EXHIBIT C. 2011-2012 UPDATE OF I&I ANALYSIS

Consulting Engineer's Brief Sheet
(Melanie Mankamyer)
Prepared February 6, 2013 for February 13, 2013 Commissioner's Meeting

2011-2012 Update of Inflow and Infiltration Analysis

Background

At the request of the District, we have prepared this updated analysis of the sewer collection system's inflow and infiltration (I&I). Inflow is water that enters the sewer collection system from the surface, while infiltration is water that enters the system through cracks, separated joints, or other flaws in the pipes or manholes.

This analysis was last completed using data from 2002-2004 and was included in the District's last Comprehensive Sewer Plan. In the intervening years the District has undertaken several projects to reduce the quantity of I&I that enters the collection system. The District has installed manhole dishes in approximately 39% of the sewer manholes to minimize inflow from the surface. The District also routinely uses video inspection of its sewer pipes during wet weather to locate pipe leaks and then contracts to have the leaks repaired. In recent years staff has inspected about 25% of the system in a year but the quantity should increase with the newly purchased camera system. The District contracted for cure-in-place pipe spot repairs in 2005, 2010, 2011 and 2012.

In 2012 the District also contracted to repair leaking manholes. The contractor's report indicated that they were able to stop approximately 400 gallons per minute of water leaking into the sewer system with the manhole repairs.

The District contracted its first of a series of smoke tests to look for anomalies and illegal drain connections. The first area tested was Geneva in the summer of 2012, with North Shore and Sudden Valley to be smoke tested in subsequent years. The anomalies found through the Geneva smoke tests included the following (a complete list is attached):

1. Three illegal roof drain connections
2. One broken sewer lateral
3. Four buried and/or improperly set sewer manholes
4. 22 broken cleanouts
5. One cleanout in a driveway that had been converted into a catch basin.

As established by the actions described above, the District has an ongoing and active program to reduce the quantity of inflow and infiltration that enters its sewer collection system.

Analysis

For the I&I analysis we selected several different conditions from high rainfall on presumed saturated ground (Winter-Spring) to no rainfall on presumed dry ground (Summer). In comparing rain events with the previous I&I analysis covering 2002-2004, the 2011-2012 period did not have as many nor as heavy of rainfall events. Given that no two storm events are ever

the same, direct comparison with the previous data is not necessarily a good measure of the efficacy of the District's ongoing efforts.

To analyze the current impact of I&I on the District's collection systems, we reviewed sewer flows and rain data over the last 18 months. Our data set was limited due to the telemetry data being less than reliable for January-May 2011. Our evaluation criteria were based on those outlined in the Sewer System Infrastructure Analysis and Rehabilitation Handbook (EPA/625/6-91/030) for construction grant applicants:

> "No further I/I analysis will be necessary if domestic wastewater plus non-excessive infiltration does not exceed 120 gallons per capita per day (gpcd) during periods of high groundwater. The total daily flow during a storm should not exceed 275 gpcd, and there should be no operational problems such as surcharges, bypasses or poor treatment performance resulting from hydraulic overloading of the treatment works during storm events."

Typically, the ground in this area is saturated from November through April. The attached analyses for Spring Weather-Presumed High Groundwater and Winter Weather without a Major Storm Day-Presumed High Groundwater include two-three examples which were used to determine the District's I&I levels for periods of high ground water. Also included in this analysis were examples for Dry Weather-No Rain to indicate a "baseline" level of sewer flows without I&I. Each example is based on the data gathered for the week selected.

A. Inflow and Infiltration South Shore

The South Shore (Sudden Valley, Geneva) sewer collection system consists of 6-inch to 10-inch gravity sewers with lift stations and force mains feeding either of two interceptor systems. The District regularly conducts video inspections of the gravity sewers to determine locations and severity of inflow and infiltration.

An analysis of the daily and weekly rainfall and sewer meter flow records show that the South Shore gravity sewer collection system shows a moderate to major flow increase during wet weather events. The attached charts graphically illustrates the total weekly rainfall and the average daily flow by week for the South Shore sewer collection system from May 2011 through November 2012. Weeks with higher rainfall are accompanied by increases in the total weekly flow through the sewer meters. Rainfall has a higher impact on sewer flows when the ground is saturated.

The analyses for Winter Weather without a Major Storm Day-Presumed High Groundwater include examples which were used to determine the District's I&I levels for periods of high ground water. The calculated average daily flow per capita ranged from 69-73 gpcd. Since these values are less than 120 gpcd, the South Shore system does not have excessive I&I due to high groundwater. These values are also less than the previous 2002-2004 values of 72-88 gpcd for Winter - no major storms, which would indicate progress in reducing infiltration from high groundwater.

The analysis of sewer flows during storm events shows a definite impact of rain-influenced infiltration (RII). In the Peak Wet Weather Day with Rainfall on Successive Days analysis, the peak sewer flow occurred on the day after the peak rainfall. The two storm events included in this section were very different in the rain patterns, but the peak daily flows per capita were within 3% of each other (169-174 gpcd).

The Peak Wet Weather Day and Antecedent Rainfall represent the potential worst-case examples of RII since the preceding rain will saturate the ground immediately prior to the major storm. Under these conditions, the calculated peak flow per capita did not exceed the 275 gpcd criteria as it had in the 2002-2004 analyses, but the 121-169 gpcd is closer to the values above for Rainfall on Successive Days. In 2002-2004 there are mitigating circumstances (e.g. the County storm system overflowing which flooded streets and inundated manholes) that resulted in unusually high levels of inflow. Based on these experiences, the District determined areas most susceptible to inflow due to flooding, and installed dish inserts into the manholes in these areas.

Also included in this analysis were examples for Dry Weather-No Rain. The calculated average daily flow per capita ranged from 56-60 gpcd for the dry conditions. These values are about the same as the 57-63 gpcd seen in 2002-2004. The estimated "peaking factor" relating the peak wet weather flow to the peak dry weather flow for South Shore is 2.77.

B. Inflow and Infiltration North Shore

The North Shore sewer collection system consists of 8-inch-10-inch gravity lateral sewers feeding an interceptor system with three lift stations and force mains. The District regularly conducts video inspections of the gravity sewers to determine locations and severity of inflow and infiltration.

The North Shore collection system I&I analysis was similar to the analysis described above for the South Shore collection system. We reviewed sewer flows and rain data over the last 18 months. The attached charts graphically illustrates the total weekly rainfall and the average daily flow by week for the South Shore sewer collection system from May 2011 through November 2012.

The analyses for Winter Weather without a Major Storm Day-Presumed High Groundwater include examples which were used to determine the District's I&I levels for periods of high ground water. Each example is based on the data gathered for the week selected. The calculated average daily flow per capita ranged from 58-86 gpcd for Winter (no major storms). Since these values are much less than 120 gpcd, the North Shore collection system does not have excessive I&I due to high groundwater.

The analysis of North Shore sewer flows during storm events does not show as much of an impact of rain-influenced infiltration (RII) as seen in the South Shore collection system. For the analyses including storm events, the peak daily flow per capita was 102-145 gpcd, which is

much less than the 275 gpcd EPA criteria for daily flow defining excessive infiltration during a storm event.

Also included in this analysis were examples for Dry Weather-No Rain. The calculated average daily flow per capita ranged from 57-66 gpcd for the dry conditions. These values are about 6% higher than the South Shore collection system but lower than the 73-77 gpcd seen in 2002-2004. (This may be more indicative of the different water use patterns between North Shore and South Shore than the condition of the sewer collection system.)

The estimated "peaking factor" relating the peak wet weather flow to the peak dry weather flow for North Shore is 1.93.

Summary and Recommendations

In summary, the District's sewer collection systems substantially exceed the standards set by the EPA for acceptable inflow and infiltration. Furthermore the District has had no operational problems such as surcharges, bypasses or overflows during normal storm events, and has used the Detention Basin only once since the January 2009 flood (rain on snow event) where the volume was of any significance (around 1/2 to 2/3 full). There were a few other times the Basin was used, but the volume stored was insignificant - 1-2 feet deep or less.

In addition, the analyses appear to show a reduction of infiltration from high groundwater and a reduction in peak flows during storm events (though no single event in 2011-2012 matched the intensity of the major storm events of 2002-2004).

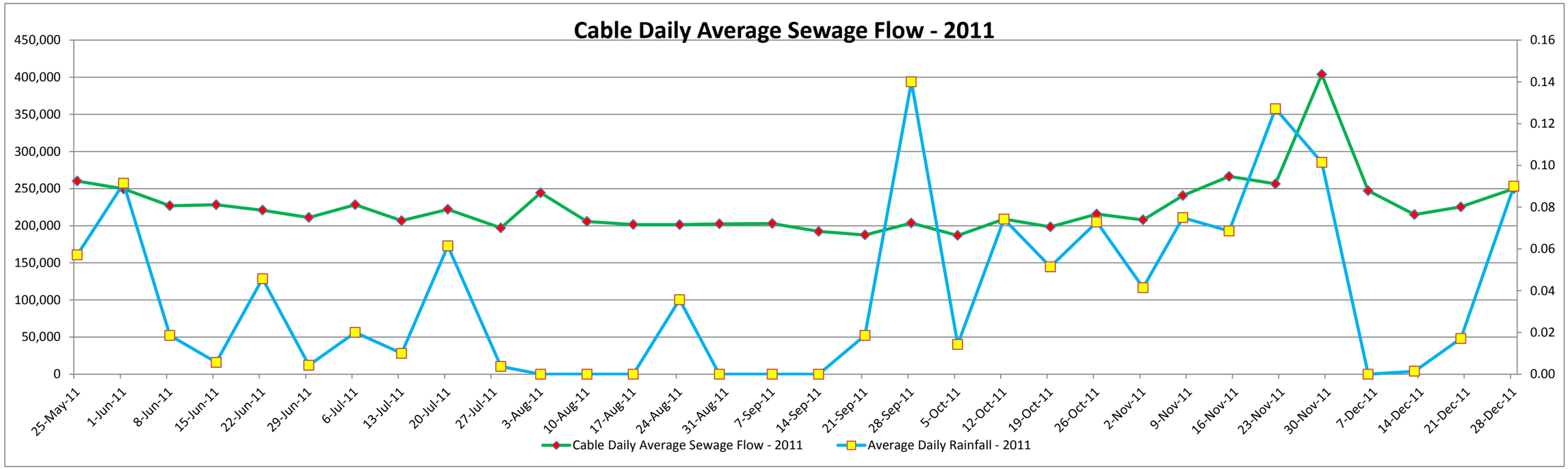
Our recommendations include:

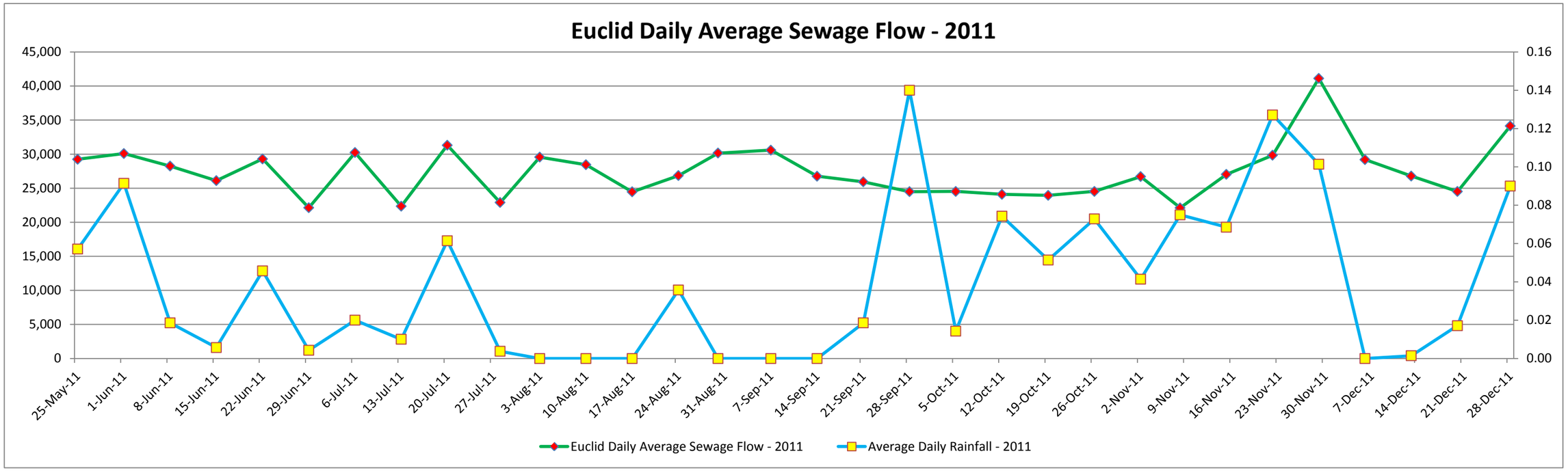
1. Continue video inspection of the sewer collection system to identify defects and contract for those repairs
2. Continue to smoke test areas to find anomalies, illegal connections and "lost" manholes
3. Continue to inspect manholes and have leaks repaired
4. Conduct an I&I analysis every two years.

Enclosures:

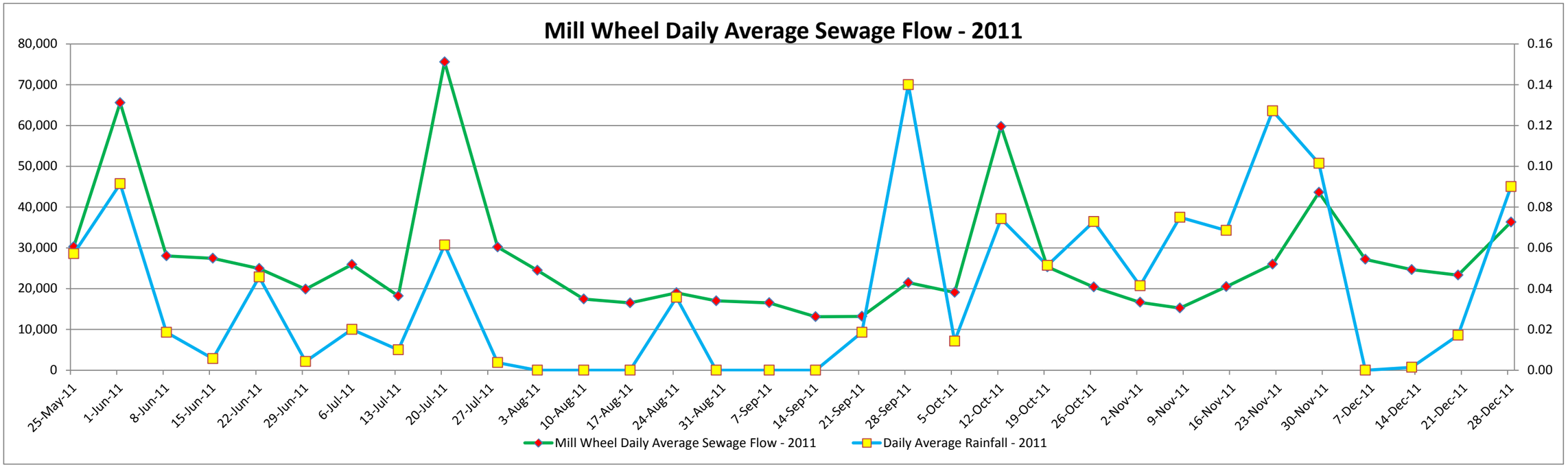
- Daily Average Flows vs Rain Data charts
- South Shore Collection System Flow Analyses
- North Shore Collection System Flow Analyses
- Geneva Smoke Testing Defects List

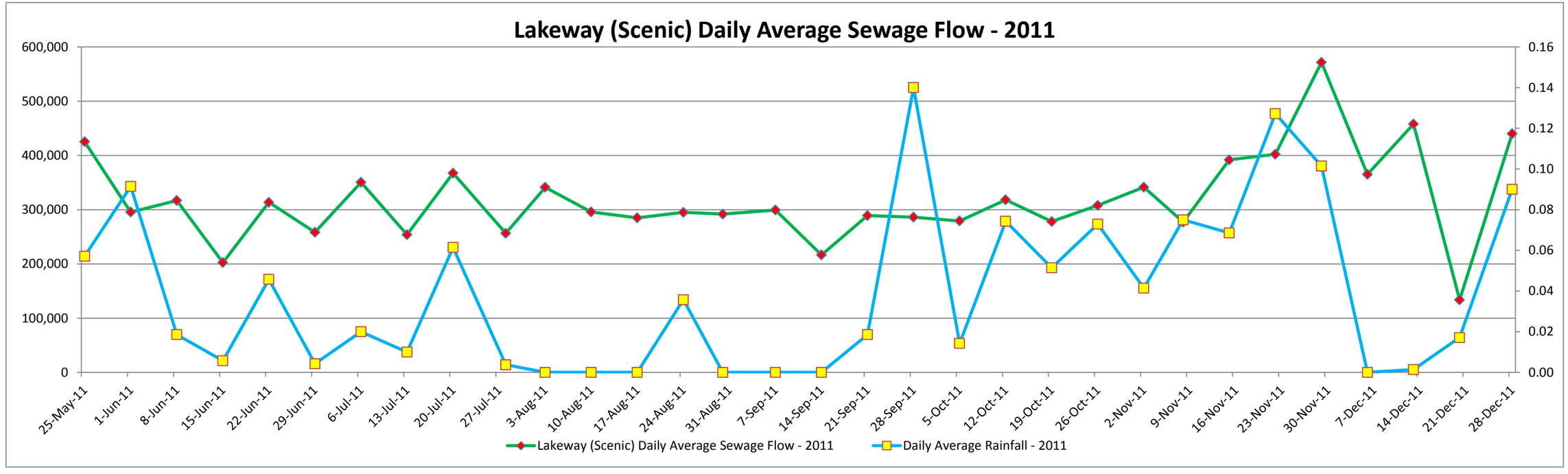
AVERAGE DAILY SEWER FLOWS AND RAIN DATA





AVERAGE DAILY SEWER FLOWS AND RAIN DATA





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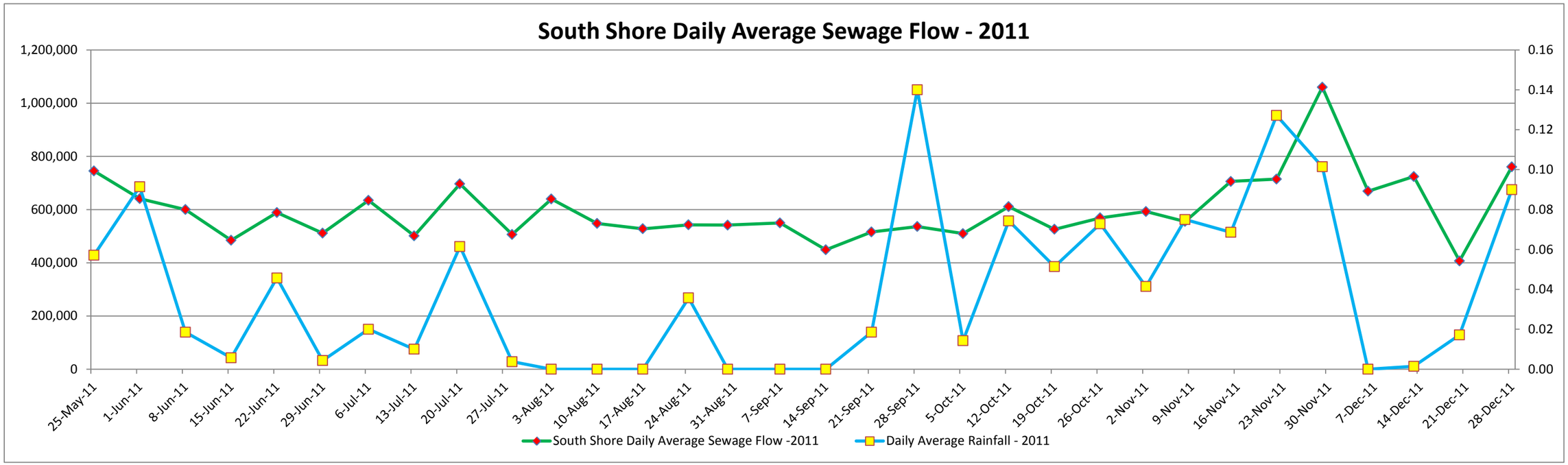

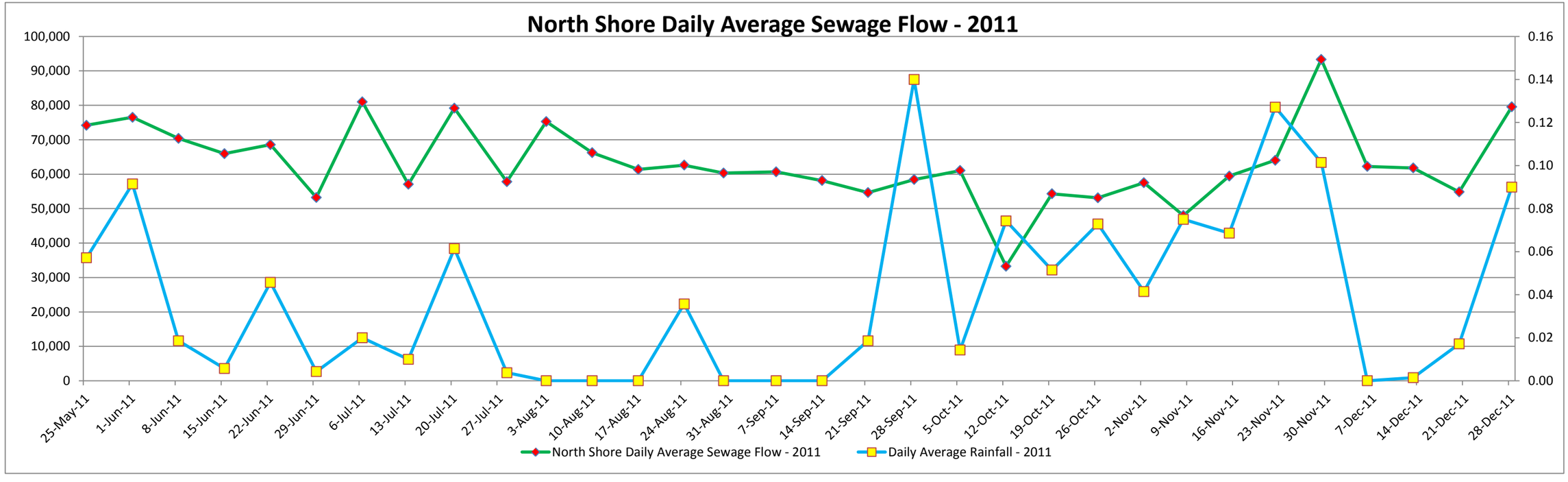

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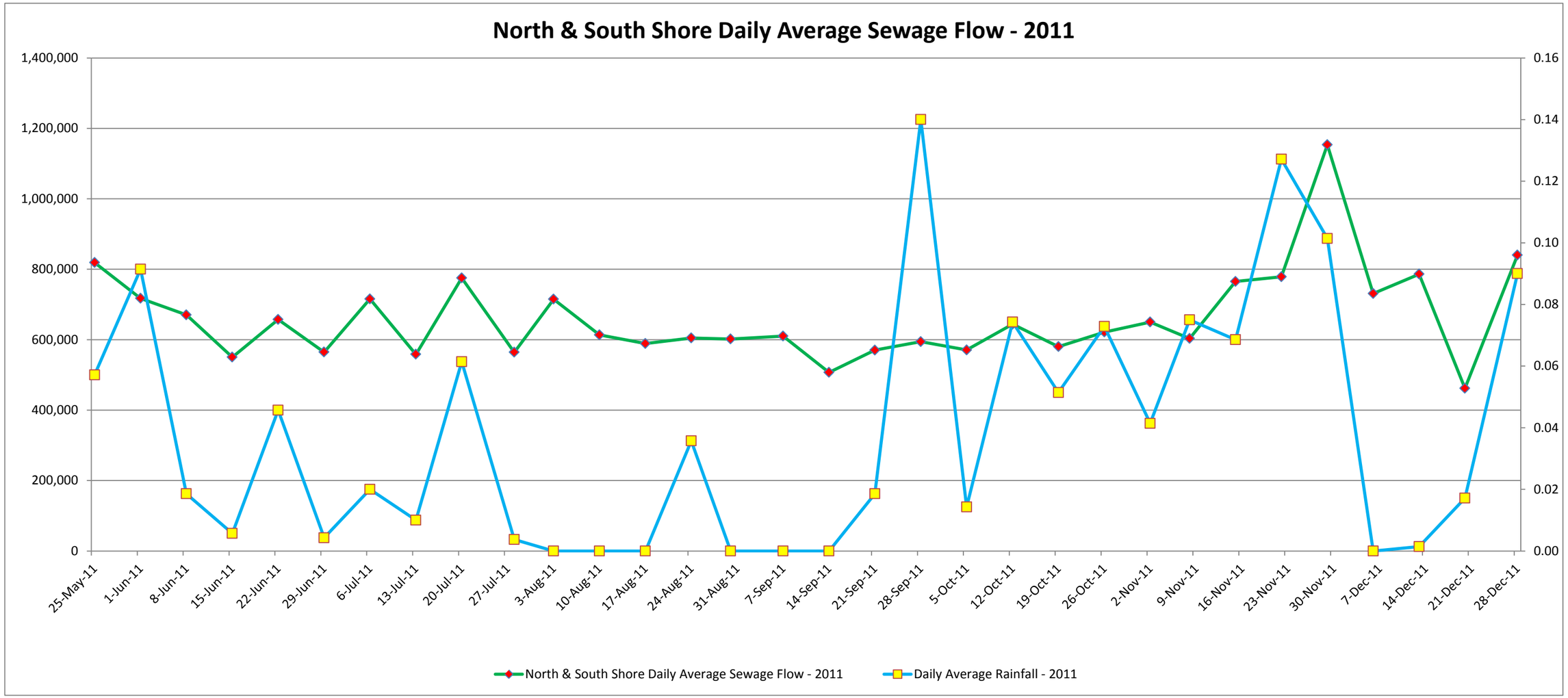

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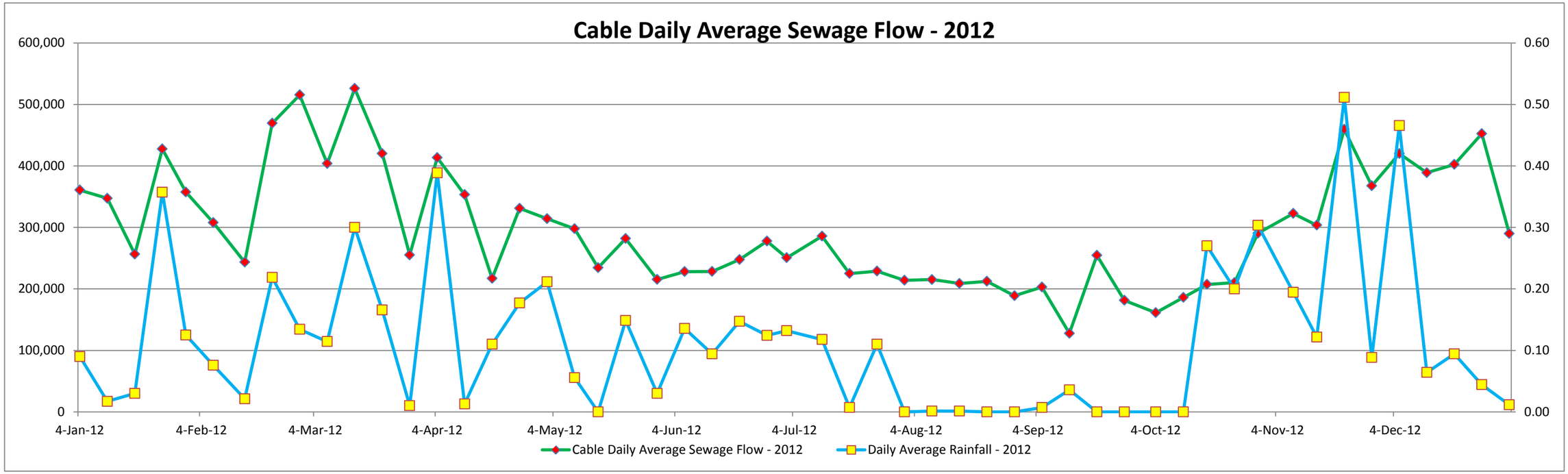

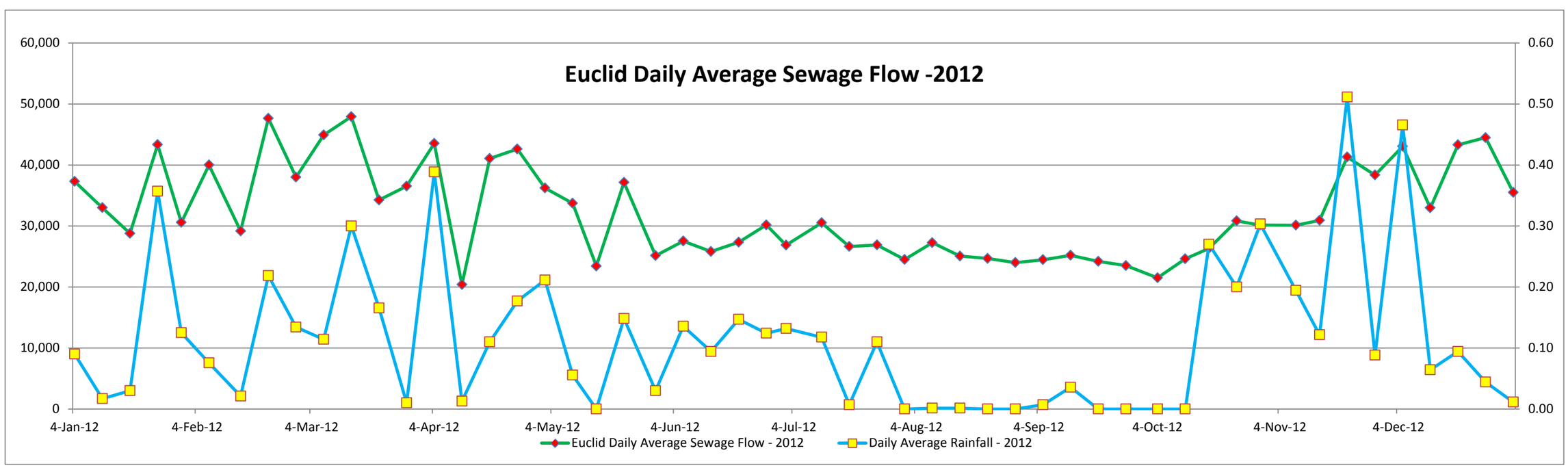

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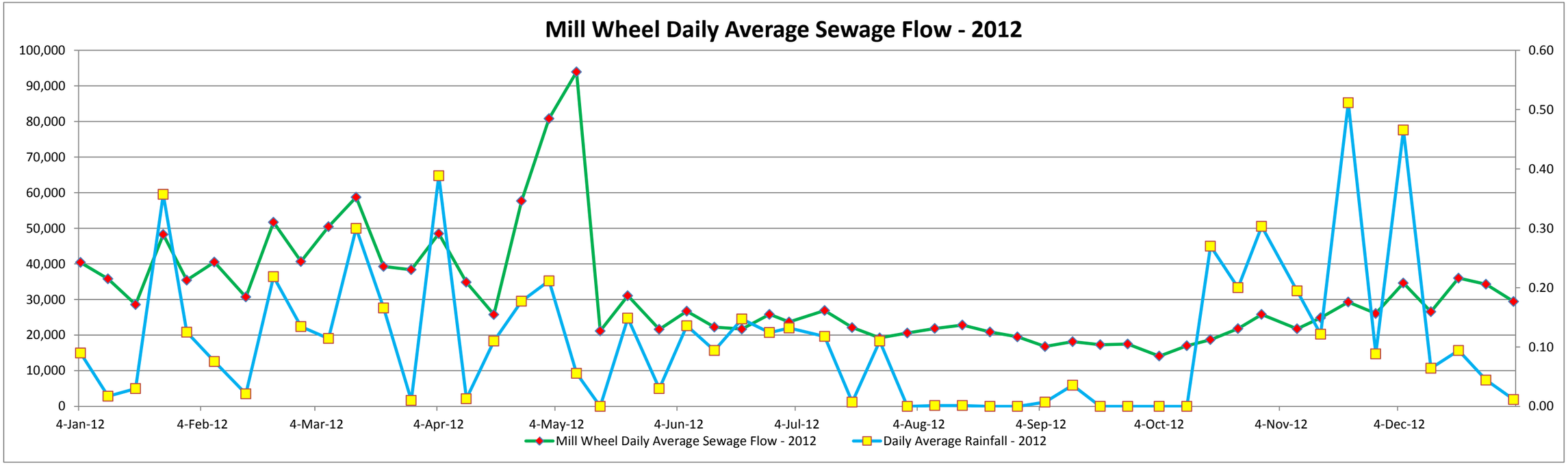

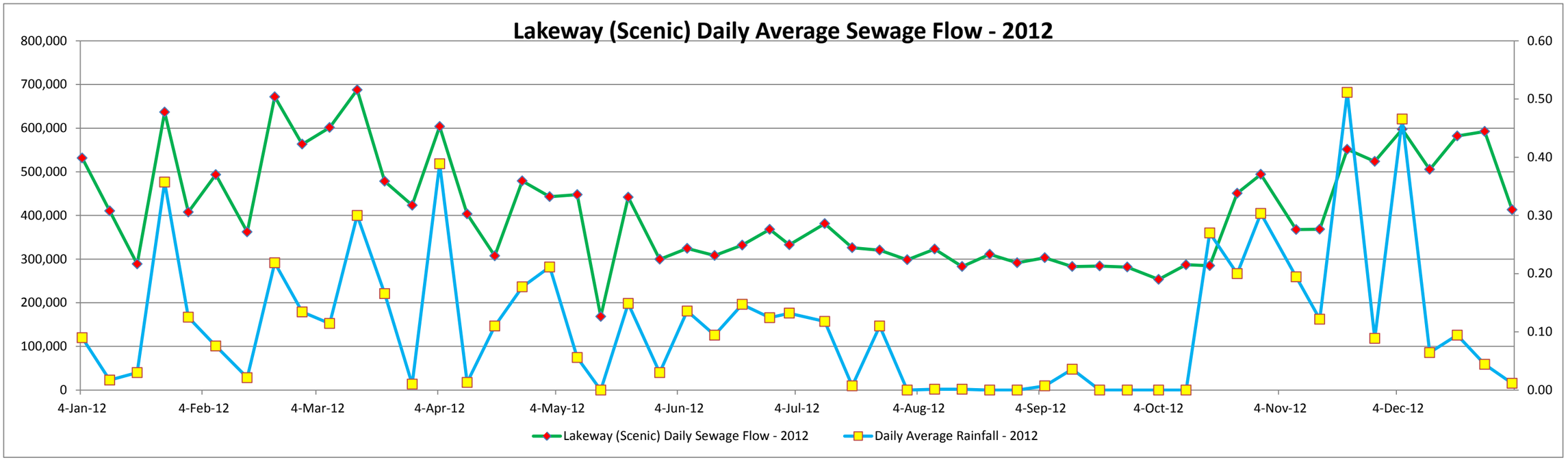

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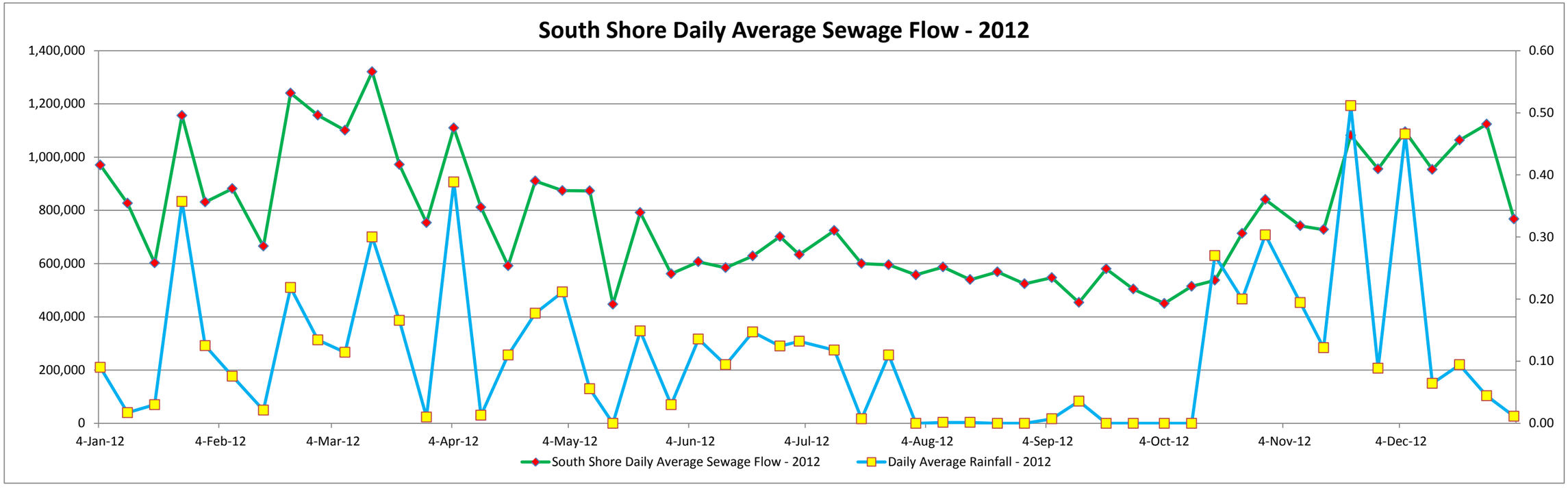

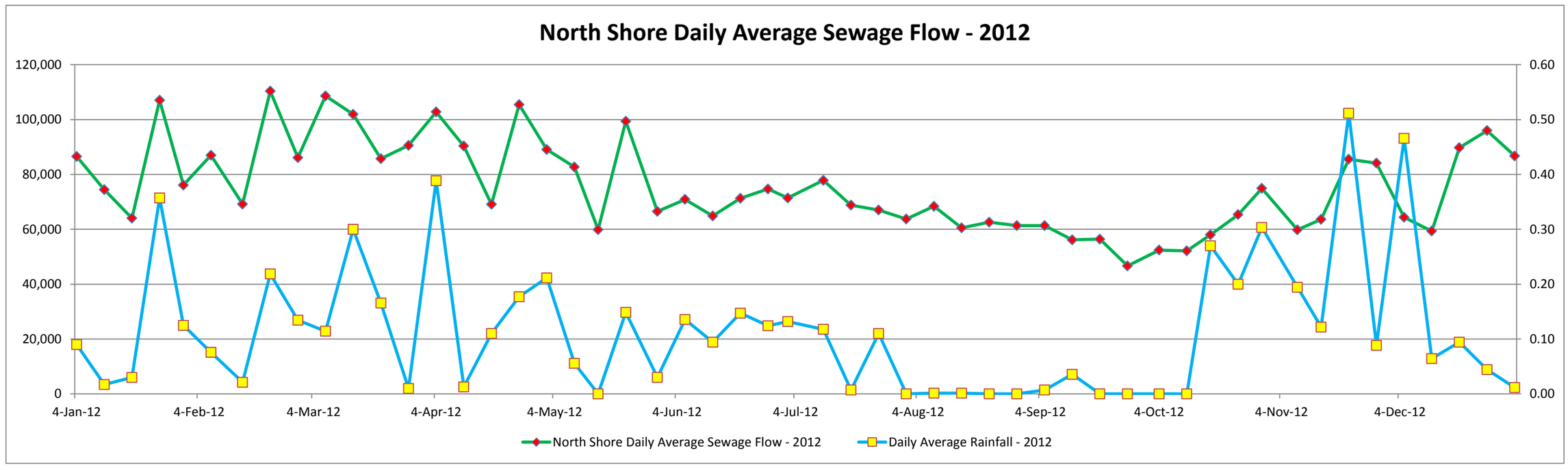

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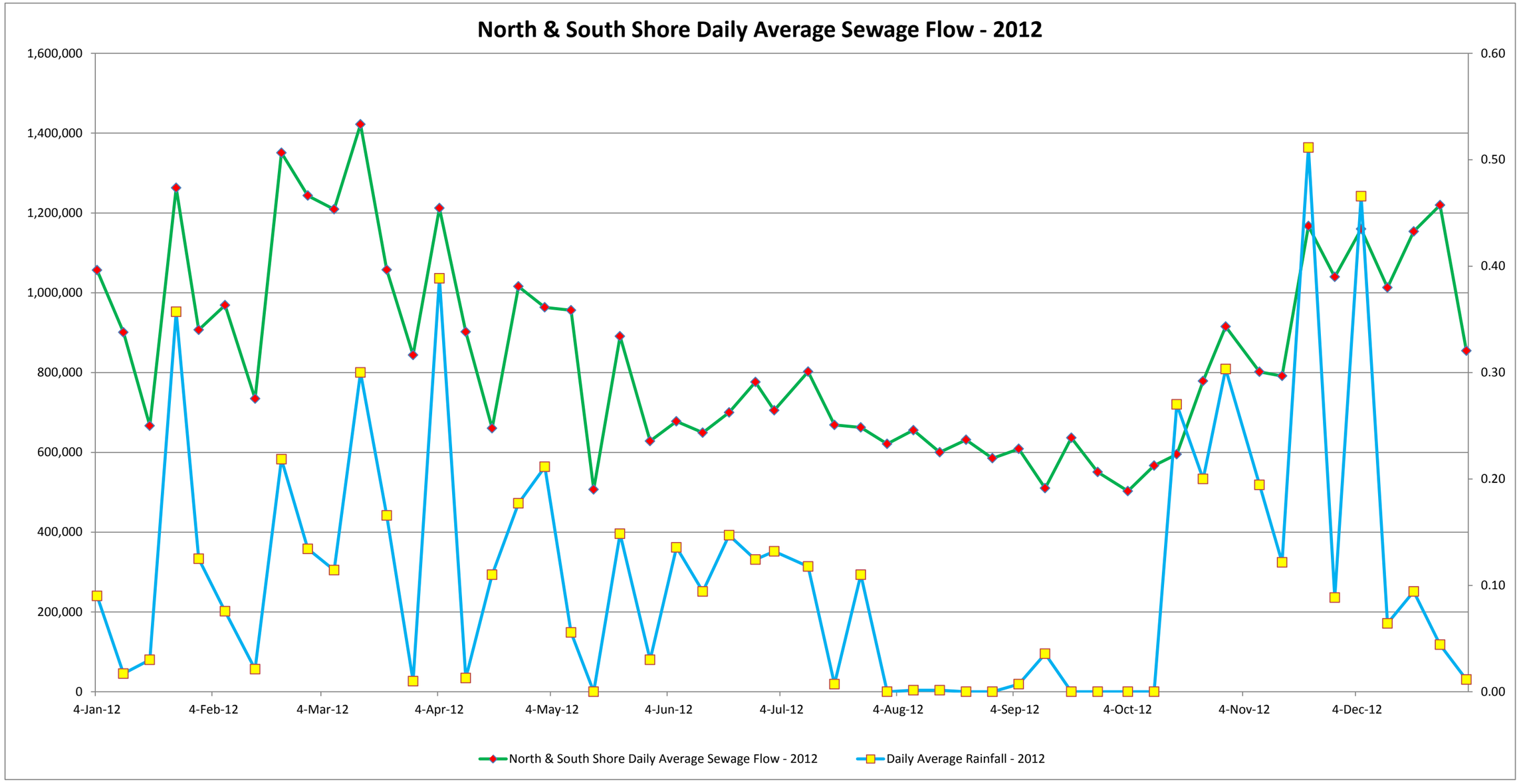

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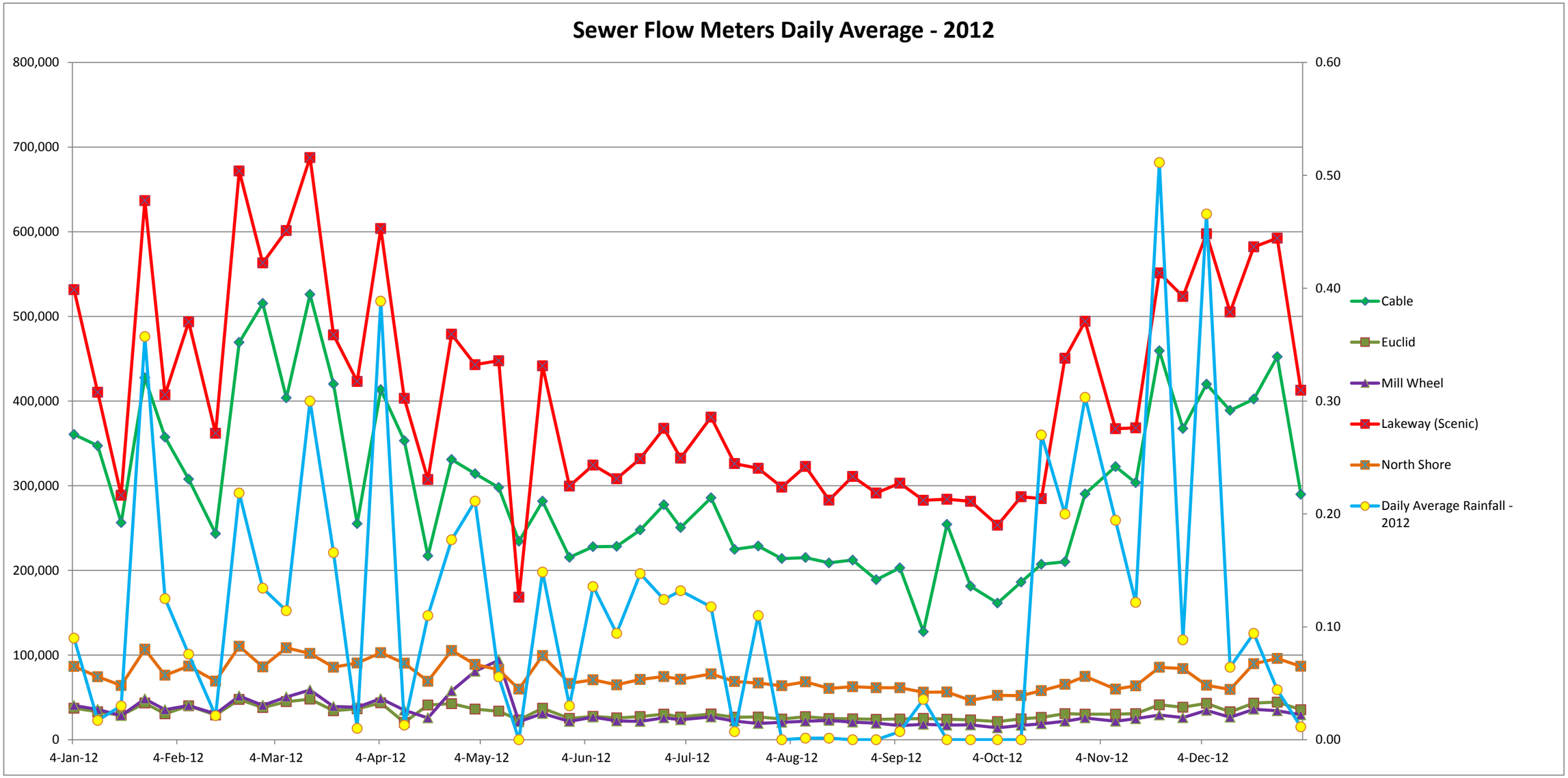


South Shore Collection System

Spring Weather, Presumed High Groundwater

	Total Metered Weekly Flow (Million Gal.)	Avg Daily Flow in this Week (Million Gal.)	Min. Daily Flow Observed in This Week (Million Gal.)	Max. Daily Flow Observed in This Week[2] (Million Gal.)	% of Available Interceptor Capacity Used[3] on Max Day	% of Total System Capacity Used[3] on Max Day	
Week Beginning 2/15/2012	Total Rain (in)=	2.4					
Cable	2.55	0.36	0.24	0.59	39%		LWB Interceptor
Euclid	0.26	0.04	0.03	0.05			LWB Interceptor
Scenic	4.70	0.67	N/A	1.08	54%		LLR Interceptor
Mill Wheel	0.28	0.04	0.03	0.06			Gravity
Cable+Euclid+Scenic+Mill Wheel	7.80	1.11	0.29	1.78		60%	Total to B'ham - South Shore
Approx. Active Sewer Connections:		3842					
Approx. Acreage in Basin:		1870					
Calc. Avg Daily Flow per Capita (2.6 per house)[1]		111					
Calc. Peak Daily Flow per Capita (2.6 per house)[1]				178	← **Demonstrates Non-Excessive I&I for storm flow (<275 gpcpd)**		
Calc. Gallons per day per acre of service area		595		952			
Week Beginning 3/15/12	Total Rain (in)=	1.4					
Cable	3.02	0.43	0.33	0.52	35%		LWB Interceptor
Euclid	0.30	0.04	0.04	0.05			LWB Interceptor
Scenic	4.09	0.58	0.46	0.69	34%		LLR Interceptor
Mill Wheel	0.33	0.05	0.04	0.05			Gravity
Cable+Euclid+Scenic+Mill Wheel	7.75	1.11	0.87	1.31		44%	Total to B'ham - South Shore
Approx. Active Sewer Connections:		3842					
Approx. Acreage in Basin:		1870					
Calc. Avg Daily Flow per Capita (2.6 per house)[1]		111					
Calc. Peak Daily Flow per Capita (2.6 per house)[1]				132	← **Demonstrates Non-Excessive I&I for storm flow (<275 gpcpd)**		
Gallons per day per acre of service area		592		703			
Week Beginning 4/25/2012	Total Rain (in)=	2.1					
Cable	2.18	0.31	0.28	0.37	25%		LWB Interceptor
Euclid	0.25	0.04	0.03	0.04			LWB Interceptor
Scenic	2.86	0.41	0.36	0.46	23%		LLR Interceptor
Mill Wheel	0.59	0.08	0.04	0.18			Gravity
Cable+Euclid+Scenic+Mill Wheel	5.88	0.84	0.72	1.05		35%	Total to B'ham - South Shore
Approx. Active Sewer Connections:		3842					
Approx. Acreage in Basin:		1870					
Calc. Avg Daily Flow per Capita (2.6 per house)[1]		84					
Calc. Peak Daily Flow per Capita (2.6 per house)[1]				105	← **Demonstrates Non-Excessive I&I for storm flow (<275 gpcpd)**		
Calc. Gallons per day per acre of service area		449		562			

NOTES:

1. Weighted average of 2.6 residents per household comes from 2/3 SV with 2.5 per house, and 1/3 Geneva with 2.9 per house.
2. Min./Max. Daily Flow data is not reliable for Scenic for all weeks; Min. Flow is N/A and Max is estimated as 1.4 - 1.7 times Avg. Daily Flow (based on LWB max/avg ratios).
3. Capacities based on the following: LWB at 1,150 gpm, LLRI at 1,400 gpm, Mill Wheel gravity at 440 gpm, and Detention Basin at 700,000 gallons.

South Shore Collection System

Winter Weather without a Major Storm Day, Presumed High Groundwater

	Total Metered Weekly Flow (Million Gal.)	Avg Daily Flow in this Week (Million Gal.)	Min. Daily Flow Observed in This Week (Million Gal.)	Max. Daily Flow Observed in This Week[2] (Million Gal.)	% of Available Interceptor Capacity Used[3] on Max Day	% of Total System Capacity Used[3] on Max Day	
Week Beginning 11/29/2011	Total Rain (in)=	0.1					
Cable	1.83	0.26	0.24	0.32	21%		LWB Interceptor
Euclid	0.21	0.03	0.03	0.03			LWB Interceptor
Scenic	2.56	0.37	N/A	0.44	22%		LLR Interceptor
Mill Wheel	0.21	0.03	0.03	0.04			Gravity
Cable+Euclid+Scenic+Mill Wheel	4.81	0.69	0.29	0.82		28%	Total to B'ham - South Shore
Approx. Active Sewer Connections:		3838					
Approx. Acreage in Basin:		1870					
Calc. Avg Daily Flow per Capita (2.6 per house)[1]		69					
Calc. Peak Daily Flow per Capita (2.6 per house)[1]				83	← **Demonstrates Non-Excessive I&I flow (<120 gpcpd)**		
Gallons per day per acre of service area		367		441			
Week Beginning 12/6/2012	Total Rain (in)=	0					
Cable	1.55	0.22	0.21	0.24	16%		LWB Interceptor
Euclid	0.20	0.03	0.03	0.03			LWB Interceptor
Scenic	3.20	0.46	N/A	0.49	24%		LLR Interceptor
Mill Wheel	0.18	0.03	0.02	0.03			Gravity
Cable+Euclid+Scenic+Mill Wheel	5.13	0.73	0.26	0.79		26%	Total to B'ham - South Shore
Approx. Active Sewer Connections:		3842					
Approx. Acreage in Basin:		1870					
Calc. Avg Daily Flow per Capita (2.6 per house)[1]		73					
Calc. Peak Daily Flow per Capita (2.6 per house)[1]				79	← **Demonstrates Non-Excessive I&I flow (<120 gpcpd)**		
Gallons per day per acre of service area		392		420			

NOTES:
1. Weighted average of 2.6 residents per household comes from 2/3 SV with 2.5 per house, and 1/3 Geneva with 2.9 per house.
2. Min./Max. Daily Flow data is not reliable for Scenic for all weeks; Min. Flow is N/A and Max is estimated as 1.4 - 1.7 times Avg. Daily Flow (based on LWB max/avg ratios).
3. Capacities based on the following: LWB at 1,150 gpm, LLRI at 1,400 gpm, Mill Wheel gravity at 440 gpm, and Detention Basin at 700,000 gallons.

South Shore Collection System

Peak Wet Weather Day and Antecedent Rainfall

	Total Metered Weekly Flow (Million Gal.)	Avg Daily Flow in this Week (Million Gal.)	Min. Daily Flow Observed in This Week (Million Gal.)	Max. Daily Flow Observed in This Week[2] (Million Gal.)	% of Available Interceptor Capacity Used[3] on Max Day	% of Total System Capacity Used[3] on Max Day	
Week Beginning 4/16/12 **Peak Day April 20, 2012 Total 24 Hour Rain: 0.83 inches, with 0.86 inches in preceding three days**							
Cable	2.15	0.31	0.25	0.48	31%		LWB Interceptor
Euclid	0.25	0.04	0.03	0.04			LWB Interceptor
Scenic	2.86	0.41	0.34	0.59	29%		LLR Interceptor
Mill Wheel	0.33	0.05	0.03	0.10			Gravity
Cable+Euclid+Scenic+Mill Wheel	5.59	0.80	0.66	1.21		41%	Total to B'ham - South Shore
Approx. Active Sewer Connections:		3842					
Approx. Acreage in Basin:		1870					
Calc. Avg Daily Flow per Capita (2.6 per house)[1]		80					
Calc. Peak Daily Flow per Capita (2.6 per house)[1]				121	← **Demonstrates Non-Excessive I&I for storm flow (<275 gpcpd)**		
Gallons per day per acre of service area		427		648	**Includes Rain-Influenced Infiltration**		
Week Beginning 11/17/12 **Peak Day November 20, 2012 Total 24 Hour Rain: 2.22 inches, with 1.03 inches in preceding two days.**							
Cable	3.58	0.51	0.24	0.75	49%		LWB Interceptor
Euclid	0.31	0.04	0.03	0.06			LWB Interceptor
Scenic	4.28	0.61	0.35	0.84	41%		LLR Interceptor
Mill Wheel	0.23	0.03	0.02	0.04			Gravity
Cable+Euclid+Scenic+Mill Wheel	8.39	1.20	0.63	1.69		56%	Total to B'ham - South Shore
Approx. Active Sewer Connections:		3842					
Approx. Acreage in Basin:		1870					
Calc. Avg Daily Flow per Capita (2.6 per house)[1]		120					
Calc. Peak Daily Flow per Capita (2.6 per house)[1]				169	← **Demonstrates Non-Excessive I&I for storm flow (<275 gpcpd)**		
Gallons per day per acre of service area		641		902	**Includes Rain-Influenced Infiltration**		

NOTES:
1. Weighted average of 2.6 residents per household comes from 2/3 SV with 2.5 per house, and 1/3 Geneva with 2.9 per house.
2. Min./Max. Daily Flow data is not reliable for Scenic for all weeks; Min. Flow is N/A and Max is estimated as 1.4 - 1.7 times Avg. Daily Flow (based on LWB max/avg ratios).
3. Capacities based on the following: LWB at 1,150 gpm, LLRI at 1,400 gpm, Mill Wheel gravity at 440 gpm, and Detention Basin at 700,000 gallons.

South Shore Collection System

Peak Wet Weather Day with Rainfall on Successive Days

	Total Metered Weekly Flow (Million Gal.)	Avg Daily Flow in this Week (Million Gal.)	Min. Daily Flow Observed in This Week (Million Gal.)	Max. Daily Flow Observed in This Week[2] (Million Gal.)	% of Available Interceptor Capacity Used[3] on Max Day	% of Total System Capacity Used[3] on Max Day	
Week Beginning 11-22-2011 **Peak Rain Day 11-23-11; Total 24 Hour Rain: 0.98 inches, with 1.28 inches in following 2 days. Peak Sewer Flow on 11-24-11**							
Cable	2.73	0.39	0.25	0.66	43%		LWB Interceptor
Euclid	0.25	0.04	0.03	0.05			LWB Interceptor
Scenic	4.00	0.57	N/A	0.97	48%		LLR Interceptor
Mill Wheel	0.27	0.04	0.03	0.06			Gravity
Cable+Euclid+Scenic+Mill Wheel	7.25	1.04	0.30	1.73		58%	Total to B'ham - South Shore
Approx. Active Sewer Connections:		3838					
Approx. Acreage in Basin:		1870					
Calc. Avg Daily Flow per Capita (2.6 per house)[1]		104					
Calc. Peak Daily Flow per Capita (2.6 per house)[1]				174	← **Demonstrates Non-Excessive I&I for storm flow (<275 gpcpd)**		
Calc. Gallons per day per acre of service area		554		928	**Includes Rain-Influenced Infiltration**		
Week Beginning 11-19-2012 **Peak Rain Day 11-20-12; Total 24 Hour Rain: 2.22 inches, with 0.81 inches in following 2 days. Peak Sewer Flow on (11/21/12)**							
Cable	3.78	0.54	0.38	0.75	49%		LWB Interceptor
Euclid	0.32	0.05	0.04	0.06			LWB Interceptor
Scenic	4.62	0.66	0.53	0.84	41%		LLR Interceptor
Mill Wheel	0.23	0.03	0.03	0.04			Gravity
Cable+Euclid+Scenic+Mill Wheel	8.96	1.28	0.97	1.69		56%	Total to B'ham - South Shore
Approx. Active Sewer Connections:		3842					
Approx. Acreage in Basin:		1870					
Calc. Avg Daily Flow per Capita (2.6 per house)[1]		128					
Calc. Peak Daily Flow per Capita (2.6 per house)[1]				169	← **Demonstrates Non-Excessive I&I for storm flow (<275 gpcpd)**		
Calc. Gallons per day per acre of service area		684		902	**Includes Rain-Influenced Infiltration**		

NOTES:
1. Weighted average of 2.6 residents per household comes from 2/3 SV with 2.5 per house, and 1/3 Geneva with 2.9 per house.
2. Min./Max. Daily Flow data is not reliable for Scenic for all weeks; Min. Flow is N/A and Max is estimated as 1.4 - 1.7 times Avg. Daily Flow (based on LWB max/avg ratios).
3. Capacities based on the following: LWB at 1,150 gpm, LLRI at 1,400 gpm, Mill Wheel gravity at 440 gpm, and Detention Basin at 700,000 gallons.

South Shore Collection System

Dry Weather

	Total Metered Weekly Flow (Million Gal.)	Avg Daily Flow in this Week (Million Gal.)	Min. Daily Flow Observed in This Week (Million Gal.)	Max. Daily Flow Observed in This Week[2] (Million Gal.)	% of Available Interceptor Capacity Used[3] on Max Day	% of Total System Capacity Used[3] on Max Day	
Week Beginning 8/31/2011	Total Rain (in)=	0					
Cable	1.43	0.20	0.19	0.22	15%		LWB Interceptor
Euclid	0.22	0.03	0.03	0.03			LWB Interceptor
Scenic	2.40	0.34	N/A	0.37	19%		LLR Interceptor
Mill Wheel	0.12	0.02	0.02	0.02			Gravity
Cable+Euclid+Scenic+Mill Wheel	4.16	0.59	0.23	0.65		22%	Total to B'ham - South Shore
Approx. Active Sewer Connections:		3838					
Approx. Acreage in Basin:		1870					
Calc. Avg Daily Flow per Capita (2.6 per house)[1]		60	←		**Lowest likely average per capita flows**		
Calc. Peak Daily Flow per Capita (2.6 per house)[1]				65	← **Lowest likely peak per capita flows**		
Gallons per day per acre of service area		318		347			
Week Beginning 8/11/2012	Total Rain (in)=	0					
Cable	1.45	0.21	0.20	0.22	15%		LWB Interceptor
Euclid	0.18	0.03	0.02	0.03			LWB Interceptor
Scenic	2.09	0.30	0.29	0.32	16%		LLR Interceptor
Mill Wheel	0.16	0.02	0.02	0.03			Gravity
Cable+Euclid+Scenic+Mill Wheel	3.88	0.55	0.54	0.59		20%	Total to B'ham - South Shore
Approx. Active Sewer Connections:		3842					
Approx. Acreage in Basin:		1870					
Calc. Avg Daily Flow per Capita (2.6 per house)[1]		56	←		**Lowest likely average per capita flows**		
Calc. Peak Daily Flow per Capita (2.6 per house)[1]				59	← **Lowest likely peak per capita flows**		
Gallons per day per acre of service area		297		316			

NOTES:
1. Weighted average of 2.6 residents per household comes from 2/3 SV with 2.5 per house, and 1/3 Geneva with 2.9 per house.
2. Min./Max. Daily Flow data is not reliable for Scenic for all weeks; Min. Flow is N/A and Max is estimated as 1.4 - 1.7 times Avg. Daily Flow (based on LWB max/avg ratios).
3. Capacities based on the following: LWB at 1,150 gpm, LLRI at 1,400 gpm, Mill Wheel gravity at 440 gpm, and Detention Basin at 700,000 gallons.

North Shore Collection System

Spring Weather, Presumed High Groundwater

		Total Metered Weekly Flow (Million Gal.)	Avg Daily Flow in this Week (Million Gal.)	Min. Daily Flow Observed in This Week (Million Gal.)	Max. Daily Flow Observed in This Week (Million Gal.)	% of Available Interceptor Capacity Used on Max Day	
Week Beginning 2/15/2012	Total Rain (in)=		2.4				
Northshore Meter	0.59		0.08	0.07	0.11	7%	Total to B'ham from NS
Approx. Active Sewer Connections:			358				
Approx. Acreage in Basin:			2125				
Calc. Avg Daily Flow per Capita (2.9 per house)			82				
Calc. Peak Flow per Capita (2.9 per house)					102	←	**Demonstrates Non-Excessive I&I for storm flow (<275 gpcpd)**
Gallons per day per acre of service area			40		50		**Includes Rain-Influenced Infiltration**
Week Beginning 3/15/12	Total Rain (in)=		1.4				
Northshore Meter	0.69		0.10	0.09	0.11	7%	Total to B'ham from NS
Approx. Active Sewer Connections:			359				
Approx. Acreage in Basin:			2125				
Calc. Avg Daily Flow per Capita (2.9 per house)			95		0		
Calc. Peak Flow per Capita (2.9 per house)					104	←	**Demonstrates Non-Excessive I&I for storm flow (<275 gpcpd)**
Calc. Gallons per day per acre of service area			47		51		**Includes Rain-Influenced Infiltration**
Week Beginning 4/25/2012	Total Rain (in)=		2.1				
Northshore Meter	0.62		0.09	0.08	0.10	7%	Total to B'ham from NS
Approx. Active Sewer Connections:			359				
Approx. Acreage in Basin:			2125				
Calc. Avg Daily Flow per Capita (2.9 per house)			86		0		
Calc. Peak Flow per Capita (2.9 per house)					96	←	**Demonstrates Non-Excessive I&I for storm flow (<275 gpcpd)**
Calc. Gallons per day per acre of service area			42		47		**Includes Rain-Influenced Infiltration**

North Shore Collection System

Winter Weather without a Major Storm Day, Presumed High Groundwater

		Total Metered Weekly Flow (Million Gal.)	Avg Daily Flow in this Week (Million Gal.)	Min. Daily Flow Observed in This Week (Million Gal.)	Max. Daily Flow Observed in This Week (Million Gal.)	% of Available Interceptor Capacity Used on Max Day	
Week Beginning 11/29/2011	Total Rain (in)=		0.1				
Northshore Meter		0.45	0.06	0.06	0.07	5%	Total to B'ham from NS
Approx. Active Sewer Connections:			359				
Approx. Acreage in Basin:			2125				
Calc. Avg Daily Flow per Capita (2.9 per house)			58		0		
Calc. Peak Flow per Capita (2.9 per house)					67	←	**Demonstrates Non-Excessive I&I flow (<120 gpcpd)**
Gallons per day per acre of service area			28		33		
Week Beginning 12/6/2011	Total Rain (in)=		0				
Northshore Meter		0.43	0.060	0.06	0.07	5%	Total to B'ham from NS
Approx. Active Sewer Connections:			359				
Approx. Acreage in Basin:			2125				
Calc. Avg Daily Flow per Capita (2.9 per house)			58				
Calc. Peak Flow per Capita (2.9 per house)					67	←	**Demonstrates Non-Excessive I&I flow (<120 gpcpd)**
Calc. Gallons per day per acre of service area			28		33		
Week Beginning 3/19/2012	Total Rain (in)=		0.31				
Northshore Meter		0.61	0.090	0.08	0.10	7%	Total to B'ham from NS
Approx. Active Sewer Connections:			359				
Approx. Acreage in Basin:			2125				
Calc. Avg Daily Flow per Capita (2.9 per house)			86				
Calc. Peak Flow per Capita (2.9 per house)					96	←	**Demonstrates Non-Excessive I&I flow (<120 gpcpd)**
Calc. Gallons per day per acre of service area			42		47		

North Shore Collection System

Peak Wet Weather Day and Antecedent Rainfall

	Total Metered Weekly Flow (Million Gal.)	Avg Daily Flow in this Week (Million Gal.)	Min. Daily Flow Observed in This Week (Million Gal.)	Max. Daily Flow Observed in This Week (Million Gal.)	% of Available Interceptor Capacity Used on Max Day	
Week Beginning 10/27/12	**Peak Day October 31, 2012 Total 24 Hour Rain: 1.07 inches, with 1.48 inches in preceding three days**					
Northshore Meter	0.54	0.08	0.06	0.10	7%	Total to B'ham from NS
Approx. Active Sewer Connections:		322				
Approx. Acreage in Basin:		2125				
Calc. Avg Daily Flow per Capita (2.9 per house)		86				
Calc. Peak Flow per Capita (2.9 per house)				107	←	**Demonstrates Non-Excessive I&I for storm flow (<275 gpcpd)**
Calc. Gallons per day per acre of service area		38		47		**Includes Rain-Influenced Infiltration**
Week Beginning 11/17/12	**Peak Day November 20, 2012 Total 24 Hour Rain: 2.22 inches, with 1.03 inches in preceding two days.**					
Northshore Meter	0.66	0.09	0.05	0.14	9%	Total to B'ham from NS
Approx. Active Sewer Connections:		322				
Approx. Acreage in Basin:		2125				
Calc. Avg Daily Flow per Capita (2.9 per house)		96				
Calc. Peak Flow per Capita (2.9 per house)				145	←	**Demonstrates Non-Excessive I&I for storm flow (<275 gpcpd)**
Calc. Gallons per day per acre of service area		42		64		**Includes Rain-Influenced Infiltration**

North Shore Collection System

Peak Wet Weather Day with Rainfall on Successive Days

	Total Metered Weekly Flow (Million Gal.)	Avg Daily Flow in this Week (Million Gal.)	Min. Daily Flow Observed in This Week (Million Gal.)	Max. Daily Flow Observed in This Week (Million Gal.)	% of Available Interceptor Capacity Used on Max Day	
Week Beginning 11-22-2011 **Peak Rain Day 11-23-11; Total 24 Hour Rain: 0.98 inches, with 1.28 inches in following 2 days. Peak Sewer Flow on 11-24-11**						
Northshore Meter	0.59	0.08	0.06	0.13	9%	Total to B'ham from NS
Approx. Active Sewer Connections:		358				
Approx. Acreage in Basin:		2125				
Calc. Avg Daily Flow per Capita (2.9 per house)		77				
Calc. Avg Peak Flow per Capita (2.9 per house)				125	←	**Demonstrates Non-Excessive I&I for storm flow (<275 gpcpd)**
Calc. Gallons per day per acre of service area		38		61		**Includes Rain-Influenced Infiltration**
Week Beginning 11-19-2012 **Peak Rain Day 11-20-12; Total 24 Hour Rain: 2.22 inches, with 0.81 inches in following 2 days. Peak Sewer Flow on (11/21/12)**						
Northshore Meter	0.70	0.10	0.08	0.14	10%	Total to B'ham from NS
Approx. Active Sewer Connections:		359				
Approx. Acreage in Basin:		2125				
Calc. Avg Daily Flow per Capita (2.9 per house)		96				
Calc. Avg Peak Flow per Capita (2.9 per house)				134	←	**Demonstrates Non-Excessive I&I for storm flow (<275 gpcpd)**
Calc. Gallons per day per acre of service area		47		66		**Includes Rain-Influenced Infiltration**

North Shore Collection System

Dry Weather

	Total Metered Weekly Flow (Million Gal.)	Avg Daily Flow in this Week (Million Gal.)	Min. Daily Flow Observed in This Week (Million Gal.)	Max. Daily Flow Observed in This Week (Million Gal.)	% of Available Interceptor Capacity Used on Max Day	
Week Beginning 8/30/2011	Total Rain (in)=	0				
Northshore Meter	0.42	0.06	0.06	0.06	4%	Total to B'ham from NS
Approx. Active Sewer Connections:		358				
Approx. Acreage in Basin:		2125				
Calc. Avg Daily Flow per Capita (2.9 per house)		57	←			**Lowest likely average per capita flows**
Calc. Avg Peak Flow per Capita (2.9 per house)				61	←	**Lowest likely peak per capita flows**
Gallons per day per acre of service area		28		30		
Week Beginning 8/11/2012	Total Rain (in)=	0				
Northshore Meter	0.48	0.07	0.06	0.08	5%	Total to B'ham
Approx. Active Sewer Connections:		359				
Approx. Acreage in Basin:		2125				
Calc. Avg Daily Flow per Capita (2.9 per house)		66	←			**Lowest likely average per capita flows**
Calc. Avg Peak Flow per Capita (2.9 per house)				73	←	**Lowest likely peak per capita flows**
Gallons per day per acre of service area		33		36		

2012 Sewer Smoke Testing Defect List

Area	US MH	DS MH	Size	Length	Street/Location	Smoke In House/Bldg	Roof Vent Smoke	Smoke From Cleanout	Smoke From Roof Drain	Other Defect
High Priority										
Geneva	G9-100	G9-99	8	267	Easement	NO	YES	YES	YES	ROOF DRAIN HOOKED TO CLEAN OUT
Geneva	GT-25	GT-24	8	393	Lake Whatcom Blvd	NO	YES	YES	YES	SMOKE FROM ROOF DRAIN AT HOUSE 2027
Geneva	G5-20	G5-19	8	128	Strawberry Point	NO	YES	YES	NO	Smoke out of the ground at house 38
Geneva	G15E	G15-21	8	110	alley	NO	YES	NO	NO	Smoke around mh G15-21
Geneva	G15-4	G15-3	8	327	Coronado Ave	NO	YES	NO	NO	Smoke around mh G15-3
Geneva	G6-11	G6-10	8	178	Easement. Geneva	NO	YES	NO	NO	there are 4 mhs above mh G6-12 behind fire
Geneva	G7-11	G7-12	8	245	Lake Whatcom Blvd	NO	YES	NO	NO	Smoke around m/h G7-12 at riser in ditch
Geneva	G4-13	G4-12	8	158	Coronado ave	N0	YES	YES	NO	c/o has a drain top on it in driveway at 1020
Geneva	G9-126	G9-101	8	38	Parkstone ln	NO	YES	NO	NO	SMOKE AROUND M/H G9-126
Meduim Priority										
Geneva	G9-110	G9-108	8	331	Parkstone Ln	NO	YES	YES	NO	SMOKE AT CLEAN OUT AT HOUSE 1344
Geneva	GL-4	GL-3	8	119	Lowe Ave	NO	YES	YES	NO	BROKEN CAP AT FIRST CLEAN OUT, BROKEN PIPE AT
Geneva	GL-3	GL-2	8	147	Lowe Ave	NO	YES	NO	NO	2ND CLEAN OUT AT HOUSE# 1440
Geneva	G9-51	G9-50	8	278	Cedarbrook ct	NO	YES	NO	NO	cap off
Geneva	G5-5	G5-4	8	121	Easement	NO	YES	YES	NO	Broken c/o at 2660 and 2672
Geneva	G5-4	G5-3	8	149	Easement	NO	YES	NO	NO	smoke under deck
Geneva	G7-30	G7-29	8	249	Columbus Ave	NO	YES	YES	NO	Broken c/o at 4112 smoke from under front stairs
Geneva	LAS3	LAS2	8	188	Lasalle Ave	NO	YES	YES	NO	Broken c/o at 4736 Lassalle
Geneva	LAS2	LAS1	8	270	Beecher Ave	NO	YES	YES	NO	Smoke outside c/o at 4740 Lassalle
Geneva	G4-14	G4-13	8	345	Coronado ave	N0	YES	YES	NO	Broken c/o at house # 1029
Geneva	G6-10	G6-1	8	272	Austin Ct	NO	YES	YES	NO	station and parking lot broken c/o
Geneva	G1-56	G1-55	8	383	Austin Ct	NO	YES	YES	NO	smoke broken c/o at 1201
Geneva	G6-12	G6-12A	8	154	By play field	YES	YES	NO	NO	under a tree behind house 4540 cable st
Geneva	G12-9	G12-8	8	410	Geneva St	NO	YES	YES	NO	city's clean out broken. c/o not on map
Geneva	G12-2	G12-1	8	375	Fir Way	NO	YES	YES	NO	broken c/o at house 4530
Geneva	G1-4	G1-3	8	210	Euclid Ave	NO	YES	NO	NO	open c/o at house # 1701
Geneva	G12-14	G12-13	8	442	Freemont	NO	YES	NO	NO	broken c/o at house # 4424
Geneva	G9-16	G9-15	8	200	Euclid	NO	YES	YES	NO	BROKEN C/O AT HOUSE 1105
Geneva	G9-25	G9-24	8	342	Lowe Ave	NO	YES	NO	NO	broken c/o at 1322 lowe ave
Geneva	G9-125	G9-121	8	324	Easement	NO	YES	YES	NO	broken c/o at 1209 Lakeview dr in the bushes
Geneva	G9-121	G9-136	8	103	Easement	NO	YES	NO	NO	c/o open at trailer park 1209 lakeview dr
Geneva	G6-3	G6-2	8	313	Austin Ct	NO	YES	YES	NO	Smoke in c/o

Area	US MH	DS MH	Size	Length	Street/Location	Smoke In House/Bldg	Roof Vent Smoke	Smoke From Cleanout	Smoke From Roof Drain	Other Defect
Low Proirity										
Geneva	G9-81	G9-80	8	406	Easement	NO	YES	NO	NO	NO SMOKE AT HOUSE# 1109
Geneva	G9-48	G9-51	8	284	Cedarbrook ct	NO	NO	YES	NO	No smoke at 3925 cleanout
Geneva	G9-59	G9-58	8	269	York st	NO	YES	NO	NO	NO SMOKE AT HOUSE 4104
Geneva	G91	G9-65	8	204	willowbrook pl	NO	YES	YES	NO	
Geneva	G9-57	G9-56	8	261	Susan ct	NO	YES	YES	NO	
Geneva	G7-42	G7-41	8	75	Easement	NO	YES	NO	NO	mh G7-42 not found. Mh G7-41 under flower pot next to brick
Geneva	G1-72	G1-51	8	43	Lake Whatcom Blvd	NO	YES	NO	NO	smoke at school
Geneva	G1-89	G1-88	8	336	Lakeview St	NO	YES	NO	NO	no smoke at 1211
Geneva	G1-88	G1-87	8	353	Lakeview St	NO	YES	NO	NO	no smoke at 1218 and 1220
Geneva	G1-87	G1-91	8	166	Lakeview St	NO	YES	NO	NO	no smoke at 1228
Geneva	G1-60	G1-59	8	327	Morgan St	NO	YES	YES	NO	
Geneva	G7-18	G7-4	8	209	Lake Whatcom Blvd	N0	YES	NO	NO	No smoke at house 2757
Geneva	G6-12	G6-11	8	197	Geneva St	YES	YES	NO	NO	Smoke in kitchen at House 4540 Cable St
Geneva	G1-55	G1-54	8	301	Spring St	NO	YES	NO	NO	No smoke at 4720
Geneva	G6-8	G6-7	8	246	Easement. Cable St	NO	YES	NO	NO	No smoke at 4800
Geneva	G6-7	G6-6B	8	201	Easement Cable St	NO	YES	NO	NO	No smoke at 4811
Geneva	G6-12A	G6-12B	8	78	Easement	NO	YES	YES	NO	behind fire station
Geneva	G6-12B	G6-12C	8	112	Easement	NO	YES	NO	NO	behind fire station
Geneva	G6-12C	G6-12D	8	69	Easement	NO	YES	NO	NO	Fire station parking lot
Geneva	G12-11	G12-10	8	296	Fremont St	NO	YES	NO	NO	No smoke at house 4625, 4610
Geneva	G12-10	G6-5A	8	23	Fremont St	NO	YES	NO	NO	No smoke at house , 4645
Geneva	G12-1	G6-3B	8	359	Fir Way	NO	YES	NO	NO	no smoke at house 1125
Geneva	G10-2	G10-1	8	203	Glen Cove Ln	NO	YES	NO	NO	no smoke from house # 1527
Geneva	G1-5	G1-4	8	110	Euclid Ave	NO	YES	NO	NO	no smoke at house # 1623
Geneva	G1-2	G1-1	8	214	Euclid Ave	NO	YES	NO	NO	no smoke at house # 11715
Geneva	G12-15	G12-14	8	353	Lakeview ST	NO	YES	NO	NO	no smoke at house #1116
Geneva	G9-15	G9-14	8	144	Euclid	NO	YES	NO	NO	No smoke on house 1105
Geneva	G9-14	G9-13	8	213	Euclid	NO	YES	NO	NO	No smoke on house 930
Geneva	G9-7	G9-6	8	213	Euclid	NO	YES	NO	NO	No smoke at house 1409
Geneva	G9-77	G9-76	8	141	Ridgewood Ave	NO	YES	NO	NO	no smoke from house 1299 richmond
Geneva	G9-76	G9-25	8	63	Lowe Ave	NO	YES	NO	NO	No smoke from house 1345 Lowe ave
Geneva	G9-22	G9-21	8	282	Lowe Ave	NO	YES	NO	NO	smoke out of pipe house being remodel
Geneva	G9-21	G9-20	8	102	Lakeway Dr	NO	NO	NO	NO	No smoke out of house 4215 Lakeway Dr

EXHIBIT D. HYDRAULIC SEWER MODEL CAPACITY ANALYSIS

EXHIBIT D

TECHNICAL MEMORANDUM
HYDRAULIC SEWER MODEL CAPACITY ANALYSIS

This Technical Memorandum describes the software and methods used for the Comprehensive Sewer Plan hydraulic capacity analysis.

1. HYDRAULIC MODELING SOFTWARE

InfoSewer for ArcGIS by MWHSoft was used for modeling select portions of Lake Whatcom Water and Sewer District's (District) sanitary sewer system infrastructure to evaluate capacity. InfoSewer is operated within a GIS platform (ArcGIS 10.0 in the case of this analysis). InfoSewer is capable of steady-state or extended period simulations. This capacity analysis for the District sewer system is done using steady-state simulation at peak flow conditions.

2. MODEL NETWORK CONSTRUCTION AND OPERATION

The District constructed the model network based on their data sources. The model is on the District (a.k.a. Old City of Bellingham) vertical datum. The model was obtained from the District and minor refinements, flow loading, and analyses were performed by Wilson Engineering.

Gravity pipes were modeled using Manning's friction loss coefficient value of n=0.013. Force main pipes were modeled using Hazen-Williams friction loss coefficient value of C=100. However, the North Shore Agate Bay pump station force main C value was adjusted to 90 so that simulated discharge better matched the design duty point of the pump curve. All gravity loading manholes were assigned a headloss coefficient value of 0.75. These values are used to represent pipes that are older and have more friction than new pipes.

<u>South Shore</u>

The South Shore model physical network can be used to represent the low energy (formerly dry season) operating scenario, in which the Sudden Valley (SV) Pump Station is routed to Lake Whatcom Boulevard Interceptor (LWBI) (see Exhibit E-1, Sewer Comprehensive Plan), or the high energy (formerly wet season) operating scenario, in which SV pump station is routed to Lake Louise Road Interceptor (LLRI) (see Exhibit E-2, Sewer Comprehensive Plan). The LLRI is not simulated in the model, but effects of its use on LWBI can be evaluated by simply removing the Sudden Valley Pump Station loads from the model. The effects of the SV Detention Basin, which is located just upstream of the SV Pump Station and captures Ranch House, Louise Park, and Afternoon Beach, can

be evaluated in the model by reducing the flow loading into SV Pump Station. The South Shore model is comprised of SV Pump Station, LWBI force main to near Strawberry Point, and the LWBI gravity main from Strawberry Point to Cable Street (CAB) Pump Station. SV and CAB pump stations are simulated as fixed capacity pumps with the design flow rate of one pump in operation. The LWBI force main is segmented with nodes at the contributing pump stations that pump directly into the force main; North Point, Airport, Plum, and Boulevard. These contributing pump station nodes are simulated as gravity loading manholes with an artificially high rim elevation (actual elevation plus 1,000 feet) in order to contain the hydraulic grade line and keep the force main pressurized. Due to operational issues with flow continuity, loading, and simulating pressurized force main, junction chambers were not used to simulate these locations.

Figure D-1 (Attachment D-1) shows the South Shore model network. South Shore network data is included as Attachment D-3a.

North Shore

The North Shore model is comprised of Agate Bay Pump Station, and the force main and gravity main collector to the North Shore meter. The Agate Bay Pump Station is simulated as a 3-point curve based on the actual pump curve for one pump running. The North Shore model network consists of standard loading manholes and standard force main and gravity pipes (Exhibit F, Sewer Comprehensive Plan). There are no varying operational scenarios.

The North Shore meter (magnetic flow meter) is simulated as a representative length of reduced diameter 4 inch pipe through the meter vault with an assumed Manning's roughness coefficient n=0.013. The head losses through the simulated meter and piping at peak flows are in line with calculated head loss through the actual reduced piping arrangement and meter.

Figure D-2 (Attachment D-2) shows the North Shore model network. North Shore network data is included as Attachment D-4a.

3. MODEL SEWER LOADING

Model sewer loading was calculated using data provided by a compilation of GIS shapefiles. Whatcom County parcel data containing District parcel/customer information was provided by the District and was later updated and further refined by the District and Wilson Engineering to estimate existing ERUs. Future ERUs were estimated by removing additional parcels that were either undevelopable or restricted by the District (25-yr ULID restriction), Sudden Valley Community Association (dedicated open space), or City Watershed Protected Parcel program coupled with estimating future growth based on parcel size and zoning.

Average daily flows for each sewer basin were calculated based on 2010 U.S. Census Bureau data and an assumed 100 gallons per capita day (gpcd) as follows:

South Shore

- Geneva; average household size = 2.67 x 100 gpcd = 267, use **270 gpd/ERU**
- Sudden Valley; average household size = 2.52 x 100 gpcd = 252, use **255 gpd/ERU**

North Shore

- Whatcom County; average household size = 2.43 x 100 gpcd = 243, use **245 gpd/ERU**

Peak flows (peak hourly) for each sewer basin were calculated applying a peaking factor based on the following criteria:

- # ERU < 500; Peaking Factor = 4
- 500 < # ERU < 2000; Peaking Factor = 3
- 2000 < # ERU; Peaking Factor = 2.5

Simulations were operated without 'Pumped Flow Conservation', which more closely simulates average peak hourly flow instead of instantaneous peaks caused by pumping. Calculated peak flow loading into pumping stations is translated through the station and downstream without any flow adjustments due to pumping.

Loads for each sewer basin were applied at the most appropriate representative node in the model. For areas of dispersed gravity connections, loads were lumped and typically applied at a manhole in the upstream 2/3 of the pipe segment within the area. Each manhole with a load was assigned two loads. Load 1 represents the peaked load for that individual basin. Because each load contributing basin individually has a smaller population and number of ERUs it has a higher peaking factor. The cumulative effect of the resulting higher peak load on the downstream end of the collection system is corrected by adding a negative load (Load 2) to each loading manhole. The correction is applied proportionally to its contributing load.

South Shore

The Lake Whatcom Boulevard (LWB) gravity connections sewer basin is large and spans a long segment of the gravity main portion of the LWBI. Because of this it was divided into 6 sub-basins to better simulate the distribution of flow loading.

Hourly data at Cable St Pump Station meter for the time periods February 2012 – June 2012 and October 2012-February 2013 were used to check calculated peak loads. The high flow (hourly average) from this data appears to be 1,083 gpm (November 19, 2012) and there are several readings in the 700-850 gpm range. There is one flow data point of 1,450 gpm on Nov 19, 2012, but it appears this flow is high because of meter totalizer reading errors. The high flow of 1,083 gpm was cross checked and verified with the

pump run time data. During this time period, and for the last several years, the District has operated with Sudden Valley Pump Station discharging to the LLRI at all times because of the lack of capacity in the LWBI. The detention vault was not in use during this time period.

Calculated peak flow for current operating conditions (high energy) is 879 gpm, which is less than the observed peak flow data of 1,083 gpm. The cumulative flow of each sewer basin without the overall correction factor (1,078 gpm) as described previously matches the observed peak flow more closely. For the model simulations the correction Load 2 was removed, and an additional conservative factor of 1.02 was applied to the model loading to better match actual flow conditions. Model peak flow for existing conditions is 1,100 gpm. This same flow calibration logic was applied to all simulated South Shore model scenarios.

Calculated South Shore peak loading at Cable St Pump Station for the simulated model scenarios (with flow calibration adjustments) are as follows:

o

	Calculated Load (based on ERUs)	Adjusted Model Values (based on observed flows)	Contributing ERUs
Low Energy:			
Existing w/out Basin	1,175 gpm	1,611 gpm	2,507
Existing w/ Basin	"	1,285 gpm	2,507
Future w/out Basin	1,418 gpm	1,952 gpm	3,025
Future w/ Basin	"	1,560 gpm	3,025
High Energy:			
Existing	879 gpm	1,100 gpm	1,562
Future	1,066 gpm	1,339 gpm	1,895

North Shore

The NSG sewer basin consisting of gravity connections is large and spans a long segment of gravity main. Because of this it was divided into 5 sub-basins to better simulate the distribution of flow loading.

Hourly data at North Shore meter for the time periods February 2012 – June 2012 and October 2012-February 2013 were used to check calculated peak loads. The high flows (hourly average) from this data appear to be approximately 240 gpm (November 6-7, 2012) and there are several readings in the 200-240 gpm range. There are two higher data points in March 2012 of approximately 310 and 280 gpm, but it appears these flows are high because of meter totalizer reading errors.

The calculated existing conditions peak flow is 249 gpm for 366 ERU to the North Shore meter. Calculated peak flow and available observed peak flow data are very close and no adjustments are made to the model loading for this analysis.

Calculated future conditions peak flow is 278 gpm for 545 ERU to the North Shore meter. It is important to note that for future conditions a lower peaking factor is used (3.5 for >500 ERU, instead of 4). Thus, a relatively minor increase in peak flow is calculated for the anticipated growth in ERUs.

4. CAPACITY ANALYSIS

The capacity analysis was conducted using steady-state conditions during the wet weather peak hourly flow event. As noted previously, this analysis simulates the average peak hourly flow and not the instantaneous peak flow effects from short-term pumping rates.

South Shore

South Shore modeling results for the following scenarios are included as Attachments D-3b (simulation reports) and D-3c (output reports).

Sudden Valley PS to LWBI ('Low Energy')

Existing conditions
Model simulations confirm that LWBI does not have sufficient capacity for this operating scenario. There are many pipes (12-11 to 30-29 all but one) flowing above capacity and flooding manholes (GT-20 to GT-30) from Strawberry Point west to Wellington Ave.

Existing conditions w/ Sudden Valley Detention Basin active
With the Detention Basin removing full inflow to Sudden Valley pump station (approximate 333 gpm), LWBI capacity is still insufficient. There are 3 flooding manholes (GT-25, GT-26, GT29STP) and still several pipes flowing above capacity. The three manholes identified are shallow; 4.1, 4.0, and 4.6 feet, respectively, deep from rim to invert.

Sudden Valley PS to LLRI (current operating scenario year-round, 'High Energy')

Existing conditions
Model simulations indicate no flooding manholes for this scenario (highest filled manhole is GT-25 at 1.8 feet below rim). However, there are several pipes flowing near or above capacity.

Future (ultimate build-out) conditions

Model simulations indicate that LWBI does not have sufficient capacity for these conditions. There are 3 flooding manholes (GT-25, GT-26, GT-29STP) and many pipes flowing at or above capacity. Further model simulations indicate that manhole flooding occurs at 1,190 gpm, or approximately 1,700 ERU (at current 0.7 gpm/ERU). This is 138 ERU more than existing ERU. Capacity of LWBI should be monitored as development occurs and infrastructure continues to age to evaluate actual capacity.

When the LWBI reaches capacity, the flows from North Point PS, and the pump stations upstream, will be redirected away from LWBI and towards the Sudden Valley PS, and pumped to the LLRI (see Exhibit E-3, Sewer Comprehensive Plan).

North Shore

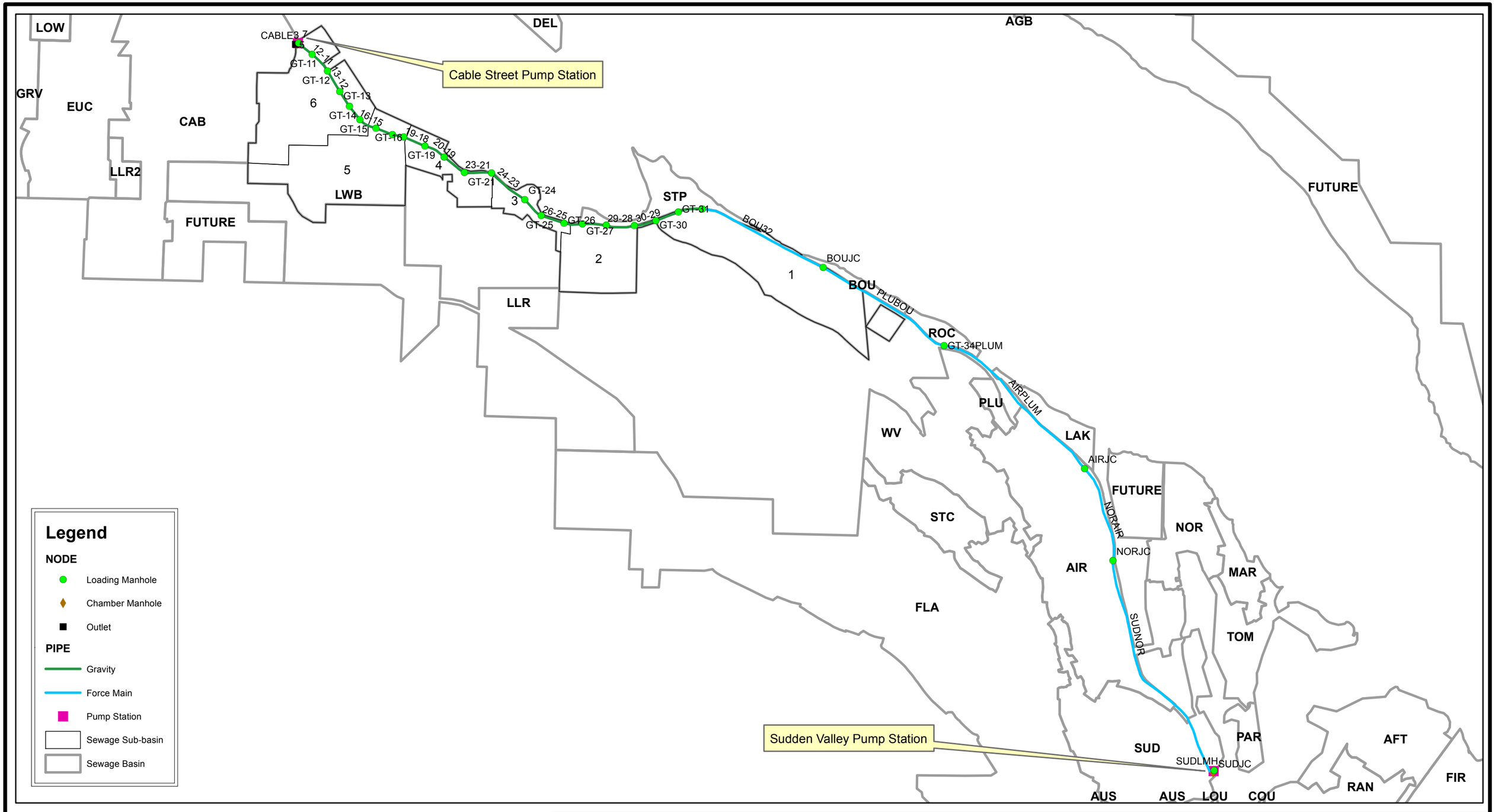
Simulations were performed to evaluate existing and future (ultimate build-out) conditions in the North Shore collection system. Model simulations indicate the North Shore trunk main has adequate capacity for existing conditions.

Modeling of future conditions indicates that the trunk main has sufficient capacity. The 4-inch North Shore flow meter could become a restriction in the trunk main at some point in the future. Two manholes upstream 600-1,000 LF of the meter are shallow manholes (NT-3 = 4.01 ft rim to invert, NT-4 = 2.92 ft rim to invert) and are most at risk of flooding due to meter caused backwater at high flows. Model simulations indicate flooding at manhole NT-4 could occur as flows through the meter approach 350 gpm. Future conditions assume full build-out, 'normal' infiltration, and typical peaking factor criteria. Shallow manhole flooding and flow meter sizing should be monitored as potential issues as future flow increases with development and as infrastructure continues to age.

North Shore modeling results for all scenarios are included as Attachments D-4b (simulation reports) and D-4c (output reports).

Exhibit D - Attachments

- Attachment D-1 - Figure D-1: South Shore Model Network
- Attachment D-2 - Figure D-2: North Shore Model Network
- Attachment D-3 - South Shore modeling reports:
    - D-3a - Modeling network data
    - D-3b - Modeling simulation reports
    - D-3c - Modeling output reports
- Attachment D-4 – North Shore modeling reports:
    - D-4a - Modeling network data
    - D-4b - Modeling simulation reports
    - D-4c - Modeling output reports



Legend

NODE

- Loading Manhole
- Chamber Manhole
- Outlet

PIPE

- Gravity
- Force Main
- Pump Station
- Sewage Sub-basin
- Sewage Basin

1,500 Feet

1 inch = 1,500 feet

N

Wilson SURVEY/ENGINEERING

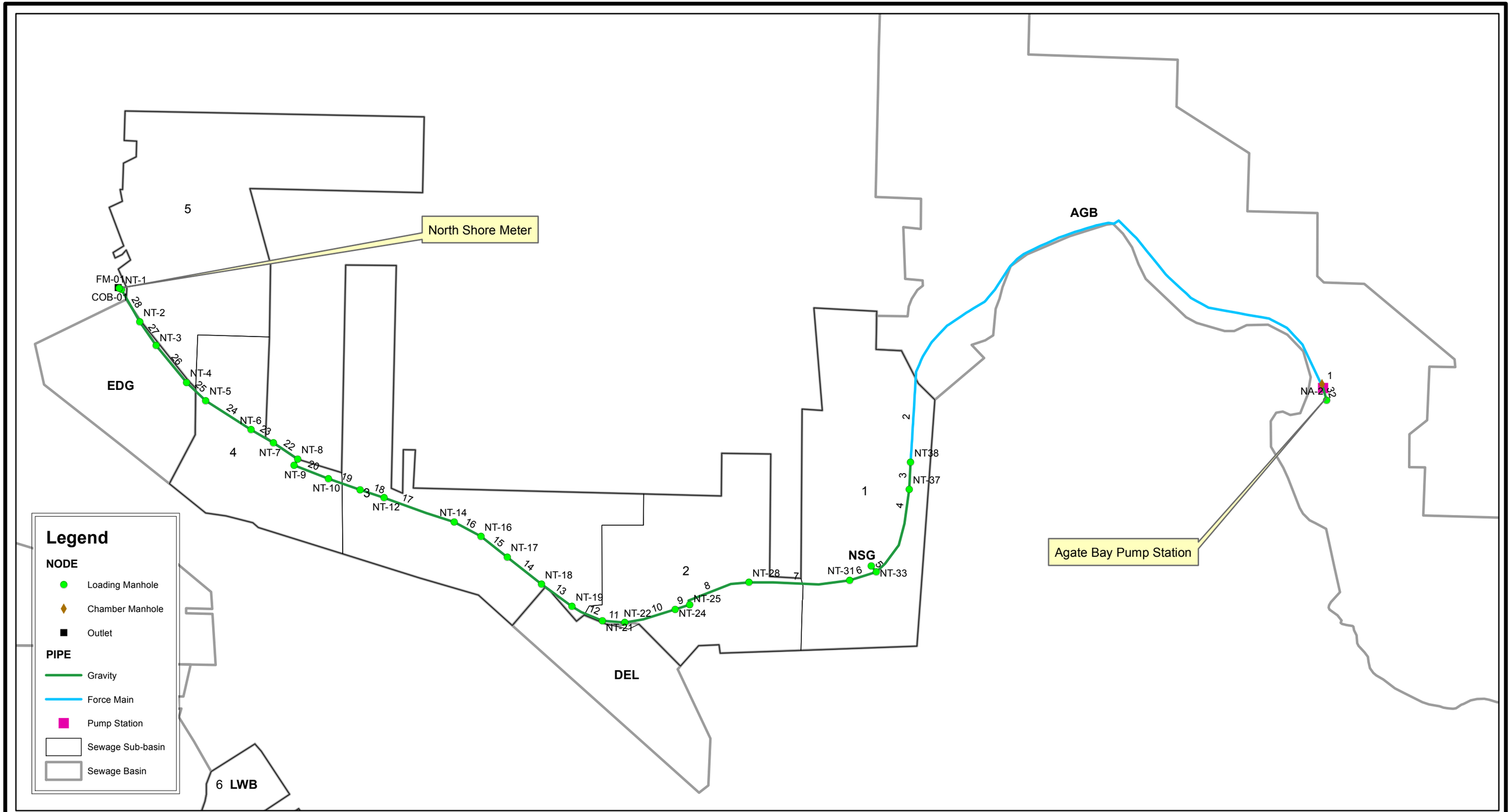
WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 FAX (360) 647-9061
www.wilsonengineering.com

DATE	SHEET
JULY 2013	1
SCALE	OF
1:18,000	1
JOB NUMBER	
2013-014	

LAKE WHATCOM WATER & SEWER DISTRICT

WHATCOM COUNTY WASHINGTON

FIGURE D-1
SOUTH SHORE MODEL NETWORK



810 Feet

1 inch = 800 feet

N

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DATE JULY 2013

SCALE 1:9,600

JOB NUMBER 2013-014

SHEET 1

OF 1

LAKE WHATCOM WATER & SEWER DISTRICT

WHATCOM COUNTY WASHINGTON

FIGURE D-2
NORTH SHORE MODEL NETWORK

South Shore model - DB Table - 'Manhole Modeling Data'

		ID (Char)	DIAMETER (Num)	RIM_ELEV (Num)	HEADLOSS (Num)
1		SUDJC	4.000	367.940	0.000
2		SUDLMH	4.000	368.000	0.000
3		NORJC	4.000	386.980	0.000
4		AIRJC	4.000	388.000	0.000
5		GT-34PLUM	4.000	422.500	0.000
6		BOUJC	4.000	326.000	0.000
7		GT-32	4.000	381.730	0.750
8		GT-29STP	4.000	329.780	0.750
9		GT-31	4.000	361.520	0.750
10		GT-30	4.000	334.390	0.750
11		GT-28	4.000	329.160	0.750
12		GT-27	4.000	324.460	0.750
13		GT-26	4.000	321.400	0.750
14		GT-25	4.000	319.390	0.750
15		GT-24	4.000	319.800	0.750
16		GT-23	4.000	319.200	0.750
17		GT-21	4.000	319.140	0.750
18		GT-20	4.000	320.040	0.750
19		GT-19	4.000	319.980	0.750
20		GT-18	4.000	319.630	0.750
21		GT-17	4.000	319.380	0.750
22		GT-16	4.000	319.600	0.750
23		GT-15	4.000	319.890	0.750
24		GT-14	4.000	320.100	0.750
25		GT-13	4.000	319.700	0.750
26		GT-12	4.000	320.020	0.750
27		GT-11	4.000	318.770	0.750
28		CABLE	4.000	319.000	0.000
29		3	4.000	319.000	0.000
30		5	4.000	319.000	0.000
31		7	4.000	319.000	0.750

South Shore model - DB Table - 'Manhole'

		ID (Char)	DESCRIPT (Char)	TYPE (Num)	ELEVATION (Num)	YR_INST (Num)	YR_RETIRE (Num)	ZONE (Char)	PHASE (Num)
1		SUDJC	Sudden Valley Junction Chambe	1: Chamber	352.540				
2		SUDLMH	SUD Loading Manhole	0: Loading	355.130				
3		NORJC	North Point Junction Chamber	0: Loading	376.190				
4		AIRJC	Alirport Junction Chamber	0: Loading	381.500				
5		GT-34PLUM	Plum Jucntion Chamber	0: Loading	415.930				
6		BOUJC	Boulevard Junction Chamber	0: Loading	322.000				
7		GT-32	Begin Gavity Main	0: Loading	376.590				
8		GT-29STP	Strawberry Point Loading MH	0: Loading	325.180				
9		GT-31	Gravity Manhole	0: Loading	357.100				
10		GT-30	Gravity Manhole	0: Loading	329.170				
11		GT-28	Gravity Manhole	0: Loading	322.110				
12		GT-27	Gravity Manhole	0: Loading	319.590				
13		GT-26	Gravity Manhole	0: Loading	317.390				
14		GT-25	Gravity Manhole	0: Loading	315.280				
15		GT-24	Gravity Manhole	0: Loading	314.490				
16		GT-23	Gravity Manhole	0: Loading	314.210				
17		GT-21	Gravity Manhole	0: Loading	313.190				
18		GT-20	Gravity Manhole	0: Loading	312.300				
19		GT-19	Gravity Manhole	0: Loading	311.690				
20		GT-18	Gravity Manhole	0: Loading	311.320				
21		GT-17	Gravity Manhole	0: Loading	310.440				
22		GT-16	Gravity Manhole	0: Loading	310.330				
23		GT-15	Gravity Manhole	0: Loading	310.060				
24		GT-14	Gravity Manhole	0: Loading	309.720				
25		GT-13	Gravity Manhole	0: Loading	309.290				
26		GT-12	Gravity Manhole	0: Loading	308.740				
27		GT-11	Gravity Manhole	0: Loading	308.670				
28		CABLE	Cable St Junction Chamber	1: Chamber	307.000				
29		3	Cable Disch Out	0: Loading	307.000				
30		5	Cable Outlet	2: Outlet	305.000				
31		7	Cable PS loading mahnole	0: Loading	307.380				

South Shore model - DB Table - 'Pipe Modeling Data'

	ID (Char)	FROM_INV (Num)	TO_INV (Num)	LENGTH (Num)	DIAMETER (Num)	COEFF (Num)	PARALLEL (Num)
1	SUDLGP	355.130	354.600	100.000	10.000	0.013	
2	SUDNOR	352.540	376.190	3,931.040	10.000	100.000	
3	NORAIR	376.190	381.500	1,519.450	10.000	100.000	
4	AIRPLUM	381.500	415.930	3,235.040	10.000	100.000	
5	PLUBOU	415.930	322.000	2,444.120	10.000	100.000	
6	BOU32	322.000	376.590	2,262.940	10.000	100.000	
7	32-31	376.590	357.100	412.100	10.000	0.013	
8	31-30	357.100	329.170	398.770	10.000	0.013	
9	30-29	329.170	325.180	372.870	10.000	0.013	
10	29-28	325.180	322.110	479.630	10.000	0.013	
11	28-27	322.110	319.590	385.850	10.000	0.013	
12	27-26	319.590	317.390	313.420	10.000	0.013	
13	26-25	317.390	315.280	385.400	10.000	0.013	
14	25-24	315.280	314.490	401.940	10.000	0.013	
15	24-23	314.490	314.210	437.990	14.000	0.013	
16	23-21	314.210	313.190	654.890	14.000	0.013	
17	21-20	313.190	312.300	472.110	14.000	0.013	
18	20-19	312.300	311.690	372.650	14.000	0.013	
19	19-18	311.690	311.320	384.240	14.000	0.013	
20	18-17	311.320	310.440	195.760	14.000	0.013	
21	17-16	310.440	310.330	292.200	14.000	0.013	
22	16-15	310.330	310.060	321.460	14.000	0.013	
23	15-14	310.060	309.720	267.680	14.000	0.013	
24	14-13	309.720	309.290	305.940	14.000	0.013	
25	13-12	309.290	308.740	409.600	14.000	0.013	
26	12-11	308.740	308.670	374.280	14.000	0.013	
27	11-SPCAB	308.670	307.380	299.120	14.000	0.013	
28	499	307.000	307.000	100.000	12.000	100.000	
29	501	307.000	305.000	20.000	12.000	0.013	
30	503	307.380	307.000	20.000	14.000	0.013	

South Shore model - DB Table - 'Pipe'

		ID (Char)	DESCRIPT (Char)	TYPE (Num)	YR_INST (Num)	YR_RETIRE (Num)	ZONE (Char)	PHASE (Num)	MATERIAL (Char)	LINING (Char)	COST_ID (Char)
1		SUDLGP	Gravity Loading Pipe	0: Gravity							
2		SUDNOR	Force Main	1: Force	1974				Ductile Iron		
3		NORAIR	NORAIR Force Main	1: Force	1974				Ductile Iron		
4		AIRPLUM	AIRPLUM Force Main	1: Force	1974				Ductile Iron		
5		PLUBOU	PLUMBOU Force Main	1: Force	1974				Ductile Iron		
6		BOU32	BOU32 Force Main	1: Force	1974				Ductile Iron		
7		32-31	Gravity Main	0: Gravity							
8		31-30	Gravity Main	0: Gravity							
9		30-29	Gravity Main	0: Gravity							
10		29-28	Gravity Main	0: Gravity							
11		28-27		0: Gravity							
12		27-26	Gravity Main	0: Gravity							
13		26-25		0: Gravity							
14		25-24		0: Gravity							
15		24-23		0: Gravity							
16		23-21		0: Gravity							
17		21-20		0: Gravity							
18		20-19		0: Gravity							
19		19-18		0: Gravity							
20		18-17		0: Gravity							
21		17-16		0: Gravity							
22		16-15		0: Gravity							
23		15-14		0: Gravity							
24		14-13		0: Gravity							
25		13-12		0: Gravity							
26		12-11		0: Gravity							
27		11-SPCAB		0: Gravity							
28		499	Cable Disch Out Pipe - arbitrar	1: Force							
29		501	Cable Outlet pipe	0: Gravity							
30		503	CAB load MH to WW	0: Gravity							

South Shore model - DB Table - 'Pump Modeling Data'

	ID (Char)	TYPE (Num)	PARALLEL (Num)	CAPACITY (Num)	SHUT_HEAD (Num)	DSGN_HEAD (Num)	DSGN_FLOW (Num)	HIGH_HEAD (Num)	HIGH_FLOW (Num)
1	SUDPUMP	0: Constant Capacity		500.000	0.000	0.000	0.000	0.000	0.000
2	CAB	0: Constant Capacity		1,000.000	0.000	0.000	0.000	0.000	0.000

South Shore model - DB Table - 'Pump'

		ID (Char)	DESCRIPT (Char)	YR_INST (Num)	YR_RETIRE (Num)	ZONE (Char)	RATED_PWR (Num)	COST_ID (Char)	PHASE (Num)
1		SUDPUMP	2 dry pit S&L, 2 submersible (cap=900gpr	1971			40.000		
2		CAB	triplex submersible pumps	2011			55.000		

		ID (Char)	DESCRIPT (Char)	YR_INST (Num)	YR_RETIRE (Num)	ZONE (Char)	PHASE (Num)	COST_ID (Char)
1		SPSUD	Sudden Valley PS Wet Wel	0				
2		SPCAB	Cable St PS Wet Well	0				

South Shore model - DB Table - 'Wetwell Modeling Data'

		ID (Char)	TYPE (Num)	BTM_ELEV (Num)	HEADLOSS (Num)	MIN_LEVEL (Num)	MAX_LEVEL (Num)	INIT_LEVEL (Num)	DIAMETER (Num)	CURVE (Char)
1		SPSUD	0: Cylindrical	352.540	0.750	1.800	7.400	5.500	10.000	
2		SPCAB	0: Cylindrical	307.000	0.750	0.380	3.830	3.330	10.000	

South Shore model - Existing SV to LLRI - Simulation Report

```
*******************************************************
*     Computer Modeling for Design and Planning       *
*               of Sanitary Sewer Systems             *
*                    Innovyze, Inc.                   *
*******************************************************
```

[Title]

[Summary]

Number of loading manholes	:	28
Number of outlets	:	1
Number of junction chambers	:	2
Number of wet wells	:	2
Number of pipes	:	24
Number of force-mains	:	6
Number of pumps	:	2

[Loading Manholes]

Manhole ID	Base Flow	Storm Load	Total Flow
7	256.0000	0.0000	261.1200
AIRJC	183.0000	0.0000	186.6600
BOUJC	26.0000	0.0000	26.5200
GT-13	72.0000	0.0000	73.4400
GT-17	86.0000	0.0000	87.7200
GT-21	15.0000	0.0000	15.3000
GT-24	14.0000	0.0000	14.2800
GT-28	6.0000	0.0000	6.1200
GT-29STP	37.0000	0.0000	37.7400
GT-32	3.0000	0.0000	3.0600
GT-34PLUM	138.0000	0.0000	140.7600
NORJC	244.0000	0.0000	248.8800
3	0.0000	0.0000	0.0000
GT-11	0.0000	0.0000	0.0000
GT-12	0.0000	0.0000	0.0000
GT-14	0.0000	0.0000	0.0000
GT-15	0.0000	0.0000	0.0000
GT-16	0.0000	0.0000	0.0000
GT-18	0.0000	0.0000	0.0000
GT-19	0.0000	0.0000	0.0000
GT-20	0.0000	0.0000	0.0000
GT-23	0.0000	0.0000	0.0000

GT-25	0.0000	0.0000	0.0000
GT-26	0.0000	0.0000	0.0000
GT-27	0.0000	0.0000	0.0000
GT-30	0.0000	0.0000	0.0000
GT-31	0.0000	0.0000	0.0000
SUDLMH	0.0000	0.0000	0.0000

[Pipes]

Pipe ID	From ID	To ID	Pipe Count	Pipe Crit slope	Pipe Full Diam	Total Cover Flow	Storm Load	UnPeak Flow	Peak Flow	Cover Flow	I/I Flow	Flow Veloc	Actual d/D	Flow Depth	Froude Number	Depth	Flow	Count
11-SPCAB	GT-11	7	1	0.004	14.00	840.48	0.00	840.48	0.00	0.00	0.00	3.36	0.52	0.60	0.86	0.56	1588.26	0.00
12-11	GT-12	GT-11	1	0.000	14.00	840.48	0.00	840.48	0.00	0.00	0.00	1.75	1.00	1.17	0.29	0.34	330.75	0.00
13-12	GT-13	GT-12	1	0.001	14.00	840.48	0.00	840.48	0.00	0.00	0.00	2.10	0.78	0.91	0.39	0.56	886.24	0.00
14-13	GT-14	GT-13	1	0.001	14.00	767.04	0.00	767.04	0.00	0.00	0.00	2.12	0.71	0.82	0.43	0.53	906.70	0.00
15-14	GT-15	GT-14	1	0.001	14.00	767.04	0.00	767.04	0.00	0.00	0.00	2.03	0.73	0.86	0.40	0.53	861.95	0.00
16-15	GT-16	GT-15	1	0.001	14.00	767.04	0.00	767.04	0.00	0.00	0.00	1.60	1.00	1.17	0.26	0.51	700.92	0.00
17-16	GT-17	GT-16	1	0.000	14.00	767.04	0.00	767.04	0.00	0.00	0.00	1.60	1.00	1.17	0.26	0.41	469.25	0.00
18-17	GT-18	GT-17	1	0.004	14.00	679.32	0.00	679.32	0.00	0.00	0.00	3.23	0.45	0.53	0.90	0.50	1621.54	0.00
19-18	GT-19	GT-18	1	0.001	14.00	679.32	0.00	679.32	0.00	0.00	0.00	1.77	0.75	0.87	0.34	0.50	750.50	0.00
20-19	GT-20	GT-19	1	0.002	14.00	679.32	0.00	679.32	0.00	0.00	0.00	2.20	0.61	0.72	0.50	0.50	978.51	0.00
21-20	GT-21	GT-20	1	0.002	14.00	679.32	0.00	679.32	0.00	0.00	0.00	2.33	0.59	0.68	0.55	0.50	1050.08	0.00
23-21	GT-23	GT-21	1	0.002	14.00	664.02	0.00	664.02	0.00	0.00	0.00	2.15	0.61	0.72	0.49	0.49	954.48	0.00
24-23	GT-24	GT-23	1	0.001	14.00	664.02	0.00	664.02	0.00	0.00	0.00	1.38	1.00	1.17	0.23	0.47	611.50	0.00
25-24	GT-25	GT-24	1	0.002	10.00	649.74	0.00	649.74	0.00	0.00	0.00	2.65	1.00	0.83	0.51	0.44	437.12	0.00
26-25	GT-26	GT-25	1	0.005	10.00	649.74	0.00	649.74	0.00	0.00	0.00	3.37	0.74	0.61	0.78	0.54	729.55	0.00
27-26	GT-27	GT-26	1	0.007	10.00	649.74	0.00	649.74	0.00	0.00	0.00	3.74	0.67	0.56	0.94	0.54	826.07	0.00
28-27	GT-28	GT-27	1	0.007	10.00	649.74	0.00											

649.74 0.00 0.00 0.00 3.63 0.69 0.57 0.89 0.54 796.82 0.00
29-28 GT-29STP GT-28 1 0.006 10.00 643.62 0.00
643.62 0.00 0.00 0.00 3.59 0.69 0.57 0.88 0.54 788.83 0.00
30-29 GT-30 GT-29STP 1 0.011 10.00 605.88 0.00
605.88 0.00 0.00 0.00 4.34 0.55 0.46 1.25 0.52 1019.95 0.00
31-30 GT-31 GT-30 1 0.070 10.00 605.88 0.00
605.88 0.00 0.00 0.00 8.68 0.33 0.27 3.43 0.52 2609.42 0.00
32-31 GT-32 GT-31 1 0.047 10.00 605.88 0.00
605.88 0.00 0.00 0.00 7.53 0.36 0.30 2.81 0.52 2144.24 0.00
501 3 5 1 0.100 12.00 1101.60 0.00
1101.60 0.00 0.00 0.00 11.49 0.32 0.32 4.23 0.67 5070.16 0.00
503 7 SPCAB 1 0.019 14.00 1101.60 0.00
1101.60 0.00 0.00 0.00 6.23 0.40 0.46 1.87 0.64 3333.69 0.00
SUDLGP SUDLMH SPSUD 1 0.005 10.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 717.81 0.00

[Force Mains]

Pipe ID	From ID	To ID	Pipe Diam	Pipe Flow	Pipe Vel.	Pipe Loss
499	CABLE	3	12.00	1101.60	2.84	0.412
AIRPLUM	AIRJC	GT-34PLUM	10.00	435.54	1.78	6.950
BOU32	BOUJC	GT-32	10.00	602.82	2.46	8.876
NORAIR	NORJC	AIRJC	10.00	248.88	1.02	1.158
PLUBOU	GT-34PLUM	BOUJC	10.00	576.30	2.35	8.820
SUDNOR	SUDJC	NORJC	10.00	0.00	2.04	10.905

[Pumps]

Pump ID	Wet Well ID	Manhole ID	Pump Type	Pump Count	Pump Flow	Pump Head
CAB	SPCAB	CABLE	Fixed Capacity	1	1000.00	0.00
SUDPUMP	SPSUD	SUDJC	Fixed Capacity	1	500.00	29.89

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*******************************************************
*     Computer Modeling for Design and Planning       *
*               of Sanitary Sewer Systems             *
*                    Innovyze, Inc.                   *
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[Title]

[Summary]

Number of loading manholes	:	28
Number of outlets	:	1
Number of junction chambers	:	2
Number of wet wells	:	2
Number of pipes	:	24
Number of force-mains	:	6
Number of pumps	:	2

[Loading Manholes]

Manhole ID	Base Flow	Storm Load	Total Flow
7	256.0000	0.0000	261.1200
AIRJC	183.0000	0.0000	186.6600
BOUJC	26.0000	0.0000	26.5200
GT-13	72.0000	0.0000	73.4400
GT-17	86.0000	0.0000	87.7200
GT-21	15.0000	0.0000	15.3000
GT-24	14.0000	0.0000	14.2800
GT-28	6.0000	0.0000	6.1200
GT-29STP	37.0000	0.0000	37.7400
GT-32	3.0000	0.0000	3.0600
GT-34PLUM	138.0000	0.0000	140.7600
NORJC	244.0000	0.0000	248.8800
SUDLMH	502.0000	0.0000	512.0400
3	0.0000	0.0000	0.0000
GT-11	0.0000	0.0000	0.0000
GT-12	0.0000	0.0000	0.0000
GT-14	0.0000	0.0000	0.0000
GT-15	0.0000	0.0000	0.0000
GT-16	0.0000	0.0000	0.0000
GT-18	0.0000	0.0000	0.0000
GT-19	0.0000	0.0000	0.0000
GT-20	0.0000	0.0000	0.0000

GT-23	0.0000	0.0000	0.0000
GT-25	0.0000	0.0000	0.0000
GT-26	0.0000	0.0000	0.0000
GT-27	0.0000	0.0000	0.0000
GT-30	0.0000	0.0000	0.0000
GT-31	0.0000	0.0000	0.0000

[Pipes]

Pipe ID	From ID	To ID	Pipe Count	Pipe Crit slope	Pipe Full Diam	Total Cover Flow	Storm Load	UnPeak Flow	Peak Flow	Cover Flow	I/I Flow	Flow Veloc	Actual d/D	Flow Depth	Froude Number	Depth	Flow	Count
11-SPCAB	GT-11	7	1	0.004	14.00	1352.52	0.00	1352.52	0.00	0.00	0.00	3.72	0.71	0.83	0.75	0.71	1588.26	0.00
12-11	GT-12	GT-11	1	0.000	14.00	1352.52	0.00	1352.52	0.00	0.00	0.00	2.82	1.00	1.17	0.46	0.34	330.75	0.00
13-12	GT-13	GT-12	1	0.001	14.00	1352.52	0.00	1352.52	0.00	0.00	0.00	2.82	1.00	1.17	0.46	0.57	886.24	0.00
14-13	GT-14	GT-13	1	0.001	14.00	1279.08	0.00	1279.08	0.00	0.00	0.00	2.67	1.00	1.17	0.43	0.58	906.70	0.00
15-14	GT-15	GT-14	1	0.001	14.00	1279.08	0.00	1279.08	0.00	0.00	0.00	2.67	1.00	1.17	0.43	0.56	861.95	0.00
16-15	GT-16	GT-15	1	0.001	14.00	1279.08	0.00	1279.08	0.00	0.00	0.00	2.67	1.00	1.17	0.43	0.51	700.92	0.00
17-16	GT-17	GT-16	1	0.000	14.00	1279.08	0.00	1279.08	0.00	0.00	0.00	2.67	1.00	1.17	0.43	0.41	469.25	0.00
18-17	GT-18	GT-17	1	0.004	14.00	1191.36	0.00	1191.36	0.00	0.00	0.00	3.69	0.64	0.74	0.81	0.67	1621.54	0.00
19-18	GT-19	GT-18	1	0.001	14.00	1191.36	0.00	1191.36	0.00	0.00	0.00	2.48	1.00	1.17	0.41	0.52	750.50	0.00
20-19	GT-20	GT-19	1	0.002	14.00	1191.36	0.00	1191.36	0.00	0.00	0.00	2.48	1.00	1.17	0.41	0.60	978.51	0.00
21-20	GT-21	GT-20	1	0.002	14.00	1191.36	0.00	1191.36	0.00	0.00	0.00	2.48	1.00	1.17	0.41	0.62	1050.08	0.00
23-21	GT-23	GT-21	1	0.002	14.00	1176.06	0.00	1176.06	0.00	0.00	0.00	2.45	1.00	1.17	0.40	0.59	954.48	0.00
24-23	GT-24	GT-23	1	0.001	14.00	1176.06	0.00	1176.06	0.00	0.00	0.00	2.45	1.00	1.17	0.40	0.47	611.50	0.00
25-24	GT-25	GT-24	1	0.002	10.00	1161.78	0.00	1161.78	0.00	0.00	0.00	4.75	1.00	0.83	0.92	0.44	437.12	0.00
26-25	GT-26	GT-25	1	0.005	10.00	1161.78	0.00	1161.78	0.00	0.00	0.00	4.75	1.00	0.83	0.92	0.57	729.55	0.00
27-26	GT-27	GT-26	1	0.007	10.00	1161.78	0.00	1161.78	0.00	0.00	0.00	4.75	1.00	0.83	0.92	0.61	826.07	0.00
28-27	GT-28	GT-27	1	0.007	10.00	1161.78	0.00											

1161.78	0.00	0.00	0.00	4.75	1.00	0.83	0.92	0.60	796.82	0.00	
29-28		GT-29STP		GT-28				1	0.006	10.00	1155.66	0.00
1155.66	0.00	0.00	0.00	4.72	1.00	0.83	0.91	0.59	788.83	0.00	
30-29		GT-30		GT-29STP				1	0.011	10.00	1117.92	0.00
1117.92	0.00	0.00	0.00	4.57	1.00	0.83	0.88	0.67	1019.95	0.00	
31-30		GT-31		GT-30				1	0.070	10.00	1117.92	0.00
1117.92	0.00	0.00	0.00	10.25	0.46	0.38	3.34	0.70	2609.42	0.00	
32-31		GT-32		GT-31				1	0.047	10.00	1117.92	0.00
1117.92	0.00	0.00	0.00	8.85	0.51	0.43	2.68	0.70	2144.24	0.00	
501		3		5				1	0.100	12.00	1613.64	0.00
1613.64	0.00	0.00	0.00	12.78	0.39	0.39	4.19	0.81	5070.16	0.00	
503		7		SPCAB				1	0.019	14.00	1613.64	0.00
1613.64	0.00	0.00	0.00	6.89	0.49	0.57	1.82	0.78	3333.69	0.00	
SUDLGP		SUDLMH		SPSUD				1	0.005	10.00	512.04	0.00
512.04	0.00	0.00	0.00	3.19	0.62	0.52	0.84	0.48	717.81	0.00		

[Force Mains]

Pipe ID	From ID	To ID	Pipe Diam	Pipe Flow	Pipe Vel.	Pipe Loss
499	CABLE	3	12.00	1613.64	2.84	0.412
AIRPLUM	AIRJC	GT-34PLUM	10.00	947.58	3.87	29.322
BOU32	BOUJC	GT-32	10.00	1114.86	4.55	27.717
NORAIR	NORJC	AIRJC	10.00	760.92	3.11	9.174
PLUBOU	GT-34PLUM	BOUJC	10.00	1088.34	4.45	28.631
SUDNOR	SUDJC	NORJC	10.00	512.04	2.04	10.905

[Pumps]

Pump ID	Wet Well ID	Manhole ID	Pump Type	Pump Count	Pump Flow	Pump Head
CAB	SPCAB	CABLE	Fixed Capacity	1	1000.00	0.00
SUDPUMP	SPSUD	SUDJC	Fixed Capacity	1	500.00	29.89

South Shore model - Existing SV to LWBI (w Det) - Simulation Report

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*******************************************************
*     Computer Modeling for Design and Planning       *
*               of Sanitary Sewer Systems             *
*                    Innovyze, Inc.                   *
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[Title]

[Summary]

Number of loading manholes	:	28
Number of outlets	:	1
Number of junction chambers	:	2
Number of wet wells	:	2
Number of pipes	:	24
Number of force-mains	:	6
Number of pumps	:	2

[Loading Manholes]

Manhole ID	Base Flow	Storm Load	Total Flow
7	256.0000	0.0000	261.1200
AIRJC	183.0000	0.0000	186.6600
BOUJC	26.0000	0.0000	26.5200
GT-13	72.0000	0.0000	73.4400
GT-17	86.0000	0.0000	87.7200
GT-21	15.0000	0.0000	15.3000
GT-24	14.0000	0.0000	14.2800
GT-28	6.0000	0.0000	6.1200
GT-29STP	37.0000	0.0000	37.7400
GT-32	3.0000	0.0000	3.0600
GT-34PLUM	138.0000	0.0000	140.7600
NORJC	244.0000	0.0000	248.8800
SUDLMH	176.0000	0.0000	179.5200
3	0.0000	0.0000	0.0000
GT-11	0.0000	0.0000	0.0000
GT-12	0.0000	0.0000	0.0000
GT-14	0.0000	0.0000	0.0000
GT-15	0.0000	0.0000	0.0000
GT-16	0.0000	0.0000	0.0000
GT-18	0.0000	0.0000	0.0000
GT-19	0.0000	0.0000	0.0000
GT-20	0.0000	0.0000	0.0000

GT-23	0.0000	0.0000	0.0000
GT-25	0.0000	0.0000	0.0000
GT-26	0.0000	0.0000	0.0000
GT-27	0.0000	0.0000	0.0000
GT-30	0.0000	0.0000	0.0000
GT-31	0.0000	0.0000	0.0000

[Pipes]

Pipe ID	UnPeak Flow	Peak Flow	From ID	Cover Flow	I/I Flow	Flow Veloc	To ID	Actual d/D	Flow Depth	Froude Number	Pipe Count	Pipe Crit slope	Pipe Full Depth	Pipe Diam Flow	Total Cover Count	Storm Load
11-SPCAB	1020.00	0.00	GT-11	0.00	0.00	3.51	7	0.58	0.68	0.83	1	0.004	14.00	1020.00	0.62 1588.26	0.00
12-11	1020.00	0.00	GT-12	0.00	0.00	2.13	GT-11	1.00	1.17	0.35	1	0.000	14.00	1020.00	0.34 330.75	0.00
13-12	1020.00	0.00	GT-13	0.00	0.00	2.13	GT-12	1.00	1.17	0.35	1	0.001	14.00	1020.00	0.57 886.24	0.00
14-13	946.56	0.00	GT-14	0.00	0.00	1.97	GT-13	1.00	1.17	0.32	1	0.001	14.00	946.56	0.58 906.70	0.00
15-14	946.56	0.00	GT-15	0.00	0.00	1.97	GT-14	1.00	1.17	0.32	1	0.001	14.00	946.56	0.56 861.95	0.00
16-15	946.56	0.00	GT-16	0.00	0.00	1.97	GT-15	1.00	1.17	0.32	1	0.001	14.00	946.56	0.51 700.92	0.00
17-16	946.56	0.00	GT-17	0.00	0.00	1.97	GT-16	1.00	1.17	0.32	1	0.000	14.00	946.56	0.41 469.25	0.00
18-17	858.84	0.00	GT-18	0.00	0.00	3.43	GT-17	0.52	0.60	0.87	1	0.004	14.00	858.84	0.56 1621.54	0.00
19-18	858.84	0.00	GT-19	0.00	0.00	1.79	GT-18	1.00	1.17	0.29	1	0.001	14.00	858.84	0.52 750.50	0.00
20-19	858.84	0.00	GT-20	0.00	0.00	2.30	GT-19	0.73	0.85	0.45	1	0.002	14.00	858.84	0.56 978.51	0.00
21-20	858.84	0.00	GT-21	0.00	0.00	2.44	GT-20	0.69	0.80	0.51	1	0.002	14.00	858.84	0.56 1050.08	0.00
23-21	843.54	0.00	GT-23	0.00	0.00	2.25	GT-21	0.73	0.85	0.44	1	0.002	14.00	843.54	0.56 954.48	0.00
24-23	843.54	0.00	GT-24	0.00	0.00	1.76	GT-23	1.00	1.17	0.29	1	0.001	14.00	843.54	0.47 611.50	0.00
25-24	829.26	0.00	GT-25	0.00	0.00	3.39	GT-24	1.00	0.83	0.65	1	0.002	10.00	829.26	0.44 437.12	0.00
26-25	829.26	0.00	GT-26	0.00	0.00	3.39	GT-25	1.00	0.83	0.65	1	0.005	10.00	829.26	0.57 729.55	0.00
27-26	829.26	0.00	GT-27	0.00	0.00	3.39	GT-26	1.00	0.83	0.65	1	0.007	10.00	829.26	0.61 826.07	0.00
28-27			GT-28				GT-27				1	0.007	10.00	829.26		0.00

829.26	0.00	0.00	0.00	3.39	1.00	0.83	0.65	0.60	796.82	0.00	
29-28		GT-29STP		GT-28				1	0.006	10.00	823.14	0.00
823.14	0.00	0.00	0.00	3.36	1.00	0.83	0.65	0.59	788.83	0.00	
30-29		GT-30		GT-29STP				1	0.011	10.00	785.40	0.00
785.40	0.00	0.00	0.00	4.60	0.66	0.55	1.17	0.59	1019.95	0.00	
31-30		GT-31		GT-30				1	0.070	10.00	785.40	0.00
785.40	0.00	0.00	0.00	9.33	0.38	0.31	3.41	0.59	2609.42	0.00	
32-31		GT-32		GT-31				1	0.047	10.00	785.40	0.00
785.40	0.00	0.00	0.00	8.08	0.42	0.35	2.78	0.59	2144.24	0.00	
501		3		5				1	0.100	12.00	1281.12	0.00
1281.12	0.00	0.00	0.00	11.99	0.34	0.34	4.22	0.72	5070.16	0.00		
503		7		SPCAB				1	0.019	14.00	1281.12	0.00
1281.12	0.00	0.00	0.00	6.49	0.43	0.50	1.85	0.69	3333.69	0.00		
SUDLGP		SUDLMH		SPSUD				1	0.005	10.00	179.52	0.00
179.52	0.00	0.00	0.00	2.44	0.34	0.28	0.94	0.28	717.81	0.00		

[Force Mains]

Pipe ID	From ID	To ID	Pipe Diam	Pipe Flow	Pipe Vel.	Pipe Loss
499	CABLE	3	12.00	1281.12	2.84	0.412
AIRPLUM	AIRJC	GT-34PLUM	10.00	615.06	2.51	13.170
BOU32	BOUJC	GT-32	10.00	782.34	3.20	14.383
NORAIR	NORJC	AIRJC	10.00	428.40	1.75	3.166
PLUBOU	GT-34PLUM	BOUJC	10.00	755.82	3.09	14.574
SUDNOR	SUDJC	NORJC	10.00	179.52	2.04	10.905

[Pumps]

Pump ID	Wet Well ID	Manhole ID	Pump Type	Pump Count	Pump Flow	Pump Head
CAB	SPCAB	CABLE	Fixed Capacity	1	1000.00	0.00
SUDPUMP	SPSUD	SUDJC	Fixed Capacity	1	500.00	29.89

South Shore model - Future SV to LLRI - Simulation Report

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*******************************************************
*     Computer Modeling for Design and Planning       *
*               of Sanitary Sewer Systems             *
*                    Innovyze, Inc.                   *
*******************************************************
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[Title]

[Summary]

Number of loading manholes	:	28
Number of outlets	:	1
Number of junction chambers	:	2
Number of wet wells	:	2
Number of pipes	:	24
Number of force-mains	:	6
Number of pumps	:	2

[Loading Manholes]

Manhole ID	Base Flow	Storm Load	Total Flow
7	277.0000	0.0000	282.5400
AIRJC	257.0000	0.0000	262.1400
BOUJC	31.0000	0.0000	31.6200
GT-13	80.0000	0.0000	81.6000
GT-17	101.0000	0.0000	103.0200
GT-21	17.0000	0.0000	17.3400
GT-24	19.0000	0.0000	19.3800
GT-28	10.0000	0.0000	10.2000
GT-29STP	37.0000	0.0000	37.7400
GT-32	17.0000	0.0000	17.3400
GT-34PLUM	187.0000	0.0000	190.7400
NORJC	282.0000	0.0000	287.6400
3	0.0000	0.0000	0.0000
GT-11	0.0000	0.0000	0.0000
GT-12	0.0000	0.0000	0.0000
GT-14	0.0000	0.0000	0.0000
GT-15	0.0000	0.0000	0.0000
GT-16	0.0000	0.0000	0.0000
GT-18	0.0000	0.0000	0.0000
GT-19	0.0000	0.0000	0.0000
GT-20	0.0000	0.0000	0.0000
GT-23	0.0000	0.0000	0.0000

GT-25	0.0000	0.0000	0.0000
GT-26	0.0000	0.0000	0.0000
GT-27	0.0000	0.0000	0.0000
GT-30	0.0000	0.0000	0.0000
GT-31	0.0000	0.0000	0.0000
SUDLMH	0.0000	0.0000	0.0000

[Pipes]

Pipe ID	From ID	To ID	Pipe Flow	Pipe Froude Number	Pipe Crit slope	Pipe Full Depth	Pipe Full Diam	Total Cover Flow	Storm Cover Load
11-SPCAB	GT-11	7	1058.76	0.63	0.004	14.00	1588.26	0.00	0.00
12-11	GT-12	GT-11	1058.76	0.34	0.000	14.00	330.75	0.00	0.00
13-12	GT-13	GT-12	1058.76	0.57	0.001	14.00	886.24	0.00	0.00
14-13	GT-14	GT-13	977.16	0.58	0.001	14.00	906.70	0.00	0.00
15-14	GT-15	GT-14	977.16	0.56	0.001	14.00	861.95	0.00	0.00
16-15	GT-16	GT-15	977.16	0.51	0.001	14.00	700.92	0.00	0.00
17-16	GT-17	GT-16	977.16	0.41	0.000	14.00	469.25	0.00	0.00
18-17	GT-18	GT-17	874.14	0.57	0.004	14.00	1621.54	0.00	0.00
19-18	GT-19	GT-18	874.14	0.52	0.001	14.00	750.50	0.00	0.00
20-19	GT-20	GT-19	874.14	0.57	0.002	14.00	978.51	0.00	0.00
21-20	GT-21	GT-20	874.14	0.57	0.002	14.00	1050.08	0.00	0.00
23-21	GT-23	GT-21	856.80	0.56	0.002	14.00	954.48	0.00	0.00
24-23	GT-24	GT-23	856.80	0.47	0.001	14.00	611.50	0.00	0.00
25-24	GT-25	GT-24	837.42	0.44	0.002	10.00	437.12	0.00	0.00
26-25	GT-26	GT-25	837.42	0.57	0.005	10.00	729.55	0.00	0.00
27-26	GT-27	GT-26	837.42	0.61	0.007	10.00	826.07	0.00	0.00
28-27	GT-28	GT-27	837.42	0.61	0.007	10.00	826.07	0.00	0.00

837.42	0.00	0.00	0.00	3.42	1.00	0.83	0.66	0.60	796.82	0.00	
29-28		GT-29STP		GT-28				1	0.006	10.00	827.22	0.00
827.22	0.00	0.00	0.00	3.38	1.00	0.83	0.65	0.59	788.83	0.00	
30-29		GT-30		GT-29STP				1	0.011	10.00	789.48	0.00
789.48	0.00	0.00	0.00	4.60	0.66	0.55	1.16	0.60	1019.95	0.00	
31-30		GT-31		GT-30				1	0.070	10.00	789.48	0.00
789.48	0.00	0.00	0.00	9.34	0.38	0.31	3.41	0.60	2609.42	0.00	
32-31		GT-32		GT-31				1	0.047	10.00	789.48	0.00
789.48	0.00	0.00	0.00	8.09	0.42	0.35	2.77	0.60	2144.24	0.00	
501		3		5				1	0.100	12.00	1341.30	0.00
1341.30	0.00	0.00	0.00	12.14	0.35	0.35	4.22	0.74	5070.16	0.00		
503		7		SPCAB				1	0.019	14.00	1341.30	0.00
1341.30	0.00	0.00	0.00	6.57	0.44	0.51	1.85	0.71	3333.69	0.00		
SUDLGP		SUDLMH		SPSUD				1	0.005	10.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	717.81	0.00		

[Force Mains]

Pipe ID	From ID	To ID	Pipe Diam	Pipe Flow	Pipe Vel.	Pipe Loss
499	CABLE	3	12.00	1341.30	2.84	0.412
AIRPLUM	AIRJC	GT-34PLUM	10.00	549.78	2.25	10.699
BOU32	BOUJC	GT-32	10.00	772.14	3.15	14.038
NORAIR	NORJC	AIRJC	10.00	287.64	1.18	1.514
PLUBOU	GT-34PLUM	BOUJC	10.00	740.52	3.03	14.032
SUDNOR	SUDJC	NORJC	10.00	0.00	2.04	10.905

[Pumps]

Pump ID	Wet Well ID	Manhole ID	Pump Type	Pump Count	Pump Flow	Pump Head
CAB	SPCAB	CABLE	Fixed Capacity	1	1000.00	0.00
SUDPUMP	SPSUD	SUDJC	Fixed Capacity	1	500.00	29.89

		ID	Grade (ft)
1		CABLE	310.330
2		SUDJC	352.540

	ID	From ID	To ID	Diameter (in)	Length (ft)	Total Flow (gpm)	Unpeakable Flow (gpm)	Peakable Flow (gpm)	Coverage Flow (gpm)	Infiltration Flow (gpm)	Storm Flow (gpm)	Velocity (ft/s)	Headloss (ft)
1	499	CABLE	3	12.000	100.000	1,101.600	1,101.600	0.000	0.000	0.000	0.000	2.837	0.412
2	AIRPLUM	AIRJC	-34PLU	10.000	3,235.040	435.540	435.540	0.000	0.000	0.000	0.000	1.779	6.950
3	BOU32	BOUJC	GT-32	10.000	2,262.940	602.820	602.820	0.000	0.000	0.000	0.000	2.463	8.876
4	NORAIR	NORJC	AIRJC	10.000	1,519.450	248.880	248.880	0.000	0.000	0.000	0.000	1.017	1.158
5	PLUBOU	T-34PLU	BOUJC	10.000	2,444.120	576.300	576.300	0.000	0.000	0.000	0.000	2.354	8.820
6	SUDNOR	SUDJC	NORJC	10.000	3,931.040	0.000	0.000	0.000	0.000	0.000	0.000	2.042	10.905

South Shore model - Existing SV to LLRI - Loading Manhole Report

		ID	Rim Elevation (ft)	Base Flow (cfs)	Total Flow (cfs)	Storm Flow (cfs)	Grade (ft)	Status	Hydraulic Jump	Unfilled Depth (ft)	Surcharge Depth (ft)
1		3	319.000	0.000	0.000	0.000	309.837	Not Full	No	9.163	1.837
2		7	319.000	0.570	0.582	0.000	310.433	Not Full	No	8.567	1.886
3		AIRJC	1,388.000	0.408	0.416	0.000	423.713	Not Full	No	964.287	41.380
4		BOUJC	1,326.000	0.058	0.059	0.000	385.840	Not Full	No	940.160	63.007
5		GT-11	318.770	0.000	0.000	0.000	310.832	Not Full	No	7.938	0.995
6		GT-12	320.020	0.000	0.000	0.000	311.322	Not Full	No	8.698	1.416
7		GT-13	319.700	0.160	0.164	0.000	311.856	Not Full	No	7.844	1.399
8		GT-14	320.100	0.000	0.000	0.000	312.195	Not Full	No	7.905	1.308
9		GT-15	319.890	0.000	0.000	0.000	312.495	Not Full	No	7.395	1.269
10		GT-16	319.600	0.000	0.000	0.000	312.850	Not Full	No	6.750	1.354
11		GT-17	319.380	0.192	0.195	0.000	313.176	Not Full	No	6.204	1.569
12		GT-18	319.630	0.000	0.000	0.000	313.354	Not Full	No	6.276	0.868
13		GT-19	319.980	0.000	0.000	0.000	313.682	Not Full	No	6.298	0.826
14		GT-20	320.040	0.000	0.000	0.000	314.001	Not Full	No	6.039	0.535
15		GT-21	319.140	0.033	0.034	0.000	314.399	Not Full	No	4.741	0.043
16		GT-23	319.200	0.000	0.000	0.000	314.949	Not Full	No	4.251	-0.428
17		GT-24	319.800	0.031	0.032	0.000	315.731	Not Full	No	4.069	0.074
18		GT-25	319.390	0.000	0.000	0.000	317.566	Not Full	No	1.824	1.453
19		GT-26	321.400	0.000	0.000	0.000	318.085	Not Full	No	3.315	-0.139
20		GT-27	324.460	0.000	0.000	0.000	320.229	Not Full	No	4.231	-0.194
21		GT-28	329.160	0.013	0.014	0.000	322.764	Not Full	No	6.396	-0.179
22		GT-29STP	329.780	0.082	0.084	0.000	325.833	Not Full	Yes	3.947	-0.181
23		GT-30	334.390	0.000	0.000	0.000	329.704	Not Full	No	4.686	-0.300
24		GT-31	361.520	0.000	0.000	0.000	357.445	Not Full	No	4.075	-0.489
25		GT-32	381.730	0.007	0.007	0.000	376.964	Not Full	No	4.766	-0.459
26		GT-34PLUM	1,422.500	0.307	0.314	0.000	416.763	Not Full	No	1,005.737	0.000
27		NORJC	1,386.980	0.544	0.555	0.000	424.871	Not Full	No	962.109	47.848
28		SUDLMH	368.000	0.000	0.000	0.000	358.040	Not Full	No	9.960	2.077

		ID	Flow (cfs)	Grade (ft)
1		5	2.454	305.317

		ID	From ID	To ID	Flow (gpm)	Head Increase (ft)	Power (hp)	Usage	Speed
1		CAB	SPCAB	CABLE	1,000.000	0.000	0.000	1.000	1.000
2		SUDPUMP	SPSUD	SUDJC	500.000	29.888	3.778	1.000	1.000

		ID	Grade (ft)
1		SPCAB	310.330
2		SPSUD	358.040

	ID	From ID	To ID	Diameter (in)	Length (ft)	Slope	Total Flow (gpm)	Unpeakable Flow (gpm)	Peakable Flow (gpm)	Coverage Flow (gpm)	Infiltration Flow (gpm)
1	11-SPCAB	GT-11	7	14.000	299.120	0.004	840.480	840.480	0.000	0.000	0.000
2	12-11	GT-12	GT-11	14.000	374.280	0.000	840.480	840.480	0.000	0.000	0.000
3	13-12	GT-13	GT-12	14.000	409.600	0.001	840.480	840.480	0.000	0.000	0.000
4	14-13	GT-14	GT-13	14.000	305.940	0.001	767.040	767.040	0.000	0.000	0.000
5	15-14	GT-15	GT-14	14.000	267.680	0.001	767.040	767.040	0.000	0.000	0.000
6	16-15	GT-16	GT-15	14.000	321.460	0.001	767.040	767.040	0.000	0.000	0.000
7	17-16	GT-17	GT-16	14.000	292.200	0.000	767.040	767.040	0.000	0.000	0.000
8	18-17	GT-18	GT-17	14.000	195.760	0.004	679.320	679.320	0.000	0.000	0.000
9	19-18	GT-19	GT-18	14.000	384.240	0.001	679.320	679.320	0.000	0.000	0.000
10	20-19	GT-20	GT-19	14.000	372.650	0.002	679.320	679.320	0.000	0.000	0.000
11	21-20	GT-21	GT-20	14.000	472.110	0.002	679.320	679.320	0.000	0.000	0.000
12	23-21	GT-23	GT-21	14.000	654.890	0.002	664.020	664.020	0.000	0.000	0.000
13	24-23	GT-24	GT-23	14.000	437.990	0.001	664.020	664.020	0.000	0.000	0.000
14	25-24	GT-25	GT-24	10.000	401.940	0.002	649.740	649.740	0.000	0.000	0.000
15	26-25	GT-26	GT-25	10.000	385.400	0.005	649.740	649.740	0.000	0.000	0.000
16	27-26	GT-27	GT-26	10.000	313.420	0.007	649.740	649.740	0.000	0.000	0.000
17	28-27	GT-28	GT-27	10.000	385.850	0.007	649.740	649.740	0.000	0.000	0.000
18	29-28	T-29ST	GT-28	10.000	479.630	0.006	643.620	643.620	0.000	0.000	0.000
19	30-29	GT-30	T-29ST	10.000	372.870	0.011	605.880	605.880	0.000	0.000	0.000
20	31-30	GT-31	GT-30	10.000	398.770	0.070	605.880	605.880	0.000	0.000	0.000
21	32-31	GT-32	GT-31	10.000	412.100	0.047	605.880	605.880	0.000	0.000	0.000
22	501	3	5	12.000	20.000	0.100	1,101.600	1,101.600	0.000	0.000	0.000
23	503	7	SPCAE	14.000	20.000	0.019	1,101.600	1,101.600	0.000	0.000	0.000
24	SUDLGP	SUDLMH	SPSUD	10.000	100.000	0.005	0.000	0.000	0.000	0.000	0.000

		ID	Storm Flow (gpm)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude Number	Full Flow (gpm)	Coverage Count
1		11-SPCAB	0.000	Pressurized	3.357	0.517	0.529	0.603	0.556	0.855	1,588.257	0.000
2		12-11	0.000	Pressurized	1.752	1.000	2.541	1.167	0.342	0.286	330.750	0.000
3		13-12	0.000	Pressurized	2.101	0.777	0.948	0.906	0.556	0.387	886.237	0.000
4		14-13	0.000	Pressurized	2.120	0.706	0.846	0.823	0.530	0.429	906.702	0.000
5		15-14	0.000	Pressurized	2.030	0.735	0.890	0.857	0.530	0.396	861.946	0.000
6		16-15	0.000	Pressurized	1.599	1.000	1.094	1.167	0.506	0.261	700.918	0.000
7		17-16	0.000	Pressurized	1.599	1.000	1.635	1.167	0.410	0.261	469.251	0.000
8		18-17	0.000	Pressurized	3.230	0.451	0.419	0.527	0.497	0.896	1,621.541	0.000
9		19-18	0.000	Pressurized	1.771	0.745	0.905	0.869	0.497	0.341	750.496	0.000
10		20-19	0.000	Pressurized	2.203	0.613	0.694	0.715	0.497	0.499	978.505	0.000
11		21-20	0.000	Pressurized	2.327	0.586	0.647	0.683	0.497	0.545	1,050.079	0.000
12		23-21	0.000	Free Surface	2.150	0.614	0.696	0.716	0.492	0.487	954.475	0.000
13		24-23	0.000	Pressurized	1.384	1.000	1.086	1.167	0.471	0.226	611.499	0.000
14		25-24	0.000	Pressurized	2.654	1.000	1.486	0.833	0.438	0.512	437.121	0.000
15		26-25	0.000	Free Surface	3.368	0.735	0.891	0.613	0.539	0.776	729.549	0.000
16		27-26	0.000	Free Surface	3.737	0.668	0.787	0.557	0.539	0.937	826.070	0.000
17		28-27	0.000	Free Surface	3.629	0.686	0.815	0.572	0.539	0.890	796.820	0.000
18		29-28	0.000	Free Surface	3.592	0.687	0.816	0.572	0.536	0.881	788.833	0.000
19		30-29	0.000	Free Surface	4.345	0.555	0.594	0.462	0.520	1.250	1,019.945	0.000
20		31-30	0.000	Free Surface	8.680	0.328	0.232	0.273	0.520	3.431	2,609.415	0.000
21		32-31	0.000	Free Surface	7.532	0.364	0.283	0.303	0.520	2.807	2,144.241	0.000
22		501	0.000	Free Surface	11.495	0.317	0.217	0.317	0.671	4.228	5,070.159	0.000
23		503	0.000	Pressurized	6.235	0.396	0.330	0.462	0.641	1.871	3,333.691	0.000
24		SUDLGP	0.000	Pressurized	0.000	0.000		0.000	0.000	0.000	717.806	0.000

		ID	Backwater Adjustment	Adjusted Depth (ft)	Adjusted Velocity (ft/s)
1		11-SPCAB	Yes	1.167	1.752
2		12-11	Yes	1.167	1.752
3		13-12	Yes	1.167	1.752
4		14-13	Yes	1.167	1.599
5		15-14	Yes	1.167	1.599
6		16-15	Yes	1.167	1.599
7		17-16	Yes	1.167	1.599
8		18-17	Yes	1.167	1.416
9		19-18	Yes	1.167	1.416
10		20-19	Yes	1.167	1.416
11		21-20	Yes	1.167	1.416
12		23-21	Yes	0.974	1.552
13		24-23	No	1.167	1.384
14		25-24	Yes	0.833	2.654
15		26-25	Yes	0.833	2.654
16		27-26	Yes	0.667	3.094
17		28-27	Yes	0.646	3.189
18		29-28	Yes	0.653	3.126
19		30-29	Yes	0.593	3.250
20		31-30	Yes	0.439	4.632
21		32-31	Yes	0.360	5.994
22		501	No	0.317	11.495
23		503	Yes	1.167	2.296
24		SUDLGP	Yes	0.833	0.000

		ID	Grade (ft)
1		CABLE	310.330
2		SUDJC	483.499

	ID	From ID	To ID	Diameter (in)	Length (ft)	Total Flow (gpm)	Unpeakable Flow (gpm)	Peakable Flow (gpm)	Coverage Flow (gpm)	Infiltration Flow (gpm)	Storm Flow (gpm)	Velocity (ft/s)	Headloss (ft)
1	499	CABLE	3	12.000	100.000	1,613.639	1,613.639	0.000	0.000	0.000	0.000	2.837	0.412
2	AIRPLUM	AIRJC	GT-34PLUM	10.000	3,235.040	947.580	947.580	0.000	0.000	0.000	0.000	3.871	29.322
3	BOU32	BOUJC	GT-32	10.000	2,262.940	1,114.860	1,114.860	0.000	0.000	0.000	0.000	4.554	27.717
4	NORAIR	NORJC	AIRJC	10.000	1,519.450	760.920	760.920	0.000	0.000	0.000	0.000	3.108	9.174
5	PLUBOU	GT-34PLUM	BOUJC	10.000	2,444.120	1,088.340	1,088.340	0.000	0.000	0.000	0.000	4.446	28.631
6	SUDNOR	SUDJC	NORJC	10.000	3,931.040	512.040	512.040	0.000	0.000	0.000	0.000	2.042	10.905

		ID	From ID	To ID	Diameter (in)	Length (ft)	Slope	Total Flow (gpm)	Unpeakable Flow (gpm)	Peakable Flow (gpm)	Coverage Flow (gpm)
1		11-SPCAB	GT-11	7	14.000	299.120	0.004	1,352.519	1,352.519	0.000	0.000
2		12-11	GT-12	GT-11	14.000	374.280	0.000	1,352.519	1,352.519	0.000	0.000
3		13-12	GT-13	GT-12	14.000	409.600	0.001	1,352.519	1,352.519	0.000	0.000
4		14-13	GT-14	GT-13	14.000	305.940	0.001	1,279.080	1,279.080	0.000	0.000
5		15-14	GT-15	GT-14	14.000	267.680	0.001	1,279.080	1,279.080	0.000	0.000
6		16-15	GT-16	GT-15	14.000	321.460	0.001	1,279.080	1,279.080	0.000	0.000
7		17-16	GT-17	GT-16	14.000	292.200	0.000	1,279.080	1,279.080	0.000	0.000
8		18-17	GT-18	GT-17	14.000	195.760	0.004	1,191.360	1,191.360	0.000	0.000
9		19-18	GT-19	GT-18	14.000	384.240	0.001	1,191.360	1,191.360	0.000	0.000
10		20-19	GT-20	GT-19	14.000	372.650	0.002	1,191.360	1,191.360	0.000	0.000
11		21-20	GT-21	GT-20	14.000	472.110	0.002	1,191.360	1,191.360	0.000	0.000
12		23-21	GT-23	GT-21	14.000	654.890	0.002	1,176.060	1,176.060	0.000	0.000
13		24-23	GT-24	GT-23	14.000	437.990	0.001	1,176.060	1,176.060	0.000	0.000
14		25-24	GT-25	GT-24	10.000	401.940	0.002	1,161.780	1,161.780	0.000	0.000
15		26-25	GT-26	GT-25	10.000	385.400	0.005	1,161.780	1,161.780	0.000	0.000
16		27-26	GT-27	GT-26	10.000	313.420	0.007	1,161.780	1,161.780	0.000	0.000
17		28-27	GT-28	GT-27	10.000	385.850	0.007	1,161.780	1,161.780	0.000	0.000
18		29-28	GT-29STP	GT-28	10.000	479.630	0.006	1,155.660	1,155.660	0.000	0.000
19		30-29	GT-30	GT-29STP	10.000	372.870	0.011	1,117.920	1,117.920	0.000	0.000
20		31-30	GT-31	GT-30	10.000	398.770	0.070	1,117.920	1,117.920	0.000	0.000
21		32-31	GT-32	GT-31	10.000	412.100	0.047	1,117.920	1,117.920	0.000	0.000
22		501	3	5	12.000	20.000	0.100	1,613.639	1,613.639	0.000	0.000
23		503	7	SPCAB	14.000	20.000	0.019	1,613.639	1,613.639	0.000	0.000
24		SUDLGP	SUDLMH	SPSUD	10.000	100.000	0.005	512.040	512.040	0.000	0.000

		ID	Infiltration Flow (gpm)	Storm Flow (gpm)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude Number	Full Flow (gpm)
1		11-SPCAB	0.000	0.000	Pressurized	3.717	0.709	0.852	0.827	0.713	0.749	1,588.257
2		12-11	0.000	0.000	Pressurized	2.819	1.000	4.089	1.167	0.342	0.460	330.750
3		13-12	0.000	0.000	Pressurized	2.819	1.000	1.526	1.167	0.572	0.460	886.237
4		14-13	0.000	0.000	Pressurized	2.666	1.000	1.411	1.167	0.578	0.435	906.702
5		15-14	0.000	0.000	Pressurized	2.666	1.000	1.484	1.167	0.563	0.435	861.946
6		16-15	0.000	0.000	Pressurized	2.666	1.000	1.825	1.167	0.506	0.435	700.918
7		17-16	0.000	0.000	Pressurized	2.666	1.000	2.726	1.167	0.410	0.435	469.251
8		18-17	0.000	0.000	Pressurized	3.694	0.637	0.735	0.743	0.667	0.813	1,621.541
9		19-18	0.000	0.000	Pressurized	2.483	1.000	1.587	1.167	0.524	0.405	750.496
10		20-19	0.000	0.000	Pressurized	2.483	1.000	1.218	1.167	0.602	0.405	978.505
11		21-20	0.000	0.000	Pressurized	2.483	1.000	1.135	1.167	0.625	0.405	1,050.079
12		23-21	0.000	0.000	Pressurized	2.451	1.000	1.232	1.167	0.594	0.400	954.475
13		24-23	0.000	0.000	Pressurized	2.451	1.000	1.923	1.167	0.471	0.400	611.499
14		25-24	0.000	0.000	Pressurized	4.746	1.000	2.658	0.833	0.438	0.916	437.121
15		26-25	0.000	0.000	Pressurized	4.746	1.000	1.592	0.833	0.572	0.916	729.549
16		27-26	0.000	0.000	Pressurized	4.746	1.000	1.406	0.833	0.609	0.916	826.070
17		28-27	0.000	0.000	Pressurized	4.746	1.000	1.458	0.833	0.598	0.916	796.820
18		29-28	0.000	0.000	Pressurized	4.721	1.000	1.465	0.833	0.595	0.911	788.833
19		30-29	0.000	0.000	Pressurized	4.567	1.000	1.096	0.833	0.673	0.882	1,019.945
20		31-30	0.000	0.000	Free Surface	10.248	0.457	0.428	0.381	0.701	3.338	2,609.415
21		32-31	0.000	0.000	Free Surface	8.851	0.513	0.521	0.427	0.701	2.684	2,144.241
22		501	0.000	0.000	Free Surface	12.777	0.388	0.318	0.388	0.809	4.190	5,070.159
23		503	0.000	0.000	Pressurized	6.892	0.491	0.484	0.572	0.781	1.816	3,333.691
24		SUDLGP	0.000	0.000	Pressurized	3.185	0.624	0.713	0.520	0.476	0.843	717.806

	ID	Coverage Count	Backwater Adjustment	Adjusted Depth (ft)	Adjusted Velocity (ft/s)
1	11-SPCAB	0.000	Yes	1.167	2.819
2	12-11	0.000	Yes	1.167	2.819
3	13-12	0.000	Yes	1.167	2.819
4	14-13	0.000	Yes	1.167	2.666
5	15-14	0.000	Yes	1.167	2.666
6	16-15	0.000	Yes	1.167	2.666
7	17-16	0.000	Yes	1.167	2.666
8	18-17	0.000	Yes	1.167	2.483
9	19-18	0.000	Yes	1.167	2.483
10	20-19	0.000	Yes	1.167	2.483
11	21-20	0.000	Yes	1.167	2.483
12	23-21	0.000	Yes	1.167	2.451
13	24-23	0.000	Yes	1.167	2.451
14	25-24	0.000	Yes	0.833	4.746
15	26-25	0.000	Yes	0.833	4.746
16	27-26	0.000	Yes	0.833	4.746
17	28-27	0.000	Yes	0.833	4.746
18	29-28	0.000	Yes	0.833	4.721
19	30-29	0.000	Yes	0.833	4.567
20	31-30	0.000	Yes	0.833	4.567
21	32-31	0.000	Yes	0.647	5.481
22	501	0.000	No	0.388	12.777
23	503	0.000	Yes	1.167	3.363
24	SUDLGP	0.000	Yes	0.833	2.092

	ID	Rim Elevation (ft)	Base Flow (cfs)	Total Flow (cfs)	Storm Flow (cfs)	Grade (ft)	Status	Hydraulic Jump	Unfilled Depth (ft)	Surcharge Depth (ft)
1	3	319.000	0.000	0.000	0.000	309.330	Not Full	No	9.670	1.330
2	7	319.000	0.570	0.582	0.000	310.551	Not Full	No	8.449	2.005
3	AIRJC	1,388.000	0.408	0.416	0.000	462.930	Not Full	No	925.070	80.596
4	BOUJC	1,326.000	0.058	0.059	0.000	404.977	Not Full	No	921.023	82.144
5	GT-11	318.770	0.000	0.000	0.000	311.585	Not Full	No	7.185	1.748
6	GT-12	320.020	0.000	0.000	0.000	312.854	Not Full	No	7.166	2.947
7	GT-13	319.700	0.160	0.164	0.000	314.235	Not Full	No	5.465	3.778
8	GT-14	320.100	0.000	0.000	0.000	315.178	Not Full	No	4.922	4.291
9	GT-15	319.890	0.000	0.000	0.000	316.014	Not Full	No	3.876	4.787
10	GT-16	319.600	0.000	0.000	0.000	317.001	Not Full	No	2.599	5.504
11	GT-17	319.380	0.192	0.195	0.000	317.905	Not Full	No	1.475	6.299
12	GT-18	319.630	0.000	0.000	0.000	318.455	Not Full	No	1.175	5.968
13	GT-19	319.980	0.000	0.000	0.000	319.464	Not Full	No	0.516	6.607
14	GT-20	320.040	0.000	0.000	0.000	320.040	Full	No	0.000	6.573
15	GT-21	319.140	0.033	0.034	0.000	319.140	Full	No	0.000	4.783
16	GT-23	319.200	0.000	0.000	0.000	319.200	Full	No	0.000	3.823
17	GT-24	319.800	0.031	0.032	0.000	319.800	Full	No	0.000	4.143
18	GT-25	319.390	0.000	0.000	0.000	319.390	Full	No	0.000	3.277
19	GT-26	321.400	0.000	0.000	0.000	321.400	Full	No	0.000	3.177
20	GT-27	324.460	0.000	0.000	0.000	324.460	Full	No	0.000	4.037
21	GT-28	329.160	0.013	0.014	0.000	329.160	Full	No	0.000	6.217
22	GT-29STP	329.780	0.082	0.084	0.000	329.780	Full	No	0.000	3.767
23	GT-30	334.390	0.000	0.000	0.000	334.390	Full	Yes	0.000	4.387
24	GT-31	361.520	0.000	0.000	0.000	357.724	Not Full	No	3.796	-0.209
25	GT-32	381.730	0.007	0.007	0.000	377.260	Not Full	No	4.470	-0.163
26	GT-34PLUM	1,422.500	0.307	0.314	0.000	433.608	Not Full	No	988.892	16.844
27	NORJC	1,386.980	0.544	0.555	0.000	472.103	Not Full	No	914.877	95.080
28	SUDLMH	368.000	1.118	1.141	0.000	358.311	Not Full	No	9.689	2.348

		ID	Flow (cfs)	Grade (ft)
1		5	3.595	305.388

		ID	From ID	To ID	Flow (gpm)	Head Increase (ft)	Power (hp)	Usage	Speed
1		CAB	SPCAB	CABLE	1,000.000	0.000	0.000	1.000	1.000
2		SUDPUMP	SPSUD	SUDJC	500.000	29.888	3.778	1.000	1.000

		ID	Grade (ft)
1		SPCAB	310.330
2		SPSUD	358.040

		ID	Grade (ft)
1		CABLE	310.330
2		SUDJC	434.735

		ID	From ID	To ID	Diameter (in)	Length (ft)	Total Flow (gpm)	Unpeakable Flow (gpm)	Peakable Flow (gpm)	Coverage Flow (gpm)	Infiltration Flow (gpm)	Storm Flow (gpm)	Velocity (ft/s)	Headloss (ft)
1		499	CABLE	3	12.000	100.000	1,281.120	1,281.120	0.000	0.000	0.000	0.000	2.837	0.412
2		AIRPLUM	AIRJC	-34PL	10.000	3,235.040	615.060	615.060	0.000	0.000	0.000	0.000	2.513	13.170
3		BOU32	BOUJC	GT-32	10.000	2,262.940	782.340	782.340	0.000	0.000	0.000	0.000	3.196	14.383
4		NORAIR	NORJC	AIRJC	10.000	1,519.450	428.400	428.400	0.000	0.000	0.000	0.000	1.750	3.166
5		PLUBOU	T-34PLU	BOUJC	10.000	2,444.120	755.820	755.820	0.000	0.000	0.000	0.000	3.088	14.574
6		SUDNOR	SUDJC	NORJC	10.000	3,931.040	179.520	179.520	0.000	0.000	0.000	0.000	2.042	10.905

		ID	From ID	To ID	Diameter (in)	Length (ft)	Slope	Total Flow (gpm)	Unpeakable Flow (gpm)	Peakable Flow (gpm)	Coverage Flow (gpm)	Infiltration Flow (gpm)
1		11-SPCAB	GT-11	7	14.000	299.120	0.004	1,020.000	1,020.000	0.000	0.000	0.000
2		12-11	GT-12	GT-11	14.000	374.280	0.000	1,020.000	1,020.000	0.000	0.000	0.000
3		13-12	GT-13	GT-12	14.000	409.600	0.001	1,020.000	1,020.000	0.000	0.000	0.000
4		14-13	GT-14	GT-13	14.000	305.940	0.001	946.560	946.560	0.000	0.000	0.000
5		15-14	GT-15	GT-14	14.000	267.680	0.001	946.560	946.560	0.000	0.000	0.000
6		16-15	GT-16	GT-15	14.000	321.460	0.001	946.560	946.560	0.000	0.000	0.000
7		17-16	GT-17	GT-16	14.000	292.200	0.000	946.560	946.560	0.000	0.000	0.000
8		18-17	GT-18	GT-17	14.000	195.760	0.004	858.840	858.840	0.000	0.000	0.000
9		19-18	GT-19	GT-18	14.000	384.240	0.001	858.840	858.840	0.000	0.000	0.000
10		20-19	GT-20	GT-19	14.000	372.650	0.002	858.840	858.840	0.000	0.000	0.000
11		21-20	GT-21	GT-20	14.000	472.110	0.002	858.840	858.840	0.000	0.000	0.000
12		23-21	GT-23	GT-21	14.000	654.890	0.002	843.540	843.540	0.000	0.000	0.000
13		24-23	GT-24	GT-23	14.000	437.990	0.001	843.540	843.540	0.000	0.000	0.000
14		25-24	GT-25	GT-24	10.000	401.940	0.002	829.260	829.260	0.000	0.000	0.000
15		26-25	GT-26	GT-25	10.000	385.400	0.005	829.260	829.260	0.000	0.000	0.000
16		27-26	GT-27	GT-26	10.000	313.420	0.007	829.260	829.260	0.000	0.000	0.000
17		28-27	GT-28	GT-27	10.000	385.850	0.007	829.260	829.260	0.000	0.000	0.000
18		29-28	T-29ST	GT-28	10.000	479.630	0.006	823.140	823.140	0.000	0.000	0.000
19		30-29	GT-30	T-29ST	10.000	372.870	0.011	785.400	785.400	0.000	0.000	0.000
20		31-30	GT-31	GT-30	10.000	398.770	0.070	785.400	785.400	0.000	0.000	0.000
21		32-31	GT-32	GT-31	10.000	412.100	0.047	785.400	785.400	0.000	0.000	0.000
22		501	3	5	12.000	20.000	0.100	1,281.120	1,281.120	0.000	0.000	0.000
23		503	7	SPCAB	14.000	20.000	0.019	1,281.120	1,281.120	0.000	0.000	0.000
24		SUDLGP	SUDLMH	SPSUD	10.000	100.000	0.005	179.520	179.520	0.000	0.000	0.000

	ID	Storm Flow (gpm)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude Number	Full Flow (gpm)	Coverage Count
1	11-SPCAB	0.000	Pressurized	3.514	0.583	0.642	0.680	0.615	0.826	1,588.257	0.000
2	12-11	0.000	Pressurized	2.126	1.000	3.084	1.167	0.342	0.347	330.750	0.000
3	13-12	0.000	Pressurized	2.126	1.000	1.151	1.167	0.572	0.347	886.237	0.000
4	14-13	0.000	Pressurized	1.973	1.000	1.044	1.167	0.578	0.322	906.702	0.000
5	15-14	0.000	Pressurized	1.973	1.000	1.098	1.167	0.563	0.322	861.946	0.000
6	16-15	0.000	Pressurized	1.973	1.000	1.350	1.167	0.506	0.322	700.918	0.000
7	17-16	0.000	Pressurized	1.973	1.000	2.017	1.167	0.410	0.322	469.251	0.000
8	18-17	0.000	Pressurized	3.428	0.517	0.530	0.604	0.562	0.873	1,621.541	0.000
9	19-18	0.000	Pressurized	1.790	1.000	1.144	1.167	0.524	0.292	750.496	0.000
10	20-19	0.000	Pressurized	2.300	0.726	0.878	0.848	0.562	0.453	978.505	0.000
11	21-20	0.000	Pressurized	2.441	0.688	0.818	0.802	0.562	0.505	1,050.079	0.000
12	23-21	0.000	Pressurized	2.246	0.731	0.884	0.852	0.557	0.440	954.475	0.000
13	24-23	0.000	Pressurized	1.758	1.000	1.379	1.167	0.471	0.287	611.499	0.000
14	25-24	0.000	Pressurized	3.388	1.000	1.897	0.833	0.438	0.654	437.121	0.000
15	26-25	0.000	Pressurized	3.388	1.000	1.137	0.833	0.572	0.654	729.549	0.000
16	27-26	0.000	Pressurized	3.388	1.000	1.004	0.833	0.609	0.654	826.070	0.000
17	28-27	0.000	Pressurized	3.388	1.000	1.041	0.833	0.598	0.654	796.820	0.000
18	29-28	0.000	Pressurized	3.363	1.000	1.043	0.833	0.595	0.649	788.833	0.000
19	30-29	0.000	Pressurized	4.596	0.658	0.770	0.549	0.594	1.167	1,019.945	0.000
20	31-30	0.000	Free Surfac	9.326	0.376	0.301	0.314	0.594	3.409	2,609.415	0.000
21	32-31	0.000	Free Surfac	8.081	0.419	0.366	0.349	0.594	2.775	2,144.241	0.000
22	501	0.000	Free Surfac	11.991	0.343	0.253	0.343	0.724	4.220	5,070.159	0.000
23	503	0.000	Pressurized	6.492	0.430	0.384	0.502	0.693	1.855	3,333.691	0.000
24	SUDLGP	0.000	Pressurized	2.438	0.341	0.250	0.284	0.276	0.943	717.806	0.000

		ID	Backwater Adjustment	Adjusted Depth (ft)	Adjusted Velocity (ft/s)
1		11-SPCAB	Yes	1.167	2.126
2		12-11	Yes	1.167	2.126
3		13-12	Yes	1.167	2.126
4		14-13	Yes	1.167	1.973
5		15-14	Yes	1.167	1.973
6		16-15	Yes	1.167	1.973
7		17-16	Yes	1.167	1.973
8		18-17	Yes	1.167	1.790
9		19-18	Yes	1.167	1.790
10		20-19	Yes	1.167	1.790
11		21-20	Yes	1.167	1.790
12		23-21	Yes	1.167	1.758
13		24-23	Yes	1.167	1.758
14		25-24	Yes	0.833	3.388
15		26-25	Yes	0.833	3.388
16		27-26	Yes	0.833	3.388
17		28-27	Yes	0.833	3.388
18		29-28	Yes	0.833	3.363
19		30-29	Yes	0.833	3.208
20		31-30	Yes	0.833	3.208
21		32-31	Yes	0.451	5.805
22		501	No	0.343	11.991
23		503	Yes	1.167	2.670
24		SUDLGP	Yes	0.833	0.733

		ID	Rim Elevation (ft)	Base Flow (cfs)	Total Flow (cfs)	Storm Flow (cfs)	Grade (ft)	Status	Hydraulic Jump	Unfilled Depth (ft)	Surcharge Depth (ft)
1		3	319.000	0.000	0.000	0.000	309.678	Not Full	No	9.322	1.678
2		7	319.000	0.570	0.582	0.000	310.470	Not Full	No	8.530	1.923
3		AIRJC	1,388.000	0.408	0.416	0.000	429.933	Not Full	No	958.067	47.600
4		BOUJC	1,326.000	0.058	0.059	0.000	391.442	Not Full	No	934.558	68.609
5		GT-11	318.770	0.000	0.000	0.000	311.057	Not Full	No	7.713	1.220
6		GT-12	320.020	0.000	0.000	0.000	311.779	Not Full	No	8.241	1.873
7		GT-13	319.700	0.160	0.164	0.000	312.564	Not Full	No	7.136	2.108
8		GT-14	320.100	0.000	0.000	0.000	313.081	Not Full	No	7.019	2.194
9		GT-15	319.890	0.000	0.000	0.000	313.539	Not Full	No	6.351	2.312
10		GT-16	319.600	0.000	0.000	0.000	314.079	Not Full	No	5.521	2.582
11		GT-17	319.380	0.192	0.195	0.000	314.575	Not Full	No	4.805	2.968
12		GT-18	319.630	0.000	0.000	0.000	314.860	Not Full	No	4.770	2.373
13		GT-19	319.980	0.000	0.000	0.000	315.385	Not Full	No	4.595	2.528
14		GT-20	320.040	0.000	0.000	0.000	315.894	Not Full	No	4.146	2.428
15		GT-21	319.140	0.033	0.034	0.000	316.530	Not Full	No	2.610	2.174
16		GT-23	319.200	0.000	0.000	0.000	317.368	Not Full	No	1.832	1.991
17		GT-24	319.800	0.031	0.032	0.000	317.939	Not Full	No	1.861	2.283
18		GT-25	319.390	0.000	0.000	0.000	319.390	Full	No	0.000	3.277
19		GT-26	321.400	0.000	0.000	0.000	321.400	Full	No	0.000	3.177
20		GT-27	324.460	0.000	0.000	0.000	323.760	Not Full	No	0.700	3.337
21		GT-28	329.160	0.013	0.014	0.000	326.635	Not Full	No	2.525	3.692
22		GT-29STP	329.780	0.082	0.084	0.000	329.780	Full	Yes	0.000	3.767
23		GT-30	334.390	0.000	0.000	0.000	332.276	Not Full	No	2.114	2.273
24		GT-31	361.520	0.000	0.000	0.000	357.533	Not Full	No	3.987	-0.400
25		GT-32	381.730	0.007	0.007	0.000	377.059	Not Full	No	4.671	-0.364
26		GT-34PLUM	1,422.500	0.307	0.314	0.000	416.763	Not Full	No	1,005.737	0.000
27		NORJC	1,386.980	0.544	0.555	0.000	433.099	Not Full	No	953.881	56.076
28		SUDLMH	368.000	0.392	0.400	0.000	358.073	Not Full	No	9.927	2.110

		ID	Flow (cfs)	Grade (ft)
1		5	2.854	305.343

		ID	From ID	To ID	Flow (gpm)	Head Increase (ft)	Power (hp)	Usage	Speed
1		CAB	SPCAB	CABLE	1,000.000	0.000	0.000	1.000	1.000
2		SUDPUMP	SPSUD	SUDJC	500.000	29.888	3.778	1.000	1.000

		ID	Grade (ft)
1		SPCAB	310.330
2		SPSUD	358.040

		ID	From ID	To ID	Diameter (in)	Length (ft)	Total Flow (gpm)	Unpeakable Flow (gpm)	Peakable Flow (gpm)	Coverage Flow (gpm)	Infiltration Flow (gpm)	Storm Flow (gpm)	Velocity (ft/s)	Headloss (ft)
1		499	CABLE	3	12.000	100.000	1,341.299	1,341.299	0.000	0.000	0.000	0.000	2.837	0.412
2		AIRPLUM	AIRJC	-34PL	10.000	3,235.040	549.780	549.780	0.000	0.000	0.000	0.000	2.246	10.699
3		BOU32	BOUJC	GT-32	10.000	2,262.940	772.140	772.140	0.000	0.000	0.000	0.000	3.154	14.038
4		NORAIR	NORJC	AIRJC	10.000	1,519.450	287.640	287.640	0.000	0.000	0.000	0.000	1.175	1.514
5		PLUBOU	T-34PLU	BOUJC	10.000	2,444.120	740.520	740.520	0.000	0.000	0.000	0.000	3.025	14.032
6		SUDNOR	SUDJC	NORJC	10.000	3,931.040	0.000	0.000	0.000	0.000	0.000	0.000	2.042	10.905

		ID	Grade (ft)
1		CABLE	310.330
2		SUDJC	352.540

		ID	From ID	To ID	Diameter (in)	Length (ft)	Slope	Total Flow (gpm)	Unpeakable Flow (gpm)	Peakable Flow (gpm)	Coverage Flow (gpm)	Infiltration Flow (gpm)
1		11-SPCAB	GT-11	7	14.000	299.120	0.004	1,058.760	1,058.760	0.000	0.000	0.000
2		12-11	GT-12	GT-11	14.000	374.280	0.000	1,058.760	1,058.760	0.000	0.000	0.000
3		13-12	GT-13	GT-12	14.000	409.600	0.001	1,058.760	1,058.760	0.000	0.000	0.000
4		14-13	GT-14	GT-13	14.000	305.940	0.001	977.160	977.160	0.000	0.000	0.000
5		15-14	GT-15	GT-14	14.000	267.680	0.001	977.160	977.160	0.000	0.000	0.000
6		16-15	GT-16	GT-15	14.000	321.460	0.001	977.160	977.160	0.000	0.000	0.000
7		17-16	GT-17	GT-16	14.000	292.200	0.000	977.160	977.160	0.000	0.000	0.000
8		18-17	GT-18	GT-17	14.000	195.760	0.004	874.140	874.140	0.000	0.000	0.000
9		19-18	GT-19	GT-18	14.000	384.240	0.001	874.140	874.140	0.000	0.000	0.000
10		20-19	GT-20	GT-19	14.000	372.650	0.002	874.140	874.140	0.000	0.000	0.000
11		21-20	GT-21	GT-20	14.000	472.110	0.002	874.140	874.140	0.000	0.000	0.000
12		23-21	GT-23	GT-21	14.000	654.890	0.002	856.800	856.800	0.000	0.000	0.000
13		24-23	GT-24	GT-23	14.000	437.990	0.001	856.800	856.800	0.000	0.000	0.000
14		25-24	GT-25	GT-24	10.000	401.940	0.002	837.420	837.420	0.000	0.000	0.000
15		26-25	GT-26	GT-25	10.000	385.400	0.005	837.420	837.420	0.000	0.000	0.000
16		27-26	GT-27	GT-26	10.000	313.420	0.007	837.420	837.420	0.000	0.000	0.000
17		28-27	GT-28	GT-27	10.000	385.850	0.007	837.420	837.420	0.000	0.000	0.000
18		29-28	T-29ST	GT-28	10.000	479.630	0.006	827.220	827.220	0.000	0.000	0.000
19		30-29	GT-30	T-29ST	10.000	372.870	0.011	789.480	789.480	0.000	0.000	0.000
20		31-30	GT-31	GT-30	10.000	398.770	0.070	789.480	789.480	0.000	0.000	0.000
21		32-31	GT-32	GT-31	10.000	412.100	0.047	789.480	789.480	0.000	0.000	0.000
22		501	3	5	12.000	20.000	0.100	1,341.299	1,341.299	0.000	0.000	0.000
23		503	7	SPCAE	14.000	20.000	0.019	1,341.299	1,341.299	0.000	0.000	0.000
24		SUDLGP	SUDLMH	SPSUD	10.000	100.000	0.005	0.000	0.000	0.000	0.000	0.000

	ID	Storm Flow (gpm)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude Number	Full Flow (gpm)	Coverage Count
1	11-SPCAB	0.000	Pressurized	3.544	0.597	0.667	0.696	0.627	0.819	1,588.257	0.000
2	12-11	0.000	Pressurized	2.207	1.000	3.201	1.167	0.342	0.360	330.750	0.000
3	13-12	0.000	Pressurized	2.207	1.000	1.195	1.167	0.572	0.360	886.237	0.000
4	14-13	0.000	Pressurized	2.037	1.000	1.078	1.167	0.578	0.332	906.702	0.000
5	15-14	0.000	Pressurized	2.037	1.000	1.134	1.167	0.563	0.332	861.946	0.000
6	16-15	0.000	Pressurized	2.037	1.000	1.394	1.167	0.506	0.332	700.918	0.000
7	17-16	0.000	Pressurized	2.037	1.000	2.082	1.167	0.410	0.332	469.251	0.000
8	18-17	0.000	Pressurized	3.443	0.523	0.539	0.610	0.568	0.871	1,621.541	0.000
9	19-18	0.000	Pressurized	1.822	1.000	1.165	1.167	0.524	0.297	750.496	0.000
10	20-19	0.000	Pressurized	2.306	0.737	0.893	0.860	0.568	0.448	978.505	0.000
11	21-20	0.000	Pressurized	2.449	0.697	0.832	0.813	0.568	0.501	1,050.079	0.000
12	23-21	0.000	Pressurized	2.250	0.740	0.898	0.863	0.562	0.436	954.475	0.000
13	24-23	0.000	Pressurized	1.786	1.000	1.401	1.167	0.471	0.291	611.499	0.000
14	25-24	0.000	Pressurized	3.421	1.000	1.916	0.833	0.438	0.660	437.121	0.000
15	26-25	0.000	Pressurized	3.421	1.000	1.148	0.833	0.572	0.660	729.549	0.000
16	27-26	0.000	Pressurized	3.421	1.000	1.014	0.833	0.609	0.660	826.070	0.000
17	28-27	0.000	Pressurized	3.421	1.000	1.051	0.833	0.598	0.660	796.820	0.000
18	29-28	0.000	Pressurized	3.379	1.000	1.049	0.833	0.595	0.652	788.833	0.000
19	30-29	0.000	Pressurized	4.601	0.661	0.774	0.551	0.595	1.165	1,019.945	0.000
20	31-30	0.000	Free Surfac	9.339	0.377	0.303	0.314	0.595	3.409	2,609.415	0.000
21	32-31	0.000	Free Surfac	8.092	0.420	0.368	0.350	0.595	2.774	2,144.241	0.000
22	501	0.000	Free Surfac	12.145	0.351	0.265	0.351	0.741	4.216	5,070.159	0.000
23	503	0.000	Pressurized	6.571	0.441	0.402	0.515	0.710	1.848	3,333.691	0.000
24	SUDLGP	0.000	Pressurized	0.000	0.000		0.000	0.000	0.000	717.806	0.000

		ID	Backwater Adjustment	Adjusted Depth (ft)	Adjusted Velocity (ft/s)
1		11-SPCAB	Yes	1.167	2.207
2		12-11	Yes	1.167	2.207
3		13-12	Yes	1.167	2.207
4		14-13	Yes	1.167	2.037
5		15-14	Yes	1.167	2.037
6		16-15	Yes	1.167	2.037
7		17-16	Yes	1.167	2.037
8		18-17	Yes	1.167	1.822
9		19-18	Yes	1.167	1.822
10		20-19	Yes	1.167	1.822
11		21-20	Yes	1.167	1.822
12		23-21	Yes	1.167	1.786
13		24-23	Yes	1.167	1.786
14		25-24	Yes	0.833	3.421
15		26-25	Yes	0.833	3.421
16		27-26	Yes	0.833	3.421
17		28-27	Yes	0.833	3.421
18		29-28	Yes	0.833	3.379
19		30-29	Yes	0.833	3.225
20		31-30	Yes	0.833	3.225
21		32-31	Yes	0.453	5.800
22		501	No	0.351	12.145
23		503	Yes	1.167	2.796
24		SUDLGP	Yes	0.833	0.000

	ID	Rim Elevation (ft)	Base Flow (cfs)	Total Flow (cfs)	Storm Flow (cfs)	Grade (ft)	Status	Hydraulic Jump	Unfilled Depth (ft)	Surcharge Depth (ft)
1	3	319.000	0.000	0.000	0.000	309.620	Not Full	No	9.380	1.620
2	7	319.000	0.617	0.630	0.000	310.483	Not Full	No	8.517	1.936
3	AIRJC	1,388.000	0.573	0.584	0.000	427.462	Not Full	No	960.538	45.129
4	BOUJC	1,326.000	0.069	0.070	0.000	391.099	Not Full	No	934.901	68.266
5	GT-11	318.770	0.000	0.000	0.000	311.116	Not Full	No	7.654	1.279
6	GT-12	320.020	0.000	0.000	0.000	311.894	Not Full	No	8.126	1.987
7	GT-13	319.700	0.178	0.182	0.000	312.740	Not Full	No	6.960	2.283
8	GT-14	320.100	0.000	0.000	0.000	313.291	Not Full	No	6.809	2.404
9	GT-15	319.890	0.000	0.000	0.000	313.778	Not Full	No	6.112	2.552
10	GT-16	319.600	0.000	0.000	0.000	314.354	Not Full	No	5.246	2.858
11	GT-17	319.380	0.225	0.230	0.000	314.882	Not Full	No	4.498	3.276
12	GT-18	319.630	0.000	0.000	0.000	315.178	Not Full	No	4.452	2.691
13	GT-19	319.980	0.000	0.000	0.000	315.721	Not Full	No	4.259	2.865
14	GT-20	320.040	0.000	0.000	0.000	316.250	Not Full	No	3.790	2.783
15	GT-21	319.140	0.038	0.039	0.000	316.908	Not Full	No	2.232	2.552
16	GT-23	319.200	0.000	0.000	0.000	317.772	Not Full	No	1.428	2.395
17	GT-24	319.800	0.042	0.043	0.000	318.362	Not Full	No	1.438	2.705
18	GT-25	319.390	0.000	0.000	0.000	319.390	Full	No	0.000	3.277
19	GT-26	321.400	0.000	0.000	0.000	321.400	Full	No	0.000	3.177
20	GT-27	324.460	0.000	0.000	0.000	323.807	Not Full	No	0.653	3.384
21	GT-28	329.160	0.022	0.023	0.000	326.739	Not Full	No	2.421	3.796
22	GT-29STP	329.780	0.082	0.084	0.000	329.780	Full	Yes	0.000	3.767
23	GT-30	334.390	0.000	0.000	0.000	332.302	Not Full	No	2.088	2.299
24	GT-31	361.520	0.000	0.000	0.000	357.536	Not Full	No	3.984	-0.398
25	GT-32	381.730	0.038	0.039	0.000	377.061	Not Full	No	4.669	-0.362
26	GT-34PLUM	1,422.500	0.417	0.425	0.000	416.763	Not Full	No	1,005.737	0.000
27	NORJC	1,386.980	0.628	0.641	0.000	428.976	Not Full	No	958.004	51.953
28	SUDLMH	368.000	0.000	0.000	0.000	358.040	Not Full	No	9.960	2.077

		ID	Flow (cfs)	Grade (ft)
1		5	2.988	305.351

		ID	From ID	To ID	Flow (gpm)	Head Increase (ft)	Power (hp)	Usage	Speed
1		CAB	SPCAB	CABLE	1,000.000	0.000	0.000	1.000	1.000
2		SUDPUMP	SPSUD	SUDJC	500.000	29.888	3.778	1.000	1.000

		ID	Grade (ft)
1		SPCAB	310.330
2		SPSUD	358.040

DB Table - 'Manhole Modeling Data'

		ID (Char)	DIAMETER (Num)	RIM_ELEV (Num)	HEADLOSS (Num)	LOAD1 (Num)
1		1	4.000	316.000	0.000	0.000
2		NT38	4.000	345.000	0.750	0.000
3		NT-37	4.000	346.000	0.750	0.000
4		NT-33	4.000	349.500	0.750	15.000
5		NT-32	4.000	353.000	0.750	0.000
6		NT-31	4.000	352.000	0.750	0.000
7		NT-28	4.000	352.000	0.750	18.000
8		NT-25	4.000	348.500	0.750	0.000
9		NT-24	4.000	349.000	0.750	0.000
10		NT-22	4.000	348.000	0.750	0.000
11		NT-21	4.000	352.000	0.750	0.000
12		NT-19	4.000	350.000	0.750	0.000
13		NT-18	4.000	345.500	0.750	21.000
14		NT-17	4.000	340.000	0.750	0.000
15		NT-16	4.000	338.000	0.750	18.000
16		NT-14	4.000	336.000	0.750	0.000
17		NT-12	4.000	329.500	0.750	0.000
18		NT-11	4.000	328.000	0.750	0.000
19		NT-10	4.000	325.500	0.750	0.000
20		NT-9	4.000	326.500	0.750	0.000
21		NT-8	4.000	330.500	0.750	14.000
22		NT-7	4.000	324.000	0.750	0.000
23		NT-6	4.000	331.000	0.750	0.000
24		NT-5	4.000	325.500	0.750	0.000
25		NT-4	4.000	316.500	0.750	0.000
26		NT-3	4.000	317.000	0.750	0.000
27		NT-2	4.000	324.500	0.750	50.000
28		NT-1	4.000	325.000	0.750	11.000
29		COB-01	4.000	325.000	0.000	0.000
30		FM-01	4.000	325.000	0.750	0.000
31		NA-2	4.000	322.000	0.750	224.000

DB Table - 'Manhole Modeling Data'

	ID (Char)	TYPE1 (Num)	PATTERN1 (Char)	COVERAGE1 (Num)
1	1	0: Unpeakable		0.000
2	NT38	1: Peakable Base		0.000
3	NT-37	1: Peakable Base		0.000
4	NT-33	1: Peakable Base		0.000
5	NT-32	1: Peakable Base		0.000
6	NT-31	1: Peakable Base		0.000
7	NT-28	1: Peakable Base		0.000
8	NT-25	1: Peakable Base		0.000
9	NT-24	1: Peakable Base		0.000
10	NT-22	1: Peakable Base		0.000
11	NT-21	1: Peakable Base		0.000
12	NT-19	1: Peakable Base		0.000
13	NT-18	1: Peakable Base		0.000
14	NT-17	1: Peakable Base		0.000
15	NT-16	1: Peakable Base		0.000
16	NT-14	1: Peakable Base		0.000
17	NT-12	1: Peakable Base		0.000
18	NT-11	1: Peakable Base		0.000
19	NT-10	1: Peakable Base		0.000
20	NT-9	1: Peakable Base		0.000
21	NT-8	1: Peakable Base		0.000
22	NT-7	1: Peakable Base		0.000
23	NT-6	1: Peakable Base		0.000
24	NT-5	1: Peakable Base		0.000
25	NT-4	1: Peakable Base		0.000
26	NT-3	1: Peakable Base		0.000
27	NT-2	1: Peakable Base		0.000
28	NT-1	1: Peakable Base		0.000
29	COB-01	0: Unpeakable		0.000
30	FM-01	1: Peakable Base		0.000
31	NA-2	0: Unpeakable		0.000

DB Table - 'Manhole Modeling Data'

		ID (Char)	LOAD2 (Num)	TYPE2 (Num)	PATTERN2 (Char)
1		1	0.000	0: Unpeakable	
2		NT38	0.000	0: Unpeakable	
3		NT-37	0.000	0: Unpeakable	
4		NT-33	-4.000	0: Unpeakable	
5		NT-32	0.000	0: Unpeakable	
6		NT-31	0.000	0: Unpeakable	
7		NT-28	-4.000	0: Unpeakable	
8		NT-25	0.000	0: Unpeakable	
9		NT-24	0.000	0: Unpeakable	
10		NT-22	0.000	0: Unpeakable	
11		NT-21	0.000	0: Unpeakable	
12		NT-19	0.000	0: Unpeakable	
13		NT-18	-5.000	0: Unpeakable	
14		NT-17	0.000	0: Unpeakable	
15		NT-16	-5.000	0: Unpeakable	
16		NT-14	0.000	0: Unpeakable	
17		NT-12	0.000	0: Unpeakable	
18		NT-11	0.000	0: Unpeakable	
19		NT-10	0.000	0: Unpeakable	
20		NT-9	0.000	0: Unpeakable	
21		NT-8	-3.000	0: Unpeakable	
22		NT-7	0.000	0: Unpeakable	
23		NT-6	0.000	0: Unpeakable	
24		NT-5	0.000	0: Unpeakable	
25		NT-4	0.000	0: Unpeakable	
26		NT-3	0.000	0: Unpeakable	
27		NT-2	-12.000	0: Unpeakable	
28		NT-1	-3.000	0: Unpeakable	
29		COB-01	0.000	0: Unpeakable	
30		FM-01	0.000	0: Unpeakable	
31		NA-2	-56.000	0: Unpeakable	

DB Table - 'Manhole Modeling Data'

		ID (Char)	COVERAGE2 (Num)
1		1	0.000
2		NT38	0.000
3		NT-37	0.000
4		NT-33	0.000
5		NT-32	0.000
6		NT-31	0.000
7		NT-28	0.000
8		NT-25	0.000
9		NT-24	0.000
10		NT-22	0.000
11		NT-21	0.000
12		NT-19	0.000
13		NT-18	0.000
14		NT-17	0.000
15		NT-16	0.000
16		NT-14	0.000
17		NT-12	0.000
18		NT-11	0.000
19		NT-10	0.000
20		NT-9	0.000
21		NT-8	0.000
22		NT-7	0.000
23		NT-6	0.000
24		NT-5	0.000
25		NT-4	0.000
26		NT-3	0.000
27		NT-2	0.000
28		NT-1	0.000
29		COB-01	0.000
30		FM-01	0.000
31		NA-2	0.000

North Shore model - DB Table - 'Manhole'

		ID (Char)	DESCRIPT (Char)	TYPE (Num)	ELEVATION (Num)	YR_INST (Num)	YR_RETIRE (Num)	ZONE (Char)	PHASE (Num)
1		1	Agate Bay PS - simulated MH	1: Chamber	294.000				
2		NT38	Gravity Manhole	0: Loading	340.250				
3		NT-37	Gravity Manhole	0: Loading	339.890				
4		NT-33	Gravity Manhole	0: Loading	338.310				
5		NT-32	EDGEWOOD LANE Load Gravity Manhole	0: Loading	338.460				
6		NT-31	Gravity Manhole	0: Loading	337.920				
7		NT-28	E21 PL ST Load Manhole	0: Loading	336.470				
8		NT-25	Gravity Manhole	0: Loading	335.420				
9		NT-24	Gravity Manhole	0: Loading	335.120				
10		NT-22	Gravity Manhole	0: Loading	334.360				
11		NT-21	Gravity Manhole	0: Loading	333.930				
12		NT-19	Gravity Manhole	0: Loading	333.380				
13		NT-18	Dellesta PS Load Manhole	0: Loading	332.800				
14		NT-17	Gravity Manhole	0: Loading	332.210				
15		NT-16	Gravity Manhole	0: Loading	330.410				
16		NT-14	Gravity Manhole	0: Loading	328.420				
17		NT-12	Gravity Manhole	0: Loading	322.900				
18		NT-11	Gravity Manhole	0: Loading	321.900				
19		NT-10	Gravity Manhole	0: Loading	318.900				
20		NT-9	Gravity Manhole	0: Loading	315.570				
21		NT-8	Gravity Manhole	0: Loading	315.420				
22		NT-7	Gravity Manhole	0: Loading	315.030				
23		NT-6	Gravity Manhole	0: Loading	314.580				
24		NT-5	Gravity Manhole	0: Loading	313.980				
25		NT-4	Gravity Manhole	0: Loading	313.580				
26		NT-3	Gravity Manhole	0: Loading	312.990				
27		NT-2	Gravity Manhole	0: Loading	312.710				
28		NT-1	Edgewater PS Load Manhole	0: Loading	312.140				
29		COB-01	Bellingham Manhole	2: Outlet	312.000				
30		FM-01	Flow Meter MH (For Modeling Purposes)	0: Loading	312.060				
31		NA-2	Loading Manhole	0: Loading	302.000				

North Shore model - DB Table - 'Pipe Modeling Data'

	ID (Char)	FROM_INV (Num)	TO_INV (Num)	LENGTH (Num)	DIAMETER (Num)	COEFF (Num)	PARALLEL (Num)
1	2	300.000	340.300	5,905.000	8.000	90.000	
2	3	340.250	339.940	240.000	15.000	0.013	
3	4	339.890	338.510	810.000	15.000	0.013	
4	5	338.460	338.360	68.000	15.000	0.013	
5	6	338.310	337.970	227.000	15.000	0.013	
6	7	337.920	336.520	892.000	15.000	0.013	
7	8	336.470	335.470	598.000	15.000	0.013	
8	9	335.420	335.170	136.000	15.000	0.013	
9	10	335.120	334.400	460.000	15.000	0.013	
10	11	334.360	334.040	199.000	15.000	0.013	
11	12	333.930	333.430	296.500	15.000	0.013	
12	13	333.380	332.850	331.500	16.000	0.013	
13	14	332.800	332.260	386.500	15.000	0.013	
14	15	332.210	330.510	294.500	12.000	0.013	
15	16	330.410	328.520	268.000	12.000	0.013	
16	17	328.420	323.000	652.500	12.000	0.013	
17	18	322.900	322.000	221.500	12.000	0.013	
18	19	321.900	319.000	296.000	12.000	0.013	
19	20	318.980	315.620	325.000	12.000	0.013	
20	21	315.570	315.470	63.000	15.000	0.013	
21	22	315.420	315.080	259.600	15.000	0.013	
22	23	315.030	314.630	230.000	15.000	0.013	
23	24	314.580	314.030	365.600	15.000	0.013	
24	25	313.980	313.630	235.600	16.000	0.013	
25	26	313.580	312.990	418.700	16.000	0.013	
26	27	312.990	312.710	253.000	15.000	0.013	
27	28	312.710	312.140	325.000	15.000	0.013	
28	29	312.250	312.060	32.000	12.000	0.013	
29	30	312.060	312.000	17.500	4.000	0.013	
30	32	302.000	300.110	254.000	10.000	0.013	

North Shore model - DB Table - 'Pipe'

		ID (Char)	DESCRIPT (Char)	TYPE (Num)	YR_INST (Num)	YR_RETIRE (Num)	ZONE (Char)	PHASE (Num)	MATERIAL (Char)	LINING (Char)	COST_ID (Char)
1		2	AGATE FORCE MAIN	1: Force	1978				Ductile Iron		
2		3	Gravity Pipe	0: Gravity					PVC		
3		4	Gravity Pipe	0: Gravity					PVC		
4		5	Gravity Pipe	0: Gravity					PVC		
5		6	Gravity Pipe	0: Gravity					PVC		
6		7	Gravity Pipe	0: Gravity					PVC		
7		8	Gravity Pipe	0: Gravity					PVC		
8		9	Gravity Pipe	0: Gravity					PVC		
9		10	Gravity Pipe	0: Gravity					PVC		
10		11	Gravity Pipe	0: Gravity					PVC		
11		12	Gravity Pipe	0: Gravity					PVC		
12		13	Gravity Pipe	0: Gravity					Ductile Iron		
13		14	Gravity Pipe	0: Gravity					PVC		
14		15	Gravity Pipe	0: Gravity					PVC		
15		16	Gravity Pipe	0: Gravity					PVC		
16		17	Gravity Pipe	0: Gravity					PVC		
17		18	Gravity Pipe	0: Gravity					PVC		
18		19	Gravity Pipe	0: Gravity					PVC		
19		20	Gravity Pipe	0: Gravity					PVC		
20		21	Gravity Pipe	0: Gravity					PVC		
21		22	Gravity Pipe	0: Gravity					PVC		
22		23	Gravity Pipe	0: Gravity					PVC		
23		24	Gravity Pipe	0: Gravity					PVC		
24		25	Gravity Pipe	0: Gravity					Ductile Iron		
25		26	Gravity Pipe	0: Gravity					Ductile Iron		
26		27	Gravity Pipe	0: Gravity					PVC		
27		28	Gravity Pipe	0: Gravity					PVC		
28		29	Gravity Pipe	0: Gravity					PVC		
29		30	Gravity Pipe	0: Gravity					Ductile Iron		
30		32	Gravity Loading Pipe	0: Gravity							

		ID (Char)	TYPE (Num)	PARALLEL (Num)	CAPACITY (Num)	SHUT_HEAD (Num)	DSGN_HEAD (Num)	DSGN_FLOW (Num)	HIGH_HEAD (Num)	HIGH_FLOW (Num)
1		AGATE	2: Exponential 3-Point Curve		350.000	86.000	72.000	350.000	43.000	1,000.000

		ID (Char)	DESCRIPT (Char)	YR_INST (Num)	YR_RETIRE (Num)	ZONE (Char)	RATED_PWR (Num)	COST_ID (Char)	PHASE (Num)
1		AGATE	Pump - top-mount S&I	1977			15.000		

		ID (Char)	TYPE (Num)	BTM_ELEV (Num)	HEADLOSS (Num)	MIN_LEVEL (Num)	MAX_LEVEL (Num)	INIT_LEVEL (Num)	DIAMETER (Num)	CURVE (Char)
1		SPAGA	0: Cylindrical	294.000	0.750	2.000	6.000	5.500	10.000	

North Shore model - Existing - Simulation Report

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*******************************************************
*     Computer Modeling for Design and Planning       *
*               of Sanitary Sewer Systems             *
*                    Innovyze, Inc.                   *
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[Title]

[Summary]

Number of loading manholes	:	29
Number of outlets	:	1
Number of junction chambers	:	1
Number of wet wells	:	1
Number of pipes	:	29
Number of force-mains	:	1
Number of pumps	:	1

[Loading Manholes]

Manhole ID	Base Flow	Storm Load	Total Flow
NA-2	114.0000	0.0000	114.0000
NT-1	11.0000	0.0000	11.0000
NT-16	14.0000	0.0000	14.0000
NT-18	20.0000	0.0000	20.0000
NT-2	46.0000	0.0000	46.0000
NT-28	17.0000	0.0000	17.0000
NT-33	14.0000	0.0000	14.0000
NT-8	13.0000	0.0000	13.0000
FM-01	0.0000	0.0000	0.0000
NT-10	0.0000	0.0000	0.0000
NT-11	0.0000	0.0000	0.0000
NT-12	0.0000	0.0000	0.0000
NT-14	0.0000	0.0000	0.0000
NT-17	0.0000	0.0000	0.0000
NT-19	0.0000	0.0000	0.0000
NT-21	0.0000	0.0000	0.0000
NT-22	0.0000	0.0000	0.0000
NT-24	0.0000	0.0000	0.0000
NT-25	0.0000	0.0000	0.0000
NT-3	0.0000	0.0000	0.0000
NT-31	0.0000	0.0000	0.0000
NT-32	0.0000	0.0000	0.0000

NT-37	0.0000	0.0000	0.0000
NT-4	0.0000	0.0000	0.0000
NT-5	0.0000	0.0000	0.0000
NT-6	0.0000	0.0000	0.0000
NT-7	0.0000	0.0000	0.0000
NT-9	0.0000	0.0000	0.0000
NT38	0.0000	0.0000	0.0000

[Pipes]

Pipe ID	UnPeak Flow	Peak Flow	From ID	Cover Flow	I/I Flow	Flow Veloc	To ID	Actual d/D	Flow Depth	Froude Number	Pipe Count	Pipe Crit slope	Pipe Full Depth	Total Diam Flow	Cover Flow Count	Storm Load
10	114.00	31.00	NT-24	0.00	0.00	1.43	NT-22	0.24	0.30	0.55	1	0.002	15.00	145.00	0.00	0.00
11	114.00	31.00	NT-22	0.00	0.00	1.44	NT-21	0.24	0.30	0.55	1	0.002	15.00	145.00	0.00	0.00
12	114.00	31.00	NT-21	0.00	0.00	1.47	NT-19	0.24	0.29	0.57	1	0.002	15.00	145.00	0.00	0.00
13	114.00	31.00	NT-19	0.00	0.00	1.43	NT-18	0.22	0.29	0.56	1	0.002	16.00	145.00	0.00	0.00
14	114.00	51.00	NT-18	0.00	0.00	1.42	NT-17	0.26	0.33	0.52	1	0.001	15.00	165.00	0.00	0.00
15	114.00	51.00	NT-17	0.00	0.00	2.41	NT-16	0.25	0.25	1.01	1	0.006	12.00	165.00	0.00	0.00
16	114.00	65.00	NT-16	0.00	0.00	2.65	NT-14	0.25	0.25	1.12	1	0.007	12.00	179.00	0.00	0.00
17	114.00	65.00	NT-14	0.00	0.00	2.81	NT-12	0.24	0.24	1.21	1	0.008	12.00	179.00	0.00	0.00
18	114.00	65.00	NT-12	0.00	0.00	2.18	NT-11	0.28	0.28	0.85	1	0.004	12.00	179.00	0.00	0.00
19	114.00	65.00	NT-11	0.00	0.00	2.98	NT-10	0.23	0.23	1.31	1	0.010	12.00	179.00	0.00	0.00
20	114.00	65.00	NT-10	0.00	0.00	3.04	NT-9	0.22	0.22	1.35	1	0.010	12.00	179.00	0.00	0.00
21	114.00	65.00	NT-9	0.00	0.00	1.53	NT-8	0.27	0.33	0.55	1	0.002	15.00	179.00	0.00	0.00
22	114.00	78.00	NT-8	0.00	0.00	1.45	NT-7	0.29	0.36	0.50	1	0.001	15.00	192.00	0.00	0.00
23	114.00	78.00	NT-7	0.00	0.00	1.61	NT-6	0.27	0.34	0.58	1	0.002	15.00	192.00	0.00	0.00
24	114.00	78.00	NT-6	0.00	0.00	1.53	NT-5	0.28	0.35	0.54	1	0.002	15.00	192.00	0.00	0.00
25	114.00	78.00	NT-5	0.00	0.00	1.51	NT-4	0.26	0.34	0.54	1	0.001	16.00	192.00	0.00	0.00

26		NT-4			NT-3			1	0.001	16.00	192.00	0.00	
114.00	78.00	0.00	0.00	1.48	0.26	0.35	0.53	0.25	1296.20	0.00			
27		NT-3			NT-2			1	0.001	15.00	192.00	0.00	
114.00	78.00	0.00	0.00	1.37	0.30	0.38	0.46	0.25	967.10	0.00			
28		NT-2			NT-1			1	0.002	15.00	238.00	0.00	
114.00	124.00	0.00	0.00	1.71	0.30	0.37	0.58	0.28	1217.44	0.00			
29		NT-1			FM-01			1	0.006	12.00	249.00	0.00	
114.00	135.00	0.00	0.00	2.74	0.30	0.30	1.03	0.31	1235.45	0.00			
3		NT38			NT-37			1	0.001	15.00	114.00	0.00	
114.00	0.00	0.00	0.00	1.24	0.22	0.28	0.50	0.19	1044.78	0.00			
30		FM-01			COB-01			1	0.003	4.00	249.00	0.00	
114.00	135.00	0.00	0.00	6.36	1.00	0.33	1.94	0.19	50.15	0.00			
32		NA-2			SPAGA			1	0.007	10.00	114.00	0.00	
114.00	0.00	0.00	0.00	2.42	0.25	0.21	1.12	0.22	850.52	0.00			
4		NT-37			NT-33			1	0.002	15.00	114.00	0.00	
114.00	0.00	0.00	0.00	1.37	0.21	0.26	0.57	0.19	1199.91	0.00			
5		NT-32			NT-33			1	0.001	15.00	0.00	0.00	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1114.80	0.00			
6		NT-33			NT-31			1	0.001	15.00	128.00	0.00	
114.00	14.00	0.00	0.00	1.36	0.23	0.28	0.53	0.21	1125.07	0.00			
7		NT-31			NT-28			1	0.002	15.00	128.00	0.00	
114.00	14.00	0.00	0.00	1.38	0.23	0.28	0.55	0.21	1151.68	0.00			
8		NT-28			NT-25			1	0.002	15.00	145.00	0.00	
114.00	31.00	0.00	0.00	1.46	0.24	0.29	0.56	0.22	1188.78	0.00			
9		NT-25			NT-24			1	0.002	15.00	145.00	0.00	
114.00	31.00	0.00	0.00	1.51	0.23	0.29	0.59	0.22	1246.39	0.00			

[Force Mains]

Pipe ID	From ID	To ID	Pipe Diam	Pipe Flow	Pipe Vel.	Pipe Loss
2	1	NT38	8.00	114.00	2.24	30.526

[Pumps]

Pump ID	Wet Well ID	Manhole ID	Pump Type	Pump Count	Pump Flow	Pump Head
AGATE	SPAGA	1	Exponential 3-Point	1	350.18	71.99

North Shore model - Future - Simulation Report

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*******************************************************
*     Computer Modeling for Design and Planning       *
*               of Sanitary Sewer Systems             *
*                    Innovyze, Inc.                   *
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[Title]

[Summary]

Number of loading manholes	:	29
Number of outlets	:	1
Number of junction chambers	:	1
Number of wet wells	:	1
Number of pipes	:	29
Number of force-mains	:	1
Number of pumps	:	1

[Loading Manholes]

Manhole ID	Base Flow	Storm Load	Total Flow
NA-2	168.0000	0.0000	168.0000
NT-1	8.0000	0.0000	8.0000
NT-16	13.0000	0.0000	13.0000
NT-18	16.0000	0.0000	16.0000
NT-2	38.0000	0.0000	38.0000
NT-28	14.0000	0.0000	14.0000
NT-33	11.0000	0.0000	11.0000
NT-8	11.0000	0.0000	11.0000
FM-01	0.0000	0.0000	0.0000
NT-10	0.0000	0.0000	0.0000
NT-11	0.0000	0.0000	0.0000
NT-12	0.0000	0.0000	0.0000
NT-14	0.0000	0.0000	0.0000
NT-17	0.0000	0.0000	0.0000
NT-19	0.0000	0.0000	0.0000
NT-21	0.0000	0.0000	0.0000
NT-22	0.0000	0.0000	0.0000
NT-24	0.0000	0.0000	0.0000
NT-25	0.0000	0.0000	0.0000
NT-3	0.0000	0.0000	0.0000
NT-31	0.0000	0.0000	0.0000
NT-32	0.0000	0.0000	0.0000

NT-37	0.0000	0.0000	0.0000
NT-4	0.0000	0.0000	0.0000
NT-5	0.0000	0.0000	0.0000
NT-6	0.0000	0.0000	0.0000
NT-7	0.0000	0.0000	0.0000
NT-9	0.0000	0.0000	0.0000
NT38	0.0000	0.0000	0.0000

[Pipes]

Pipe ID	UnPeak Flow	Peak Flow	From ID	Cover Flow	I/I Flow	Flow Veloc	To ID	Actual d/D	Flow Depth	Froude Number	Pipe Count	Crit slope	Pipe Depth	Full Flow	Pipe Diam	Total Flow	Cover Count	Storm Load
10	160.00	33.00	NT-24	0.00	0.00	1.55	NT-22	0.28	0.35	0.55	1	0.002	0.25	1150.11	15.00	193.00	0.00	0.00
11	160.00	33.00	NT-22	0.00	0.00	1.57	NT-21	0.28	0.34	0.56	1	0.002	0.25	1165.74	15.00	193.00	0.00	0.00
12	160.00	33.00	NT-21	0.00	0.00	1.59	NT-19	0.27	0.34	0.57	1	0.002	0.25	1193.78	15.00	193.00	0.00	0.00
13	160.00	33.00	NT-19	0.00	0.00	1.55	NT-18	0.25	0.34	0.56	1	0.002	0.25	1380.68	16.00	193.00	0.00	0.00
14	155.00	54.00	NT-18	0.00	0.00	1.52	NT-17	0.30	0.37	0.52	1	0.001	0.27	1086.61	15.00	209.00	0.00	0.00
15	155.00	54.00	NT-17	0.00	0.00	2.58	NT-16	0.28	0.28	1.02	1	0.006	0.28	1218.16	12.00	209.00	0.00	0.00
16	150.00	72.00	NT-16	0.00	0.00	2.82	NT-14	0.27	0.27	1.12	1	0.007	0.29	1346.43	12.00	222.00	0.00	0.00
17	150.00	72.00	NT-14	0.00	0.00	2.99	NT-12	0.26	0.26	1.22	1	0.008	0.29	1461.27	12.00	222.00	0.00	0.00
18	150.00	72.00	NT-12	0.00	0.00	2.32	NT-11	0.32	0.32	0.85	1	0.004	0.29	1022.01	12.00	222.00	0.00	0.00
19	150.00	72.00	NT-11	0.00	0.00	3.17	NT-10	0.25	0.25	1.32	1	0.010	0.29	1586.99	12.00	222.00	0.00	0.00
20	150.00	72.00	NT-10	0.00	0.00	3.23	NT-9	0.25	0.25	1.36	1	0.010	0.29	1630.23	12.00	222.00	0.00	0.00
21	150.00	72.00	NT-9	0.00	0.00	1.62	NT-8	0.30	0.37	0.55	1	0.002	0.27	1158.19	15.00	222.00	0.00	0.00
22	147.00	86.00	NT-8	0.00	0.00	1.53	NT-7	0.32	0.40	0.50	1	0.001	0.28	1052.06	15.00	233.00	0.00	0.00
23	147.00	86.00	NT-7	0.00	0.00	1.70	NT-6	0.30	0.37	0.58	1	0.002	0.28	1212.32	15.00	233.00	0.00	0.00
24	147.00	86.00	NT-6	0.00	0.00	1.61	NT-5	0.31	0.39	0.54	1	0.002	0.28	1127.53	15.00	233.00	0.00	0.00
25	147.00	86.00	NT-5	0.00	0.00	1.60	NT-4	0.28	0.38	0.54	1	0.001	0.28	1330.89	16.00	233.00	0.00	0.00

26		NT-4			NT-3			1	0.001	16.00	233.00	0.00
147.00	86.00	0.00	0.00	1.57	0.29	0.38	0.53	0.28	1296.20	0.00		
27		NT-3			NT-2			1	0.001	15.00	233.00	0.00
147.00	86.00	0.00	0.00	1.44	0.33	0.42	0.46	0.28	967.10	0.00		
28		NT-2			NT-1			1	0.002	15.00	271.00	0.00
135.00	136.00	0.00	0.00	1.78	0.32	0.40	0.58	0.30	1217.44	0.00		
29		NT-1			FM-01			1	0.006	12.00	279.00	0.00
132.00	147.00	0.00	0.00	2.83	0.32	0.32	1.03	0.33	1235.45	0.00		
3		NT38			NT-37			1	0.001	15.00	168.00	0.00
168.00	0.00	0.00	0.00	1.39	0.27	0.34	0.50	0.24	1044.78	0.00		
30		FM-01			COB-01			1	0.003	4.00	279.00	0.00
132.00	147.00	0.00	0.00	7.12	1.00	0.33	2.17	0.19	50.15	0.00		
32		NA-2			SPAGA			1	0.007	10.00	168.00	0.00
168.00	0.00	0.00	0.00	2.70	0.30	0.25	1.12	0.27	850.52	0.00		
4		NT-37			NT-33			1	0.002	15.00	168.00	0.00
168.00	0.00	0.00	0.00	1.54	0.25	0.32	0.57	0.24	1199.91	0.00		
5		NT-32			NT-33			1	0.001	15.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1114.80	0.00		
6		NT-33			NT-31			1	0.001	15.00	179.00	0.00
164.00	15.00	0.00	0.00	1.49	0.27	0.34	0.54	0.25	1125.07	0.00		
7		NT-31			NT-28			1	0.002	15.00	179.00	0.00
164.00	15.00	0.00	0.00	1.52	0.27	0.33	0.55	0.25	1151.68	0.00		
8		NT-28			NT-25			1	0.002	15.00	193.00	0.00
160.00	33.00	0.00	0.00	1.59	0.27	0.34	0.57	0.25	1188.78	0.00		
9		NT-25			NT-24			1	0.002	15.00	193.00	0.00
160.00	33.00	0.00	0.00	1.64	0.27	0.33	0.59	0.25	1246.39	0.00		

[Force Mains]

Pipe ID	From ID	To ID	Pipe Diam	Pipe Flow	Pipe Vel.	Pipe Loss
2	1	NT38	8.00	168.00	2.24	30.526

[Pumps]

Pump ID	Wet Well ID	Manhole ID	Pump Type	Pump Count	Pump Flow	Pump Head
AGATE	SPAGA	1	Exponential 3-Point	1	350.18	71.99

North Shore model - Future Max Cap - Simulation Report

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*******************************************************
*     Computer Modeling for Design and Planning       *
*               of Sanitary Sewer Systems             *
*                    Innovyze, Inc.                   *
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[Title]

[Summary]

Number of loading manholes	:	29
Number of outlets	:	1
Number of junction chambers	:	1
Number of wet wells	:	1
Number of pipes	:	29
Number of force-mains	:	1
Number of pumps	:	1

[Loading Manholes]

Manhole ID	Base Flow	Storm Load	Total Flow
NA-2	168.0000	0.0000	215.0400
NT-1	8.0000	0.0000	10.2400
NT-16	13.0000	0.0000	16.6400
NT-18	16.0000	0.0000	20.4800
NT-2	38.0000	0.0000	48.6400
NT-28	14.0000	0.0000	17.9200
NT-33	11.0000	0.0000	14.0800
NT-8	11.0000	0.0000	14.0800
FM-01	0.0000	0.0000	0.0000
NT-10	0.0000	0.0000	0.0000
NT-11	0.0000	0.0000	0.0000
NT-12	0.0000	0.0000	0.0000
NT-14	0.0000	0.0000	0.0000
NT-17	0.0000	0.0000	0.0000
NT-19	0.0000	0.0000	0.0000
NT-21	0.0000	0.0000	0.0000
NT-22	0.0000	0.0000	0.0000
NT-24	0.0000	0.0000	0.0000
NT-25	0.0000	0.0000	0.0000
NT-3	0.0000	0.0000	0.0000
NT-31	0.0000	0.0000	0.0000
NT-32	0.0000	0.0000	0.0000

NT-37	0.0000	0.0000	0.0000
NT-4	0.0000	0.0000	0.0000
NT-5	0.0000	0.0000	0.0000
NT-6	0.0000	0.0000	0.0000
NT-7	0.0000	0.0000	0.0000
NT-9	0.0000	0.0000	0.0000
NT38	0.0000	0.0000	0.0000

[Pipes]

Pipe ID	UnPeak Flow	Peak Flow	From ID	Cover Flow	I/I Flow	Flow Veloc	To ID	Actual d/D	Flow Depth	Froude Number	Pipe Count	Crit slope	Pipe Depth	Full Flow	Pipe Diam	Total Flow	Cover Count	Storm Load
10			NT-24				NT-22				1	0.002	15.00		247.04			0.00
	204.80	42.24		0.00	0.00	1.66		0.31	0.39	0.55			0.29	1150.11		0.00		
11			NT-22				NT-21				1	0.002	15.00		247.04			0.00
	204.80	42.24		0.00	0.00	1.68		0.31	0.39	0.56			0.29	1165.74		0.00		
12			NT-21				NT-19				1	0.002	15.00		247.04			0.00
	204.80	42.24		0.00	0.00	1.71		0.31	0.39	0.57			0.29	1193.78		0.00		
13			NT-19				NT-18				1	0.002	16.00		247.04			0.00
	204.80	42.24		0.00	0.00	1.67		0.29	0.38	0.56			0.28	1380.68		0.00		
14			NT-18				NT-17				1	0.001	15.00		267.52			0.00
	198.40	69.12		0.00	0.00	1.63		0.34	0.42	0.52			0.30	1086.61		0.00		
15			NT-17				NT-16				1	0.006	12.00		267.52			0.00
	198.40	69.12		0.00	0.00	2.77		0.32	0.32	1.02			0.32	1218.16		0.00		
16			NT-16				NT-14				1	0.007	12.00		284.16			0.00
	192.00	92.16		0.00	0.00	3.03		0.31	0.31	1.12			0.33	1346.43		0.00		
17			NT-14				NT-12				1	0.008	12.00		284.16			0.00
	192.00	92.16		0.00	0.00	3.21		0.30	0.30	1.22			0.33	1461.27		0.00		
18			NT-12				NT-11				1	0.004	12.00		284.16			0.00
	192.00	92.16		0.00	0.00	2.48		0.36	0.36	0.85			0.33	1022.01		0.00		
19			NT-11				NT-10				1	0.010	12.00		284.16			0.00
	192.00	92.16		0.00	0.00	3.41		0.29	0.29	1.32			0.33	1586.99		0.00		
20			NT-10				NT-9				1	0.010	12.00		284.16			0.00
	192.00	92.16		0.00	0.00	3.47		0.28	0.28	1.36			0.33	1630.23		0.00		
21			NT-9				NT-8				1	0.002	15.00		284.16			0.00
	192.00	92.16		0.00	0.00	1.74		0.34	0.42	0.55			0.31	1158.19		0.00		
22			NT-8				NT-7				1	0.001	15.00		298.24			0.00
	188.16	110.08		0.00	0.00	1.64		0.36	0.46	0.50			0.32	1052.06		0.00		
23			NT-7				NT-6				1	0.002	15.00		298.24			0.00
	188.16	110.08		0.00	0.00	1.82		0.34	0.42	0.58			0.32	1212.32		0.00		
24			NT-6				NT-5				1	0.002	15.00		298.24			0.00
	188.16	110.08		0.00	0.00	1.73		0.35	0.44	0.54			0.32	1127.53		0.00		
25			NT-5				NT-4				1	0.001	16.00		298.24			0.00
	188.16	110.08		0.00	0.00	1.71		0.32	0.43	0.54			0.31	1330.89		0.00		

26		NT-4			NT-3			1	0.001	16.00	298.24	0.00
188.16	110.08	0.00	0.00	1.68	0.33	0.43	0.53	0.31	1296.20	0.00		
27		NT-3			NT-2			1	0.001	15.00	298.24	0.00
188.16	110.08	0.00	0.00	1.55	0.38	0.48	0.46	0.32	967.10	0.00		
28		NT-2			NT-1			1	0.002	15.00	346.88	0.00
172.80	174.08	0.00	0.00	1.91	0.37	0.46	0.58	0.34	1217.44	0.00		
29		NT-1			FM-01			1	0.006	12.00	357.12	0.00
168.96	188.16	0.00	0.00	3.03	0.37	0.37	1.02	0.37	1235.45	0.00		
3		NT38			NT-37			1	0.001	15.00	215.04	0.00
215.04	0.00	0.00	0.00	1.49	0.31	0.38	0.50	0.27	1044.78	0.00		
30		FM-01			COB-01			1	0.003	4.00	357.12	0.00
168.96	188.16	0.00	0.00	9.12	1.00	0.33	2.78	0.19	50.15	0.00		
32		NA-2			SPAGA			1	0.007	10.00	215.04	0.00
215.04	0.00	0.00	0.00	2.90	0.34	0.29	1.12	0.30	850.52	0.00		
4		NT-37			NT-33			1	0.002	15.00	215.04	0.00
215.04	0.00	0.00	0.00	1.65	0.29	0.36	0.57	0.27	1199.91	0.00		
5		NT-32			NT-33			1	0.001	15.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1114.80	0.00		
6		NT-33			NT-31			1	0.001	15.00	229.12	0.00
209.92	19.20	0.00	0.00	1.60	0.31	0.38	0.54	0.28	1125.07	0.00		
7		NT-31			NT-28			1	0.002	15.00	229.12	0.00
209.92	19.20	0.00	0.00	1.63	0.30	0.38	0.55	0.28	1151.68	0.00		
8		NT-28			NT-25			1	0.002	15.00	247.04	0.00
204.80	42.24	0.00	0.00	1.70	0.31	0.39	0.57	0.29	1188.78	0.00		
9		NT-25			NT-24			1	0.002	15.00	247.04	0.00
204.80	42.24	0.00	0.00	1.76	0.30	0.38	0.60	0.29	1246.39	0.00		

[Force Mains]

Pipe ID	From ID	To ID	Pipe Diam	Pipe Flow	Pipe Vel.	Pipe Loss
2	1	NT38	8.00	215.04	2.24	30.526

[Pumps]

Pump ID	Wet Well ID	Manhole ID	Pump Type	Pump Count	Pump Flow	Pump Head
AGATE	SPAGA	1	Exponential 3-Point	1	350.18	71.99

		ID	Grade (ft)
1		1	371.492

		ID	From ID	To ID	Diameter (in)	Length (ft)	Total Flow (gpm)	Unpeakable Flow (gpm)	Peakable Flow (gpm)	Coverage Flow (gpm)	Infiltration Flow (gpm)	Storm Flow (gpm)	Velocity (ft/s)	Headloss (ft)
1		2	1	NT38	8.000	5,905.000	114.000	114.000	0.000	0.000	0.000	0.000	2.235	30.526

		ID	From ID	To ID	Diameter (in)	Length (ft)	Slope	Total Flow (gpm)	Unpeakable Flow (gpm)	Peakable Flow (gpm)	Coverage Flow (gpm)	Infiltration Flow (gpm)
1		10	NT-24	NT-22	15.000	460.000	0.002	145.000	114.000	31.000	0.000	0.000
2		11	NT-22	NT-21	15.000	199.000	0.002	145.000	114.000	31.000	0.000	0.000
3		12	NT-21	NT-19	15.000	296.500	0.002	145.000	114.000	31.000	0.000	0.000
4		13	NT-19	NT-18	16.000	331.500	0.002	145.000	114.000	31.000	0.000	0.000
5		14	NT-18	NT-17	15.000	386.500	0.001	165.000	114.000	51.000	0.000	0.000
6		15	NT-17	NT-16	12.000	294.500	0.006	165.000	114.000	51.000	0.000	0.000
7		16	NT-16	NT-14	12.000	268.000	0.007	179.000	114.000	65.000	0.000	0.000
8		17	NT-14	NT-12	12.000	652.500	0.008	179.000	114.000	65.000	0.000	0.000
9		18	NT-12	NT-11	12.000	221.500	0.004	179.000	114.000	65.000	0.000	0.000
10		19	NT-11	NT-10	12.000	296.000	0.010	179.000	114.000	65.000	0.000	0.000
11		20	NT-10	NT-9	12.000	325.000	0.010	179.000	114.000	65.000	0.000	0.000
12		21	NT-9	NT-8	15.000	63.000	0.002	179.000	114.000	65.000	0.000	0.000
13		22	NT-8	NT-7	15.000	259.600	0.001	192.000	114.000	78.000	0.000	0.000
14		23	NT-7	NT-6	15.000	230.000	0.002	192.000	114.000	78.000	0.000	0.000
15		24	NT-6	NT-5	15.000	365.600	0.002	192.000	114.000	78.000	0.000	0.000
16		25	NT-5	NT-4	16.000	235.600	0.001	192.000	114.000	78.000	0.000	0.000
17		26	NT-4	NT-3	16.000	418.700	0.001	192.000	114.000	78.000	0.000	0.000
18		27	NT-3	NT-2	15.000	253.000	0.001	192.000	114.000	78.000	0.000	0.000
19		28	NT-2	NT-1	15.000	325.000	0.002	238.000	114.000	124.000	0.000	0.000
20		29	NT-1	FM-01	12.000	32.000	0.006	249.000	114.000	135.000	0.000	0.000
21		3	NT38	NT-37	15.000	240.000	0.001	114.000	114.000	0.000	0.000	0.000
22		30	FM-01	COB-01	4.000	17.500	0.003	249.000	114.000	135.000	0.000	0.000
23		32	NA-2	SPAGA	10.000	254.000	0.007	114.000	114.000	0.000	0.000	0.000
24		4	NT-37	NT-33	15.000	810.000	0.002	114.000	114.000	0.000	0.000	0.000
25		5	NT-32	NT-33	15.000	68.000	0.001	0.000	0.000	0.000	0.000	0.000
26		6	NT-33	NT-31	15.000	227.000	0.001	128.000	114.000	14.000	0.000	0.000
27		7	NT-31	NT-28	15.000	892.000	0.002	128.000	114.000	14.000	0.000	0.000
28		8	NT-28	NT-25	15.000	598.000	0.002	145.000	114.000	31.000	0.000	0.000
29		9	NT-25	NT-24	15.000	136.000	0.002	145.000	114.000	31.000	0.000	0.000

		ID	Storm Flow (gpm)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude Number	Full Flow (gpm)	Coverage Count
1		10	0.000	Free Surface	1.428	0.240	0.126	0.300	0.220	0.547	1,150.109	0.000
2		11	0.000	Free Surface	1.442	0.238	0.124	0.298	0.220	0.554	1,165.735	0.000
3		12	0.000	Free Surface	1.467	0.235	0.121	0.294	0.220	0.567	1,193.780	0.000
4		13	0.000	Free Surface	1.429	0.219	0.105	0.292	0.216	0.556	1,380.676	0.000
5		14	0.000	Free Surface	1.424	0.263	0.152	0.329	0.235	0.518	1,086.610	0.000
6		15	0.000	Free Surface	2.413	0.249	0.135	0.249	0.250	1.013	1,218.157	0.000
7		16	0.000	Free Surface	2.653	0.246	0.133	0.246	0.261	1.120	1,346.434	0.000
8		17	0.000	Free Surface	2.812	0.236	0.122	0.236	0.261	1.213	1,461.272	0.000
9		18	0.000	Free Surface	2.180	0.283	0.175	0.283	0.261	0.853	1,022.012	0.000
10		19	0.000	Free Surface	2.982	0.227	0.113	0.227	0.261	1.315	1,586.992	0.000
11		20	0.000	Free Surface	3.039	0.224	0.110	0.224	0.261	1.350	1,630.232	0.000
12		21	0.000	Free Surface	1.525	0.266	0.155	0.332	0.245	0.552	1,158.194	0.000
13		22	0.000	Free Surface	1.453	0.289	0.183	0.362	0.254	0.502	1,052.055	0.000
14		23	0.000	Free Surface	1.608	0.269	0.158	0.336	0.254	0.578	1,212.321	0.000
15		24	0.000	Free Surface	1.527	0.279	0.170	0.349	0.254	0.538	1,127.534	0.000
16		25	0.000	Free Surface	1.510	0.257	0.144	0.342	0.250	0.540	1,330.890	0.000
17		26	0.000	Free Surface	1.482	0.260	0.148	0.347	0.250	0.526	1,296.195	0.000
18		27	0.000	Pressurized	1.368	0.302	0.199	0.378	0.254	0.462	967.097	0.000
19		28	0.000	Pressurized	1.715	0.300	0.195	0.375	0.284	0.581	1,217.439	0.000
20		29	0.000	Pressurized	2.742	0.305	0.202	0.305	0.309	1.031	1,235.445	0.000
21		3	0.000	Free Surface	1.244	0.223	0.109	0.279	0.195	0.495	1,044.785	0.000
22		30	0.000	Pressurized	6.357	1.000	4.965	0.333	0.187	1.940	50.146	0.000
23		32	0.000	Free Surface	2.419	0.247	0.134	0.206	0.218	1.116	850.517	0.000
24		4	0.000	Free Surface	1.372	0.208	0.095	0.260	0.195	0.566	1,199.910	0.000
25		5	0.000	Free Surface	0.000	0.000	0.000	0.000	0.000	0.000	1,114.800	0.000
26		6	0.000	Free Surface	1.356	0.228	0.114	0.285	0.207	0.534	1,125.066	0.000
27		7	0.000	Free Surface	1.379	0.225	0.111	0.281	0.207	0.546	1,151.683	0.000
28		8	0.000	Free Surface	1.462	0.236	0.122	0.295	0.220	0.565	1,188.778	0.000
29		9	0.000	Free Surface	1.512	0.230	0.116	0.288	0.220	0.591	1,246.385	0.000

		ID	Backwater Adjustment	Adjusted Depth (ft)	Adjusted Velocity (ft/s)
1		10	No	0.300	1.428
2		11	No	0.298	1.442
3		12	No	0.294	1.467
4		13	No	0.292	1.429
5		14	No	0.329	1.424
6		15	No	0.249	2.413
7		16	No	0.246	2.653
8		17	No	0.236	2.812
9		18	No	0.283	2.180
10		19	No	0.227	2.982
11		20	Yes	0.255	2.525
12		21	No	0.332	1.525
13		22	No	0.362	1.453
14		23	No	0.336	1.608
15		24	No	0.349	1.527
16		25	Yes	0.549	0.789
17		26	Yes	1.058	0.360
18		27	Yes	1.250	0.349
19		28	Yes	1.250	0.432
20		29	Yes	1.000	0.706
21		3	No	0.279	1.244
22		30	No	0.333	6.357
23		32	No	0.206	2.419
24		4	No	0.260	1.372
25		5	Yes	0.185	0.000
26		6	No	0.285	1.356
27		7	No	0.281	1.379
28		8	No	0.295	1.462
29		9	No	0.288	1.512

	ID	Rim Elevation (ft)	Base Flow (cfs)	Total Flow (cfs)	Storm Flow (cfs)	Grade (ft)	Status	Hydraulic Jump	Unfilled Depth (ft)	Surcharge Depth (ft)
1	FM-01	325.000	0.000	0.000	0.000	314.286	Not Full	No	10.714	1.892
2	NA-2	322.000	0.254	0.254	0.000	302.209	Not Full	No	19.791	-0.625
3	NT-1	325.000	0.025	0.025	0.000	314.299	Not Full	No	10.701	1.049
4	NT-10	325.500	0.000	0.000	0.000	319.207	Not Full	No	6.293	-0.773
5	NT-11	328.000	0.000	0.000	0.000	322.130	Not Full	No	5.870	-0.770
6	NT-12	329.500	0.000	0.000	0.000	323.186	Not Full	Yes	6.314	-0.714
7	NT-14	336.000	0.000	0.000	0.000	328.659	Not Full	No	7.341	-0.761
8	NT-16	338.000	0.031	0.031	0.000	330.659	Not Full	No	7.341	-0.751
9	NT-17	340.000	0.000	0.000	0.000	332.461	Not Full	No	7.539	-0.749
10	NT-18	345.500	0.045	0.045	0.000	333.130	Not Full	No	12.370	-0.920
11	NT-19	350.000	0.000	0.000	0.000	333.672	Not Full	No	16.328	-1.041
12	NT-2	324.500	0.102	0.102	0.000	314.323	Not Full	No	10.177	0.363
13	NT-21	352.000	0.000	0.000	0.000	334.225	Not Full	No	17.775	-0.955
14	NT-22	348.000	0.000	0.000	0.000	334.659	Not Full	No	13.341	-0.951
15	NT-24	349.000	0.000	0.000	0.000	335.421	Not Full	No	13.579	-0.949
16	NT-25	348.500	0.000	0.000	0.000	335.709	Not Full	No	12.791	-0.961
17	NT-28	352.000	0.038	0.038	0.000	336.766	Not Full	No	15.234	-0.954
18	NT-3	317.000	0.000	0.000	0.000	314.336	Not Full	No	2.664	0.096
19	NT-31	352.000	0.000	0.000	0.000	338.202	Not Full	No	13.798	-0.968
20	NT-32	353.000	0.000	0.000	0.000	338.595	Not Full	No	14.405	-1.115
21	NT-33	349.500	0.031	0.031	0.000	338.595	Not Full	No	10.905	-0.965
22	NT-37	346.000	0.000	0.000	0.000	340.151	Not Full	No	5.849	-0.989
23	NT-4	316.500	0.000	0.000	0.000	314.350	Not Full	No	2.150	-0.564
24	NT-5	325.500	0.000	0.000	0.000	314.358	Not Full	No	11.142	-0.955
25	NT-6	331.000	0.000	0.000	0.000	314.930	Not Full	No	16.070	-0.900
26	NT-7	324.000	0.000	0.000	0.000	315.368	Not Full	No	8.632	-0.912
27	NT-8	330.500	0.029	0.029	0.000	315.783	Not Full	No	14.717	-0.887
28	NT-9	326.500	0.000	0.000	0.000	315.903	Not Full	Yes	10.597	-0.917
29	NT38	345.000	0.000	0.000	0.000	345.000	Full	No	0.000	3.500

		ID	Flow (cfs)	Grade (ft)
1		COB-01	0.555	312.333

		ID	From ID	To ID	Flow (gpm)	Head Increase (ft)	Power (hp)	Usage	Speed
1		AGATE	SPAGA	1	350.182	71.992	6.373	1.000	1.000

		ID	Grade (ft)
1		SPAGA	299.500

		ID	Grade (ft)
1		1	371.492

		ID	From ID	To ID	Diameter (in)	Length (ft)	Total Flow (gpm)	Unpeakable Flow (gpm)	Peakable Flow (gpm)	Coverage Flow (gpm)	Infiltration Flow (gpm)	Storm Flow (gpm)	Velocity (ft/s)	Headloss (ft)
1		2	1	NT38	8.000	5,905.000	168.000	168.000	0.000	0.000	0.000	0.000	2.235	30.526

North Shore model - Future - Gravity Main Report

		ID	From ID	To ID	Diameter (in)	Length (ft)	Slope	Total Flow (gpm)	Unpeakable Flow (gpm)	Peakable Flow (gpm)	Coverage Flow (gpm)	Infiltration Flow (gpm)
1		10	NT-24	NT-22	15.000	460.000	0.002	193.000	160.000	33.000	0.000	0.000
2		11	NT-22	NT-21	15.000	199.000	0.002	193.000	160.000	33.000	0.000	0.000
3		12	NT-21	NT-19	15.000	296.500	0.002	193.000	160.000	33.000	0.000	0.000
4		13	NT-19	NT-18	16.000	331.500	0.002	193.000	160.000	33.000	0.000	0.000
5		14	NT-18	NT-17	15.000	386.500	0.001	209.000	155.000	54.000	0.000	0.000
6		15	NT-17	NT-16	12.000	294.500	0.006	209.000	155.000	54.000	0.000	0.000
7		16	NT-16	NT-14	12.000	268.000	0.007	222.000	150.000	72.000	0.000	0.000
8		17	NT-14	NT-12	12.000	652.500	0.008	222.000	150.000	72.000	0.000	0.000
9		18	NT-12	NT-11	12.000	221.500	0.004	222.000	150.000	72.000	0.000	0.000
10		19	NT-11	NT-10	12.000	296.000	0.010	222.000	150.000	72.000	0.000	0.000
11		20	NT-10	NT-9	12.000	325.000	0.010	222.000	150.000	72.000	0.000	0.000
12		21	NT-9	NT-8	15.000	63.000	0.002	222.000	150.000	72.000	0.000	0.000
13		22	NT-8	NT-7	15.000	259.600	0.001	233.000	147.000	86.000	0.000	0.000
14		23	NT-7	NT-6	15.000	230.000	0.002	233.000	147.000	86.000	0.000	0.000
15		24	NT-6	NT-5	15.000	365.600	0.002	233.000	147.000	86.000	0.000	0.000
16		25	NT-5	NT-4	16.000	235.600	0.001	233.000	147.000	86.000	0.000	0.000
17		26	NT-4	NT-3	16.000	418.700	0.001	233.000	147.000	86.000	0.000	0.000
18		27	NT-3	NT-2	15.000	253.000	0.001	233.000	147.000	86.000	0.000	0.000
19		28	NT-2	NT-1	15.000	325.000	0.002	271.000	135.000	136.000	0.000	0.000
20		29	NT-1	FM-01	12.000	32.000	0.006	279.000	132.000	147.000	0.000	0.000
21		3	NT38	NT-37	15.000	240.000	0.001	168.000	168.000	0.000	0.000	0.000
22		30	FM-01	COB-01	4.000	17.500	0.003	279.000	132.000	147.000	0.000	0.000
23		32	NA-2	SPAGA	10.000	254.000	0.007	168.000	168.000	0.000	0.000	0.000
24		4	NT-37	NT-33	15.000	810.000	0.002	168.000	168.000	0.000	0.000	0.000
25		5	NT-32	NT-33	15.000	68.000	0.001	0.000	0.000	0.000	0.000	0.000
26		6	NT-33	NT-31	15.000	227.000	0.001	179.000	164.000	15.000	0.000	0.000
27		7	NT-31	NT-28	15.000	892.000	0.002	179.000	164.000	15.000	0.000	0.000
28		8	NT-28	NT-25	15.000	598.000	0.002	193.000	160.000	33.000	0.000	0.000
29		9	NT-25	NT-24	15.000	136.000	0.002	193.000	160.000	33.000	0.000	0.000

		ID	Storm Flow (gpm)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude Number	Full Flow (gpm)
1		10	0.000	Free Surface	1.551	0.277	0.168	0.346	0.255	0.549	1,150.109
2		11	0.000	Free Surface	1.566	0.275	0.166	0.344	0.255	0.556	1,165.735
3		12	0.000	Free Surface	1.593	0.272	0.162	0.340	0.255	0.570	1,193.780
4		13	0.000	Free Surface	1.553	0.253	0.140	0.337	0.250	0.560	1,380.676
5		14	0.000	Free Surface	1.523	0.297	0.192	0.372	0.265	0.519	1,086.610
6		15	0.000	Free Surface	2.583	0.280	0.172	0.280	0.283	1.016	1,218.157
7		16	0.000	Free Surface	2.823	0.275	0.165	0.275	0.292	1.123	1,346.434
8		17	0.000	Free Surface	2.992	0.263	0.152	0.263	0.292	1.217	1,461.272
9		18	0.000	Free Surface	2.317	0.317	0.217	0.317	0.292	0.852	1,022.012
10		19	0.000	Free Surface	3.174	0.253	0.140	0.253	0.292	1.321	1,586.992
11		20	0.000	Free Surface	3.235	0.249	0.136	0.249	0.292	1.356	1,630.232
12		21	0.000	Free Surface	1.622	0.297	0.192	0.371	0.274	0.553	1,158.194
13		22	0.000	Free Surface	1.535	0.320	0.221	0.400	0.281	0.502	1,052.055
14		23	0.000	Free Surface	1.699	0.297	0.192	0.371	0.281	0.579	1,212.321
15		24	0.000	Free Surface	1.613	0.308	0.207	0.386	0.281	0.538	1,127.534
16		25	0.000	Free Surface	1.597	0.283	0.175	0.378	0.276	0.541	1,330.890
17		26	0.000	Free Surface	1.567	0.287	0.180	0.383	0.276	0.527	1,296.195
18		27	0.000	Pressurized	1.445	0.334	0.241	0.418	0.281	0.461	967.097
19		28	0.000	Pressurized	1.779	0.321	0.223	0.401	0.303	0.581	1,217.439
20		29	0.000	Pressurized	2.832	0.323	0.226	0.323	0.328	1.030	1,235.445
21		3	0.000	Free Surface	1.392	0.271	0.161	0.339	0.237	0.499	1,044.785
22		30	0.000	Pressurized	7.123	1.000	5.564	0.333	0.187	2.174	50.146
23		32	0.000	Free Surface	2.703	0.301	0.198	0.251	0.266	1.120	850.517
24		4	0.000	Free Surface	1.536	0.253	0.140	0.316	0.237	0.572	1,199.910
25		5	0.000	Free Surface	0.000	0.000	0.000	0.000	0.000	0.000	1,114.800
26		6	0.000	Free Surface	1.494	0.270	0.159	0.337	0.245	0.537	1,125.066
27		7	0.000	Free Surface	1.519	0.267	0.155	0.333	0.245	0.549	1,151.683
28		8	0.000	Free Surface	1.588	0.272	0.162	0.341	0.255	0.567	1,188.778
29		9	0.000	Free Surface	1.642	0.266	0.155	0.333	0.255	0.595	1,246.385

		ID	Coverage Count	Backwater Adjustment	Adjusted Depth (ft)	Adjusted Velocity (ft/s)
1		10	0.000	No	0.346	1.551
2		11	0.000	No	0.344	1.566
3		12	0.000	No	0.340	1.593
4		13	0.000	No	0.337	1.553
5		14	0.000	No	0.372	1.523
6		15	0.000	No	0.280	2.583
7		16	0.000	No	0.275	2.823
8		17	0.000	No	0.263	2.992
9		18	0.000	No	0.317	2.317
10		19	0.000	No	0.253	3.174
11		20	0.000	Yes	0.288	2.638
12		21	0.000	No	0.371	1.622
13		22	0.000	No	0.400	1.535
14		23	0.000	No	0.371	1.699
15		24	0.000	Yes	0.621	0.853
16		25	0.000	Yes	1.073	0.431
17		26	0.000	Yes	1.333	0.372
18		27	0.000	Yes	1.250	0.423
19		28	0.000	Yes	1.250	0.492
20		29	0.000	Yes	1.000	0.791
21		3	0.000	No	0.339	1.392
22		30	0.000	No	0.333	7.123
23		32	0.000	No	0.251	2.703
24		4	0.000	No	0.316	1.536
25		5	0.000	Yes	0.238	0.000
26		6	0.000	No	0.337	1.494
27		7	0.000	No	0.333	1.519
28		8	0.000	No	0.341	1.588
29		9	0.000	No	0.333	1.642

North Shore model - Future - Loading Manhole Report

		ID	Rim Elevation (ft)	Base Flow (cfs)	Total Flow (cfs)	Storm Flow (cfs)	Grade (ft)	Status	Hydraulic Jump	Unfilled Depth (ft)	Surcharge Depth (ft)
1		FM-01	325.000	0.000	0.000	0.000	314.784	Not Full	No	10.216	2.391
2		NA-2	322.000	0.374	0.374	0.000	302.257	Not Full	No	19.743	-0.577
3		NT-1	325.000	0.018	0.018	0.000	314.801	Not Full	No	10.199	1.551
4		NT-10	325.500	0.000	0.000	0.000	319.234	Not Full	No	6.266	-0.746
5		NT-11	328.000	0.000	0.000	0.000	322.157	Not Full	No	5.843	-0.743
6		NT-12	329.500	0.000	0.000	0.000	323.221	Not Full	Yes	6.279	-0.679
7		NT-14	336.000	0.000	0.000	0.000	328.688	Not Full	No	7.312	-0.732
8		NT-16	338.000	0.029	0.029	0.000	330.689	Not Full	No	7.311	-0.721
9		NT-17	340.000	0.000	0.000	0.000	332.494	Not Full	No	7.506	-0.716
10		NT-18	345.500	0.036	0.036	0.000	333.173	Not Full	No	12.327	-0.877
11		NT-19	350.000	0.000	0.000	0.000	333.718	Not Full	No	16.282	-0.995
12		NT-2	324.500	0.085	0.085	0.000	314.833	Not Full	No	9.667	0.873
13		NT-21	352.000	0.000	0.000	0.000	334.271	Not Full	No	17.729	-0.909
14		NT-22	348.000	0.000	0.000	0.000	334.705	Not Full	No	13.295	-0.905
15		NT-24	349.000	0.000	0.000	0.000	335.468	Not Full	No	13.532	-0.902
16		NT-25	348.500	0.000	0.000	0.000	335.754	Not Full	No	12.746	-0.916
17		NT-28	352.000	0.031	0.031	0.000	336.812	Not Full	No	15.188	-0.908
18		NT-3	317.000	0.000	0.000	0.000	314.851	Not Full	No	2.149	0.611
19		NT-31	352.000	0.000	0.000	0.000	338.254	Not Full	No	13.746	-0.916
20		NT-32	353.000	0.000	0.000	0.000	338.648	Not Full	No	14.352	-1.062
21		NT-33	349.500	0.025	0.025	0.000	338.648	Not Full	No	10.852	-0.912
22		NT-37	346.000	0.000	0.000	0.000	340.207	Not Full	No	5.793	-0.933
23		NT-4	316.500	0.000	0.000	0.000	314.872	Not Full	No	1.628	-0.042
24		NT-5	325.500	0.000	0.000	0.000	314.884	Not Full	No	10.616	-0.429
25		NT-6	331.000	0.000	0.000	0.000	314.968	Not Full	No	16.032	-0.862
26		NT-7	324.000	0.000	0.000	0.000	315.403	Not Full	No	8.597	-0.877
27		NT-8	330.500	0.025	0.025	0.000	315.822	Not Full	No	14.678	-0.848
28		NT-9	326.500	0.000	0.000	0.000	315.943	Not Full	Yes	10.557	-0.877
29		NT38	345.000	0.000	0.000	0.000	345.000	Full	No	0.000	3.500

		ID	Flow (cfs)	Grade (ft)
1		COB-01	0.622	312.333

		ID	From ID	To ID	Flow (gpm)	Head Increase (ft)	Power (hp)	Usage	Speed
1		AGATE	SPAGA	1	350.182	71.992	6.373	1.000	1.000

		ID	Grade (ft)
1		SPAGA	299.500

		ID	Grade (ft)
1		1	371.492

		ID	From ID	To ID	Diameter (in)	Length (ft)	Total Flow (gpm)	Unpeakable Flow (gpm)	Peakable Flow (gpm)	Coverage Flow (gpm)	Infiltration Flow (gpm)	Storm Flow (gpm)	Velocity (ft/s)	Headloss (ft)
1		2	1	NT38	8.000	5,905.000	215.040	215.040	0.000	0.000	0.000	0.000	2.235	30.526

	ID	From ID	To ID	Diameter (in)	Length (ft)	Slope	Total Flow (gpm)	Unpeakable Flow (gpm)	Peakable Flow (gpm)	Coverage Flow (gpm)	Infiltration Flow (gpm)
1	10	NT-24	NT-22	15.000	460.000	0.002	247.040	204.800	42.240	0.000	0.000
2	11	NT-22	NT-21	15.000	199.000	0.002	247.040	204.800	42.240	0.000	0.000
3	12	NT-21	NT-19	15.000	296.500	0.002	247.040	204.800	42.240	0.000	0.000
4	13	NT-19	NT-18	16.000	331.500	0.002	247.040	204.800	42.240	0.000	0.000
5	14	NT-18	NT-17	15.000	386.500	0.001	267.520	198.400	69.120	0.000	0.000
6	15	NT-17	NT-16	12.000	294.500	0.006	267.520	198.400	69.120	0.000	0.000
7	16	NT-16	NT-14	12.000	268.000	0.007	284.160	192.000	92.160	0.000	0.000
8	17	NT-14	NT-12	12.000	652.500	0.008	284.160	192.000	92.160	0.000	0.000
9	18	NT-12	NT-11	12.000	221.500	0.004	284.160	192.000	92.160	0.000	0.000
10	19	NT-11	NT-10	12.000	296.000	0.010	284.160	192.000	92.160	0.000	0.000
11	20	NT-10	NT-9	12.000	325.000	0.010	284.160	192.000	92.160	0.000	0.000
12	21	NT-9	NT-8	15.000	63.000	0.002	284.160	192.000	92.160	0.000	0.000
13	22	NT-8	NT-7	15.000	259.600	0.001	298.240	188.160	110.080	0.000	0.000
14	23	NT-7	NT-6	15.000	230.000	0.002	298.240	188.160	110.080	0.000	0.000
15	24	NT-6	NT-5	15.000	365.600	0.002	298.240	188.160	110.080	0.000	0.000
16	25	NT-5	NT-4	16.000	235.600	0.001	298.240	188.160	110.080	0.000	0.000
17	26	NT-4	NT-3	16.000	418.700	0.001	298.240	188.160	110.080	0.000	0.000
18	27	NT-3	NT-2	15.000	253.000	0.001	298.240	188.160	110.080	0.000	0.000
19	28	NT-2	NT-1	15.000	325.000	0.002	346.880	172.800	174.080	0.000	0.000
20	29	NT-1	FM-01	12.000	32.000	0.006	357.120	168.960	188.160	0.000	0.000
21	3	NT38	NT-37	15.000	240.000	0.001	215.040	215.040	0.000	0.000	0.000
22	30	FM-01	COB-01	4.000	17.500	0.003	357.120	168.960	188.160	0.000	0.000
23	32	NA-2	SPAGA	10.000	254.000	0.007	215.040	215.040	0.000	0.000	0.000
24	4	NT-37	NT-33	15.000	810.000	0.002	215.040	215.040	0.000	0.000	0.000
25	5	NT-32	NT-33	15.000	68.000	0.001	0.000	0.000	0.000	0.000	0.000
26	6	NT-33	NT-31	15.000	227.000	0.001	229.120	209.920	19.200	0.000	0.000
27	7	NT-31	NT-28	15.000	892.000	0.002	229.120	209.920	19.200	0.000	0.000
28	8	NT-28	NT-25	15.000	598.000	0.002	247.040	204.800	42.240	0.000	0.000
29	9	NT-25	NT-24	15.000	136.000	0.002	247.040	204.800	42.240	0.000	0.000

		ID	Storm Flow (gpm)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude Number	Full Flow (gpm)	Coverage Count	Backwater Adjustment
1		10	0.000	Free Surface	1.663	0.315	0.215	0.393	0.289	0.549	1,150.109	0.000	No
2		11	0.000	Free Surface	1.680	0.313	0.212	0.391	0.289	0.557	1,165.735	0.000	No
3		12	0.000	Free Surface	1.709	0.309	0.207	0.386	0.289	0.570	1,193.780	0.000	No
4		13	0.000	Free Surface	1.667	0.286	0.179	0.382	0.284	0.561	1,380.676	0.000	No
5		14	0.000	Free Surface	1.633	0.338	0.246	0.423	0.301	0.518	1,086.610	0.000	No
6		15	0.000	Free Surface	2.770	0.318	0.220	0.318	0.321	1.016	1,218.157	0.000	No
7		16	0.000	Free Surface	3.028	0.312	0.211	0.312	0.331	1.123	1,346.434	0.000	No
8		17	0.000	Free Surface	3.211	0.299	0.194	0.299	0.331	1.219	1,461.272	0.000	No
9		18	0.000	Free Surface	2.482	0.361	0.278	0.361	0.331	0.849	1,022.012	0.000	No
10		19	0.000	Free Surface	3.407	0.286	0.179	0.286	0.331	1.324	1,586.992	0.000	No
11		20	0.000	Free Surface	3.472	0.283	0.174	0.283	0.331	1.360	1,630.232	0.000	Yes
12		21	0.000	Free Surface	1.739	0.337	0.245	0.422	0.311	0.552	1,158.194	0.000	Yes
13		22	0.000	Free Surface	1.644	0.364	0.283	0.455	0.318	0.500	1,052.055	0.000	Yes
14		23	0.000	Pressurized	1.821	0.338	0.246	0.422	0.318	0.578	1,212.321	0.000	Yes
15		24	0.000	Pressurized	1.728	0.351	0.265	0.439	0.318	0.537	1,127.534	0.000	Yes
16		25	0.000	Pressurized	1.712	0.322	0.224	0.429	0.313	0.541	1,330.890	0.000	Yes
17		26	0.000	Pressurized	1.680	0.326	0.230	0.435	0.313	0.526	1,296.195	0.000	Yes
18		27	0.000	Pressurized	1.546	0.381	0.308	0.476	0.318	0.458	967.097	0.000	Yes
19		28	0.000	Pressurized	1.905	0.365	0.285	0.457	0.344	0.578	1,217.439	0.000	Yes
20		29	0.000	Pressurized	3.032	0.368	0.289	0.368	0.373	1.025	1,235.445	0.000	Yes
21		3	0.000	Free Surface	1.493	0.308	0.206	0.385	0.269	0.499	1,044.785	0.000	No
22		30	0.000	Pressurized	9.118	1.000	7.122	0.333	0.187	2.783	50.146	0.000	No
23		32	0.000	Free Surface	2.897	0.343	0.253	0.286	0.303	1.117	850.517	0.000	No
24		4	0.000	Free Surface	1.649	0.287	0.179	0.358	0.269	0.573	1,199.910	0.000	No
25		5	0.000	Free Surface	0.000	0.000	0.000	0.000	0.000	0.000	1,114.800	0.000	Yes
26		6	0.000	Free Surface	1.603	0.306	0.204	0.383	0.278	0.537	1,125.066	0.000	No
27		7	0.000	Free Surface	1.630	0.302	0.199	0.378	0.278	0.550	1,151.683	0.000	No
28		8	0.000	Free Surface	1.704	0.309	0.208	0.387	0.289	0.568	1,188.778	0.000	No
29		9	0.000	Free Surface	1.762	0.302	0.198	0.377	0.289	0.595	1,246.385	0.000	No

		ID	Adjusted Depth (ft)	Adjusted Velocity (ft/s)
1		10	0.393	1.663
2		11	0.391	1.680
3		12	0.386	1.709
4		13	0.382	1.667
5		14	0.423	1.633
6		15	0.318	2.770
7		16	0.312	3.028
8		17	0.299	3.211
9		18	0.361	2.482
10		19	0.286	3.407
11		20	0.646	1.179
12		21	1.098	0.554
13		22	1.250	0.541
14		23	1.250	0.541
15		24	1.250	0.541
16		25	1.333	0.476
17		26	1.333	0.476
18		27	1.250	0.541
19		28	1.250	0.630
20		29	1.000	1.013
21		3	0.385	1.493
22		30	0.333	9.118
23		32	0.286	2.897
24		4	0.358	1.649
25		5	0.285	0.000
26		6	0.383	1.603
27		7	0.378	1.630
28		8	0.387	1.704
29		9	0.377	1.762

North Shore model - Future Max Cap - Loading Manhole Report

	ID	Rim Elevation (ft)	Base Flow (cfs)	Total Flow (cfs)	Storm Flow (cfs)	Grade (ft)	Status	Hydraulic Jump	Unfilled Depth (ft)	Surcharge Depth (ft)
1	FM-01	325.000	0.000	0.000	0.000	316.349	Not Full	No	8.651	3.956
2	NA-2	322.000	0.374	0.479	0.000	302.295	Not Full	No	19.705	-0.539
3	NT-1	325.000	0.018	0.023	0.000	316.377	Not Full	No	8.623	3.127
4	NT-10	325.500	0.000	0.000	0.000	319.270	Not Full	No	6.230	-0.710
5	NT-11	328.000	0.000	0.000	0.000	322.194	Not Full	No	5.806	-0.706
6	NT-12	329.500	0.000	0.000	0.000	323.268	Not Full	Yes	6.232	-0.632
7	NT-14	336.000	0.000	0.000	0.000	328.726	Not Full	No	7.274	-0.694
8	NT-16	338.000	0.029	0.037	0.000	330.729	Not Full	No	7.271	-0.681
9	NT-17	340.000	0.000	0.000	0.000	332.535	Not Full	No	7.465	-0.675
10	NT-18	345.500	0.036	0.046	0.000	333.225	Not Full	No	12.275	-0.825
11	NT-19	350.000	0.000	0.000	0.000	333.764	Not Full	No	16.236	-0.950
12	NT-2	324.500	0.085	0.108	0.000	316.428	Not Full	No	8.072	2.468
13	NT-21	352.000	0.000	0.000	0.000	334.318	Not Full	No	17.682	-0.862
14	NT-22	348.000	0.000	0.000	0.000	334.753	Not Full	No	13.247	-0.857
15	NT-24	349.000	0.000	0.000	0.000	335.516	Not Full	No	13.484	-0.854
16	NT-25	348.500	0.000	0.000	0.000	335.800	Not Full	No	12.700	-0.870
17	NT-28	352.000	0.031	0.040	0.000	336.859	Not Full	No	15.141	-0.861
18	NT-3	317.000	0.000	0.000	0.000	316.458	Not Full	No	0.542	2.218
19	NT-31	352.000	0.000	0.000	0.000	338.300	Not Full	No	13.700	-0.870
20	NT-32	353.000	0.000	0.000	0.000	338.695	Not Full	No	14.305	-1.015
21	NT-33	349.500	0.025	0.031	0.000	338.695	Not Full	No	10.805	-0.865
22	NT-37	346.000	0.000	0.000	0.000	340.250	Not Full	No	5.750	-0.890
23	NT-4	316.500	0.000	0.000	0.000	316.492	Not Full	No	0.008	1.579
24	NT-5	325.500	0.000	0.000	0.000	316.513	Not Full	No	8.987	1.199
25	NT-6	331.000	0.000	0.000	0.000	316.555	Not Full	No	14.445	0.725
26	NT-7	324.000	0.000	0.000	0.000	316.583	Not Full	No	7.417	0.303
27	NT-8	330.500	0.025	0.031	0.000	316.613	Not Full	No	13.887	-0.057
28	NT-9	326.500	0.000	0.000	0.000	316.623	Not Full	Yes	9.877	-0.197
29	NT38	345.000	0.000	0.000	0.000	345.000	Full	No	0.000	3.500

		ID	Flow (cfs)	Grade (ft)
1		COB-01	0.796	312.333

		ID	From ID	To ID	Flow (gpm)	Head Increase (ft)	Power (hp)	Usage	Speed
1		AGATE	SPAGA	1	350.182	71.992	6.373	1.000	1.000

		ID	Grade (ft)
1		SPAGA	299.500