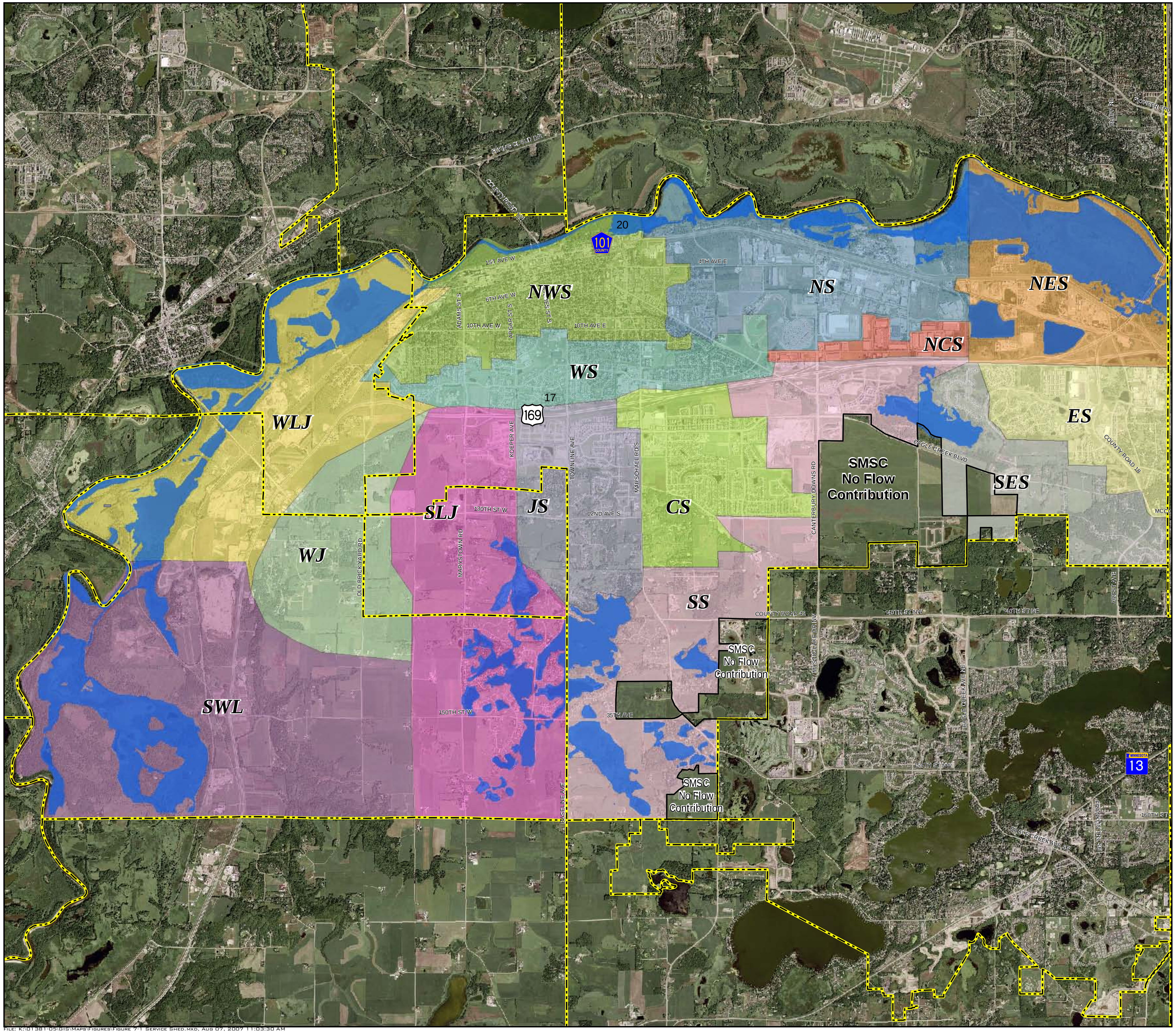
WSB & Associates, Inc.

Comprehensive Sanitary Sewer Plan For the City of

SHAKOPEE

Sanitary Sewer Sheds

Figure 7-1



N

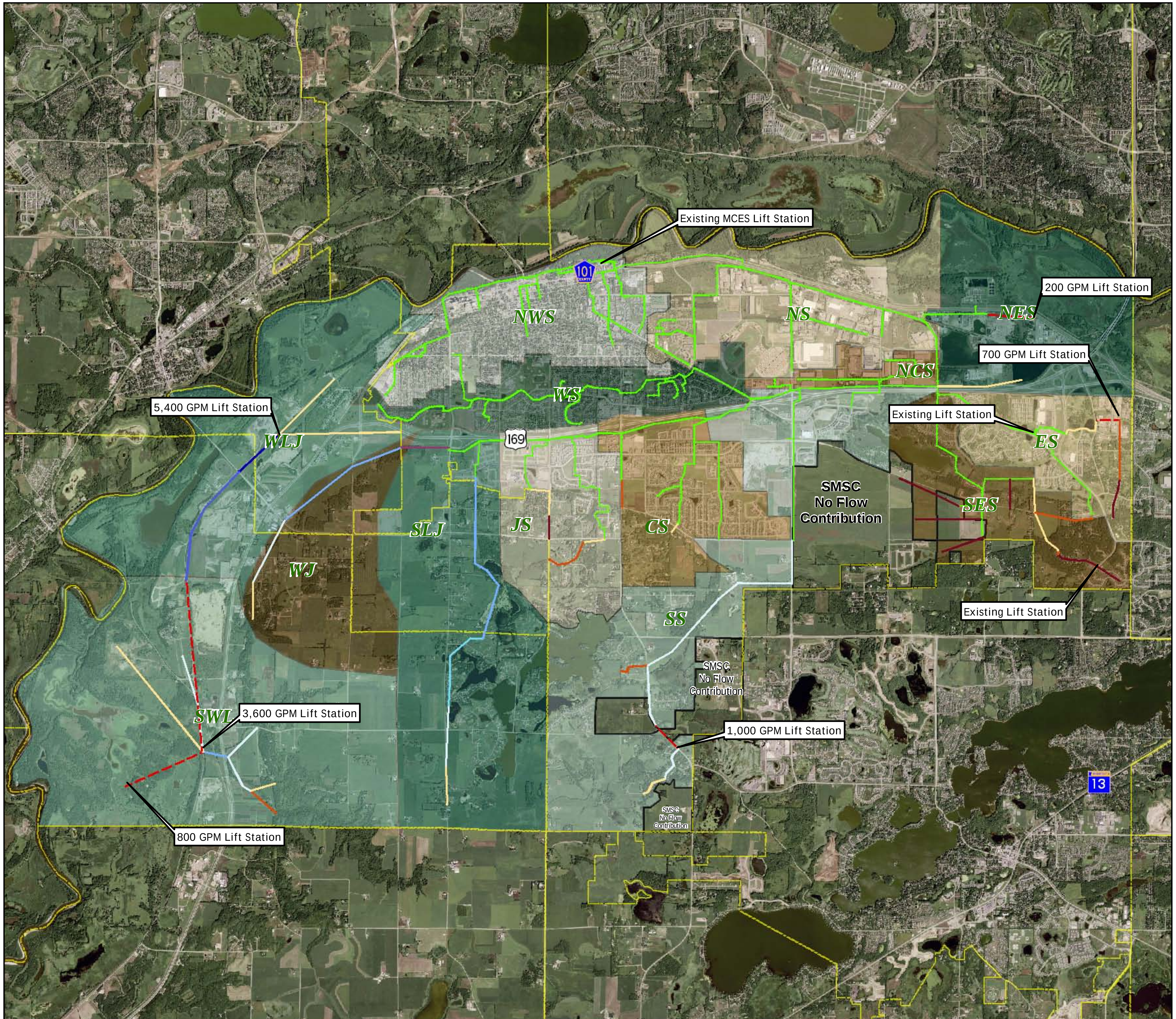
0 2,750 5,500 11,000 Feet

Legend

- Major Water Features
- Central Shakopee Sewer Shed
- West Shakopee Sewer Shed
- East Shakopee Sewer Shed
- Jackson/Shakopee Sewer Shed
- North Central Shakopee Sewer Shed
- North Shakopee Sewer Shed
- Northeast Shakopee Sewer Shed
- Northwest Shakopee Sewer Shed
- South Shakopee Sewer Shed
- Southeast Shakopee Sewer Shed
- Southwest Louisville Sewer Shed
- West Jackson Sewer Shed
- West Louisville/Jackson Sewer Shed
- South Louisville/Jackson Sewer Shed

WSB & Associates, Inc.

File: K:\01381-05\GIS\Maps\Figures\Figure 7-1 Service Shed.mxd, Aug 07, 2007 11:03:30 AM



Comprehensive
Sanitary Sewer Plan
For the City of

SHAKOPEE

Future Trunk Sewer System Alternative 1

Figure 7-2

N

0 2,500 5,000 10,000 Feet

Legend

- Existing Pipe
- 8 inch pipe
- 10 inch pipe
- 12 inch pipe
- 15 inch pipe
- 18 inch pipe
- 21 inch pipe
- 24 inch pipe
- 33 inch pipe
- 36 inch pipe
- 42 inch pipe
- FORCEMAIN
- Corporate Boundary

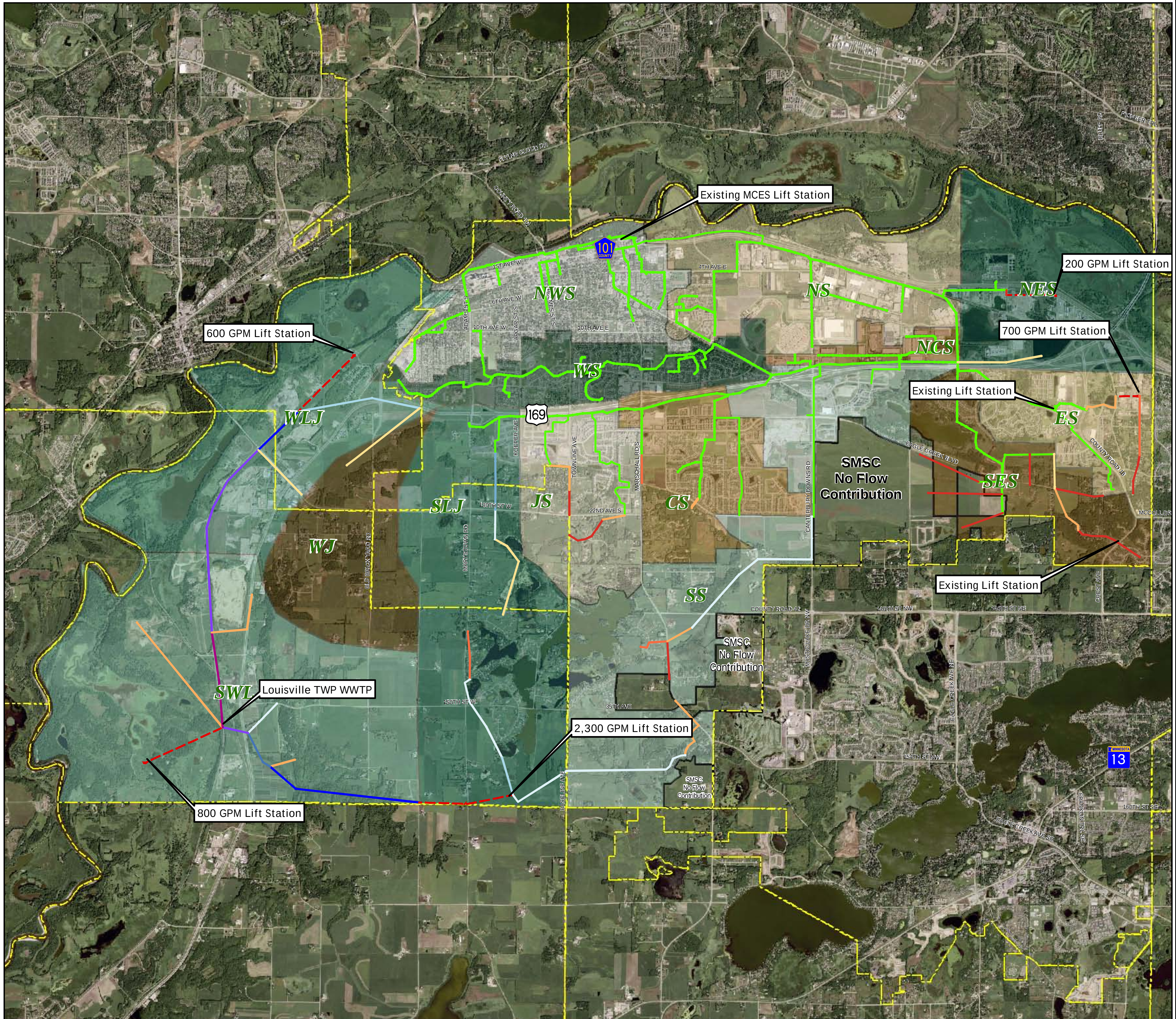
WSB & Associates, Inc.

Comprehensive Sanitary Sewer Plan For the City of

SHAKOPEE

Future Trunk Sewer System Alternative 2

Figure 7-3



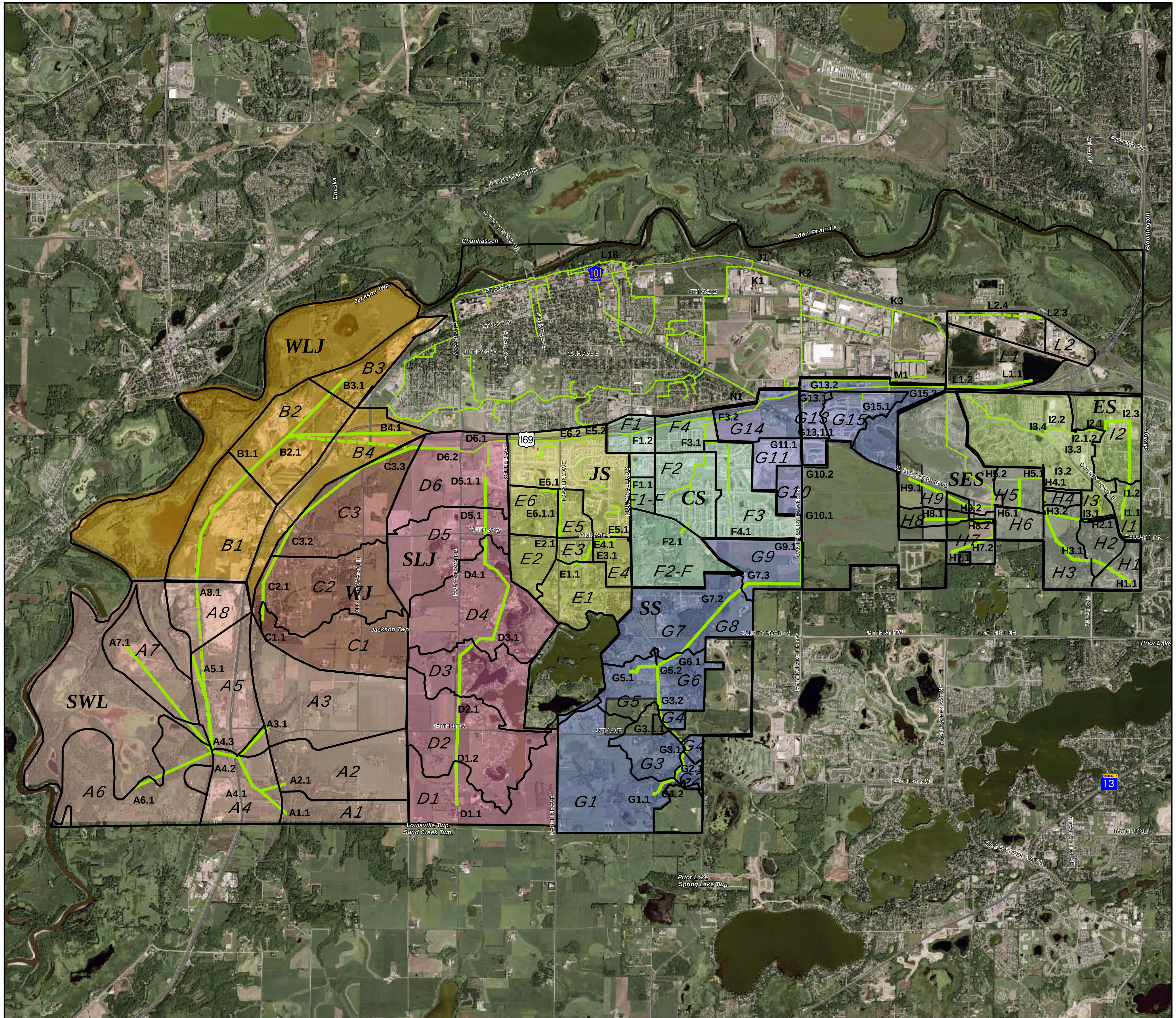
N

0 2,500 5,000 10,000 Feet

Legend

- 8 inch pipe
- 10 inch pipe
- 12 inch pipe
- 15 inch pipe
- 18 inch pipe
- 21 inch pipe
- 24 inch pipe
- 27 inch pipe
- 30 inch pipe
- 33 inch pipe
- 36 inch pipe
- FORCEMAIN
- Existing Pipe
- Corporate Boundary

WSB & Associates, Inc.



Comprehensive Sanitary Sewer Plan For the City of

SHAKOPEE

Future Trunk Sewer System Points Alternative 1

Figure 7-4

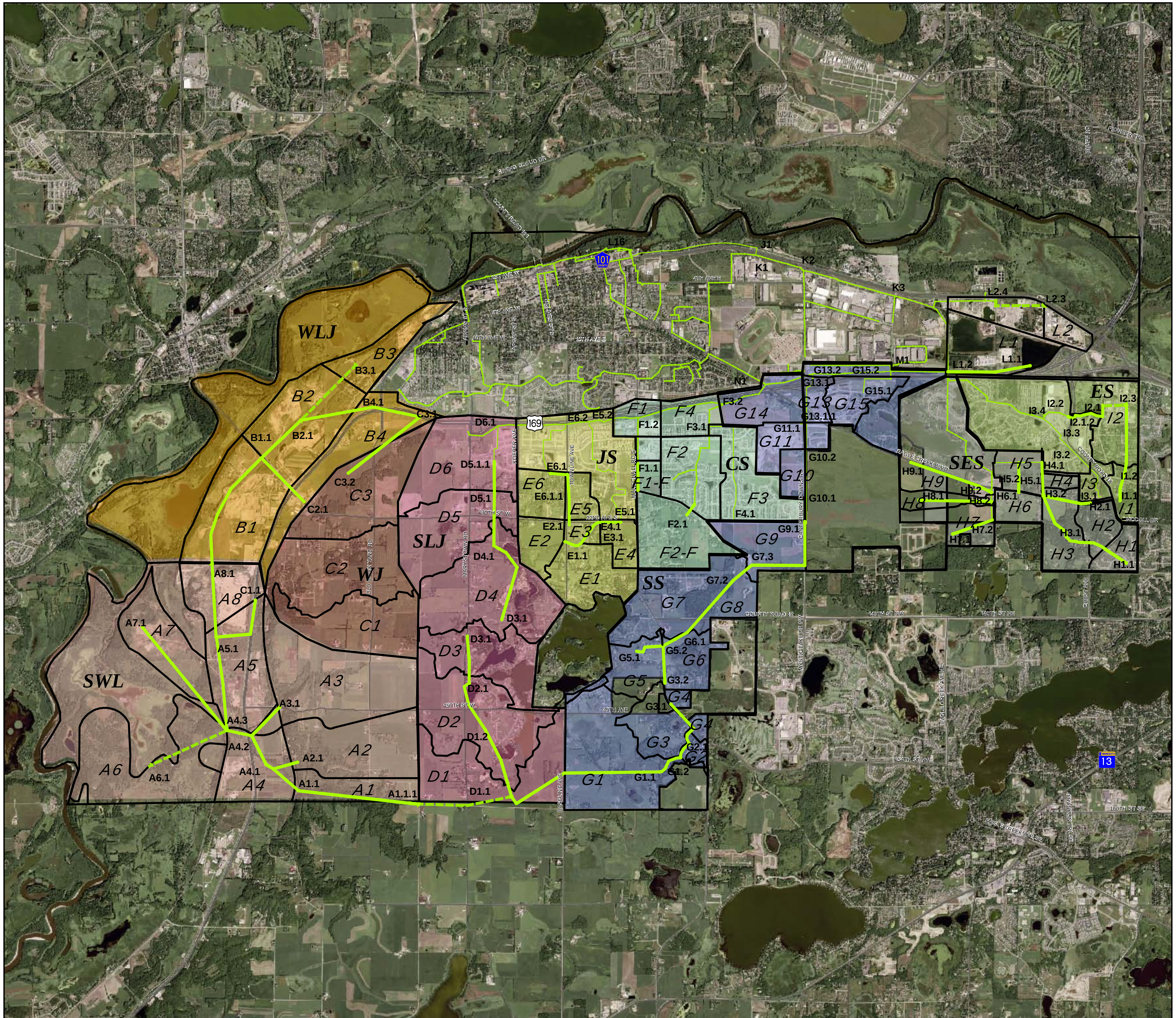
N

0 2,250 4,500 9,000 Feet

Legend

- Existing Sanitary Sewer
- Future Force Main
- Future Sanitary Sewer

WSB & Associates, Inc.



Comprehensive Sanitary Sewer Plan For the City of

SHAKOPEE

Future Trunk Sewer System Points Alternative 2

Figure 7-5

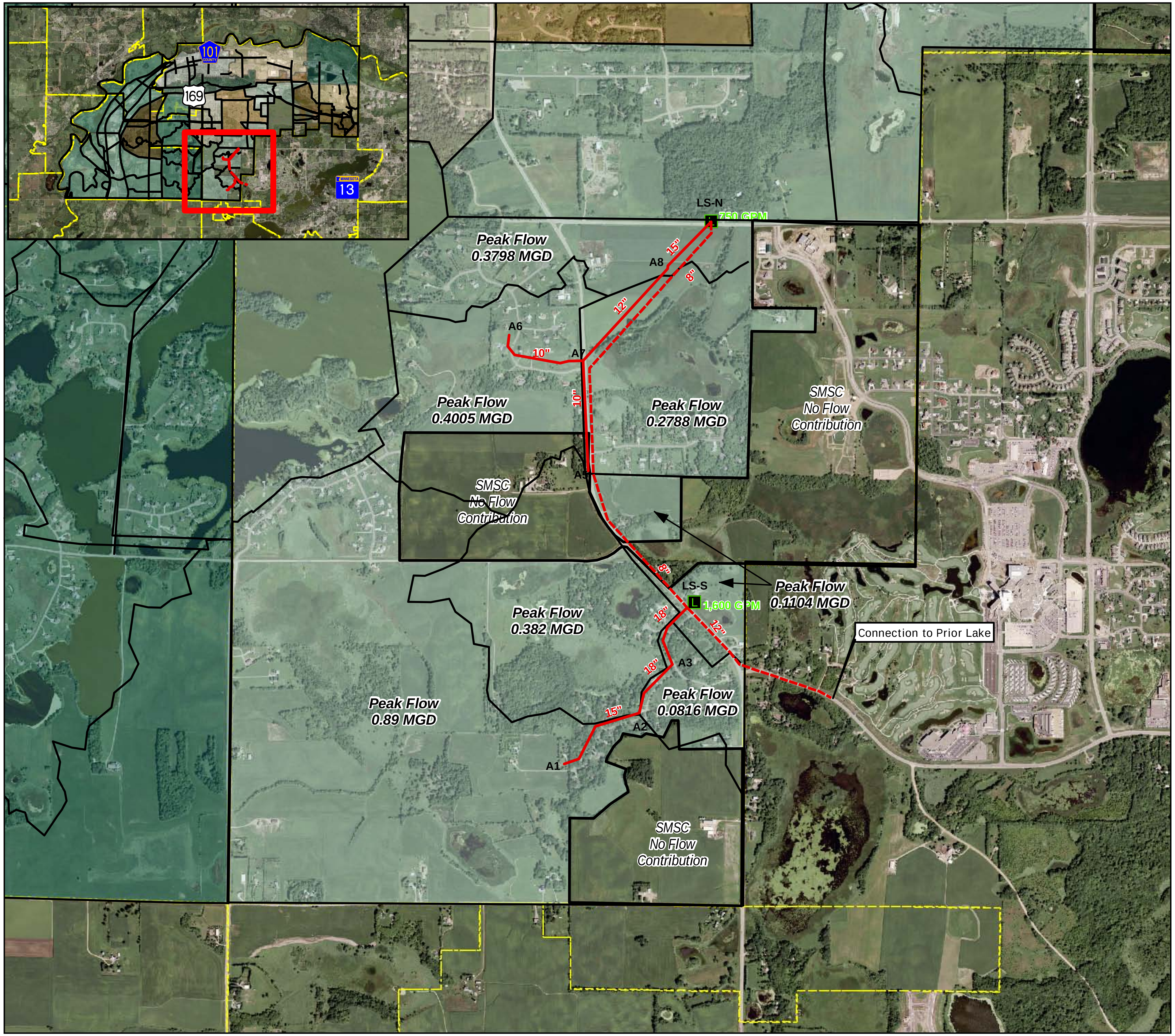
N

0 2,250 4,500 9,000 Feet

Legend

- Future Sanitary Sewer
- Future Force Main
- Existing Sanitary Sewer

WSB & Associates, Inc.



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Comprehensive Sanitary Sewer Plan For the City of

SHAKOPEE

Future Trunk Sewer System Alternative 3

Figure 7-6

N

0 750 1,500 3,000 Feet

Legend

- Lift Station
- Future Force Main
- Future Sanitary Sewer
- Sewer Shed Districts

Sewer Sheds

- Central Shakopee Sewer Shed
- Jackson/Shakopee Sewer Shed
- South Shakopee Sewer Shed
- South Louisville/Jackson Sewer Shed
- SMSC
- Corporate Boundary

WSB & Associates, Inc.

APPENDIX 1

MCES Hourly Peaking Factors

MCES Hourly Peaking Factor	
Appendix 1	
Average Flow Range (mgd)	MCES Peaking Factor
0 - 0.11	4.0
0.12 - 0.18	3.9
0.19 - 0.23	3.8
0.24 - 0.29	3.7
0.30 - 0.39	3.6
0.40 - 0.49	3.5
0.50 - 0.64	3.4
0.65 - 0.79	3.3
0.80 - 0.99	3.2
1.00 - 1.19	3.1
1.20 - 1.49	3.0
1.50 - 1.89	2.9
1.90 - 2.29	2.8
2.30 - 2.89	2.7
2.90 - 3.49	2.6
3.50 - 4.19	2.5
4.20 - 5.09	2.4
5.10 - 6.39	2.3
6.40 - 7.99	2.2
8.00 - 10.39	2.1
10.40 - 13.49	2.0
13.50 - 17.99	1.9
18.00 - 29.99	1.8
Over 30.00	1.7

APPENDIX 2

MCES L16 Ownership Transfer Agreement

SHAKOPEE INTERCEPTOR AND LIFT STATION TRANSFER AGREEMENT

THIS TRANSFER AGREEMENT ("Agreement"), effective on the date of execution by both of the parties, is made and entered into by the CITY OF SHAKOPEE, a municipal corporation ("Shakopee") and the METROPOLITAN COUNCIL, a public corporation and political subdivision of the State of Minnesota ("Met Council"), collectively referred to as the "Parties").

BACKGROUND RECITALS

1. Pursuant to Minnesota Statutes §473.146 the Met Council has adopted a comprehensive plan for the collection, treatment and disposal of sewage in the Minneapolis-St. Paul metropolitan area.

2. To implement its comprehensive plan for the collection, treatment and disposal of sewage, Met Council owns and operates the wastewater treatment and collection facilities including the sanitary sewer interceptor systems for the Minneapolis-St. Paul, Minnesota region hereinafter referred to in this Agreement as the "Metropolitan Disposal System".

3. As part of the Metropolitan Disposal System, Met Council owns and operates interceptor sewers and related ancillary facilities which for the purposes of this Agreement is identified as the Interceptor MSB 7024 from Lift Station L16 including Meter 401on Bluff Ave E; MSB7023 from MH22 and 22A along 2nd Avenue E, to and including a section of MSB 6904 at junction Box JB 4 and Siphon Outlet S2 (referred to in this Agreement as "Shakopee Interceptor), the location of which is shown on Exhibit A attached hereto and made a part of this Agreement.

4. On February 9, 2005, Met Council, in accordance with Minnesota Statutes § 473.511, subd. 2, determined that the Shakopee Interceptor is no longer necessary for Met Council's Comprehensive Plan for the collection, treatment and disposal of sewage in the metropolitan area. Met Council notified Shakopee in writing of this determination on February 10, 2005. On February 9, 2005, in accordance with Minnesota Statutes § 473.5111, subd. 3, Met Council further determined that the Shakopee Interceptor continues to be of benefit to the Shakopee sanitary sewer system. Met Council notified Shakopee in writing of this determination on February 10, 2005.

5. Further, on February 9, 2005, Met Council, in accordance with Minnesota Statutes § 473.5111, subd. 3 declared the Shakopee Interceptor to be in good operating condition as that term is defined by Minnesota Statutes § 473.5111. Met Council as part of this agreement will perform repairs specifically listed in Exhibit B attached, and the Shakopee will perform replacement specifically listed in Exhibit C attached and hereto made part of , and

Upon completion of the repairs and replacement listed in subparagraph 5 above, pursuant to Minnesota Statutes § 473.5111(7)(b), Met Council will transfer to Shakopee, the Shakopee Interceptor and Lift Station L16 in accordance with the terms and conditions of this Agreement.

6. Shakopee recognizes and agrees with the determinations made by Met Council as stated above in the Recitals.

7. Further, Met Council has determined that it is in its best interest for Shakopee to act as Met Council's agent to select, purchase and install a replacement communications system, at Met Council's expense, for Met Council's Lift Station L16 to convey Lift Station L-16 to Shakopee.

8. The Parties have now reached agreement on the topics and issues related to the transfer of the Shakopee Interceptor and Lift Station L16 and hereby set forth their agreement pursuant to their power and authority under Minnesota Statutes § 473.501, *et. Seq.*, § 473.5111, § 473.59, and other applicable statutes.

Shakopee is authorized to enter into this Agreement pursuant to ________________ dated __________________. The Council is authorized to enter into this Agreement pursuant to Council Action dated September 13, 2006.

Further, the parties specifically acknowledge and agree that it is their intent by this Agreement that Met Council, upon completion of the repair and replacement items specifically listed in this Agreement, will transfer to Shakopee and Shakopee will accept ownership and all responsibility and liability for maintenance and operation of the Shakopee Interceptor and Lift Station 16.

NOW, THEREFORE, for mutual consideration, the sufficiency of which has been agreed to by the Parties, Shakopee and Met Council agree as follows:

I.
Purpose of Agreement

1. The purpose of this Agreement is to set forth the terms and conditions with respect to the transfer of the Shakopee Interceptor from Met Council to Shakopee. For purposes of this Agreement, the Shakopee Interceptor is the interceptor shown on Exhibit A attached hereto and made a part hereof. The Shakopee Interceptor begins at MH 3 and Junction Box JB 4 (6904) in Shakopee and ends at MH401 and Lift Station L-16 in Shakopee.

2. The Parties agree that the purpose of this Agreement is to serve as the agreement governing transfer pursuant to Minnesota Statutes § 473.5111, subd. 7(b).

Met Council will transfer the Shakopee Interceptor and Lift Station 16 in accordance with the terms of this Agreement.

3. Shakopee agrees that the Shakopee Interceptor and Lift Station 16 is beneficial to Shakopee as a local Shakopee sanitary sewer system and Shakopee will accept the transfer of the Shakopee Interceptor and Lift Station 16 in accordance with the terms of this Agreement.

4. Met Council has determined and Shakopee agrees that the Shakopee Interceptor and Lift Station L16 is in good operating condition as that term is defined in Minnesota Statutes § 473.5111, subd. 1(a) "Good Operating Condition"). As part of the reconveyance and as terms to

this agreement Shakopee will accept the Shakopee Interceptor and Lift Station L16 subject to certain repairs and replacement to be performed at Met Council's expense. The repairs to be performed by Met Council are specified in Exhibit B attached hereto and made a part hereof ("Repairs"). Shakopee, as Met Council's agent, will perform replacement as specified in Exhibit C attached hereto and made a part hereof ("Replacement").

Shakopee hereby waives any right provided by Minnesota Statutes § 473.5111 or any other applicable statute to contest or request a hearing on Met Council's determination that the Shakopee Interceptor and Lift Station L16 is in Good Operating Condition subject to the Repairs to be performed by Met Council, and the Replacement to be performed by Shakopee.

II.
Communications Replacement Provisions of Met Council Lift Station L-16

1. For purposes of this Agreement, the Met Council Lift Station L-16 replacement project that is the subject of this Agreement is identified as Lift Station L-16 Communications Replacement and consists of facility Lift Station L-16 details of which are shown on Exhibit C (description of facility) attached hereto and made a part hereof. For purposes of this Agreement, the Met Council Lift Station L-16 Project is referred to as "Lift Station L-16 Project".

2. Met Council in connection with the communications system replacement of the Lift Station L-16 Project does hereby appoint Shakopee as its agent to select, purchase and install a communications system suitable to the needs of Shakopee.

3. Shakopee will prepare and submit to Met Council for Met Council's review and approval the specifications and proposed replacement costs pertaining to the Lift Station L-16 Project.

Evidence of Met Council's written approval or consent pursuant to this Paragraph II will be a letter to Shakopee from the Project Manager of Met Council's Environmental Services Division ("MCES")**. Met Council shall not unreasonably withhold approval**.

4. Shakopee will administer the contract and inspect the installation of the contract work. Shakopee will provide to Met Council final cost documents. Final Cost Documents will be submitted to the Project Manager of Met Council's Environmental Services Division ("MCES").

Bill Moeller, Assistant General Manager
Metropolitan Council Environmental Services
Regional Maintenance Facility
3565 Kennebec Drive
Eagan, MN 55122

5. Met Council shall reimburse Shakopee for the purchase and installation of the communications system of L-16 Lift Station Project as provided in this Agreement in the approximate amount of Five Thousand Six Hundred/100 Dollars, plus any required installation

costs. Payments to the contractor for work performed on the L-16 Lift Station Project will be made by Shakopee and Met Council will reimburse Shakopee in accordance with the terms of this Agreement.

6. Met Council has agreed to provide Shakopee 80 hours of training on the operation and maintenance of L-16 Lift Station, to be accomplished by the end of ~~2007.~~**2007 at no expense to Shakopee.**

IV.
General Conditions

1. Met Council and Shakopee agree that Met Council may not have property rights in its own name for the Shakopee Interceptor or portions thereof and that Met Council shall have no obligation to obtain any property right or rights, easements, or right of way for the Shakopee Interceptor or any portion thereof. However, Met Council agrees to reasonably cooperate in any transfer of property rights it does have.

2. Nothing in this Agreement shall be construed to modify or limit any statutory authority or legal obligations or responsibilities of Met Council. Specifically, and without limitation, nothing in this Agreement shall be deemed to modify or limit Met Council's review authority over Shakopee's plans under Minnesota Statutes §§ 103D.401, 103D.405, or 473.165, or other applicable law.

V.
Transfer of the Shakopee Interceptor and Lift Station L16

1. Met Council ~~will~~**shall**, at its own expense, perform the Repairs for Shakopee interceptor specifically listed in Exhibit B attached hereto and made a part hereof. The work may be periodically inspected by Shakopee's project manager in accordance with an inspection schedule arranged by the project managers of Met Council and Shakopee but Shakopee will have no responsibility for supervision of the work.

2. Met Council and Shakopee agree that Shakopee will, at Met Council's expense perform the Purchase and Replacement of a communications system for the Shakopee Lift Station L16 specifically listed in Exhibit C.

3. Upon completion of the Repairs by Met Council and Replacement by Shakopee, that pursuant to Minnesota Statutes § 473.5111, subd. 6(b)(2) and Met Council action September 13, 2006 that Shakopee Interceptor is in Good Operating Condition.

4. Immediately upon completion of the repairs listed in Exhibit B by Met Council, and the replacement listed in Exhibit C by Shakopee, Met Council shall transfer to Shakopee, at no cost to Shakopee, and Shakopee shall accept the transfer of Met Council's interest in the Shakopee Interceptor and Lift Station L16 and Met Council's interest in any associated property.

Met Council shall transfer and Shakopee shall accept by such transfer the Shakopee Interceptor and Lift Station L16 in "as is" condition by means of a Bill of Sale for Met Council's interest in the pipes and associated facilities constituting the Shakopee Interceptor and Lift Station L16 and a Quit Claim Deed for Met Council's property rights associated with the Shakopee Interceptor and Lift Station L16.

Shakopee acknowledges that any rights transferred by Met Council to Shakopee are subject to existing easements and rights-of-way for highways, roads, railroads, pipelines, canals, laterals, ditches or electric or telephone lines previously granted by Met Council or by any other party or parties.

5. Subsequent to transfer of the Shakopee Interceptor and Lift Station L16 to Shakopee, Shakopee shall have full and sole liability and responsibility for operation and maintenance of the Shakopee Interceptor and Lift Station L16.

VI.
Warranty

1. Provided that Shakopee has performed routine maintenance on the Shakopee Interceptor and Lift Station L16 , Met Council agrees, pursuant to Minnesota Statutes § 473.5111 that it will reimburse Shakopee for Met Council's share as provided in this Agreement, for the actual, reasonable and verifiable cost of uninsured and unwarranted emergency repairs for the Shakopee Interceptor and Lift Station L16 for a period of ten (10) years starting on the date Met Council has certified the Shakopee Interceptor to be in Good Operating Condition pursuant to Minnesota Statutes § 473.5111, subd. 6(2) and Section III of this Agreement and ending ten (10) years from such date. Met Council will transfer to Shakopee any warranties or guarantees Met Council has received from its contractors and subcontractors for such Repairs.

For the purposes of this Agreement, emergency repairs are only such repairs needed to fix any imminent and bona fide threat to the structural integrity of the Shakopee Interceptor and Lift Station L16 within the ten year period stated above in this Section IV. Specifically, repairs due to outside sources, including, but not limited to, acts of God, terrorism, use of facilities for other than wastewater purposes, misuse of facilities and vandalism are not considered to be due to structural condition of the pipe and are the responsibility of Shakopee.

2. Met Council's obligation to reimburse Shakopee for its share in the cost of emergency repairs for the Shakopee Interceptor and Lift Station L16 is subject to the following conditions:

a. Shakopee has provided written notice as soon as practicable to Met Council that an imminent and bona fide threat to the structural integrity of the Shakopee Interceptor has occurred, the date on which the threat first occurred, and the nature and cause of imminent and bona fide threat; and

b. If there is disagreement that the condition reported by Shakopee constitutes an imminent and bona fide threat to Shakopee MSB 7024, 7023 Interceptor or Lift Station L16 an independent third party will be contracted to make the determination.

c. The determining date for eligibility of the emergency repair costs to be shared by Met Council under the terms of this Agreement is the date on which the incident causing the bona fide and imminent threat was noticed to Met Council as provided in subparagraph 2(a) above in this Section IV; and

(d) Shakopee has submitted to Met Council written plans for the emergency repair to the Shakopee Interceptor and Met Council has reviewed such plans and determined that the plans are reasonable and necessary for the emergency repair; and

(e) Shakopee provides to Met Council maintenance records that demonstrate the routine maintenance of the facilities to be repaired; and

(f) Any portion of the facilities for which Shakopee has done a material rehabilitation or repairs previously covered under this Section IV of this Agreement are not eligible for repair under this Section IV of this Agreement.

3. Met Council will provide 100% emergency repair costs in year one until the first anniversary, decreasing by ten percent each year. On the tenth anniversary of the (re)conveyance, Met Council is released of all obligations, warranties and liabilities for the Interceptor.

4. Met Council will make the reimbursement for emergency repairs in accordance with the following procedure:

Met Council will reimburse Shakopee within 45 days of submittal to Met Council of an invoice from Shakopee specifically listing the reimbursable costs listed in this Section IV of this Agreement, written evidence of payment to contractors and subcontractors by Shakopee including written receipts of such payments from contractors and subcontractors, and certification from Shakopee that the work for which it is requesting reimbursement has been completed to the satisfaction of Shakopee and Shakopee has accepted such work in accordance with the terms of its contract with its contractor.

In the event any items of an invoice are contested, the uncontested portion of the invoice shall be paid in accordance with the normal 45-day period and the contested items shall be paid within 45 days of resolution of the matter.

Upon completion of the emergency repairs, Shakopee will submit a Final Estimate for the emergency repairs, a final invoice for any remaining eligible reimbursable costs, together with certification from Shakopee that the emergency repairs have been completed in accordance with the construction documents and accepted by Shakopee and certification from Shakopee that all contractors and subcontractors have been paid.

Shakopee agrees that Met Council may use general obligation bond funds to reimburse Shakopee for any eligible costs under this Section IV of this Agreement, and Shakopee agrees to consult with Met Council in advance of spending such funds and to comply with any requirements of Met Council for use of bond funds.

VII.
General Provisions

1. Applicable provisions of federal law, Minnesota law, and of any applicable local ordinances relating to civil rights and discrimination and the Affirmative Action Policy statements of Shakopee and Met Council shall be considered a part of this Agreement as though fully set forth herein. Specifically, Shakopee agrees to comply with all federal, state and local applicable laws and ordinances relating to nondiscrimination, affirmative action, public purchases, contracting, employment, including workers' compensation and surety deposits required for construction contracts. Shakopee agrees to request payment of state labor wage information from its contractor and provide such information to Met Council.

2. It is understood and agreed that the entire Agreement between the parties is contained herein and that this Agreement supersedes all oral agreements and negotiations between the parties relating to the subject matter hereof. All items referred to in this Agreement are incorporated or attached and deemed to be part of this Agreement.

3. All employees of Shakopee and all other persons engaged by Shakopee in the performance of any work or services required or provided for herein to be performed by Shakopee shall not be considered employees of Met Council, and that any and all claims that may or might arise under the Worker's Compensation Act or the Unemployment Compensation Act of the state of Minnesota on behalf of said employees while so engaged, and any and all claims made by any third parties as a consequence of any act or omission on the part of said employees while so engaged, on any of the work or services provided to be rendered herein, shall in no way be the obligation or responsibility of Met Council.

It is further agreed that any and all employees of Met Council and all other persons engaged by Met Council in the performance of any work or services required or provided herein to be performed by Met Council shall not be considered employees of Shakopee, and that any and all claims that may or might arise under the Worker's Compensation Act or the Minnesota Economic Security Law of behalf of said employees while so engaged, and any and all claims made by any third parties as a consequence of any act or omission of the part of said employees while so engaged , on any work or services provided to be rendered herein, shall in no way be the obligation or responsibility of Shakopee.

4. The provisions of this Agreement shall be deemed severable. If any part of this Agreement is rendered void, invalid, or unenforceable, such rendering shall not affect the validity and enforceability of the remainder of this Agreement unless the part or parts which are void, invalid or otherwise unenforceable shall substantially impair the value of the entire Agreement with respect to the parties. One or more waivers by said party of any provision, term, condition or covenant shall not be construed by the other party as a waiver of a subsequent breach of the same by the other party.

5. All records kept by Met Council and Shakopee with respect to this Agreement shall be subject to examination by the representatives of each party hereto and the State Auditor, and its representatives. All data collected, created, received, maintained or disseminated for any

purpose by the activities of Shakopee and Met Council pursuant to this Agreement shall be governed by Minnesota Statutes, Chapter 13, as amended, and the Minnesota Rules implementing such Act now in force or hereafter adopted.

6. The covenants of this Agreement shall be binding upon and inure to the benefit of the parties hereto, their successors and assigns.

7. Any notice or demand, which may or must be given or made by a party hereto, under the terms of this Agreement or any statute or ordinance, shall be in writing and shall be sent certified mail or delivered in person to the other party addressed as follows:

Regional Administrator
Metropolitan Council
390 Robert Street North
St. Paul, MN 55101-1805

with a copy to:

Metropolitan Council Environmental Services
c/o General Manager
390 Robert Street North
St. Paul, MN 55101-1805

City Administrator
City of Shakopee
129 Holmes Street S.
Shakopee, MN 55379-1328

8. This Contract is entered into in and under the laws of the State of Minnesota and shall be interpreted in accordance therewith.

9. If a dispute should arise between Met Council and Shakopee with respect to this Agreement or any of its provisions, Met Council and Shakopee agree to attempt to resolve such dispute through the use of a mediator mutually acceptable to Met Council and Shakopee prior to initiation of any legal action on the part of Met Council or Shakopee with respect to this Agreement, any of its provisions and/or its enforcement. The costs of such mediation shall be shared equally by the parties.

10 Met Council's project manager is:

William Moeller, Assistant General Manager, Interceptor Services
or his designee
Metropolitan Council Environmental Services

Shakopee's project manager is:

Bruce Loney or his designee
Public Works Director
City of Shakopee

11. The parties agree that any agreement or contract entered into by them pursuant to this Agreement shall include clauses that shall: 1) require the contractor to defend, indemnify and hold harmless Shakopee and the Met Council, their officials, agents, contractors and employees from claims, suits, demands, damages, judgments, costs, interest, expenses (including, without limitation, reasonable attorneys' fees, witness fees and disbursements incurred in the defense thereof) arising out of or by reason of the negligence of the said contractor, its officers, employees, agents, or subcontractors; 2) require the contractor to provide and maintain insurance and provide to the parties prior to commencement of the construction a Certificate of Insurance evidencing the insurance coverage and naming both parties as additional insureds; and 3) require the contractor to be an independent contractor for purposes of completing the work provided for in this Agreement.

12. Each party agrees that it will be responsible for its own acts and the results thereof, to the extent authorized by law, and shall not be responsible for the acts of the other party and the results thereof. The Met Council's and Shakopee's liability is governed by the provisions of Minnesota Statutes Chapter 466. The Met Council and Shakopee each warrant that they are able to comply with the aforementioned liability requirements through an insurance or self-insurance program and have minimum coverage consistent

with the liability limits contained in Minnesota Statutes Chapter 466.

IN TESTIMONY WHEREOF, the parties hereto have caused this Agreement to be executed by their respective duly authorized officers as of the day and year first above written.

CITY OF SHAKOPEE

ATTEST:

______________________________ By______________________________

Shakopee City Mayor

Date:______________________________

______________________________ By______________________________

Shakopee City Administrator

Date:______________________________

______________________________ By______________________________

Shakopee City Clerk

Date:______________________________

APPROVED AS TO FORM

______________________________ By______________________________

Shakopee City Attorney

Date______________________________

METROPOLITAN COUNCIL

Approved as to form:

______________________________ By______________________________

Office of General Council

Its______________________________

EXHIBIT LIST

Exhibit A – Map Showing Location of the Shakopee Interceptor and Lift Station L16

Exhibit B – Repairs to interceptor to be made by Met Council

Exhibit C – Replacement of communications by MCES and Shakopee, to Lift Station L-16

EXHIBIT A

Map Showing Location of the Shakopee Interceptor and Lift Station L16

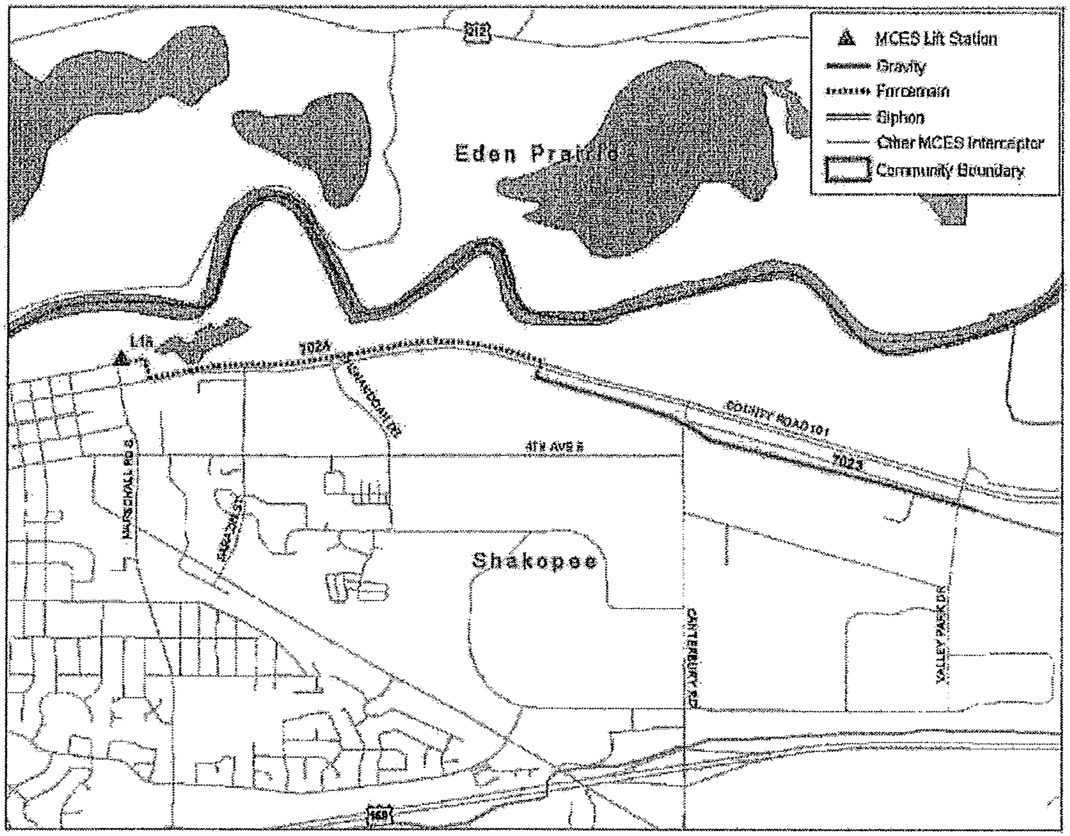

EXHIBIT B

SECTION

SUMMARY OF WORK INTERCEPTOR

GENERAL

1.0 Basic description: Work will consist of rehabilitating 7261 feet of 42" RCP interceptor using Cured In Place Pipe (CIPP). This type of lining creates a structural lining of 15-17 mm thickness with little/no loss of capacity in the line. The CIPP lining will begin at MH 13 at the intersection of Canterbury Downs Blvd (interceptor 7023) to Junction structure #4 to the east at Siphon Outlet (interceptor 6904).

1.1 Timeline: Project is scheduled to commence in 2007 and is expected to be completed in 2007.

EXHIBIT C

Installation of Telemetry System

Installation of Remote Site Wireless Lift Station Analyzer/Equipment Monitor:

Item A: Crystal Ball Plus Multimedia Alarm "Management System Remote Site Wireless Lift Station Analyzer/Equipment Monitor-2 units @ $2800/ea

Total: $5600.00 not including electrical work

Electiral Work, Crane/Lift and Locks

1. Metropolitan Council staff shall perform the electrical work necessary for the provision of the crane/lift installment at no cost to City of Shakopee.

2. Metropolitan Council staff shall perform electrical work required for the provision of the contractor to install Telemetry System at no cost to City of Shakopee.

3. Metropolitan Council staff shall provide for the change of locks on the lift station at no cost to City of Shakopee.

Document comparison done by DeltaView on Friday, December 01, 2006 10:02:03 AM

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Document 2	PowerDocs://DOCSOPEN/302179/2
Rendering set	K&G Standard

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~~Moved from~~	
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Style change	
Format change	
~~Moved deletion~~	
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Deleted cell	
Moved cell	
Split/Merged cell	
Padding cell	

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APPENDIX 3

Total Future Flows Generated in Each Sub-district

Appendix 3 - Total Ultimate Flows Generated in each Subdistrict

District	Subdistrict	Land Use	Flow/Acre (gpad)	Area (acre)	Per/Acre	Flow/Per	Avg. Flow (mgd)	Notes
SWL	A1	Res.	475	217	5.56	75	0.1031	
	A2	Res.	475	427	5.56	75	0.2028	
	A3	Res.	475	888	5.56	75	0.4218	
	A4	Res.	475	339	5.56	75	0.1610	
	A5	Res.	475	474	5.56	75	0.2252	
	A6	Res.	475	670	5.56	75	0.3183	
	A7	Res.	475	454	5.56	75	0.2157	
	A8	Res.	475	325	5.56	75	0.1544	
	SWL Total Average Day Flow						**1.8022**	
WLJ	B1	Res.	475	573	5.56	75	0.2722	
	B2	Non-Res	800	481			0.3848	
	B3	Non-Res	800	292			0.2336	
	B4	Non-Res	800	299			0.2392	
	B4	Res.	475	64	5.56	75	0.0304	
	WLJ Total Average Day Flow						**1.1602**	
WJ	C1	Res.	475	414	5.56	75	0.1967	
	C2	Res.	475	622	5.56	75	0.2955	
	C3	Res.	475	476	5.56	75	0.2261	
	C3	Non-Res	800	125			0.1000	
	WJ Total Average Day Flow						**0.8182**	
SLJ	D1	Res.	475	488	5.56	75	0.2318	
	D2	Res.	475	611	5.56	75	0.2902	151 ac lake/swamp
	D3	Res.	475	252	5.56	75	0.1197	160 ac lake/swamp
	D4	Res.	475	632	5.56	75	0.3002	92 ac lake/swamp
	D5	Res.	475	454	5.56	75	0.2157	32 ac lake/swamp
	D6	Res.	475	385	5.56	75	0.1829	
	D6	Non-Res	800	200			0.1600	
	D6	Ex. Res	475	90	5.64	75	0.0428	
	SLJ Total Average Day Flow						**1.5432**	
JS	E1	Res.	475	265	5.56	75	0.1259	22 ac open space
	E2	Res.	475	174	5.56	75	0.0827	
	E3	Res.	475	35	5.56	75	0.0166	22 ac open space
	E4	Res.	475	107	5.56	75	0.0508	
	E5	Res.	475	93	5.56	75	0.0442	
	E6	Res.	475	135	5.56	75	0.0641	18.5 ac open space
	Ex Res.	Non-Res			2000	19.6	0.0392	School in existing service area
	Ex. Res	Res.	475	50	5.64	75	0.0238	Undeveloped in existing service area
	Ex. Res	Res.	475	76	5.64	75	0.0361	Existing Flow in West Interceptor
	Ex. Res	Res.	475	320	5.64	75	0.1520	Existing Flow in East Interceptor
	JS Total Average Day Flow						**0.6353**	
CS	F1	Non-Res	800	122			0.0976	Existing Flow
	F1-F	Non-Res	800	50			0.0400	Future Flow
	F2	Res	381	235	5.08	75	0.0895	Existing Flow
	F2-F	Res	475	300	5.56	75	0.1425	Future Flow
	F3	Res	381	235	5.08	75	0.0895	
	F4	Res	381	235	5.08	75	0.0896	
	CS Total Average Day Flow						**0.5487**	

Appendix 3 - Total Future Flows Generated in each Subdistrict

District	Subdistrict	Land Use	Flow/Acre (gpad)	Area (acre)	Per/Acre	Flow/Per	Avg. Flow (mgd)	Notes
SS	G1	Res.	475	493	5.56	75	0.2342	137 ac lake/swamp
	G2	Res.	475	43	5.56	75	0.0204	138 ac lake/swamp
	G3	Res.	475	201	5.56	75	0.0955	22 ac open space
	G4	Res.	475	58	5.56	75	0.0276	29 ac lake/swamp
	G5	Res.	475	211	5.56	75	0.1002	
	G6	Res.	475	147	5.56	75	0.0698	10 ac open space
	G7	Res.	475	477	5.56	75	0.2266	
	G8	Res.	475	197	5.56	75	0.0936	
	G9	Res.	475	252	5.56	75	0.1197	
	G10	Res.	475	83	5.56	75	0.0394	
	G11	Res.	475	86	5.56	75	0.0409	
	G11	Non-Res	800	44			0.0352	
	Ex. Res.	Res.	381	46	5.08	75	0.0175	Into trunk along 83
	Ex. Res.	Res.	381	72	5.08	75	0.0274	Directly to Chaska interceptor
	G13	Non-Res	800	81			0.0648	
	G14	Non-Res	800	77			0.0616	
	G14	Res.	475	75	5.56	75	0.0356	4 ac open space
	G15	Non-Res	800	74			0.0592	
	SS Total Average Day Flow						**1.3692**	
SES	H1	Res.	475	91	5.56	75	0.0432	
	H2	Res.	475	135	5.56	75	0.0641	
	H3	Res.	475	228	5.56	75	0.1083	11 ac open space
	H4	Res.	475	39	5.56	75	0.0185	
	H5	Res.	475	135	5.56	75	0.0641	
	H6	Res.	475	98	5.56	75	0.0466	
	H7	Res.	475	66	5.56	75	0.0314	
	H8	Res.	475	45	5.56	75	0.0214	
	H9	Res.	475	66	5.56	75	0.0314	
	Ex. SES	Res.	381	188	5.08	75	0.0716	Undeveloped area w/in existing service area
	Ex. SES	Res.	381	100	5.08	75	0.0381	Existing developed area
	SES Total Average Day Flow						**0.5387**	
ES	I1	Res.	475	112	5.56	75	0.0532	
	I2	Res.	475	55	5.56	75	0.0261	
	I2	Non-Res	800	248			0.1984	
	I3	Res.	475	70	5.56	75	0.0333	
	Ex. ES	Res.					0.0478	Undeveloped area w/in existing service area
	Ex. ES	Non-Res	800	70			0.0560	Existing flow w/in existing service area
	Ex. ES	Res.	381	480	5.08	75	0.1829	Existing flow w/in existing service area
	ES Total Average Day Flow						**0.5977**	Total Future Flow
NWS	**NWS Total Average Day Flow**						**1.2600**	Existing Flow per lift station
NS	Existing	Res.	643	143	5.08	75	0.0919	Avg. Existing Non-Residential flow/acre, approx
	Existing	Non-Res	500	1288			0.6440	500 acres open space
	Future	Non-Res	800	204			0.1632	
	NS Total Average Day Flow						**0.8991**	Total Future Flow
NES	L1	Non-Res	800	294			0.2352	
	L2	Non-Res	800	96			0.0768	Approx. 1500 acres open space/river
	L1	Res	475	102	5.56	75	0.0483	
	Existing	Non-Res					0.0900	Existing Flow
	NES Total Average Day Flow						**0.4503**	Total Future Flow
NCS	Exisitng	Non-Res	500	301			0.1505	Existing Flow
	NCS Total Average Day Flow						**0.1505**	
WS	Existing	Res.	475	665	5.08	75	0.3159	
	Existing	Non-Res	500	271			0.1355	Approx. 160 acres open space
	Future	Res.	475	85	6.33	75	0.0404	
	Future	Non-Res	800	73			0.0584	
	WS Total Average Day Flow						**0.5502**	Total Future Flow

APPENDIX 4

Future Sanitary Sewer System Flows Alternative 1

Appendix 4 - Future Sanitary Sewer System Flows Alternative 1

	From Point	To Point	Pipe Size (in)	Pipe Material	Proposed Segment Length (ft)	Proposed Upstream Inv. Eleavation (ft)	Proposed Downstream Inv. Elevation (ft)	Average Slope (%)	Minimum Slope (%)	Average Flow (MGD)	Peak Flow Factor	Proposed Peak Flow (MGD)	Pipe Capacity @ Min Grade (MGD)	Capacity Status at Peak Flow (%)	
	A1.1	A4.1	10	PVC	1830	772.00	752.00	1.09%	0.28%	0.1031	4	0.4123	0.7489	55%	A1
	A2.1	A4.1	12	PVC	1330	772.00	752.00	1.50%	0.22%	0.2028	3.8	0.7707	1.0795	71%	A2
	A3.1	A4.2	18	RCP	2230	772.00	740.20	1.43%	0.12%	0.4218	3.5	1.4763	2.3506	63%	A3
	A4.1	A4.2	18	RCP	2240	752.00	740.20	0.53%	0.12%	0.4669	3.5	1.6342	2.3506	70%	A1,A2,A4
SWL	A4.2	A4.3	24	RCP	1360	740.20	738.00	0.16%	0.08%	0.8887	3.2	2.8439	4.1334	69%	A1-A4
	A5.1	A4.3	18	RCP	5310	740.00	725.00	0.28%	0.12%	0.3795	3.6	1.3663	2.3506	58%	A5+A8
	A7.1	A4.3	12	PVC	7350	742.00	721.00	0.29%	0.22%	0.2157	3.8	0.8195	1.0795	76%	A7
	A6.1	A4.3	8	PVC	4700	684.00	721.00	-0.79%		0.3183	3.6	1.1457			A6
	A4.3	A8.1	18	PVC	9250	721.00	758.00	-0.40%		1.8022	2.9	5.2262			A1-A8
	A8.1	B1.1	33	RCP	6890	758.00	736.00	0.32%	0.05%	2.0743	2.8	5.8081	7.7906	75%	A1-A8, B1
	B1.1	B2.1	36	RCP	2980	736.00	733.50	0.08%	0.05%	2.4591	2.7	6.6396	9.2410	72%	A1-A8, B1-B2
WLJ	B4.1	B2.1	15	PVC	6530	790.00	722.70	1.03%	0.15%	0.2696	3.7	0.9975	1.6162	62%	B4
	B3.1	B2.1	15	PVC	4210	732.00	722.70	0.22%	0.15%	0.2336	3.8	0.8877	1.6162	55%	B3
	B2.1	C3.3	24	PVC	6630	717.00	820.00	-1.55%		2.9623	2.6	7.7020			A1-A8, B1-B4
	C1.1	C2.1	12	PVC	1990	844.00	836.10	0.40%	0.22%	0.1967	3.8	0.7473	1.0795	69%	C1
WJ	C2.1	C3.2	18	RCP	3750	836.10	829.10	0.19%	0.12%	0.4921	3.5	1.7224	2.3506	73%	C1-C2
	C3.2	C3.3	24	RCP	7550	829.10	820.00	0.12%	0.08%	0.8182	3.2	2.6182	4.1334	63%	C1-C3
	C3.3	D6.2	42	RCP	2790				0.37%	3.7805	2.5	9.4513	39.5336	24%	A1-A8, B1-B4, C1-C3
	D1.1	D1.2	15	PVC	2080	945.00	936.60	0.40%	0.15%	0.2318	3.8	0.8808	1.6162	55%	D1
	D1.2	D2.1	18	RCP	3270	936.60	929.40	0.22%	0.12%	0.5220	3.4	1.7749	2.3506	76%	D1-D2
SLJ	D2.1	D3.1	21	RCP	4840	929.40	922.20	0.15%	0.10%	0.6417	3.4	2.1819	3.2368	67%	D1-D3
	D3.1	D4.1	24	RCP	4800	922.20	916.35	0.12%	0.08%	0.9419	3.2	3.0142	4.1334	73%	D1-D4
	D4.1	D5.1	24	RCP	2910	914.70	902.00	0.44%	0.08%	1.1576	3.1	3.5885	4.1334	87%	D1-D5
	D5.1	D5.1.1	24	RCP	1710	902.00	849.74	3.06%	0.15%	1.5005	2.9	4.3513	5.6599	77%	D1-D6
	D5.1.1	D6.1	24	RCP	2360	849.74	815.75	1.44%	0.37%	1.5432	2.9	4.4753	8.8892	50%	D1-D6
	E2.1	E6.1.1	8	PVC	1875	900.00	892.00	0.43%	0.40%	0.0827	4	0.3306	0.4937	67%	E2
	E6.1.1	E6.1	12	PVC	3370	892.00	829.60	1.85%	0.22%	0.1910	3.8	0.7256	1.0795	67%	E2+E5+E6
	E6.1	E6.2	12	PVC	3850	829.60	797.84	0.82%	0.22%	0.2663	3.7	0.9851	1.0795	91%	Existing Flow+School+E2+E5+E6
JS	E1.1	E3.1	10	PVC	1560	902.00	892.00	0.64%	0.28%	0.1259	3.9	0.4909	0.7489	66%	E1
	E3.1	E4.1	10	PVC	1150	892.00	888.00	0.35%	0.28%	0.1425	3.9	0.5558	0.7489	74%	E1+E3
	E4.1	E5.1	12	PVC	1180	888.00	884.63	0.29%	0.22%	0.1933	3.8	0.7346	1.0795	68%	E1+E3+E4
	E5.1	E5.2	15	RCP	8070	884.63	795.50	1.10%	0.15%	0.3691	3.6	1.3287	1.6162	82%	Existing Flow+Future in existing developed area+E1+E3+E4
	F1.1	F1.2	10	PVC	2950	826.78	792.39	1.17%	0.28%	0.1376	3.9	0.5366	0.7489	72%	Existing F1+F1 Future
CS	F2.1	F3.1	12	PVC	5560	835.14	797.47	0.68%	0.22%	0.2320	3.8	0.8817	1.0795	82%	Existing F2+F2 Future
	F4.1	F3.1	8	PVC	6620	829.04	797.47	0.40%	0.40%	0.0895	4	0.3581	0.4937	73%	Existing F3
	F3.1	F3.2	15	PVC	1700	797.47	777.24	1.19%	0.15%	0.4111	3.5	1.4390	1.6162	89%	Existing F2,F3,F4+F2 Future

Appendix 4 - Future Sanitary Sewer System Flows Alternative 1

	From Point	To Point	Pipe Size (in)	Pipe Material	Proposed Segment Length (ft)	Proposed Upstream Inv. Eleavation (ft)	Proposed Downstream Inv. Elevation (ft)	Average Slope (%)	Minimum Slope (%)	Average Flow (MGD)	Peak Flow Factor	Proposed Peak Flow (MGD)	Pipe Capacity @ Min Grade (MGD)	Capacity Status at Peak Flow (%)	
SS	G15.1	G15.2	12	PVC	2600				0.22%	0.0866	4	0.3465	1.0795	32%	G15
	G1.1	G1.2	15	PVC	1550	930.00	926.55	0.22%	0.15%	0.2342	3.8	0.8899	1.6162	55%	G1
	G1.2	G2.1	18	RCP	950	926.55	925.10	0.15%	0.12%	0.3297	3.6	1.1867	2.3506	50%	G1+G3
	G2.1	G3.1	18	RCP	1000	925.10	923.60	0.15%	0.12%	0.3501	3.6	1.2603	2.3506	54%	G1-G3
	G3.1	G3.1.1	10	PVC	1800	921.00	972.00	-2.83%		0.3501	3.6	1.2603	2.3506		
	G3.1.1	G3.2	18	RCP	1240	972.00	970.10	0.15%	0.12%	0.3776	3.6	1.3595	2.3506	58%	G1-G4.
	G3.2	G5.2	18	RCP	1950	970.10	922.00	2.47%	0.12%	0.4475	3.5	1.5661	2.3506	67%	G1-G4 +G6
	G5.1	G5.2	10	PVC	1640	932.00	922.00	0.61%	0.28%	0.1002	4	0.4009	0.7489	54%	G5
	G5.2	G6.1	18	RCP	1590	922.00	918.15	0.24%	0.17%	0.5477	3.4	1.8621	2.7978	67%	G1-G6
	G6.1	G7.2	18	RCP	3630	918.15	872.00	1.27%	0.28%	0.7743	3.3	2.5550	3.5906	71%	G1-G7
	G7.2	G7.3	18	RCP	1530	872.00	868.00	0.26%	0.26%	0.8678	3.2	2.7770	3.4600	80%	G1-G8
	G7.3	G9.1	18	RCP	5250	868.00	802.15	1.25%	0.41%	0.9875	3.2	3.1601	4.3450	73%	G1-G9
	G9.1	G10.1	18	RCP	1200			0.25%	0.25%	0.9875	3.2	3.1601	3.3928	93%	G1-G9
	G10.1	G10.2	18	RCP	2660			0.28%	0.28%	1.0270	3.1	3.1835	3.5906	89%	G1-G10
	G10.2	G11.1	24	RCP	1350			0.00%	0.08%	1.1205	3.1	3.4736	4.1334	84%	G1-G11+Existing Flow
	G11.1	G13.1.1	24	RCP	940			0.63%	0.63%	1.2826	3	3.8477	11.5994	33%	G1-G14+Existing Flow
	G13.1.1	G13.1	24	RCP	1800			0.54%	0.54%	1.2826	3	3.8477	10.7389	36%	G1-G14+Existing Flow
	G13.1	G13.2	18	RCP	620	728.93	724.65	0.69%	0.12%	1.2826	3	3.8477	2.3506	164%	G1-G14+Existing Flow
SES	H1.1	H3.1	8	PVC	3760	990.00	937.70	1.39%	0.40%	0.0432	4	0.1729	0.4937	35%	H1
	H2.1	H3.2	8	PVC	2650	793.00	782.00	0.42%	0.40%	0.0641	4	0.2565	0.4937	52%	H2
	H3.1	H3.2	12	PVC	3950	937.70	782.00	3.94%	0.22%	0.1515	3.9	0.5909	1.0795	55%	H1+H3
	H3.2	H4.1	15	PVC	1580	782.00	752.00	1.90%	0.15%	0.2342	3.8	0.8899	1.6162	55%	H1-H4
	H4.1	H5.1	15	PVC	1340	752.00	749.00	0.22%	0.15%	0.2983	3.7	1.1037	1.6162	68%	H1-H5
	H6.1	H5.1	8	PVC	1400	792.00	749.00	3.07%	0.40%	0.0466	4	0.1862	0.4937	38%	H6
	H7.1	H7.2	8	PVC	2300	800.00	785.39	0.64%	0.40%	0.0314	4	0.1254	0.4937	25%	H7
	H8.1	H8.2	8	PVC	3850	822.00	783.77	0.99%	0.40%	0.0214	4	0.0855	0.4937	17%	H8
	H9.1	H9.2	8	PVC	4500	802.00	783.04	0.42%	0.40%	0.0549	4	0.2194	0.4937	44%	H9
	H5.1	H5.2	15	PVC	1400	749.00	738.32	0.76%	0.15%	0.3449	3.6	1.2415	1.6162	77%	H1-H6
ES	I1.1	I1.2	8	PVC	5300	792.00	732.00	1.13%	0.40%	0.0532	4	0.2128	0.4937	43%	I1
	I1.2	I2.3	10	PVC	2400	732.00	719.00	0.54%	0.28%	0.0793	4	0.3173	0.7489	42%	I1+south half I2
	FM from I2.3 to I2.1		8	PVC	1270	719.00	732.00	-0.66%		0.2777	3.7	1.0276			I1+I2 (715 GPM LS)
	I2.1	I2.1.2	12	PVC	1810	732.00	727.43	0.36%	0.22%	0.2777	3.7	1.0276	1.0795	95%	I1+I2
	I2.1.2	I2.2	12	PVC	730	727.43	725.45	0.27%	0.27%	0.2937	3.7	1.0868	1.1959	91%	I1+I2+(20 ac existing non-residential flow)
	I2.2	I3.4	15	PVC	1200				0.15%	0.3337	3.6	1.2014	1.6162	74%	I1+I2+(existing non-residential flow)
	I3.1	I3.2	10	PVC	3100	802.12			0.28%	0.0333	4	0.1330	0.7489	18%	I3
	I3.2	I3.3	15	RCP	1300		736.43		0.15%	0.2161	3.8	0.8213	1.6162	51%	Existing residential flow + I3
	I3.3	I3.4	15	PVC	1500	736.43	734.11		0.12%	0.2639	3.7	0.9765	1.4456	68%	I3+Existing residential Flow+Future w/in Existing svc. Area
	I3.4	MCES	18	RCP	6000	734.11	726.18		0.12%	0.5977	3.4	2.0320	2.3506	86%	All subdistricts
NWS	L16	J1	14	PVC	8560	682.00	727.49	-0.53%		1.2600	3	3.7800			
NS	City Trunk	K1	24	RCP	Various				0.08%	0.8600	3.2	2.7520	4.1334		
	City Trunk	K2	15	RCP					0.15%				1.6162		
	City Trunk	K3	10	RCP					0.28%				0.7489		
NES	L1.1	L1.2	15	PVC	4560	730.1	723.1	0.15%	0.15%	0.2835	3.7	1.0488	1.6162	65%	Future L1 flows
	L2.3	L2.4	4	PVC	2900	719	722.9	-0.13%		0.0768	4	0.3072			Future L2 flows
NCS	City Trunk	M1	12	PVC	Various				0.22%	0.1505	3.9	0.5870	1.0795	54%	
WS	City Trunk	N1	21	RCP	Various				0.10%	0.5502	3.4	1.8705	3.2368	58%	

APPENDIX 5

Future Sanitary Sewer System Flows Alternative 2

Appendix 5 - Future Sanitary Sewer System Flows Alternative 2

	From Point	To Point	Pipe Size	Pipe Material	Proposed Segment Length	Proposed Upstream Inv. Eleavation	Proposed Downstream Inv. Elevation	Average Slope	Minimum Slope	Average Flow	Peak Flow Factor	Proposed Peak Flow	Pipe Capacity @ Min Grade	Capacity Status at Peak Flow	
			(in)		(ft)	(ft)	(ft)	(%)	(%)	(MGD)		(MGD)	(MGD)	(%)	
SWL	A8.1	A5.1	33	RCP	4050	724.50	722.50	0.05%	0.05%	1.9361	2.8	5.4211	7.7906	70%	B1-B4, C2-C3,A8
	A5.1	A4.3	36	RCP	5190	722.50	720.00	0.05%	0.05%	2.3579	2.7	6.3663	9.2410	69%	B1-B4, C1-C3,A5+A8
	A6.1	A4.3	10	PVC	4700	684.00	720.00	-0.77%		0.3183	3.6	1.1457			A6
	A7.1	A4.3	12	PVC	7350	742.00	720.00	0.30%	0.22%	0.2157	3.8	0.8195	1.0795	76%	A7
	D1.1	A1.1.1	15	PVC	5100	926.00	942.00	-0.31%		1.0194	3.1	3.1600			G1-G4, D1-D3
	A1.1.1	A1.1	27	RCP	6700	942.00	772.00	2.54%	0.07%	1.1224	3	3.3673	5.1785	65%	G1-G4, D1-D3+A1
	A1.1	A4.1	27	RCP	1830	772.00	752.00	1.09%	0.07%	1.1224	3	3.3673	5.1785	65%	G1-G4, D1-D3+A1
	A2.1	A4.1	12	PVC	1380	772.00	752.00	1.45%	0.22%	0.2028	3.8	0.7707	1.0795	71%	A2
	A3.1	A4.2	18	RCP	2230	772.00	740.20	1.43%	0.12%	0.4218	3.5	1.4763	2.3506	63%	A3
	A4.1	A4.2	30	RCP	2240	752.00	740.20	0.53%	0.06%	1.3253	3	3.9758	6.3812	62%	G1-G4, D1-D3, A1-A2
	A4.2	A4.3	33	RCP	1400	740.20	738.00	0.16%	0.05%	1.9081	2.8	5.3426	7.7906	69%	G1-G4, D1-D3, A1-A4
	A4.3	WWTP								4.7999	2.4	11.5197			G1-G4, D1-D3, A1-A8, B1-B4, C1-C3
WLJ	B4.1	B2.1	21	RCP	6700	779.00	730.00	0.73%	0.10%	0.5957	3.4	2.0254	3.2368	63%	C3+B4
	B3.1	B2.1	6	PVC	4290	729.00	730.00	-0.02%	0.05%	0.2336	3.8	0.8877			B3
	B2.1	B1.1	27	RCP	3000	730.00	728.00	0.07%	0.07%	1.2141	3	3.6423	5.1785	70%	B2-B4, C3
	B1.1	A8.1	33	RCP	6790	728.00	724.50	0.05%	0.05%	1.7817	2.9	5.1670	7.7906	66%	B1-B4, C2-C3
WJ	C1.1	A5.1	12	PVC	3800	782.00	722.50	1.57%	0.22%	0.1967	3.8	0.7473	1.0795	69%	C1
	C2.1	B1.1	15	PVC	3400	792.00	728.00	1.88%	0.15%	0.2955	3.7	1.0932	1.6162	68%	C2
	C3.2	B4.1	15	PVC	5025	790.00	779.00	0.22%	0.15%	0.3261	3.6	1.1740	1.6162	73%	C3
SLJ	D3.1	D4.1	15	PVC	4800	952.00	928.00	0.50%	0.15%	0.3002	3.8	1.1408	1.6162	71%	D4
	D4.1	D5.1	18	RCP	2920	928.00	902.00	0.89%	0.12%	0.5159	3.4	1.7539	2.3506	75%	D4-D5
	D5.1	D5.1.1	24	RCP	1710	902.00	849.74	3.06%	0.08%	0.8587	3.2	2.7479	4.1334	66%	D4-D6
	D5.1.1	D6.1	24	RCP	2100	849.74	815.75	1.62%	0.37%	0.9015	3.2	2.8847	8.8892	32%	D4-D6+Existing Flow
	D3.1	D2.1	10	PVC	2600	942.00	936.10	0.23%	0.28%	0.1197	3.9	0.4668	0.7489	62%	D3
	D2.1	D1.2	18	RCP	4900	936.10	931.60	0.09%	0.12%	0.4099	3.5	1.4347	2.3506	61%	D2-D3
	D1.2	D1.1	21	RCP	2200	931.60	929.50	0.10%	0.10%	0.6417	3.4	2.1819	3.2368	67%	D1-D3
	G1.1	D1.1	18	RCP	8860	937.00	926.00	0.12%	0.12%	0.3776	3.6	1.3595	2.3506	58%	G1-G4
JS	E2.1	E6.1.1	8	PVC	1300	900.00	892.00	0.62%	0.40%	0.0827	4	0.3306	0.4937	67%	E2
	E6.1.1	E6.1	12	PVC	3600	892.00	829.60	1.73%	0.22%	0.1910	3.8	0.7256	1.0795	67%	E2+E5+E6
	E6.1	E6.2	12	PVC	3400	829.60	797.84	0.93%	0.22%	0.2663	3.7	0.9851	1.0795	91%	Existing Flow+School+E2+E5+E6
	E1.1	E3.1	10	PVC	1560	902.00	892.00	0.64%	0.28%	0.1259	3.9	0.4909	0.7489	66%	E1
	E3.1	E4.1	10	PVC	1220	892.00	888.00	0.33%	0.28%	0.1425	3.9	0.5558	0.7489	74%	E1+E3
	E4.1	E5.1	12	PVC	1175	888.00	884.63	0.29%	0.22%	0.1933	3.8	0.7346	1.0795	68%	E1+E3+E4
	E5.1	E5.2	15	PVC	2300	884.63	795.50	3.88%	0.15%	0.3691	3.6	1.3287	1.6162	82%	Existing Flow+Future in existing developed area+E1+E3+E4
CS	F1.1	F1.2	10	PVC	4030	826.78	792.39	0.85%	0.28%	0.1376	3.9	0.5366	0.7489	72%	Existing F1+F1 Future
	F2.1	F3.1	12	PVC	5570	835.14	797.47	0.68%	0.22%	0.2320	3.8	0.8817	1.0795	82%	Existing F2+F2 Future
	F4.1	F3.1	8	PVC	6620	829.04	797.47	0.40%	0.40%	0.0895	4	0.3581	0.4937	73%	Existing F3
	F3.1	F3.2	15	PVC	1700	797.47	777.24	1.19%	0.15%	0.4111	3.5	1.4390	1.6162	89%	Existing F2,F3,F4+F2 Future

Appendix 5 - Future Sanitary Sewer System Flows Alternative 2

	From Point	To Point	Pipe Size (in)	Pipe Material	Proposed Segment Length (ft)	Proposed Upstream Inv. Eleavation (ft)	Proposed Downstream Inv. Elevation (ft)	Average Slope (%)	Minimum Slope (%)	Average Flow (MGD)	Peak Flow Factor	Proposed Peak Flow (MGD)	Pipe Capacity @ Min Grade (MGD)	Capacity Status at Peak Flow (%)	
SS	G15.1	G15.2	12	PVC	2600				0.22%	0.0616	4	0.2464	1.0795	23%	G15
	G3.1	G2.1	12	PVC	1000	952.00	941.00	1.10%	0.22%	0.1230	3.9	0.4798	1.0795	44%	G3-G4
	G2.1	G1.2	12	PVC	1000	941.00	938.80	0.22%	0.22%	0.1435	3.9	0.5595	1.0795	52%	G2-G4
	G1.2	G1.1	18	RCP	1530	938.80	937.00	0.12%	0.12%	0.3776	3.6	1.3595	2.3506	58%	G1-G4
	G3.2	G5.2	8	PVC	2050	970.10	922.00	2.35%	0.12%	0.0698	4	0.2793	0.2704	103%	G6
	G5.1	G5.2	10	PVC	1640	932.00	922.00	0.61%	0.28%	0.1002	4	0.4009	0.7489	54%	G5
	G5.2	G6.1	12	PVC	1590	922.00	918.15	0.24%	0.17%	0.1701	3.9	0.6632	0.9489	70%	G5-G6
	G6.1	G7.2	18	RCP	3630	918.15	872.00	1.27%	0.28%	0.3966	3.6	1.4279	3.5906	40%	G5-G7
	G7.2	G7.3	18	RCP	1530	872.00	868.00	0.26%	0.26%	0.4902	3.5	1.7157	3.4600	50%	G5-G8
	G7.3	G9.1	18	RCP	5250	868.00	802.15	1.25%	0.41%	0.6099	3.4	2.0737	4.3450	48%	G5-G9
	G9.1	G10.1	18	RCP	1320			0.25%	0.25%	0.6099	3.4	2.0737	3.3928	61%	G5-G9
	G10.1	G10.2	18	RCP	2660			0.28%	0.28%	0.6493	3.4	2.2077	3.5906	61%	G5-G10
	G10.2	G11.1	24	RCP	1360			0.00%	0.08%	0.7429	3.3	2.4516	4.1334	59%	G5-G11+Existing Flow
	G11.1	G13.1.1	24	RCP	940			0.63%	0.63%	0.9049	3.2	2.8958	11.5994	25%	G5-G14+Existing Flow
	G13.1.1	G13.1	24	RCP	1800			0.54%	0.54%	0.9049	3.2	2.8958	10.7389	27%	G5-G14+Existing Flow
	G13.1	G13.2	18	RCP	620	728.93	724.65	0.69%	0.12%	0.9049	3.2	2.8958	2.3506	123%	G5-G14+Existing Flow
SES	H1.1	H3.1	8	PVC	3760	990.00	937.70	1.39%	0.40%	0.0432	4	0.1729	0.4937	35%	H1
	H2.1	H3.2	8	PVC	2650	793.00	782.00	0.42%	0.40%	0.0641	4	0.2565	0.4937	52%	H2
	H3.1	H3.2	12	PVC	2500	937.70	782.00	6.23%	0.22%	0.1515	3.9	0.5909	1.0795	55%	H1+H3
	H3.2	H4.1	15	PVC	1600	782.00	752.00	1.88%	0.15%	0.2342	3.8	0.8899	1.6162	55%	H1-H4
	H4.1	H5.1	15	PVC	1340	752.00	749.00	0.22%	0.15%	0.2983	3.7	1.1037	1.6162	68%	H1-H5
	H6.1	H5.1	8	PVC	1400	792.00	749.00	3.07%	0.40%	0.0466	4	0.1862	0.4937	38%	H6
	H.7.1	H7.2	8	PVC	2300	800.00	785.39	0.64%	0.40%	0.0314	4	0.1254	0.4937	25%	H7
	H8.1	H8.2	8	PVC	4000	822.00	783.77	0.96%	0.40%	0.0214	4	0.0855	0.4937	17%	H8
	H9.1	H9.2	8	PVC	4750	802.00	783.04	0.40%	0.40%	0.0549	4	0.2194	0.4937	44%	H9
	H5.1	H5.2	15	PVC	1400	749.00	738.32	0.76%	0.15%	0.3449	3.6	1.2415	1.6162	77%	H1-H6
ES	I1.1	I1.2	8	PVC	5300	792.00	732.00	1.13%	0.40%	0.0478	4	0.1912	0.4937	39%	I1
	I1.2	I2.3	10	PVC	2400	732.00	719.00	0.54%	0.28%	0.1038	4	0.4152	0.7489	55%	I1+south half I2
	FM from I2.3 to I2.1		8	PVC	1270	719.00	732.00	-0.66%		0.2777	3.7	1.0276			I1+I2 (715 GPM LS)
	I2.1	I2.1.2	12	PVC	1810	732.00	727.43	0.36%	0.22%	0.2777	3.7	1.0276	1.0795	95%	I1+I2
	I2.1.2	I2.2	12	PVC	730	727.43	725.45	0.27%	0.27%	0.2937	3.7	1.0868	1.1959	91%	I1+I2+(20 ac existing non-residential flow)
	I2.2	I3.4	15	PVC	1200				0.15%	0.3337	3.6	1.2014	1.6162	74%	I1+I2+(existing non-residential flow)
	I3.1	I3.2	10	PVC	3100	802.12			0.28%	0.0333	4	0.1330	0.7489	18%	I3
	I3.2	I3.3	15	RCP	1300		736.43		0.15%	0.2161	3.8	0.8213	1.6162	51%	Existing residential flow + I3
	I3.3	I3.4	15	PVC	1500	736.43	734.11		0.12%	0.2639	3.7	0.9765	1.4456	68%	I3+Existing residential Flow+Future w/in Existing svc. Area
	I3.4	MCES	18	RCP	6000	734.11	726.18		0.12%	0.5977	3.4	2.0320	2.3506	86%	All subdistricts
NWS	L16	J1	14	PVC	8560	682.00	727.49	-0.53%		1.2600	3	3.7800			
NS	City Trunk	K1	24	RCP					0.08%				4.1334		
	City Trunk	K2	15	RCP	Various				0.15%	0.8600	3.2	2.7520	1.6162		
	City Trunk	K3	10	RCP					0.28%				0.7489		
NES	L.1.1	L.1.2	15	PVC	4560	730.1	723.1	0.15%	0.15%	0.2835	3.7	1.0488	1.6162	65%	Future L1 flows
	L.2.3	L.2.4	4	PVC	2900	719	722.9	-0.13%		0.0768	4	0.3072			Future L2 flows
NCS	City Trunk	M1	12	PVC	Various				0.22%	0.1505	3.9	0.5870	1.0795	54%	
WS	City Trunk	N1	21	RCP	Various				0.10%	0.5502	3.4	1.8705	3.2368	58%	

APPENDIX 6

Future Sanitary Sewer System Flows Alternative 3

Appendix 6 - Future Sanitary Sewer System Flows Alternative 3

	From Point	To Point	Pipe Size	Pipe Material	Proposed Segment Length	Proposed Upstream Inv. Eleavation	Proposed Downstream Inv. Elevation	Average Slope	Minimum Slope	Average Flow	Peak Flow Factor	Proposed Peak Flow	Pipe Capacity @ Min Grade	Capacity Status at Peak Flow	
			(in)		(ft)	(ft)	(ft)	(%)	(%)	(MGD)		(MGD)	(MGD)	(%)	
SS SOUTH HALF	A.1	A.2	15	PVC	1550	930.00	927.65	0.15%	0.15%	0.2342	3.8	0.8899	1.6162	55%	G1
	A.2	A.3	18	RCP	950	927.65	926.20	0.15%	0.12%	0.3297	3.6	1.1867	2.3506	50%	G1+G3
	A.3	LS-S	18	RCP	1000	926.20	924.70	0.15%	0.12%	0.3501	3.6	1.2603	2.3506	54%	G1-G3
	A.6	A.7	10	PVC	1400	952.00	922.00	2.14%	0.28%	0.1002	4	0.4009	0.7489	54%	G5
	A.5	A.7	10	PVC	1950	972.00	922.00	2.56%	0.28%	0.0974	4	0.3895	0.7489	52%	G4+G6
	A.7	A.8	12	PVC	1530	922.00	917.70	0.28%	0.22%	0.1976	3.8	0.7509	1.0795	70%	G4-G6
	A.8	LS-N	15	PVC	600	917.70	914.00	0.62%	0.15%	0.2926	3.7	1.0824	1.6162	67%	G4-G7
	LS-N	LS-S	8	PVC	7040	914.00	924.70	-0.15%		0.2926	3.7	1.0824	750 GPM LS		G4-G7
	LS-S	PRIOR	12	PVC	2720	924.70	970.00	-1.67%		0.6426	3.4	2.1849	1600 GPM LS		G1-G7
SS NORTH HALF	G-7.2	G-7.3	15	PVC	1530	872.00	868.00	0.26%	0.15%	0.2252	3.8	0.8558	1.6162	53%	G7-G8
	G-7.3	G-9.1	18	RCP	5250	868.00	802.15	1.25%	0.12%	0.3449	3.6	1.2416	2.3506	53%	G7-G9
	G-9.1	G-10.1	18	RCP	1320			0.25%	0.25%	0.3449	3.6	1.2416	3.3928	37%	G7-G9
	G-10.1	G-10.2	18	RCP	2660			0.28%	0.28%	0.3843	3.6	1.3836	3.5906	39%	G7-G10
	G-10.2	G-11.1	24	RCP	1360			0.00%	0.08%	0.4779	3.5	1.6727	4.1334	40%	G7-G11+Existing Flow
	G-11.1	G-13.1.1	24	RCP	940			0.63%	0.63%	0.6399	3.4	2.1757	11.5994	19%	G7-G14+Existing Flow
	G-13.1.1	G-13.1	24	RCP	1800			0.54%	0.54%	0.6399	3.4	2.1757	10.7389	20%	G7-G14+Existing Flow
	G-13.1	G-13.2	18	RCP	620	728.93	724.65	0.69%	0.12%	0.6399	3.4	2.1757	2.3506	93%	G7-G14+Existing Flow

APPENDIX 7

Opinion of Probable Cost

Appendix 7 - Opinion of Probable Cost

Future Trunk System Alternative 1 - SWL District

Item No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
1	800 GPM LIFT STATION (Standard submersible type, no stand-by generator)	LUMP SUM	1.00	$360,500.00	$360,500.00
2	3,600 GPM LIFT STATION (Standard submersible type, no stand-by generator)	LUMP SUM	1.00	$618,000.00	$618,000.00
3	8" PVC FORCE MAIN	LIN FT	4700.00	$37.08	$174,276.00
4	18" PVC FORCE MAIN	LIN FT	9250.00	$53.56	$495,430.00
5	10" PVC SEWER	LIN FT	1830.00	$51.50	$94,245.00
6	12" PVC SEWER	LIN FT	8680.00	$61.80	$536,424.00
7	18" RCP SEWER	LIN FT	9780.00	$92.70	$906,606.00
8	24" RCP SEWER	LIN FT	1360.00	$118.45	$161,092.00
9	SANITARY SEWER INSPECTION (TELEVISING)	LIN FT	21650.00	$1.03	$22,299.50
10	CONST 48" DIA SAN SEWER MANHOLE	EACH	73.00	$3,090.00	$225,570.00
11	CASTING ASSEMBLY	EACH	73.00	$515.00	$37,595.00
12	AIR RELEASE VALVE AND MH	EACH	14.00	$2,575.00	$36,050.00
				SUB TOTAL	*$3,632,037.50*
				Cont. 10%	$363,203.75
				SUB TOTAL	*$3,995,241.25*
				Engr/Legal 20%	$799,048.25
				TOTAL	***$4,794,289.50***

1. Costs are for budgeting pruposes only, and are subject to change as projects are studied, designed, and constructed.
2. Costs are estimated based on 2008 construction costs.
3. Land acquisition costs are not included.

Appendix 7 - Opinion of Probable Cost

Future Trunk System Alternative 1 - WLJ District

Item No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
1	5,400 GPM LIFT STATION (Standard submersible type, no stand-by generator)	LUMP SUM	1.00	$772,500.00	$772,500.00
2	24" PVC FORCE MAIN	LIN FT	6630.00	$61.80	$409,734.00
3	15" PVC SEWER	LIN FT	10740.00	$72.10	$774,354.00
4	33" RCP SEWER	LIN FT	6890.00	$159.65	$1,099,988.50
5	36" RCP SEWER	LIN FT	2980.00	$180.25	$537,145.00
6	SANITARY SEWER INSPECTION (TELEVISING)	LIN FT	20610.00	$1.03	$21,228.30
7	CONST 48" DIA SAN SEWER MANHOLE	EACH	69.00	$3,090.00	$213,210.00
8	CASTING ASSEMBLY	EACH	69.00	$515.00	$35,535.00
9	AIR RELEASE VALVE AND MH	EACH	7.00	$2,575.00	$18,025.00
				SUB TOTAL	*$3,881,719.80*
				Cont. 10%	$388,171.98
				SUB TOTAL	*$4,269,891.78*
				Engr/Legal 20%	$853,978.36
				TOTAL	***$5,123,870.14***

1. Costs are for budgeting pruposes only, and are subject to change as projects are studied, designed, and constructed.
2. Costs are estimated based on 2008 construction costs.
3. Land acquisition costs are not included.

Appendix 7 - Opinion of Probable Cost

Future Trunk System Alternative 1 - WJ District

Item No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
1	12" PVC SEWER	LIN FT	1990.00	$61.80	$122,982.00
2	18" RCP SEWER	LIN FT	3750.00	$92.70	$347,625.00
3	24" RCP SEWER	LIN FT	7550.00	$118.45	$894,297.50
4	SANITARY SEWER INSPECTION (TELEVISING)	LIN FT	13290.00	$1.03	$13,688.70
5	CONST 48" DIA SAN SEWER MANHOLE	EACH	45.00	$3,090.00	$139,050.00
6	CASTING ASSEMBLY	EACH	45.00	$515.00	$23,175.00
				SUB TOTAL	*$1,540,818.20*
				Cont. 10%	$154,081.82
				SUB TOTAL	*$1,694,900.02*
				Engr/Legal 20%	$338,980.00
				TOTAL	***$2,033,880.02***

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2. Costs are estimated based on 2008 construction costs.
3. Land acquisition costs are not included.

Appendix 7 - Opinion of Probable Cost

Future Trunk System Alternative 1 - SLJ District

Item No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
1	15" PVC SEWER	LIN FT	2080.00	$72.10	$149,968.00
2	18" RCP SEWER	LIN FT	3270.00	$92.70	$303,129.00
3	21" RCP SEWER	LIN FT	4840.00	$108.15	$523,446.00
4	24" RCP SEWER	LIN FT	9420.00	$118.45	$1,115,799.00
5	42" RCP SEWER	LIN FT	2790.00	$206.00	$574,740.00
6	SANITARY SEWER INSPECTION (TELEVISING)	LIN FT	22400.00	$1.03	$23,072.00
7	CONST 48" DIA SAN SEWER MANHOLE	EACH	75.00	$3,090.00	$231,750.00
8	CASTING ASSEMBLY	EACH	75.00	$515.00	$38,625.00
				SUB TOTAL	*$2,960,529.00*
				Cont. 10%	$296,052.90
				SUB TOTAL	*$3,256,581.90*
				Engr/Legal 20%	$651,316.38
				TOTAL	***$3,907,898.28***

1. Costs are for budgeting pruposes only, and are subject to change as projects are studied, designed, and constructed.
2. Costs are estimated based on 2008 construction costs.
3. Land acquisition costs are not included.

Appendix 7 - Opinion of Probable Cost

Future Trunk System Alternative 1 - JS District

Item No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
1	8" PVC SEWER	LIN FT	1875.00	$46.35	$86,906.25
2	10" PVC SEWER	LIN FT	2710.00	$51.50	$139,565.00
3	12" PVC SEWER	LIN FT	4550.00	$61.80	$281,190.00
4	SANITARY SEWER INSPECTION (TELEVISING)	LIN FT	9135.00	$1.03	$9,409.05
5	CONST 48" DIA SAN SEWER MANHOLE	EACH	31.00	$3,090.00	$95,790.00
6	CASTING ASSEMBLY	EACH	31.00	$515.00	$15,965.00
				SUB TOTAL	*$628,825.30*
				Cont. 10%	$62,882.53
				SUB TOTAL	*$691,707.83*
				Engr/Legal 20%	$138,341.57
				TOTAL	***$830,049.40***

1. Costs are for budgeting pruposes only, and are subject to change as projects are studied, designed, and constructed.
2. Costs are estimated based on 2008 construction costs.
3. Land acquisition costs are not included.

Appendix 7 - Opinion of Probable Cost

Future Trunk System Alternative 1 - CS District

Item No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
1	10" PVC SEWER	LIN FT	1500.00	$51.50	$77,250.00
2	12" PVC SEWER	LIN FT	300.00	$61.80	$18,540.00
3	SANITARY SEWER INSPECTION (TELEVISING)	LIN FT	1800.00	$1.03	$1,854.00
4	CONST 48" DIA SAN SEWER MANHOLE	EACH	6.00	$3,090.00	$18,540.00
5	CASTING ASSEMBLY	EACH	6.00	$515.00	$3,090.00
				SUB TOTAL	*$119,274.00*
				Cont. 10%	$11,927.40
				SUB TOTAL	*$131,201.40*
				Engr/Legal 20%	$26,240.28
				TOTAL	***$157,441.68***

1. Costs are for budgeting pruposes only, and are subject to change as projects are studied, designed, and constructed.
2. Costs are estimated based on 2008 construction costs.
3. Land acquisition costs are not included.

Appendix 7 - Opinion of Probable Cost

Future Trunk System Alternative 1 - SS District

Item No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
1	1,000 GPM LIFT STATION (Standard submersible type, no stand-by generator)	LUMP SUM	1.00	$412,000.00	$412,000.00
2	10" PVC FORCE MAIN	LIN FT	1800.00	$41.20	$74,160.00
3	10" PVC SEWER	LIN FT	1640.00	$51.50	$84,460.00
4	15" PVC SEWER	LIN FT	1550.00	$72.10	$111,755.00
5	18" RCP SEWER	LIN FT	17140.00	$92.70	$1,588,878.00
6	SANITARY SEWER INSPECTION (TELEVISING)	LIN FT	20330.00	$1.03	$20,939.90
7	CONST 48" DIA SAN SEWER MANHOLE	EACH	68.00	$3,090.00	$210,120.00
8	CASTING ASSEMBLY	EACH	68.00	$515.00	$35,020.00
9	AIR RELEASE VALVE AND MH	EACH	2.00	$2,575.00	$5,150.00
				SUB TOTAL	*$2,542,482.90*
				Cont. 10%	$254,248.29
				SUB TOTAL	*$2,796,731.19*
				Engr/Legal 20%	$559,346.24
				TOTAL	***$3,356,077.43***

1. Costs are for budgeting pruposes only, and are subject to change as projects are studied, designed, and constructed.
2. Costs are estimated based on 2008 construction costs.
3. Land acquisition costs are not included.

Appendix 7 - Opinion of Probable Cost

Future Trunk System Alternative 1 - SES District

Item No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
1	8" PVC SEWER	LIN FT	18460.00	$46.35	$855,621.00
2	12" PVC SEWER	LIN FT	3950.00	$61.80	$244,110.00
3	15" PVC SEWER	LIN FT	2920.00	$72.10	$210,532.00
4	SANITARY SEWER INSPECTION (TELEVISING)	LIN FT	25330.00	$1.03	$26,089.90
5	CONST 48" DIA SAN SEWER MANHOLE	EACH	85.00	$3,090.00	$262,650.00
6	CASTING ASSEMBLY	EACH	85.00	$515.00	$43,775.00
				SUB TOTAL	*$1,642,777.90*
				Cont. 10%	$164,277.79
				SUB TOTAL	*$1,807,055.69*
				Engr/Legal 20%	$361,411.14
				TOTAL	***$2,168,466.83***

1. Costs are for budgeting pruposes only, and are subject to change as projects are studied, designed, and constructed.
2. Costs are estimated based on 2008 construction costs.
3. Land acquisition costs are not included.

Appendix 7 - Opinion of Probable Cost

Future Trunk System Alternative 1 - ES District					
Item No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
1	700 GPM LIFT STATION (Standard submersible type, no stand-by generator)	LUMP SUM	1.00	$334,750.00	$334,750.00
2	8" PVC FORCE MAIN	LIN FT	1270.00	$37.08	$47,091.60
3	8" PVC SEWER	LIN FT	5300.00	$46.35	$245,655.00
4	10" PVC SEWER	LIN FT	2400.00	$51.50	$123,600.00
5	12" PVC SEWER	LIN FT	1810.00	$61.80	$111,858.00
6	SANITARY SEWER INSPECTION (TELEVISING)	LIN FT	9510.00	$1.03	$9,795.30
7	CONST 48" DIA SAN SEWER MANHOLE	EACH	32.00	$3,090.00	$98,880.00
8	CASTING ASSEMBLY	EACH	32.00	$515.00	$16,480.00
9	AIR RELEASE VALVE AND MH	EACH	2.00	$2,575.00	$5,150.00
				SUB TOTAL	*$993,259.90*
				Cont. 10%	$99,325.99
				SUB TOTAL	*$1,092,585.89*
				Engr/Legal 20%	$218,517.18
				TOTAL	***$1,311,103.07***

1. Costs are for budgeting pruposes only, and are subject to change as projects are studied, designed, and constructed.
2. Costs are estimated based on 2008 construction costs.
3. Land acquisition costs are not included.

Appendix 7 - Opinion of Probable Cost

Future Trunk System Alternative 1 - NES District

Item No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
1	200 GPM LIFT STATION (Standard submersible type, no stand-by generator)	LUMP SUM	1.00	$257,500.00	$257,500.00
2	4" PVC FORCE MAIN	LIN FT	2900.00	$28.84	$83,636.00
3	15" PVC SEWER	LIN FT	4560.00	$72.10	$328,776.00
4	SANITARY SEWER INSPECTION (TELEVISING)	LIN FT	4560.00	$1.03	$4,696.80
5	CONST 48" DIA SAN SEWER MANHOLE	EACH	16.00	$3,090.00	$49,440.00
6	CASTING ASSEMBLY	EACH	16.00	$515.00	$8,240.00
7	AIR RELEASE VALVE AND MH	EACH	3.00	$2,575.00	$7,725.00
				SUB TOTAL	*$740,013.80*
				Cont. 10%	$74,001.38
				SUB TOTAL	*$814,015.18*
				Engr/Legal 20%	$162,803.04
				TOTAL	***$976,818.22***

1. Costs are for budgeting pruposes only, and are subject to change as projects are studied, designed, and constructed.
2. Costs are estimated based on 2008 construction costs.
3. Land acquisition costs are not included.

Appendix 7 - Opinion of Probable Cost

Future Trunk System Alternative 2 - SWL District

Item No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
1	800 GPM LIFT STATION (Standard submersible type, no stand-by generator)	LUMP SUM	1.00	$360,500.00	$360,500.00
2	10" PVC FORCE MAIN	LIN FT	4700.00	$41.20	$193,640.00
3	15" PVC FORCE MAIN	LIN FT	5100.00	$49.44	$252,144.00
4	12" PVC SEWER	LIN FT	8730.00	$61.80	$539,514.00
5	18" RCP SEWER	LIN FT	2230.00	$92.70	$206,721.00
6	27" RCP SEWER	LIN FT	8530.00	$133.90	$1,142,167.00
7	30" RCP SEWER	LIN FT	2240.00	$144.20	$323,008.00
8	33" RCP SEWER	LIN FT	5450.00	$159.65	$870,092.50
9	36" RCP SEWER	LIN FT	5190.00	$180.25	$935,497.50
10	SANITARY SEWER INSPECTION (TELEVISING)	LIN FT	32370.00	$1.03	$33,341.10
11	CONST 48" DIA SAN SEWER MANHOLE	EACH	108.00	$3,090.00	$333,720.00
12	CASTING ASSEMBLY	EACH	108.00	$515.00	$55,620.00
13	AIR RELEASE VALVE AND MH	EACH	5.00	$2,575.00	$12,875.00
				SUB TOTAL	*$5,258,840.10*
				Cont. 10%	$525,884.01
				SUB TOTAL	*$5,784,724.11*
				Engr/Legal 20%	$1,156,944.82
				TOTAL	***$6,941,668.93***

1. Costs are for budgeting pruposes only, and are subject to change as projects are studied, designed, and constructed.
2. Costs are estimated based on 2008 construction costs.
3. Land acquisition costs are not included.

Appendix 7 - Opinion of Probable Cost

Future Trunk System Alternative 2 - WLJ District

Item No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
1	600 GPM LIFT STATION (Standard submersible type, no stand-by generator)	LUMP SUM	1.00	$334,750.00	$334,750.00
2	6" PVC FORCE MAIN	LIN FT	4290.00	$32.96	$141,398.40
3	21" RCP SEWER	LIN FT	6700.00	$108.15	$724,605.00
4	27" RCP SEWER	LIN FT	3000.00	$133.90	$401,700.00
5	33" RCP SEWER	LIN FT	6790.00	$159.65	$1,084,023.50
6	SANITARY SEWER INSPECTION (TELEVISING)	LIN FT	16490.00	$1.03	$16,984.70
7	CONST 48" DIA SAN SEWER MANHOLE	EACH	55.00	$3,090.00	$169,950.00
8	CASTING ASSEMBLY	EACH	55.00	$515.00	$28,325.00
9	AIR RELEASE VALVE AND MH	EACH	5.00	$2,575.00	$12,875.00
				SUB TOTAL	*$2,914,611.60*
				Cont. 10%	$291,461.16
				SUB TOTAL	*$3,206,072.76*
				Engr/Legal 20%	$641,214.55
				TOTAL	***$3,847,287.31***

1. Costs are for budgeting pruposes only, and are subject to change as projects are studied, designed, and constructed.
2. Costs are estimated based on 2008 construction costs.
3. Land acquisition costs are not included.

Appendix 7 - Opinion of Probable Cost

Future Trunk System Alternative 2 - WJ District

Item No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
1	12" PVC SEWER	LIN FT	3800.00	$61.80	$234,840.00
2	15" PVC SEWER	LIN FT	8425.00	$72.10	$607,442.50
3	SANITARY SEWER INSPECTION (TELEVISING)	LIN FT	12225.00	$1.03	$12,591.75
4	CONST 48" DIA SAN SEWER MANHOLE	EACH	41.00	$3,090.00	$126,690.00
5	CASTING ASSEMBLY	EACH	41.00	$515.00	$21,115.00
				SUB TOTAL	*$1,002,679.25*
				Cont. 10%	$100,267.93
				SUB TOTAL	*$1,102,947.18*
				Engr/Legal 20%	$220,589.44
				TOTAL	***$1,323,536.61***

1. Costs are for budgeting pruposes only, and are subject to change as projects are studied, designed, and constructed.
2. Costs are estimated based on 2008 construction costs.
3. Land acquisition costs are not included.

Appendix 7 - Opinion of Probable Cost

Future Trunk System Alternative 2 - SLJ District

Item No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
1	2,300 GPM LIFT STATION (Standard submersible type, no stand-by generator)	LUMP SUM	1.00	$540,750.00	$540,750.00
2	10" PVC SEWER	LIN FT	2600.00	$51.50	$133,900.00
3	15" PVC SEWER	LIN FT	4800.00	$72.10	$346,080.00
4	18" RCP SEWER	LIN FT	16680.00	$92.70	$1,546,236.00
5	21" RCP SEWER	LIN FT	2200.00	$108.15	$237,930.00
6	24" RCP SEWER	LIN FT	1710.00	$118.45	$202,549.50
7	SANITARY SEWER INSPECTION (TELEVISING)	LIN FT	27990.00	$1.03	$28,829.70
8	CONST 48" DIA SAN SEWER MANHOLE	EACH	94.00	$3,090.00	$290,460.00
9	CASTING ASSEMBLY	EACH	94.00	$515.00	$48,410.00
				SUB TOTAL	*$3,375,145.20*
				Cont. 10%	$337,514.52
				SUB TOTAL	*$3,712,659.72*
				Engr/Legal 20%	$742,531.94
				TOTAL	***$4,455,191.66***

1. Costs are for budgeting pruposes only, and are subject to change as projects are studied, designed, and constructed.
2. Costs are estimated based on 2008 construction costs.
3. Land acquisition costs are not included.

Appendix 7 - Opinion of Probable Cost

Future Trunk System Alternative 2 - SS District

Item No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
1	8" PVC SEWER	LIN FT	2050.00	$46.35	$95,017.50
2	10" PVC SEWER	LIN FT	1640.00	$51.50	$84,460.00
3	12" PVC SEWER	LIN FT	3590.00	$72.10	$258,839.00
4	18" RCP SEWER	LIN FT	11940.00	$92.70	$1,106,838.00
5	SANITARY SEWER INSPECTION (TELEVISING)	LIN FT	19220.00	$1.03	$19,796.60
6	CONST 48" DIA SAN SEWER MANHOLE	EACH	65.00	$3,090.00	$200,850.00
7	CASTING ASSEMBLY	EACH	65.00	$515.00	$33,475.00
				SUB TOTAL	*$1,799,276.10*
				Cont. 10%	$179,927.61
				SUB TOTAL	*$1,979,203.71*
				Engr/Legal 20%	$395,840.74
				TOTAL	***$2,375,044.45***

1. Costs are for budgeting pruposes only, and are subject to change as projects are studied, designed, and constructed.
2. Costs are estimated based on 2008 construction costs.
3. Land acquisition costs are not included.

Appendix 7 - Opinion of Probable Cost

Future Trunk System Alternative 3 - SS District

Item No.	Description	Unit	Estimated Total Quantity	Estimated Unit Price	Estimated Total Cost
1	750 GPM LIFT STATION (Standard submersible type, no stand-by generator)	LUMP SUM	1.00	$360,500.00	$360,500.00
2	1,600 GPM LIFT STATION (Standard submersible type, no stand-by generator)	LUMP SUM	1.00	$463,500.00	$463,500.00
3	8" PVC FORCE MAIN	LIN FT	7040.00	$37.08	$261,043.20
4	12" PVC FORCE MAIN	LIN FT	2720.00	$45.32	$123,270.40
5	10" PVC SEWER	LIN FT	3350.00	$46.35	$155,272.50
6	12" PVC SEWER	LIN FT	1530.00	$51.50	$78,795.00
7	15" PVC SEWER	LIN FT	3680.00	$72.10	$265,328.00
8	18" RCP SEWER	LIN FT	7200.00	$92.70	$667,440.00
9	SANITARY SEWER INSPECTION (TELEVISING)	LIN FT	15760.00	$1.03	$16,232.80
10	CONST 48" DIA SAN SEWER MANHOLE	EACH	53.00	$3,090.00	$163,770.00
11	CASTING ASSEMBLY	EACH	53.00	$515.00	$27,295.00
				SUB TOTAL	*$2,582,446.90*
				Cont. 10%	$258,244.69
				SUB TOTAL	*$2,840,691.59*
				Engr/Legal 20%	$568,138.32
				TOTAL	***$3,408,829.91***

1. Costs are for budgeting pruposes only, and are subject to change as projects are studied, designed, and constructed.
2. Costs are estimated based on 2008 construction costs.
3. Land acquisition costs are not included.

APPENDIX 8

Five Year Increment Flows Generated per District

Appendix 8 - 5 year Incremental Future Flows Generated in each Subdistrict

District	Subdistrict	Land Use	2010 Area (acre)	2010 Avg. Flow (mgd)	2015 Area (acre)	2015 Avg. Flow (mgd)	2020 Area (acre)	2020 Avg. Flow (mgd)	2025 Area (acre)	2025 Avg. Flow (mgd)	2030 Area (acre)	2030 Avg. Flow (mgd)	2050 Area (acre)	2050 Avg. Flow (mgd)	Ultimate Area (acre)	Ultimate Avg. Flow (mgd)	Flow/Acre (gpad)	Per/Acre	Flow/Per	Notes
SWL	A1	Res.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	100	0.0419	217	0.1031	475	5.56	75	
	A2	Res.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	198	0.0826	427	0.2028	475	5.56	75	
	A3	Res.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	411	0.1714	888	0.4218	475	5.56	75	
	A4	Res.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	157	0.0655	339	0.1610	475	5.56	75	
	A5	Res.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	220	0.0917	474	0.2252	475	5.56	75	
	A6	Res.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	310	0.1293	670	0.3183	475	5.56	75	
	A7	Res.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	210	0.0876	454	0.2157	475	5.56	75	
	A8	Res.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	151	0.0630	325	0.1544	475	5.56	75	
	SWL Total Avg. Flow			**0.0000**		**0.0000**		**0.0000**		**0.0000**	**0**	**0.0000**	**1,757**	**0.7328**	**3,794**	**1.8022**				
WLJ	B1	Res.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	205	0.0855	573	0.2722	475	5.56	75	
	B2	Non-Res	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	481	0.3848	481	0.3848	800			
	B3	Non-Res	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	292	0.2336	292	0.2336	800			
	B4	Non-Res	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	299	0.2392	299	0.2392	800			
	B4	Res.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	23	0.0095	64	0.0304	475	5.56	75	
	WLJ Total Avg. Flow			**0.0000**		**0.0000**		**0.0000**		**0.0000**	**0**	**0.0000**	**1,300**	**0.9526**	**1,709**	**1.1602**				
WJ	C1	Res.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	254	0.1059	414	0.1967	475	5.56	75	
	C2	Res.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	381	0.1589	622	0.2955	475	5.56	75	
	C3	Res.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	293	0.1220	476	0.2261	475	5.56	75	
	C3	Non-Res	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	125	0.1000	125	0.1000	800			
	WJ Total Avg. Flow			**0.0000**		**0.0000**		**0.0000**		**0.0000**	**0**	**0.0000**	**1,053**	**0.4868**	**1,637**	**0.8182**				
SLJ	D1	Res.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	336	0.1400	488	0.2318	475	5.56	75	
	D2	Res.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	421	0.1755	611	0.2902	475	5.56	75	151 ac lake/swamp
	D3	Res.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	174	0.0726	252	0.1197	475	5.56	75	160 ac lake/swamp
	D4	Res.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0.5	0.0002	435	0.1813	632	0.3002	475	5.56	75	92 ac lake/swamp
	D5	Res.	100	0.0417	132	0.0550	163	0.0680	226	0.0942	289	0.1205	313	0.1305	454	0.2157	475	5.56	75	32 ac lake/swamp
	D6	Res.	385	0.1605	385	0.1605	385	0.1605	385	0.1605	385	0.1605	265	0.1105	385	0.1829	475	5.56	75	
	D6	Non-Res	150	0.1200	200	0.1600	200	0.1600	200	0.1600	200	0.1600	200	0.1600	200	0.1600	800			
	D6	Ex. Res	90	0.0381	90	0.0381	90	0.0381	90	0.0381	90	0.0381	62	0.0262	90	0.0428	475	5.64	75	
	SLJ Total Avg. Flow			**0.3603**		**0.4137**		**0.4266**		**0.4529**	**965**	**0.4793**	**2,205**	**0.9966**	**3,112**	**1.5432**				
JS	E1	Res.	265	0.1104	265	0.1104	265	0.1104	264.8	0.1104	265	0.1104	265	0.1105	265	0.1259	475	5.56	75	22 ac open space
	E2	Res.	164	0.0684	164	0.0684	164	0.0684	164	0.0684	164	0.0684	174	0.0726	174	0.0827	475	5.56	75	
	E3	Res.	35	0.0146	35	0.0146	35	0.0146	35	0.0146	35	0.0146	35	0.0146	35	0.0166	475	5.56	75	22 ac open space
	E4	Res.	107	0.0446	107	0.0446	107	0.0446	107	0.0446	107	0.0446	107	0.0446	107	0.0508	475	5.56	75	
	E5	Res.	93	0.0388	93	0.0388	93	0.0388	93	0.0388	93	0.0388	93	0.0388	93	0.0442	475	5.56	75	
	E6	Res.	135	0.0563	135	0.0563	135	0.0563	135	0.0563	135	0.0563	135	0.0563	135	0.0641	475	5.56	75	18.5 ac open space
	Ex Res.	Non-Res		0.0392		0.0392		0.0392		0.0392		0.0392		0.0392		0.0392		2000	19.6	School in existing service area
	Ex. Res	Res.	50	0.0212	50	0.0212	50	0.0212	50	0.0212	50	0.0212	50	0.0212	50	0.0238	475	5.64	75	Undeveloped in existing service area
	Ex. Res	Res.	76	0.0321	76	0.0321	76	0.0321	76	0.0321	76	0.0321	76	0.0321	76	0.0361	475	5.64	75	Existing Flow in West Interceptor
	Ex. Res	Res.	320	0.1354	320	0.1354	320	0.1354	320	0.1354	320	0.1354	320	0.1354	320	0.1520	475	5.64	75	Existing Flow in East Interceptor
	JS Total Avg. Flow			**0.5610**		**0.5610**		**0.5610**		**0.5610**	**1,245**	**0.5610**	**1,255**	**0.5652**	**1,255**	**0.6353**				
CS	F1	Non-Res	122	0.0976	122	0.0976	122	0.0976	122	0.0976	122	0.0976	122	0.0976	122	0.0976	800			Existing Flow
	F1-F	Non-Res	50	0.0400	50	0.0400	50	0.0400	50	0.0400	50	0.0400	50	0.0400	50	0.0400	800			Future Flow
	F2	Res	235	0.0895	235	0.0895	235	0.0895	235	0.0895	235	0.0895	235	0.0895	235	0.0895	381	5.08	75	Existing Flow
	F2-F	Res	300	0.1251	300	0.1251	300	0.1251	300	0.1251	300	0.1251	300	0.1251	300	0.1425	475	5.56	75	Future Flow
	F3	Res	235	0.0895	235	0.0895	235	0.0895	235	0.0895	235	0.0895	235	0.0895	235	0.0895	381	5.08	75	
	F4	Res	235.1	0.0896	235.1	0.0896	235	0.0896	235	0.0896	235	0.0896	235	0.0896	235	0.0896	381	5.08	75	
	CS Total Avg. Flow			**0.5313**		**0.5313**		**0.5313**		**0.5313**	**1,177**	**0.5313**	**1,177**	**0.5313**	**1,177**	**0.5487**				

Appendix 8 - 5 year Incremental Future Flows Generated in each Subdistrict

District	Subdistrict	Land Use	2010 Area (acre)	2010 Avg. Flow (mgd)	2015 Area (acre)	2015 Avg. Flow (mgd)	2020 Area (acre)	2020 Avg. Flow (mgd)	2025 Area (acre)	2025 Avg. Flow (mgd)	2030 Area (acre)	2030 Avg. Flow (mgd)	2050 Area (acre)	2050 Avg. Flow (mgd)	Ultimate Area (acre)	Ultimate Avg. Flow (mgd)	Flow/Acre (gpad)	Per/Acre	Flow/Per	Notes
SS	G1	Res.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	76	0.0319	269	0.1120	493	0.2342	475	5.56	75	137 ac lake/swamp
	G2	Res.	0	0.0000	0	0.0000	0	0.0000	0	0.0000	43	0.0179	43	0.0179	43	0.0204	475	5.56	75	138 ac lake/swamp
	G3	Res.	0	0.0000	0	0.0000	0	0.0000	69	0.0288	201	0.0838	201	0.0838	201	0.0955	475	5.56	75	22 ac open space
	G4	Res.	0	0.0000	0	0.0000	0	0.0000	58	0.0242	58	0.0242	58	0.0242	58	0.0276	475	5.56	75	29 ac lake/swamp
	G5	Res.	0	0.0000	0	0.0000	86	0.0359	211	0.0880	211	0.0880	211	0.0880	211	0.1002	475	5.56	75	
	G6	Res.	0	0.0000	0	0.0000	147	0.0613	147	0.0613	147	0.0613	147	0.0613	147	0.0698	475	5.56	75	10 ac open space
	G7	Res.	0	0.0000	238	0.0992	477	0.1989	477	0.1989	477	0.1989	477	0.1989	477	0.2266	475	5.56	75	
	G8	Res.	0	0.0000	197	0.0821	197	0.0821	197	0.0821	197	0.0821	197	0.0821	197	0.0936	475	5.56	75	
	G9	Res.	113	0.0471	252	0.1051	252	0.1051	252	0.1051	252	0.1051	252	0.1051	252	0.1197	475	5.56	75	
	G10	Res.	42	0.0175	83	0.0346	83	0.0346	83	0.0346	83	0.0346	83	0.0346	83	0.0394	475	5.56	75	
	G11	Res.	0	0.0000	86	0.0359	86	0.0359	86	0.0359	86	0.0359	86	0.0359	86	0.0409	475	5.56	75	
	G11	Non-Res	0	0.0000	44	0.0352	44	0.0352	44	0.0352	44	0.0352	44	0.0352	44	0.0352	800			
	Ex. Res.	Res.	46	0.0175	46	0.0175	46	0.0175	46	0.0175	46	0.0175	46	0.0175	46	0.0175	381	5.08	75	Into trunk along 83
	Ex. Res.	Res.	72	0.0274	72	0.0274	72	0.0274	72	0.0274	72	0.0274	72	0.0274	72	0.0274	381	5.08	75	Directly to Chaska interceptor
	G13	Non-Res	81	0.0648	81	0.0648	81	0.0648	81	0.0648	81	0.0648	81	0.0648	81	0.0648	800			
	G14	Non-Res	52	0.0416	52	0.0416	77	0.0616	77	0.0616	77	0.0616	77	0.0616	77	0.0616	800			
	G14	Res.	75	0.0313	75	0.0313	75	0.0313	75	0.0313	75	0.0313	75	0.0313	75	0.0356	475	5.56	75	4 ac open space
	G15	Non-Res	74	0.0592	74	0.0592	74	0.0592	74	0.0592	74	0.0592	74	0.0592	74	0.0592	800			
	SS Total Avg. Flow			**0.3065**		**0.6340**		**0.8508**		**0.9559**	**2,300**	**1.0607**	**2,493**	**1.1409**	**2,717**	**1.3692**				
SES	H1	Res.	91	0.0379	91	0.0379	91	0.0379	91	0.0379	91	0.0728	91	0.0379	91	0.0432	475	5.56	75	
	H2	Res.	0	0.0000	0	0.0000	135	0.0563	135	0.0563	135	0.1080	135	0.0563	135	0.0641	475	5.56	75	
	H3	Res.	50	0.0209	95	0.0396	228	0.0951	228	0.0951	228	0.1824	228	0.0951	228	0.1083	475	5.56	75	11 ac open space
	H4	Res.	20	0.0083	25	0.0104	39	0.0163	39	0.0163	39	0.0312	39	0.0163	39	0.0185	475	5.56	75	
	H5	Res.	135	0.0563	135	0.0563	135	0.0563	135	0.0563	135	0.1080	135	0.0563	135	0.0641	475	5.56	75	
	H6	Res.	0	0.0000	0	0.0000	98	0.0409	98	0.0409	98	0.0784	98	0.0409	98	0.0466	475	5.56	75	
	H7	Res.	66	0.0275	66	0.0275	66	0.0275	66	0.0275	66	0.0528	66	0.0275	66	0.0314	475	5.56	75	
	H8	Res.	45	0.0188	45	0.0188	45	0.0188	45	0.0188	45	0.0360	45	0.0188	45	0.0214	475	5.56	75	
	H9	Res.	66	0.0275	66	0.0275	66	0.0275	66	0.0275	66	0.0528	66	0.0275	66	0.0314	475	5.56	75	
	Ex. SES	Res.	188	0.0716	188	0.0716	188	0.0716	188	0.0716	188	0.1504	188	0.0716	188	0.0716	381	5.08	75	Undeveloped area w/in existing service area
	Ex. SES	Res.	100	0.0381	100	0.0381	100	0.0381	100	0.0381	100	0.0800	100	0.0381	100	0.0381	381	5.08	75	Existing developed area
	SES Total Avg. Flow			**0.3070**		**0.3278**		**0.4863**		**0.4863**	**1191**	**0.9528**	**1191**	**0.4863**	**1,191**	**0.5387**				
ES	I1	Res.	0	0.0000	0	0.0000	112	0.0467	112	0.0467	112	0.0467	112	0.0467	112	0.0532	475	5.56	75	
	I2	Res.	0	0.0000	0	0.0000	55	0.0229	55	0.0229	55	0.0229	55	0.0229	55	0.0261	475	5.56	75	
	I2	Non-Res		0.0000		0.0000	248	0.1984	248	0.1984	248	0.1984	248	0.1984	248	0.1984	800			
	I3	Res.	70	0.0292	70	0.0292	70	0.0292	70	0.0292	70	0.0292	70	0.0292	70	0.0333	475	5.56	75	
	Ex. ES	Res.		0.0478		0.0478		0.0478		0.0478		0.0478		0.0478		0.0478			75	Undeveloped area w/in existing service area
	Ex. ES	Non-Res	70	0.0560	70	0.0560	70	0.0560	70	0.0560	70	0.0560	70	0.0560	70	0.0560	800			Existing flow w/in existing service area
	Ex. ES	Res.	480	0.1829	480	0.1829	480	0.1829	480	0.1829	480	0.1829	480	0.1829	480	0.1829	381	5.08	75	Existing flow w/in existing service area
	ES Total Avg. Flow			**0.3159**		**0.3159**	**1035**	**0.5839**	**1035**	**0.5839**	**1035**	**0.5839**	**1035**	**0.5839**	**1,035**	**0.5977**				Total Future Flow
NWS	**NWS Total Avg. Flow**			**1.2600**		**1.2600**		**1.2600**		**1.2600**		**1.2600**		**1.2600**		**1.2600**				Existing Flow per lift station
NS	Existing	Res.	143	0.0919	143	0.0919	143	0.0919	143	0.0919	143	0.0919	143	0.0919	143	0.0919	643	8.57	75	Avg. Existing Non-Residential flow/acre,
	Existing	Non-Res	1288	0.6440	1288	0.6440	1288	0.6440	1288	0.6440	1288	0.6440	1288	0.6440	1288	0.6440	500			approx 500 acres open space
	Future	Non-Res	0	0.0000	0	0.0000	204	0.1632	204	0.1632	204	0.1632	204	0.1632	204	0.1632	800			
	NS Total Avg. Flow			**0.7359**		**0.7359**		**0.8991**		**0.8991**	**1,635**	**0.8991**	**1,635**	**0.8991**	**1,635**	**0.8991**				Total Future Flow
NES	L1	Non-Res	0	0.0000	200	0.1600	294	0.2352	294	0.2352	294	0.2352	294	0.2352	294	0.2352	800			
	L2	Non-Res	0	0.0000	70	0.0560	96	0.0768	96	0.0768	96	0.0768	96	0.0768	96	0.0768	800			Approx. 1500 acres open space/river
	L1	Res	102	0.0483	102	0.0483	102	0.0483	102	0.0483	102	0.0483	102	0.0483	102	0.0483	475	5.56	75	
	Existing	Non-Res		0.0900		0.0900		0.0900		0.0900		0.0900		0.0900		0.0900				Existing Flow
	NES Total Avg. Flow			**0.1383**		**0.3543**		**0.4503**		**0.4503**	**492**	**0.4503**	**492**	**0.4503**	**492**	**0.4503**				Total Future Flow
NCS	Exisitng	Non-Res	301	0.1505	301	0.1505	301	0.1505	301	0.1505	301	0.1505	301	0.1505	301	0.1505	500			Existing Flow
	NCS Total Avg. Flow			**0.1505**		**0.1505**		**0.1505**		**0.1505**		**0.1505**		**0.1505**		**0.1505**				
WS	Existing	Res.	665	0.2993	665	0.2993	665	0.2993	665	0.2993	665	0.2993	665	0.2993	665	0.3159	475	6.00	75	
	Existing	Non-Res	271	0.1355	271	0.1355	271	0.1355	271	0.1355	271	0.1355	271	0.1355	271	0.1355	500			Approx. 160 acres open space
	Future	Res.	85	0.0383	85	0.0383	85	0.0383	85	0.0383	85	0.0383	85	0.0383	85	0.0404	475	6.00	75	
	Future	Non-Res	0	0.0000	73	0.0584	73	0.0584	73	0.0584	73	0.0584	73	0.0584	73	0.0584	800			
	WS Total Avg. Flow			**0.4730**		**0.5314**		**0.5314**		**0.5314**	**1,094**	**0.5314**	**1,094**	**0.5314**	**1,094**	**0.5502**				Total Future Flow
Total System Avg. Flow				**5.1396**		**5.8157**		**6.7312**		**6.8625**		**7.4603**		**9.7678**		**12.3233**				