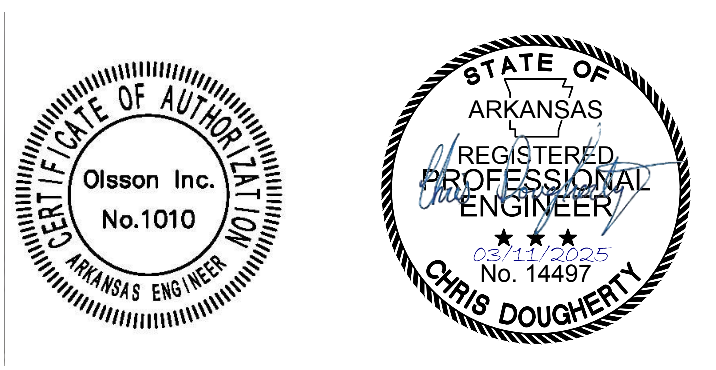
APPENDIX A

Lift Station Technical Memo

BENTONVILLE, AR
LIFT STATION ANALYSIS TECHNICAL MEMO

Prepared for:

The City of Bentonville, Arkansas



REV March 2025

Olsson Project No. 020-2321

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ACRONYMS AND ABBREVIATIONS

A.K.A. .... Also Known As
DIP .... Ductile-Iron Pipe
EQ .... Equalization
GPM .... Gallons Per Minute
HDPE .... High-Density Polyethylene
HP .... Horsepower
LS .... Lift Station
MG .... Million Gallons
MGD .... Million Gallons Per Day
NACA .... Northwest Arkansas Conservation Authority
PLC .... Programmable Logic Controller
PVC .... Polyvinyl Chloride
WWTF .... Wastewater Treatment Facility

TABLE OF CONTENTS

(Click to follow links)

LIST OF FIGURES

(Click to follow links)

LIST OF TABLES

(Click to follow links)

APPENDICES

1. INTRODUCTION

The Lift Station Analysis Technical Memo is associated with the Sewer Collection Analysis and Peak Flow Management Program project for the City of Bentonville, Arkansas (City). As part of the project, Olsson was tasked with evaluating three (3) major lift stations: McKisic Lift Station (LS), North LS (also known as Shewmaker), and South LS. Olsson met with City Staff, and conducted a site visit to each LS location to determine current pumping operational strategy, pump conditions, and operational issues. All of the items mentioned above are addressed in this Technical Memo, including associated costs for all recommended improvements.

The purpose of this Technical Memo is to summarize the findings from site investigations, establish pump station capacities, and recommend potential improvements in conjunction with the overall Peak Flow Management Study.

2. EXISTING CONDITIONS

The City currently owns and operates an extensive wastewater collection system, which includes several lift stations across Bentonville. Three (3) of these lift stations were included in the following analysis: the McKisic LS, North LS, and South LS. The locations of these lift stations are as follows:

- McKisic Lift Station – 3690 Peach Orchard Road
- North Lift Station (Shewmaker) – 2311 NE A Street
- South Lift Station – 3608 SE Riviera Road

Figure 1 below shows the location of the three lift stations in relation to the City of Bentonville and the Bentonville Wastewater Treatment Facility (WWTF). A map that shows the routing of the force mains associated with these three stations is provided in Appendix A.1.

Figure 1. Map of Three (3) Lift Stations

Table 1 on the following page shows the various attributes of each lift station. A desktop analysis was conducted utilizing information derived from City-provided As-Built drawings and existing installed pump datasheets to calculate the existing pump curves and system curves for each lift station. The calculations utilized C factors for the force main pipe ranging from 100 to 120. The C factor is a measure of the pipe's relative roughness. It is used to calculate frictional losses in the Hazen-Williams equation. (Smoother pipes, such as PVC and HDPE, have higher C factors than cast-iron and concrete pipe.) It was assumed that conservative C factors would be used to determine each station's firm capacity. This is defined as the discharge capacity for the overall lift station with the largest pump out of service.

Table 1: Overall Summary of Lift Station Attributes

Lift Station	Firm Capacity (gpm)	Rated Point (gpm/ft)	Number of Pumps (N + 1)	Discharge Force Main Length (ft)
McKisic (Dogwood – south side)	4,800	1,500/138	5	13,200
McKisic (Turner – east side)	1,030	343/30.75	4	40
North (Shewmaker)	2,200	1,300/77	4	3,600
South	2,400	1,600/64	3	15,200

Additional detail of the existing features of each lift station is further discussed in Sections 2.1 through 2.3.

2.1. McKisic Lift Station

The McKisic LS is located on the northern border of Bentonville city limits at 3690 Peach Orchard Road, Bentonville, AR 72712. This LS was constructed in 1995, and includes several features as shown in the aerial image in Appendix A.2: ferric drip odor control, automatic and manual bar screens, two lift stations with separate wetwells, and two 2-million-gallon (MG) equalization (EQ) basins. The McKisic LS has an on-site permanent generator to provide back-up power to the station in the case of a power outage. The original generator was replaced in 2015. The smaller LS on the southeast corner of McKisic is known as the Turner LS and receives its flow from the east. The Turner LS then transfers the wastewater to the larger LS on the southwest corner of McKisic, the Dogwood LS, before the Dogwood LS pumps send the wastewater to the WWTF.

The Turner LS receives flow from a smaller collection area located in the northern part of the City's sewershed, which is combined into an 18" gravity DIP line before entering the 37' deep, 12' by 12' wetwell. There are four 5-hp Flygt submersible pumps that lift the wastewater from the Turner wetwell to a 6' manhole. It then flows by gravity to the manhole that receives the Dogwood flow, before entering a diversion box.

The Dogwood LS receives flow from a larger collection area located in the northern portion of the City's sewershed. Flow from Dogwood first enters a 6' manhole where the Turner flow is combined, before entering a diversion box through a 24" gravity DIP line. Under normal conditions, the flow passes through a Muffin Monster bar screen with ½" teeth. However, using valves in the diversion box, the flow can bypass the Muffin Monster screen and instead passes through a manual bar screen. Also located on the Dogwood side, is a storage tank which supplies a ferric drip-type odor control system.

Figure 2. Dogwood Diversion Box and Bar Screen

The combined flow then enters the larger 37’ deep, 37’ by 12’ Dogwood wetwell, where five 85-hp submersible Flygt pumps are installed. The wetwell was originally designed to accommodate six pumps; however, the sixth pump is no longer in service, and the discharge line for this pump has been capped off. Normal operation consists of one pump on at a time; pump operation then alternates with each ensuing pumping cycle. According to the operation staff, flow is low during the night, and during the day (7am-10pm) one pump is typically on, pushing steady flow at approximately 1,455 gpm to the Bentonville WWTF. A process flow diagram for the McKisic LS can be found in Appendix A.3.

The original design of the McKisic LS included transducers/bubble analyzers for level readings in both wetwells. These have since been replaced with pressure plate measuring devices that communicate to a programmable logic controller (PLC) to turn on and off the pumps. Backup floats are tied to an alarm, however, according to the operator, by the time an alarm would be triggered, the manholes upstream would already be overflowing.

Figure 3. McKisic LS Pressure Plate

Wastewater leaves the McKisic LS through a single 24” DIP line which includes a mag meter to measure the outgoing flow. The pump discharge lines are backflushed into the Dogwood wetwell hourly to mitigate the development of air pockets in the outgoing flow that would lead to inaccuracies in measurement. Approximately 3 years ago, the original 1.5” air release line broke and filled the vault room with wastewater. It has since been replaced with a new 2” line and operates with the original air release valve.

Previously, the McKisic LS received flow from the Benton County Jail, in which trash was a major issue. However, the prison’s wastewater has since been re-routed to the Northwest Arkansas Conservation Authority (NACA) WWTF. With the primary stream consisting of flow from ¼” grinder pumps and the use of the bar screen, the operator stated there have been no issues with the pumps regarding clogging. When the pumps require maintenance, a 2-ton bridge crane is used to retrieve and transfer them to a truck loading area on the west side of the LS building.

Also constructed during the construction of the McKisic LS are two 2-MG EQ basins (165’ diameter, 18’-9” tall walls). One 24” DIP gravity line is located approximately 7.5’ above the Dogwood wetwell floor and feeds the center of the first basin. The two EQ basins are tied together with the same 24” DIP gravity line. During peak flow/storm conditions, the first EQ fills, then the second EQ, and as flows stabilize and the pumps in the wetwell bring the level down, the second EQ drains back to the first EQ through the same gravity line and then gravity flows from the first EQ back to the Dogwood wetwell. Both EQ basins were originally designed to operate with an air infusion system, which has since become obsolete. The blower building is now used as spare pump storage for many of the City’s lift stations.

2.2. North Lift Station (Shewmaker)

The North LS is located at 2311 NE A Street, Bentonville, AR 72712, approximately one-half mile north of the WWTF. This LS was constructed in 1986. Appendix A.4 includes an aerial of the layout of this lift station. The North LS receives flow from the majority of the northeast portion of the City through a 12” gravity DIP line that discharges into an 18’ deep, 8’ by 22’ wetwell. Unlike the McKisic LS, the North LS pumps and valves are housed in a dry pit.

Figure 4. North LS Pump/Valve Room

The pump/valve room is 18’ deep and is located beneath the electrical operations room. Originally, the pump motors were located above ground level in the electrical room and were driven by 15’ extended shafts. Currently, the LS utilizes four 37.8-hp Pentair, dry-pit submersible pumps. A process flow diagram for the North LS can be found in Appendix A.5.

Normal operation consists of one pump running at a time at approximately 700 gpm; pump alternation occurs approximately every 5 minutes. Similar to the McKisic LS, a pressure plate measuring device communicates with a PLC to turn the pumps on and off. Backup floats are tied to an alarm in case of a major pump failure. Wastewater leaves the North LS through a single 12” DIP line and discharges directly to the WWTF.

When pumps require maintenance, a 1-ton crane trolley is used to move the pumps to the northwest corner of the pump/valve room where a grate covers a square hole in the ceiling to the electrical room above. Then a ½-ton hoist is used to lift the pump up to ground level.

Figure 5. Crane in Pump/Valve Room (Left) and Hoist in Electrical Operations Room (Right)

The North LS has an on-site permanent generator to provide back-up power to the station in the event of a power outage were upgraded in 2017.

2.3. South Lift Station

The South LS is located at 3608 SE Riviera Road, Bentonville, AR 72712. The operator indicated concern that this area of Bentonville has been experiencing rapid expansion with significant residential development that could impact the influent to this lift station in the future. The LS was constructed in 1995 and Appendix A.6 includes an aerial of its layout. The South LS receives flow the majority of the Southeast portion of the City through an 18” gravity DIP line that discharges into a trough within the 24’ deep, 6’ by 16’ wetwell. Similar to the North LS, the South LS utilizes a dry pit to house its pumps and valves. A process flow diagram for the South LS can be found in Appendix A.5.

Figure 6. South LS Pump/Valve Room

The pump/valve room is also 24’ deep, located beneath the electrical operations room. Currently, the LS utilizes three 35.75-hp Fairbank, submersible rated pumps, in a vertical dry-pit configuration. Originally, the pumps required a water-cooling system, which has since been abandoned.

Normal operation consists of one pump on at a time at approximately 1,200 gpm, alternating. Similar to the other LS’s, a pressure plate measuring device that communicates to a PLC is used to turn the pumps on and off. Backup floats are tied to an alarm in the case of a major pump failure. Wastewater leaves the South LS through a single 16” DIP line (which had been upgraded from the original 10” DIP in 2015) and a mag meter is located to measure the outgoing flow that discharges to the NACA along with the west side of the City of Bentonville.

When pumps require maintenance, a 2-ton bridge crane is used to move the pumps to the southeast side of the pump/valve room where a hatch covers a square opening in the ceiling to the electrical operations room above. Then, a crane truck is used to lift the pump through the hatch in the electrical operations room floor and through another hatch in the ceiling.

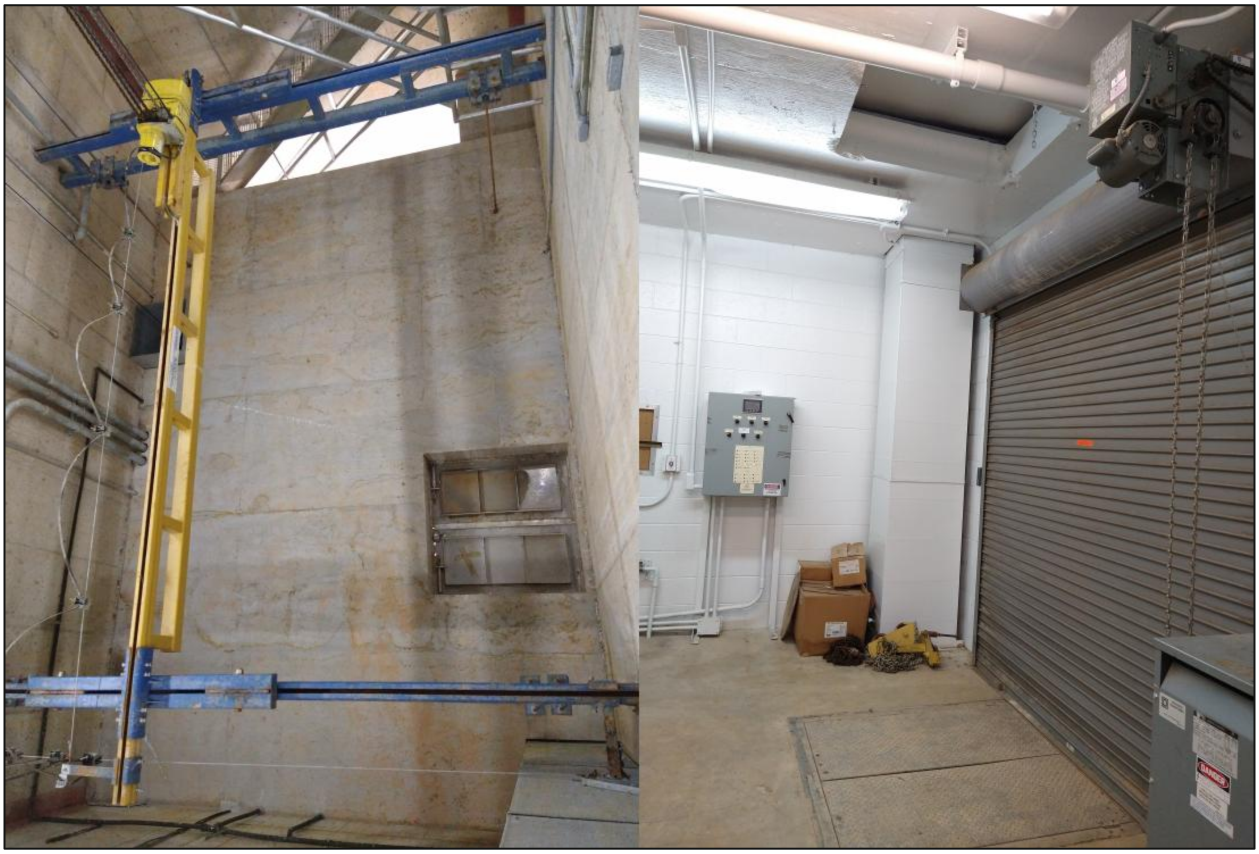

Figure 7. South LS Bridge Crane in Pump/Vault Room (Left) and Electrical Operations Room Hatches (Right)

The South LS has on-site permanent generator to provide back-up power to the pump operations in the case of power outage and reading systems were upgraded in 2018.

The operator had seen the pump/valve room flood only once during his employment with the city, due to a failure in the flexible discharge coupling. The flexible discharge couplings have since been replaced, and are still used due to elevation variances between the pump and discharge piping. During Olsson’s visit, a sound like gravel passing theough the operating pump was heard; however, the operator mentioned that the South LS is generally reliable and has no current operational issues.

3. HYDRAULIC SUMMARY

The City furnished Olsson with pump flow data for all three pump stations that covers the period from June 2020 through May 2021. Monthly average flow rates to the various pump stations were calculated from this data, as were peak day and peak hourly flow rates. The peak day flow rate was assumed to be twice the average day rate, whereas the peak hour rate was twice the peak day rate (four times the average day rate). These peaking factors were selected based upon a review of industry standards, including the 10 State Standards. This information was used to evaluate the adequacy of the pumping capacity provided at each station and is included in Appendix A.7.

3.1. McKisic Lift Station

Review of the monthly flow data for the McKisic LS (Dogwood south side) revealed that pump #4 appears to be the lead pump for every pumping cycle. The pump operation sequence for this station is 4-5-6-3-2. As was mentioned earlier in this report, pump #1 is not in service. Based upon this operational sequence, pump #4 is experiencing extensive wear compared to the other pumps. Reprogramming of the operation cycle is recommended to correct this situation.

McKisic LS (Turner east side) has a firm 3 pump capacity of 1,030 gpm at low wetwell level 1120.00 (6 ft above floor elevation of 1014.00). From analysis of the gravity sewer, the lowest manhole has a rim elevation of approximately 1037.00. If the Turner wetwell is allowed to fill to elevation 1033.00, leaving 4 feet for freeboard and line losses, the firm 3 pump capacity improves to 1,875 gpm. If all 4 pumps are operating, the pump rate with wetwell elevation of 1033.00 is estimated to be 2,500 gpm.

In comparing the McKisic LS (Dogwood south side) station's firm capacity of 4,800 gpm, as listed in Table 1, to the anticipated peak flow conditions, the station has capacity to meet the projected peak hour flow rates through a 5-year storm with the additional storage capacity provided by the equalization basins. McKisic LS (Turner east side) does not have the capacity to meet the projected peak hour flow rates through a 1-year storm.

Upgrades to the McKisic lift station are currently required on the Turner side and may be required in the future on the Dogwood side as the City continues to expand and peak flows increase.

3.2. North Lift Station (Shewmaker)

Review of the data for the North LS revealed that, with the exception of pump #4, the station's pumps are seeing balanced service. Reprogramming of the operation cycle is recommended to include pump #4 in the pump rotation cycle.

In comparing the station's firm capacity of 2,200 the pump station, as listed in Table 1, to the anticipated peak flow conditions, it can be seen that the station has ample capacity to meet the projected peak hourly flow rates. This station appears to be capable of taking on additional flow from new development without the need for significant improvements.

3.3. South Lift Station

Review of the data for the South LS revealed that the pumps are seeing balanced service.

In comparing the station's firm capacity of 2,400 gpm, as listed in Table 1, with the anticipated peak flow conditions, the station does not have adequate capacity to meet the peak hourly flow rate during a 1-year floor. Improvements to the South lift station are required to meet current peak flows.

4. RECOMMENDATIONS

As part of the overall Sewer Collection Analysis and Peak Flow Management Program project, various recommendations were made for the lift stations based on the existing conditions assessment, known hydraulic capacity and results of the flow monitoring and modeling. Based on modeling of existing wet weather flows, McKisic Lift Station has adequate pumping and storage capacity for the 5-year design storm on the Dogwood side while the Turner side firm pumping capacity cannot accommodate a 1-year design storm. The North Lift Station has adequate pumping capacity to pump the peak flow rates experienced during a 25-year design storm. Based on modeling results, the South Lift Station firm pumping capacity cannot accommodate a 1-year design storm. Table 2 below represents the lift stations level of service while also showing the firm capacity and peak hourly flows for each design storm to each of the lift stations. If the text is red, the lift station (including storage) cannot meet the level of service.

Table 2: Lift Station Level of Service

Lift Station Level of Service						
	Design Storm Peak Hour Flow (gpm)					
Lift Station	Firm Capacity (gpm)	1-yr Storm (3.36", 24-hr)	2-yr Storm (3.79", 24-hr)	5-yr Storm (4.53", 24-hr)	10-yr Storm (5.19", 24-hr)	25-yr Storm (6.16", 24-hr)
McKisic LS (Dogwood - south side)	4,800	3,310	3,653	4,221	5,337	4,650
McKisic LS (Turner - east side)	1,030	1,462	1,605	1,804	1,925	2,114
North LS (Shewmaker)	2,200	1,557	1,577	1,579	1,580	1,580
South LS	2,400	2,719	2,827	2,901	2,905	3,100

4.1. McKisic Lift Station

Reprogramming of the operation cycle is recommended to correct the uneven pump wear situation that is occurring in this station.

The Turner side lift station had insufficient capacity to convey flow for the 1-year storm event level of service. To increase the level of service, larger or additional pumps could be added to the station to increase firm capacity. Another option, detailed more in this document, includes reducing the peak flows expected during rain events through an I/I reduction plan.

Investigation of the collection system hydraulics is recommended to confirm the adequacy of the storage capacity provided by the flow equalization basins for the City's desired level of service. This investigation should include the capacity at the WRRF, which currently limits the flow rates pumped from the McKisic Lift Station and affects the necessary storage capacity at the McKisic Lift Station.

4.2. North Lift Station (Shewmaker)

Reprogramming of the operation cycle to incorporate pump #4 in the pump rotation cycle is recommended. Based on our findings, the North Lift Station has adequate capacity to ensure the desired level of service for wet weather events.

4.3. South Lift Station

The South Lift Station had insufficient capacity to convey flow for the 1-year storm event level of service. To increase level of service from the South Lift Station, there are several strategies recommended to ensure this lift station meets City requirements outlined below.

One opportunity, which is further discussed in this document, to reduce the peak flow being conveyed to the South Lift Station is utilizing an I/I reduction program. Monitoring of the South Lift Station to ensure the peak flow rate is being reduced with I/I abatement strategies will be required to ensure the lift station reaches a minimum of a desired level of service.

If sufficient I/I reduction can occur at this lift station service area, it is possible that the level of service could increase to an acceptable level without major lift station improvements. If I/I reduction does not allow for the desired storm event level of service, some improvements to help the lift station will be required. These improvements can vary from:

1) Peak Flow Extraneous Holding Basin – a wet weather storage basin could be constructed to hold back excessive volume of flow for a particular design storm. Additional study for siting and sizing the basin will be required to determine the best outcome for the City;
2) Wet-Weather Pump Station – a wet-weather force main, wetwell and associated pumping equipment could be constructed adjacent to the South Lift Station. Additional siting study and economic analysis will be required to determine design flow and head conditions, wet well sizing and other key considerations.

Olsson recommends that peak flow improvement alternative analysis be performed to determine the most cost-effective approach that takes into consideration population growth.

APPENDIX A.1
Wastewater Collection System Map

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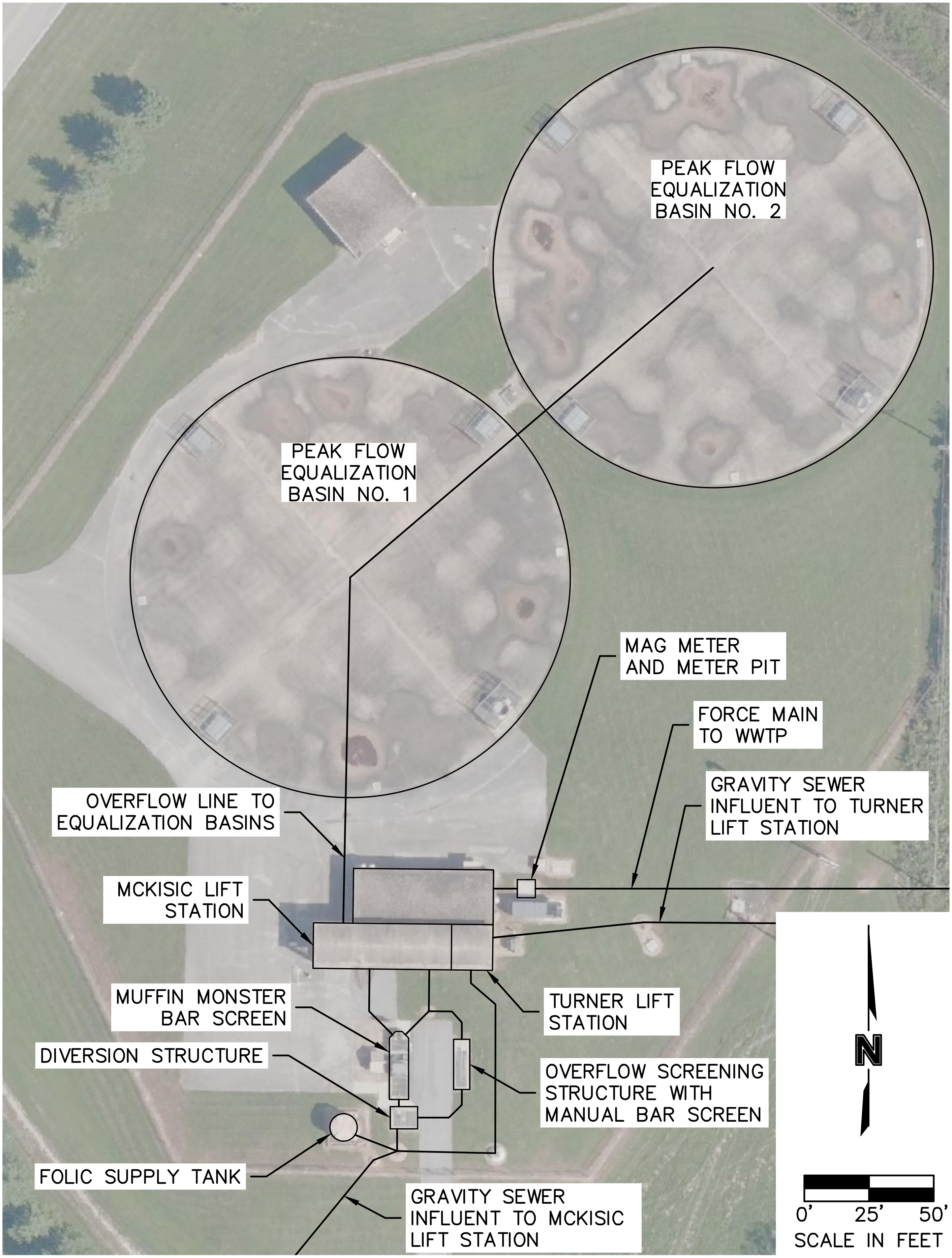
Bentonville Lift Stations
(McKisic, North, and South)

N

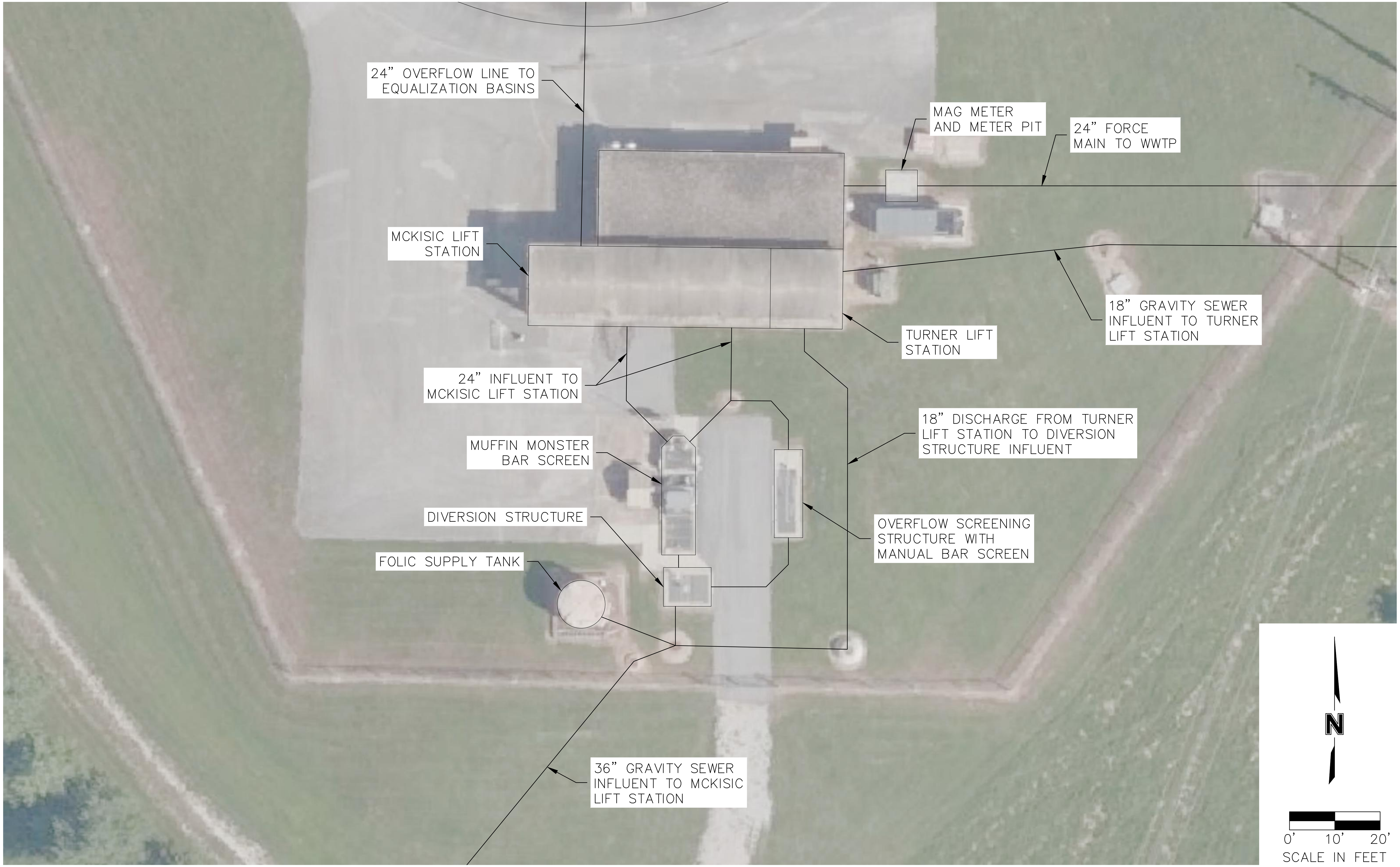
1 inch = 2,500 feet

APPENDIX A.2

McKisic Lift Station Aerial



PEAK FLOW EQUALIZATION BASIN NO. 2
PEAK FLOW EQUALIZATION BASIN NO. 1
MAG METER AND METER PIT
FORCE MAIN TO WWTP
GRAVITY SEWER INFLUENT TO TURNER LIFT STATION
OVERFLOW LINE TO EQUALIZATION BASINS
MCKISIC LIFT STATION
MUFFIN MONSTER BAR SCREEN
TURNER LIFT STATION
DIVERSION STRUCTURE
OVERFLOW SCREENING STRUCTURE WITH MANUAL BAR SCREEN
FOLIC SUPPLY TANK
GRAVITY SEWER INFLUENT TO MCKISIC LIFT STATION
N
0' 25' 50'
SCALE IN FEET



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PROJECT: 020-2321
DRAWN BY: TRJ
DATE: 03/16/2021

MCKISIC LIFT STATION AERIAL

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550 St. Louis Street
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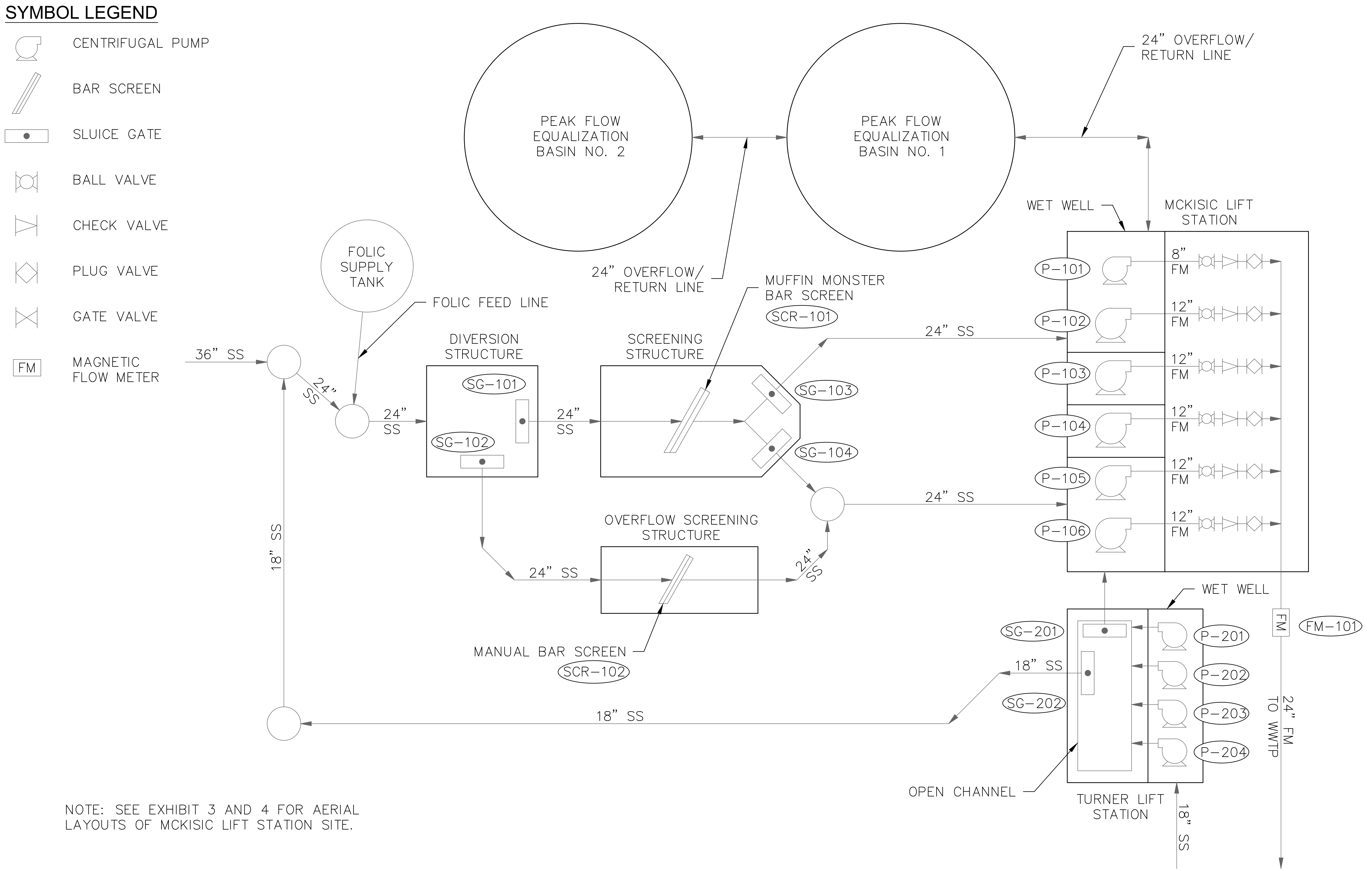
EXHIBIT 4

APPENDIX A.3

McKisic Lift Station Process Flow Diagram



NOTE: SEE EXHIBIT 3 AND 4 FOR AERIAL LAYOUTS OF MCKISIC LIFT STATION SITE.

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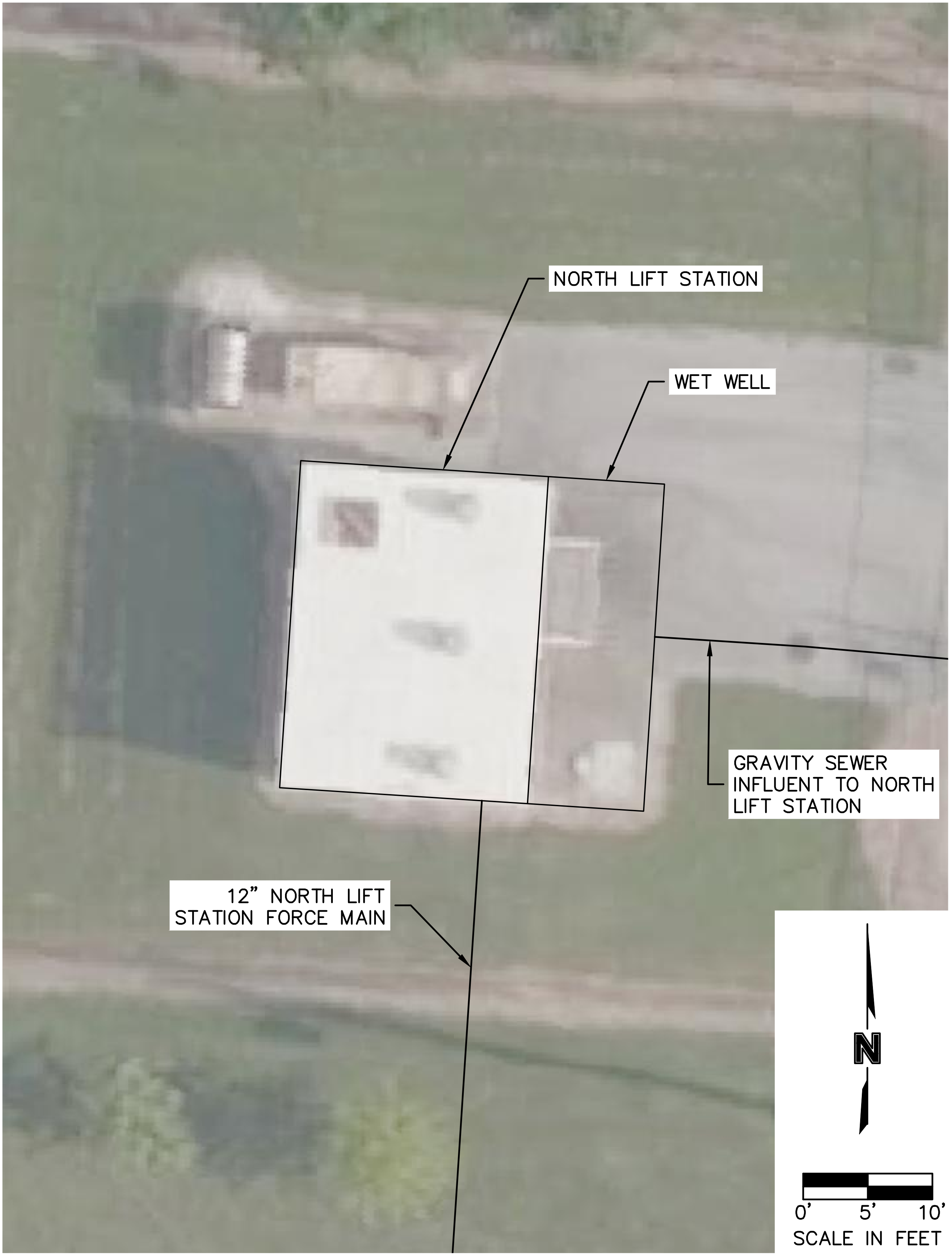
APPENDIX A.4

North Lift Station Aerial



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PROJECT NO: 020-2321	NORTH LIFT STATION AERIAL	olsson 550 St. Louis Street Springfield, MO 65806 TEL 417.890.8802	EXHIBIT
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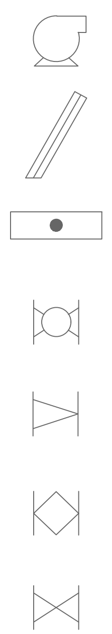
DATE: 03/16/2021			

APPENDIX A.5

North and South Lift Station Process Flow Diagram

SYMBOL LEGEND



CENTRIFUGAL PUMP

BAR SCREEN

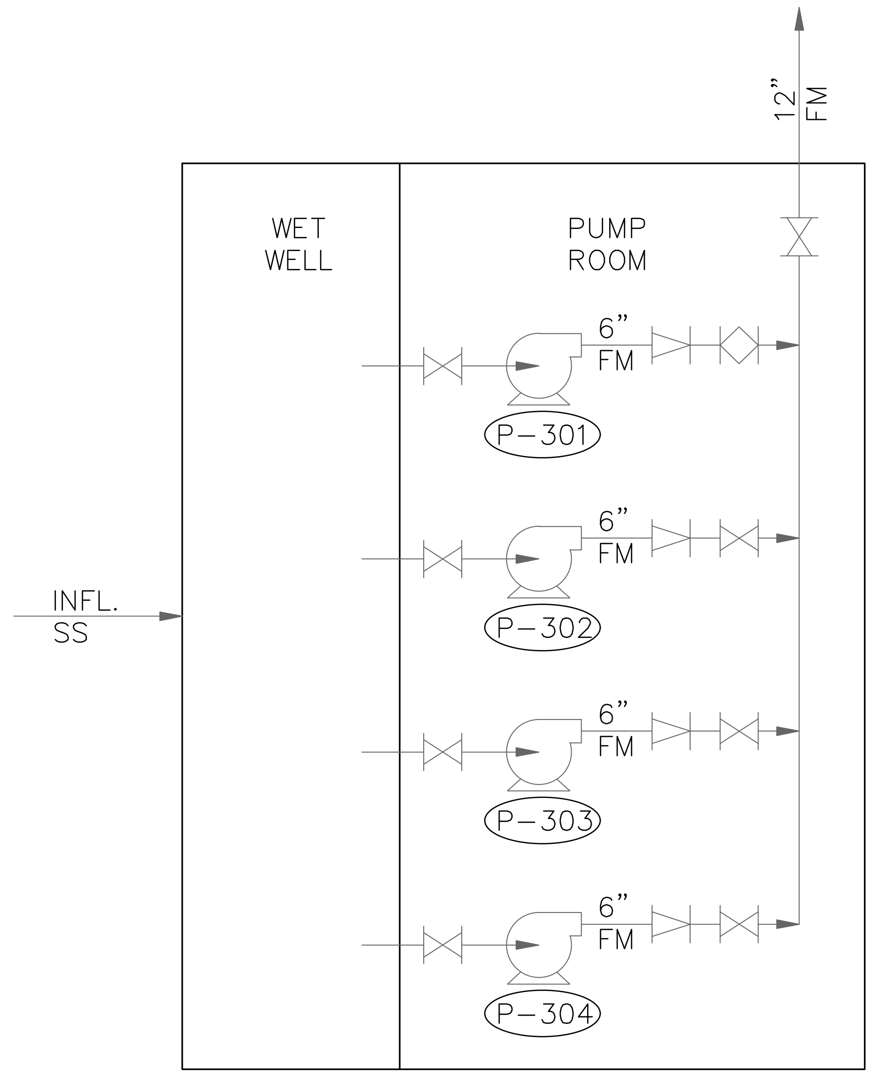
SLUICE GATE

BALL VALVE

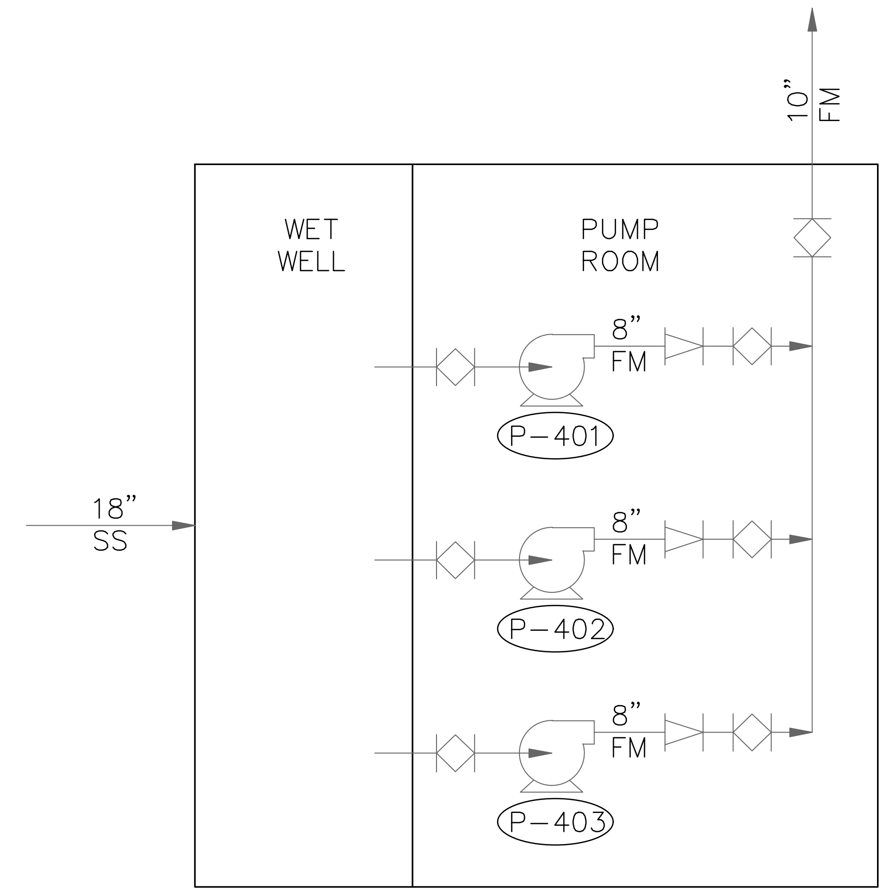
CHECK VALVE

PLUG VALVE

GATE VALVE



NORTH LIFT STATION



SOUTH LIFT STATION

NOTE: SEE EXHIBIT 5 FOR AERIAL LAYOUT OF NORTH LIFT STATION SITE AND EXHIBIT 6 FOR AERIAL LAYOUT OF SOUTH LIFT STATION SITE.

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DATE: 03/16/2021

NORTH AND SOUTH LIFT STATION PROCESS FLOW DIAGRAM

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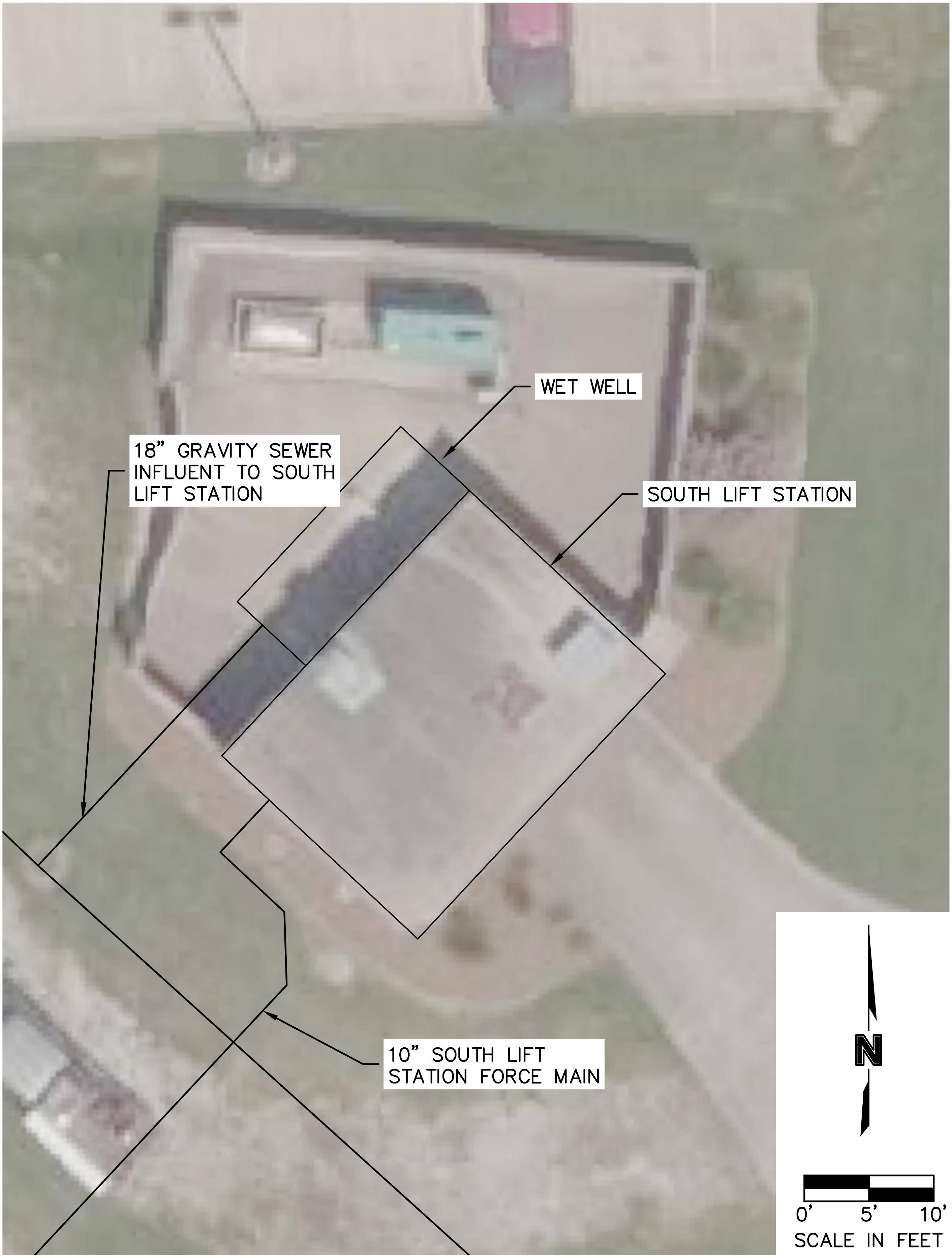
EXHIBIT
2

APPENDIX A.6
South Lift Station Aerial



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PROJECT NO: 020-2321 DRAWN BY: TRJ DATE: 03/16/2021	SOUTH LIFT STATION AERIAL	olsson 550 St. Louis Street Springfield, MO 65806 TEL 417.890.8802	EXHIBIT 6

APPENDIX A.7

Lift Stations Pump Data

McKisic Lift Station Pump Information

	2021	2021	2021	2021	2021	2020	2020	2020	2020	2020	2020	2020
Pump #	**May**	**April**	**March**	**February**	**January**	**December**	**November**	**October**	**September**	**August**	**July**	**June**
1												
2									6,367			
3	1,772,100	4,543,740	1,337,130					7,245	12,465			
4	52,605,945	48,023,618	51,067,440	38,937,442	50,467,320	40,531,095	40,454,527	34,497,382	32,732,212	36,971,460	39,675,510	37,916,527
5	5,328,607	4,419,787	6,483,622		8,680,050	210,172		6,228,607	305,572			76,140
6	2,370,060	2,657,835	4,409,820		189,157	75,960	1,818,990	3,354,322	32,557		372,240	
7	6,142,100	4,279,933	1,970,300	1,244,447	2,849,140	4,503,280	2,933,513	3,469,627	1,766,093	2,811,560	1,299,740	6,709,167
8	6,438,947	7,536,047	5,748,347	2,557,707	5,579,193	2,844,760	2,255,987	2,396,680	3,891,000	4,443,113	2,793,353	1,365,173
9	6,466,780	5,669,387	5,941,880	2,836,993	5,137,980	976,647	4,061,553	6,403,547	692,713	131,913	5,697,193	1,847
10	845,673	1,997,560	3,755,980	4,121,500	4,659,860	2,892,500	5,473,773	3,178,120	2,136,407	1,995,707	6,445,207	1,668,213
McKisic Basin Total Flow MG	42.2	40.2	45.9	28.2	41.1	29.6	27.5	28.6	24.6	27.6	23.8	28.2
Turner Basin Total Flow MG	19.9	19.5	17.4	10.8	18.2	11.2	14.7	15.4	8.5	9.4	16.2	9.7
Total Monthly Gallons	62,076,712	59,644,980	63,298,012	38,937,442	59,336,527	40,817,227	42,273,517	44,087,556	33,089,173	36,971,460	40,047,750	37,992,667
Monthly Average (MGD)	2.00	1.92	2.04	1.26	1.91	1.32	1.36	1.42	1.07	1.19	1.29	1.23
Monthly Average (gpm)	1,391	1,336	1,418	872	1,329	914	947	988	741	828	897	851
Peak Day (gpm)	*2,781*	*2,672*	*2,836*	*1,745*	*2,658*	*1,829*	*1,894*	*1,975*	*1,482*	*1,656*	*1,794*	*1,702*
Peak Hour (gpm)	*5,562*	*5,345*	*5,672*	*3,489*	*5,317*	*3,657*	*3,788*	*3,950*	*2,965*	*3,313*	*3,589*	*3,404*

North Lift Station Pump Information

	2021	2021	2021	2021	2021	2020	2020	2020	2020	2020	2020	2020
Pump #	**May**	**April**	**March**	**February**	**January**	**December**	**November**	**October**	**September**	**August**	**July**	**June**
1	3,972,150	3,534,680	3,555,050	2,934,250	3,591,910	3,216,520	3,164,140	3,101,090	2,646,160	2,832,400	2,943,950	2,801,360
2	4,459,760	3,888,380	4,076,700	3,275,270	4,079,910	3,645,490	3,642,280	3,525,650	3,080,530	3,262,430	3,361,940	3,184,320
3	6,445,500	5,031,000	5,086,500	3,873,750	5,253,000	4,456,500	4,510,500	4,748,250	3,559,500	3,715,500	4,040,250	3,651,000
4	6,860	13,720	7,840	6,860	18,620	12,740	3,920	7,840	5,880	4,900	7,840	
Total Monthly Gallons	14,884,270	12,467,780	12,726,090	10,090,130	12,943,440	11,331,250	11,320,840	11,382,830	9,292,070	9,815,230	10,353,980	9,636,680
Monthly Average (MGD)	0	0	0	0	0	0	0	0	0	0	0	0
Monthly Average (gpm)	333	279	285	226	290	254	254	255	208	220	232	216
Peak Day (gpm)	*667*	*559*	*570*	*452*	*580*	*508*	*507*	*510*	*416*	*440*	*464*	*432*
Peak Hour (gpm)	*1,334*	*1,117*	*1,140*	*904*	*1,160*	*1,015*	*1,014*	*1,020*	*833*	*880*	*928*	*864*

South Lift Station Pump Information

	2021	2021	2021	2021	2021	2020	2020	2020	2020	2020	2020	2020
Pump #	**May**	**April**	**March**	**February**	**January**	**December**	**November**	**October**	**September**	**August**	**July**	**June**
1	12,539,840	10,417,430	13,573,430	8,197,710	11,564,110	9,199,740	8,846,005	9,483,780	7,872,905	9,031,420	10,054,490	8,505,420
2	13,308,120	11,935,980	11,735,640	8,400,420	10,008,180	9,865,800	9,485,280	10,470,600	7,234,920	7,718,760	7,906,500	7,514,640
3	17,608,050	13,814,550	10,844,550	8,190,450	10,932,300	9,175,950	8,230,950	9,911,700	7,896,150	8,775,000	8,677,800	7,635,600
Total Monthly Gallons	43,456,010	36,167,960	36,153,620	24,788,580	32,504,590	28,241,490	26,562,235	29,866,080	23,003,975	25,525,180	26,638,790	23,655,660
Monthly Average (MGD)	1	1	1	1	1	1	1	1	1	1	1	1
Monthly Average (gpm)	973	810	810	555	728	633	595	669	515	572	597	530
Peak Day (gpm)	*1,947*	*1,620*	*1,620*	*1,111*	*1,456*	*1,265*	*1,190*	*1,338*	*1,031*	*1,144*	*1,193*	*1,060*
Peak Hour (gpm)	*3,894*	*3,241*	*3,240*	*2,221*	*2,913*	*2,531*	*2,380*	*2,676*	*2,061*	*2,287*	*2,387*	*2,120*

SEWER COLLECTION ANALYSIS AND PEAK FLOW MANAGEMENT PROGRAM

Bentonville, Arkansas

REV March 2025

Olsson Project No. 020-2321

APPENDIX B

Sewer Collection System Study Area Map

Sewer Collection System Study Area Map

Sewer Collection Analysis and Peak Flow Management Program
Bentonville, AR

N

1 inch = 2,000 feet

0 2,500 5,000 10,000 Feet

APPENDIX C
NOAA Precipitation Frequency Estimates

NOAA Precipitation Frequency Estimates

NOAA Atlas 14 Volume 9 Version 2
Data Type: Precipitation Depth
Time series type: Partial duration
Project area: Southeastern States
Location name (ESRI Maps): B Arkansas USA
Station Name: -
Latitude: 36.3723°
Longitude: -94.2095°
Elevation (USGS): 1295.71 ft

Table C-1. NOAA Precipitation Frequency Estimates

Precipitation Frequency Estimates (Inches)										
ARI* (years):	**1**	**2**	**5**	**10**	**25**	**50**	**100**	**200**	**500**	**1000**
5-min:	0.401	0.458	0.553	0.632	0.743	0.829	0.916	1.01	1.12	1.22
10-min:	0.587	0.671	0.809	0.926	1.09	1.21	1.34	1.47	1.65	1.78
15-min:	0.716	0.818	0.987	1.13	1.33	1.48	1.64	1.8	2.01	2.17
30-min:	1.03	1.18	1.43	1.65	1.94	2.17	2.4	2.64	2.96	3.2
60-min:	1.36	1.57	1.92	2.22	2.65	3	3.36	3.73	4.25	4.65
2-hr:	1.69	1.95	2.4	2.79	3.36	3.83	4.31	4.82	5.53	6.1
3-hr:	1.91	2.2	2.71	3.17	3.84	4.4	4.98	5.61	6.49	7.19
6-hr:	2.35	2.67	3.26	3.8	4.6	5.28	6	6.78	7.89	8.78
12-hr:	2.85	3.2	3.83	4.41	5.28	6.01	6.8	7.65	8.86	9.84
24-hr:	3.36	3.79	4.53	5.19	6.16	6.95	7.79	8.69	9.94	10.9
2-day:	3.85	4.43	5.4	6.23	7.4	8.33	9.28	10.3	11.6	12.7
3-day:	4.22	4.85	5.9	6.81	8.09	9.11	10.1	11.2	12.7	13.9
4-day:	4.55	5.19	6.29	7.22	8.55	9.62	10.7	11.8	13.4	14.6
7-day:	5.42	6.09	7.22	8.18	9.56	10.7	11.8	13	14.6	15.8

Source: https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=md

**ARI: Average Recurrence Interval*

APPENDIX D

Rainfall Frequency Estimates

Table D-1. Rain Gauge M1 Rain Events

Event Start	Event End	Duration (hr)	Total Rainfall Depth (in)	Average Intensity (in/hr)	Precipitation Frequency
Fall/Winter Monitoring Period					
9/10/2020 2:00 AM	9/10/2020 11:05 AM	9.08	0.19	0.021	NA
9/22/2020 2:50 AM	9/22/2020 6:45 PM	15.92	0.43	0.027	NA
9/27/2020 8:15 PM	9/27/2020 11:05 PM	2.83	0.18	0.064	NA
10/18/2020 10:30 PM	10/19/2020 8:55 AM	10.42	0.745	0.072	NA
10/20/2020 11:10 AM	10/20/2020 9:40 PM	10.50	0.21	0.020	NA
10/23/2020 6:35 AM	10/23/2020 7:35 AM	1.00	0.41	0.410	NA
10/26/2020 7:30 AM	10/27/2020 11:55 AM	28.42	2.72	0.096	NA
10/28/2020 7:50 AM	10/29/2020 1:10 PM	29.33	3.42	0.117	NA
11/10/2020 12:41 PM	11/10/2020 3:06 PM	2.42	0.15	0.062	NA
11/14/2020 9:41 AM	11/14/2020 10:56 PM	13.25	0.43	0.032	NA
11/21/2020 6:26 AM	11/22/2020 3:21 AM	20.92	0.93	0.044	NA
11/24/2020 3:11 PM	11/25/2020 7:31 AM	16.33	1.09	0.067	NA
12/2/2020 11:10 AM	12/3/2020 5:05 AM	17.92	0.63	0.035	NA
12/14/2020 10:45 AM	12/14/2020 5:50 PM	7.08	0.41	0.058	NA
12/17/2020 12:40 PM	12/17/2020 2:10 PM	0.59	0.14	0.237	NA
12/31/2020 6:40 PM	1/1/2021 3:10 AM	8.50	1.25	0.147	NA
1/6/2021 9:10 AM	1/7/2021 11:15 AM	26.08	0.81	0.031	NA
1/24/2021 11:40 PM	1/25/2021 8:10 AM	8.50	1.52	0.179	NA
Spring Monitoring Period					
3/11/2021 8:45 AM	3/13/2021 12:05 PM	51.33	1.86	0.036	NA
3/14/2021 2:15 PM	3/14/2021 7:35 PM	5.33	0.89	0.167	NA
3/17/2021 7:35 AM	3/18/2021 8:30 AM	24.92	0.86	0.035	NA
4/7/2021 6:35 AM	4/7/2021 1:00 PM	6.42	0.62	0.097	NA
4/9/2021 9:40 PM	4/9/2021 11:10 PM	1.50	0.63	0.420	NA
4/13/2021 10:25 PM	4/14/2021 6:20 AM	7.92	0.68	0.086	NA
4/23/2021 8:20 PM	4/24/2021 9:20 AM	13.00	1.04	0.080	NA
4/28/2021 1:50 AM	4/29/2021 6:20 AM	28.50	2.37	0.083	NA
5/3/2021 10:35 PM	5/4/2021 3:05 PM	16.50	0.76	0.046	NA

Event Start	Event End	Duration (hr)	Total Rainfall Depth (in)	Average Intensity (in/hr)	Precipitation Frequency
5/17/2021 2:05 AM	5/17/2021 8:10 AM	6.08	0.68	0.112	NA
5/21/2021 12:20 AM	5/22/2021 9:45 AM	33.42	0.71	0.021	NA
5/27/2021 1:00 PM	5/27/2021 11:55 PM	10.92	1.95	0.179	NA
5/31/2021 8:20 PM	6/1/2021 6:50 AM	10.50	0.98	0.093	NA
6/30/2021 11:50 AM	7/1/2021 8:20 AM	20.50	1.22	0.060	NA

Table D-2. Rain Gauge M2 Rain Events

Event Start	Event End	Duration (hr)	Total Rainfall Depth (in)	Average Intensity (in/hr)	Precipitation Frequency
Fall/Winter Monitoring Period					
9/10/2020 1:55 AM	9/10/2020 11:50 AM	9.92	0.17	0.017	NA
9/22/2020 3:45 AM	9/22/2020 7:05 PM	15.33	0.38	0.025	NA
9/27/2020 5:50 PM	9/28/2020 12:25 AM	6.58	0.31	0.047	NA
10/18/2020 2:50 PM	10/19/2020 9:10 AM	18.33	0.48	0.026	NA
10/20/2020 5:55 AM	10/20/2020 9:35 PM	15.67	0.33	0.021	NA
10/23/2020 6:40 AM	10/23/2020 8:05	1.42	0.405	0.286	NA
10/26/2020 7:40 AM	11/1/2020 3:36 PM	151.93	5.78	0.038	1.5 year; 7 day
11/10/2020 12:51 PM	11/10/2020 3:11 PM	2.33	0.15	0.064	NA
11/14/2020 8:06 AM	11/15/2020 1:51 PM	29.75	0.73	0.025	NA
11/21/2020 6:41 AM	11/23/2020 10:06 AM	51.42	0.69	0.013	NA
11/24/2020 3:11 PM	11/25/2020 10:31 AM	19.33	1.08	0.056	NA
12/2/2020 11:00 AM	12/3/2020 4:45 AM	17.75	0.67	0.038	NA
12/14/2020 10:55 AM	12/14/2020 5:05 PM	6.17	0.28	0.045	NA
12/17/2020 11:10 AM	12/17/2020 3:55 PM	4.75	0.44	0.093	NA
12/31/2020 6:40 PM	1/1/2021 3:05 AM	8.42	1.24	0.147	NA
1/6/2021 7:40 AM	1/7/2021 1:20 PM	29.67	0.92	0.031	NA
1/24/2021 11:25 PM	1/25/2021 7:50 AM	8.42	1.56	0.185	NA
1/30/2021 6:10 AM	1/30/2021 2:20 PM	8.17	0.4	0.049	NA
2/18/2021 4:40 PM	2/19/2021 17:25	24.75	0.46	0.019	NA
Spring Monitoring Period					
3/12/2021 8:35 PM	3/13/2021 11:40 AM	15.08	1.71	0.113	NA
3/14/2021 2:15 PM	3/14/2021 7:35 PM	5.33	1.12	0.210	NA
3/17/2021 7:25 AM	3/18/2021 8:35 AM	25.17	0.57	0.023	NA
4/9/2021 9:40 PM	4/9/2021 11:10 PM	1.50	0.69	0.460	NA
4/13/2021 10:30 PM	4/14/2021 6:25 AM	7.92	0.71	0.090	NA
4/23/2021 8:15 PM	4/24/2021 9:20 AM	13.08	0.95	0.073	NA
4/28/2021 2:05 AM	4/29/2021 6:10 AM	28.08	4.43	0.158	4 year; 28 hour
5/2/2021 3:35 PM	5/2/2021 5:30 PM	1.92	0.54	0.282	NA
5/3/2021 10:20 PM	5/4/2021 3:05 PM	16.75	0.79	0.047	NA

Event Start	Event End	Duration (hr)	Total Rainfall Depth (in)	Average Intensity (in/hr)	Precipitation Frequency
5/17/2021 3:55 AM	5/17/2021 6:25 PM	14.50	0.7	0.048	NA
5/19/2021 7:55 PM	5/22/2021 7:45 AM	59.83	0.91	0.015	NA
5/27/2021 1:00 PM	5/27/2021 9:55 PM	8.92	1.73	0.194	NA
5/31/2021 7:35 PM	6/1/2021 1:00 PM	17.42	1	0.057	NA

Table D-3. Rain Gauge M3 Rain Events

Event Start	Event End	Duration (hr)	Total Rainfall Depth (in)	Average Intensity (in/hr)	Precipitation Frequency
Fall/Winter Monitoring Period					
9/10/2020 1:50 AM	9/10/2020 10:35 AM	8.75	0.18	0.021	NA
9/22/2020 3:30 AM	9/22/2020 7:35 PM	16.08	0.33	0.021	NA
9/27/2020 6:05 PM	9/28/2020 12:30 AM	6.42	0.355	0.055	NA
10/18/2020 2:46 PM	10/19/2020 9:06 AM	18.33	0.37	0.020	NA
10/20/2020 5:51 AM	10/20/2020 11:41 PM	17.83	0.27	0.015	NA
10/23/2020 6:46 AM	10/23/2020 7:41 AM	0.92	0.42	0.458	NA
10/26/2020 7:36 AM	10/27/2020 11:36 AM	28.00	2.57	0.092	NA
10/28/2020 4:06 AM	10/29/2020 1:06 PM	33.00	3.23	0.098	NA
11/10/2020 12:52 PM	11/10/2020 2:22 PM	1.50	0.09	0.060	NA
11/14/2020 3:50 AM	11/14/2020 6:51 PM	15.02	0.27	0.018	NA
11/21/2020 6:42 AM	11/22/2020 3:12 AM	20.50	0.68	0.033	NA
11/24/2020 3:07 PM	11/25/2020 9:27 AM	18.33	0.97	0.053	NA
12/2/2020 10:55 AM	12/3/2020 4:40 AM	17.75	0.69	0.039	NA
12/14/2020 1:30 PM	12/14/2020 5:05 PM	3.58	0.2	0.056	NA
12/17/2020 1:50 PM	12/18/2020 2:00 AM	12.17	0.39	0.032	NA
12/31/2020 6:35 PM	1/1/2021 9:05 AM	14.50	1.27	0.088	NA
1/6/2021 8:05 AM	1/7/2021 3:35 AM	19.50	0.71	0.036	NA
1/24/2021 11:25 PM	1/25/2021 7:45 AM	8.33	1.83	0.220	NA
1/30/2021 6:15 AM	1/30/2021 2:15 PM	8.00	0.39	0.049	NA
Spring Monitoring Period					
3/12/2021 8:25 PM	3/14/2021 7:35 PM	47.17	2.51	0.053	NA
3/17/2021 5:05 PM	3/18/2021 6:00 AM	12.92	0.39	0.030	NA
4/13/2021 10:35 PM	4/14/2021 6:45 AM	8.17	0.79	0.097	NA
4/23/2021 5:45 PM	4/24/2021 9:25 AM	15.67	1	0.064	NA
4/28/2021 1:25 AM	4/29/2021 6:20 AM	28.92	4.93	0.170	6.5 year; 29 hour
5/3/2021 10:20 PM	5/4/2021 3:10 PM	16.83	0.89	0.053	NA
5/21/2021 12:25 AM	5/22/2021 9:40 AM	33.25	0.81	0.024	NA
5/27/2021 1:10 PM	5/27/2021 10:00 PM	8.83	1.17	0.132	NA

Event Start	Event End	Duration (hr)	Total Rainfall Depth (in)	Average Intensity (in/hr)	Precipitation Frequency
5/31/2021 7:25 PM	6/1/2021 1:00 PM	17.58	1.06	0.060	NA
6/21/2021 5:35 AM	6/21/2021 12:25 PM	6.83	0.53	0.078	NA

Table D-4. M4 Rain Gauge Rain Events

Event Start	Event End	Duration (hr)	Total Rainfall Depth (in)	Average Intensity (in/hr)	Precipitation Frequency
Fall/Winter Monitoring Period					
9/10/2020 1:30 AM	9/10/2020 10:45 AM	9.25	0.23	0.025	NA
9/22/2020 3:40 AM	9/22/2020 7:10 PM	15.50	0.48	0.031	NA
9/27/2020 6:05 PM	9/28/2020 12:25 AM	6.33	0.26	0.041	NA
10/18/2020 10:20 PM	10/19/2020 9:15 AM	10.92	0.46	0.042	NA
10/20/2020 5:50 AM	10/21/2020 5:05 AM	23.25	0.45	0.019	NA
10/23/2020 6:35 AM	10/23/2020 7:20 AM	0.75	0.53	0.707	NA
10/26/2020 7:30 AM	10/27/2020 12:15 PM	28.75	2.77	0.096	NA
10/28/2020 7:45 AM	10/29/2020 1:20 PM	29.58	3.57	0.121	1 year; 30 hour
11/10/2020 12:55 PM	11/10/2020 3:00 PM	2.08	0.13	0.062	NA
11/14/2020 8:05 AM	11/14/2020 10:55 PM	14.83	0.84	0.057	NA
11/21/2020 6:35 AM	11/22/2020 6:20 AM	23.75	0.77	0.032	NA
11/24/2020 3:10 PM	11/25/2020 8:25 AM	17.25	1.27	0.074	NA
12/2/2020 11:00 AM	12/3/2020 4:45 AM	17.75	0.77	0.043	NA
12/14/2020 1:25 PM	12/14/2020 5:15 PM	3.83	0.34	0.089	NA
12/17/2020 12:10 PM	12/17/2020 4:25 PM	4.25	0.36	0.085	NA
12/31/2020 6:25 PM	1/1/2021 1:05 PM	18.67	1.34	0.072	NA
1/6/2021 9:05 AM	1/7/2021 11:10 AM	26.08	1.02	0.039	NA
1/24/2021 11:25 PM	1/25/2021 7:55 AM	8.50	1.95	0.229	NA
1/30/2021 6:10 AM	1/30/2021 2:35 PM	8.42	0.41	0.049	NA
Spring Monitoring Period					
3/12/2021 8:30 PM	3/13/2021 1:40 AM	5.17	1.27	0.246	NA
3/13/2021 6:20 AM	3/13/2021 5:35 PM	11.25	0.67	0.060	NA
3/14/2021 2:10 PM	3/14/2021 8:30 PM	6.33	0.83	0.131	NA
3/17/2021 5:00 PM	3/18/2021 7:45 AM	14.75	0.62	0.042	NA
4/13/2021 10:25 PM	4/14/2021 8:20 AM	9.92	0.74	0.075	NA
4/23/2021 8:25 PM	4/24/2021 9:30 AM	13.08	1.11	0.085	NA
4/27/2021 10:15 PM	4/29/2021 8:50 AM	34.58	3.91	0.113	1.7 year; 35 hour
5/3/2021 10:20 PM	5/4/2021 3:00 PM	16.67	0.78	0.047	NA

Event Start	Event End	Duration (hr)	Total Rainfall Depth (in)	Average Intensity (in/hr)	Precipitation Frequency
5/17/2021 3:55 AM	5/17/2021 6:25 PM	14.50	0.9	0.062	NA
5/20/2021 9:00 PM	5/22/2021 9:45 AM	36.75	0.83	0.023	NA
5/25/2021 4:30 AM	5/25/2021 5:25 PM	12.92	0.53	0.041	NA
5/27/2021 1:00 PM	5/27/2021 10:25 PM	9.42	1.41	0.150	NA
5/31/2021 7:30 PM	6/1/2021 7:25 AM	11.92	1.05	0.088	NA
6/30/2021 1:25 PM	7/1/2021 9:45 PM	32.33	0.6	0.019	NA

Table D-5. M5 Rain Gauge Rain Events

Event Start	Event End	Duration (hr)	Total Rainfall Depth (in)	Average Intensity (in/hr)	Precipitation Frequency
Fall/Winter Monitoring Period					
9/10/2020 1:25 AM	9/11/2020 2:15 AM	24.83	0.29	0.012	NA
9/22/2020 3:50 AM	9/22/2020 6:41 PM	14.85	0.37	0.025	NA
9/27/2020 6:00 PM	9/28/2020 12:35 AM	6.58	0.37	0.056	NA
10/18/2020 8:50 PM	10/19/2020 9:05 AM	12.25	0.53	0.043	NA
10/20/2020 5:50 AM	10/20/2020 9:35 PM	15.75	0.48	0.030	NA
10/23/2020 6:35 AM	10/23/2020 7:30 AM	0.92	0.605	0.660	NA
10/26/2020 7:35 AM	10/27/2020 10:50 AM	27.25	2.79	0.102	NA
10/28/2020 12:10 AM	10/29/2020 1:10 PM	37.00	3.64	0.098	NA
11/10/2020 12:40 PM	11/10/2020 3:00 PM	2.33	0.14	0.060	NA
11/14/2020 8:00 AM	11/14/2020 10:56 PM	14.93	0.92	0.062	NA
11/21/2020 6:30 AM	11/22/2020 3:25 AM	20.92	0.77	0.037	NA
11/24/2020 3:06 PM	11/25/2020 7:30 AM	16.40	1.075	0.066	NA
12/2/2020 10:55 AM	12/3/2020 4:45 AM	17.83	0.75	0.042	NA
12/14/2020 11:10 AM	12/14/2020 5:25 PM	6.25	0.31	0.050	NA
12/17/2020 11:10 AM	12/17/2020 4:00 PM	4.83	0.38	0.079	NA
12/31/2020 6:05 PM	1/1/2021 10:20 AM	16.25	1.38	0.085	NA
1/6/2021 7:40 AM	1/7/2021 11:40 AM	28.00	0.92	0.033	NA
1/24/2021 11:25 PM	1/25/2021 7:50 AM	8.42	1.69	0.201	NA
1/30/2021 6:10 AM	1/30/2021 2:20 PM	8.17	0.41	0.050	NA
Spring Monitoring Period					
3/12/2021 8:30 PM	3/14/2021 7:25 PM	46.92	2.71	0.058	NA
3/17/2021 5:00 PM	3/18/2021 9:10 AM	16.17	0.79	0.049	NA
4/9/2021 9:35 PM	4/9/2021 11:10 PM	1.58	0.53	0.335	NA
4/13/2021 10:15 PM	4/14/2021 6:30 AM	8.25	0.86	0.104	NA
4/23/2021 7:30 PM	4/24/2021 9:30 AM	14.00	1.08	0.077	NA
4/27/2021 10:55 PM	4/29/2021 6:10 AM	31.25	3.86	0.124	1.8 year; 31 hour
5/3/2021 10:05 PM	5/4/2021 3:05 PM	17.00	0.83	0.049	NA
5/21/2021 12:20 AM	5/22/2021 9:40 AM	33.33	0.77	0.023	NA

Event Start	Event End	Duration (hr)	Total Rainfall Depth (in)	Average Intensity (in/hr)	Precipitation Frequency
5/27/2021 12:55 PM	5/28/2021 5:20 AM	16.42	1.26	0.077	NA
5/31/2021 7:25 PM	6/1/2021 7:40 AM	12.25	0.99	0.081	NA
6/9/2021 7:20 PM	6/9/2021 10:45 PM	3.42	0.69	0.202	NA
6/21/2021 6:45 AM	6/21/2021 10:30 AM	3.75	0.51	0.136	NA
6/27/2021 3:15 AM	6/27/2021 6:35 AM	3.33	0.78	0.234	NA
6/30/2021 1:15 PM	7/1/2021 8:35 AM	19.33	0.52	0.027	NA

Table D-6. S1 Rain Gauge Rain Events

Event Start	Event End	Duration (hr)	Total Rainfall Depth (in)	Average Intensity (in/hr)	Precipitation Frequency
Fall/Winter Monitoring Period					
9/10/2020 2:15 AM	9/10/2020 11:15 AM	9.00	0.1	0.011	NA
9/22/2020 3:05 AM	9/22/2020 6:35 PM	15.50	0.34	0.022	NA
9/27/2020 6:10 PM	9/28/2020 12:30 AM	6.33	0.33	0.052	NA
10/18/2020 8:35 PM	10/19/2020 9:10 AM	12.58	0.33	0.026	NA
10/20/2020 5:50 AM	10/20/2020 9:46 PM	15.93	0.5	0.031	NA
10/23/2020 6:40 AM	10/23/2020 7:45	1.08	0.67	0.618	NA
10/26/2020 7:46 AM	10/27/2020 11:16 AM	27.50	2.71	0.099	NA
10/28/2020 1:21 AM	10/29/2020 1:11 PM	35.83	3.26	0.091	NA
11/14/2020 6:31 AM	11/14/2020 11:01 PM	16.50	0.81	0.049	NA
11/21/2020 6:56 AM	11/22/2020 10:01 AM	27.08	0.66	0.024	NA
11/24/2020 3:11 PM	11/25/2020 9:06 AM	17.92	0.96	0.054	NA
12/2/2020 10:55 AM	12/3/2020 4:45 AM	17.83	0.72	0.040	NA
12/14/2020 12:00 PM	12/14/2020 5:25 PM	5.42	0.47	0.087	NA
12/17/2020 11:45 AM	12/17/2020 3:05 PM	3.33	0.2	0.060	NA
12/31/2020 6:20 PM	1/1/2021 9:25 AM	15.08	1.06	0.070	NA
1/6/2021 7:40 AM	1/7/2021 12:00 PM	28.33	0.99	0.035	NA
1/24/2021 11:15 PM	1/25/2021 7:50 AM	8.58	1.62	0.189	NA
Spring Monitoring Period					
3/12/2021 8:30 PM	3/14/2021 7:35 PM	47.08	2.61	0.055	NA
4/13/2021 10:35 PM	4/14/2021 6:30 AM	7.92	0.81	0.102	NA
4/23/2021 5:45 PM	4/24/2021 9:25 AM	15.67	0.92	0.059	NA
4/28/2021 1:50 AM	4/29/2021 3:30 AM	25.67	6.07	0.236	22 year; 26 hour
5/2/2021 1:25 PM	5/2/2021 5:20 PM	3.92	0.51	0.130	NA
5/3/2021 10:35 PM	5/4/2021 3:10 PM	16.58	0.96	0.058	NA
5/17/2021 4:10 AM	5/17/2021 9:35 AM	5.42	0.91	0.168	NA
5/20/2021 9:15 PM	5/22/2021 8:15 AM	35.00	0.84	0.024	NA
5/27/2021 1:10 PM	5/28/2021 1:45 AM	12.58	1.13	0.090	NA
5/31/2021 7:35 PM	6/1/2021 1:00 PM	17.42	1.16	0.067	NA

Table D-7. SLS1 Rain Gauge Rain Events

Event Start	Event End	Duration (hr)	Total Rainfall Depth (in)	Average Intensity (in/hr)	Precipitation Frequency
Fall/Winter Monitoring Period					
9/10/2020 2:35 AM	9/10/2020 11:20 AM	8.75	0.07	0.008	NA
9/22/2020 3:25 AM	9/22/2020 6:25 PM	15.00	0.3	0.020	NA
9/27/2020 7:45 PM	9/28/2020 1:20 AM	5.58	0.25	0.045	NA
10/18/2020 10:35 PM	10/19/2020 9:25 AM	10.83	0.215	0.020	NA
10/20/2020 11:15 AM	10/20/2020 9:50 PM	10.58	0.56	0.053	NA
10/23/2020 6:40 AM	10/23/2020 8:05 AM	1.42	0.41	0.289	NA
10/26/2020 7:36 AM	10/29/2020 1:16 PM	77.67	5.7	0.073	4 year; 3 day
11/10/2020 12:56 PM	11/10/2020 3:26 PM	2.50	0.12	0.048	NA
11/14/2020 8:01 AM	11/14/2020 11:16 PM	15.25	0.54	0.035	NA
11/21/2020 9:21 AM	11/22/2020 3:16 AM	17.92	0.64	0.036	NA
11/24/2020 3:11 PM	11/25/2020 9:06 AM	17.92	0.87	0.049	NA
12/2/2020 10:55 AM	12/3/2020 4:50 AM	17.92	0.69	0.039	NA
12/14/2020 11:05 AM	12/14/2020 5:35 PM	6.50	0.29	0.045	NA
12/17/2020 11:55 AM	12/17/2020 4:10 PM	4.25	0.3	0.071	NA
12/31/2020 6:40 PM	1/1/2021 9:15 AM	14.58	1	0.069	NA
1/6/2021 7:30 AM	1/7/2021 3:15 AM	19.75	0.55	0.028	NA
1/24/2021 11:30 PM	1/25/2021 7:50 AM	8.33	1.28	0.154	NA
Spring Monitoring Period					
3/11/2021 9:00 AM	3/13/2021 11:55 AM	50.92	1.63	0.032	NA
3/14/2021 2:15 PM	3/14/2021 7:35 PM	5.33	0.93	0.174	NA
3/17/2021 7:50 AM	3/18/2021 8:05 AM	24.25	0.35	0.014	NA
4/13/2021 10:35 PM	4/14/2021 6:40 AM	8.08	0.8	0.099	NA
4/23/2021 5:45 PM	4/24/2021 9:40 AM	15.92	0.85	0.053	NA
4/28/2021 1:40 AM	4/29/2021 6:55 AM	29.25	5.36	0.183	9.6 year; 29 hour
5/2/2021 1:20 PM	5/2/2021 5:05 PM	3.75	0.52	0.139	NA
5/3/2021 10:10 PM	5/4/2021 3:15 PM	17.08	0.87	0.051	NA
5/17/2021 4:10 AM	5/17/2021 12:40 PM	8.50	0.81	0.095	NA
5/21/2021 3:45 AM	5/22/2021 7:50 AM	28.08	0.67	0.024	NA

Event Start	Event End	Duration (hr)	Total Rainfall Depth (in)	Average Intensity (in/hr)	Precipitation Frequency
5/25/2021 4:10 AM	5/25/2021 2:10 PM	10.00	0.52	0.052	NA
5/27/2021 1:10 PM	5/27/2021 10:00 PM	8.83	1.15	0.130	NA
5/31/2021 7:45 PM	6/1/2021 6:10 PM	22.42	1	0.045	NA
6/21/2021 5:40 AM	6/21/2021 10:40 AM	5.00	0.58	0.116	NA

Table D-8. SLS2 Rain Gauge Rain Events

Event Start	Event End	Duration (hr)	Total Rainfall Depth (in)	Average Intensity (in/hr)	Precipitation Frequency
Fall/Winter Monitoring Period					
9/10/2020 1:50 AM	9/10/2020 10:25 AM	8.58	0.14	0.016	NA
9/22/2020 2:05 AM	9/22/2020 7:25 PM	17.33	0.29	0.017	NA
9/27/2020 6:10 PM	9/28/2020 12:45 AM	6.58	0.27	0.041	NA
10/18/2020 10:31 PM	10/19/2020 9:11 AM	10.67	0.18	0.017	NA
10/20/2020 11:11 AM	10/20/2020 9:41 PM	10.50	0.63	0.060	NA
10/23/2020 6:46 AM	10/23/2020 7:31 AM	0.75	0.62	0.827	NA
10/26/2020 4:46 AM	10/27/2020 11:41 AM	30.92	2.47	0.080	NA
10/28/2020 7:46 AM	10/29/2020 1:16 PM	29.50	3.19	0.108	NA
11/10/2020 12:51 PM	11/10/2020 3:11 PM	2.33	0.13	0.056	NA
11/14/2020 7:56 AM	11/14/2020 10:56 PM	15.00	0.45	0.030	NA
11/21/2020 10:26 AM	11/22/2020 3:21 AM	16.92	0.67	0.040	NA
11/24/2020 3:06 PM	11/25/2020 8:56 AM	17.83	0.94	0.053	NA
12/2/2020 10:50 AM	12/3/2020 4:45 AM	17.92	0.7	0.039	NA
12/14/2020 10:50 AM	12/14/2020 5:55 PM	7.08	0.35	0.049	NA
12/17/2020 11:40 AM	12/17/2020 2:40 PM	3.00	0.22	0.073	NA
12/31/2020 6:15 PM	1/1/2021 9:00 AM	14.75	1.1	0.075	NA
1/6/2021 7:20 AM	1/7/2021 10:00 AM	26.67	0.86	0.032	NA
1/24/2021 11:20 PM	1/25/2021 8:15 AM	8.92	1.58	0.177	NA
1/30/2021 6:35 AM	1/30/2021 2:15 PM	7.67	0.37	0.048	NA
Spring Monitoring Period					
3/12/2021 8:25 PM	3/13/2021 11:30 AM	15.08	1.3	0.086	NA
3/14/2021 2:15 PM	3/14/2021 7:30 PM	5.25	0.97	0.185	NA
3/17/2021 8:50 PM	3/18/2021 8:15 AM	11.42	0.32	0.028	NA
4/13/2021 10:35 PM	4/14/2021 6:30 AM	7.92	0.82	0.104	NA
4/23/2021 5:40 PM	4/24/2021 9:25 AM	15.75	1.02	0.065	NA
4/28/2021 12:30 AM	4/29/2021 12:00 AM	23.50	5.85	0.249	20 year; 24 hour
5/2/2021 1:20 PM	5/4/2021 3:15 PM	49.92	1.61	0.032	NA
5/17/2021 4:00 AM	5/17/2021 9:20 AM	5.33	0.68	0.127	NA
5/21/2021 12:15 AM	5/22/2021 9:35 AM	33.33	0.88	0.026	NA

Event Start	Event End	Duration (hr)	Total Rainfall Depth (in)	Average Intensity (in/hr)	Precipitation Frequency
5/25/2021 4:15 AM	5/25/2021 5:10 PM	12.92	0.5	0.039	NA
5/27/2021 12:55 PM	5/28/2021 5:20 AM	16.42	1.27	0.077	NA
5/31/2021 7:35 PM	6/1/2021 12:50 PM	17.25	1.07	0.062	NA
6/6/2021 3:20 PM	6/6/2021 4:25 PM	1.08	0.83	0.766	NA
6/7/2021 12:10 PM	6/7/2021 1:25 PM	1.25	0.5	0.400	NA
6/9/2021 6:00 PM	6/10/2021 1:25 AM	7.42	0.54	0.073	NA
6/21/2021 5:35 AM	6/21/2021 10:25 AM	4.83	0.86	0.178	NA

APPENDIX E
Flow Monitoring Results

Flow Meter M1

Flow meter M1 was installed on the 18-inch influent pipe from the east of manhole 236-3842, which is located east of the McKissic Lift Station. It received wastewater flow from the eastern section of the McKissic basin including the immediate subbasin and subbasins M3 and M4 upstream. The immediate subbasin covered 899 acres and included 49,750 linear feet of pipe.

Figure E-1 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter M1. The meter recorded four surcharge events in manhole 236-3842 during the monitoring period. Between October 28th, 2020 and January 1, 2021, the average velocities recorded by the meter dropped, resulting in lower recorded flows during that period.

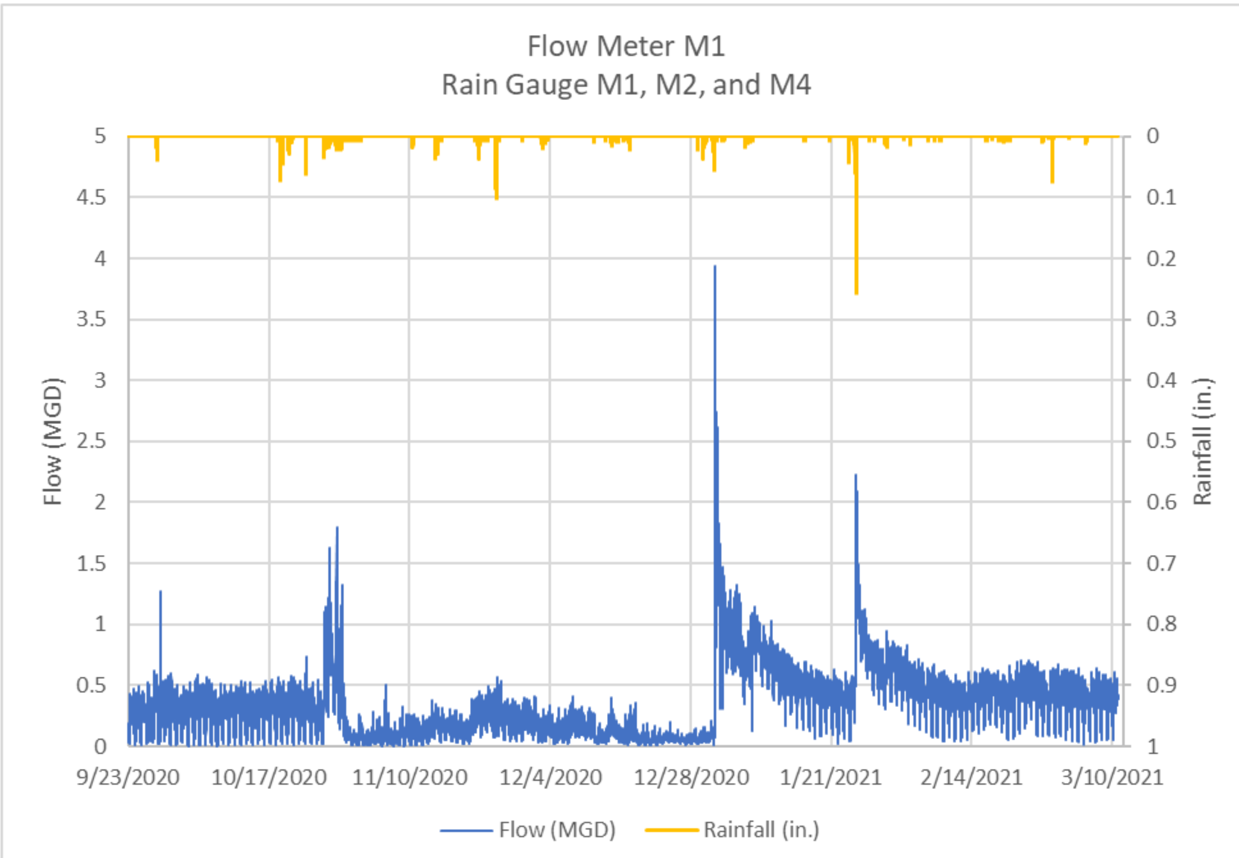


Figure E-1. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter M1.

Flow data results from the fall/winter monitoring period for flow meter M1 are as follows:

Minimum Flow	0.002 mgd
Maximum Flow	3.938 mgd
Average Flow	0.324 mgd
*Peaking Factor	12.169

*Maximum/Average Flow

Figure E-2 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter M1. The meter recorded three surcharge events in manhole 236-3842 during the monitoring period.

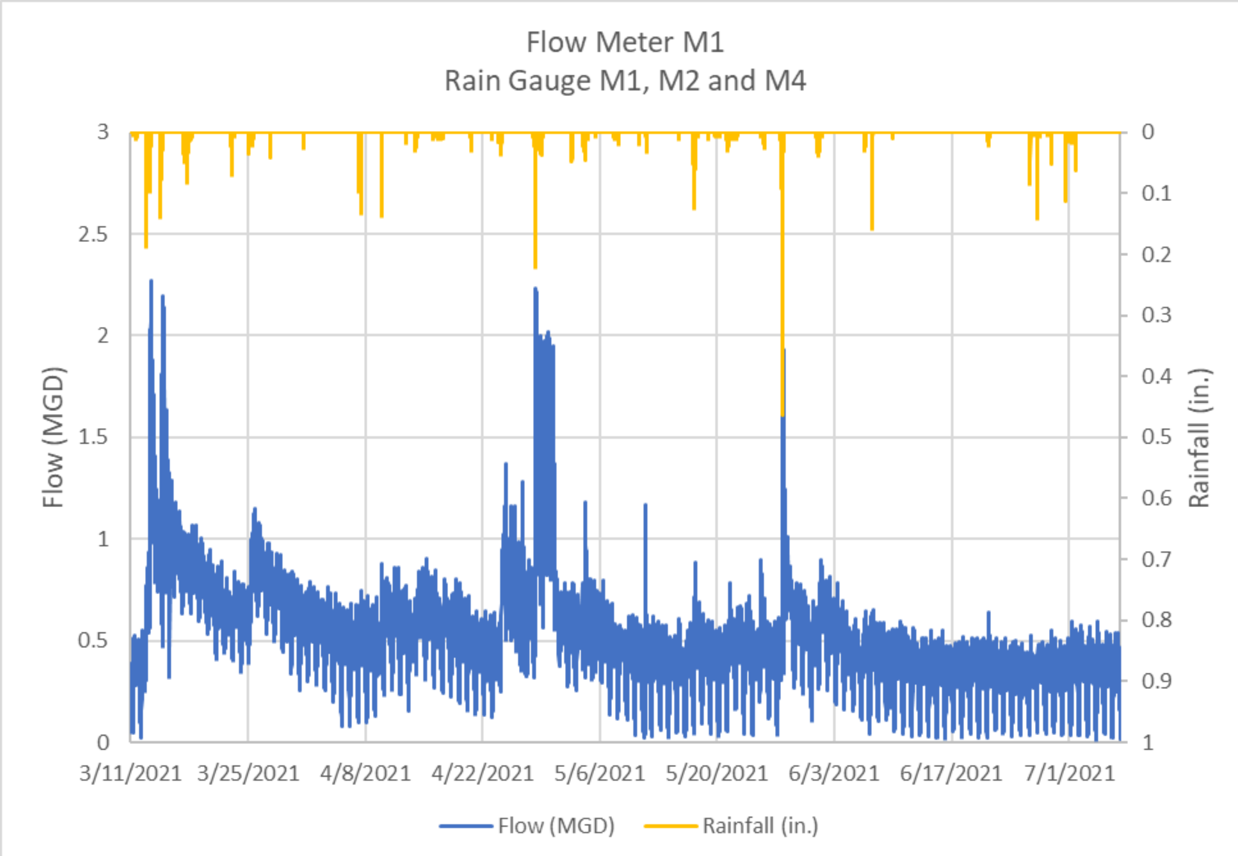


Figure E-2. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter M1.

Flow data results from the spring monitoring period for flow meter M1 are as follows:

Minimum Flow	0.015 mgd
Maximum Flow	2.270 mgd
Average Flow	0.510 mgd
*Peaking Factor	4.448

*Maximum/Average Flow

Flow Meter M2

Flow meter M2 was installed on the 30-inch influent pipe from the south of manhole 236-6662, which is located south of the McKissic Lift Station. It received wastewater flow from the western branch of the McKissic basin including the immediate subbasin and subbasins M5, M7 M8, M9, M10, M11, and M12 upstream. The immediate subbasin covered 1,203 acres and included 33,220 linear feet of pipe.

Figure E-3 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter M2. The meter recorded three surcharge events in manhole 236-6662 during the monitoring period. Upon later investigation of the meter installation site, TREKK discovered that operation of the bar screen at the McKisic lift station was affecting the depth measurements recorded by the meter.

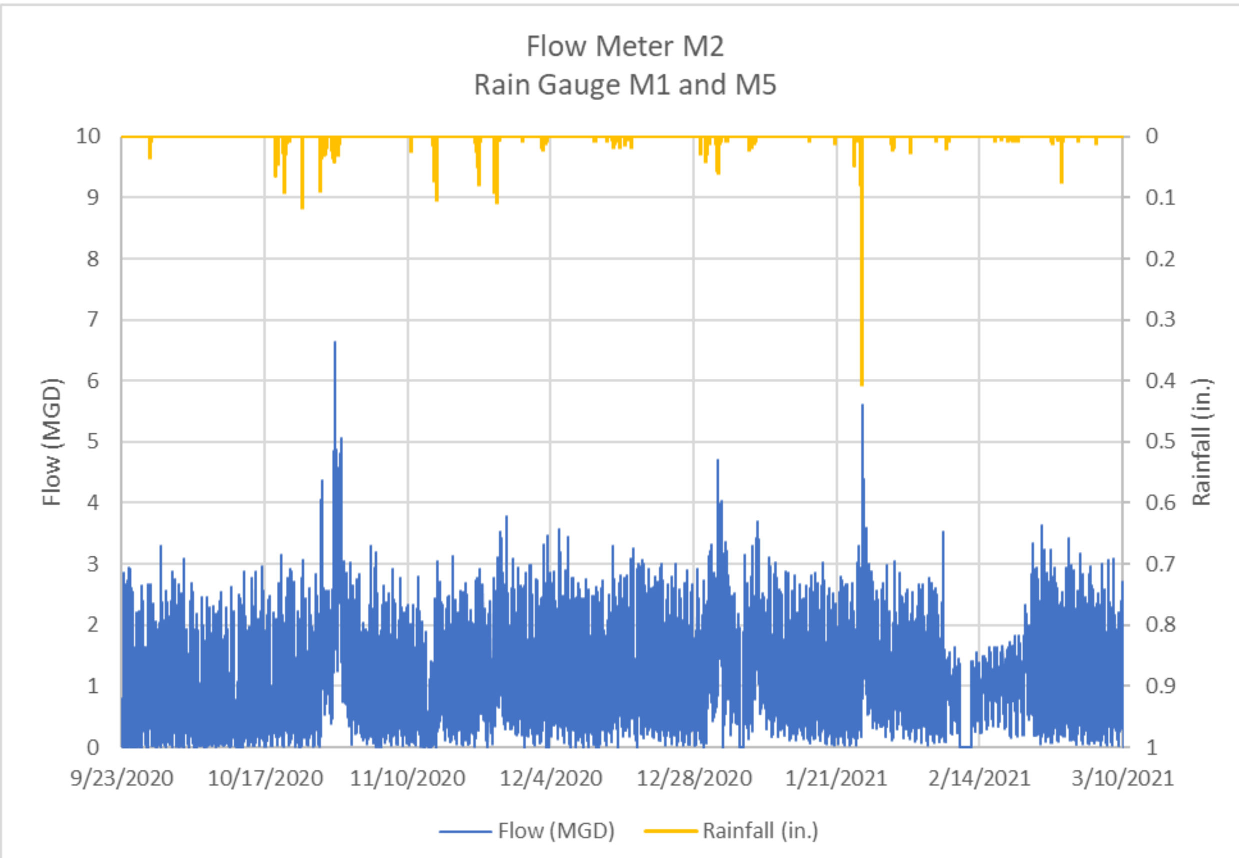


Figure E-3. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter M2.

Flow data results from the fall/winter monitoring period for flow meter M2 are as follows:

Minimum Flow	0.000 mgd
Maximum Flow	6.629 mgd
Average Flow	0.838 mgd
*Peaking Factor	7.915

*Maximum/Average Flow

Figure E-4 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter M2. The meter recorded eight surcharge events in manhole 236-6662 during the monitoring period. The meter dropped out between April 28, 2021 and May 6, 2021, so no data was collected during that period.

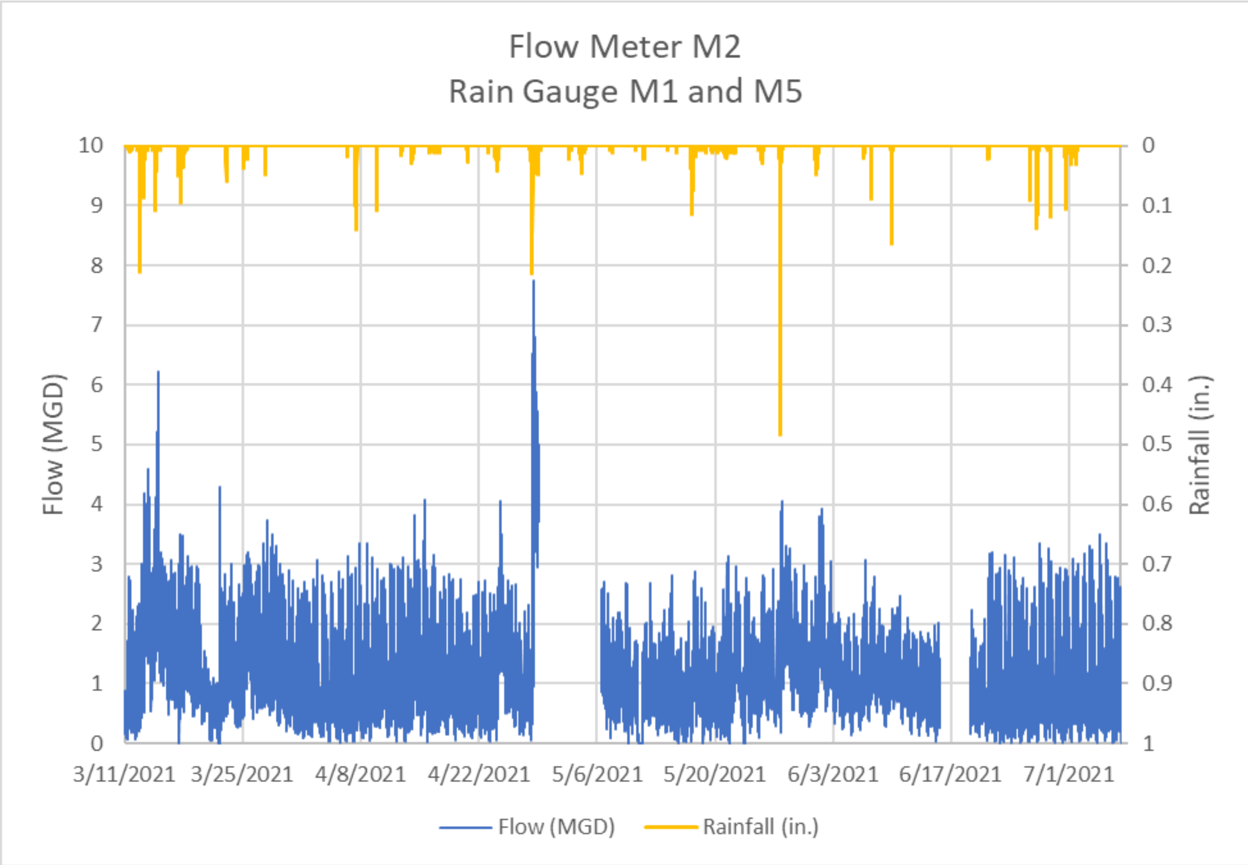


Figure E-4. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter M2.

Flow data results from the spring monitoring period for flow meter M2 are as follows:

Minimum Flow	0.000 mgd
Maximum Flow	7.742 mgd
Average Flow	0.959 mgd
*Peaking Factor	8.077

*Maximum/Average Flow

Flow Meter M3

Flow meter M3 was installed on the 10-inch influent pipe from the south of manhole 277-3808, the first manhole upstream of subbasin M1 to the north. It received wastewater flow from the immediate subbasin and subbasin M4 upstream. The immediate subbasin covered 494 acres and included 51,510 linear feet of pipe.

Figure E-5 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter M3. The meter recorded six surcharge events in manhole 277-3808 during the monitoring period.

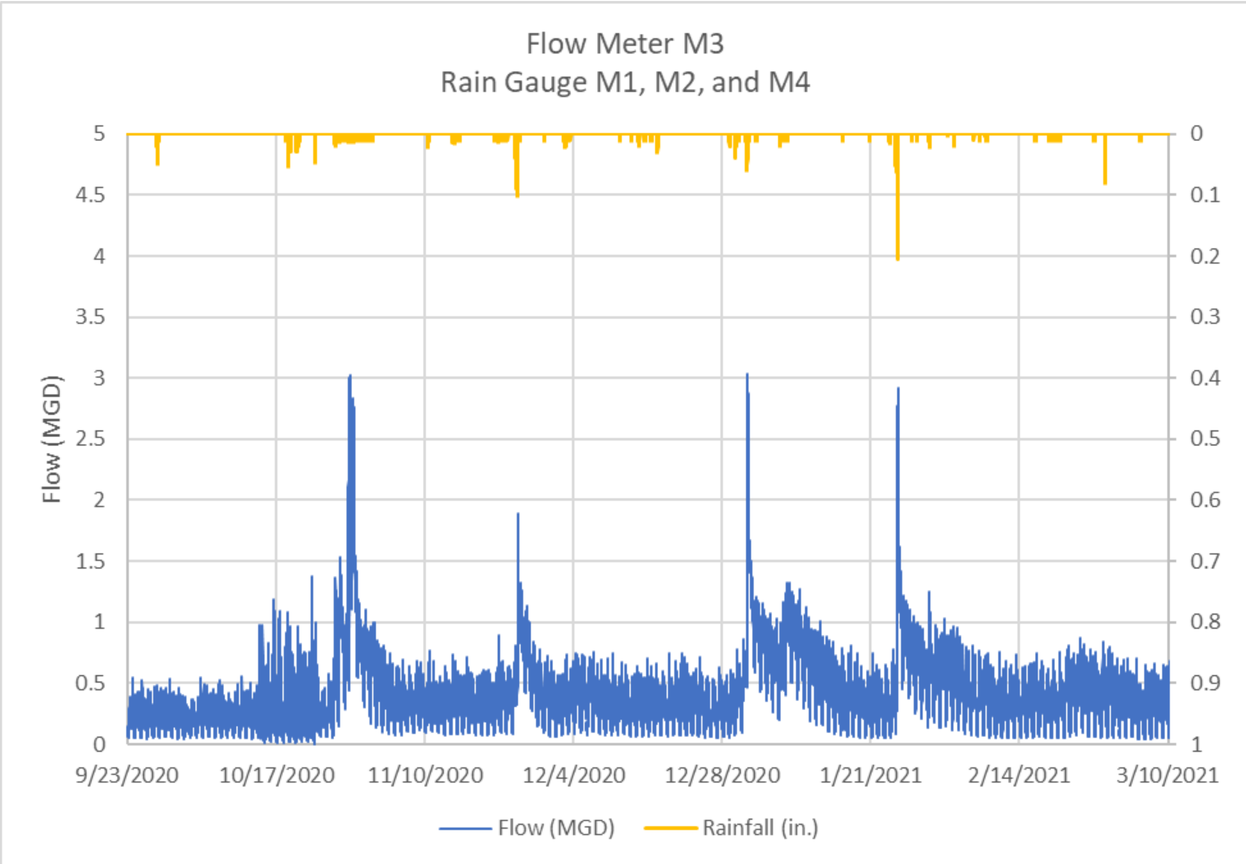


Figure E-5. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter M3.

Flow data results from the fall/winter monitoring period for flow meter M3 are as follows:

Minimum Flow	0.003 mgd
Maximum Flow	3.029 mgd
Average Flow	0.381 mgd
*Peaking Factor	7.946

*Maximum/Average Flow

Figure E-6 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter M3. The meter recorded two surcharge events in manhole 277-3808 during the monitoring period.

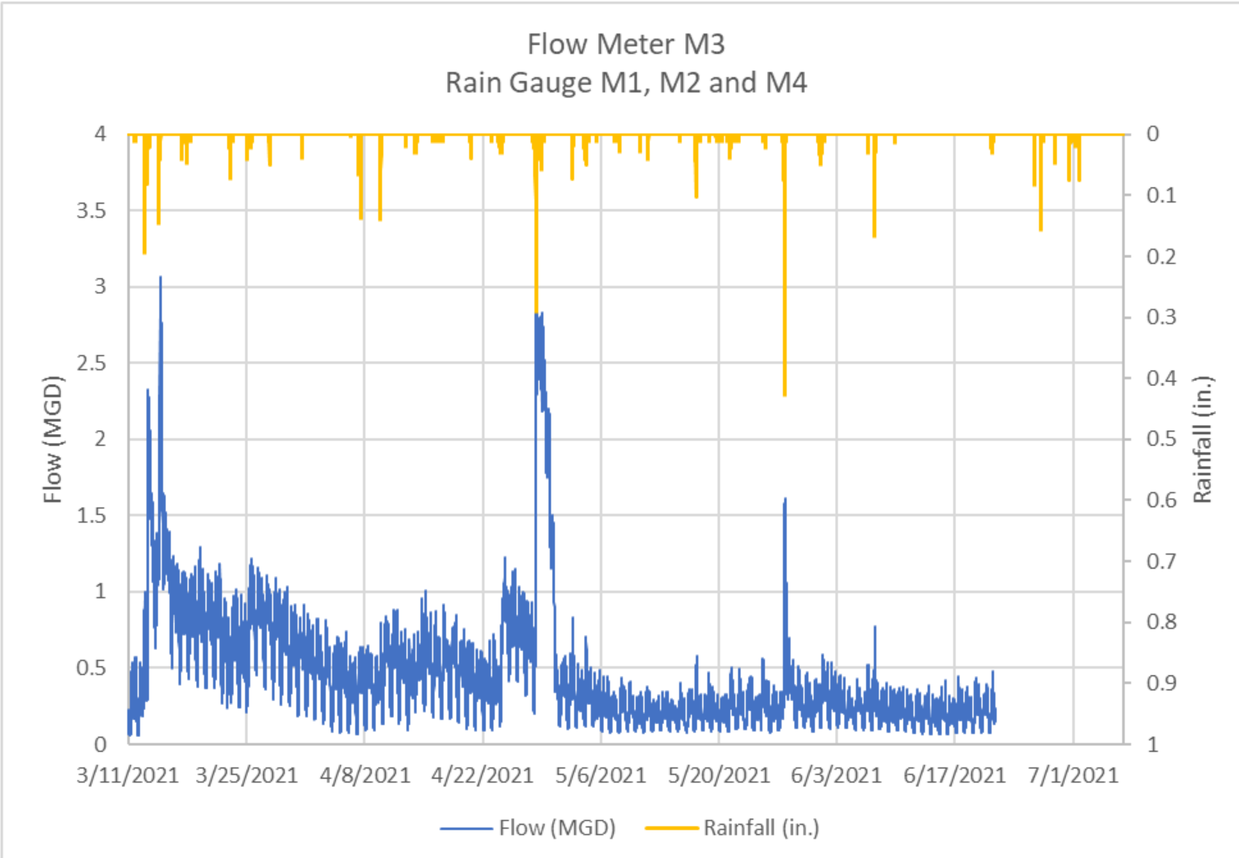


Figure E-6. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter M3.

Flow data results from the spring monitoring period for flow meter M3 are as follows:

Minimum Flow	0.058 mgd
Maximum Flow	3.064 mgd
Average Flow	0.450 mgd
*Peaking Factor	6.815

*Maximum/Average Flow

Flow Meter M4

Flow meter M4 was installed on the 8-inch influent pipe from the southwest of manhole 319-5516, the first manhole upstream of subbasin M3 to the north. No subbasins were upstream of the immediate subbasin, which covered 314 acres and included 38,230 linear feet of pipe.

Figure E-7 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter M4. The meter recorded five surcharge events in manhole 319-5516 during the monitoring period.

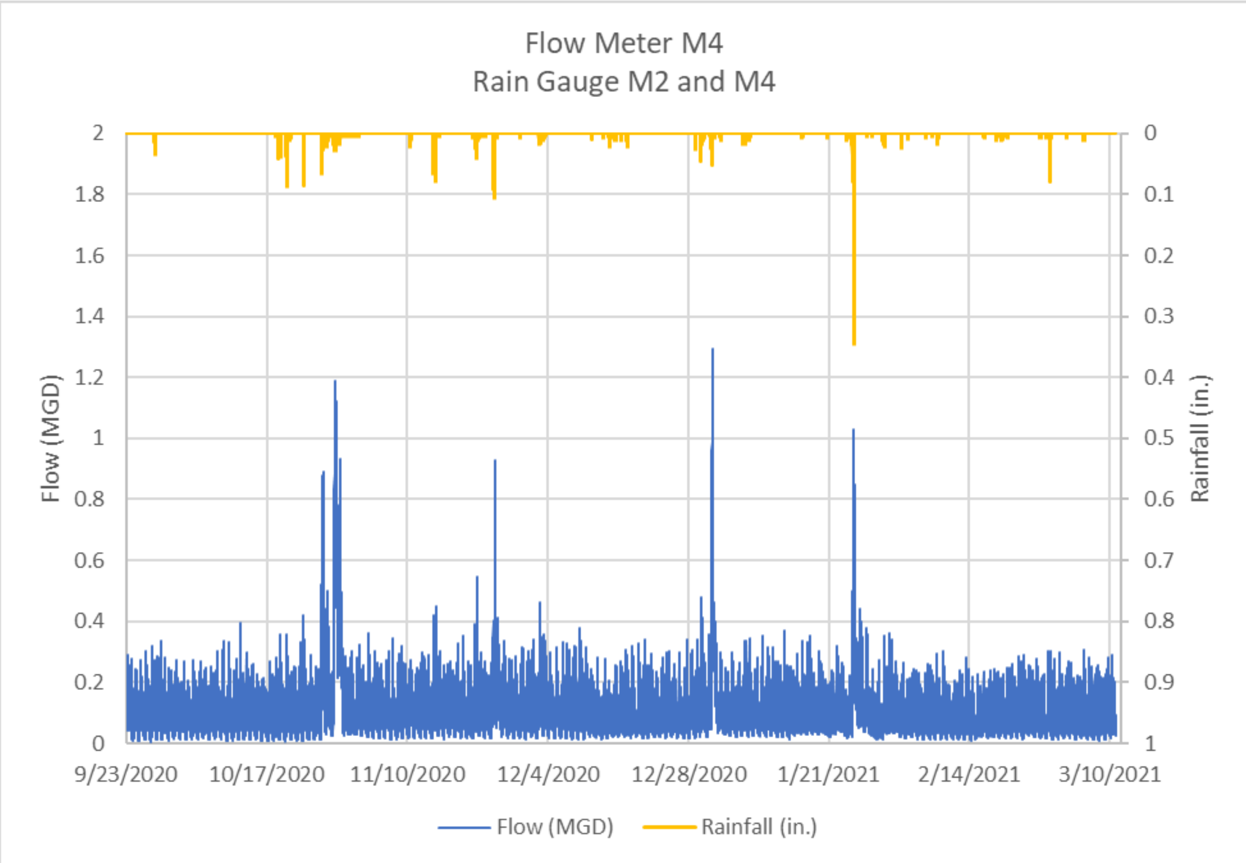


Figure E-7. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter M4.

Flow data results from the fall/winter monitoring period for flow meter M4 are as follows:

Minimum Flow	0.005 mgd
Maximum Flow	1.293 mgd
Average Flow	0.090 mgd
*Peaking Factor	14.421

*Maximum/Average Flow

Figure E-8 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter M4. The meter recorded one surcharge events in manhole 319-5516 during the monitoring period.

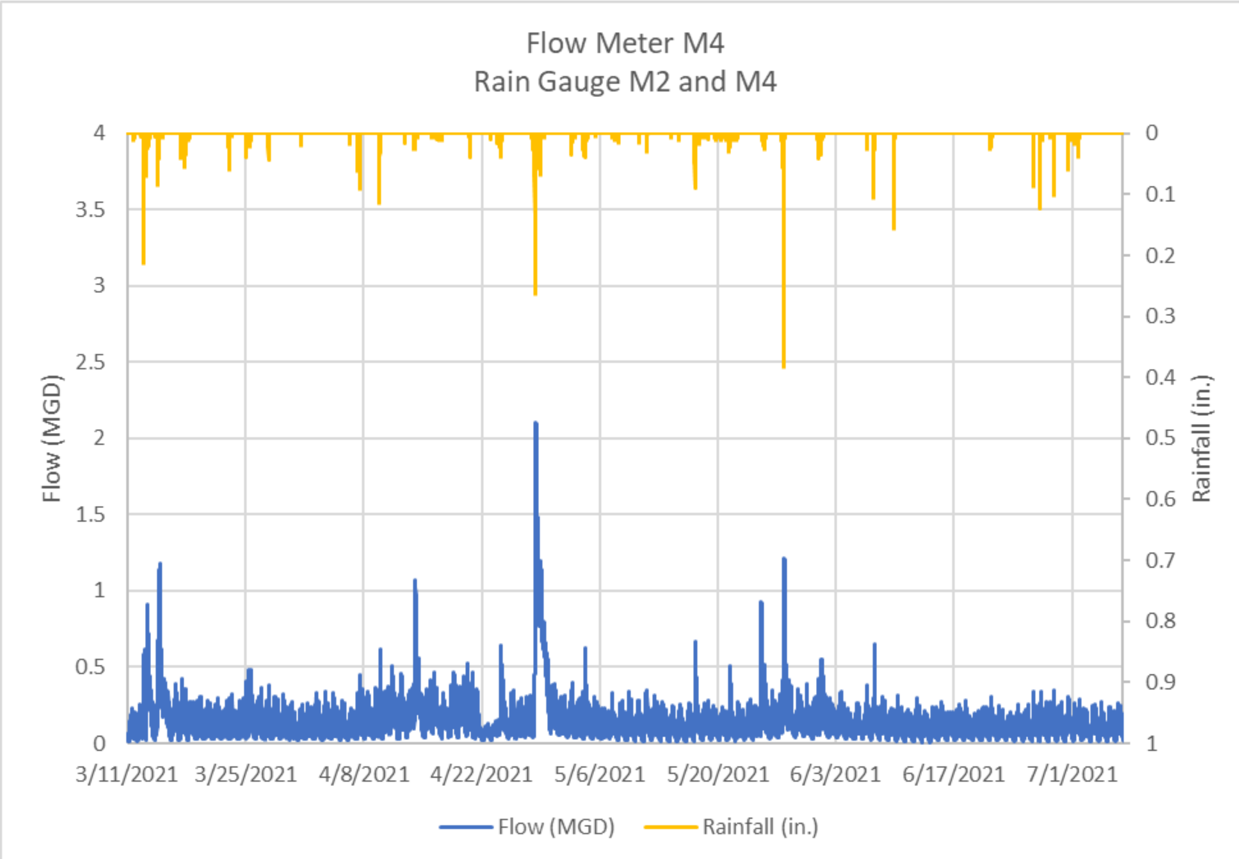


Figure E-8. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter M4.

Flow data results from the spring monitoring period for flow meter M4 are as follows:

Minimum Flow	0.002 mgd
Maximum Flow	2.105 mgd
Average Flow	0.127 mgd
*Peaking Factor	16.567

*Maximum/Average Flow

Flow Meter M5

Flow meter M5 was installed on the 24-inch influent pipe from the southwest of manhole 318-3696, the first manhole upstream of subbasin M2 to the north. It received wastewater flow from the immediate subbasin and subbasins M6, M7, M8, M9, M10, M11, and M12 upstream. The immediate subbasin covered 107 acres and included 2,550 linear feet of pipe.

Figure E-9 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter M5. The meter recorded no surcharge events in manhole 318-3696 during the monitoring period. The meter dropped out between November 23, 2020 and December 7, 2021, so no flow data is available during that time.

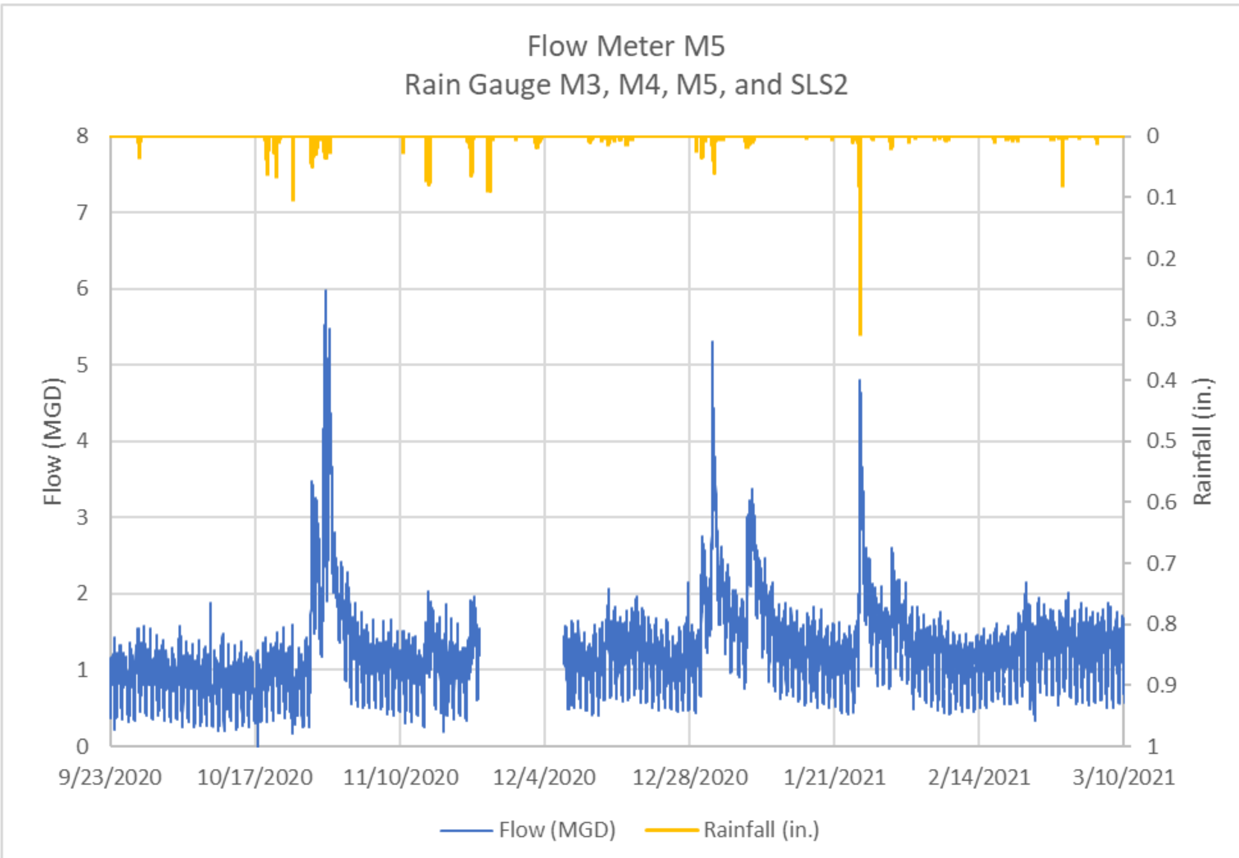


Figure E-9. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter M5.

Flow data results from the fall/winter monitoring period for flow meter M5 are as follows:

Minimum Flow	0.176 mgd
Maximum Flow	5.986 mgd
Average Flow	1.214 mgd
*Peaking Factor	4.929

*Maximum/Average Flow

Figure E-10 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter M5. The meter recorded one surcharge event in manhole 318-3696 during the monitoring period.

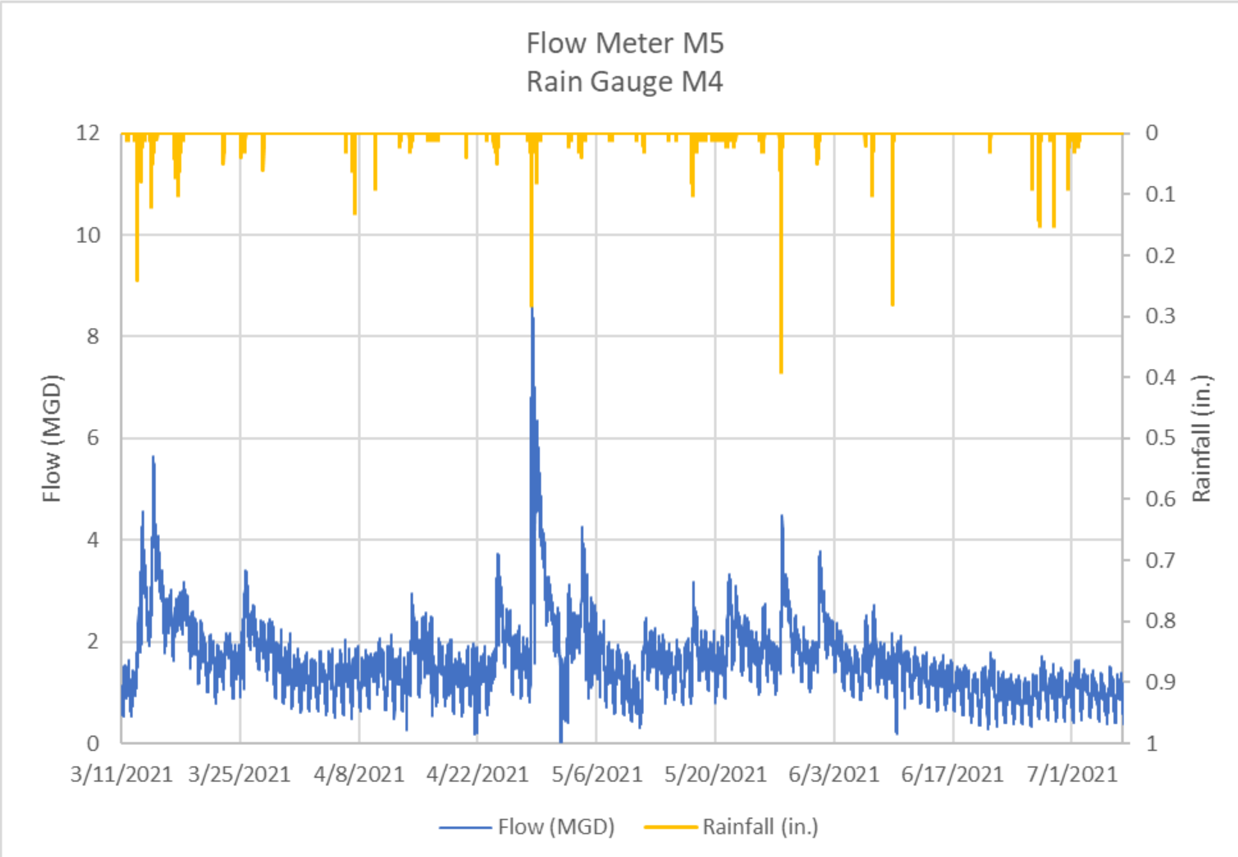


Figure E-10. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter M5.

Flow data results from the spring monitoring period for flow meter M5 are as follows:

Minimum Flow	0.032 mgd
Maximum Flow	9.531 mgd
Average Flow	1.628 mgd
*Peaking Factor	5.855

*Maximum/Average Flow

Flow Meter M6

Flow meter M6 was installed on the 12-inch influent pipe from the east of manhole 360-6518, located on the east side of the M5 subbasin. No subbasins were upstream of the immediate subbasin, which covered 544 acres and included 43,977 linear feet of pipe.

Figure E-6 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter 360-6518. The meter recorded no surcharge events in manhole 360-6518 during the monitoring period.

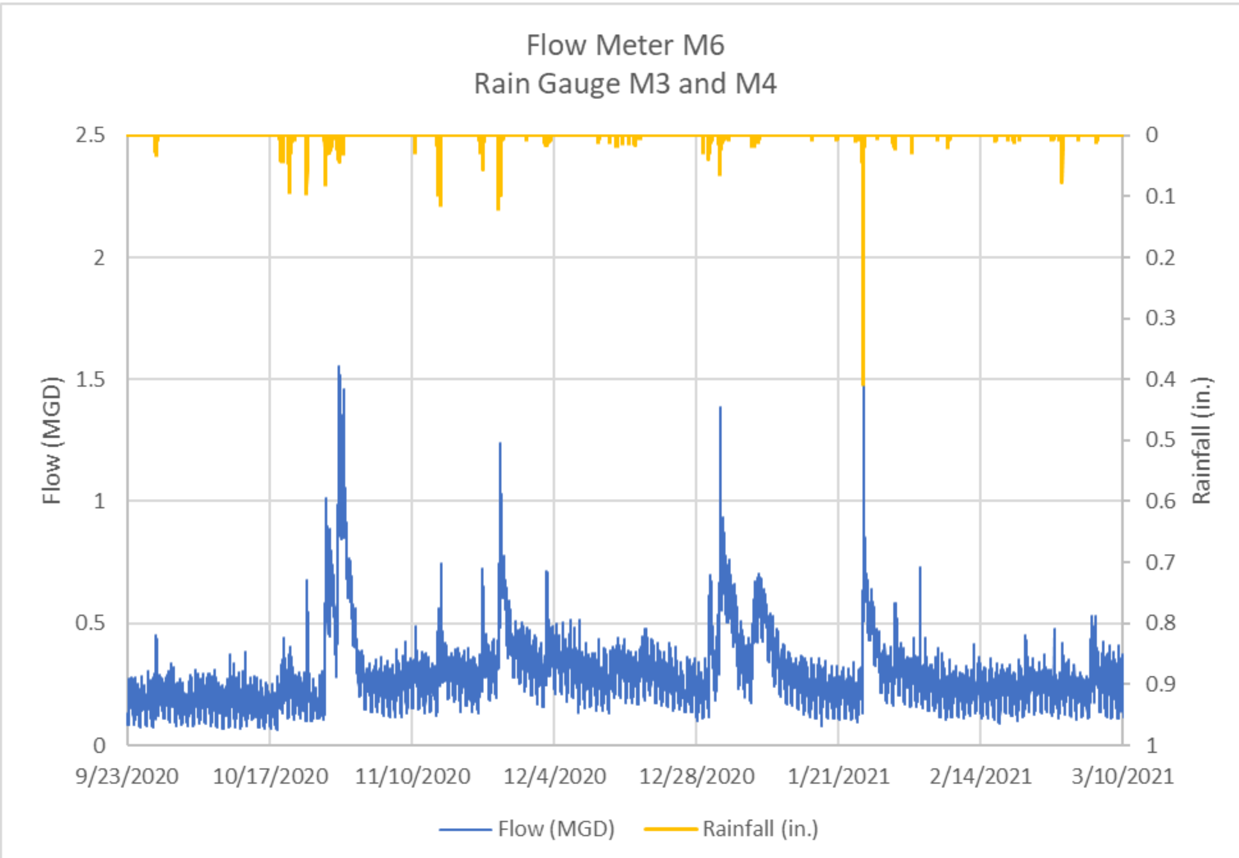


Figure E-11. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter M6.

Flow data results from the fall/winter monitoring period for flow meter M6 are as follows:

Minimum Flow	0.065 mgd
Maximum Flow	1.558 mgd
Average Flow	0.028 mgd
*Peaking Factor	5.561

*Maximum/Average Flow

Figure E-6 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter 360-6518. The meter recorded no surcharge events in manhole 360-6518 during the monitoring period.

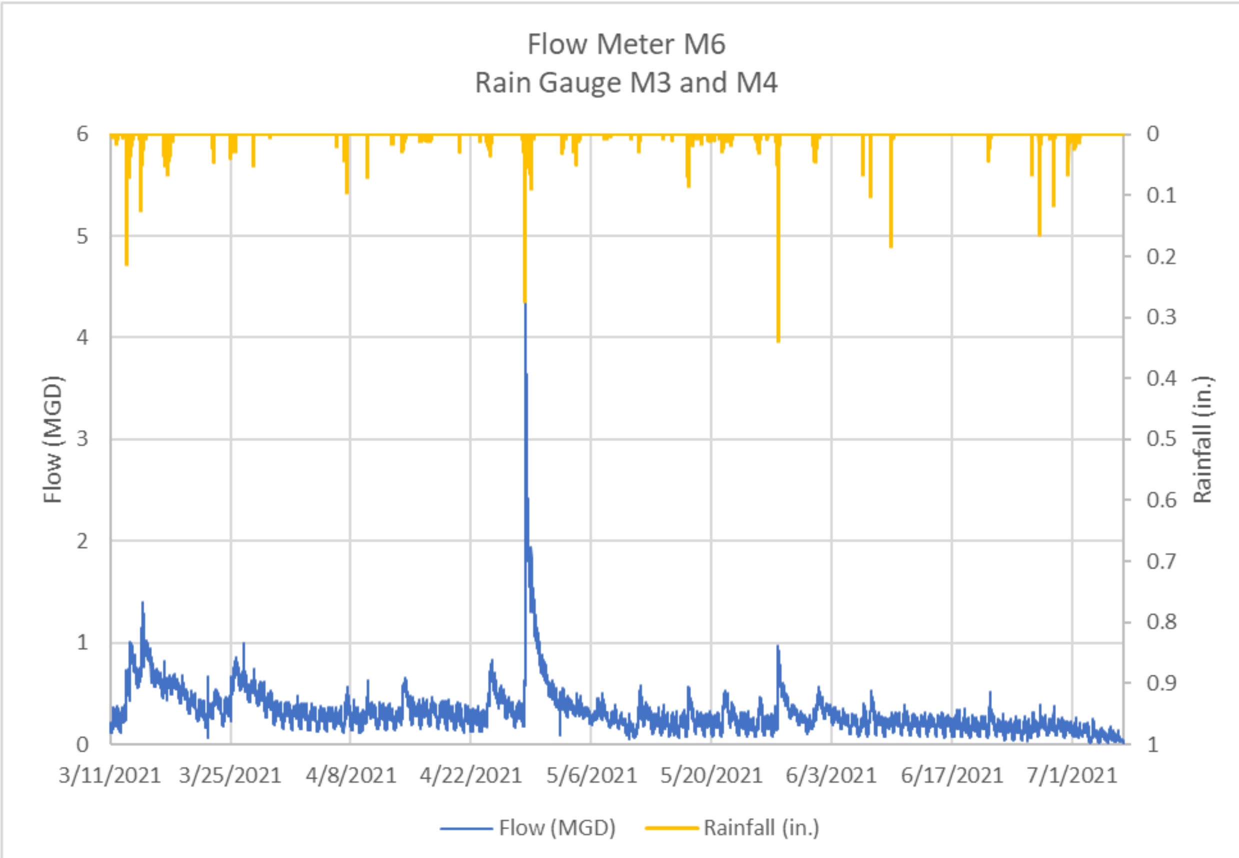


Figure E-12. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter M6.

Flow data results from the spring monitoring period for flow meter M6 are as follows:

Minimum Flow	0.011 mgd
Maximum Flow	5.643 mgd
Average Flow	0.311 mgd
*Peaking Factor	18.145

*Maximum/Average Flow

Flow Meter M7

Flow meter M7 was installed on the 24-inch influent pipe from the southeast of manhole 360-3186, which divides the M5 and M7 subbasins. It received wastewater from the immediate subbasin and subbasins M8, M9, M10, M11, and M12 upstream. The immediate subbasin covered 319 acres and included 24,355 linear feet of pipe.

Figure E-13 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter M7. The meter recorded no surcharge events in manhole 360-3186 during the monitoring period.

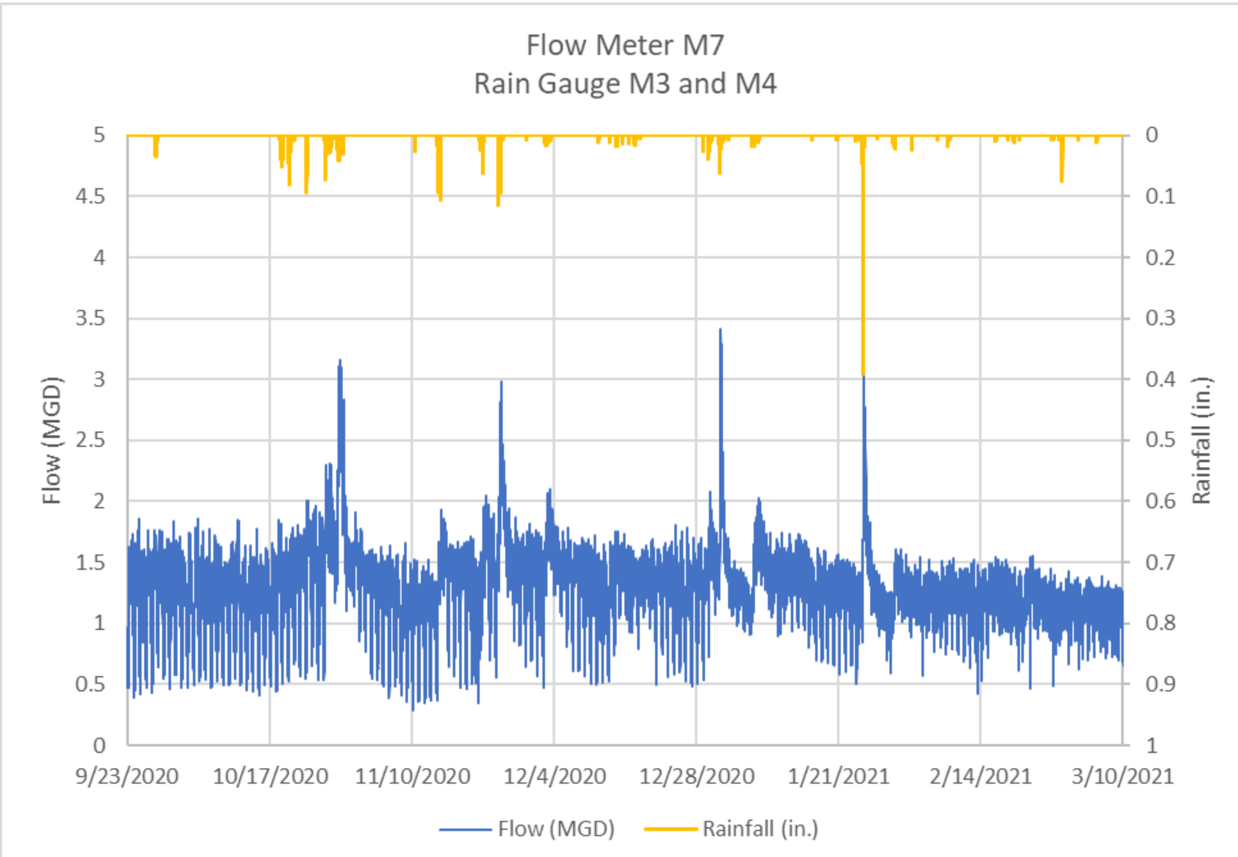


Figure E-13. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter M7.

Flow data results from the fall/winter monitoring period for flow meter M7 are as follows:

Minimum Flow	0.294 mgd
Maximum Flow	3.415 mgd
Average Flow	1.269 mgd
*Peaking Factor	2.691

*Maximum/Average Flow

Figure E-14 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter M7. The meter recorded no surcharge events in manhole 360-3186 during the monitoring period.

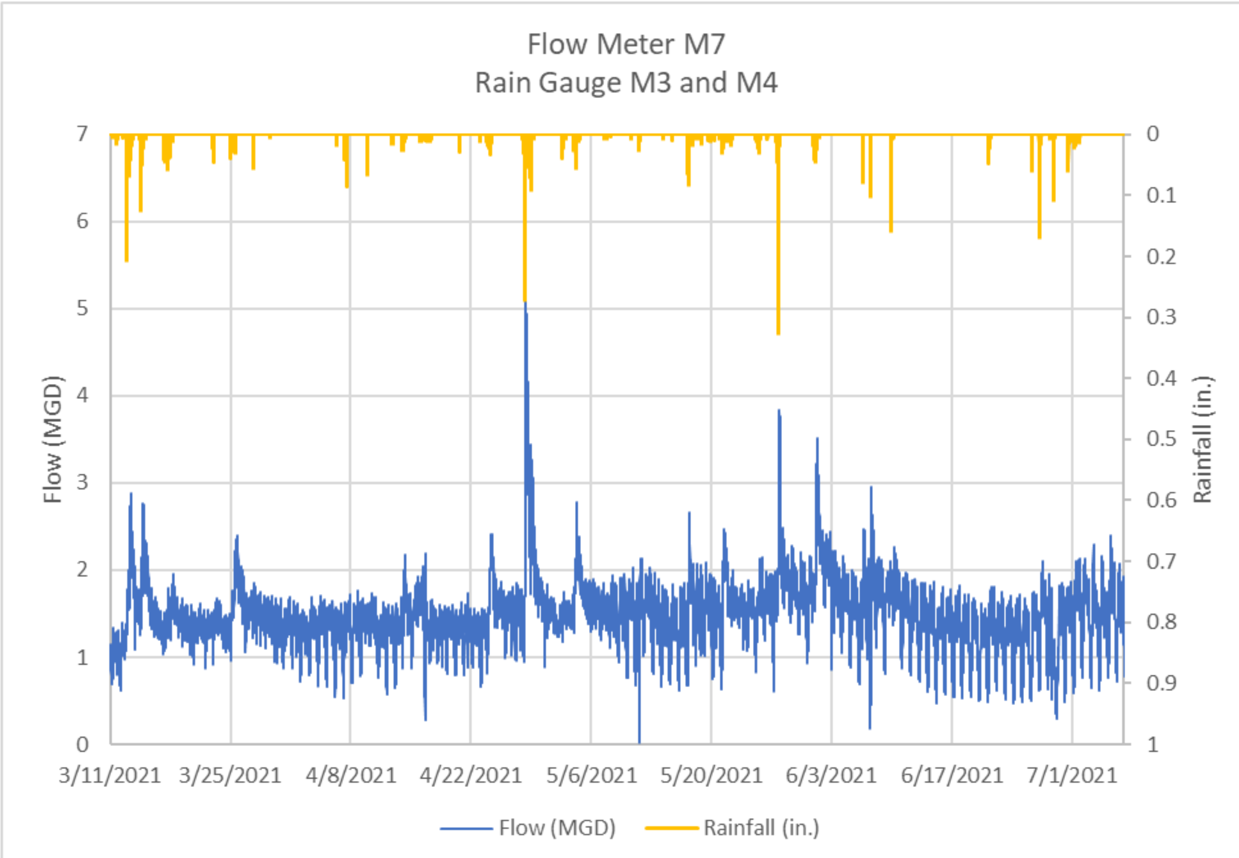


Figure E-14. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter M7.

Flow data results from the spring monitoring period for flow meter M7 are as follows:

Minimum Flow	0.028 mgd
Maximum Flow	5.777 mgd
Average Flow	1.497 mgd
*Peaking Factor	3.860

*Maximum/Average Flow

Flow Meter M8

Flow meter M8 was installed on the 12-inch influent pipe from the southwest of manhole 359-2808, which divides the M7 and M8 subbasins. No subbasins were upstream of the immediate subbasin, which covered 571 acres and included 45,870 linear feet of pipe.

Figure E-15 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter M8. The meter recorded no surcharge events in manhole 359-2808 during the monitoring period. The meter did not record data from January 1, 2021 to February 4, 2021; February 13, 2021 to February 19, 2021; and February 23, 2021 to March 3, 2021 due to meter malfunctions.

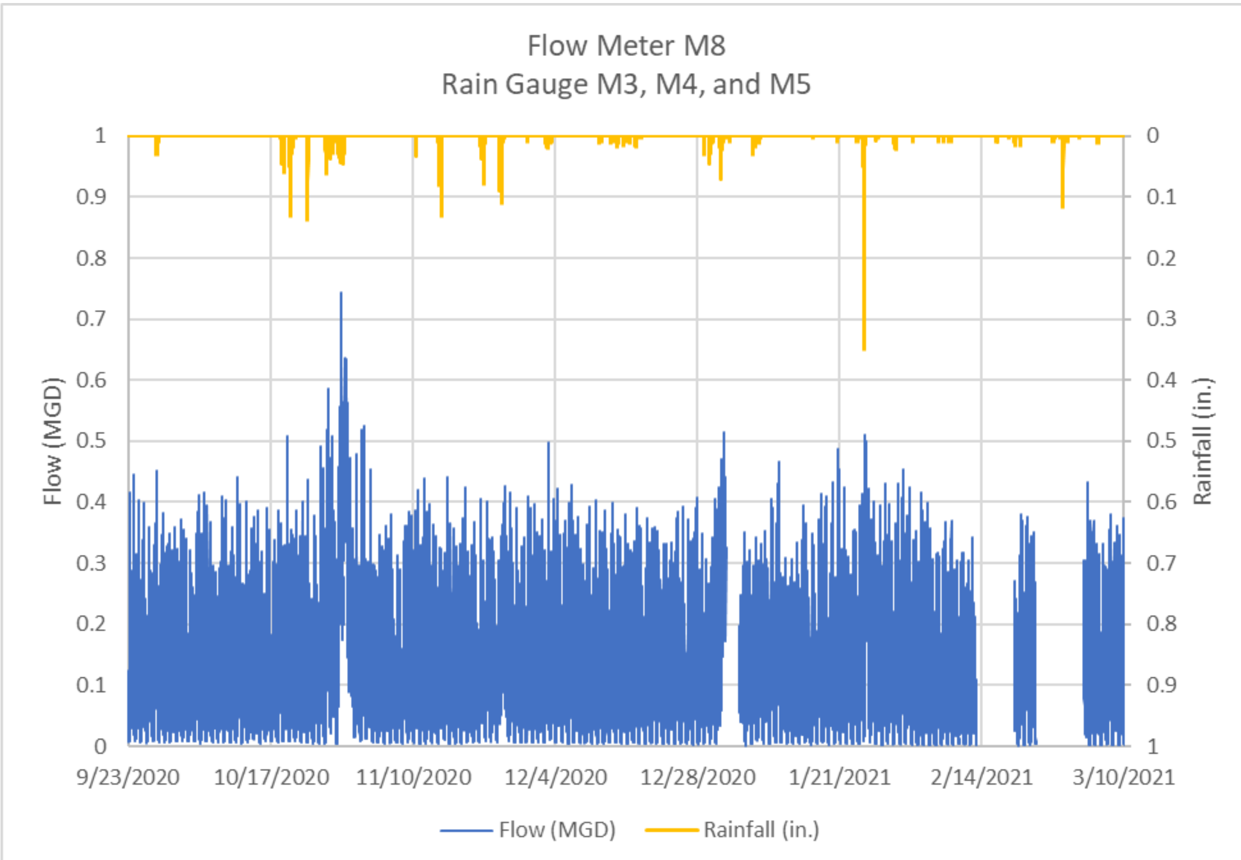


Figure E-15. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter M8.

Flow data results from the fall/winter monitoring period for flow meter M8 are as follows:

Minimum Flow	0.002 mgd
Maximum Flow	0.744 mgd
Average Flow	0.092 mgd
*Peaking Factor	8.120

*Maximum/Average Flow

Figure E-16 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter M8. The meter recorded no surcharge events in manhole 359-2808 during the monitoring period. The meter did not record data from May 14, 2021 to May 17, 2021; May 18, 2021 to May 21, 2021; and June 11, 2021 to June 21, 2021 due to meter malfunctions.

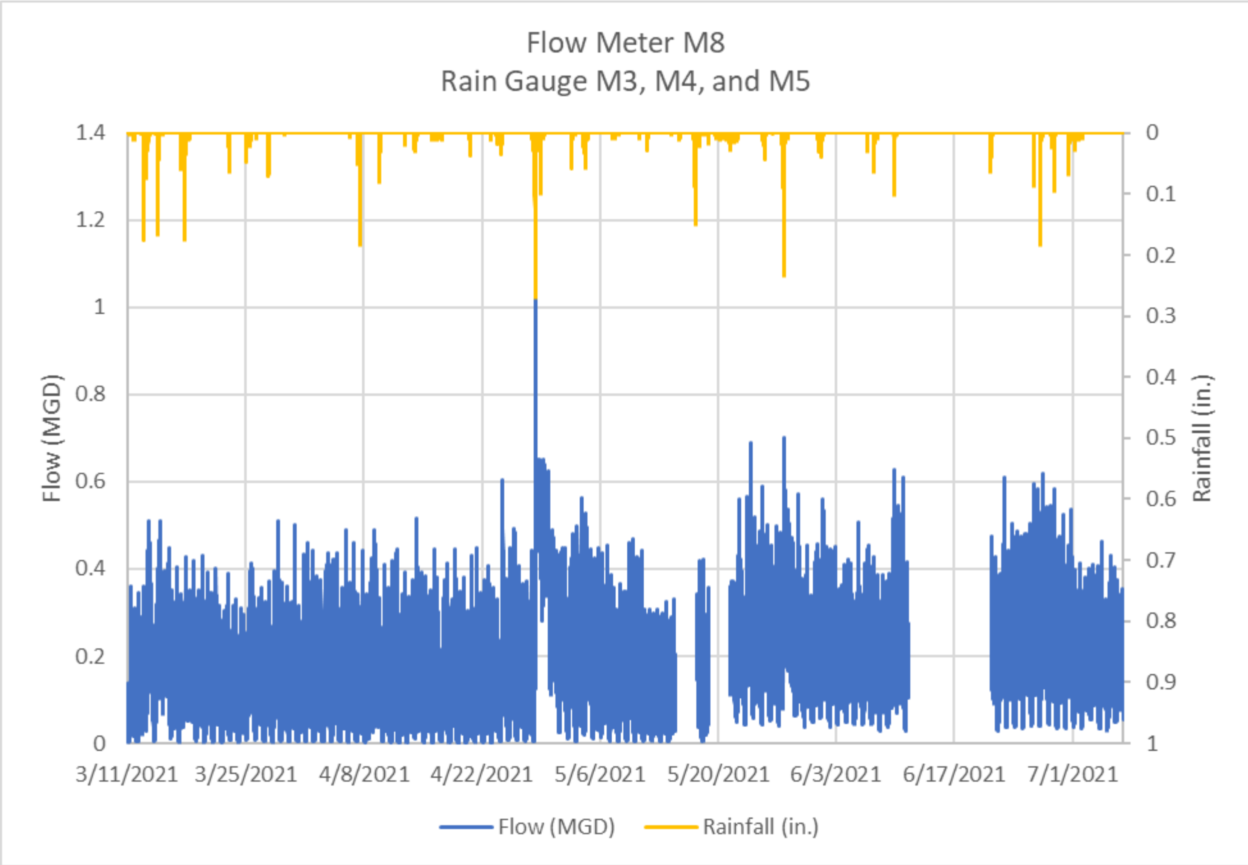


Figure E-16. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter M8.

Flow data results from the spring monitoring period for flow meter M8 are as follows:

Minimum Flow	0.002 mgd
Maximum Flow	1.195 mgd
Average Flow	0.133 mgd
*Peaking Factor	9.012

*Maximum/Average Flow

Flow Meter M9

Flow meter M9 was installed on the 24-inch influent pipe from the southeast of manhole 402-2481, to the south of subbasin M7. It received wastewater flow from the immediate subbasin and subbasins M10, M11 and M12 upstream. The immediate subbasin covered 432 acres and included 41,061 linear feet of pipe.

Figure E-17 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter M9. The meter recorded no surcharge events in manhole 402-2481 during the monitoring period.

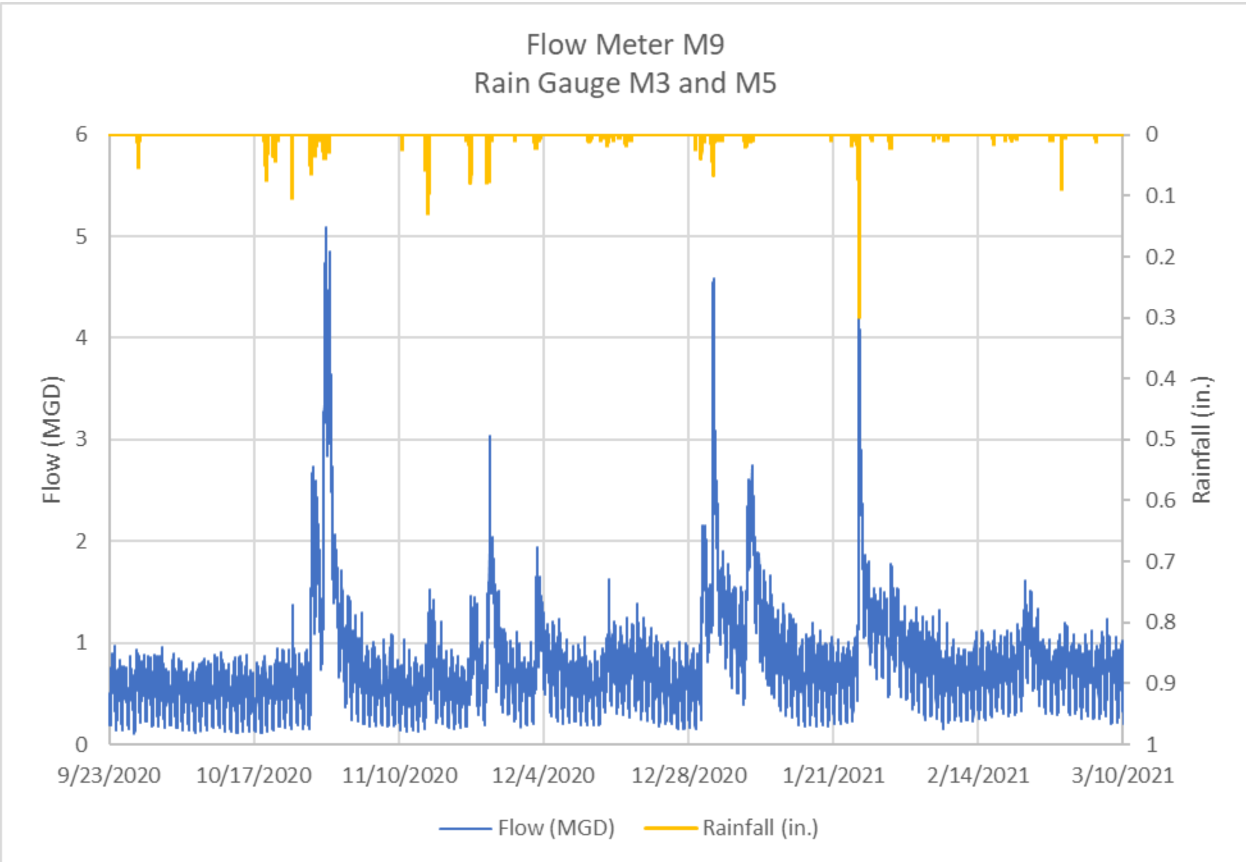


Figure E-17. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter M9.

Flow data results from the fall/winter monitoring period for flow meter M9 are as follows:

Minimum Flow	0.110 mgd
Maximum Flow	5.092 mgd
Average Flow	0.765 mgd
*Peaking Factor	6.656

*Maximum/Average Flow

Figure E-18 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter M9. The meter recorded no surcharge events in manhole 402-2481 during the monitoring period.

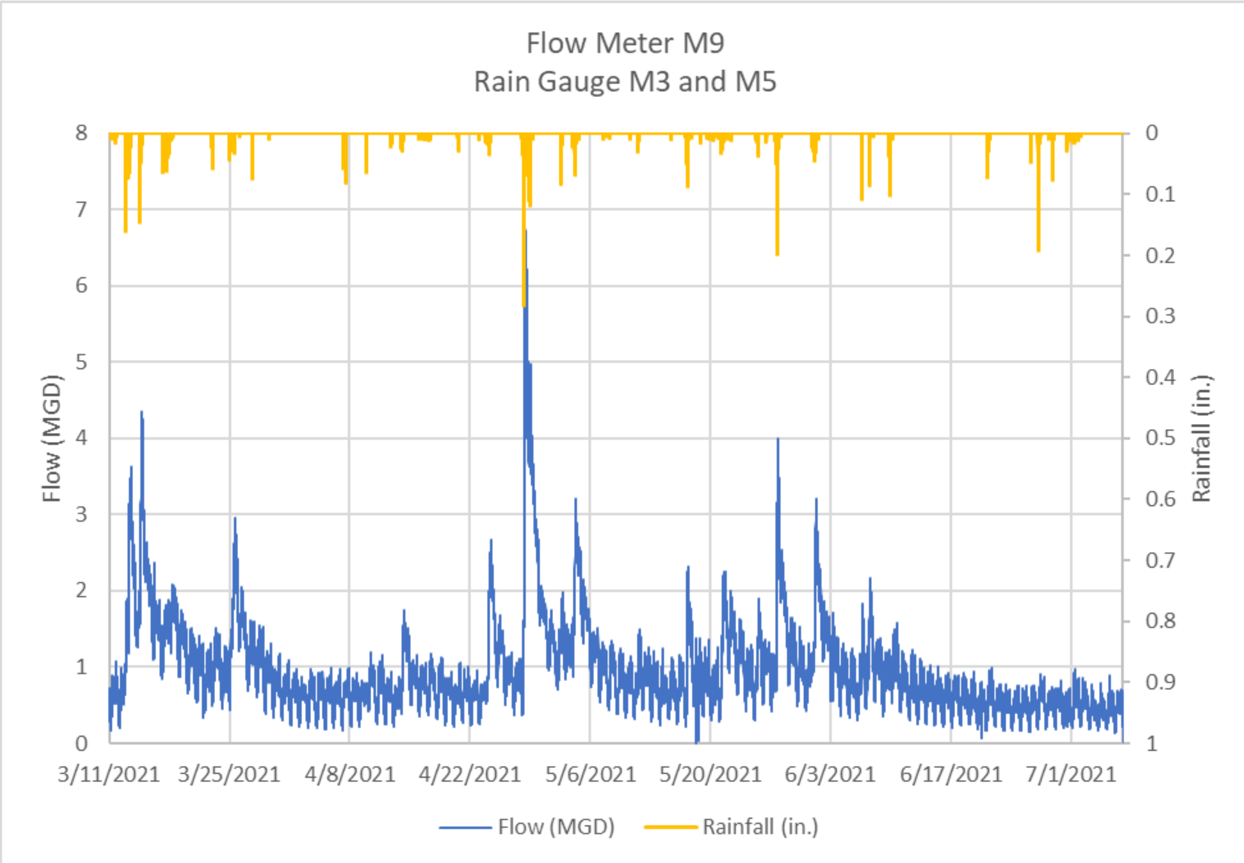


Figure E-18. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter M9.

Flow data results from the spring monitoring period for flow meter M9 are as follows:

Minimum Flow	0.005 mgd
Maximum Flow	6.982 mgd
Average Flow	0.958 mgd
*Peaking Factor	7.286

*Maximum/Average Flow

Flow Meter M10

Flow meter M10 was installed on the 24-inch influent pipe from the east of manhole 402-2471, which divides subbasins M9 and M10. It received wastewater flow from the immediate subbasin and subbasin M12 upstream. The immediate subbasin covered 511 acres and included 33,023 linear feet of pipe.

Figure E-19 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter M10. The meter recorded no surcharge events in manhole 402-2470 during the monitoring period.

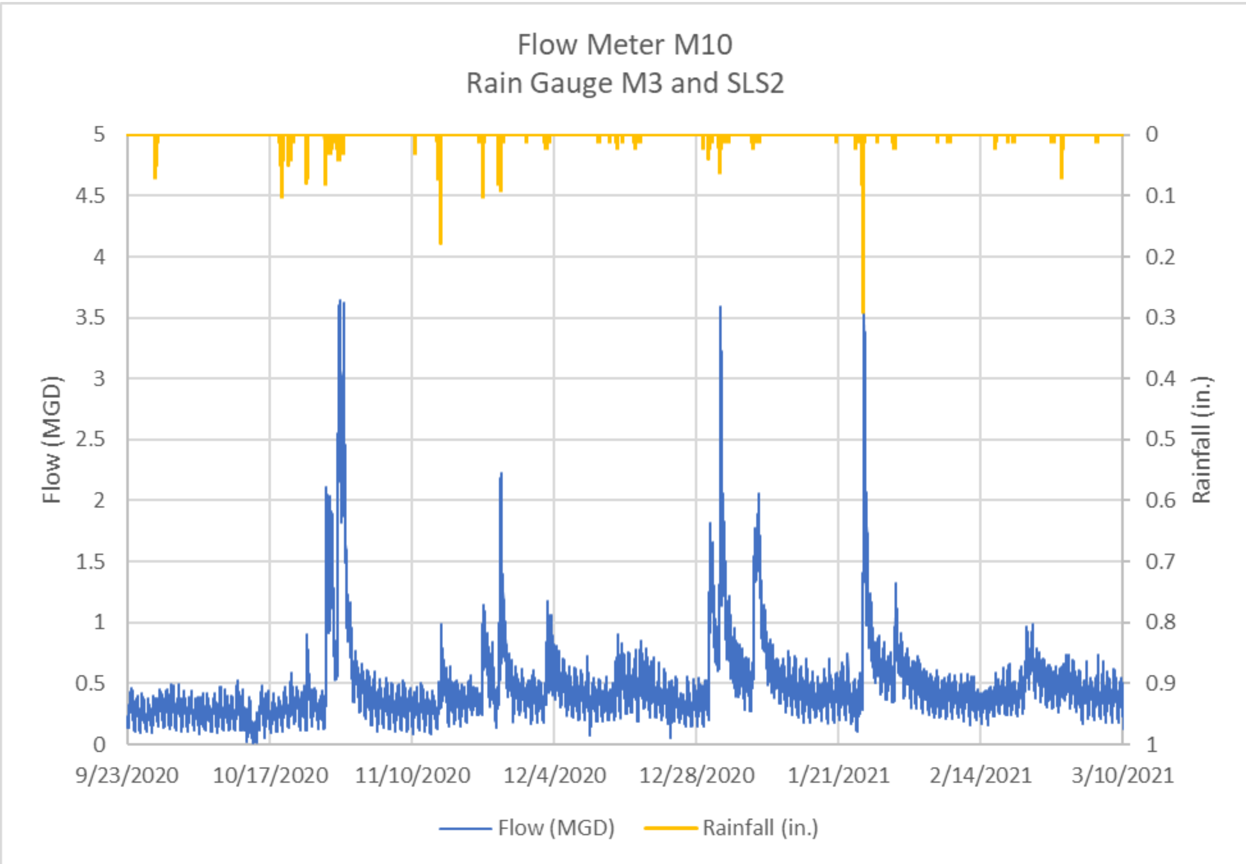


Figure E-19. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter M10.

Flow data results from the fall/winter monitoring period for flow meter M10 are as follows:

Minimum Flow	0.009 mgd
Maximum Flow	3.639 mgd
Average Flow	0.468 mgd
*Peaking Factor	7.781

*Maximum/Average Flow

Figure E-20 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter M10. The meter recorded no surcharge events in manhole 402-2470 during the monitoring period.

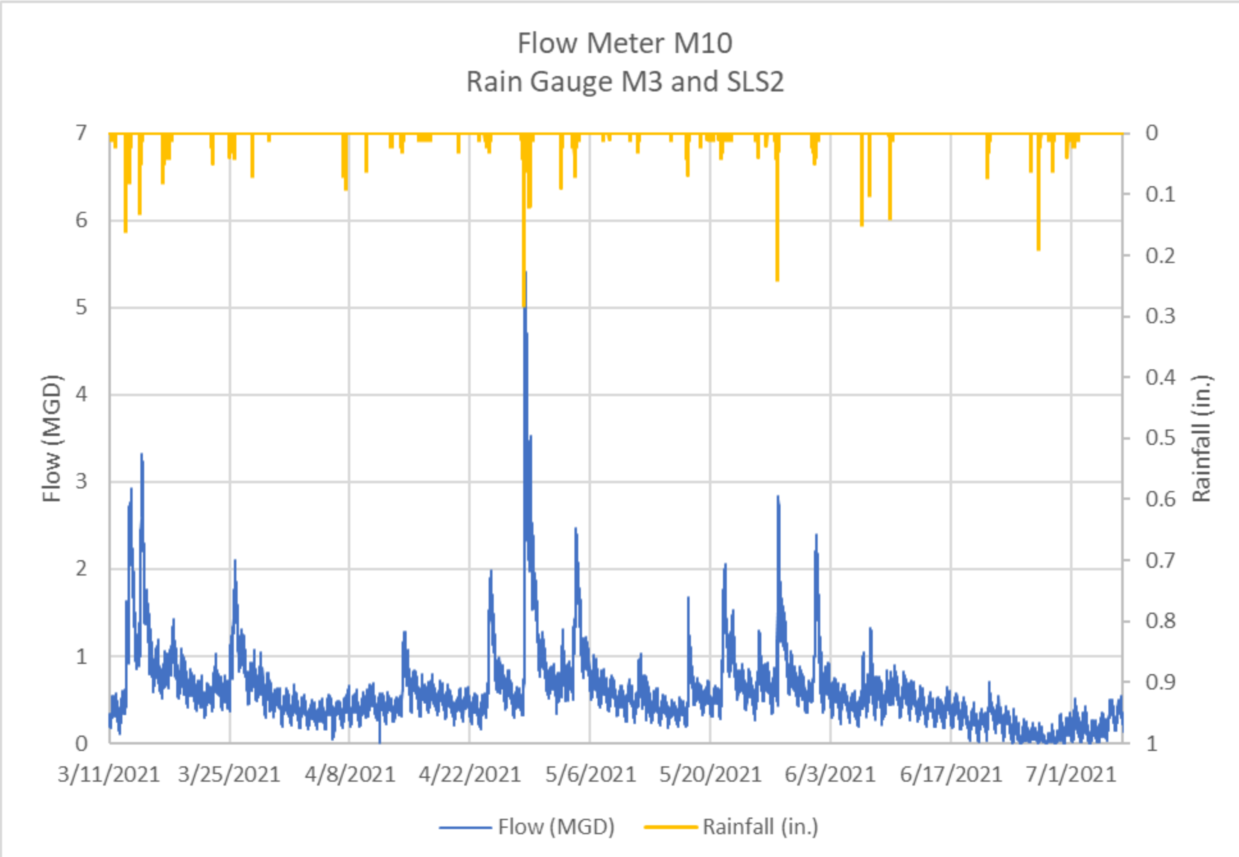


Figure E-20. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter M10.

Flow data results from the spring monitoring period for flow meter M10 are as follows:

Minimum Flow	0.001 mgd
Maximum Flow	5.882 mgd
Average Flow	0.588 mgd
*Peaking Factor	10.001

*Maximum/Average Flow

Flow Meter M11

Flow meter M11 was installed on the 18-inch influent pipe from the west of manhole 401-2221, which divides subbasins M9 and M11. No subbasins were upstream of the immediate subbasin, which covered 373 acres and included 52,090 linear feet of pipe.

Figure E-21 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter M11. The meter recorded no surcharge events during the monitoring period.

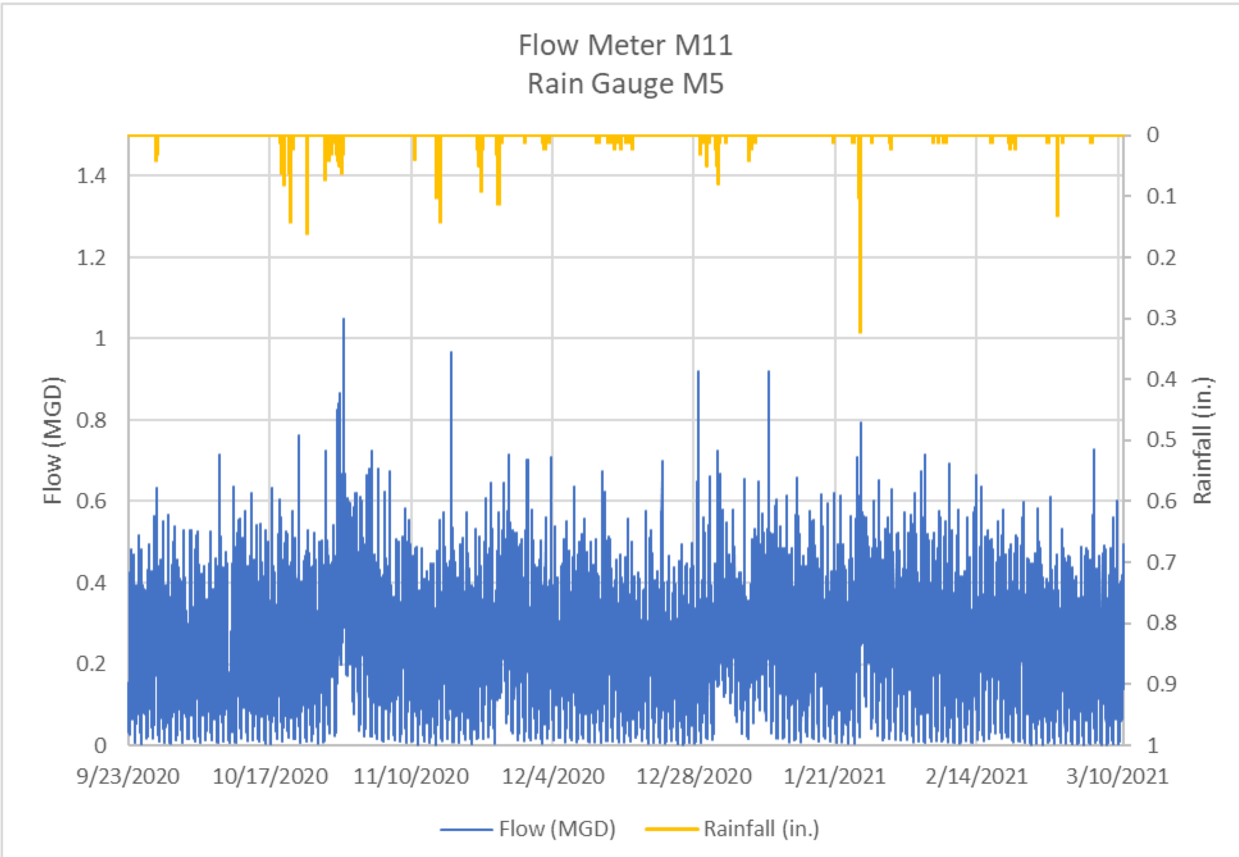


Figure E-21. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter M11.

Flow data results from the fall/winter monitoring period for flow meter M11 are as follows:

Minimum Flow	0.002 mgd
Maximum Flow	1.047 mgd
Average Flow	0.218 mgd
*Peaking Factor	4.800

*Maximum/Average Flow

Figure E-22 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter M11. The meter recorded no surcharge events during the monitoring period. The meter dropped out between May 18, 2021 and May 26, 2021, so no data is available from that period.

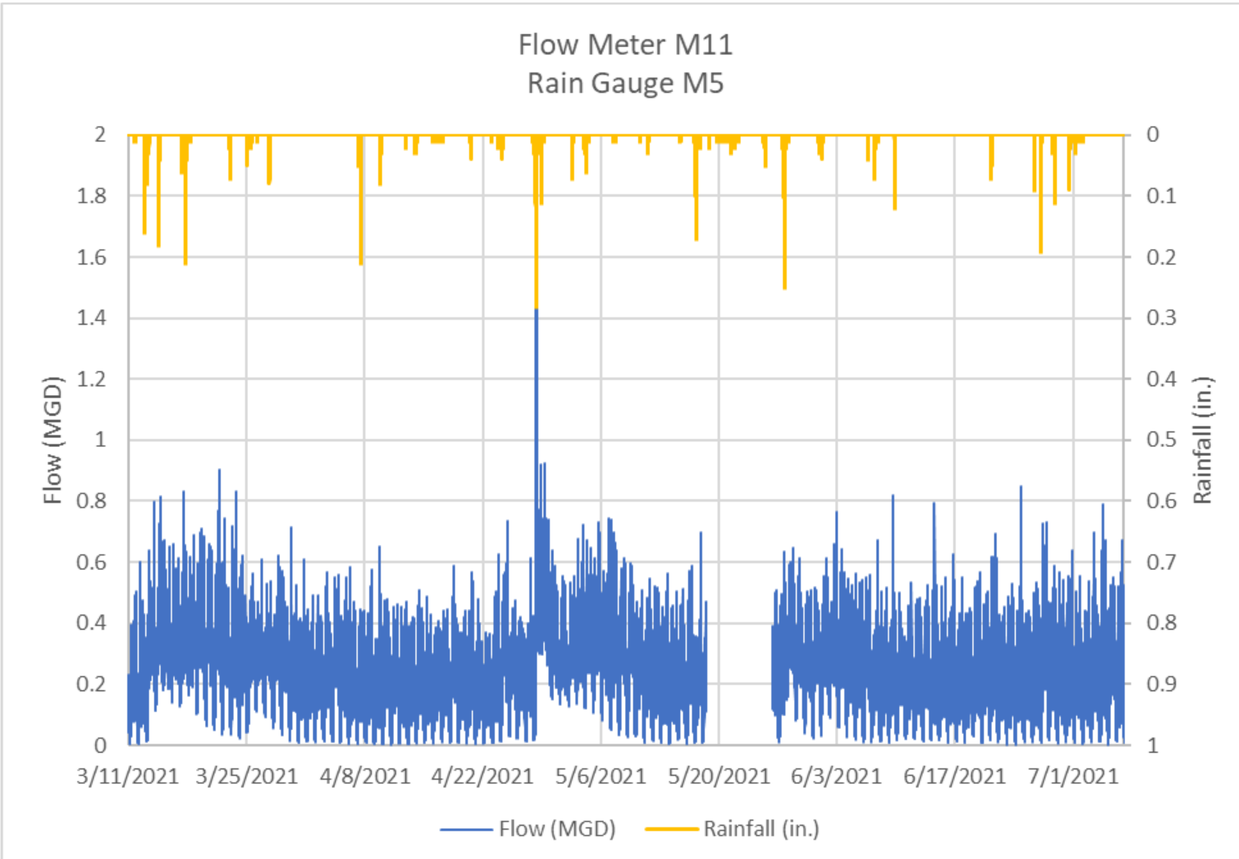


Figure E-22. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter M11.

Flow data results from the spring monitoring period for flow meter M11 are as follows:

Minimum Flow	0.002 mgd
Maximum Flow	1.759 mgd
Average Flow	0.241 mgd
*Peaking Factor	7.309

*Maximum/Average Flow

Flow Meter M12

Flow meter M12 was installed on the 12-inch influent pipe from the east of manhole 403-21, which is on the east side of subbasin M10. No subbasins were upstream of the immediate subbasin, which covered 259 acres and included 33,962 linear feet of pipe.

Figure E-23 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter M12. The meter recorded three surcharge events in manhole 403-21 during the monitoring period.

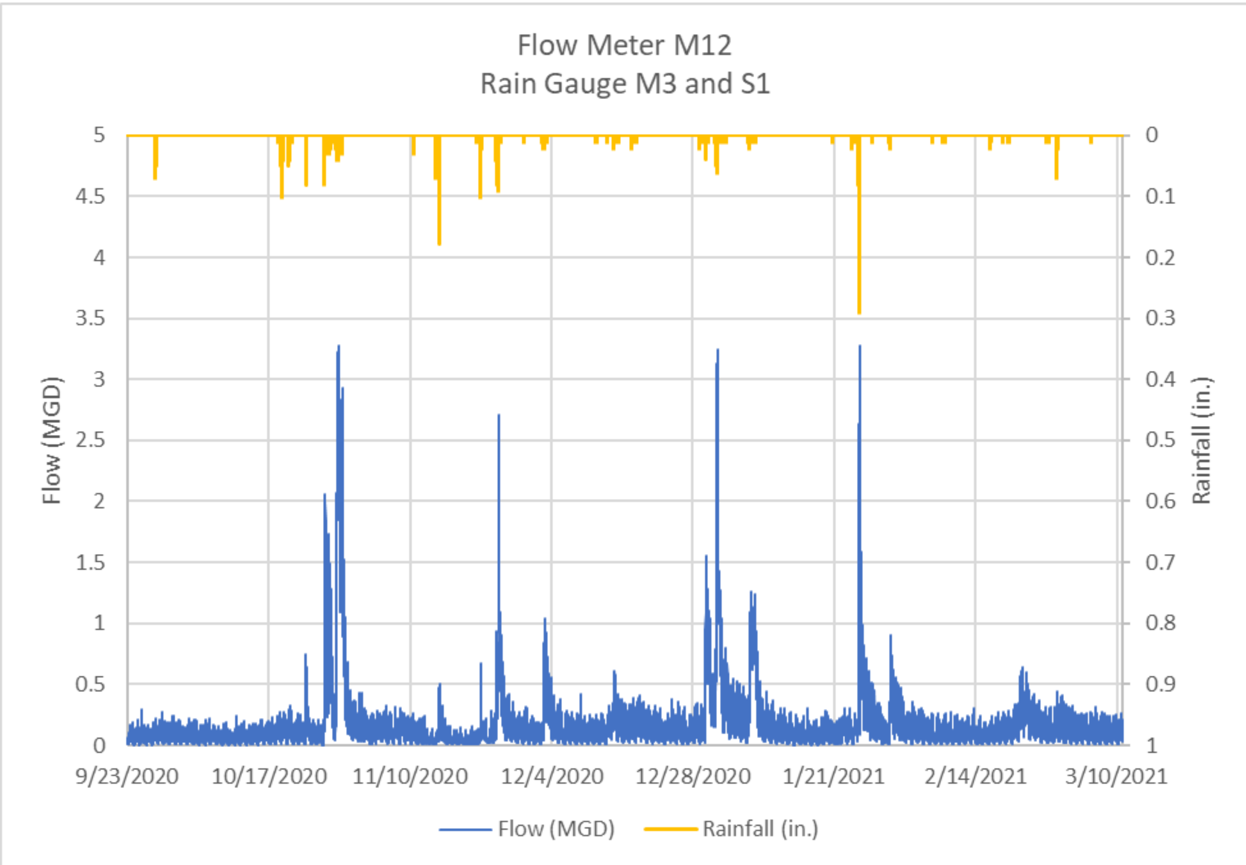


Figure E-23. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter M12.

Flow data results from the fall/winter monitoring period for flow meter M12 are as follows:

Minimum Flow	0.002 mgd
Maximum Flow	3.280 mgd
Average Flow	0.158 mgd
*Peaking Factor	20.826

*Maximum/Average Flow

Figure E-24 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter M12. The meter recorded three surcharge events in manhole 403-21 during the monitoring period.

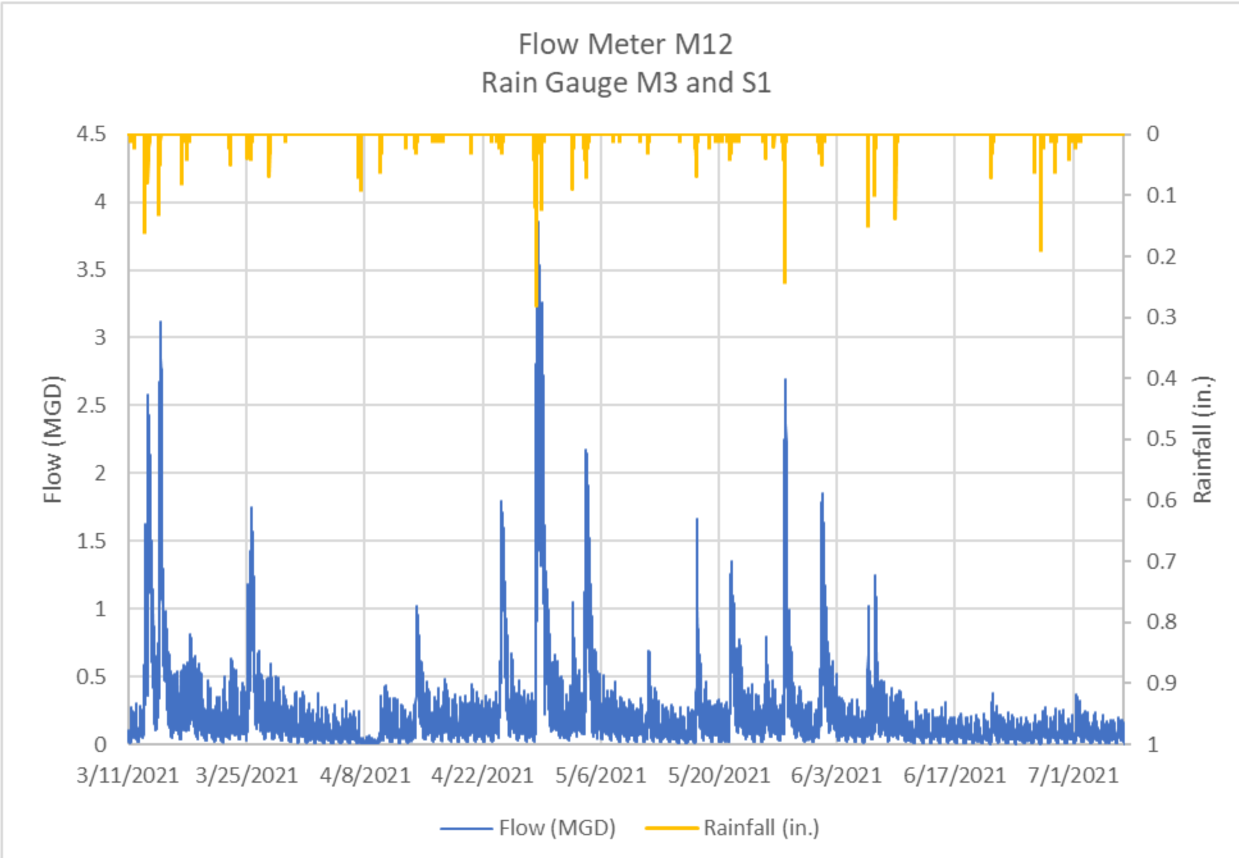


Figure E-24. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter M12.

Flow data results from the spring monitoring period for flow meter M12 are as follows:

Minimum Flow	0.004 mgd
Maximum Flow	3.886 mgd
Average Flow	0.208 mgd
*Peaking Factor	18.644

*Maximum/Average Flow

Flow Meter S1

Flow meter S1 was installed on the 12-inch influent pipe from the east of manhole 278-4437, which is located east of the North Lift Station. It received wastewater flow from the immediate subbasin and subbasins S2 and S3. The immediate subbasin covered 1,045 acres and included 41,930 linear feet of pipe.

Figure E-25 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter S1. The meter recorded no surcharge events in manhole 278-4437 during the monitoring period. The meter did not record data December 13, 2020 to December 23, 2020 due to a meter malfunction.

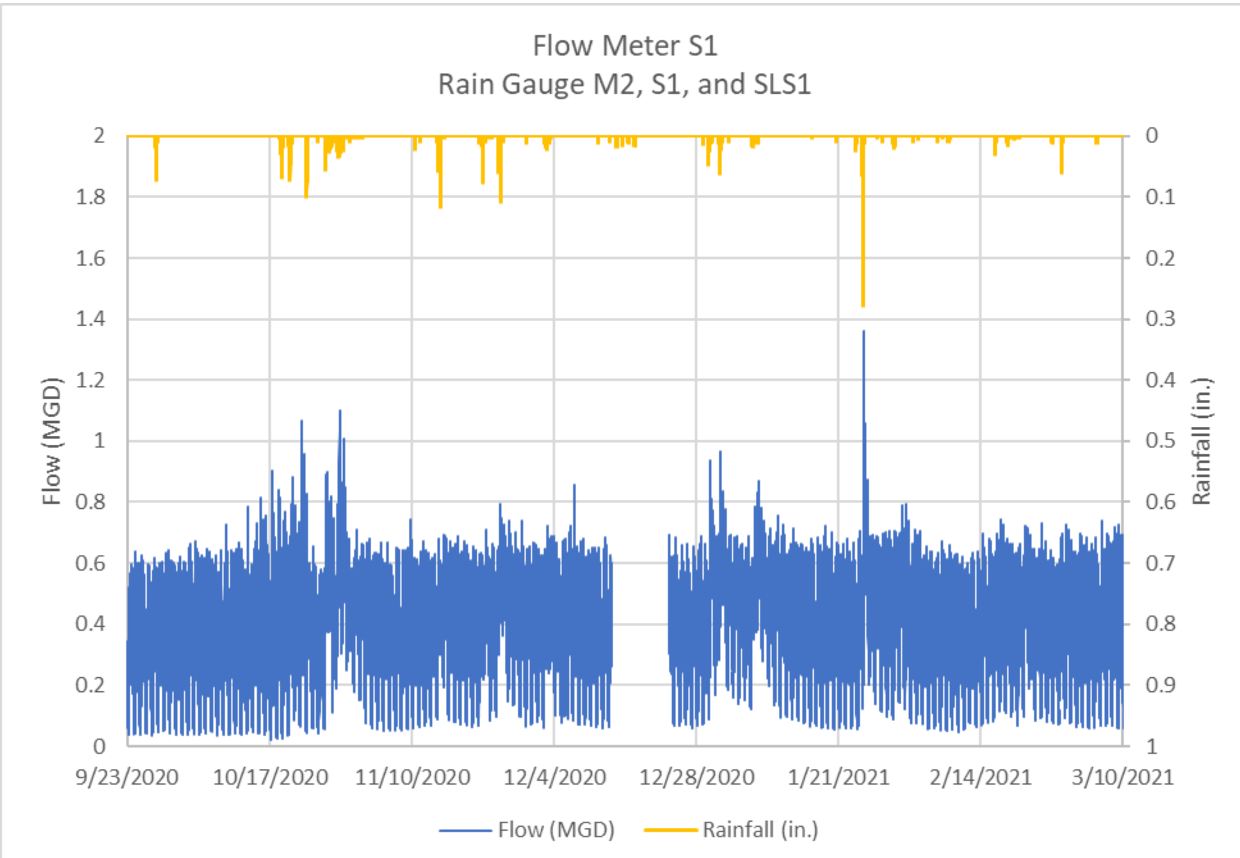


Figure E-25. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter S1.

Flow data results from the fall/winter monitoring period for flow meter S1 are as follows:

Minimum Flow	0.023 mgd
Maximum Flow	1.360 mgd
Average Flow	0.363 mgd
*Peaking Factor	3.749

*Maximum/Average Flow

Figure E-26 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter S1. The meter recorded one surcharge event in manhole 278-4437 during the monitoring period.

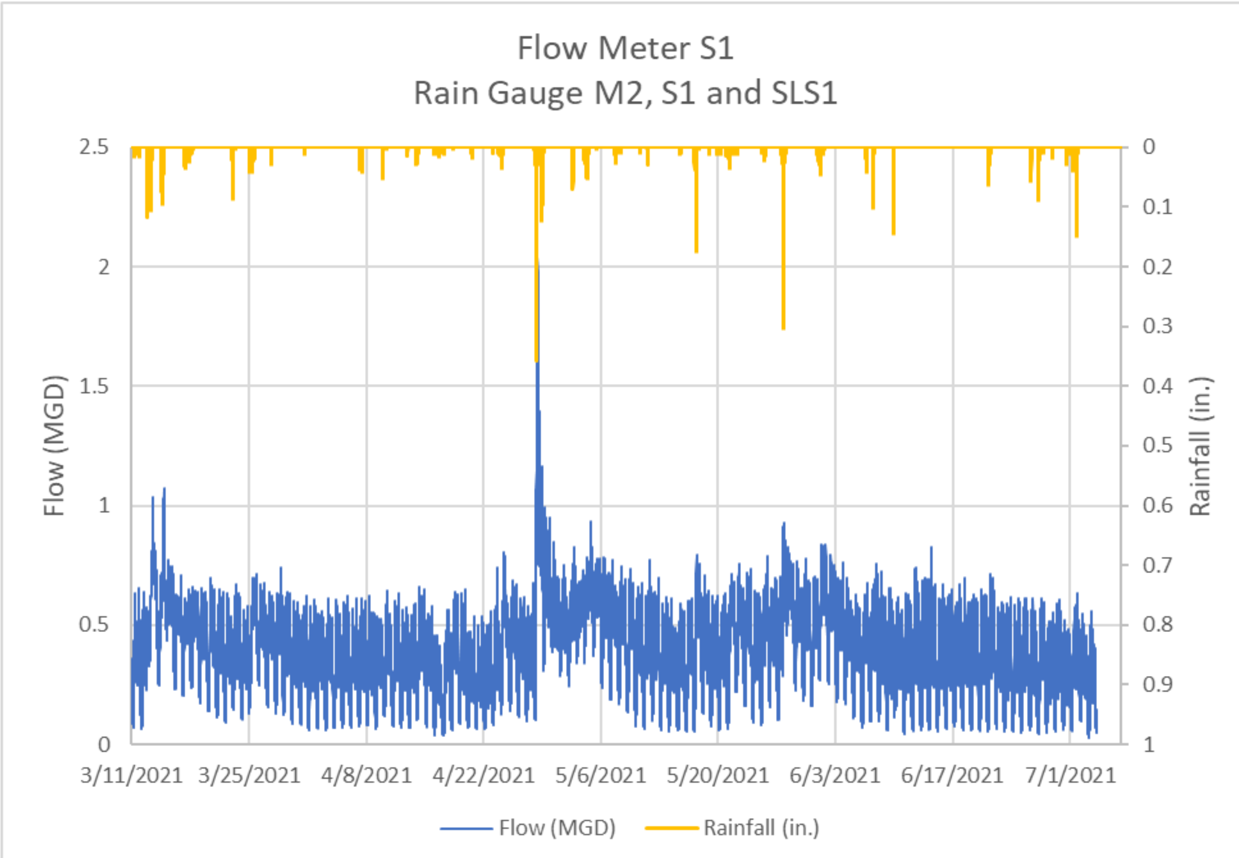


Figure E-26. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter S1.

Flow data results from the spring monitoring period for flow meter S1 are as follows:

Minimum Flow	0.027 mgd
Maximum Flow	2.299 mgd
Average Flow	0.393 mgd
*Peaking Factor	5.848

*Maximum/Average Flow

Flow Meter S2

Flow meter S2 was installed on the 18-inch influent pipe from the southeast of manhole 486-4056, which divides the S1 and S2 subbasins. It received wastewater flow from the immediate subbasin and subbasin S3. The immediate subbasin covered 1,073 acres and included 70,800 linear feet of pipe.

Figure E-27 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter S2. The meter recorded no surcharge events in manhole 486-4056 during the monitoring period.

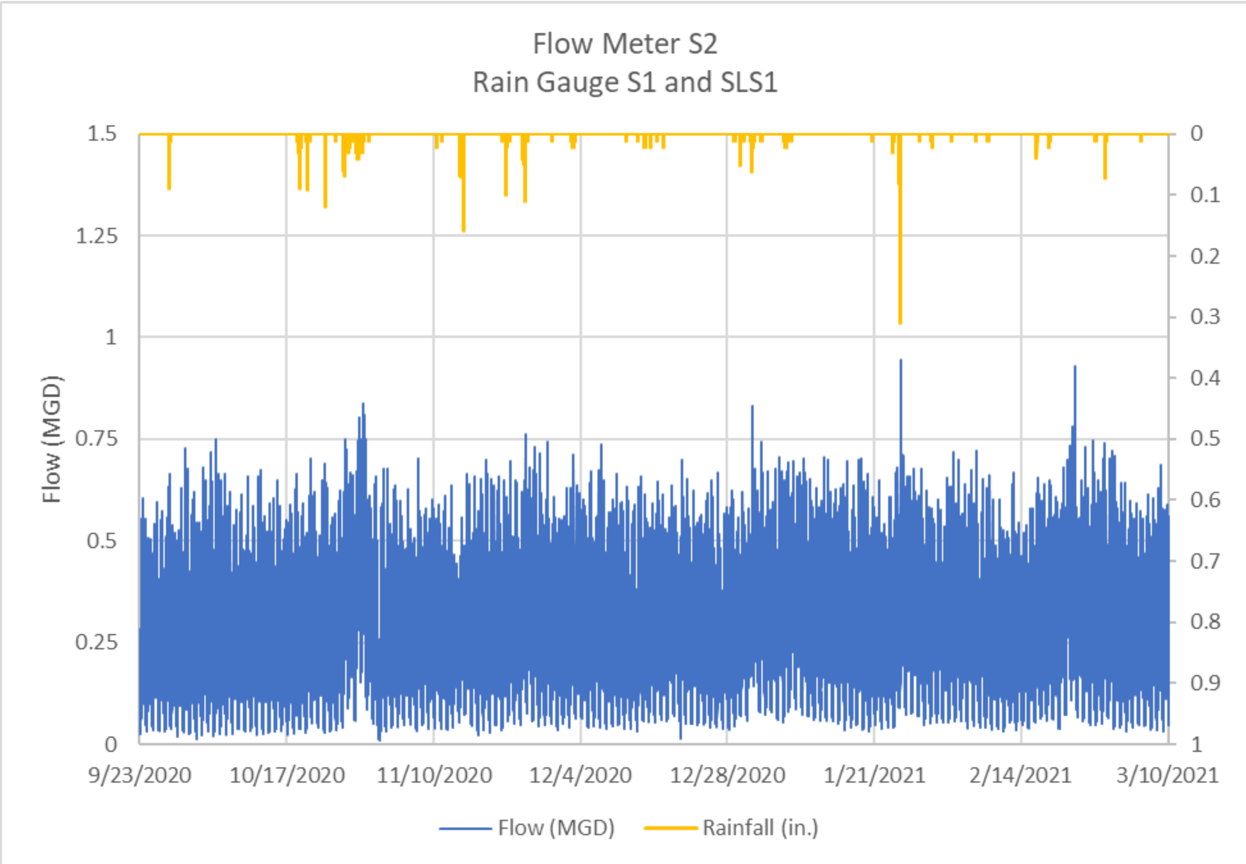


Figure E-27. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter S2.

Flow data results from fall/winter monitoring period for flow meter S2 are as follows:

Minimum Flow	0.009 mgd
Maximum Flow	0.943 mgd
Average Flow	0.235 mgd
*Peaking Factor	4.013

*Maximum/Average Flow

Figure E-28 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter S2. The meter recorded one surcharge events in manhole 486-4056 during the monitoring period.

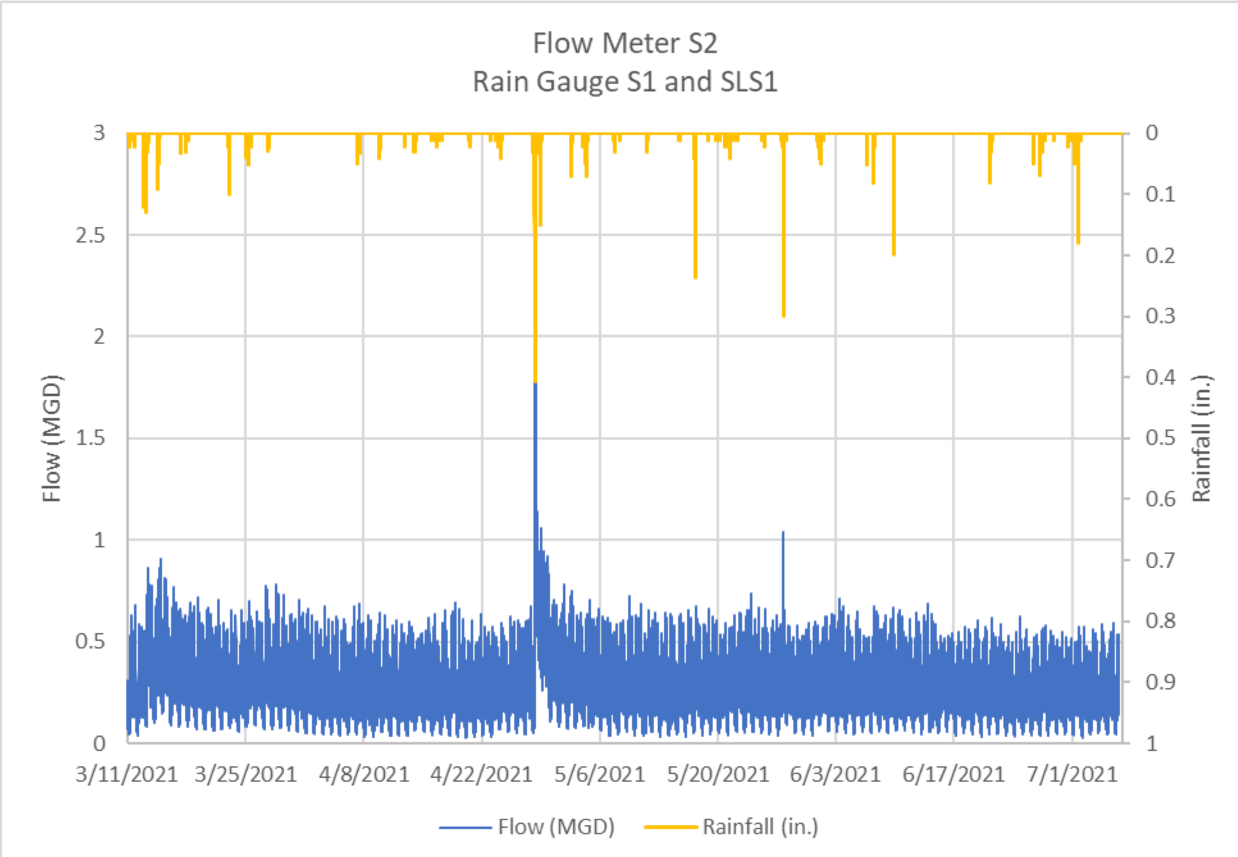


Figure E-28. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter S2.

Flow data results from spring monitoring period for flow meter S2 are as follows:

Minimum Flow	0.030 mgd
Maximum Flow	2.723 mgd
Average Flow	0.250 mgd
*Peaking Factor	10.883

*Maximum/Average Flow

Flow Meter S3

Flow meter S3 was installed on the 10-inch influent pipe from the south of manhole 363-2869, which divides the S2 and S3 subbasins. No subbasins were upstream of the immediate subbasin, which covered 637 acres and included 48,741 linear feet of pipe.

Figure E-29 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter S2. The meter recorded no surcharge events in manhole 363-2869 during the monitoring period.

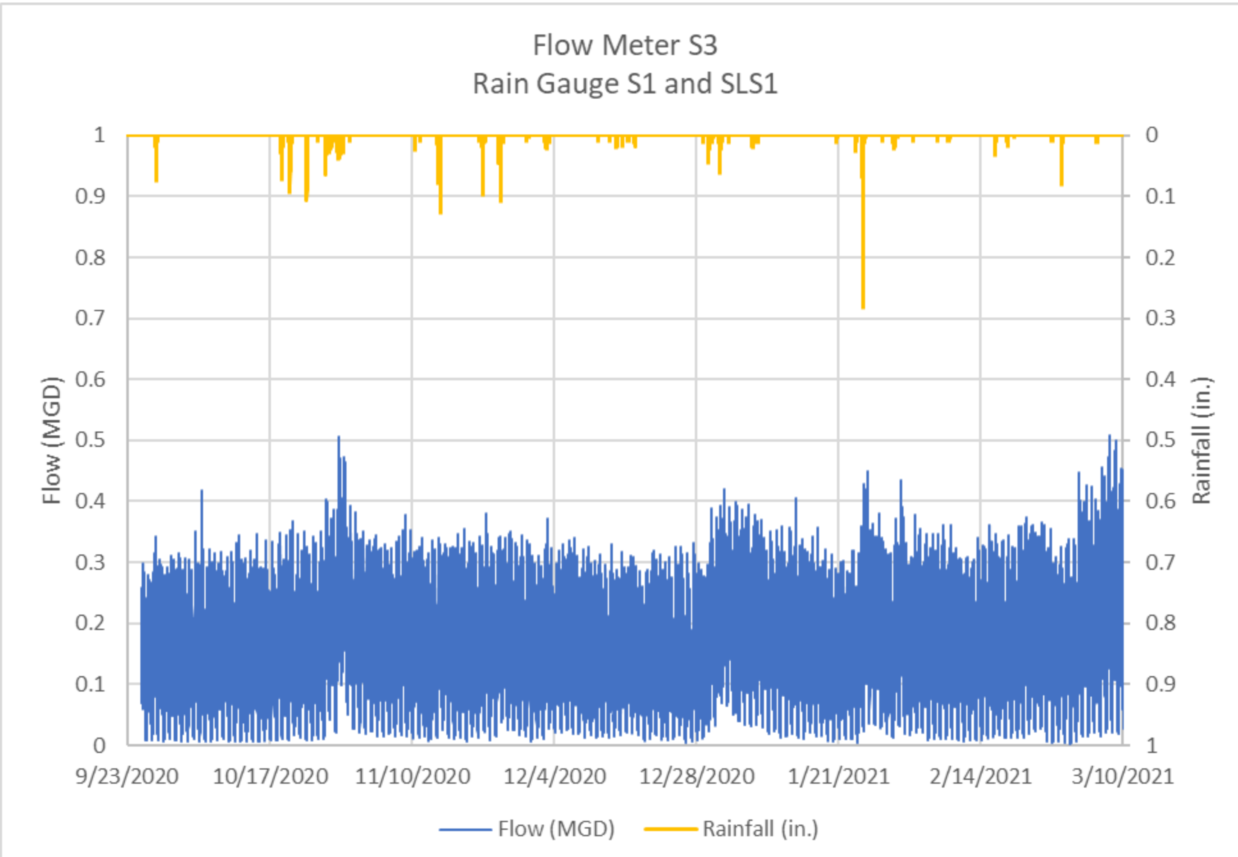


Figure E-29. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter S3.

Flow data results from the fall/winter monitoring period for flow meter S2 are as follows:

Minimum Flow	0.003 mgd
Maximum Flow	0.508 mgd
Average Flow	0.107 mgd
*Peaking Factor	4.730

*Maximum/Average Flow

Figure E-30 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter S2. The meter recorded no surcharge events in manhole 363-2869 during the monitoring period.

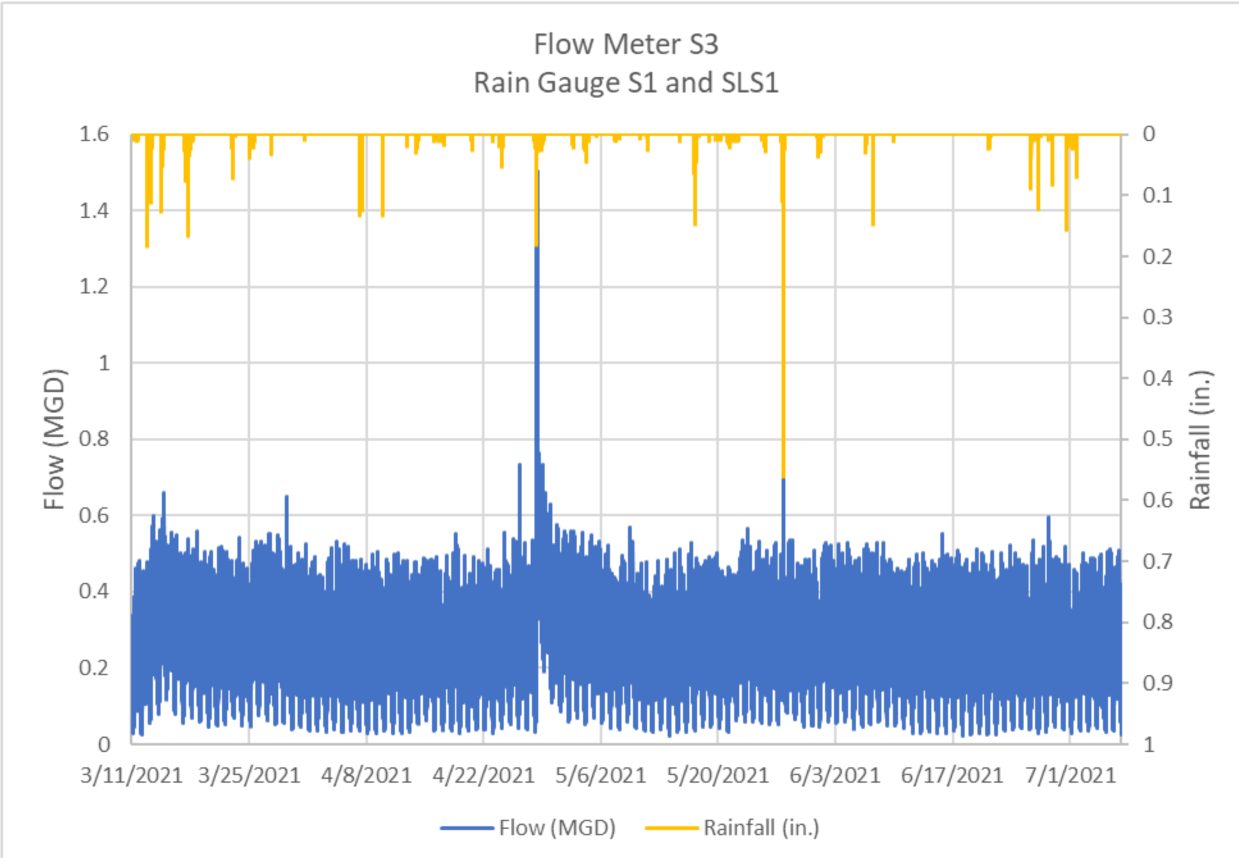


Figure E-30. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter S3.

Flow data results from the spring monitoring period for flow meter S2 are as follows:

Minimum Flow	0.022 mgd
Maximum Flow	1.504 mgd
Average Flow	0.190 mgd
*Peaking Factor	7.911

*Maximum/Average Flow

Flow Meter SLS1

Flow meter SLS1 was installed on the 18-inch influent pipe from the southwest of manhole 486-1005, which is northwest of the South Lift Station. It received wastewater flow from the immediate subbasin and subbasins SLS2, SLS3, SLS4, and SLS5 upstream. The immediate subbasin covered 322 acres and included 26,980 linear feet of pipe.

Figure E-31 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter SLS1. The meter recorded no surcharge events in manhole 486-1005 during the monitoring period.

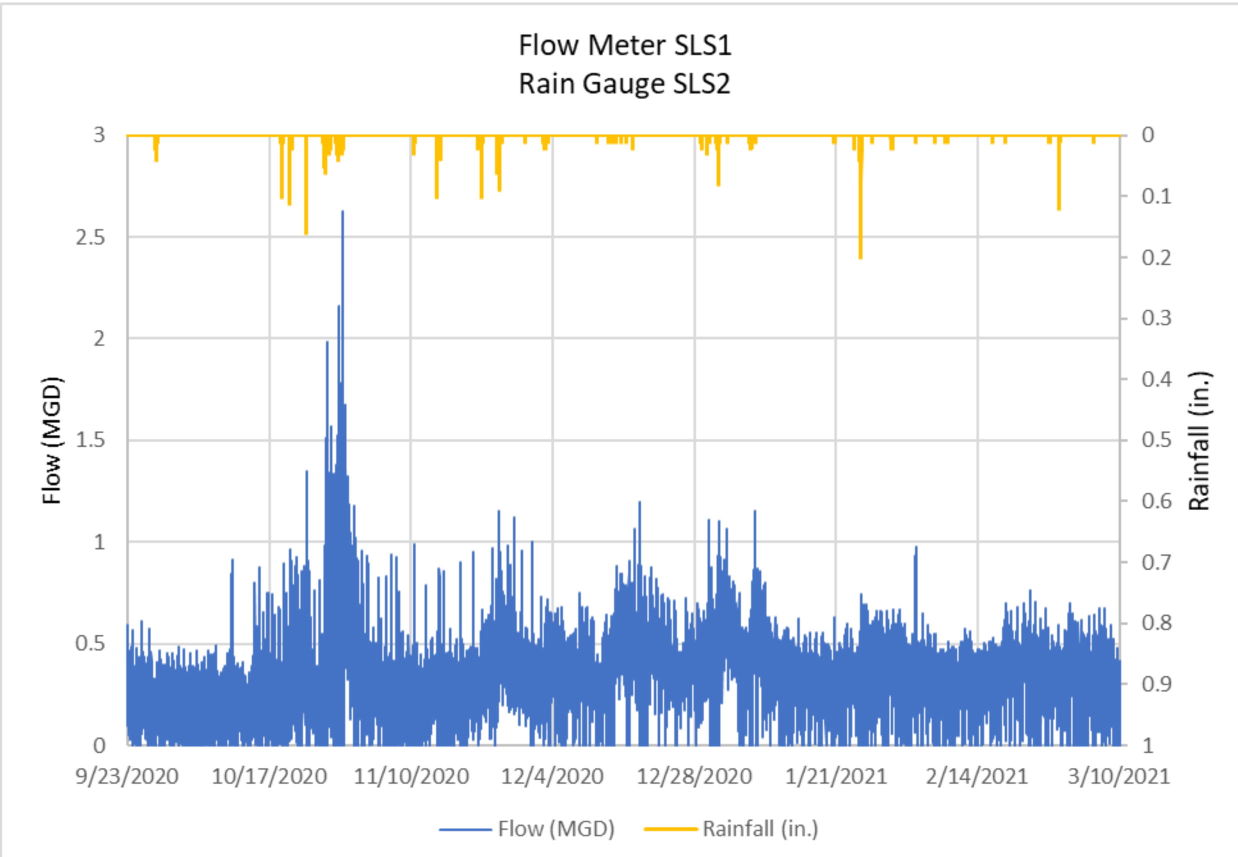


Figure E-31. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter SLS1.

Flow data results from the fall/winter monitoring period for flow meter SLS1 are as follows:

Minimum Flow	0.000 mgd
Maximum Flow	2.910 mgd
Average Flow	0.875 mgd
*Peaking Factor	3.324

*Maximum/Average Flow

Figure E-32 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter SLS1. The meter recorded fifteen surcharge events in manhole 486-1005 during the monitoring period.

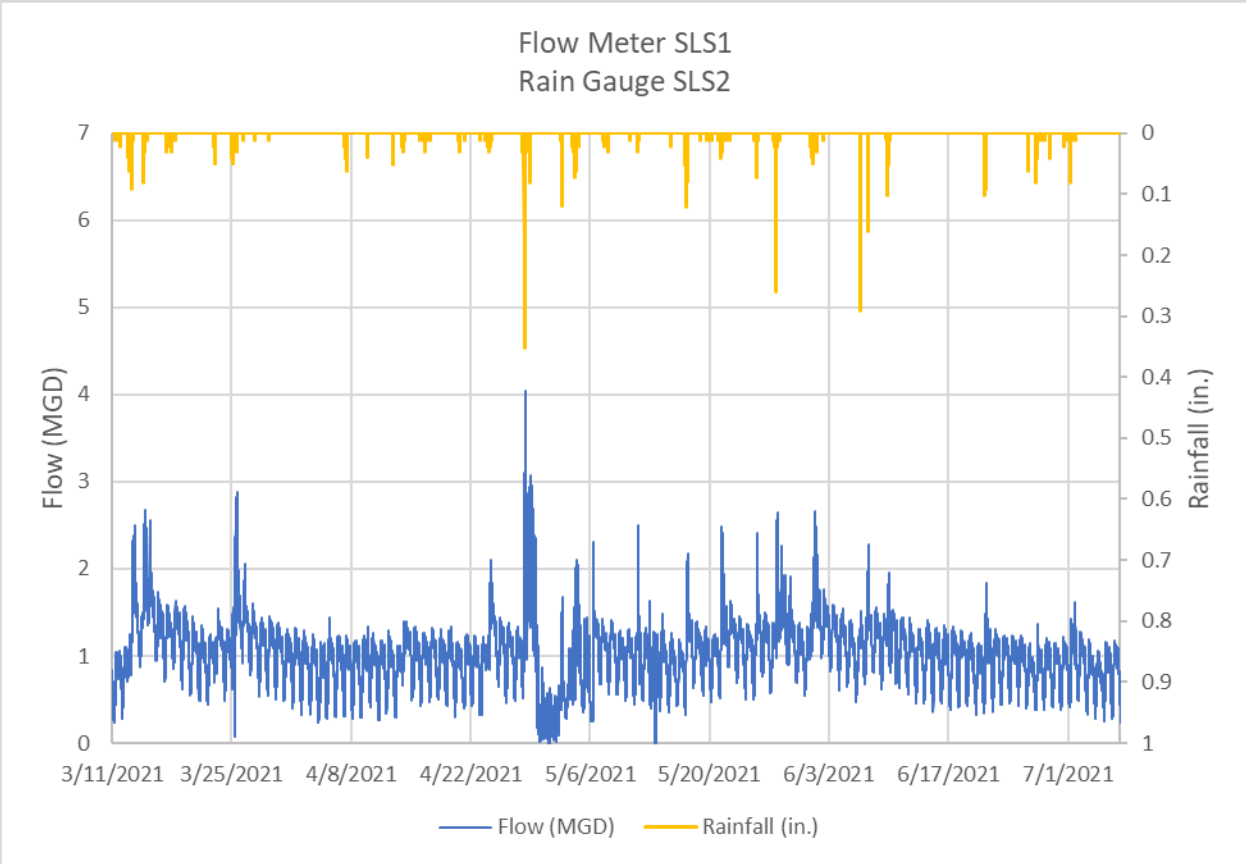


Figure E-32. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter SLS1.

Flow data results from the spring monitoring period for flow meter SLS1 are as follows:

Minimum Flow	0.000 mgd
Maximum Flow	4.040 mgd
Average Flow	1.022 mgd
*Peaking Factor	3.952

*Maximum/Average Flow

Flow Meter SLS2

Flow meter SLS2 was installed on the 18-inch influent pipe from the north of manhole 486-4056, which is on the south end of subbasin SLS2. It received wastewater flow from the immediate subbasin and subbasins SLS4 and SLS5 upstream. The immediate subbasin covered 982 acres and included 90,369 linear feet of pipe.

Figure E-33 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter SLS2. The meter recorded one surcharge event in manhole 486-4056 during the monitoring period.

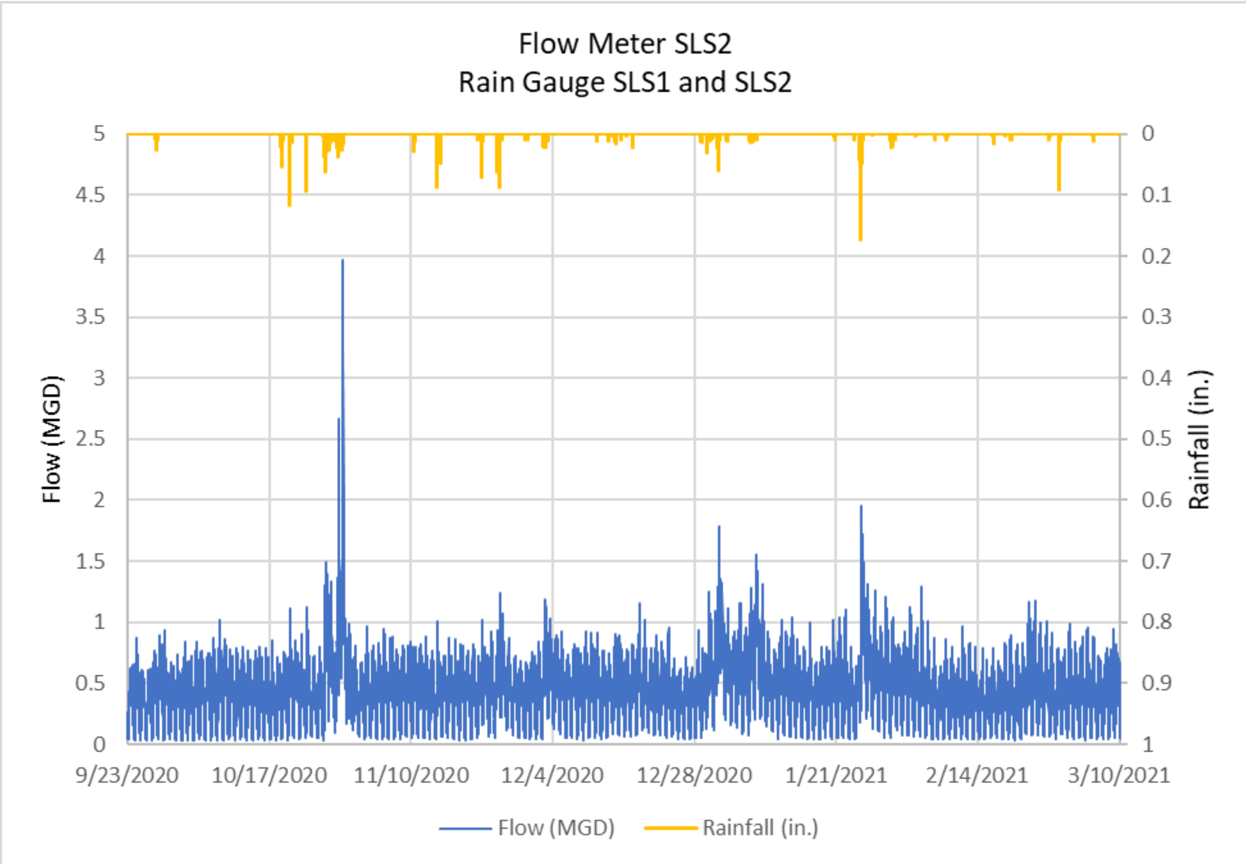


Figure E-33. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter SLS2.

Flow data results from the fall/winter monitoring period for flow meter SLS2 are as follows:

Minimum Flow	0.027 mgd
Maximum Flow	3.973 mgd
Average Flow	0.409 mgd
*Peaking Factor	9.706

*Maximum/Average Flow

Figure E-34 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter SLS2. The meter recorded one surcharge event in manhole 486-4056 during the monitoring period.

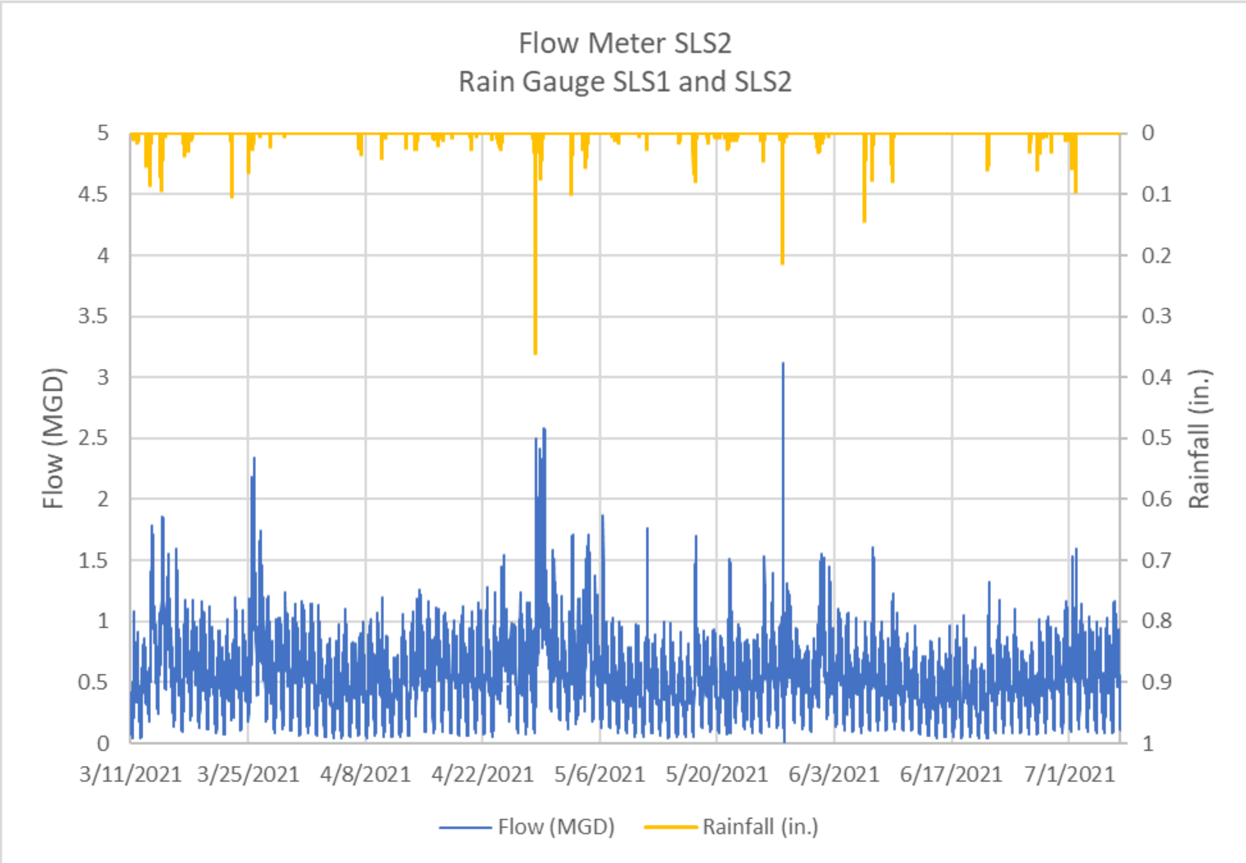


Figure E-34. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter SLS2.

Flow data results from the spring monitoring period for flow meter SLS2 are as follows:

Minimum Flow	0.015 mgd
Maximum Flow	3.119 mgd
Average Flow	0.534 mgd
*Peaking Factor	5.844

*Maximum/Average Flow

Flow Meter SLS3

Flow meter SLS3 was installed on the 12-inch influent pipe from the north of manhole 485-1165, which is on the east side of subbasin SLS3. No subbasins were upstream of the immediate subbasin, which covered 552 acres and included 30,850 linear feet of pipe.

Figure E-34 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter SLS3. The meter recorded no surcharge events in manhole 485-1165 during the monitoring period. The meter dropped out between December 18, 2020 and January 5, 2021, so no data was collected during that time.

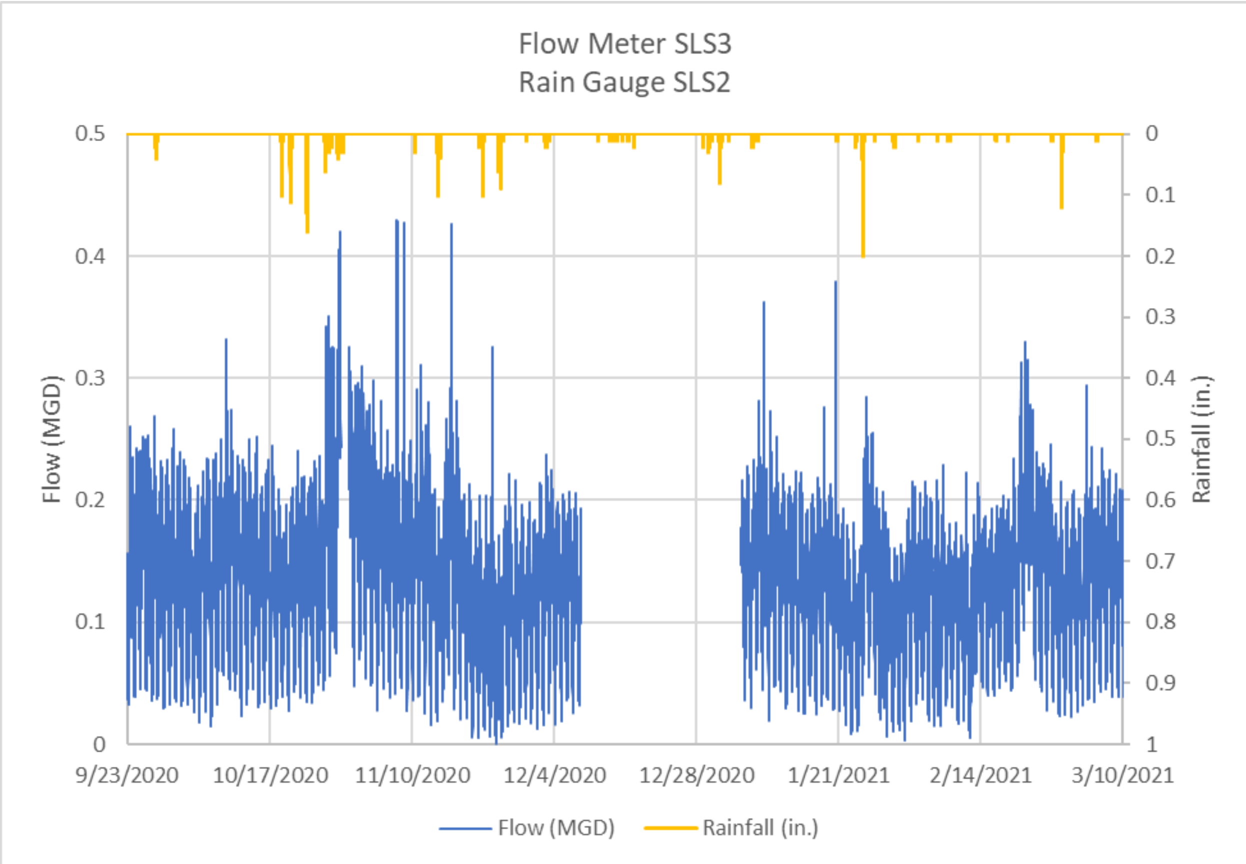


Figure E-34. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter SLS3.

Flow data results from the fall/winter monitoring period for flow meter SLS3 are as follows:

Minimum Flow	0.001 mgd
Maximum Flow	0.430 mgd
Average Flow	0.131 mgd
*Peaking Factor	3.291

*Maximum/Average Flow

Figure E-35 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter SLS3. The meter recorded one surcharge event in manhole 485-1165 during the monitoring period. Velocity readings at the site fell below average values between March 15, 2021 and March 22, 2021; April 20, 2021 and April 22, 2021; May 30, 2021 and June 1, 2021; and June 20, 2021 and June 21, 2021. These drops in velocity without corresponding drops in depth caused the decrease in flow recordings at those times.

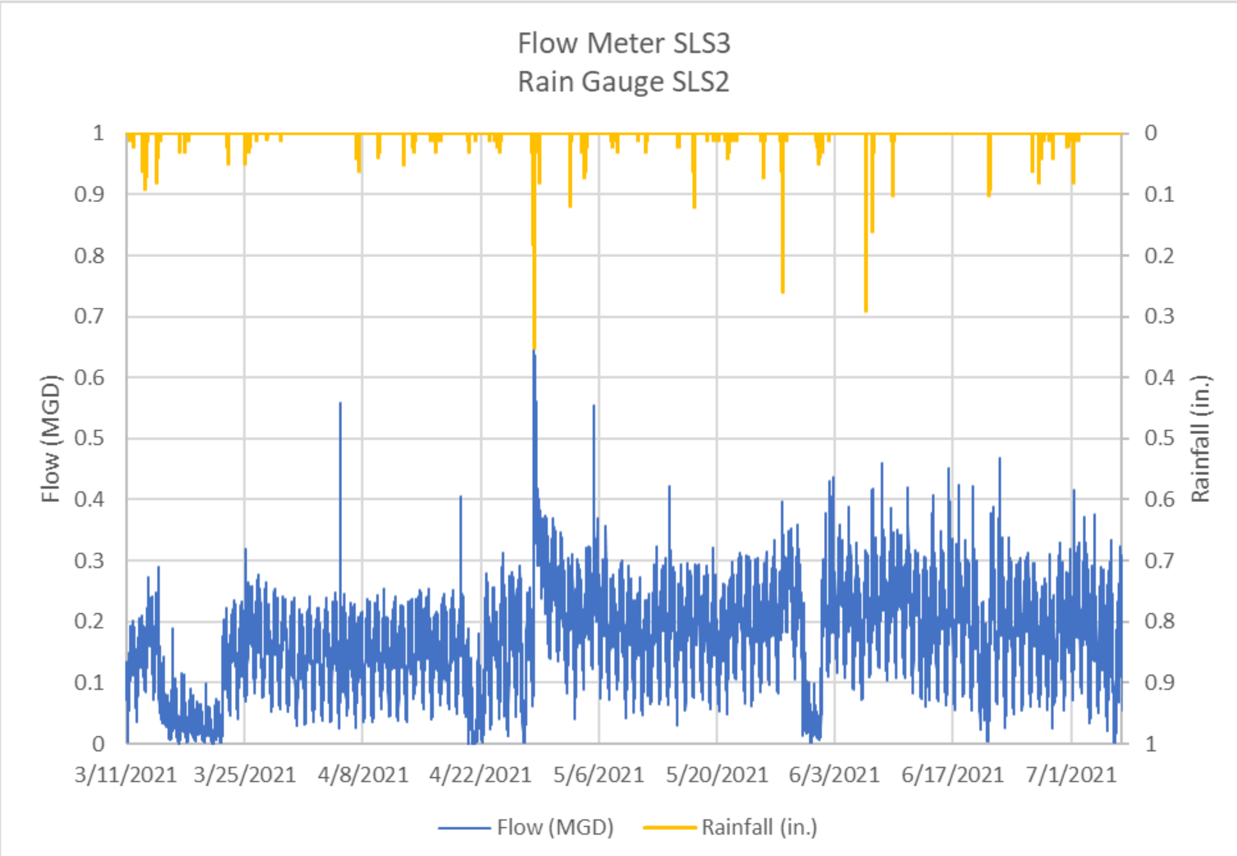


Figure E-35. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter SLS3.

Flow data results from the spring monitoring period for flow meter SLS3 are as follows:

Minimum Flow	0.001 mgd
Maximum Flow	0.430 mgd
Average Flow	0.131 mgd
*Peaking Factor	3.291

*Maximum/Average Flow

Flow Meter SLS4

Flow meter SLS4 was installed on the 12-inch influent pipe from the north of manhole 446-1584, which is on the south end of subbasin SLS4. It received wastewater flow from the immediate subbasin and subbasin SLS5 upstream. The immediate subbasin covered 334 acres and included 22,638 linear feet of pipe.

Figure E-36 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter SLS3. The meter recorded no surcharge events in manhole 446-1584 during the monitoring period.

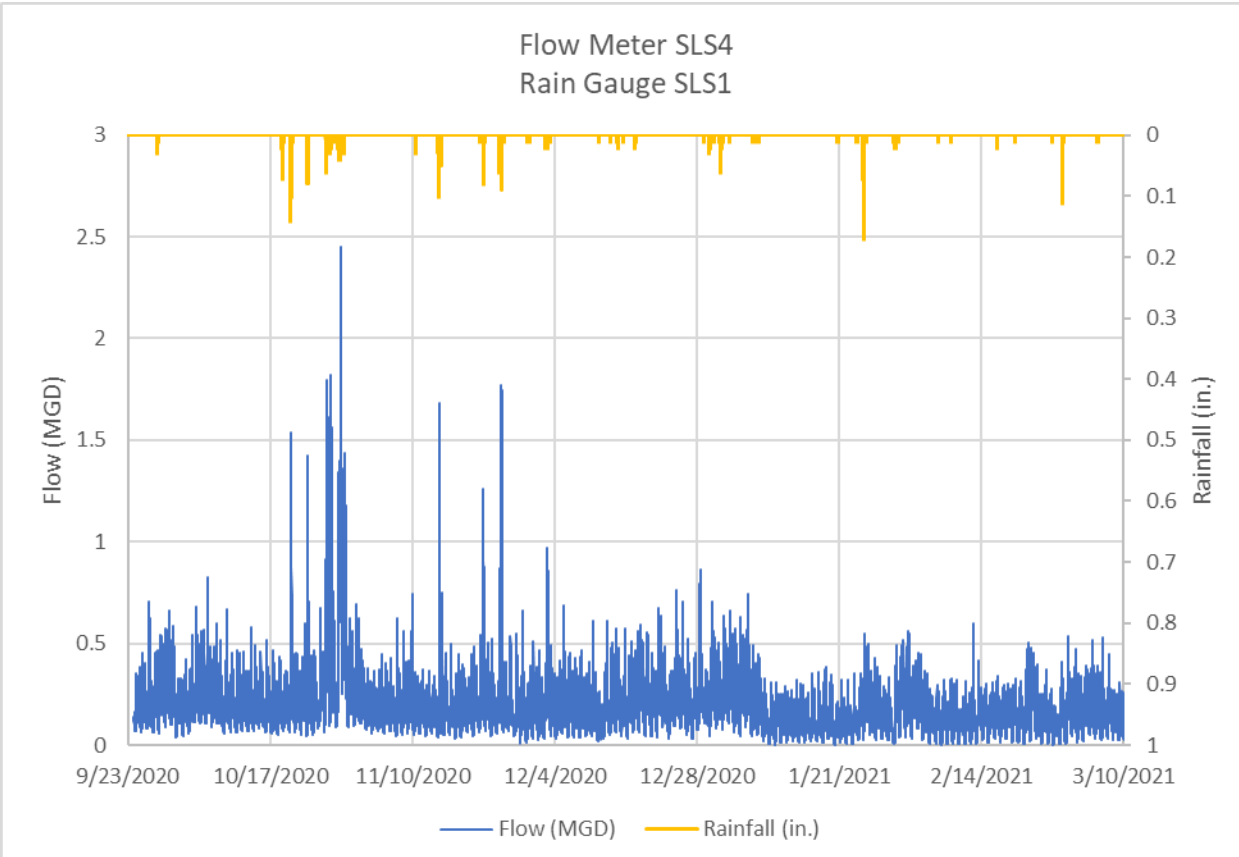


Figure E-36. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter SLS4.

Flow data results from the fall/winter monitoring period for flow meter SLS4 are as follows:

Minimum Flow	0.001 mgd
Maximum Flow	2.450 mgd
Average Flow	0.165 mgd
*Peaking Factor	14.843

*Maximum/Average Flow

Figure E-36 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter SLS3. The meter recorded one surcharge event in manhole 446-1584 during the monitoring period.

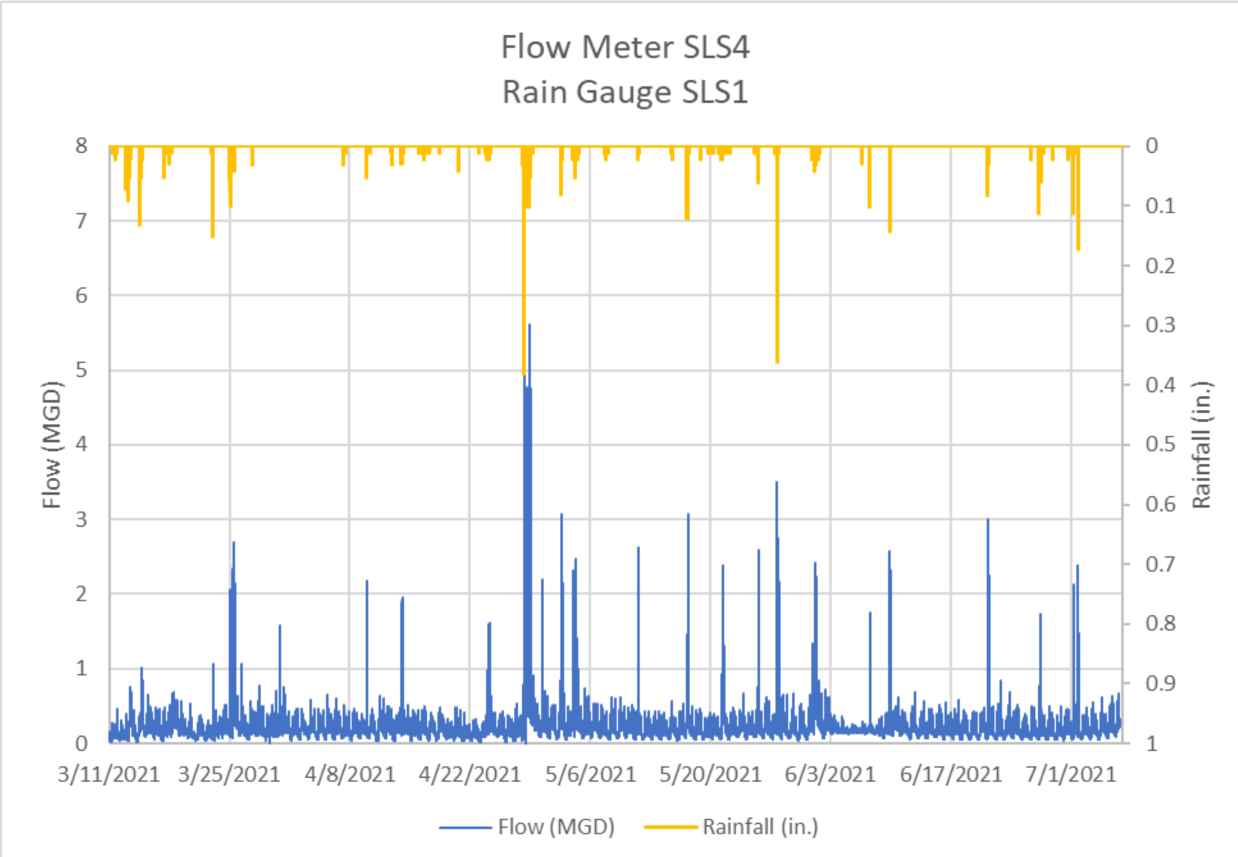


Figure E-36. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter SLS4.

Flow data results from the spring monitoring period for flow meter SLS4 are as follows:

Minimum Flow	0.000 mgd
Maximum Flow	6.777 mgd
Average Flow	0.230 mgd
*Peaking Factor	29.420

*Maximum/Average Flow

Flow Meter SLS5

Flow meter SLS5 was installed on the 10-inch influent pipe from the north of manhole 405-5309, which is on the south end of subbasin SLS5. No subbasins were upstream of the immediate subbasin, which covered 526 acres and included 38,291 linear feet of pipe.

Figure E-37 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter SLS3. The meter recorded one surcharge event in manhole 405-5309 during the monitoring period. Based on survey data obtained during this project, the metered pipe had an adverse slope.

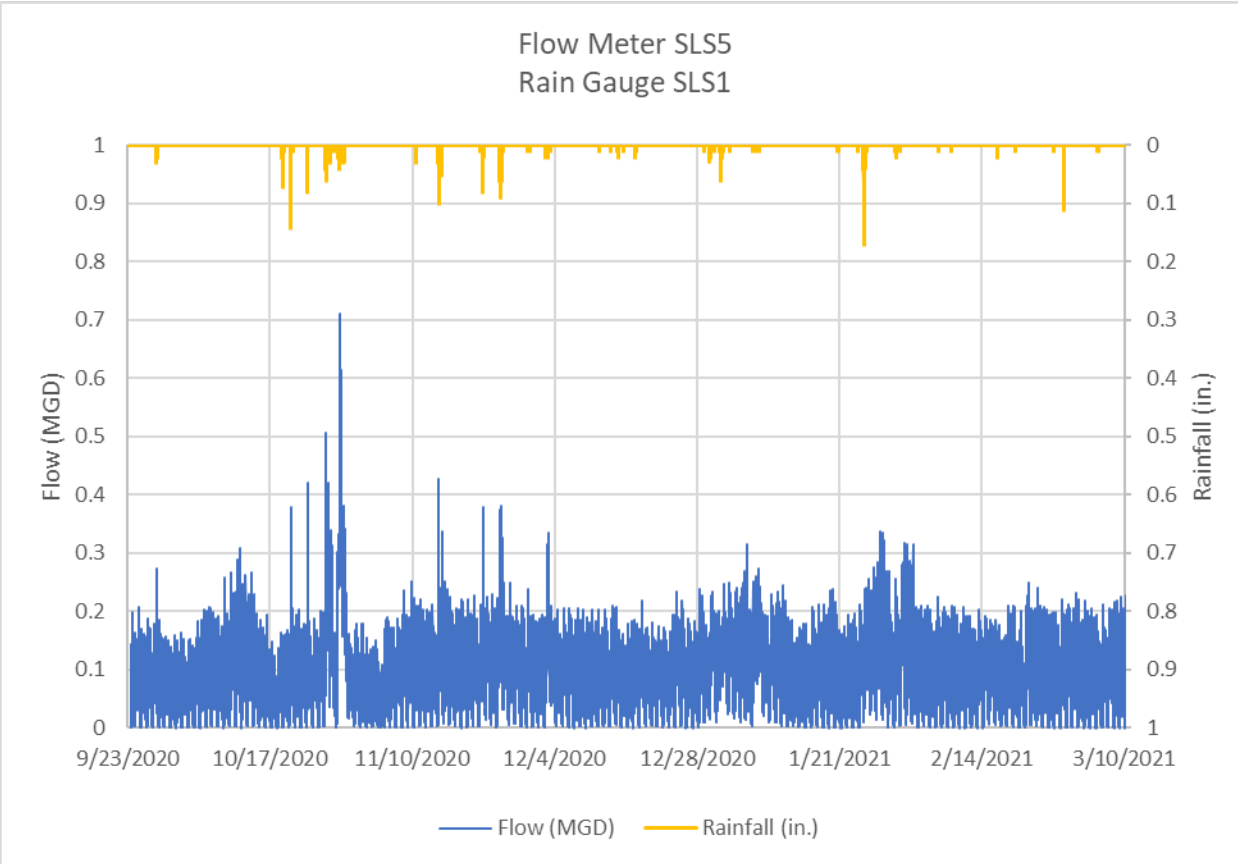


Figure E-37. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter SLS5.

Flow data results from the fall/winter monitoring period for flow meter SLS5 are as follows:

Minimum Flow	0.000 mgd
Maximum Flow	0.710 mgd
Average Flow	0.092 mgd
*Peaking Factor	7.733

*Maximum/Average Flow

Figure E-38 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter SLS3. The meter recorded twelve surcharge events in manhole 405-5309 during the monitoring period.

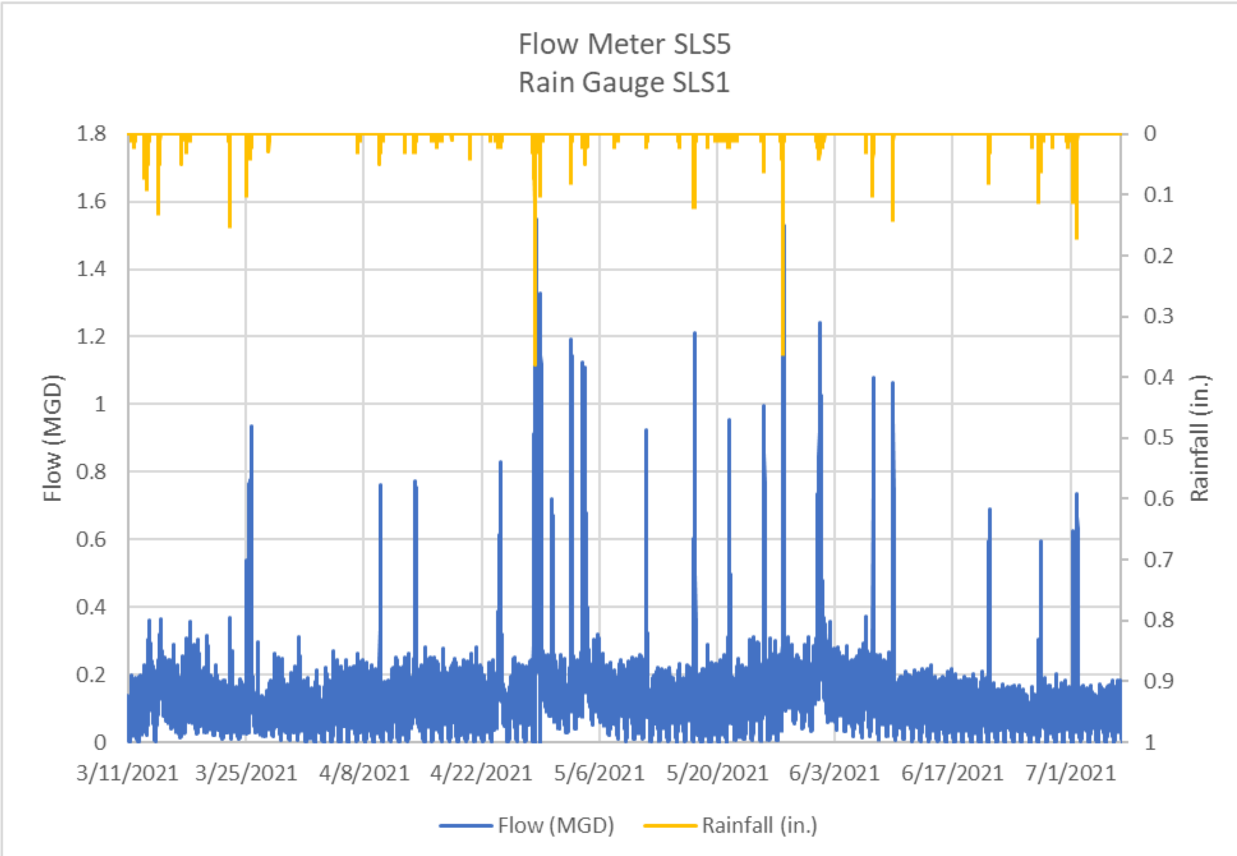


Figure E-38. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter SLS5.

Flow data results from the spring monitoring period for flow meter SLS5 are as follows:

Minimum Flow	0.000 mgd
Maximum Flow	1.546 mgd
Average Flow	0.127 mgd
*Peaking Factor	12.141

*Maximum/Average Flow

Flow Meter TB1

Flow meter TB1 was installed on the 12-inch influent pipe from the southwest of manhole 319-3436, which is located south of the Water Resource Recovery Facility. It received wastewater flow from the immediate subbasin and subbasins TB3 and TB5 upstream. The immediate subbasin covered 87 acres and included 10,294 linear feet of pipe. Throughout the fall/winter monitoring period, the meter experienced issues with debris buildup that were periodically corrected as crews were able to visit the site. The meter site was relocated to manhole 319-3414 at the beginning of the spring monitoring period to alleviate the debris issues at the site.

Figure E-39 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter TB1. The meter recorded three surcharge events in manhole 319-3436 during the monitoring period.

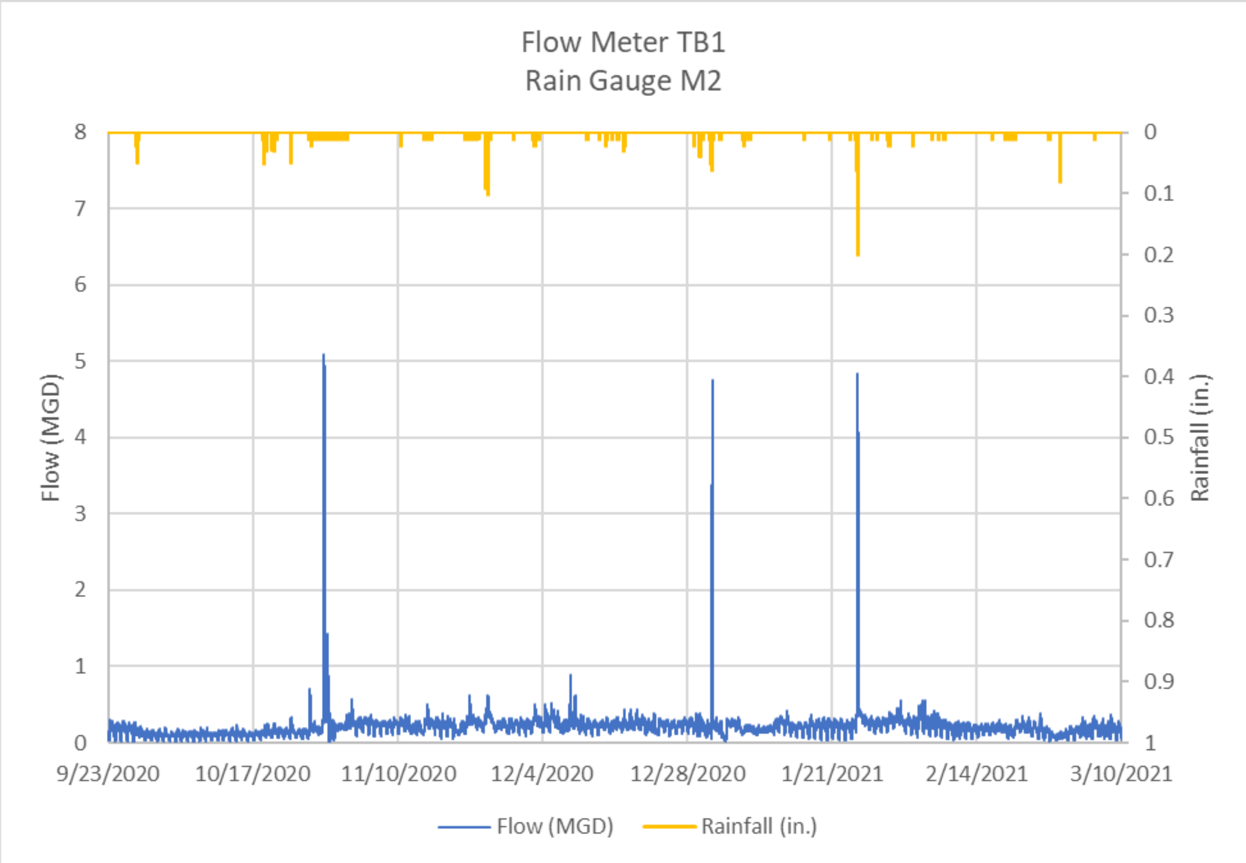


Figure E-39. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter TB1.

Flow data results from the fall/winter monitoring period for flow meter TB1 are as follows:

Minimum Flow	0.014 mgd
Maximum Flow	5.083 mgd
Average Flow	0.202 mgd
*Peaking Factor	25.132

*Maximum/Average Flow

Figure E-40 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter TB1. The meter recorded three surcharge events in manhole 319-3414 during the monitoring period.

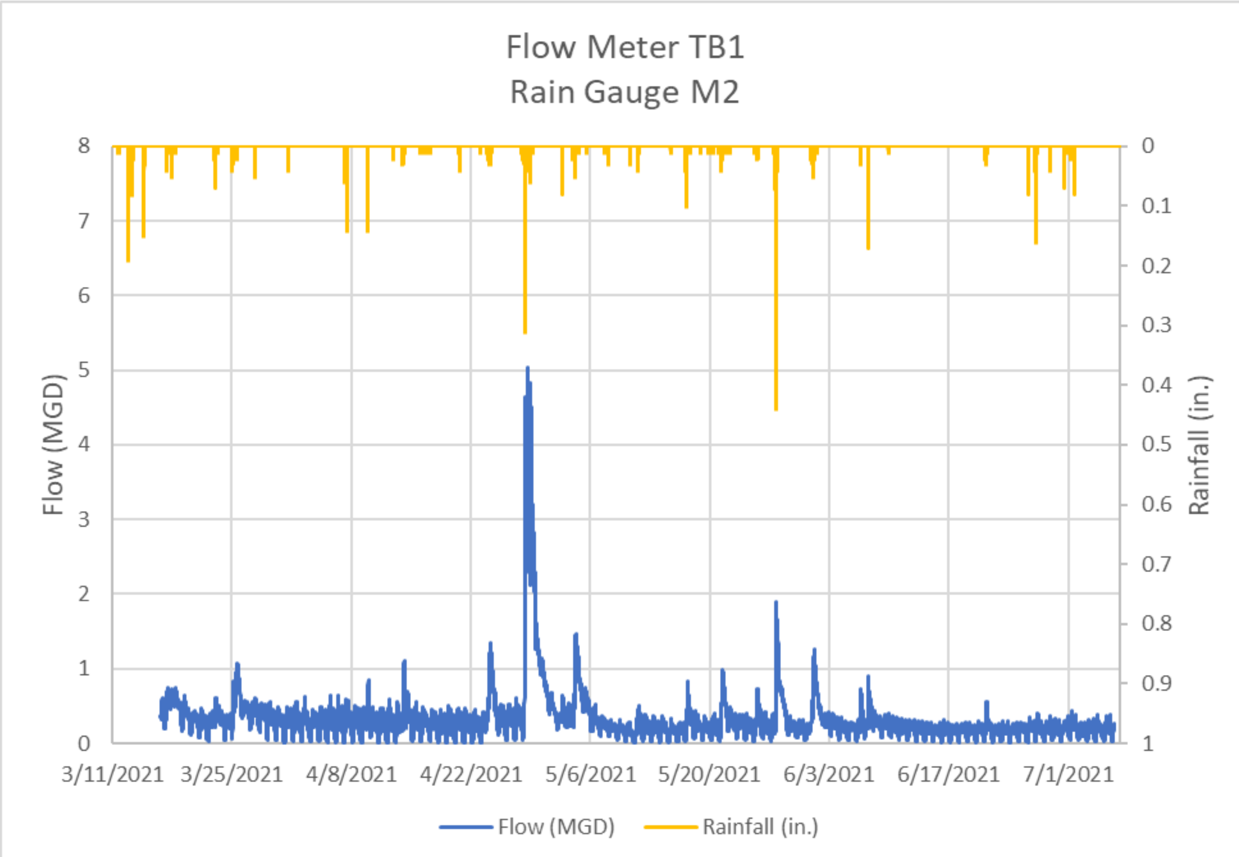


Figure E-40. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter TB1.

Flow data results from the spring monitoring period for flow meter TB1 are as follows:

Minimum Flow	-0.005 mgd
Maximum Flow	5.037 mgd
Average Flow	0.316 mgd
*Peaking Factor	15.928

*Maximum/Average Flow

Flow Meter TB2

Flow meter TB2 was installed on the 24-inch influent pipe from the southeast of manhole 320-3374, which is located south of the Water Resource Recovery Facility. It received wastewater flow from the immediate subbasin and subbasins TB4, TB6, and TB7 upstream. The immediate subbasin covered 141 acres and included 13,885 linear feet of pipe.

Figure E-41 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter TB2. The meter recorded no surcharge events in manhole 320-3374 during the monitoring period.

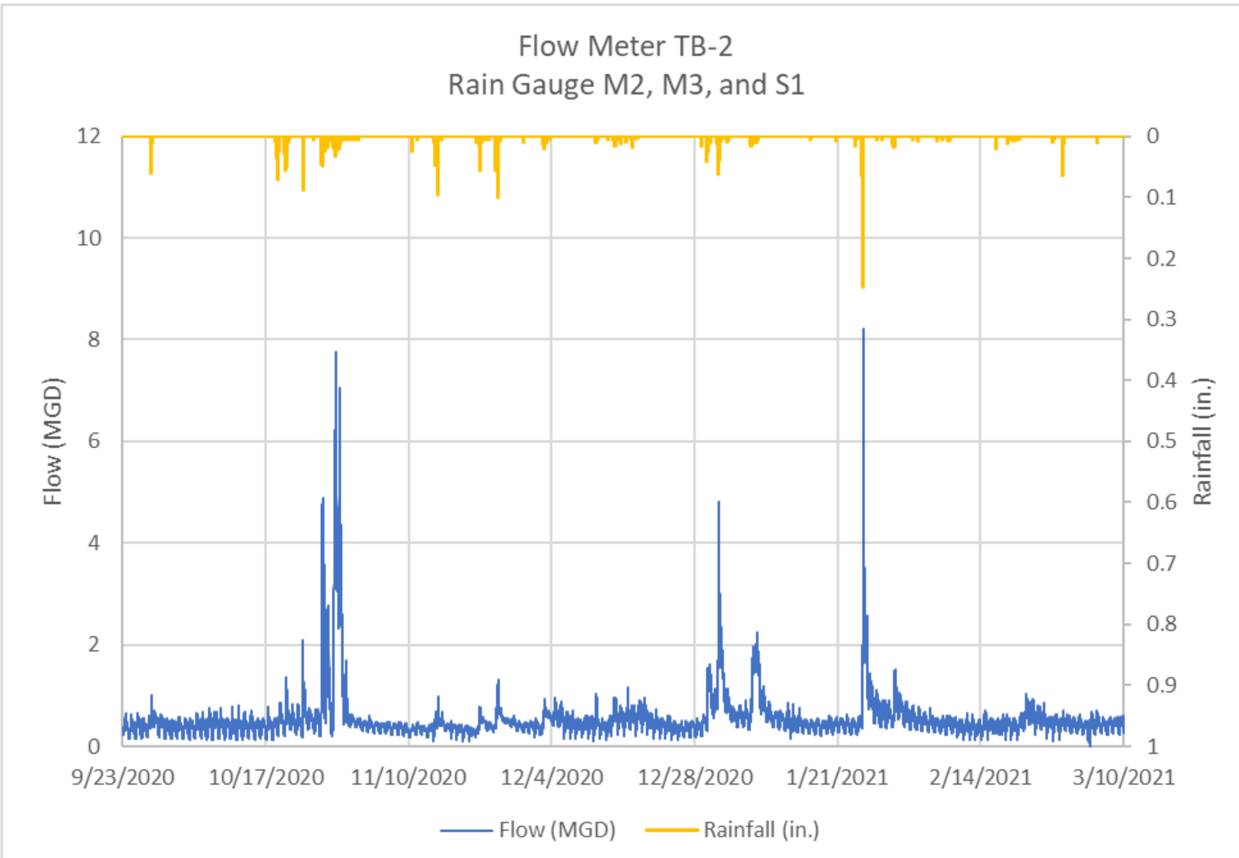


Figure E-41. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter TB2.

Flow data results from the fall/winter monitoring period for flow meter TB2 are as follows:

Minimum Flow	0 mgd
Maximum Flow	8.219 mgd
Average Flow	0.523 mgd
*Peaking Factor	15.716

*Maximum/Average Flow

Figure E-42 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter TB2. The meter recorded one surcharge event in manhole 320-3374 during the monitoring period. The meter dropped out between April 17, 2021 and April 23, 2021; June 13, 2021 and June 21, 2021; and June 22, 2021 to the end of the monitoring period, so no data is available from those periods.

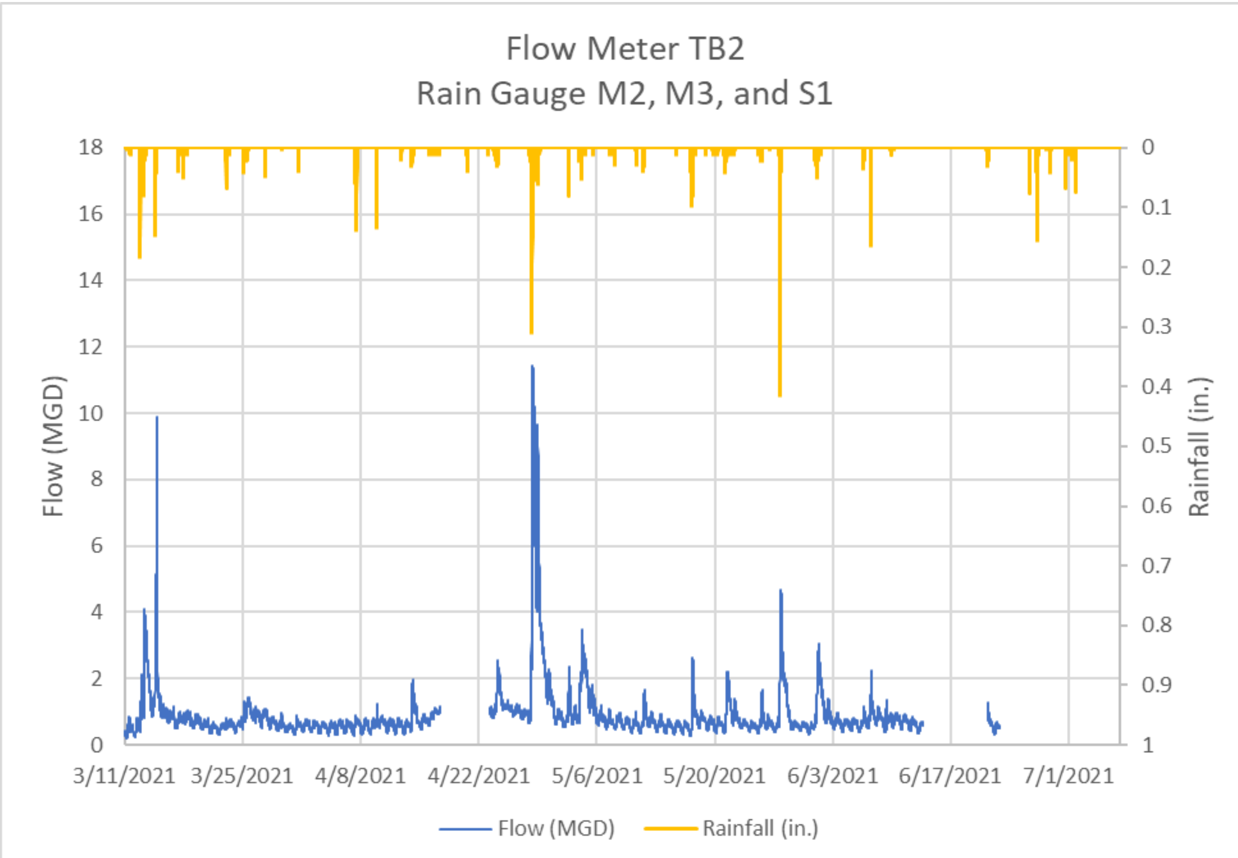


Figure E-42. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter TB2.

Flow data results from the spring monitoring period for flow meter TB2 are as follows:

Minimum Flow	0.209 mgd
Maximum Flow	11.423 mgd
Average Flow	0.883 mgd
*Peaking Factor	12.940

*Maximum/Average Flow

Flow Meter TB3

Flow meter TB3 was installed on the 12-inch influent pipe from the southwest of manhole 361-506, which divides subbasins TB1 and TB3. It received wastewater flow from the immediate subbasin and subbasin TB5 upstream. The immediate subbasin covered 262 acres and included 33,260 linear feet of pipe.

Figure E-43 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter TB3. The meter recorded no surcharge events in manhole 361-506 during the monitoring period. The meter did not record data between October 27, 2020 and November 4, 2020, and from November 8, 2020 to November 16, 2020 due to meter malfunctions.

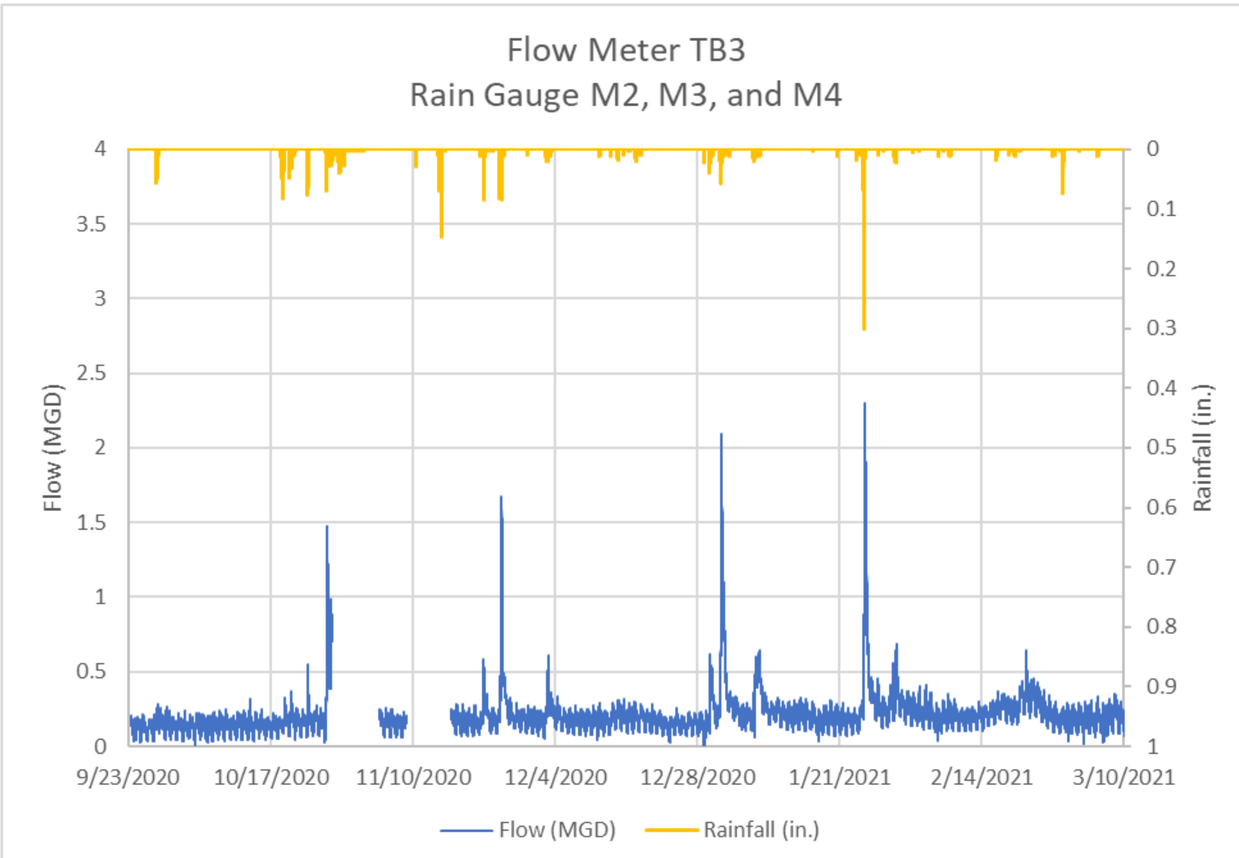


Figure E-43. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter TB3.

Flow data results from the fall/winter monitoring period for flow meter TB3 are as follows:

Minimum Flow	0.009 mgd
Maximum Flow	2.298 mgd
Average Flow	0.184 mgd
*Peaking Factor	12.519

*Maximum/Average Flow

Figure E-44 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter TB3. The meter recorded one surcharge event in manhole 361-506 during the monitoring period.

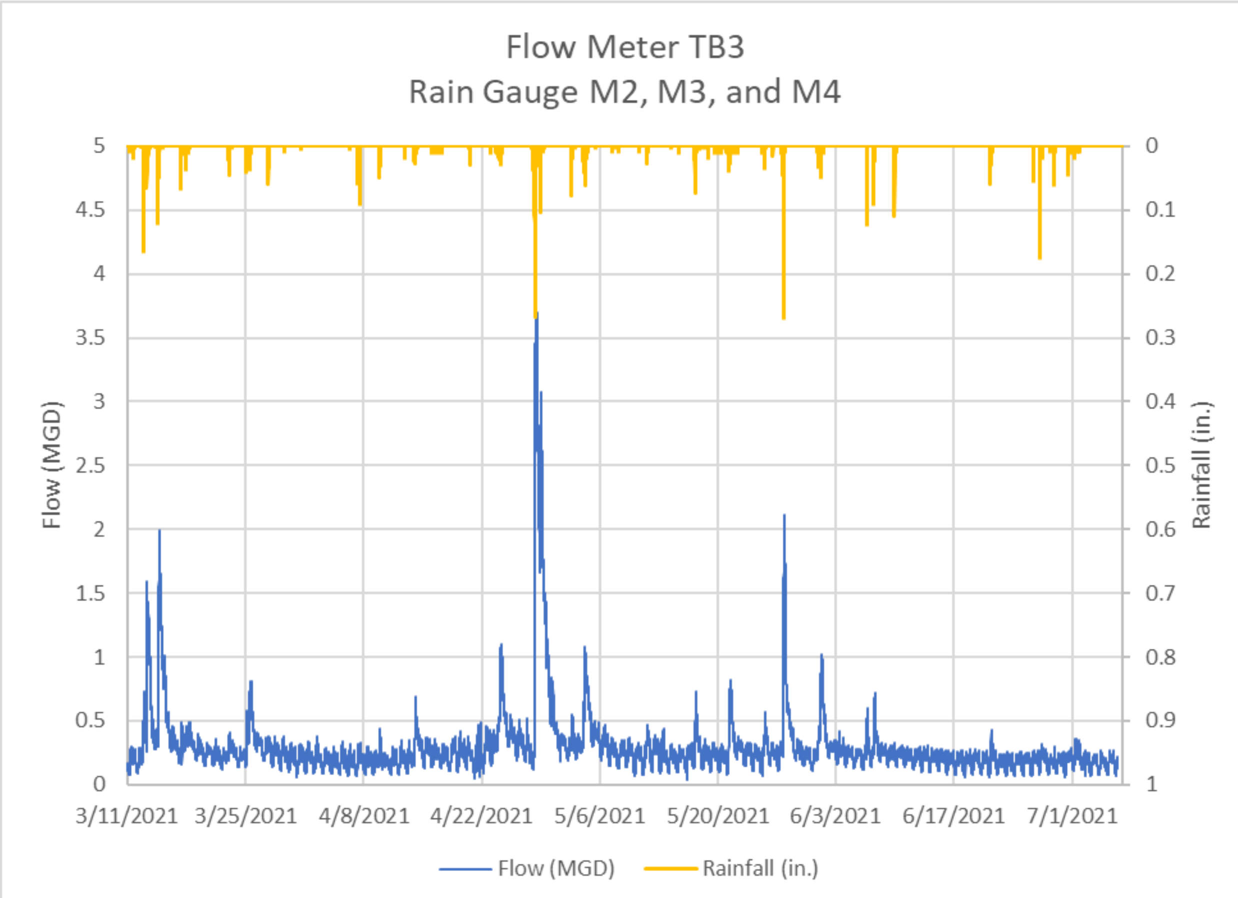


Figure E-44. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter TB3.

Flow data results from the spring monitoring period for flow meter TB3 are as follows:

Minimum Flow	0.041 mgd
Maximum Flow	3.706 mgd
Average Flow	0.294 mgd
*Peaking Factor	12.589

*Maximum/Average Flow

Flow Meter TB4

Flow meter TB4 was installed on the 24-inch influent pipe from the southwest of manhole 362-3166, which divides subbasins TB4 and TB6. It received wastewater flow from the immediate subbasin and subbasins TB6 and TB7 upstream. The immediate subbasin covered 384 acres and included 45,563 linear feet of pipe.

Figure E-45 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter TB4. The meter recorded no surcharge events in manhole 362-3166 during the monitoring period. The meter recorded an erroneous spike on February 1, 2021 that extends beyond the graphed area.

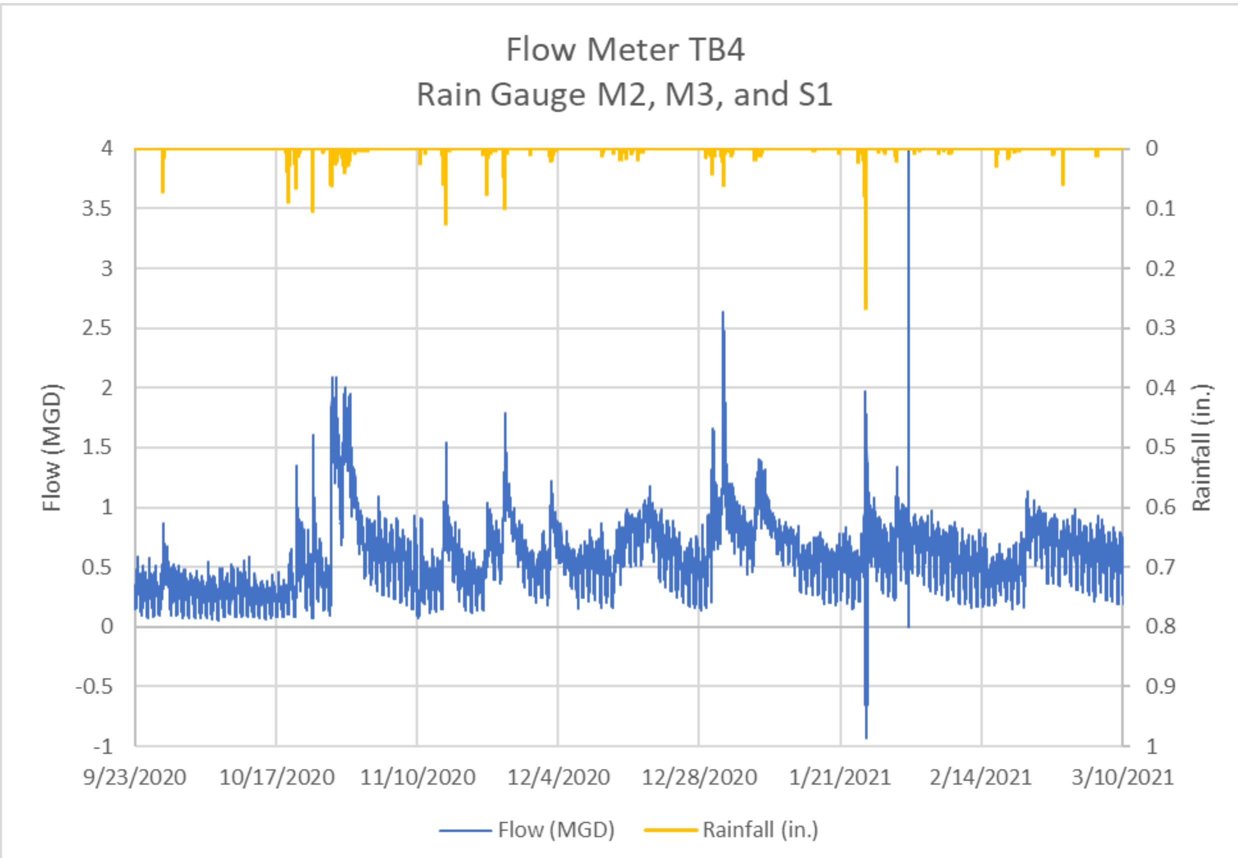


Figure E-45. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter TB4.

Flow data results from the fall/winter monitoring period for flow meter TB4 are as follows:

Minimum Flow	-0.925 mgd
Maximum Flow	2.634 mgd
Average Flow	0.576 mgd
*Peaking Factor	4.571

*Maximum/Average Flow

Figure E-46 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter TB4. The meter recorded no surcharge events in manhole 362-3166 during the monitoring period.

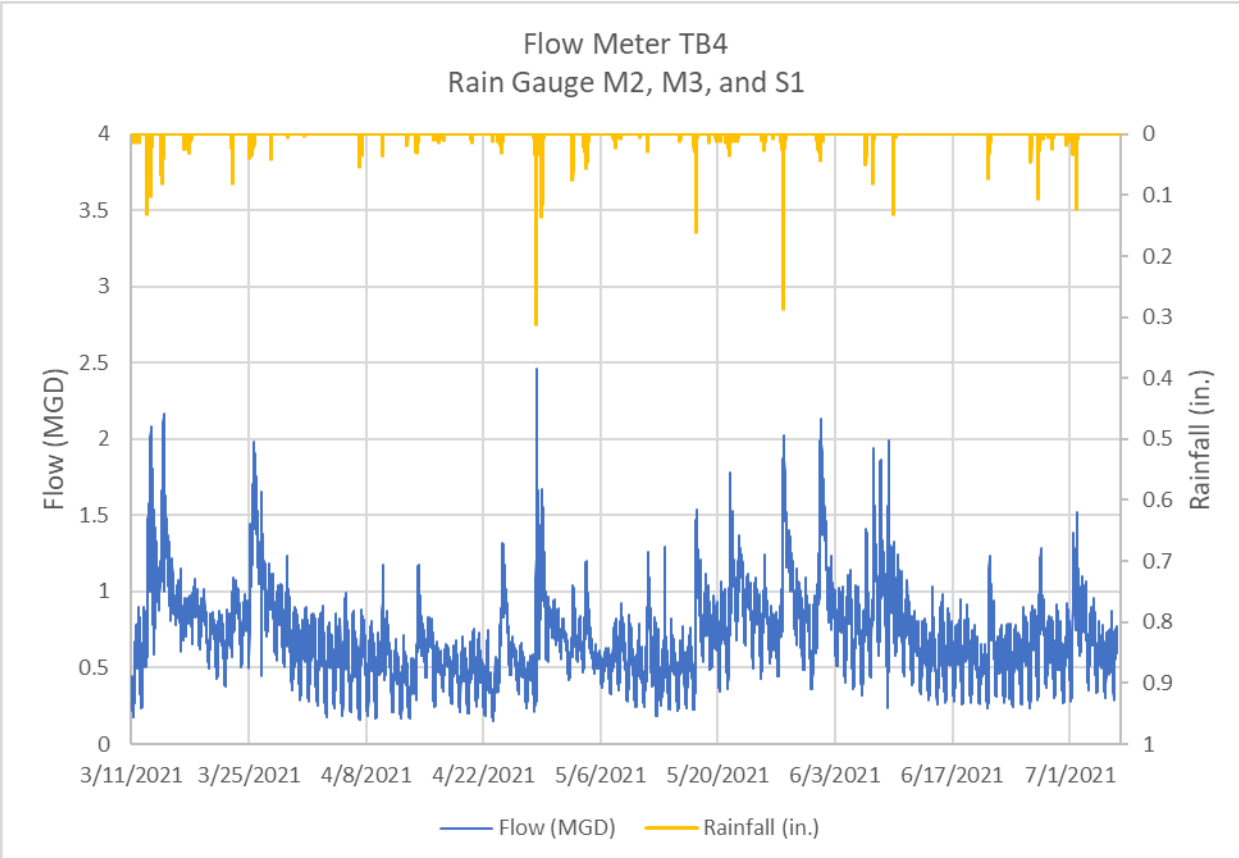


Figure E-46. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter TB4.

Flow data results from the spring monitoring period for flow meter TB4 are as follows:

Minimum Flow	0.151 mgd
Maximum Flow	2.463 mgd
Average Flow	0.696 mgd
*Peaking Factor	3.539

*Maximum/Average Flow

Flow Meter TB5

Flow meter TB5 was installed on the 12-inch influent pipe from the southeast of manhole 361-706, which divides subbasins TB3 and TB5. No subbasins were upstream of the immediate subbasin, which covered 155 acres and included 20,946 linear feet of pipe.

Figure E-46 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter TB5. The meter recorded no surcharge events in manhole 361-706 during the monitoring period.

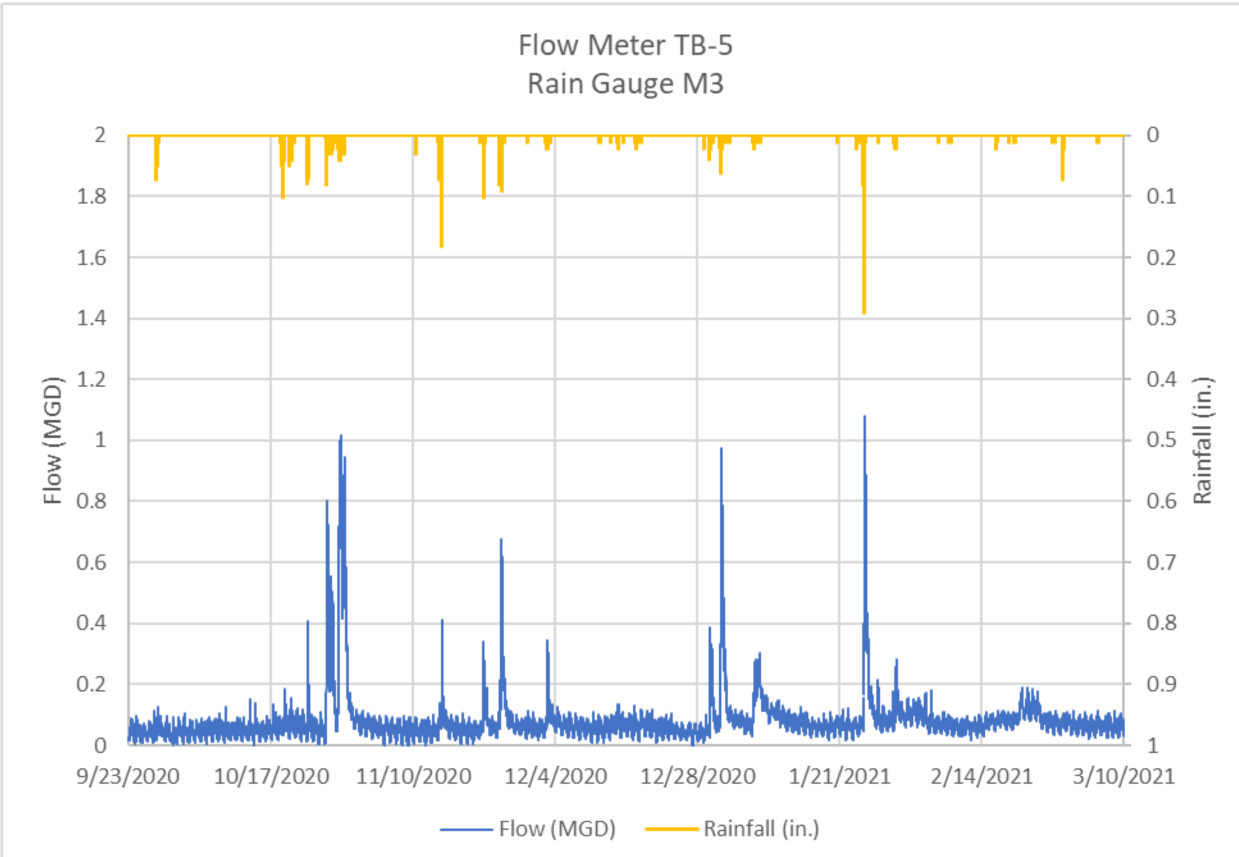


Figure E-46. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter TB5.

Flow data results from the fall/winter monitoring period for flow meter TB5 are as follows:

Minimum Flow	0 mgd
Maximum Flow	1.079 mgd
Average Flow	0.078 mgd
*Peaking Factor	13.891

*Maximum/Average Flow

Figure E-47 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter TB5. The meter recorded no surcharge events in manhole 361-706 during the monitoring period.

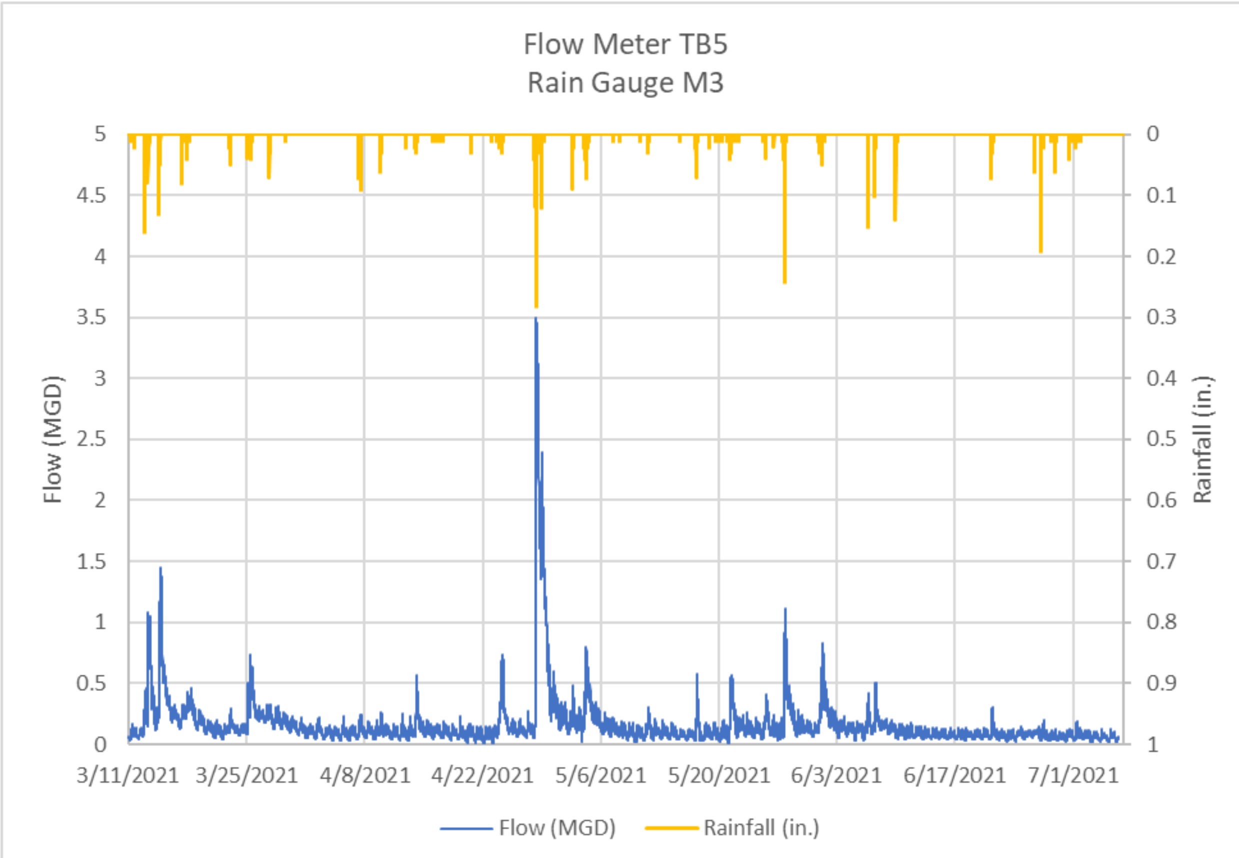


Figure E-47. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter TB5.

Flow data results from the spring monitoring period for flow meter TB5 are as follows:

Minimum Flow	0 mgd
Maximum Flow	1.079 mgd
Average Flow	0.078 mgd
*Peaking Factor	13.891

*Maximum/Average Flow

Flow Meter TB6

Flow meter TB6 was installed on the 18-inch influent pipe from the south of manhole 404-234, which between TB4 and TB6. It received wastewater flow from the immediate subbasin and subbasin TB7 upstream. The immediate subbasin covered 316 acres and included 35,273 linear feet of pipe.

Figure E-48 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter TB6. The meter recorded four surcharge events in manhole 404-234 during the monitoring period. The meter did not record data between October 22, 2020 and October 29, 2020, and from November 8, 2020 to November 16, 2020 due to meter malfunctions.

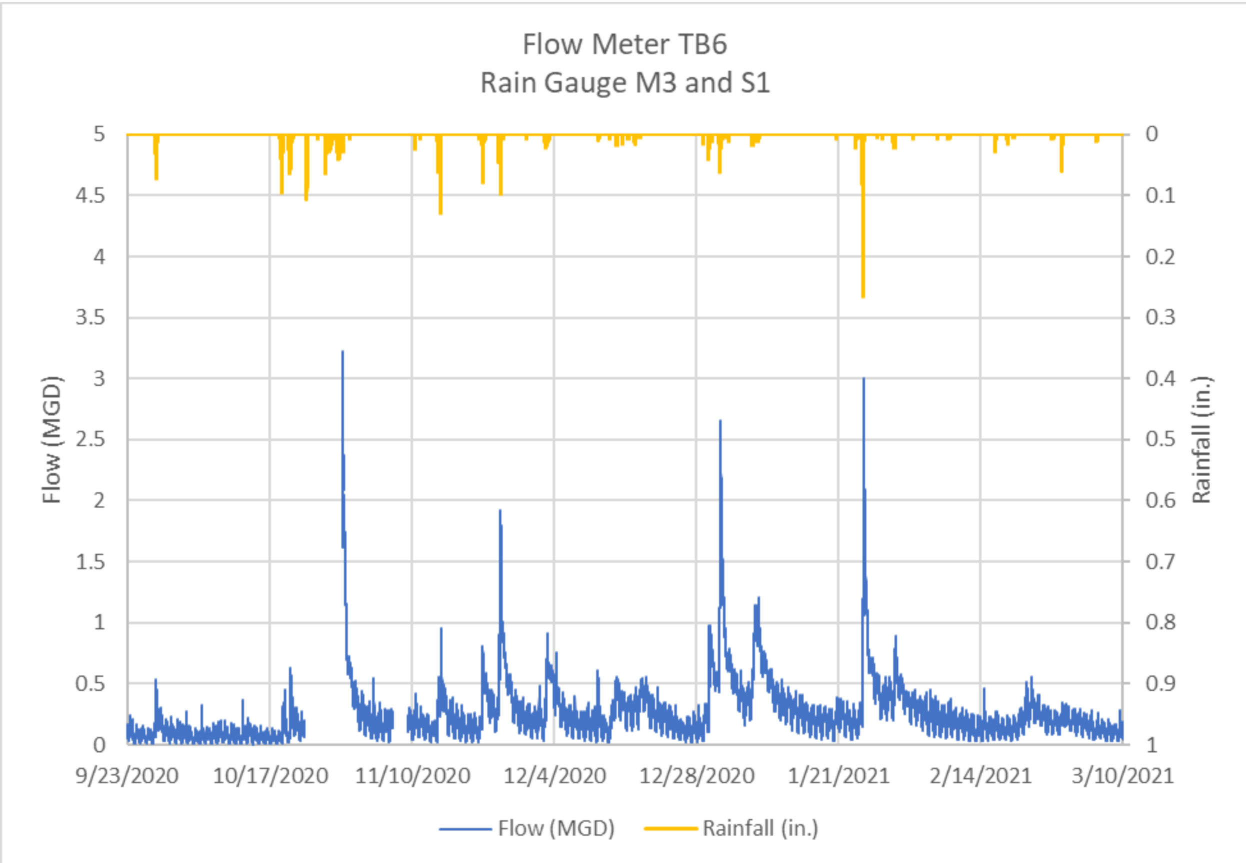


Figure E-48. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter TB6.

Flow data results from the fall/winter monitoring period for flow meter TB6 are as follows:

Minimum Flow	0.005 mgd
Maximum Flow	3.226 mgd
Average Flow	0.234 mgd
*Peaking Factor	13.808

*Maximum/Average Flow

Figure E-49 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter TB6. The meter recorded one surcharge event in manhole 404-234 during the monitoring period.

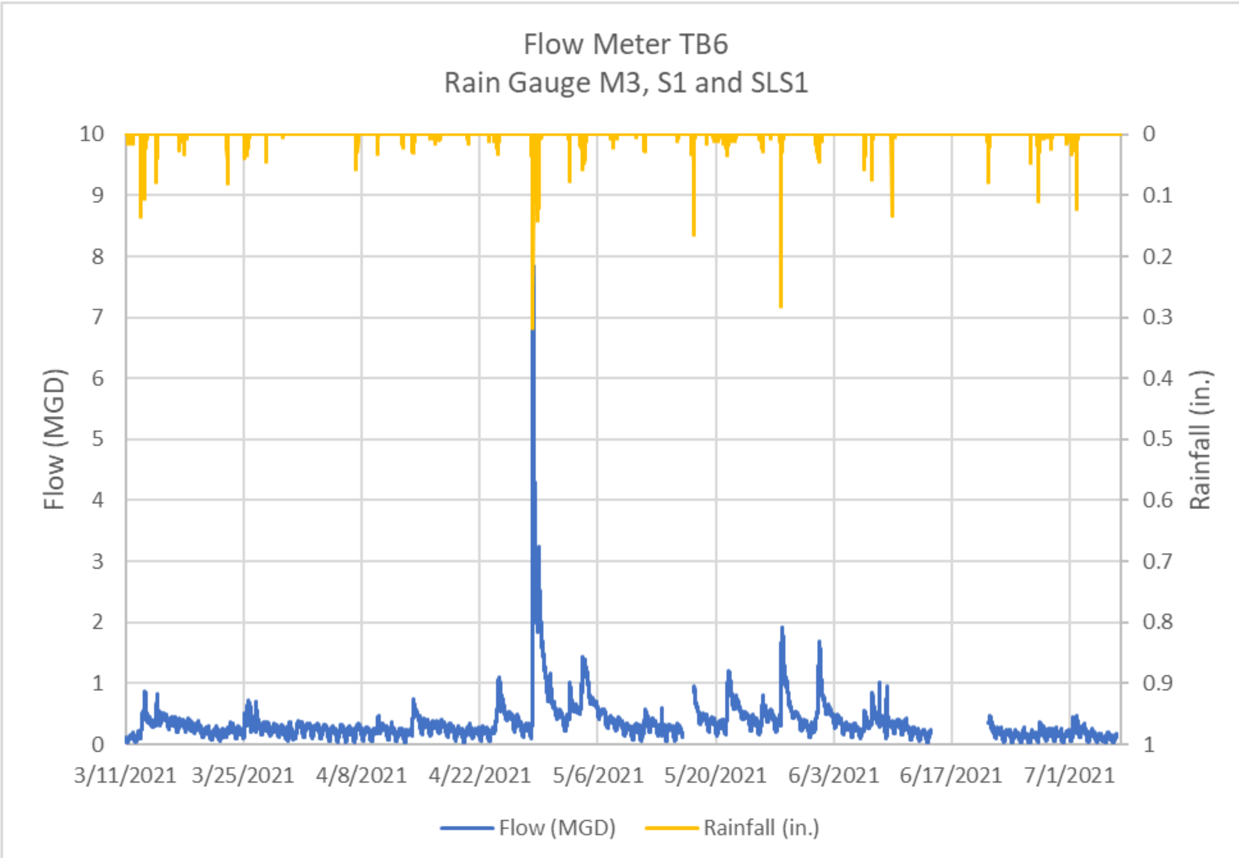


Figure E-49. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter TB6.

Flow data results from the spring monitoring period for flow meter TB6 are as follows:

Minimum Flow	0.021 mgd
Maximum Flow	7.850 mgd
Average Flow	0.351 mgd
*Peaking Factor	22.373

*Maximum/Average Flow

Flow Meter TB7

Flow meter TB7 was installed on the 12-inch influent pipe from the south of manhole 404-680, which divides TB6 and TB7. No subbasins were upstream of the immediate subbasin, which covered 351 acres and included 38,291 linear feet of pipe.

Figure E-50 shows the flow and precipitation monitoring results from the fall/winter monitoring period for Flow Meter TB7. The meter recorded no surcharge events in manhole 404-680 during the monitoring period.

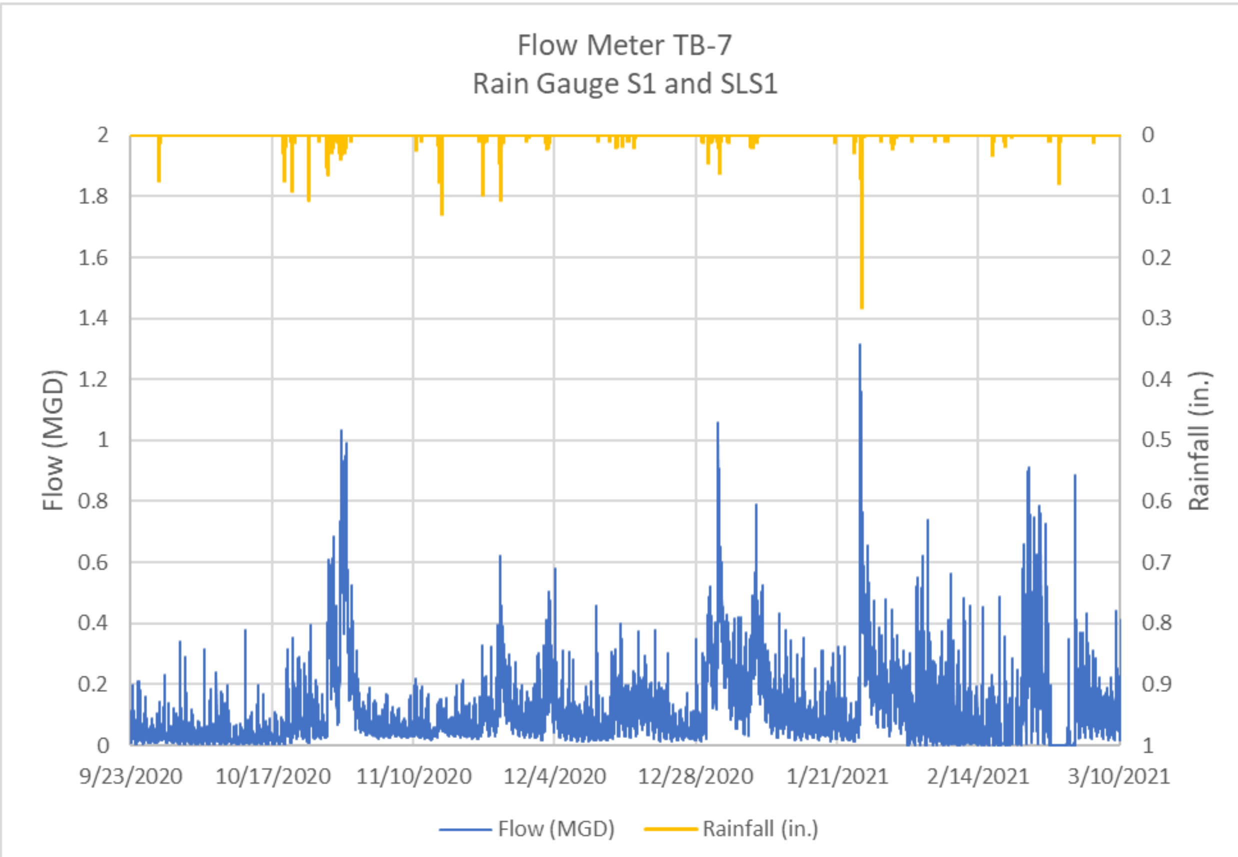


Figure E-50. Fall/Winter Measured Flow Rate versus Daily Rainfall for Flow Meter TB7.

Flow data results from the fall/winter monitoring period for flow meter TB7 are as follows:

Minimum Flow	0 mgd
Maximum Flow	1.316 mgd
Average Flow	0.095 mgd
*Peaking Factor	13.818

*Maximum/Average Flow

Figure E-51 shows the flow and precipitation monitoring results from the spring monitoring period for Flow Meter TB7. The meter recorded one surcharge event in manhole 404-680 during the monitoring period.

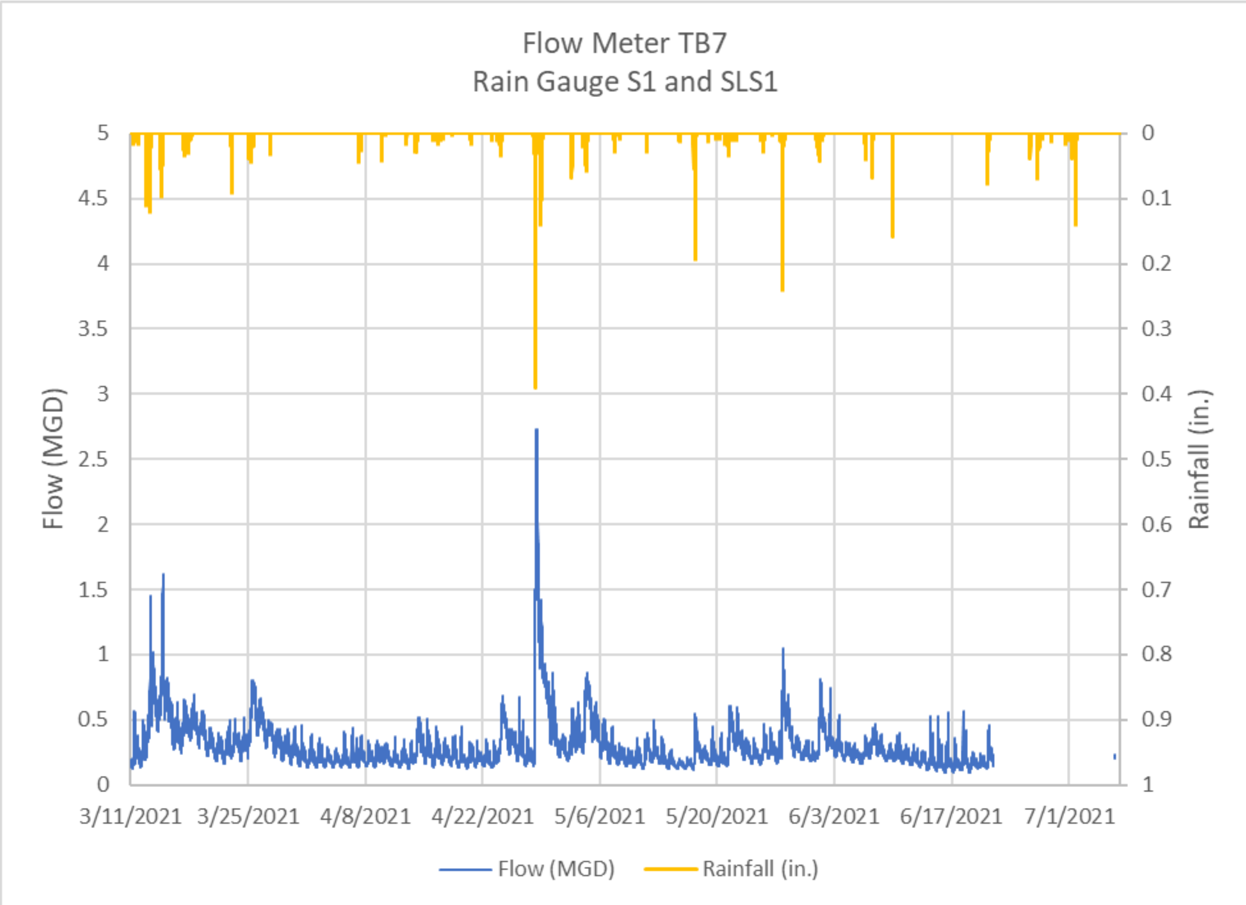


Figure E-51. Spring Measured Flow Rate versus Daily Rainfall for Flow Meter TB7.

Flow data results from the spring monitoring period for flow meter TB7 are as follows:

Minimum Flow	0.095 mgd
Maximum Flow	2.728 mgd
Average Flow	0.290 mgd
*Peaking Factor	9.407

*Maximum/Average Flow

APPENDIX F
Dry Weather Flow Statistics

Table F-1. Dry Weather Flow Statistics

Subbasin	Weekday or Weekend	Number of Days Analyzed		Maximum Daily Flow (mgd)		Average Flow (mgd)		Minimum Daily Flow (mgd)	
		Fall/Winter	Spring	Fall/Winter	Spring	Fall/Winter	Spring	Fall/Winter	Spring
McKisic 1 and 3	Weekday	55	30	0.3824	0.4356	0.2580	0.3138	0.0982	0.1485
	Weekend	24	18	0.3907	0.4280	0.2597	0.3167	0.0861	0.1567
McKisic 4	Weekday	43	34	0.1345	0.1480	0.0760	0.0881	0.0224	0.0286
	Weekend	19	16	0.1399	0.1591	0.0736	0.0885	0.0204	0.0284
McKisic 6	Weekday	66	39	0.2950	0.2953	0.2357	0.2319	0.1534	0.1437
	Weekend	26	19	0.3118	0.2980	0.2335	0.2243	0.1427	0.1367
McKisic 7	Weekday	36	27	0.7822	0.8378	0.6010	0.6201	0.3585	0.3343
	Weekend	17	14	0.7745	0.8328	0.5901	0.5915	0.3641	0.3151
McKisic 8	Weekday	27	19	0.1668	0.2136	0.0781	0.0923	0.0083	0.0069
	Weekend	11	8	0.1916	0.2297	0.0896	0.1084	0.0075	0.0105
McKisic 9	Weekday	67	27	0.1848	0.2046	0.1016	0.1157	0.0389	0.0457
	Weekend	28	14	0.1855	0.2084	0.1002	0.1202	0.0345	0.0517
McKisic 10	Weekday	54	36	0.3751	0.4221	0.2917	0.3385	0.2117	0.2489
	Weekend	24	14	0.3433	0.4047	0.2744	0.3389	0.2109	0.2702
McKisic 11	Weekday	45	27	0.3215	0.3244	0.2048	0.2110	0.0530	0.0537
	Weekend	23	14	0.3484	0.3537	0.2196	0.2241	0.0539	0.0514
McKisic 12	Weekday	76	43	0.1419	0.1789	0.0826	0.1054	0.0218	0.0285
	Weekend	30	14	0.1764	0.1811	0.0955	0.0973	0.0266	0.0245
Shewmaker 1, 2, and 3	Weekday	57	36	0.5149	0.4877	0.3389	0.3344	0.0954	0.1050
	Weekend	21	17	0.5380	0.5213	0.3413	0.3438	0.0941	0.1056
South Lift Station 1 and 3	Weekday	57	-	0.5649	-	0.4540	-	0.3371	-
	Weekend	20	-	0.5622	-	0.4430	-	0.3156	-
South Lift Station 1	Weekday	-	34	-	0.4479	-	0.3395	-	0.2145
	Weekend	-	12	-	0.4404	-	0.3500	-	0.2296
South Lift Station 2, 4, and 5	Weekday	62	-	0.6134	-	0.3825	-	0.0757	-
	Weekend	26	-	0.5696	-	0.3400	-	0.0697	-
South Lift Station 2	Weekday	-	5	-	0.6943	-	0.3929	-	0.0742
	Weekend	-	1	-	0.7095	-	0.3037	-	0.0041

Subbasin	Weekday or Weekend	Number of Days Analyzed		Maximum Daily Flow (mgd)		Average Flow (mgd)		Minimum Daily Flow (mgd)	
		Fall/Winter	Spring	Fall/Winter	Spring	Fall/Winter	Spring	Fall/Winter	Spring
South Lift Station 3	Weekday	-	35	-	0.2287	-	0.1661	-	0.0728
	Weekend	-	18	-	0.2256	-	0.1619	-	0.0745
South Lift Station 4 and 5	Weekday	-	33	-	0.2804	-	0.1750	-	0.0728
	Weekend	-	13	-	0.3065	-	0.1822	-	0.0750
Town Branch 1	Weekday	28	2	0.1257	0.1668	0.0697	0.0832	0.0263	0.0155
	Weekend	16	2	0.1044	0.1892	0.0657	0.1133	0.0297	0.0323
Town Branch 2 and 4	Weekday	54	-	0.5791	-	0.4618	-	0.3045	-
	Weekend	23	-	0.5931	-	0.4605	-	0.3118	-
Town Branch 2	Weekday	-	9	-	0.2217	-	0.1401	-	0.0674
	Weekend	-	4	-	0.1472	-	0.0892	-	0.0355
Town Branch 3	Weekday	57	33	0.1597	0.1506	0.1143	0.1089	0.0617	0.0615
	Weekend	29	15	0.1580	0.1479	0.1134	0.1090	0.0665	0.0602
Town Branch 4	Weekday	-	24	-	0.5231	-	0.3925	-	0.2328
	Weekend	-	12	-	0.5772	-	0.4432	-	0.2698
Town Branch 5	Weekday	78	39	0.0813	0.1347	0.0562	0.0937	0.0293	0.0495
	Weekend	30	19	0.0817	0.1322	0.0572	0.0945	0.0321	0.0582
Town Branch 6	Weekday	56	15	0.1854	0.1773	0.1082	0.1205	0.0315	0.0550
	Weekend	23	5	0.1969	0.1713	0.1119	0.1099	0.0386	0.0498
Town Branch 7	Weekday	80	32	0.1270	0.2859	0.0702	0.2181	0.0291	0.1594
	Weekend	30	15	0.1105	0.2683	0.0635	0.2139	0.0272	0.1656

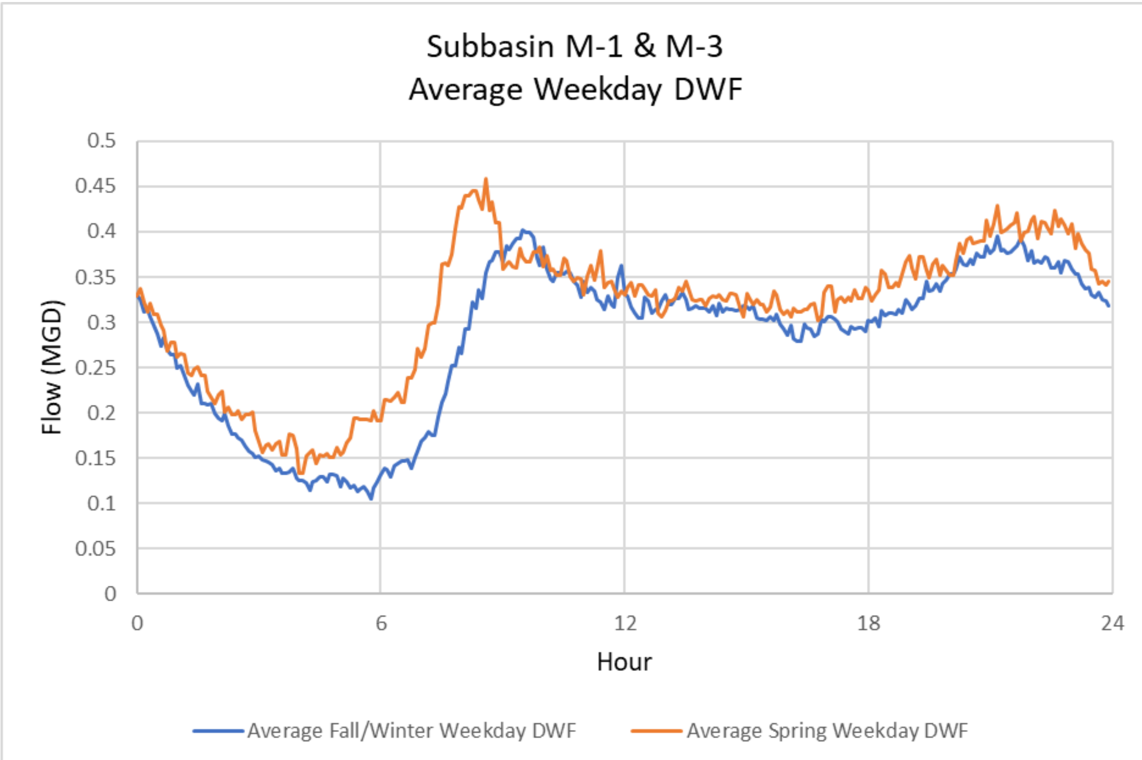


Figure F-1. Diurnal dry weather flow pattern for subbasin M-1 & M-3 during the weekday.

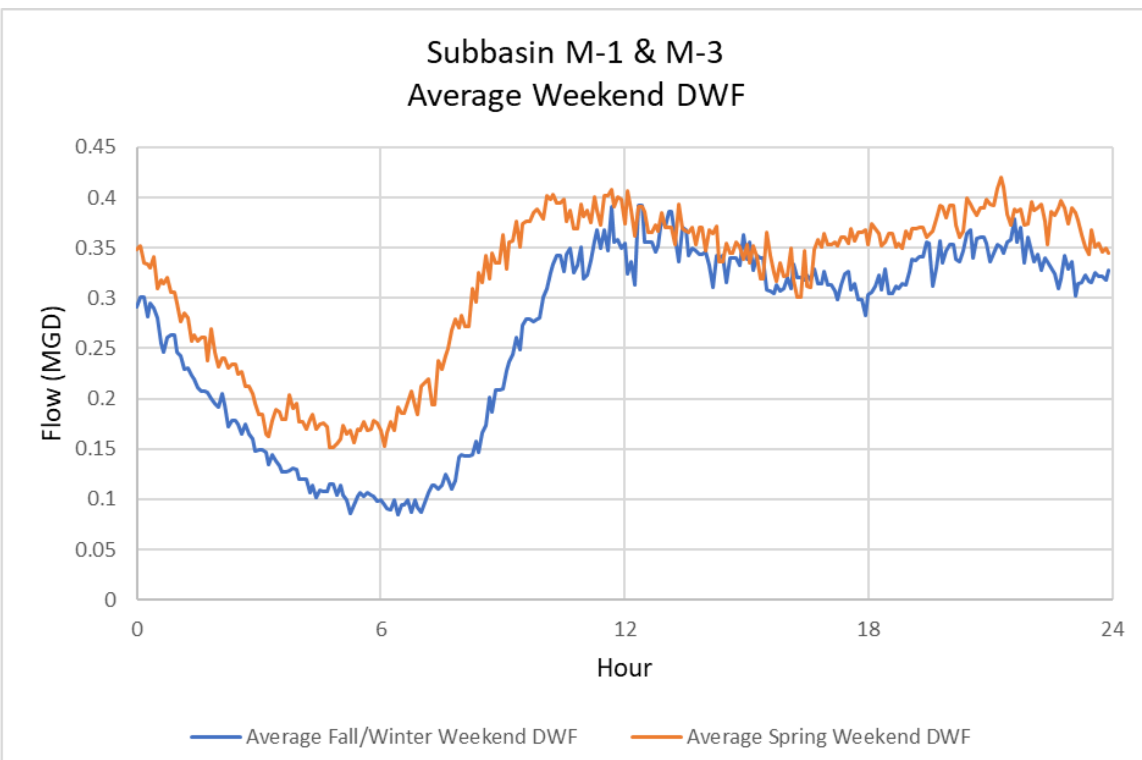


Figure F-2. Diurnal dry weather flow pattern for subbasin M-1 & M-3 during the weekend.

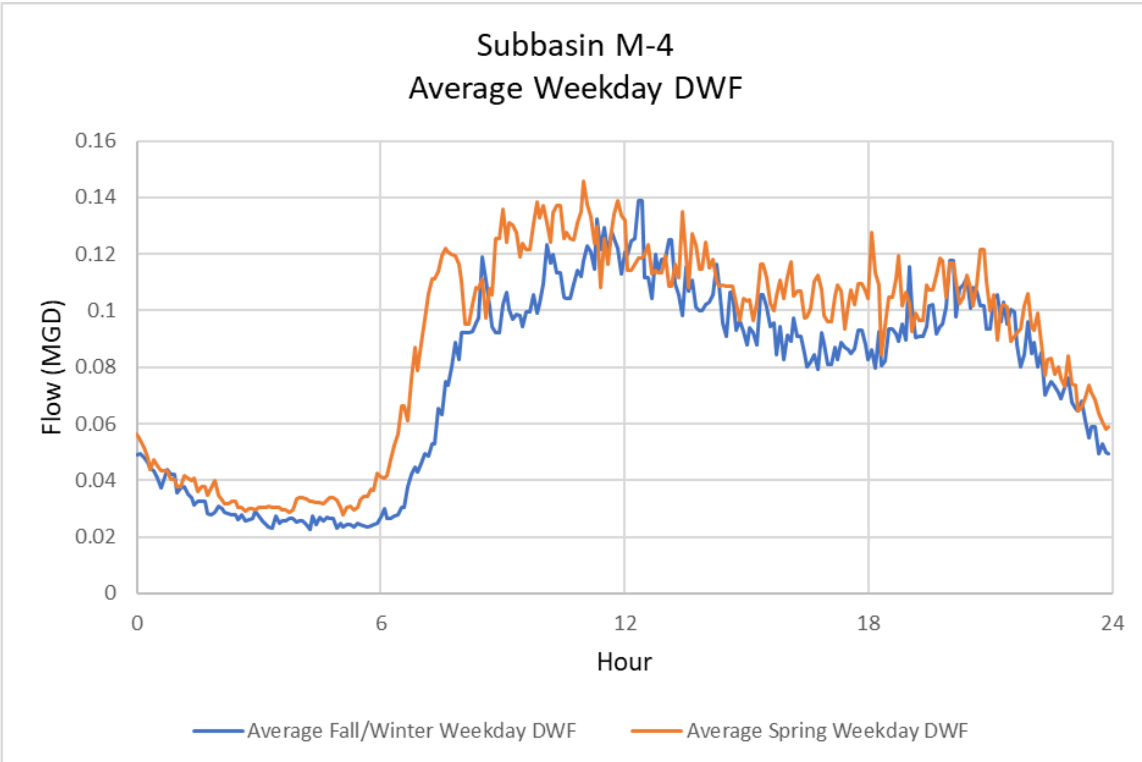


Figure F-3. Diurnal dry weather flow pattern for subbasin M-4 during the weekday.

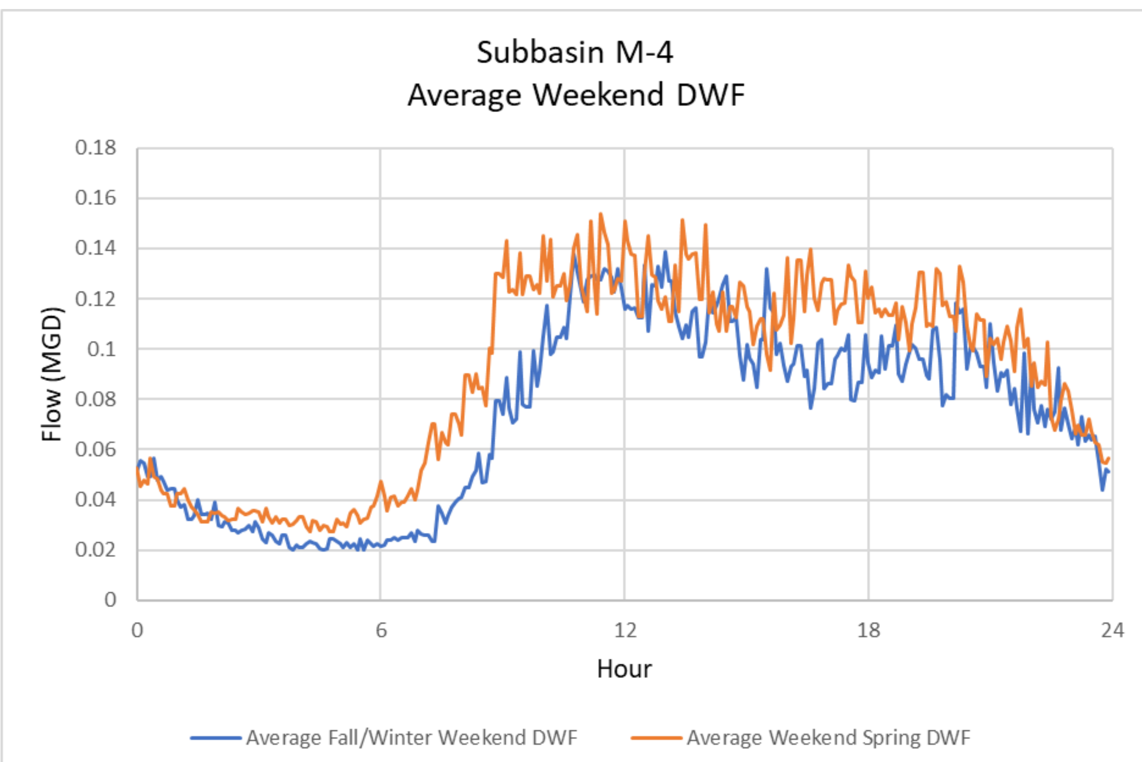


Figure F-4. Diurnal dry weather flow pattern for subbasin M-4 during the weekend.

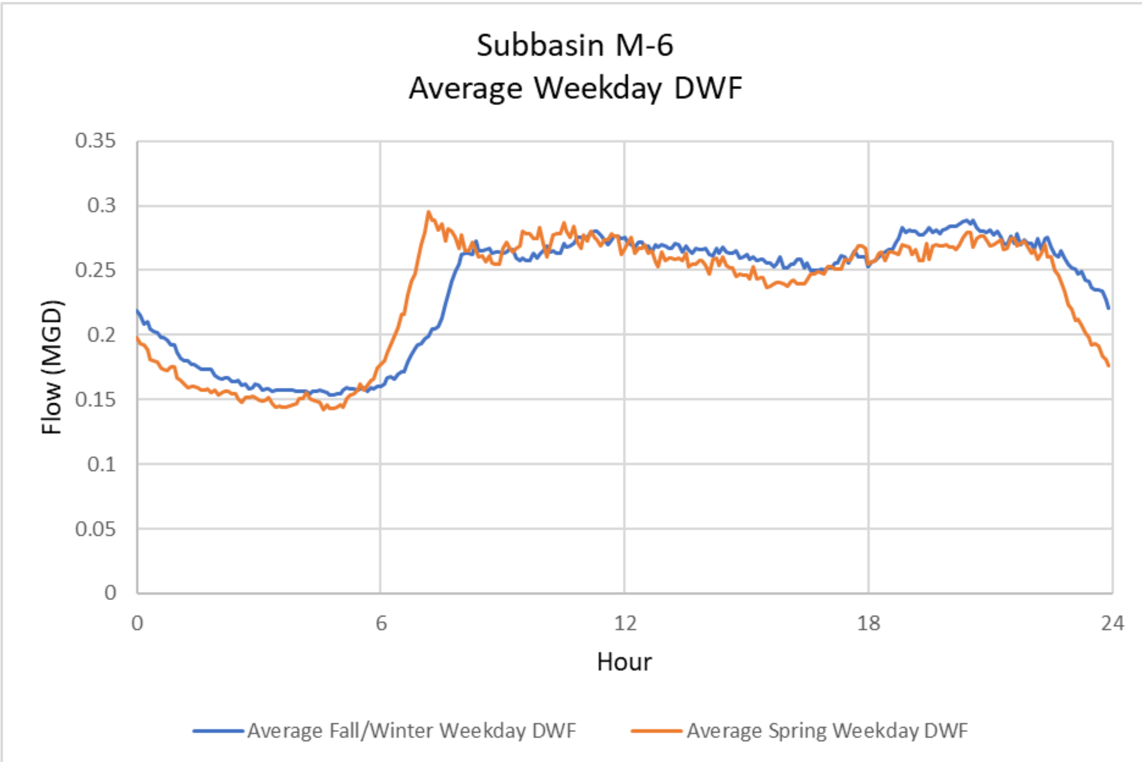


Figure F-5. Diurnal dry weather flow pattern for subbasin M-6 during the weekday.

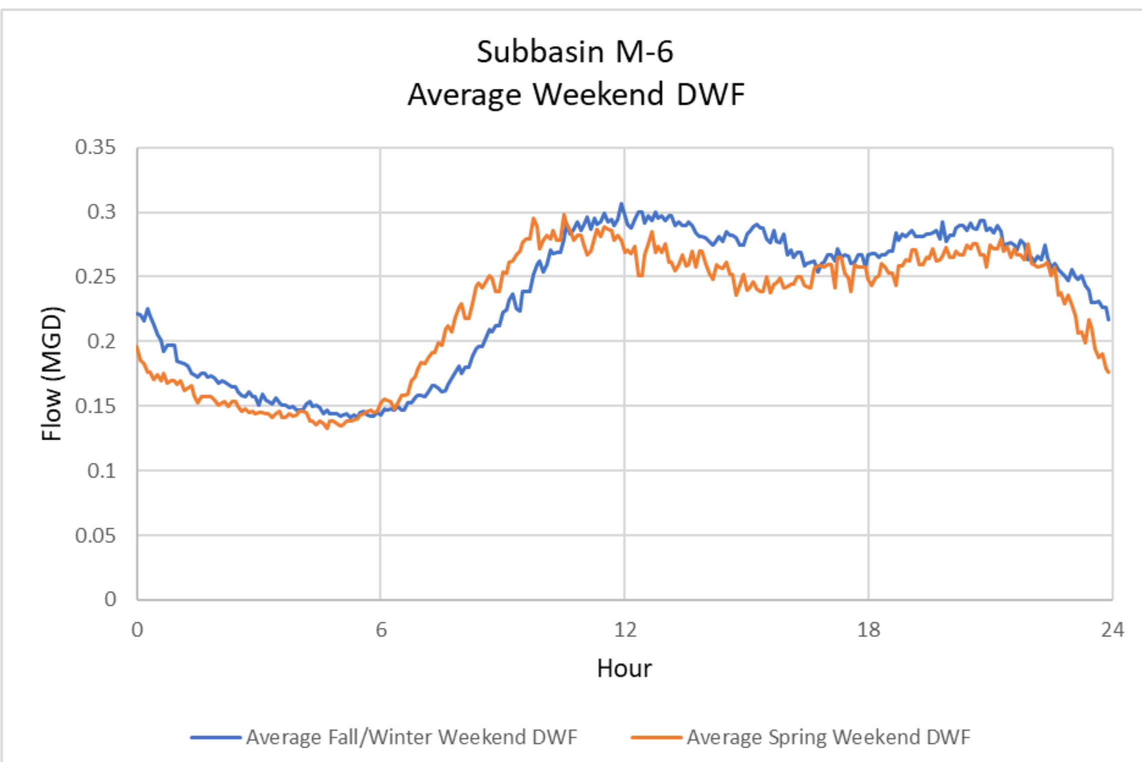


Figure F-6. Diurnal dry weather flow pattern for subbasin M-6 during the weekend.

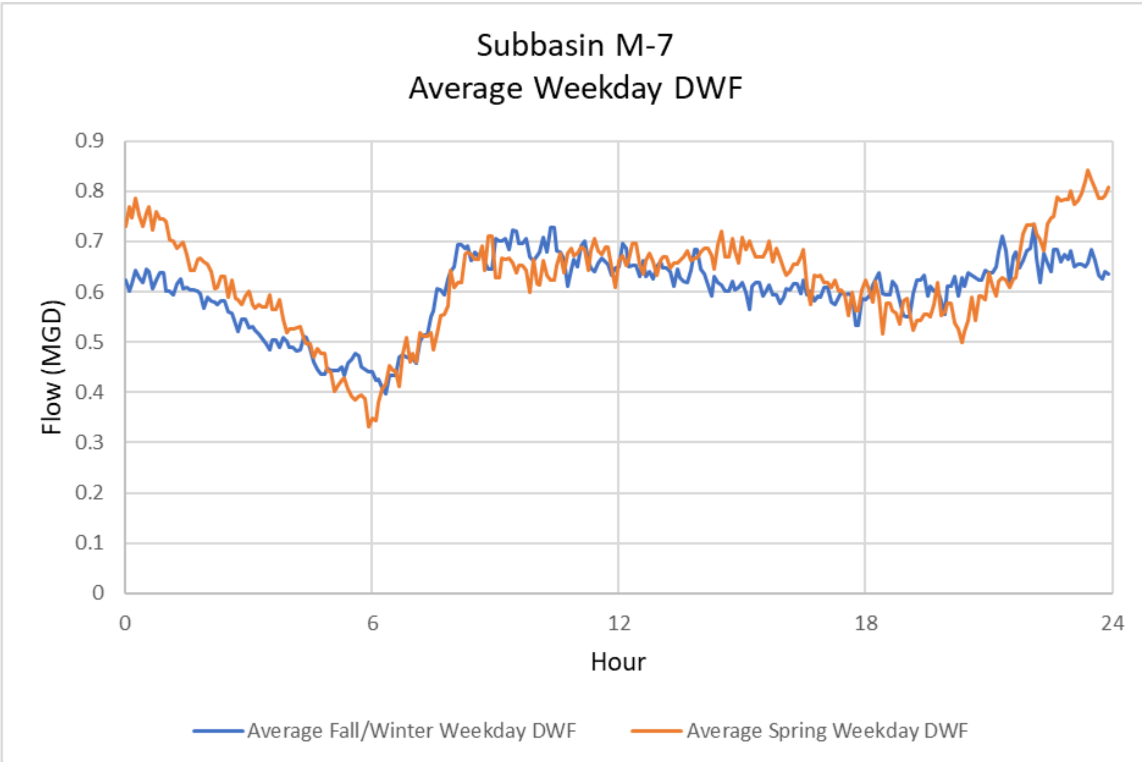


Figure F-7. Diurnal dry weather flow pattern for subbasin M-7 during the weekday.

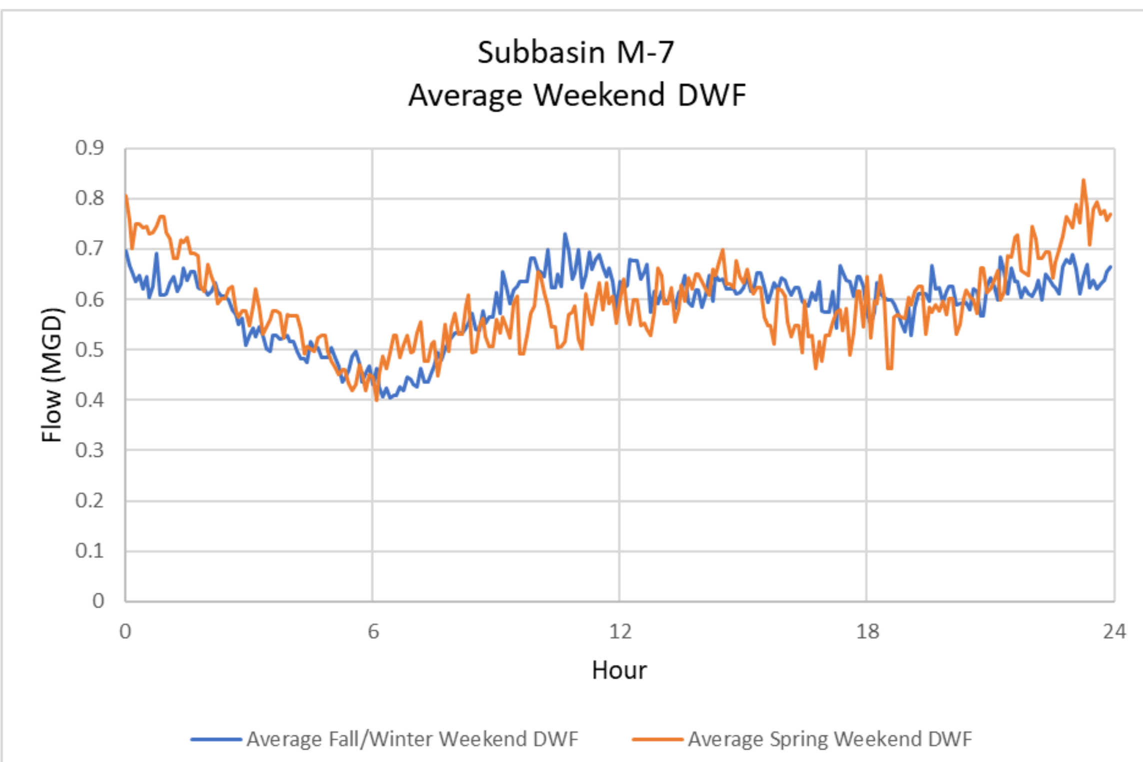


Figure F-8. Diurnal dry weather flow pattern for subbasin M-7 during the weekend.

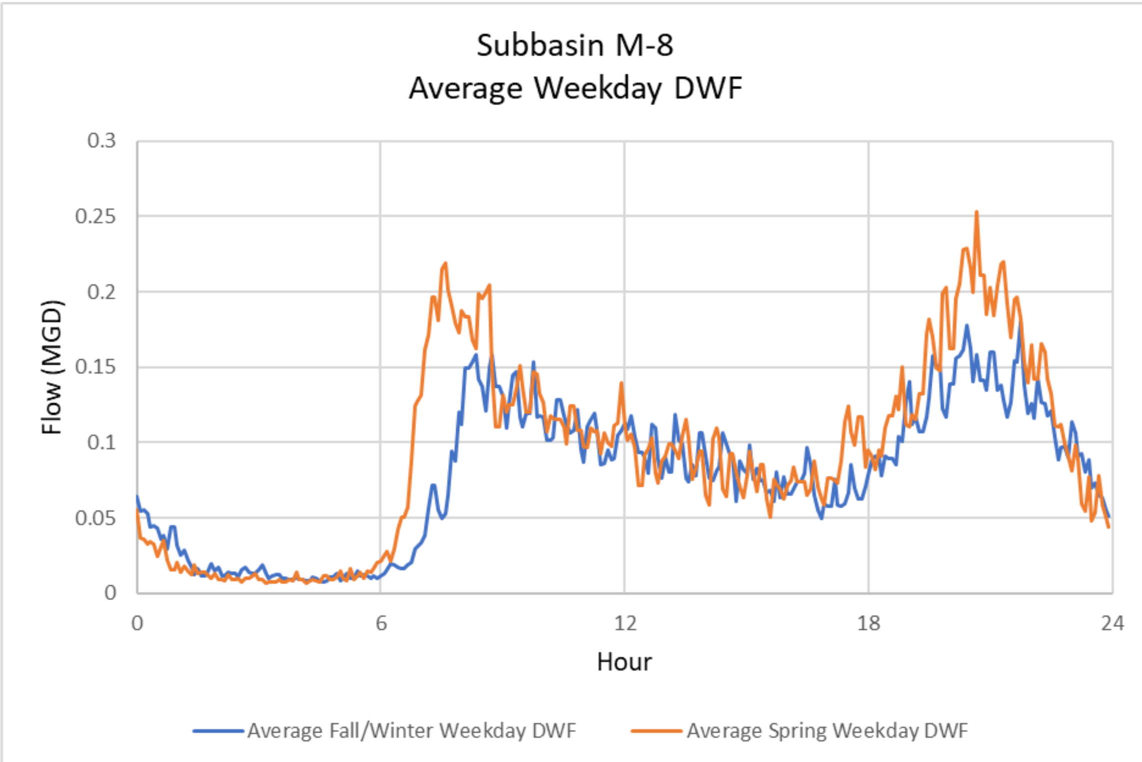


Figure F-9. Diurnal dry weather flow pattern for subbasin M-8 during the weekday.

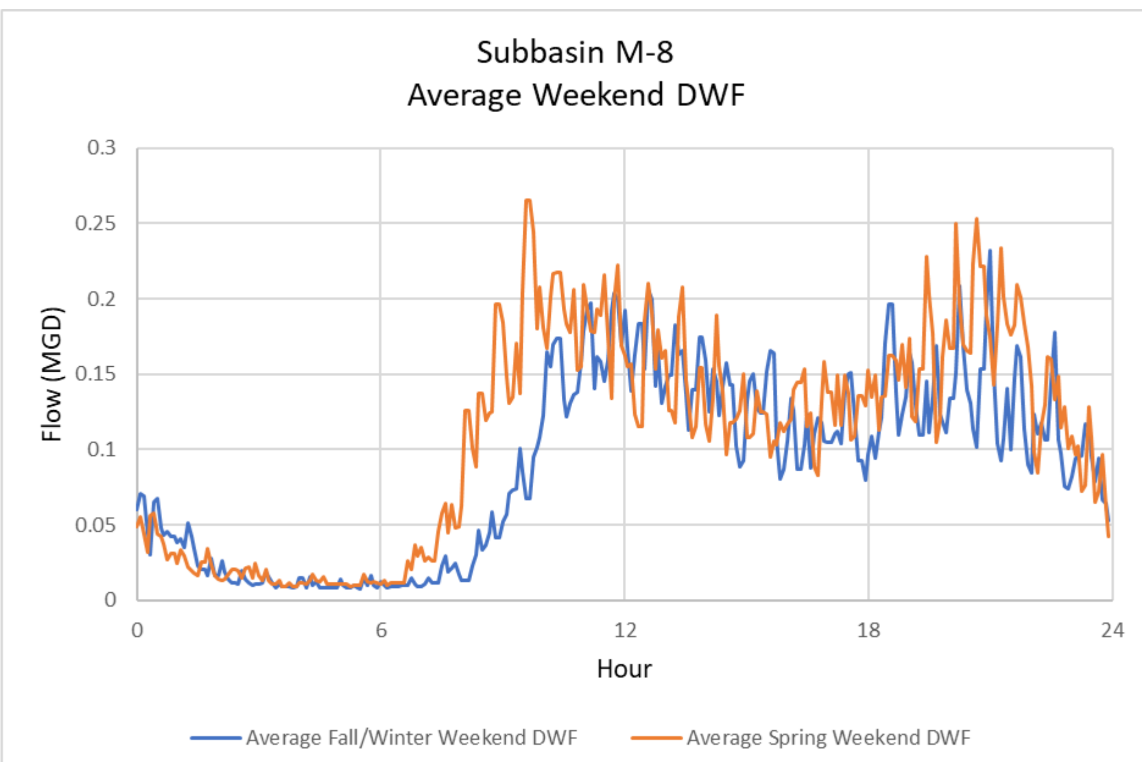


Figure F-10. Diurnal dry weather flow pattern for subbasin M-8 during the weekend.

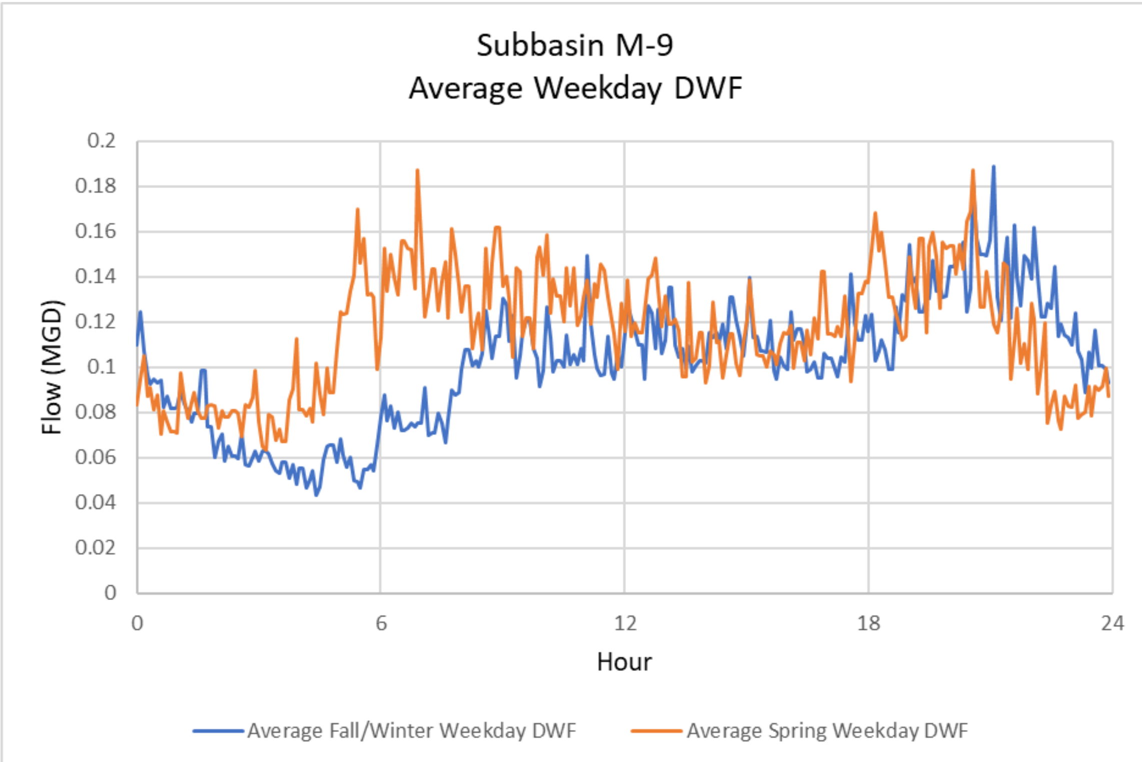


Figure F-11. Diurnal dry weather flow pattern for subbasin M-9 during the weekday.

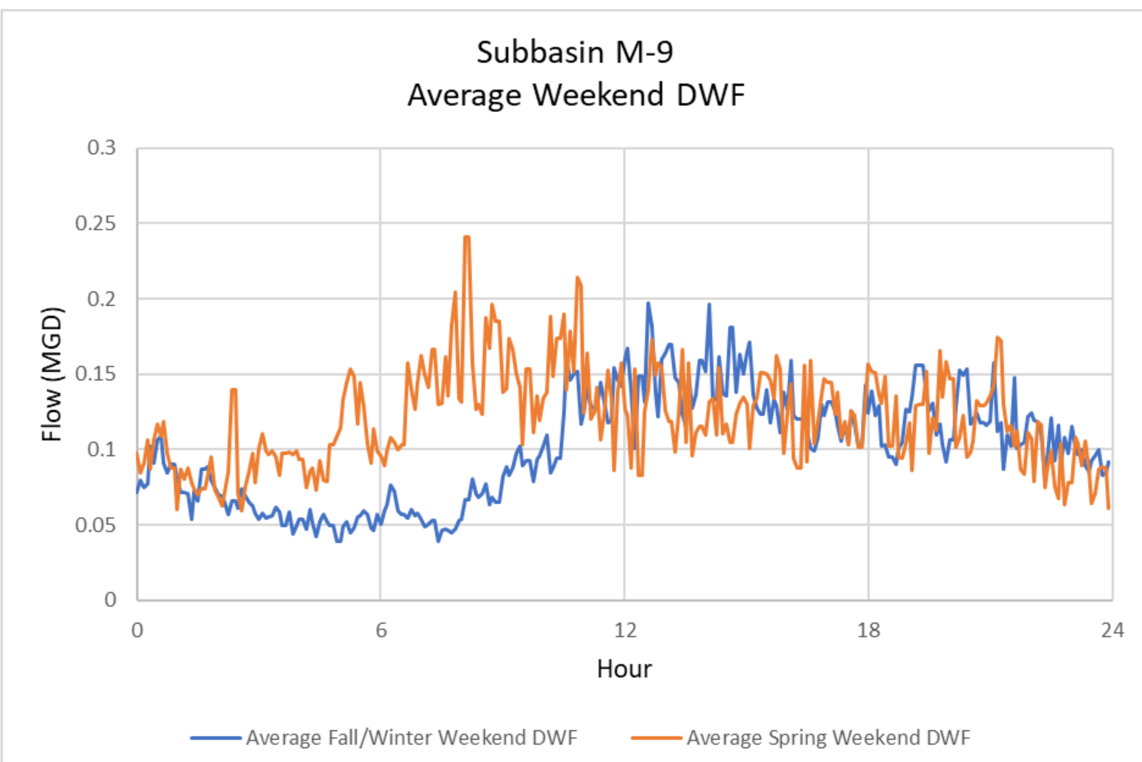


Figure F-12. Diurnal dry weather flow pattern for subbasin M-9 during the weekend.

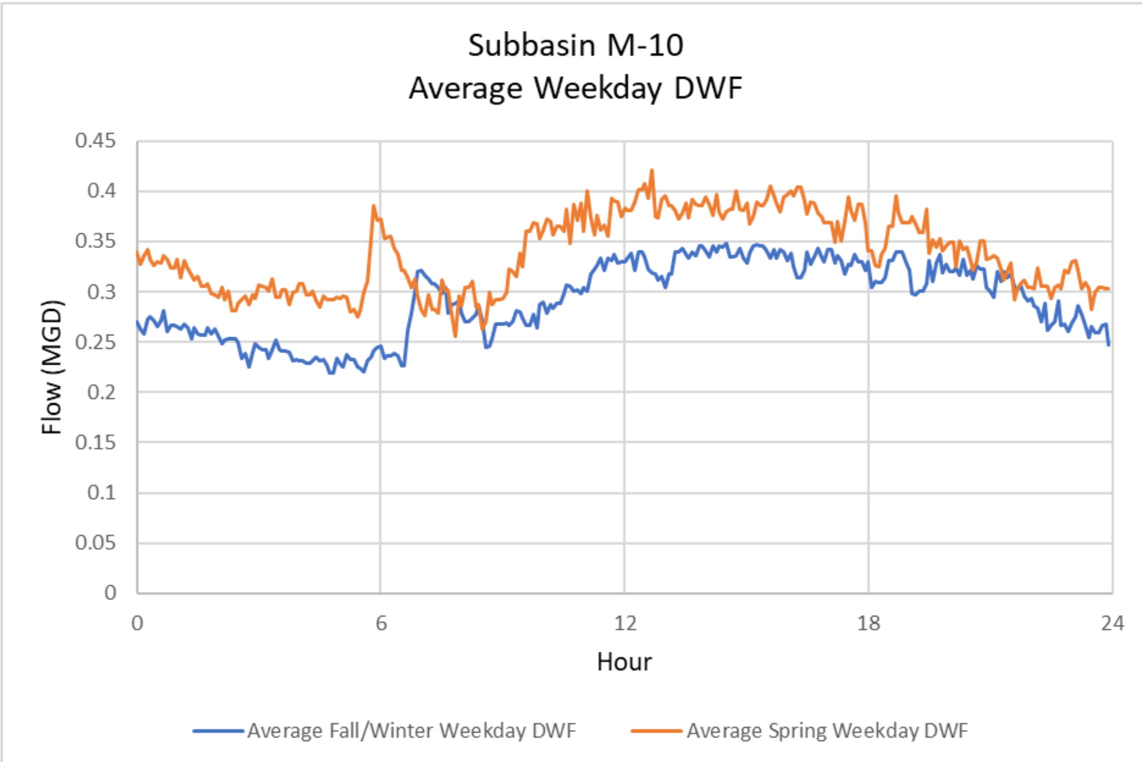


Figure F-13. Diurnal dry weather flow pattern for subbasin M-10 during the weekday.

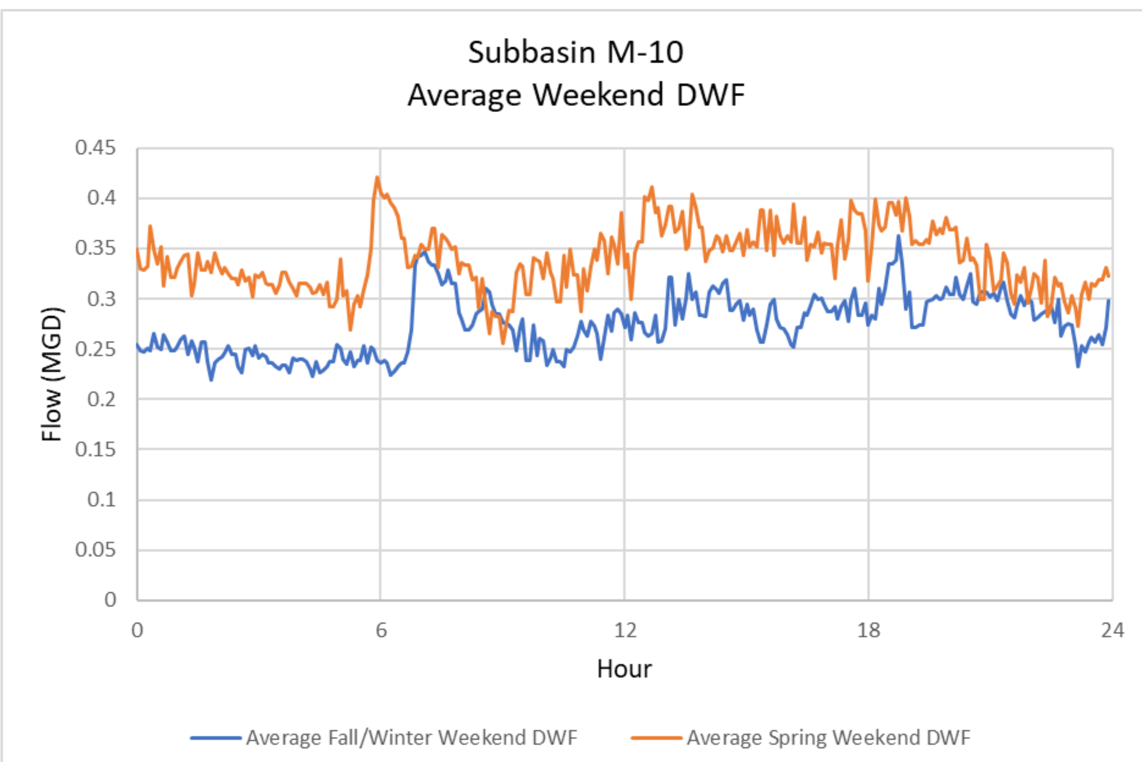


Figure F-14. Diurnal dry weather flow pattern for subbasin M-10 during the weekend.

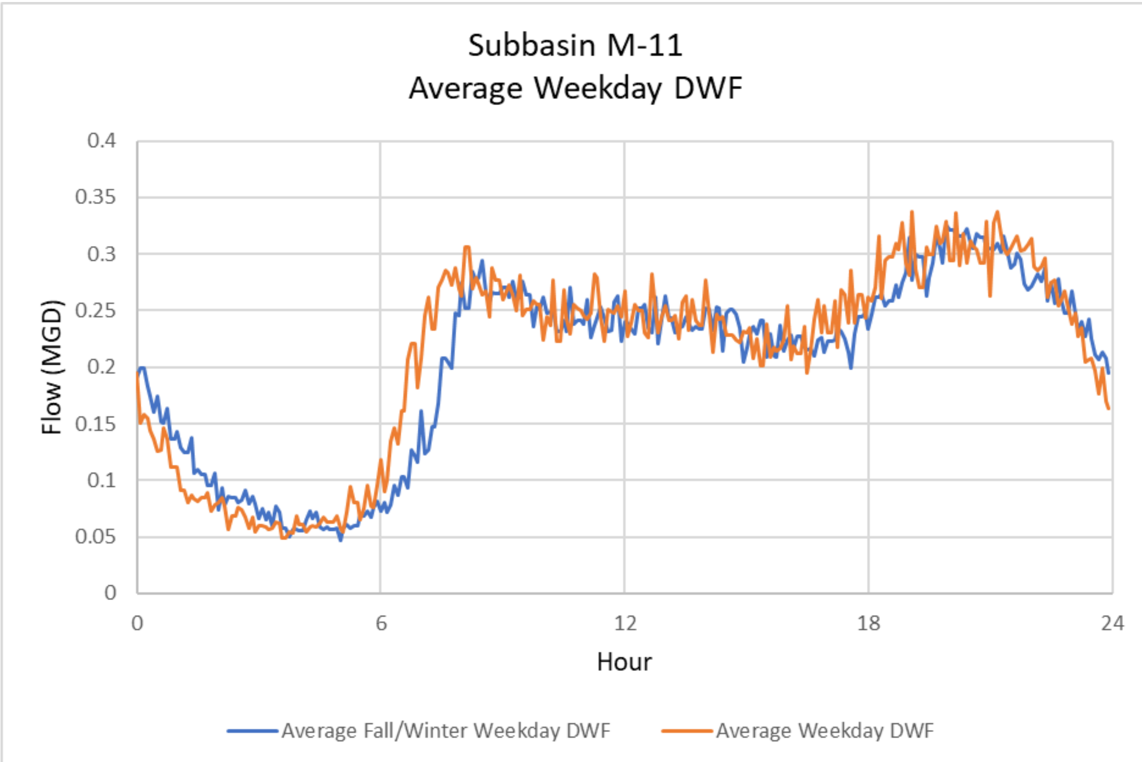


Figure F-15. Diurnal dry weather flow pattern for subbasin M-11 during the weekday.

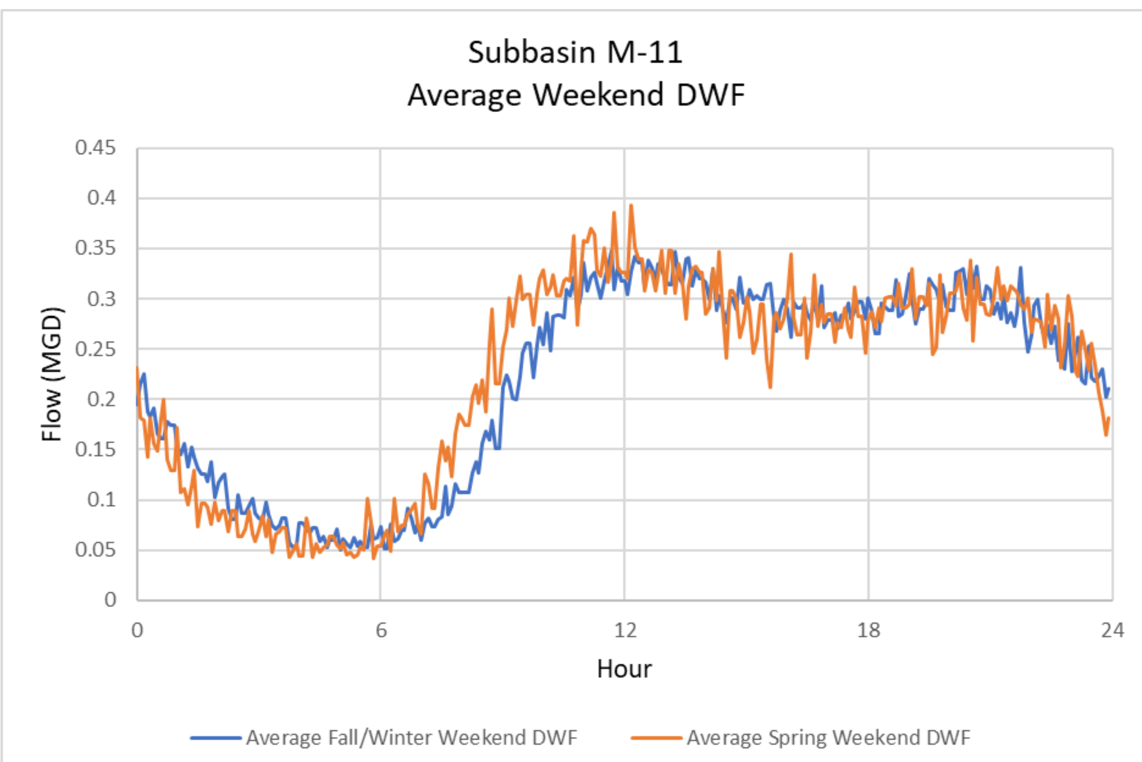


Figure F-16. Diurnal dry weather flow pattern for subbasin M-11 during the weekend.

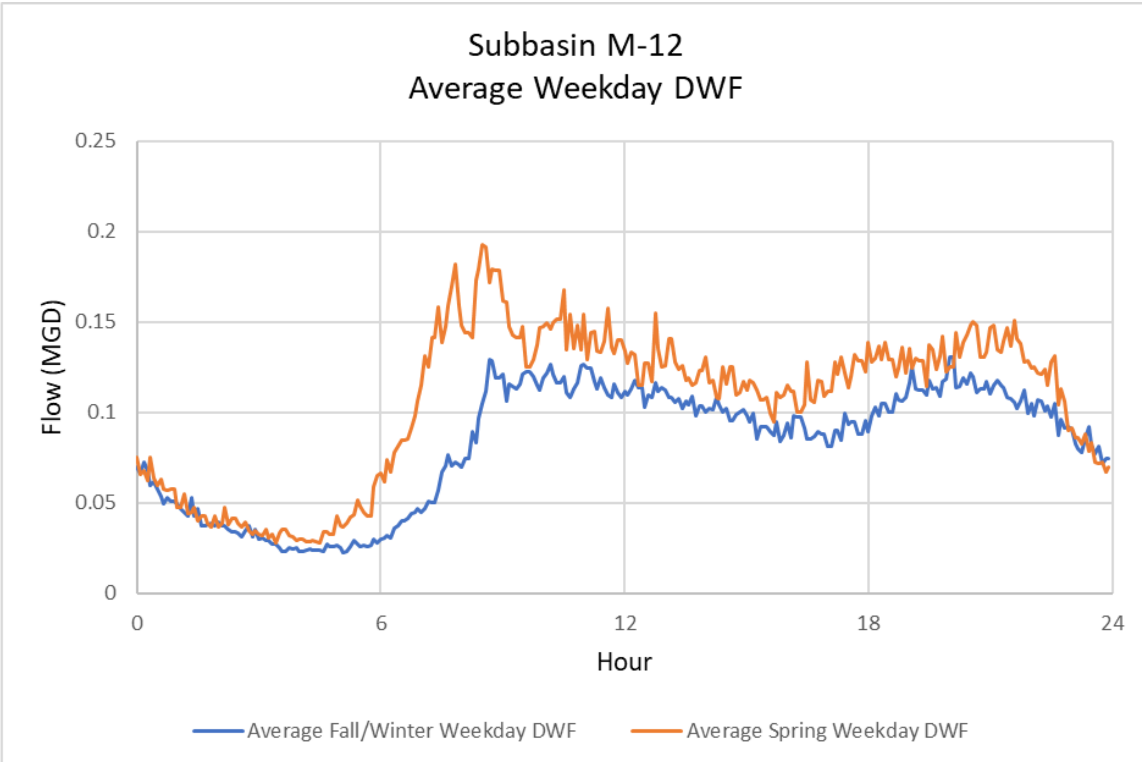


Figure F-17. Diurnal dry weather flow pattern for subbasin M-12 during the weekday.

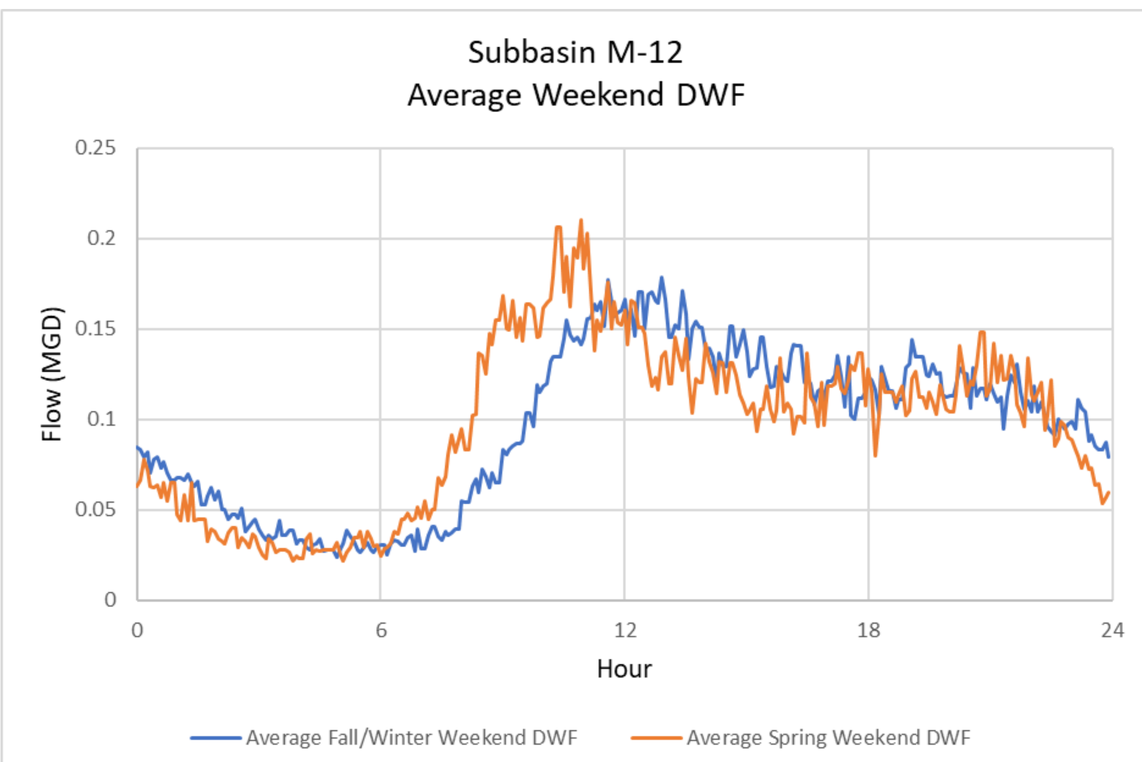


Figure F-18. Diurnal dry weather flow pattern for subbasin M-12 during the weekend.

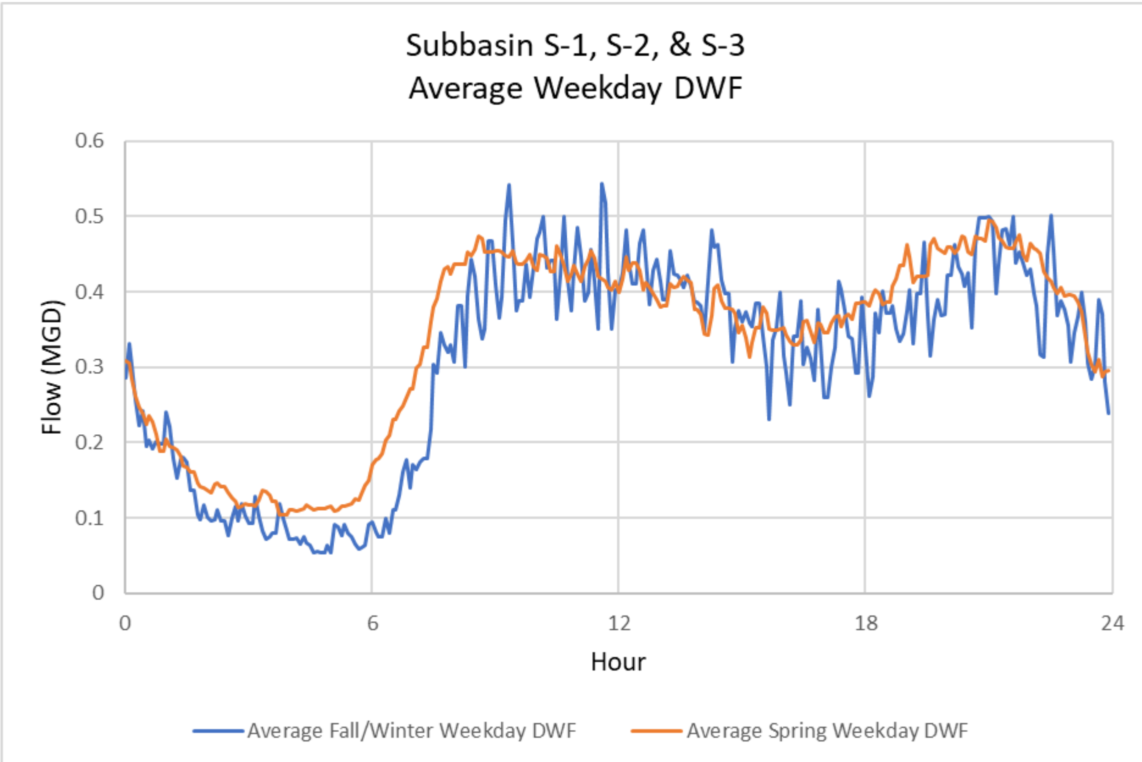


Figure F-19. Diurnal dry weather flow pattern for subbasin S-1, 2, & 3 during the weekday.

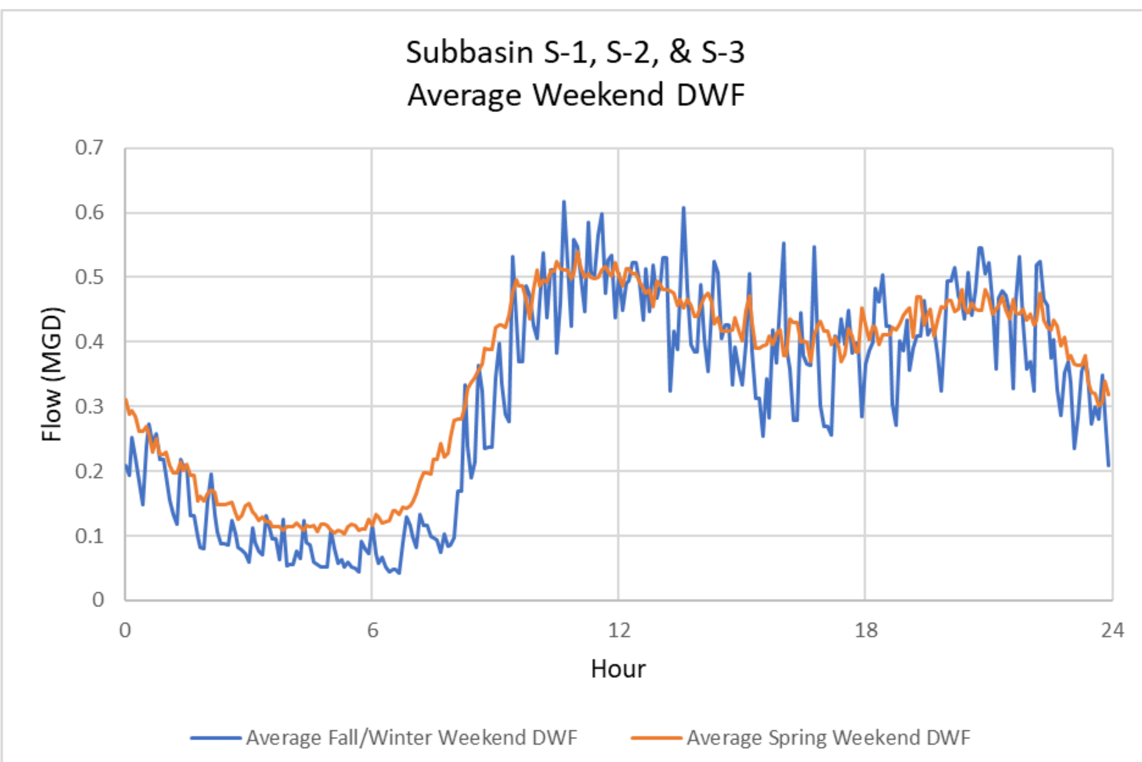


Figure F-20. Diurnal dry weather flow pattern for subbasin S-1 during the weekend.

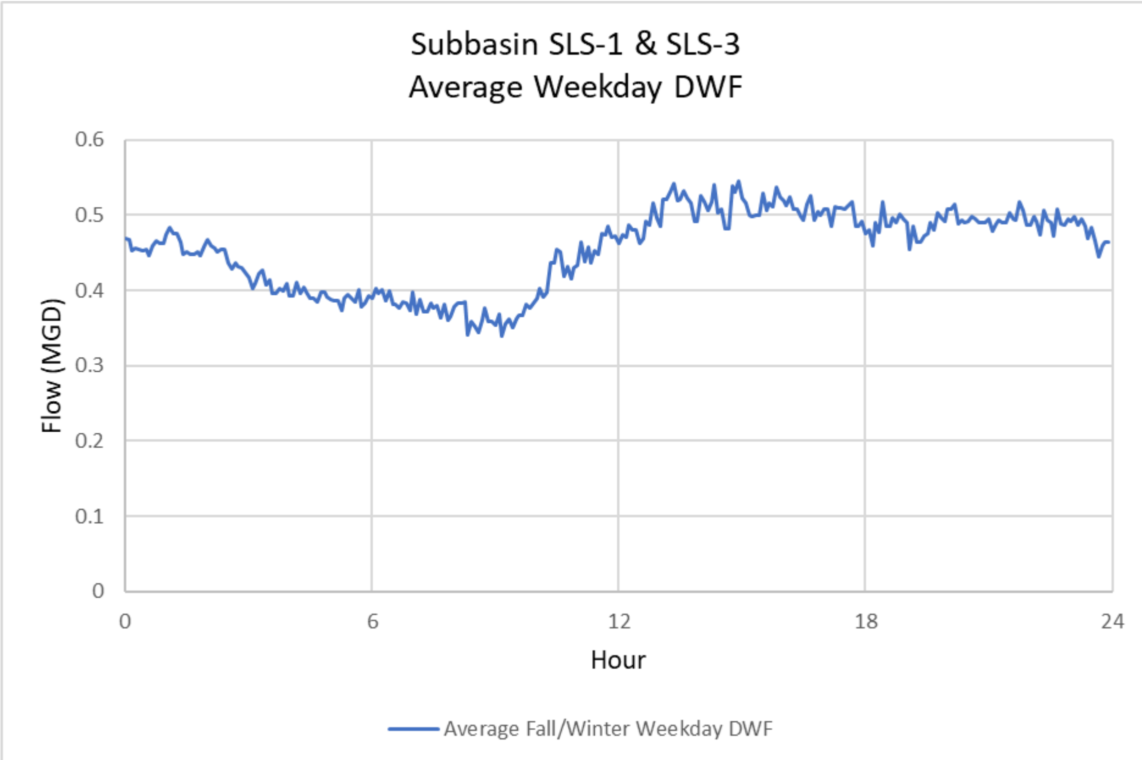


Figure F-21. Fall/winter diurnal dry weather flow pattern for subbasin SLS-1 & 3 during the weekday.

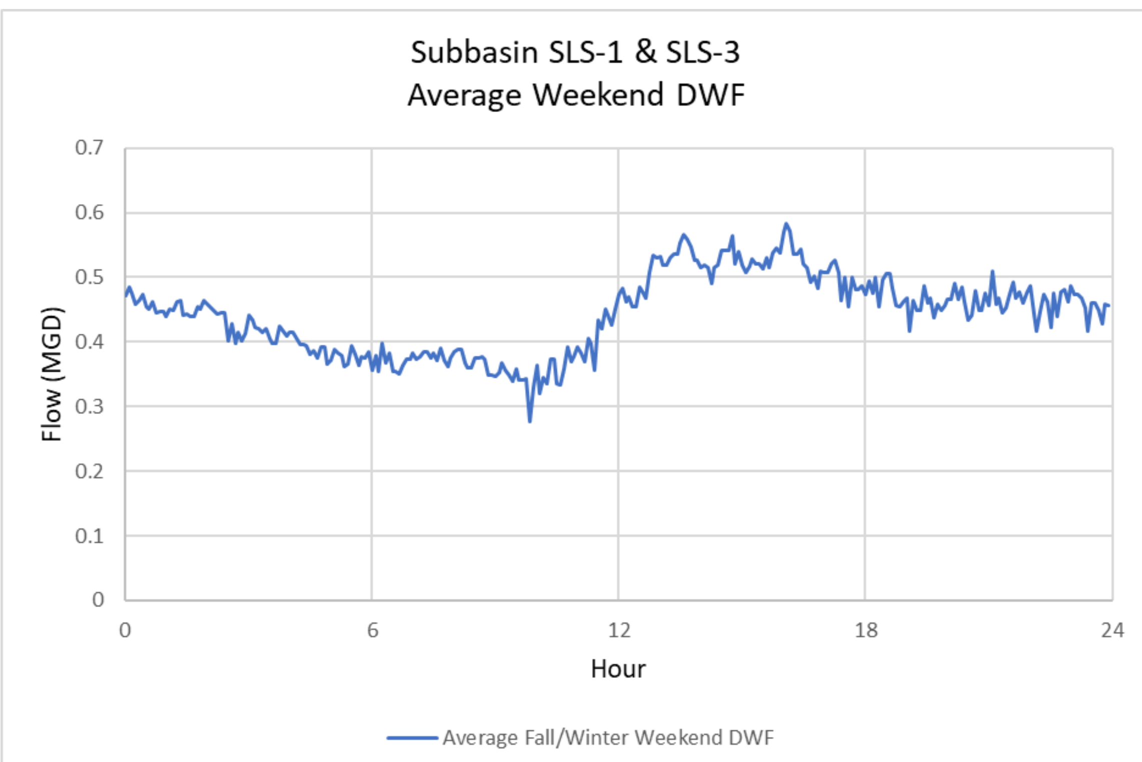


Figure F-22. Fall/winter diurnal dry weather flow pattern for subbasin SLS-1 & 3 during the weekend.

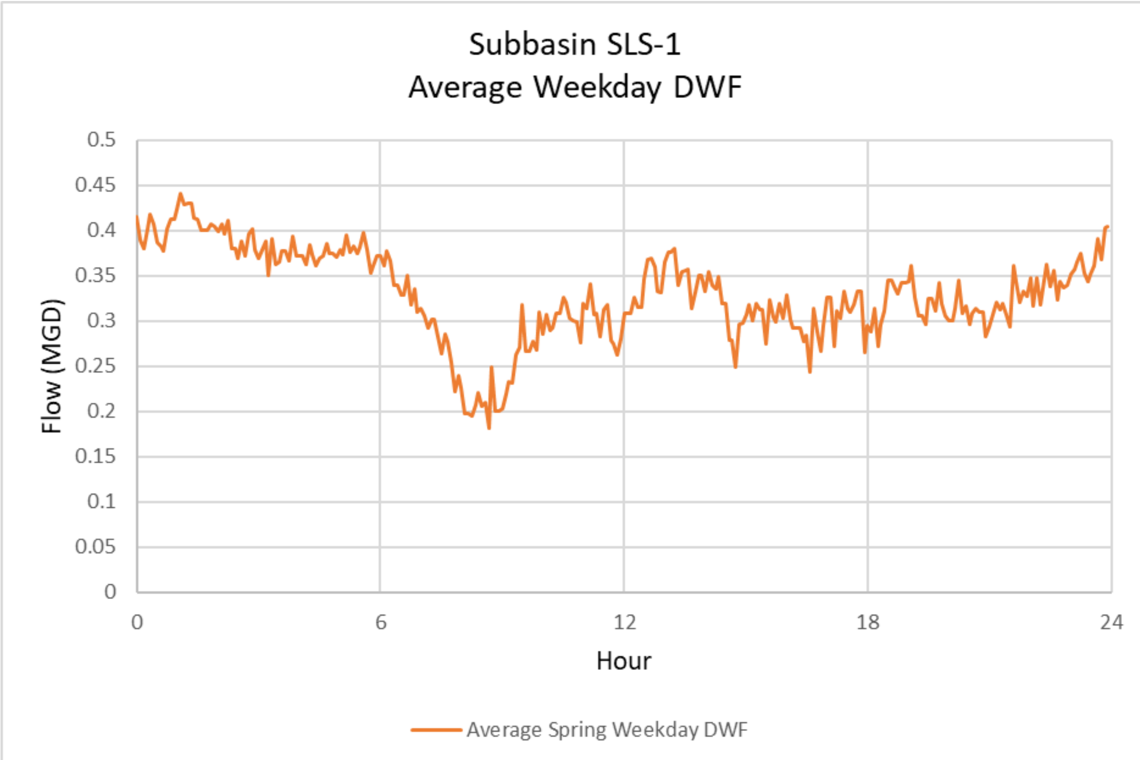


Figure F-23. Spring diurnal dry weather flow pattern for subbasin SLS-1 during the weekday.

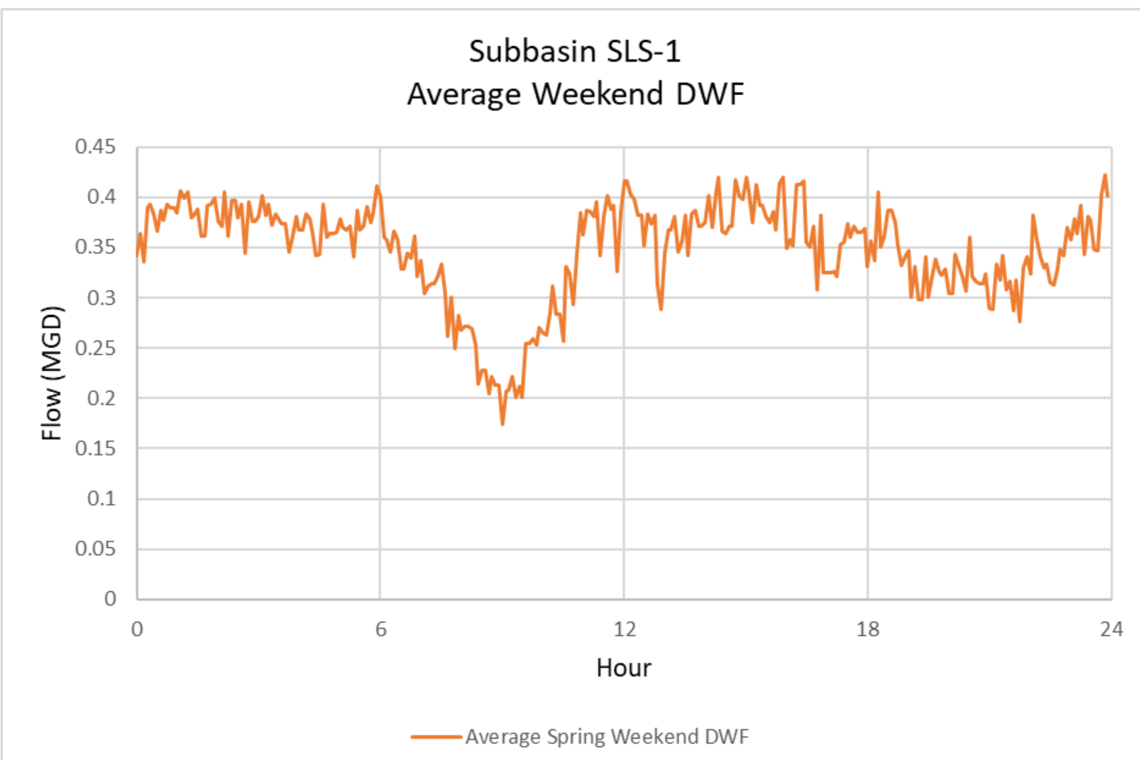


Figure F-24. Spring diurnal dry weather flow pattern for subbasin SLS-1 during the weekend.

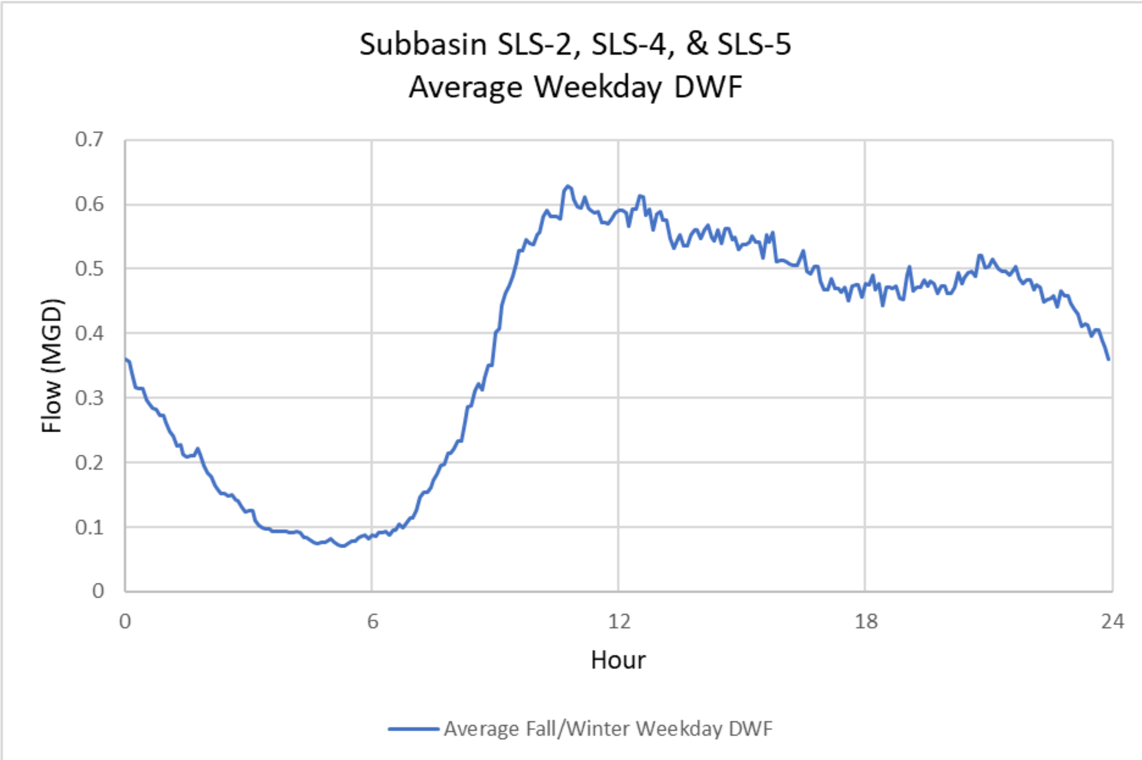


Figure F-25. Fall/winter diurnal dry weather flow pattern for subbasin SLS-2, 4, & 5 during the weekday.

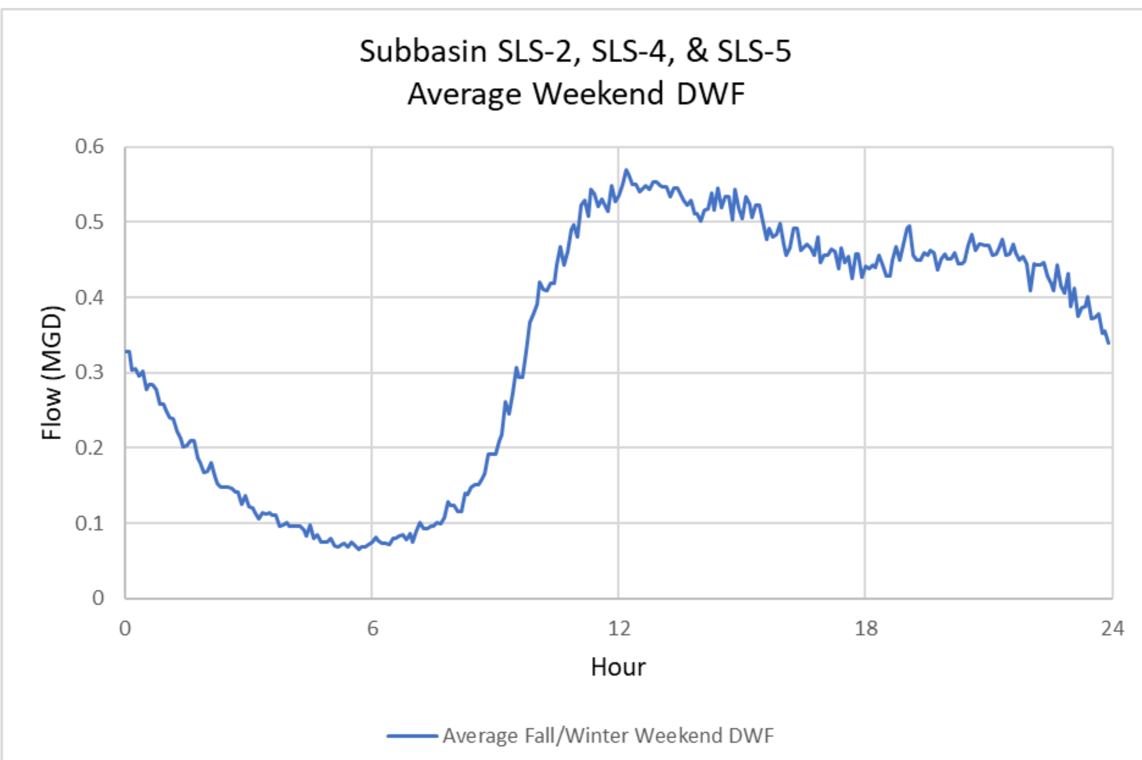


Figure F-26. Fall/winter diurnal dry weather flow pattern for subbasin SLS-2, 4, & 5 during the weekend.

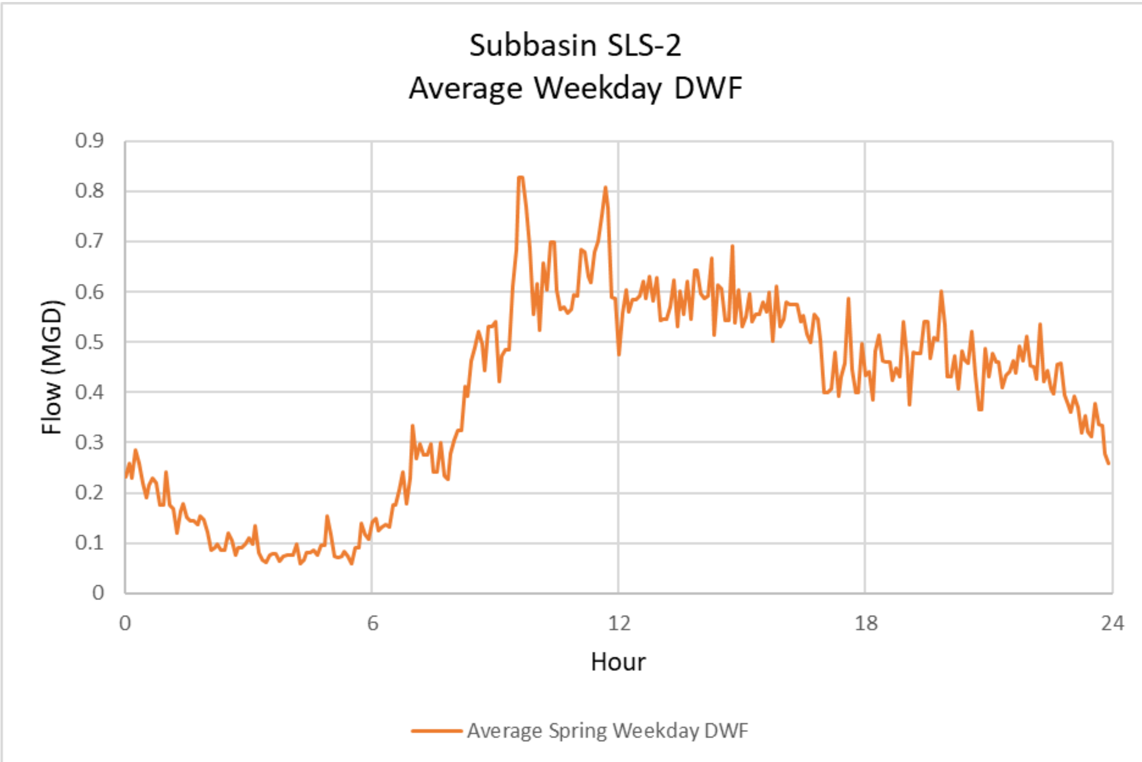


Figure F-27. Spring diurnal dry weather flow pattern for subbasin SLS-2 during the weekday.

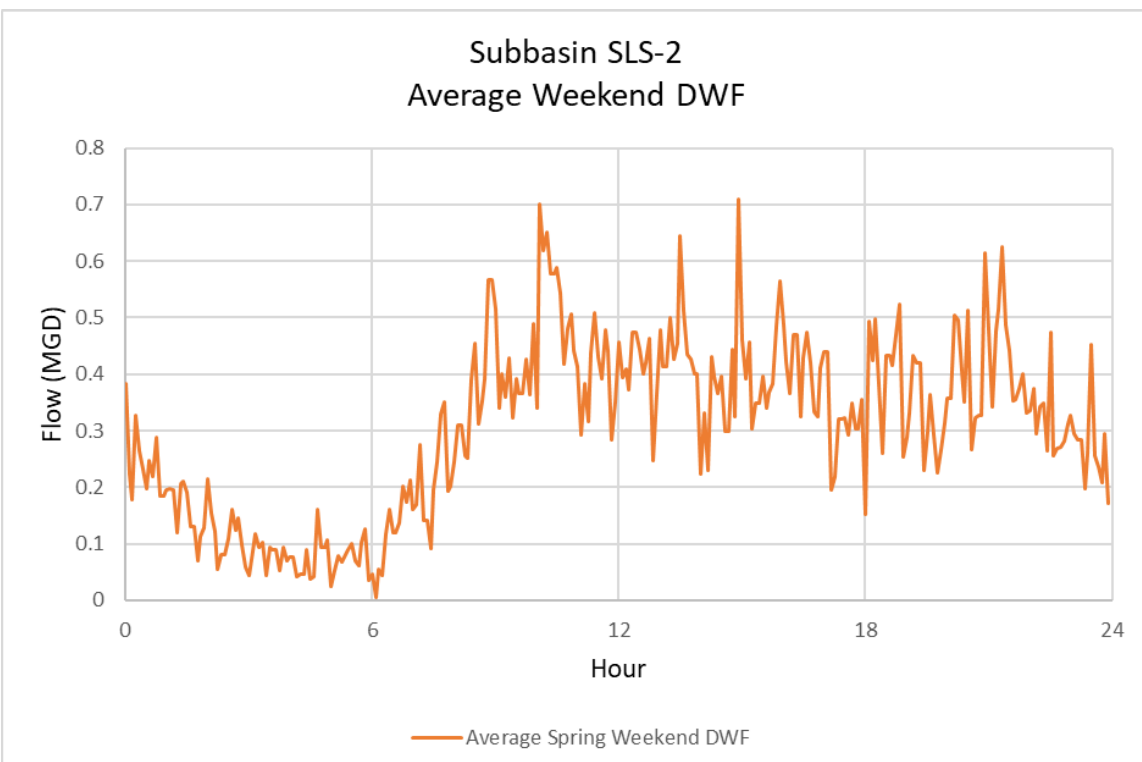


Figure F-28. Spring diurnal dry weather flow pattern for subbasin SLS-2 during the weekend.

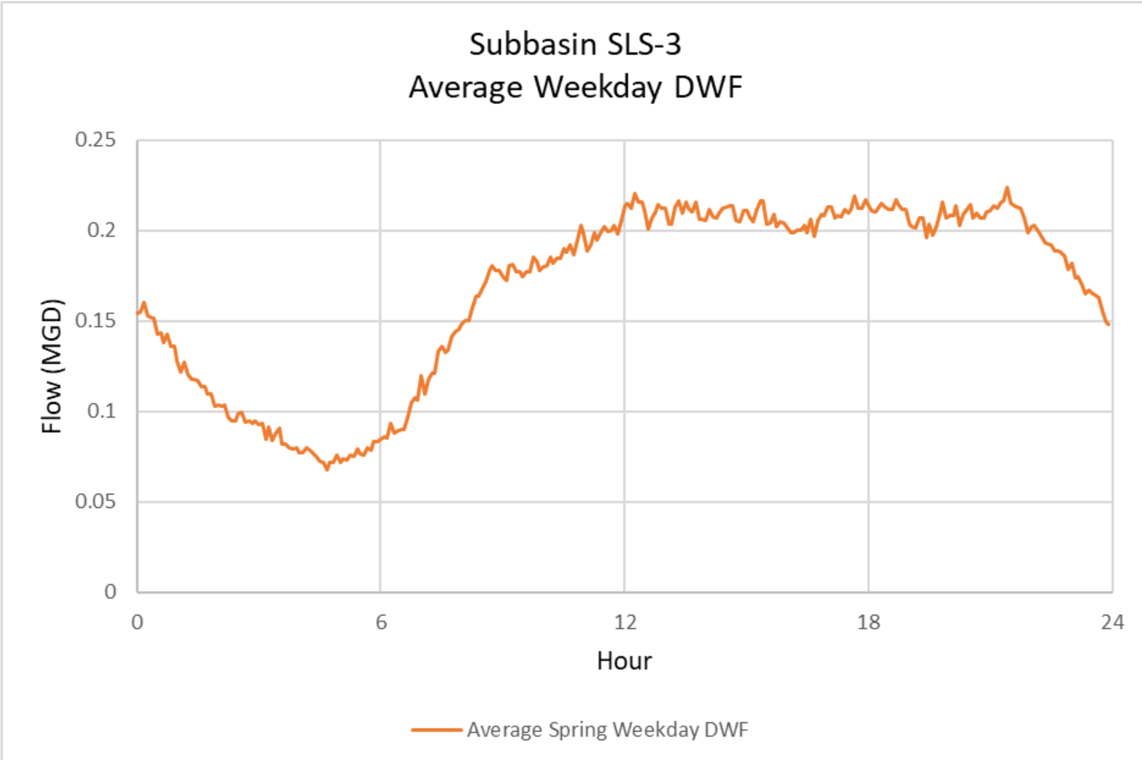


Figure F-29. Spring diurnal dry weather flow pattern for subbasin SLS-3 during the weekday.

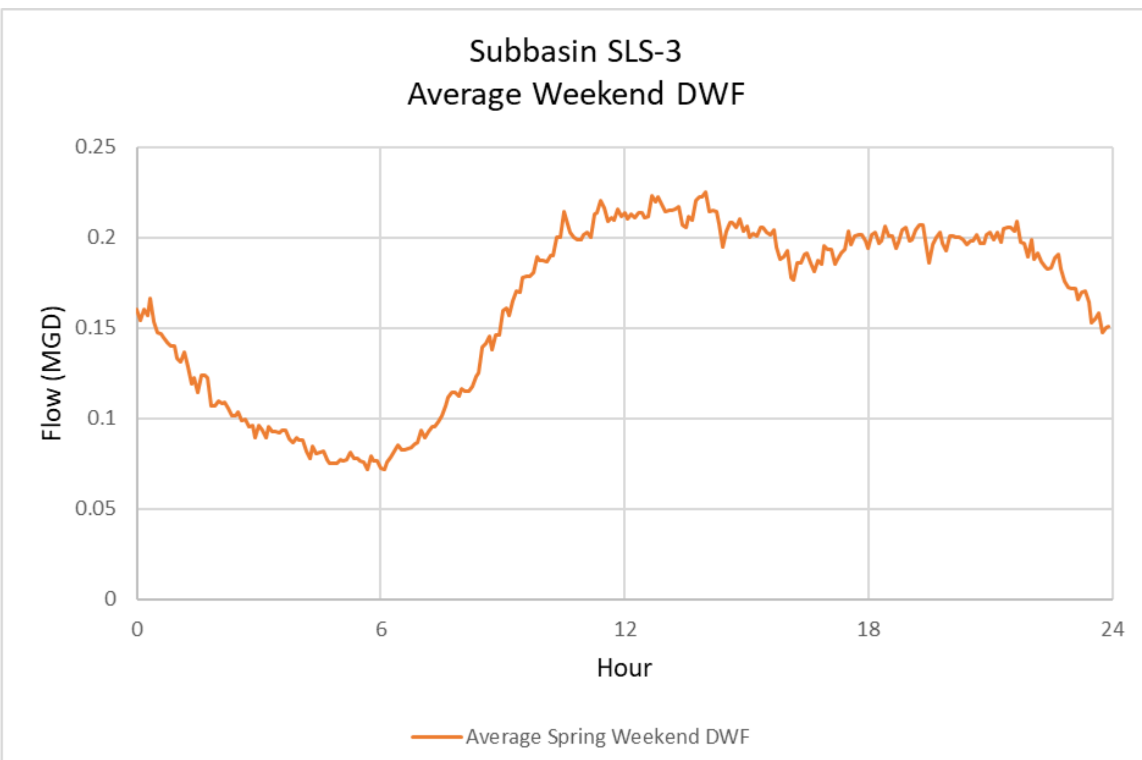


Figure F-30. Spring diurnal dry weather flow pattern for subbasin SLS-3 during the weekend.

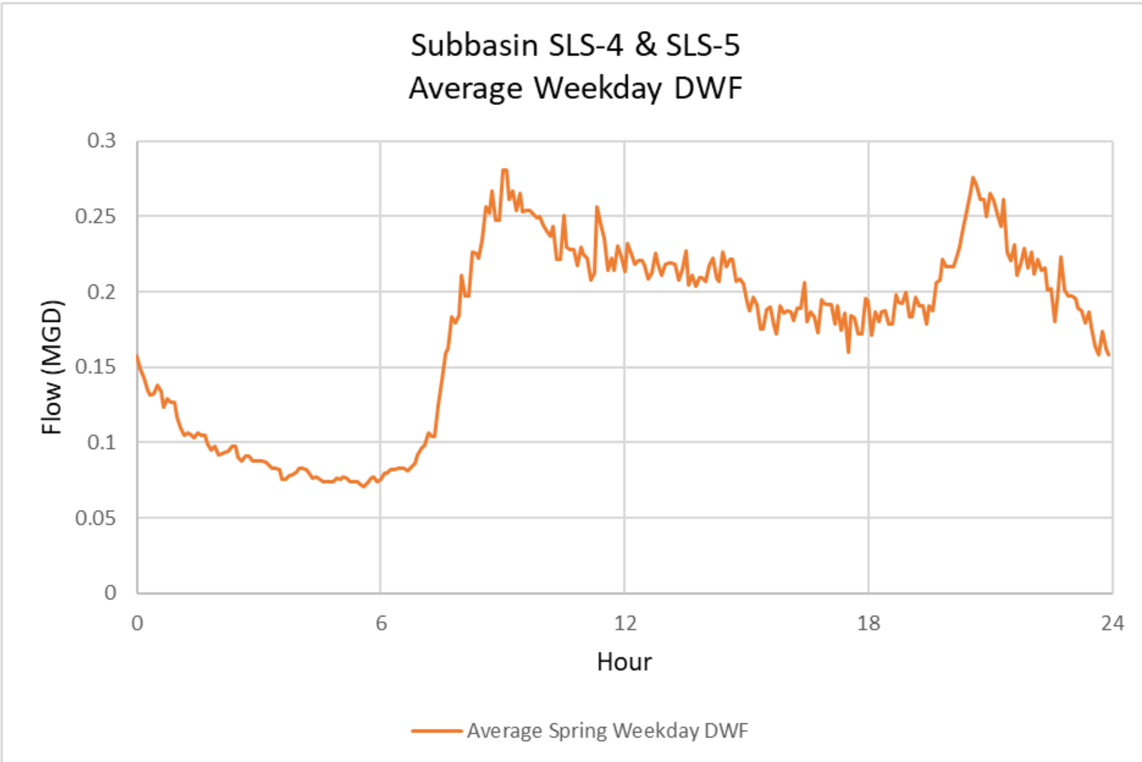


Figure F-31. Spring diurnal dry weather flow pattern for subbasin SLS-4 and SLS-5 during the weekday.

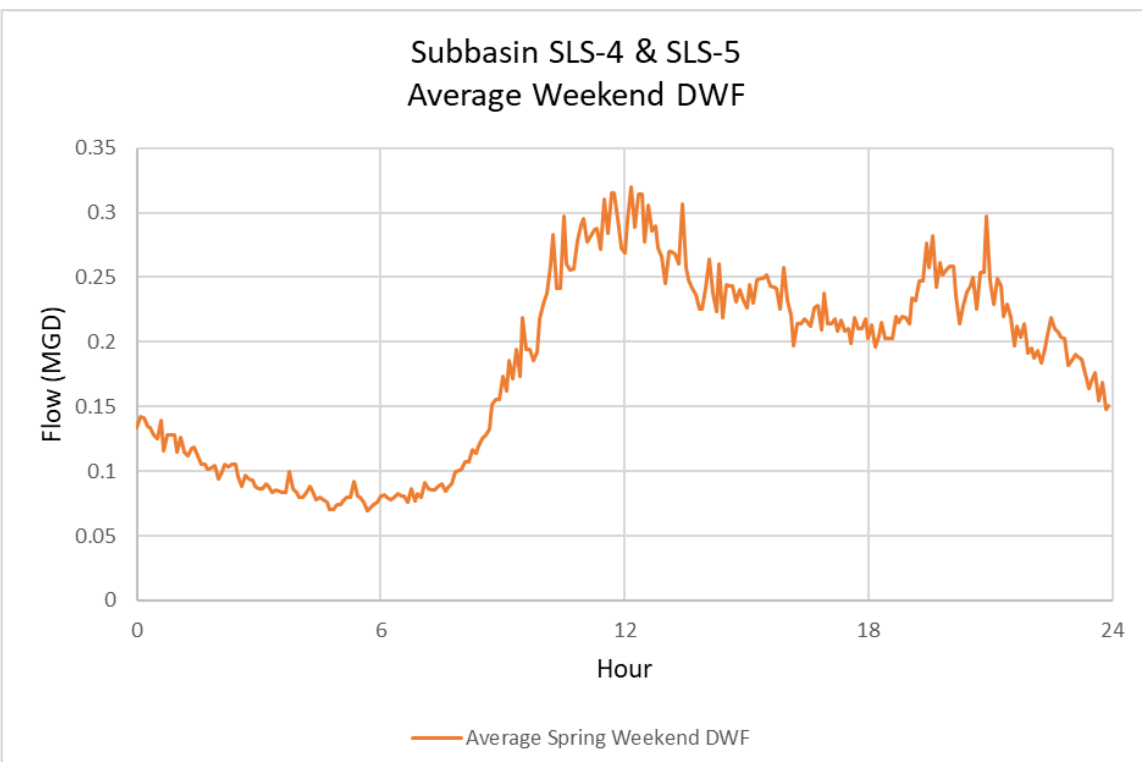


Figure F-32. Spring diurnal dry weather flow pattern for subbasin SLS-4 and SLS-5 during the weekend.

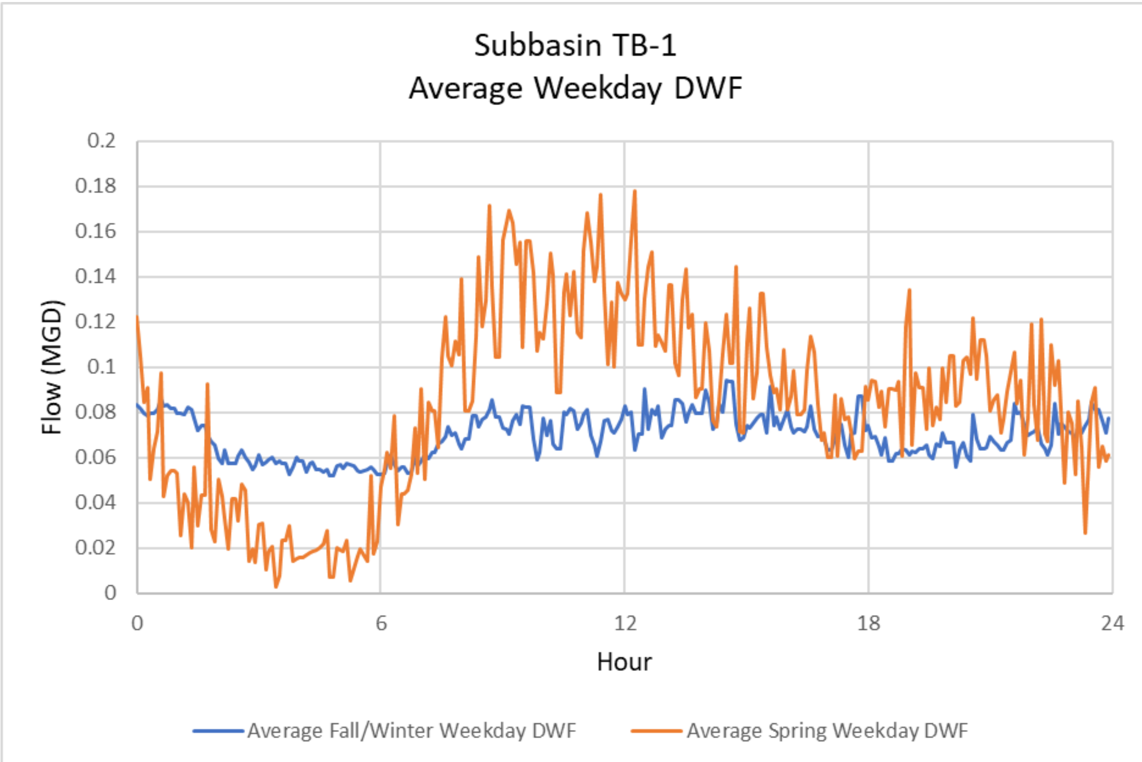


Figure F-33. Diurnal dry weather flow pattern for subbasin TB-1 during the weekday.

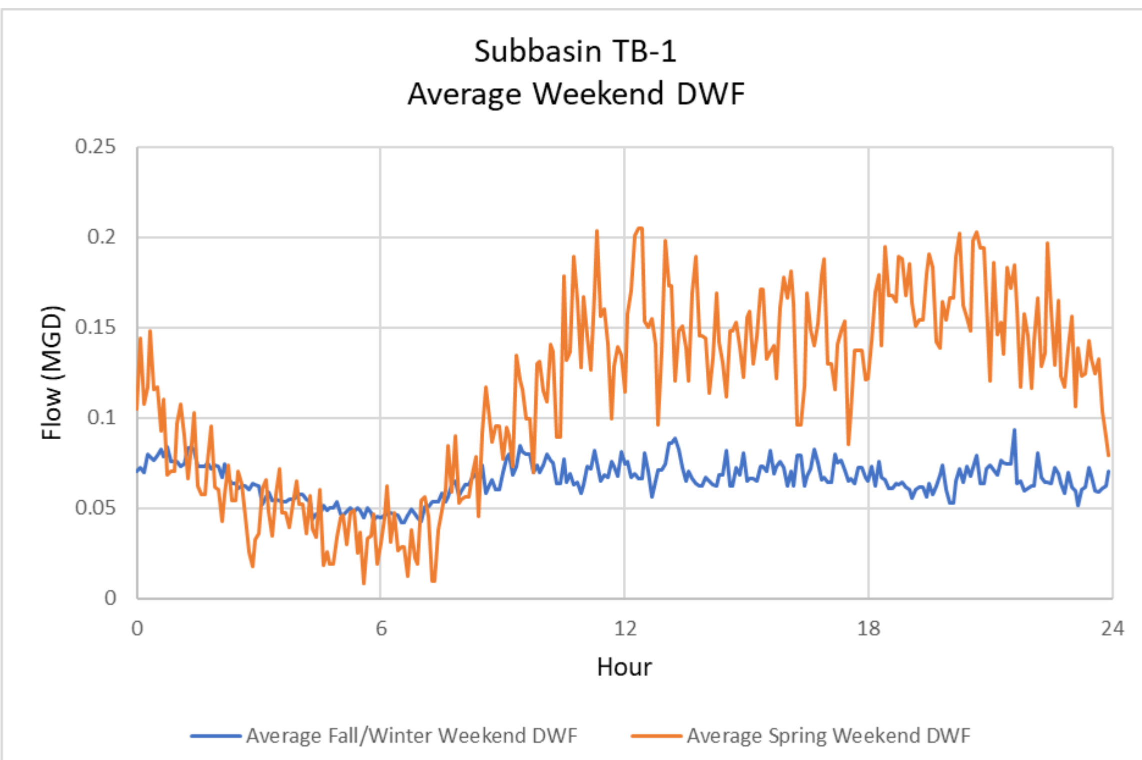


Figure F-34. Diurnal dry weather flow pattern for subbasin TB-1 during the weekend.

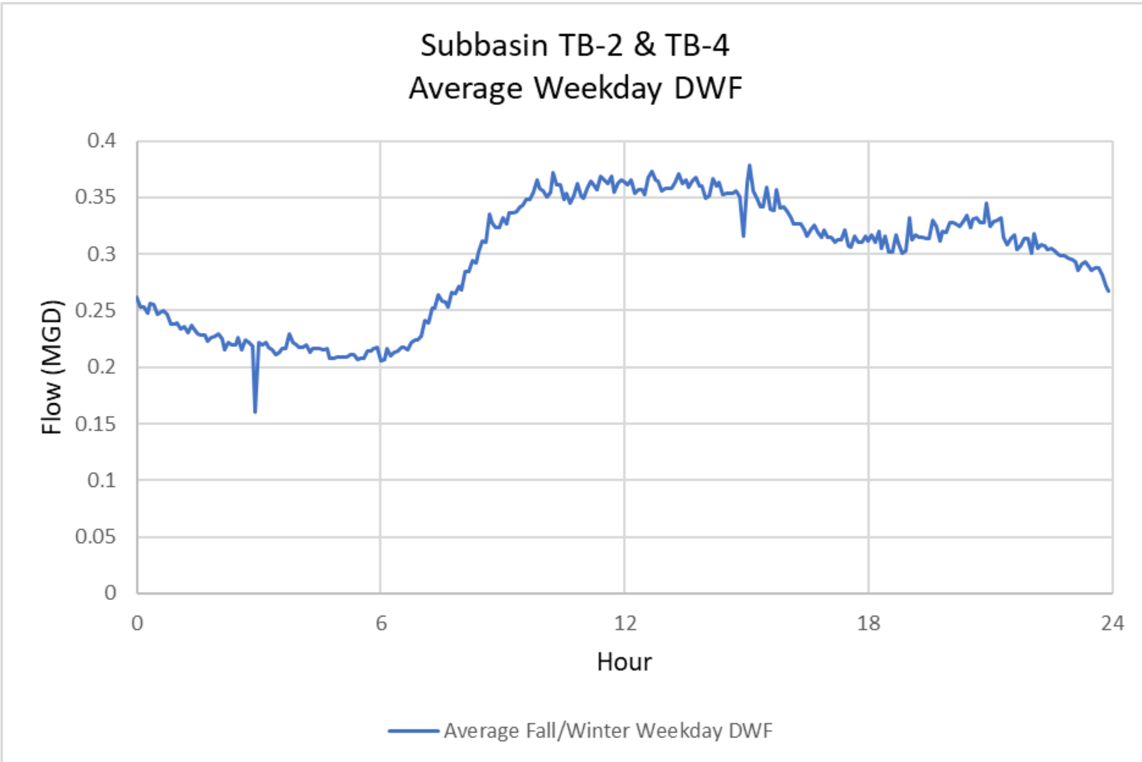


Figure F-35. Fall/winter diurnal dry weather flow pattern for subbasin TB-2 and TB-4 during the weekday.

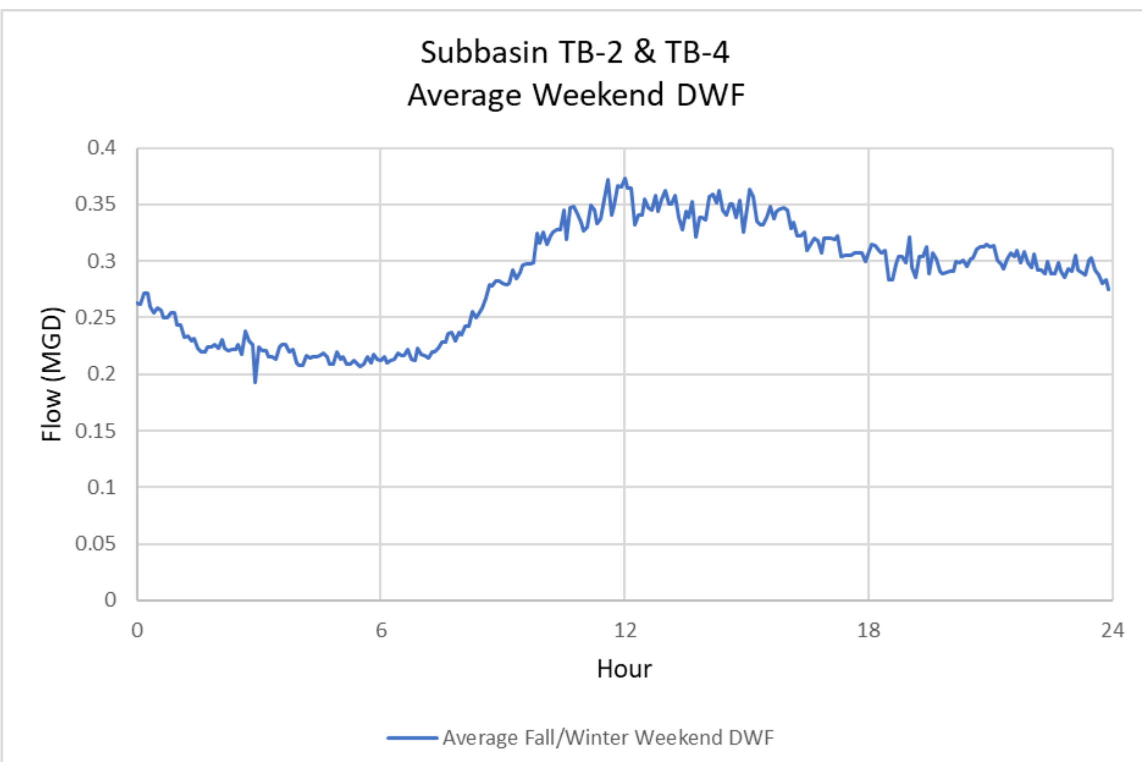


Figure F-36. Fall/winter diurnal dry weather flow pattern for subbasin TB-2 and TB-4 during the weekend.

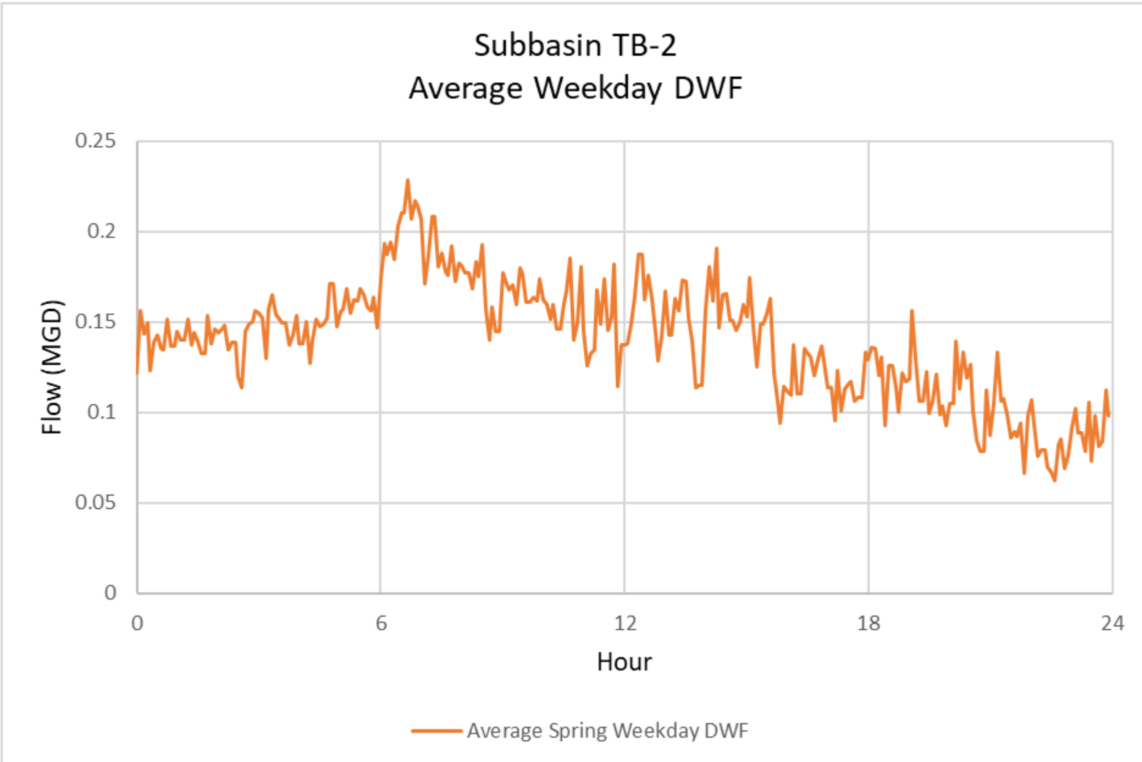


Figure F-37. Spring diurnal dry weather flow pattern for subbasin TB-2 during the weekday.

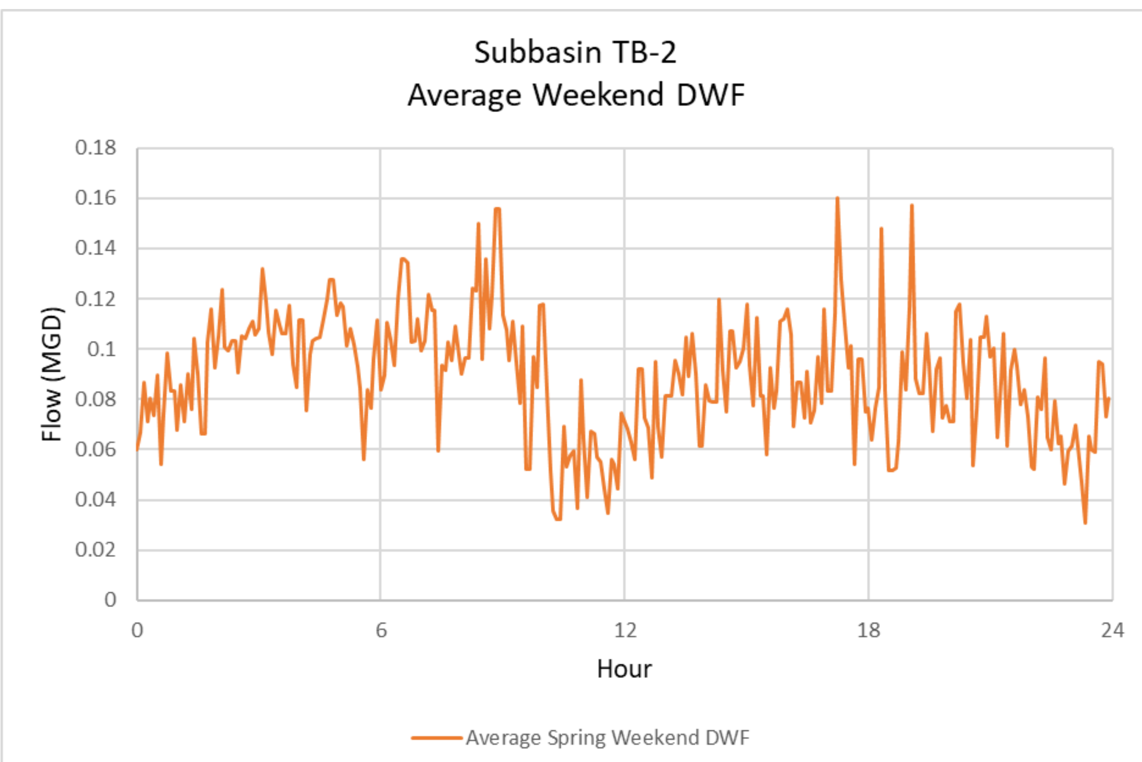


Figure F-38. Spring diurnal dry weather flow pattern for subbasin TB-2 during the weekend.

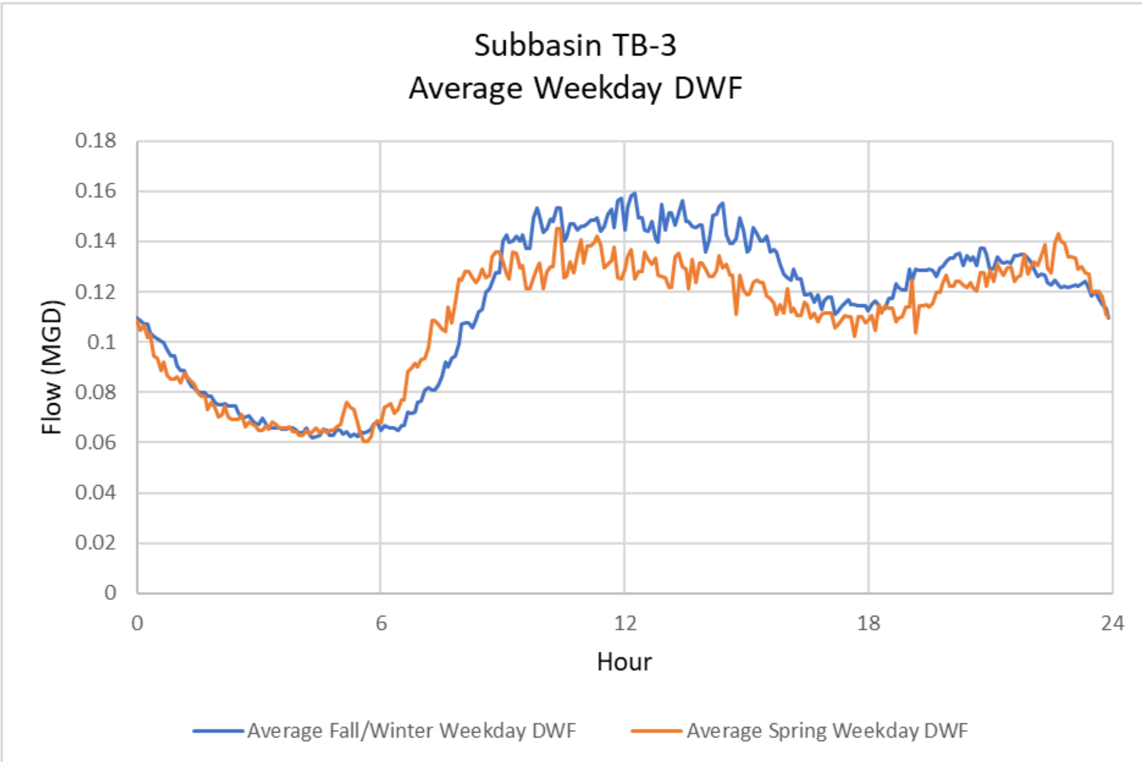


Figure F-39. Diurnal dry weather flow pattern for subbasin TB-3 during the weekday.

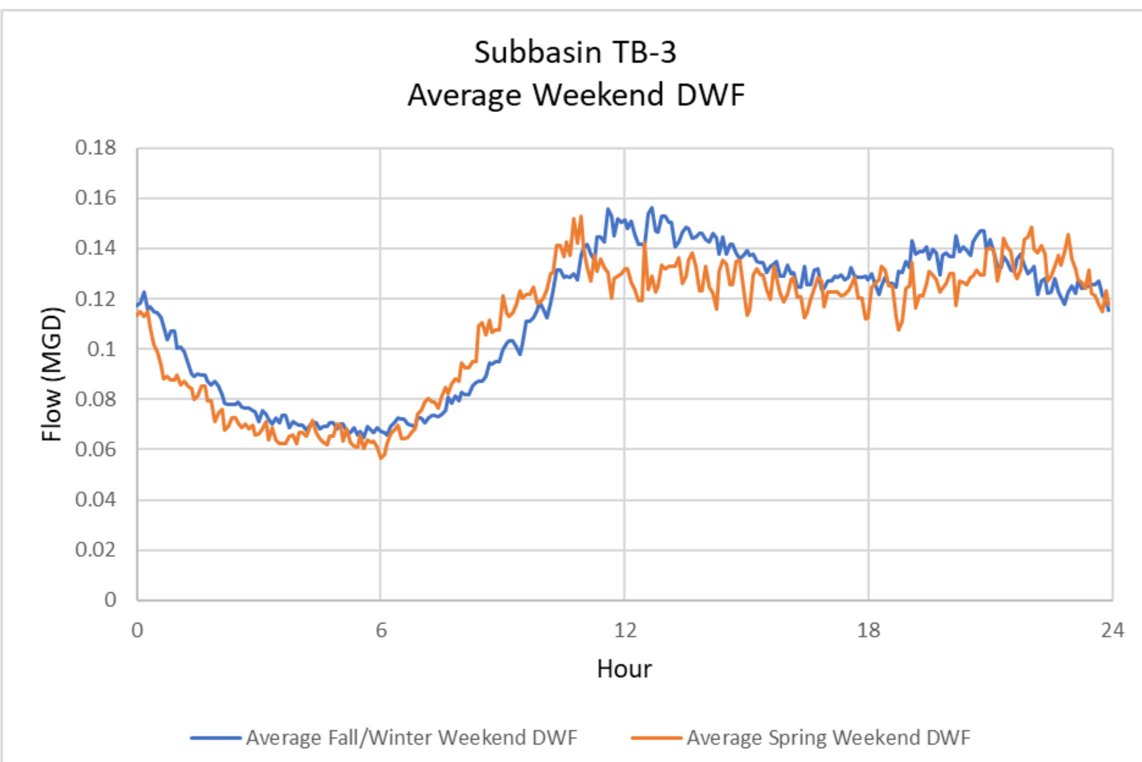


Figure F-40. Diurnal dry weather flow pattern for subbasin TB-3 during the weekend.

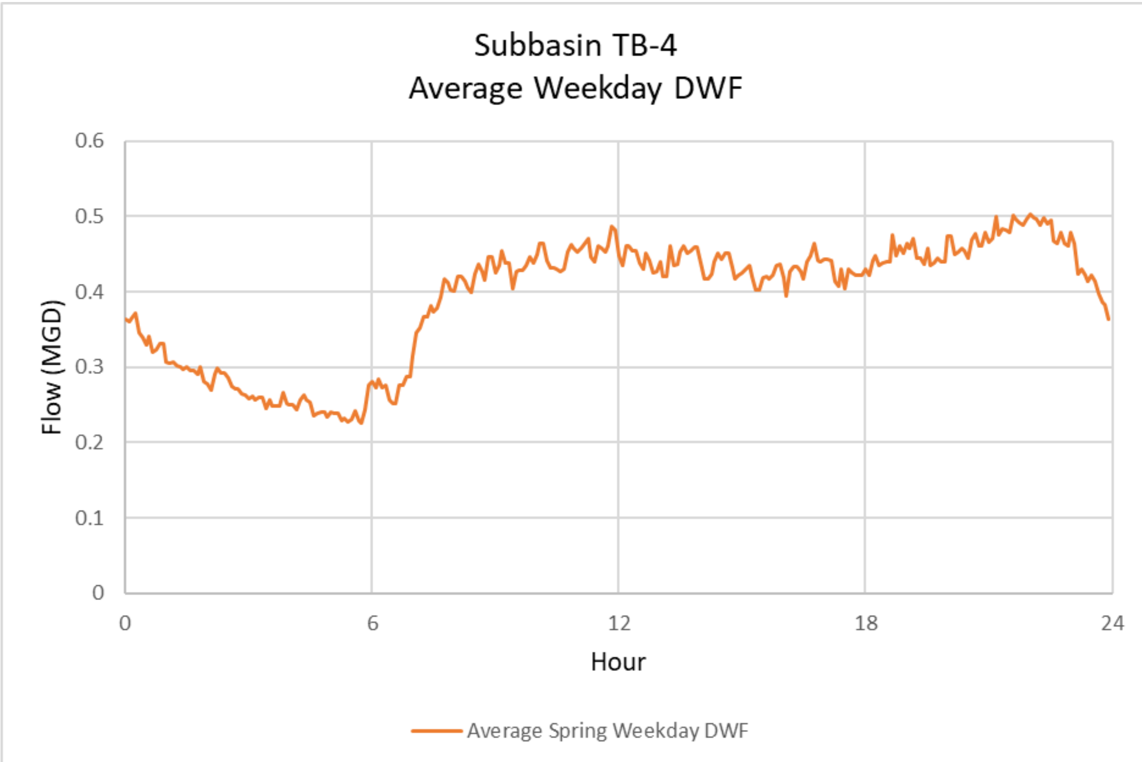


Figure F-41. Spring diurnal dry weather flow pattern for subbasin TB-4 during the weekday.

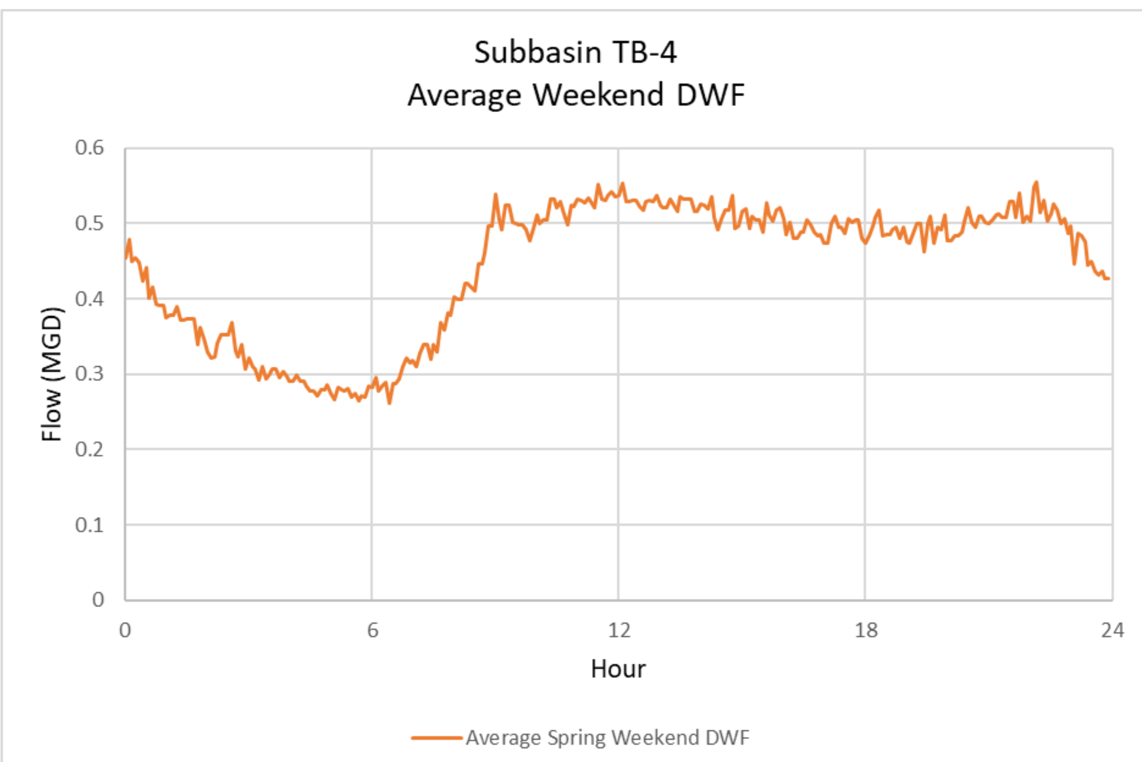


Figure F-42. Spring diurnal dry weather flow pattern for subbasin TB-4 during the weekend.

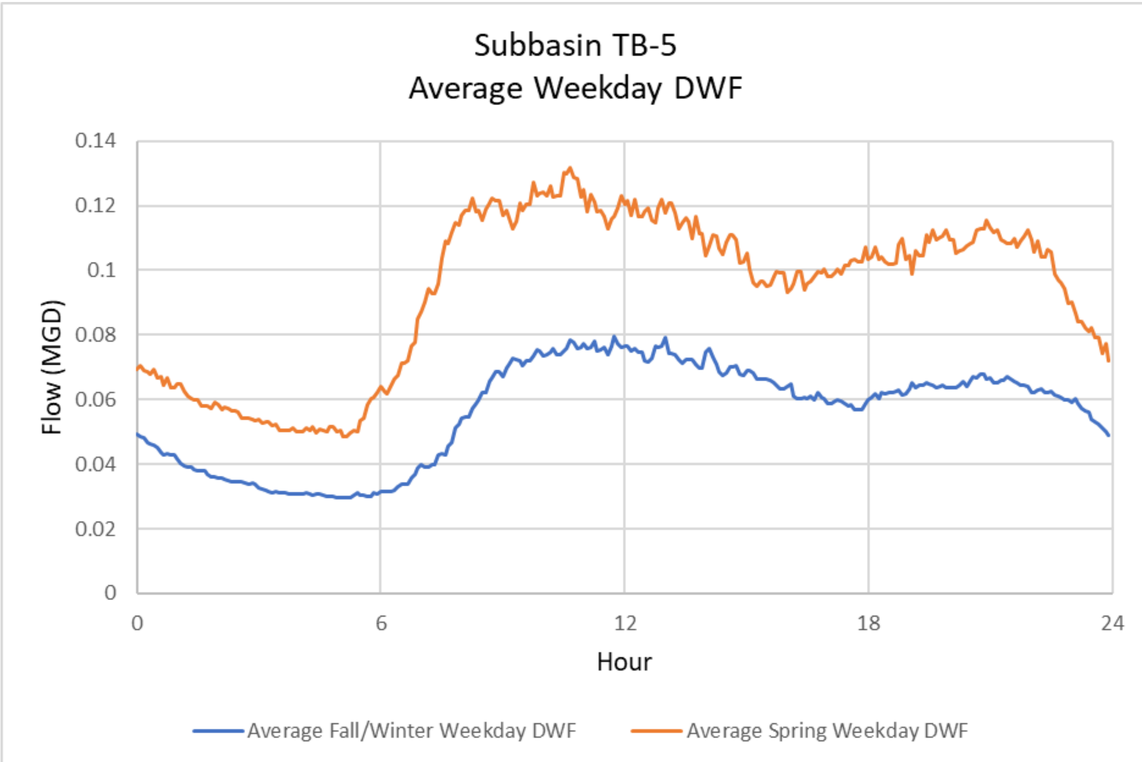


Figure F-43. Diurnal dry weather flow pattern for subbasin TB-5 during the weekday.

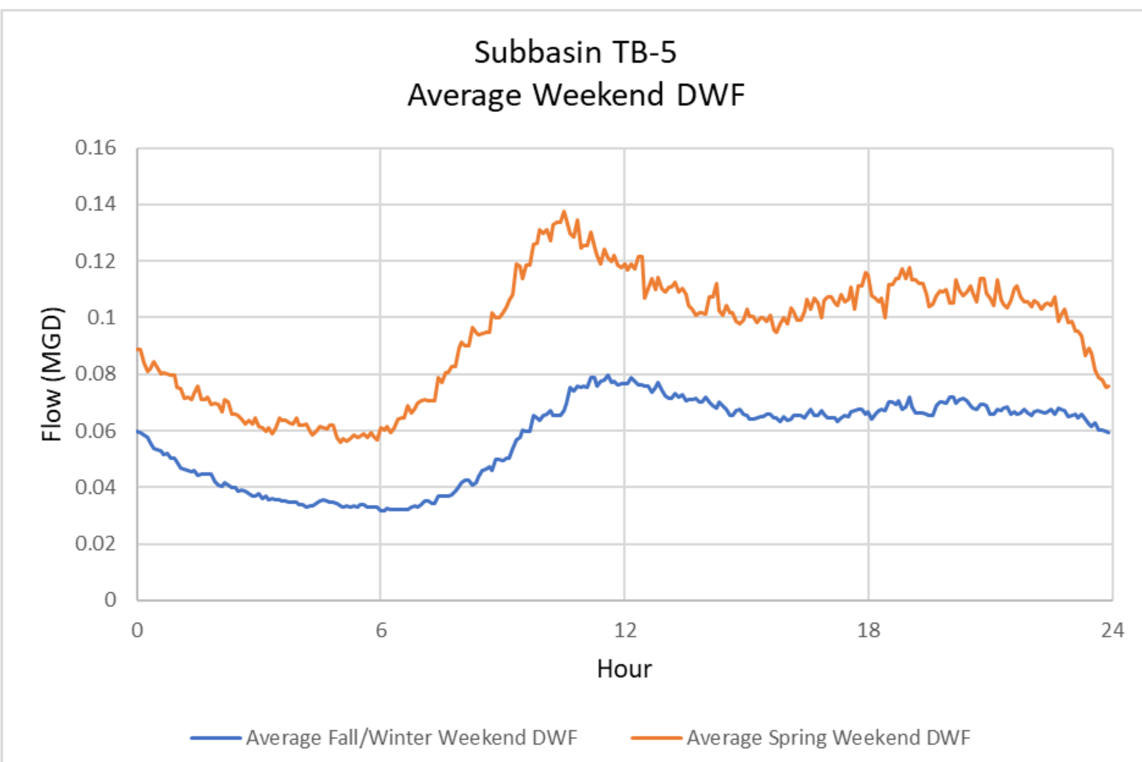


Figure F-44. Diurnal dry weather flow pattern for subbasin TB-5 during the weekend.

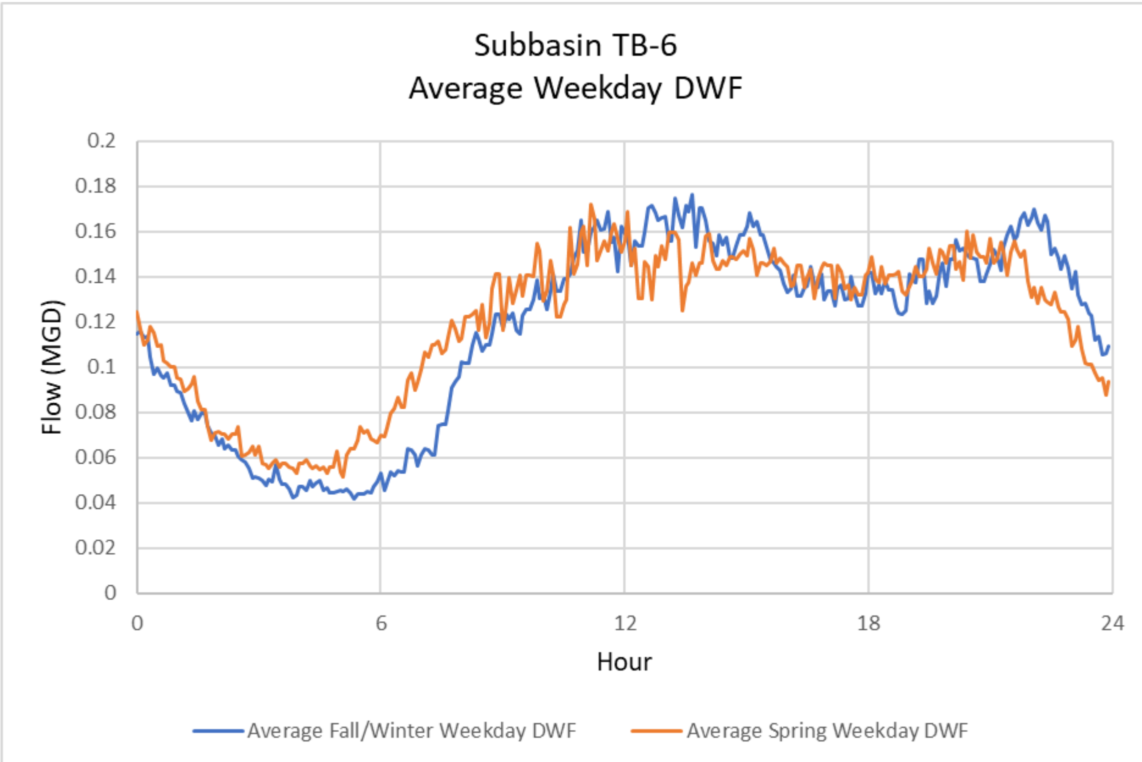


Figure F-45. Diurnal dry weather flow pattern for subbasin TB-6 during the weekday.

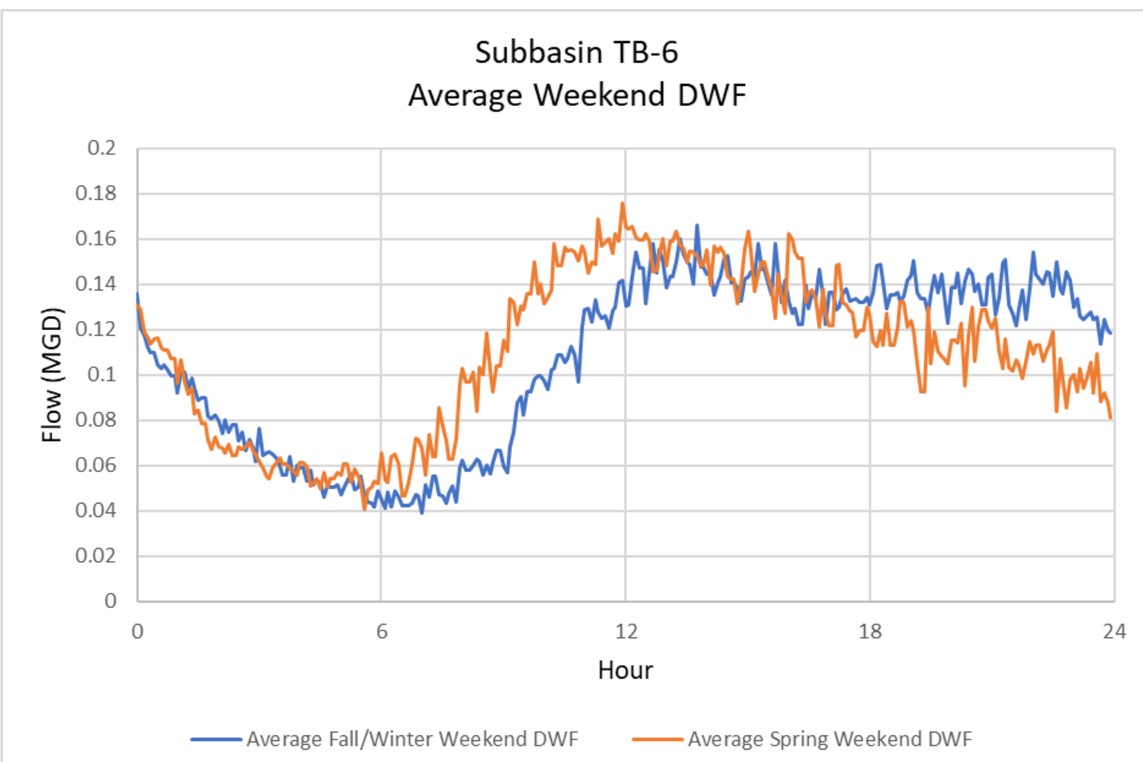


Figure F-46. Diurnal dry weather flow pattern for subbasin TB-6 during the weekend.

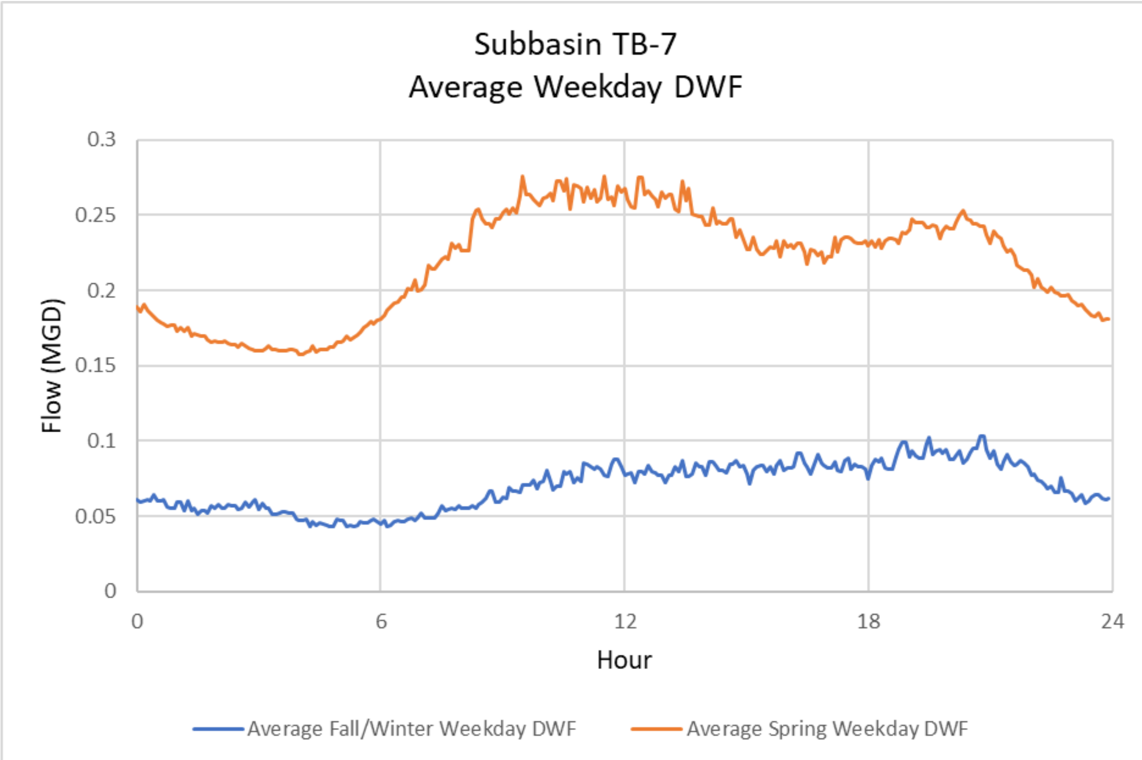


Figure F-47. Diurnal dry weather flow pattern for subbasin TB-7 during the weekday.

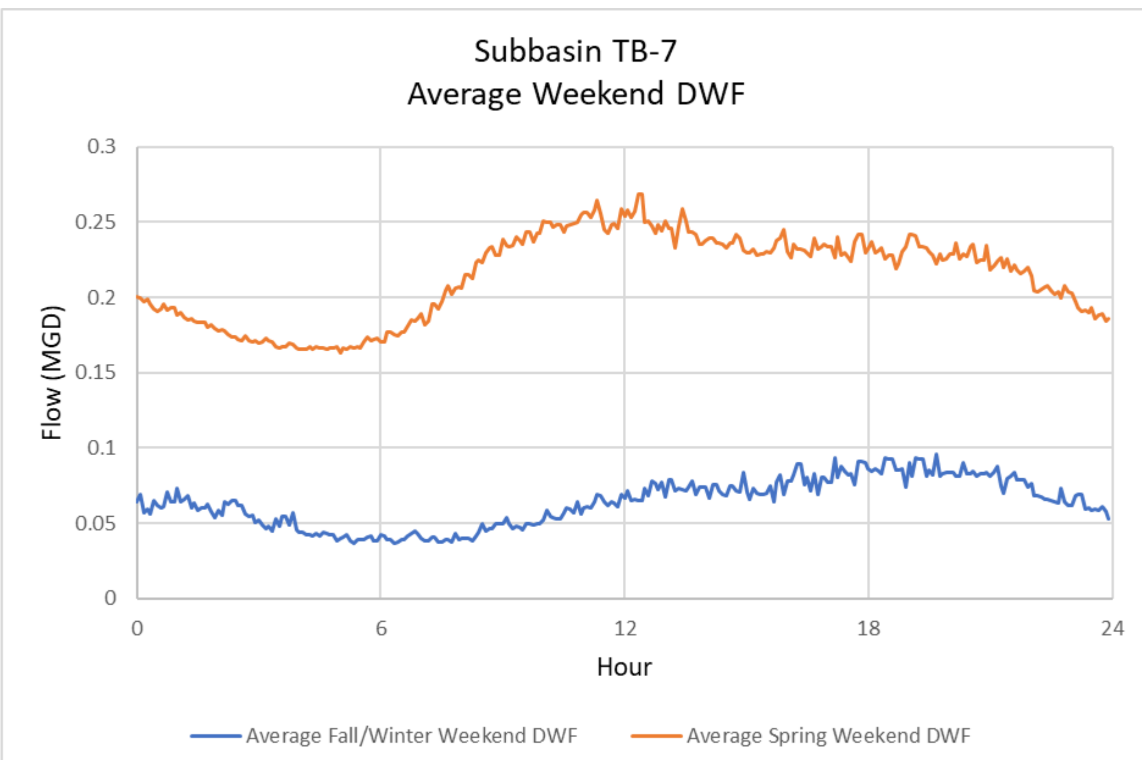


Figure F-48. Diurnal dry weather flow pattern for subbasin TB-7 during the weekend.

APPENDIX G

Rainfall-Derived Inflow/Infiltration Events Summary

Table G-1. Subbasin M-1 & M-3 RDII Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Fall/Winter Monitoring Period								
1	1/24/2021 23:20	1/30/2021 1:05	1.55	83.67	< 1 Year	121.75	1.36	1.02
Spring Monitoring Period								
1	5/27/2021 3:45	5/18/2021 0:25	0.69	14.5	< 1 Year	20.67	0.55	0.25

Table G-2. Subbasin M-4 Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Fall/Winter Monitoring Period								
1	1/24/2021 23:25	1/26/2021 14:30	1.77	8.50	< 1 Year	39.08	1.02	0.96
Spring Monitoring Period								
1	3/14/2021 14:10	3/16/2021 0:15	0.97	14.67	< 1 Year	34.08	1.16	1.03
2	4/28/2021 1:25	4/30/2021 17:40	4.14	31.33	2.6 Year	64.25	2.08	1.94
3	5/27/2021 16:15	5/29/2021 0:25	1.51	6.17	< 1 Year	32.17	1.19	1.08

Table G-3. Subbasin M-5 RDII Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Spring Monitoring Period								
1	5/27/2021 16:15	5/28/2021 23:05	1.37	6.17	< 1 Year	30.83	0.95	0.95

Table G-4. Subbasin M-6 RDII Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Fall/Winter Monitoring Period								
1	12/30/2020 1:15	12/31/2020 8:50	0.87	15.08	< 1 Year	31.58	0.65	0.44
2	12/31/2020 18:10	1/5/2021 11:55	1.36	44	< 1 Year	113.75	1.31	1.15
3	1/6/2021 8:10	1/11/2021 8:15	0.96	32.25	< 1 Year	120.08	0.67	0.38
4	1/25/2021 1:10	1/28/2021 9:15	1.77	59.25	< 1 Year	80.08	1.45	1.28
Spring Monitoring Period								
1	4/13/2021 22:20	4/15/2021 10:35	0.76	9.92	< 1 Year	36.25	0.65	0.42
2	4/23/2021 20:40	4/26/2021 22:40	1.05	12.75	< 1 Year	74.00	0.80	0.53
3	4/28/2021 1:55	5/1/2021 10:20	4.25	30.92	3 Year	80.42	5.32	4.96
4	5/21/2021 3:55	5/23/2021 16:55	0.81	29.83	< 1 Year	61.00	0.51	0.30
5	5/27/2021 16:20	5/30/2021 9:30	1.28	6.0	< 1 Year	65.17	0.94	0.71

Table G-5. Subbasin M-8 RDII Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Fall/Winter Monitoring Period								
1	10/26/2020 7:45	10/27/2020 22:15	2.72	28.42	< 1 Year	38.50	0.52	0.40
2	10/28/2020 7:45	10/30/2020 21:50	3.59	29.50	1.3 Year	62.08	0.69	0.55
3	1/24/2021 23:30	1/26/2021 19:40	1.74	8.33	< 1 Year	44.17	0.49	0.46
Spring Monitoring Period								
1	3/14/2021 14:15	3/16/2021 7:40	1.00	14.67	< 1 Year	41.42	0.46	0.32
2	4/28/2021 1:40	5/1/2021 1:10	3.93	31.00	1.9 Year	71.50	1.09	0.98
3	5/27/2021 16:05	5/29/2021 10:15	1.22	13.17	< 1 Year	42.17	0.62	0.41

Table G-6. Subbasin M-9 RDII Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Fall/Winter Monitoring Period								
1	11/24/2020 15:05	11/26/2020 19:40	1.01	18.33	< 1 Year	52.58	0.83	0.77
2	12/2/2020 13:40	12/4/2020 10:00	0.66	23.17	< 1 Year	44.33	0.82	0.75
3	12/31/2020 18:05	1/2/2021 4:30	1.33	27.67	< 1 Year	34.42	1.96	1.78
Spring Monitoring Period								
1	5/27/2021 16:15	5/29/2021 4:55	1.15	13.08	< 1 Year	36.67	1.98	1.81

Table G-7. Subbasin M-10 RDII Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Fall/Winter Monitoring Period								
1	11/21/2020 21:50	11/23/2020 19:25	0.63	5.58	< 1 Year	45.58	0.89	0.58
Spring Monitoring Period								
1	3/25/2021 0:50	3/27/2021 17:45	1.05	65.58	< 1 Year	64.92	1.04	0.59
2	5/3/2021 22:40	5/7/2021 6:15	0.86	16.50	< 1 Year	79.58	1.12	0.68
3	5/17/2021 4:00	5/18/2021 20:20	0.47	9.08	< 1 Year	40.33	0.86	0.50
4	5/27/2021 16:10	5/31/2021 1:10	1.14	13.00	< 1 Year	81.00	1.37	0.99

Table G-8. Subbasin M-11 RDII Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Fall/Winter Monitoring Period								
1	10/28/2020 7:55	10/31/2020 22:00	3.62	29.25	1.3 Year	86.08	0.79	0.49
2	11/24/2020 22:40	11/26/2020 19:35	0.64	8.67	< 1 Year	44.92	0.53	0.25
3	12/31/2020 18:40	1/2/2021 11:55	1.38	15.58	< 1 Year	41.25	0.52	0.44
Spring Monitoring Period								
1	3/14/2021 14:15	3/15/2021 18:30	1.05	5.17	< 1 Year	28.58	0.68	0.38
2	4/28/2021 1:50	4/30/2021 16:30	3.85	28.08	1.9 Year	62.67	1.60	1.33

Table G-9. Subbasin M-12 RDII Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Fall/Winter Monitoring Period								
1	12/2/2020 14:00	12/4/2020 6:45	0.63	14.75	< 1 Year	40.75	0.98	0.88
2	12/30/2020 1:20	12/31/2020 8:40	0.79	14.92	< 1 Year	31.33	1.48	1.39
3	12/31/2020 18:15	1/2/2021 7:35	1.18	27.17	< 1 Year	37.33	3.17	3.08
4	1/6/2021 12:15	1/8/2021 20:10	1.08	28.33	< 1 Year	55.92	1.23	1.08
Spring Monitoring Period								
1	4/13/2021 22:35	4/15/2021 0:25	0.81	8.17	< 1 Year	25.83	1.01	1.00
2	5/17/2021 4:00	5/18/2021 0:10	0.60	9.08	< 1 Year	20.17	1.63	1.48
3	5/21/2021 4:10	5/22/2021 22:10	0.84	29.50	< 1 Year	42.00	1.28	1.14
4	5/27/2021 17:25	5/28/2021 21:20	1.15	11.92	< 1 Year	27.92	2.58	2.44
5	6/7/2021 12:10	6/8/2021 8:15	0.46	1.42	< 1 Year	20.08	1.04	0.93

Table G-10. Subbasin S-1, S-2, & S-3 RDII Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Fall/Winter Monitoring Period								
1	11/24/2020 15:15	11/25/2020 20:10	0.99	19.25	< 1 Year	28.92	0.72	0.53
2	12/31/2020 18:25	1/2/2021 8:15	1.12	15.67	< 1 Year	37.83	0.84	0.64
3	1/25/2021 0:30	1/26/2021 13:05	1.55	13.33	< 1 Year	36.58	1.30	0.98
Spring Monitoring Period								
1	4/28/2021 1:50	4/30/2021 21:00	5.64	28.83	12 Year	67.17	2.24	1.78
2	5/27/2021 16:20	5/29/2021 23:20	1.24	9.33	< 1 Year	55.00	0.92	0.49

Table G-11. Subbasin SLS-1 & SLS-3 Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Fall/Winter Monitoring Period								
1	11/24/2020 15:10	11/26/2020 11:55	0.95	17.83	< 1 Year	44.75	1.24	0.76
2	12/31/2020 18:10	1/3/2021 13:15	1.14	42.75	< 1 Year	67.08	0.96	0.48

Table G-12. Subbasin SLS-1 Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Spring Monitoring Period								
1	5/31/2021 20:05	6/2/2021 18:55	1.07	35.75	< 1 Year	46.83	1.15	0.80

Table G-13. Subbasin SLS-3 Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Spring Monitoring Period								
1	4/28/2021 2:10	5/1/2021 17:50	5.83	23.50	20 Year	87.67	0.78	0.61
2	5/27/2021 17:25	5/29/2021 9:10	1.21	11.92	< 1 Year	39.75	0.38	0.15

Table G-14. Subbasin SLS-2, SLS-4, & SLS-5 Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Fall/Winter Monitoring Period								
1	12/31/2020 20:55	1/3/2021 10:15	1.00	40.92	< 1 Year	61.33	1.74	1.62
2	1/25/2021 0:40	1/28/2021 5:20	1.35	52.67	< 1 Year	76.67	1.86	1.55

Table G-15. Subbasin SLS-4 & SLS-5 Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Spring Monitoring Period								
1	5/27/2021 17:30	5/28/2021 5:55	1.10	4.42	< 1 Year	12.42	3.17	2.98

Table G-16. Subbasin TB-1 Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Spring Monitoring Period								
1	4/9/2021 21:25	4/10/2021 8:05	0.69	1.50	< 1 Year	10.67	0.39	0.37

Table G-17. Subbasin TB-2 & TB-4 Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Fall/Winter Monitoring Period								
1	10/23/2020 6:30	10/24/2020 23:25	0.43	1.42	< 1 Year	40.92	2.73	1.60
2	11/24/2020 15:10	11/26/2020 14:25	1.09	19.33	< 1 Year	47.25	3.10	2.42
3	1/25/2021 0:25	1/26/2021 22:50	1.53	7.33	< 1 Year	46.42	6.97	6.38

Table G-18. Subbasin TB-2 Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Spring Monitoring Period								
1	5/27/2021 16:25	5/28/2021 23:25	1.64	5.50	< 1 Year	31.00	2.92	3.21

Table G-19. Subbasin TB-3 Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Fall/Winter Monitoring Period								
1	11/24/2020 15:10	11/26/2020 17:25	1.02	19.42	< 1 Year	50.25	1.05	0.95
2	12/31/2020 18:05	1/3/2021 18:00	1.34	44.00	< 1 Year	71.92	1.24	1.16
Spring Monitoring Period								
1	5/27/2021 16:20	5/29/2021 10:00	1.21	6.00	< 1 Year	41.67	1.07	0.94

Table G-20. Subbasin TB-5 Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Fall/Winter Monitoring Period								
1	10/28/2020 5:25	10/30/2020 21:50	1.88	29.42	< 1 Year	64.42	1.00	0.91
2	11/14/2020 20:55	11/15/2020 18:40	0.34	2.08	< 1 Year	21.75	0.41	0.35
3	11/24/2020 15:45	11/26/2020 15:50	0.50	17.58	< 1 Year	48.08	0.64	0.59
4	12/30/2020 1:15	12/31/2020 8:15	0.48	15.00	< 1 Year	31.00	0.38	0.36
5	12/31/2020 18:35	1/2/2021 11:25	0.75	27.00	< 1 Year	40.83	0.94	0.91
Spring Monitoring Period								
1	4/13/2021 22:45	4/15/2021 23:40	0.78	7.92	< 1 Year	48.92	0.54	0.51
2	5/3/2021 22:50	5/6/2021 6:50	0.85	16.17	< 1 Year	56.00	0.78	0.67
3	5/27/2021 16:20	5/29/2021 3:35	1.14	5.58	< 1 Year	35.25	1.07	0.95

Table G-21. Subbasin TB-6 Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Fall/Winter Monitoring Period								
1	11/14/2020 9:40	11/17/2020 0:55	0.80	13.33	< 1 Year	63.25	0.84	0.74
2	11/24/2020 15:10	11/27/2020 8:10	0.97	18.33	< 1 Year	65.00	1.38	1.35
3	12/31/2020 18:15	1/4/2021 10:55	1.17	43.92	< 1 Year	88.67	1.80	1.63
4	1/25/2021 0:30	1/27/2021 13:35	1.66	59.92	< 1 Year	61.08	1.81	1.73
Spring Monitoring Period								
1	5/21/2021 3:50	5/24/2021 11:00	0.80	29.42	< 1 Year	79.17	0.70	0.56
2	5/27/2021 16:05	5/31/2021 9:50	1.11	9.42	< 1 Year	65.75	0.95	0.88

Table G-22. Subbasin TB-7 Event Statistics

Event	Start Date	End Date	Rainfall Amount (in)	Rainfall Duration (hrs)	Approximate Average Recurrence Interval (yr)	RDII Duration (hrs)	Peak Total Flow (mgd)	Peak I/I Flow (mgd)
Fall/Winter Monitoring Period								
1	12/31/2020 18:10	1/3/2021 23:05	1.08	43.92	< 1 Year	76.92	1.05	0.92
2	1/25/2021 0:35	1/27/2021 3:05	1.50	13.17	< 1 Year	50.50	1.21	1.16
Spring Monitoring Period								
1	4/23/2021 20:30	4/27/2021 0:00	0.87	13.08	< 1 Year	75.50	0.63	0.41
2	4/28/2021 3:00	5/2/2021 0:25	5.80	27.92	15 Year	93.42	2.70	2.44
3	5/27/2021 17:15	5/30/2021 0:50	1.08	8.25	< 1 Year	55.58	1.01	0.75

APPENDIX H

Statistical Rainfall-Derived Inflow/Infiltration Analysis

(Flow Monitoring Period September 2020 - June 2021)

Statistical RDII Analysis

Flow Meter M1 & M3 (Fall/Winter)

Number of Events:	1
Median Total-R Value:	2.5%
Average Total-R Value:	2.5%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	0.0%	15.3%	84.7%
T-Value Distribution (actual value):	1.0	4.0	10.0
K-Value Distribution (actual value):	2.0	3.0	10.0

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.0%	0.4%	2.1%
Using Average R-Value Method:	0.0%	0.4%	2.1%

Flow Meter M1 & M3 (Spring)

Number of Events:	1
Median Total-R Value:	0.6%
Average Total-R Value:	0.6%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	0.0%	0.00%	100.0%
T-Value Distribution (actual value):	0.0	0.0	6.0
K-Value Distribution (actual value):	0.0	0.0	6.5

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.0%	0.0%	0.6%
Using Average R-Value Method:	0.0%	0.0%	0.6%

Flow Meter M4 (Fall/Winter)

Number of Events:	1
Median Total-R Value:	2.3%
Average Total-R Value:	2.3%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	11.9%	52.9%	35.2%
T-Value Distribution (actual value):	0.6	2.0	7.0
K-Value Distribution (actual value):	2.0	2.0	3.6

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.3%	1.2%	0.8%
Using Average R-Value Method:	0.3%	1.2%	0.8%

Flow Meter M4 (Spring)

Number of Events:	3
Median Total-R Value:	4.1%
Average Total-R Value:	4.0%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	30.3%	23.8%	45.9%
T-Value Distribution (actual value):	1.8	3.4	6.7
K-Value Distribution (actual value):	2.0	2.3	4.3

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	1.2%	1.0%	1.9%
Using Average R-Value Method:	1.2%	0.9%	1.8%

Flow Meter M5 (Spring)

Number of Events:	1
Median Total-R Value:	12.5%
Average Total-R Value:	12.5%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	16.8%	0.0%	83.2%
T-Value Distribution (actual value):	1.1	3.0	7.5
K-Value Distribution (actual value):	1.0	3.0	2.8

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	2.1%	0.0%	10.4%
Using Average R-Value Method:	2.1%	0.0%	10.4%

Flow Meter M6 (Fall/Winter)

Number of Events:	4
Median Total-R Value:	4.9%
Average Total-R Value:	4.8%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	11.1%	15.5%	73.4%
T-Value Distribution (actual value):	1.0	3.1	9.6
K-Value Distribution (actual value):	2.0	3.0	8.5

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.5%	0.8%	3.6%
Using Average R-Value Method:	0.5%	0.7%	3.5%

Flow Meter M6 (Spring)

Number of Events:	5
Median Total-R Value:	3.0%
Average Total-R Value:	3.0%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	15.3%	24.1%	60.6%
T-Value Distribution (actual value):	0.9	3.2	8.4
K-Value Distribution (actual value):	1.9	3.5	5.2

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.5%	0.7%	1.8%
Using Average R-Value Method:	0.5%	0.7%	1.8%

Flow Meter M8 (Fall/Winter)

Number of Events:	3
Median Total-R Value:	0.7%
Average Total-R Value:	0.7%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	9.6%	21.1%	69.3%
T-Value Distribution (actual value):	0.8	3.7	6.3
K-Value Distribution (actual value):	1.0	3.0	3.3

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.1%	0.1%	0.5%
Using Average R-Value Method:	0.1%	0.1%	0.5%

Flow Meter M8 (Spring)

Number of Events:	3
Median Total-R Value:	1.3%
Average Total-R Value:	1.3%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	14.9%	12.9%	72.2%
T-Value Distribution (actual value):	0.7	3.7	7.7
K-Value Distribution (actual value):	2.0	2.3	5.2

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.2%	0.2%	1.0%
Using Average R-Value Method:	0.2%	0.2%	0.9%

Flow Meter M9 (Fall/Winter)

Number of Events:	3
Median Total-R Value:	3.4%
Average Total-R Value:	3.2%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	19.1%	34.0%	46.9%
T-Value Distribution (actual value):	1.9	4.7	8.4
K-Value Distribution (actual value):	2.0	2.2	3.3

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.6%	1.1%	1.6%
Using Average R-Value Method:	0.6%	1.1%	1.6%

Flow Meter M9 (Spring)

Number of Events:	1
Median Total-R Value:	2.8%
Average Total-R Value:	2.8%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	42.9%	3.6%	53.6%
T-Value Distribution (actual value):	0.7	3.0	7.0
K-Value Distribution (actual value):	1.0	2.0	4.0

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	1.2%	0.1%	1.5%
Using Average R-Value Method:	1.2%	0.1%	1.5%

Flow Meter M10 (Fall/Winter)

Number of Events:	1
Median Total-R Value:	4.9%
Average Total-R Value:	4.9%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	12.9%	12.9%	74.3%
T-Value Distribution (actual value):	2.0	4.0	10.0
K-Value Distribution (actual value):	1.5	2.0	3.4

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.6%	0.6%	3.6%
Using Average R-Value Method:	0.6%	0.6%	3.6%

Flow Meter M10 (Spring)

Number of Events:	4
Median Total-R Value:	5.1%
Average Total-R Value:	5.1%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	0.0%	7.1%	92.9%
T-Value Distribution (actual value):	0.3	1.3	8.5
K-Value Distribution (actual value):	0.5	0.5	5.9

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.0%	0.4%	4.8%
Using Average R-Value Method:	0.0%	0.4%	4.7%

Flow Meter M11 (Fall/Winter)

Number of Events:	3
Median Total-R Value:	1.3%
Average Total-R Value:	1.6%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	20.6%	20.0%	59.4%
T-Value Distribution (actual value):	1.0	3.0	10.0
K-Value Distribution (actual value):	2.0	2.0	5.0

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.3%	0.3%	0.8%
Using Average R-Value Method:	0.3%	0.3%	0.8%

Flow Meter M11 (Spring)

Number of Events:	2
Median Total-R Value:	1.7%
Average Total-R Value:	1.7%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	23.1%	12.8%	64.1%
T-Value Distribution (actual value):	0.9	4.0	6.5
K-Value Distribution (actual value):	1.0	2.0	5.0

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.4%	0.2%	1.1%
Using Average R-Value Method:	0.4%	0.2%	1.1%

Flow Meter M12 (Fall/Winter)

Number of Events:	4
Median Total-R Value:	12.6%
Average Total-R Value:	14.2%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	18.7%	31.0%	50.3%
T-Value Distribution (actual value):	1.4	3.4	6.4
K-Value Distribution (actual value):	1.5	2.5	4.0

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	2.4%	3.9%	6.4%
Using Average R-Value Method:	2.7%	4.4%	7.2%

Flow Meter M12 (Spring)

Number of Events:	6
Median Total-R Value:	7.5%
Average Total-R Value:	6.5%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	28.1%	29.5%	25.7%
T-Value Distribution (actual value):	0.9	2.3	4.2
K-Value Distribution (actual value):	1.1	1.9	2.6

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	2.1%	2.2%	1.9%
Using Average R-Value Method:	1.8%	1.9%	1.7%

Flow Meter S1, S2, & S3 (Fall/Winter)

Number of Events:	3
Median Total-R Value:	0.4%
Average Total-R Value:	0.4%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	25.1%	18.6%	56.3%
T-Value Distribution (actual value):	1.7	3.2	8.0
K-Value Distribution (actual value):	2.0	2.0	3.0

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.1%	0.1%	0.2%
Using Average R-Value Method:	0.1%	0.1%	0.2%

Flow Meter S1, S2, & S3 (Spring)

Number of Events:	2
Median Total-R Value:	0.4%
Average Total-R Value:	0.4%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	10.4%	25.5%	64.1%
T-Value Distribution (actual value):	1.0	2.8	8.0
K-Value Distribution (actual value):	2.0	3.0	6.0

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.0%	0.1%	0.2%
Using Average R-Value Method:	0.0%	0.1%	0.2%

Flow Meter SLS1 & SLS3 (Fall/Winter)

Number of Events:	2
Median Total-R Value:	1.4%
Average Total-R Value:	1.4%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	5.8%	33.4%	60.8%
T-Value Distribution (actual value):	0.7	4.0	9.5
K-Value Distribution (actual value):	1.0	2.5	4.0

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.1%	0.5%	0.8%
Using Average R-Value Method:	0.1%	0.5%	0.8%

Flow Meter SLS1 (Spring)

Number of Events:	1
Median Total-R Value:	3.6%
Average Total-R Value:	3.6%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	7.0%	21.4%	71.5%
T-Value Distribution (actual value):	2.0	4.0	5.0
K-Value Distribution (actual value):	1.0	2.0	6.0

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.3%	0.8%	2.5%
Using Average R-Value Method:	0.3%	0.8%	2.5%

Flow Meter SLS2, SLS4, & SLS5 (Fall/Winter)

Number of Events:	2
Median Total-R Value:	1.5%
Average Total-R Value:	1.5%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	19.9%	25.4%	54.7%
T-Value Distribution (actual value):	1.3	3.5	9.5
K-Value Distribution (actual value):	1.6	2.5	5.8

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.3%	0.4%	0.8%
Using Average R-Value Method:	0.3%	0.4%	0.8%

Flow Meter SLS3 (Spring)

Number of Events:	2
Median Total-R Value:	0.6%
Average Total-R Value:	0.6%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	8.0%	14.6%	77.4%
T-Value Distribution (actual value):	0.6	4.0	8.0
K-Value Distribution (actual value):	1.0	2.0	8.3

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.0%	0.1%	0.5%
Using Average R-Value Method:	0.0%	0.1%	0.5%

Flow Meter SLS4 & SLS5 (Spring)

Number of Events:	1
Median Total-R Value:	1.7%
Average Total-R Value:	1.7%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	39.3%	60.7%	0.0%
T-Value Distribution (actual value):	0.7	2.0	0.0
K-Value Distribution (actual value):	1.0	1.8	0.0

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.7%	1.0%	0.0%
Using Average R-Value Method:	0.7%	1.0%	0.0%

Flow Meter TB1 (Spring)

Number of Events:	1
Median Total-R Value:	2.6%
Average Total-R Value:	2.6%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	68.9%	31.1%	0.0%
T-Value Distribution (actual value):	1.4	3.0	0.0
K-Value Distribution (actual value):	1.0	2.0	0.0

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	1.8%	0.8%	0.0%
Using Average R-Value Method:	1.8%	0.8%	0.0%

Flow Meter TB2 & TB4 (Fall/Winter)

Number of Events:	3
Median Total-R Value:	6.7%
Average Total-R Value:	6.3%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	28.2%	17.4%	54.3%
T-Value Distribution (actual value):	0.9	2.8	7.3
K-Value Distribution (actual value):	1.7	2.3	4.9

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	1.9%	1.2%	3.6%
Using Average R-Value Method:	1.8%	1.1%	3.4%

Flow Meter TB2 (Spring)

Number of Events:	1
Median Total-R Value:	20.6%
Average Total-R Value:	20.6%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	7.1%	37.9%	54.9%
T-Value Distribution (actual value):	0.9	2.1	5.5
K-Value Distribution (actual value):	1.0	2.0	4.0

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	1.5%	7.8%	11.3%
Using Average R-Value Method:	1.5%	7.8%	11.3%

Flow Meter TB3 (Fall/Winter)

Number of Events:	2
Median Total-R Value:	4.8%
Average Total-R Value:	4.8%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	34.8%	35.4%	29.8%
T-Value Distribution (actual value):	1.1	3.5	9.0
K-Value Distribution (actual value):	2.4	2.8	4.8

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	1.7%	1.7%	1.4%
Using Average R-Value Method:	1.7%	1.7%	1.4%

Flow Meter TB3 (Spring)

Number of Events:	1
Median Total-R Value:	4.0%
Average Total-R Value:	4.0%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	28.8%	39.1%	32.1%
T-Value Distribution (actual value):	2.0	3.5	6.0
K-Value Distribution (actual value):	1.5	2.2	5.5

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	1.1%	1.6%	1.3%
Using Average R-Value Method:	1.1%	1.6%	1.3%

Flow Meter TB5 (Fall/Winter)

Number of Events:	5
Median Total-R Value:	9.6%
Average Total-R Value:	9.3%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	29.9%	31.4%	38.8%
T-Value Distribution (actual value):	1.5	2.6	5.0
K-Value Distribution (actual value):	1.5	2.7	5.4

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	2.9%	3.0%	3.7%
Using Average R-Value Method:	2.8%	2.9%	3.6%

Flow Meter TB5 (Spring)

Number of Events:	3
Median Total-R Value:	8.6%
Average Total-R Value:	8.4%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	29.7%	28.3%	46.0%
T-Value Distribution (actual value):	1.6	3.6	6.7
K-Value Distribution (actual value):	1.2	2.0	5.0

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	2.6%	2.1%	4.0%
Using Average R-Value Method:	2.5%	2.0%	3.9%

Flow Meter TB6 (Fall/Winter)

Number of Events:	4
Median Total-R Value:	8.6%
Average Total-R Value:	8.7%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	14.6%	28.3%	57.2%
T-Value Distribution (actual value):	1.1	3.2	9.0
K-Value Distribution (actual value):	2.0	2.5	5.8

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	1.3%	2.4%	4.9%
Using Average R-Value Method:	1.3%	2.4%	5.0%

Flow Meter TB6 (Spring)

Number of Events:	2
Median Total-R Value:	7.7%
Average Total-R Value:	7.7%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	11.8%	27.0%	61.2%
T-Value Distribution (actual value):	0.8	3.4	7.0
K-Value Distribution (actual value):	2.0	2.8	7.5

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.9%	2.1%	4.7%
Using Average R-Value Method:	0.9%	2.1%	4.7%

Flow Meter TB7 (Fall/Winter)

Number of Events:	2
Median Total-R Value:	5.1%
Average Total-R Value:	5.1%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	14.2%	23.3%	62.5%
T-Value Distribution (actual value):	0.8	3.0	9.5
K-Value Distribution (actual value):	2.0	3.0	4.9

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.7%	1.2%	3.2%
Using Average R-Value Method:	0.7%	1.2%	3.2%

Flow Meter TB7 (Spring)

Number of Events: 3

Median Total-R Value: 4.1%

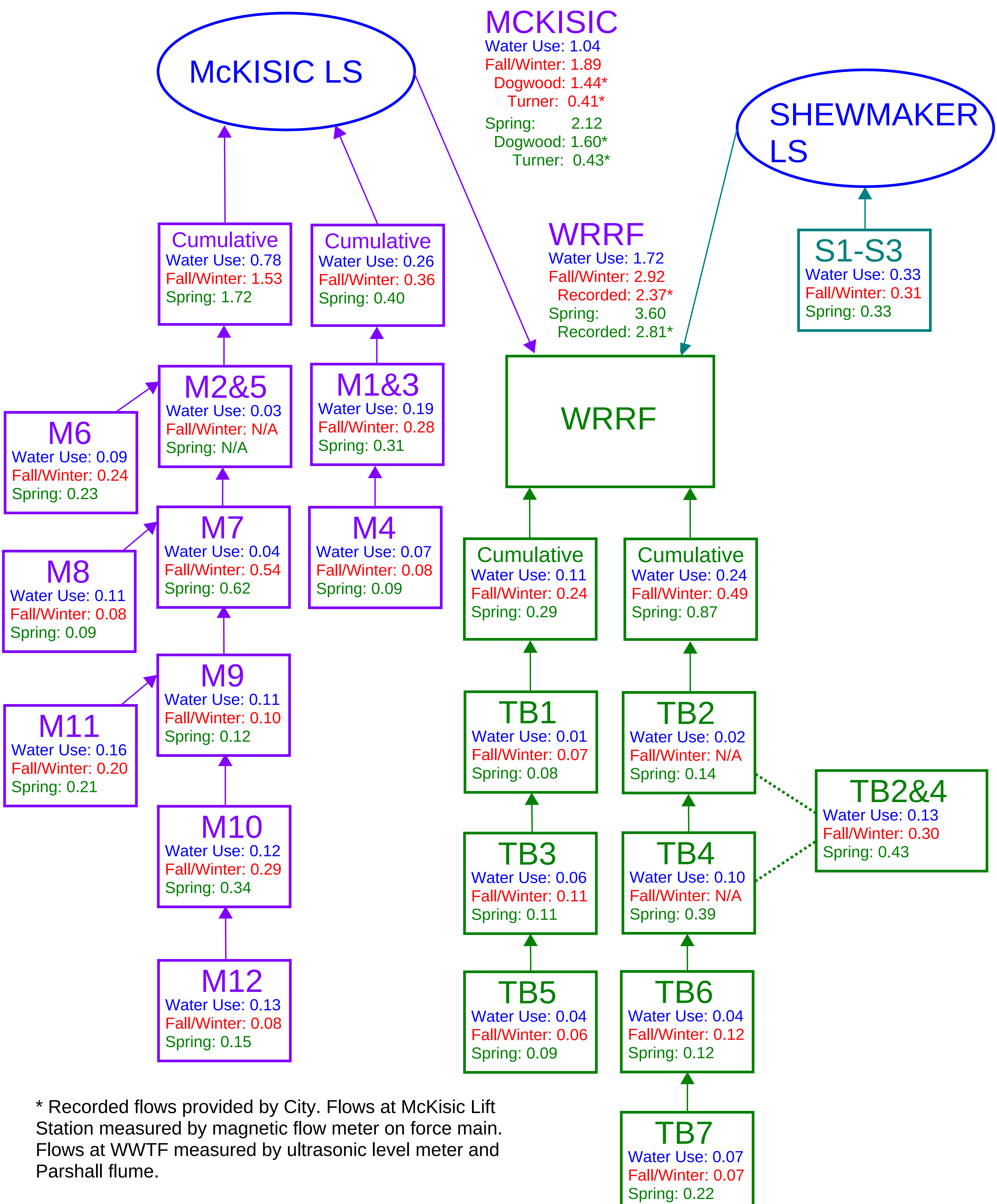
Average Total-R Value: 4.3%

Distribution of RDII Response	(Fast,	Medium,	Slow)
R-Value Distribution (ratio):	10.6%	23.5%	66.0%
T-Value Distribution (actual value):	1.3	3.6	8.7
K-Value Distribution (actual value):	2.0	2.3	6.7

RDII Representative Parameters	R1	R2	R3
Using Median R-Value Method:	0.4%	1.0%	2.7%
Using Average R-Value Method:	0.5%	1.0%	2.8%

APPENDIX I
Subbasin Dry Weather Flow Comparison
(Flow Monitoring Period September 2020 - June 2021)

METERED DRY WEATHER FLOW COMPARISON
(ALL FLOWS LISTED IN MGD)



* Recorded flows provided by City. Flows at McKisic Lift Station measured by magnetic flow meter on force main. Flows at WWTF measured by ultrasonic level meter and Parshall flume.

Fall/Winter recorded flows averaged from February 8 to 17.
Spring recorded flows averaged from March 31 to April 6.

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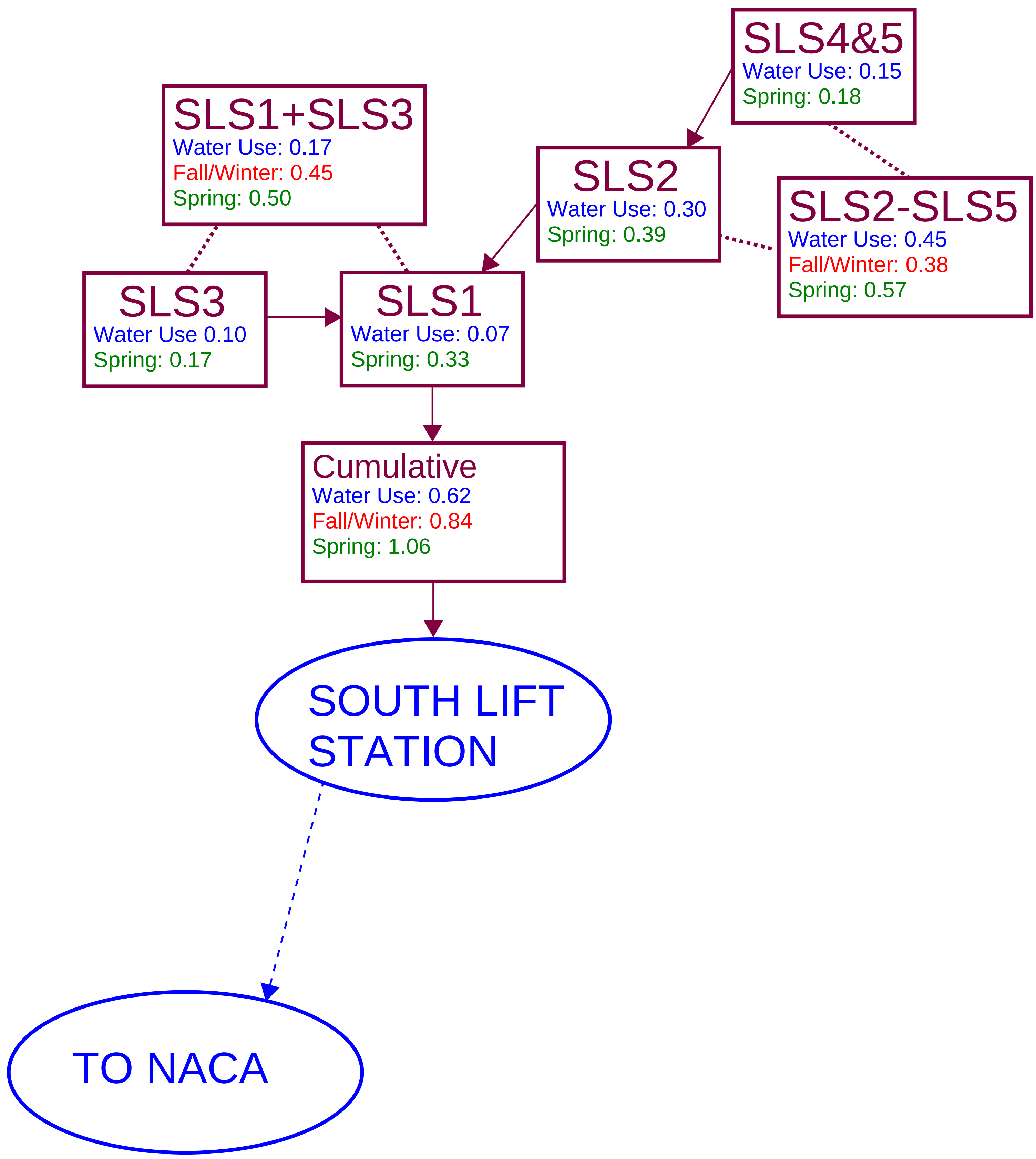
METERED DRY WEATHER FLOW COMPARISON
(ALL FLOWS LISTED IN MGD)



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BENTONVILLE SEWER STUDY

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APPENDIX J

Subbasin Inflow/Infiltration Rankings Table

Fall/Winter I/I Prioritization Ranking

Subbasin	Estimated Permanent Infiltration		Peak RDII - 5-Year, 24-hour Design Storm											
	MGD	Rank	Peak RDII Flow Rate	Rank	Peaking Factor	Rank	gpd per manhole	Rank	gpd per LF of Pipe	Rank	gpd per IDM	Rank	Composite Score	Composite Rank
M1 & M3	0.09	6	2.18	7	9	13	4,111	13	22	12	14,916	11	11	12
M4	0.01	12	2.01	11	27	5	11,167	9	53	8	39,890	7	8	8
M6	0.15	5	1.97	12	9	11	9,249	10	45	10	34,406	9	10	11
M7	0.50	1	-	-	-	-	-	-	-	-	-	-	-	-
M8	-0.03	-	0.63	15	9	12	3,073	14	14	14	8,957	14	14	14
M9	-0.01	-	2.15	8	22	6	12,079	8	52	9	27,833	10	8	9
M10	0.17	4	3.11	5	12	9	23,561	4	94	4	45,183	6	6	5
M11	0.05	10	0.61	16	4	15	2,711	15	12	15	6,904	16	15	16
M12	-0.05	-	6.12	1	75	1	43,714	1	180	1	121,440	1	1	1
TB1	0.06	8	-	-	-	-	-	-	-	-	-	-	-	-
TB2 & TB4	0.17	3	5.09	2	18	8	22,227	5	86	5	52,053	4	5	4
TB3	0.05	9	2.15	9	20	7	16,162	6	65	6	45,853	5	7	6
TB5	0.01	11	2.65	6	48	2	42,063	2	127	2	89,501	2	3	2
TB6	0.07	7	3.47	3	31	3	27,760	3	98	3	74,063	3	3	3
TB7	0.00	13	2.07	10	30	4	15,109	7	54	7	38,575	8	7	7
S1, S2, & S3	-0.02	-	1.78	13	7	14	2,236	16	11	16	7,641	15	15	15
SLS1 & SLS3	0.28	2	1.30	14	4	16	5,579	11	22	11	13,475	13	13	13
SLS2, SLS4, & SLS5	-0.06	-	3.25	4	9	10	5,575	12	21	13	13,493	12	10	10

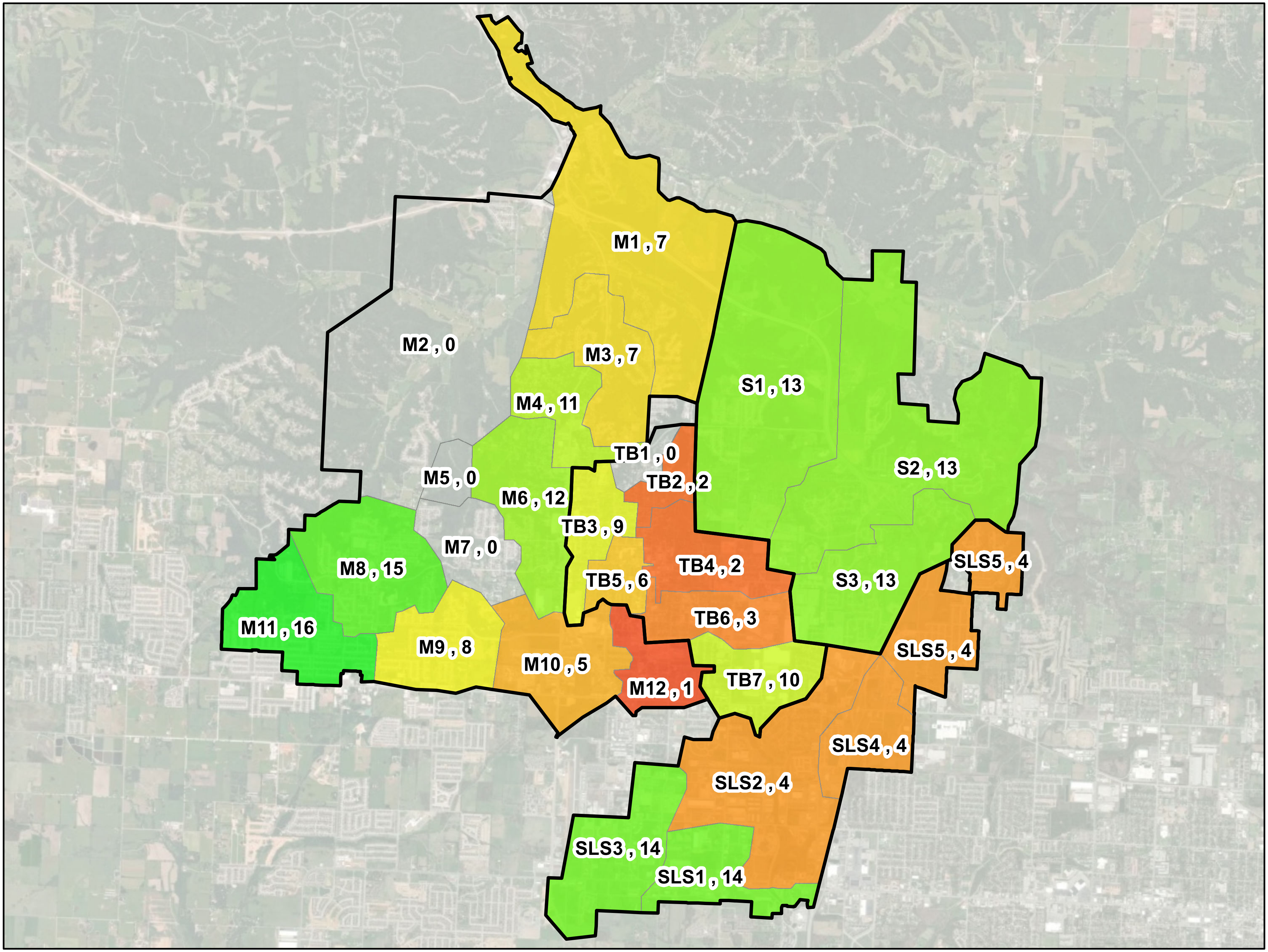
Spring I/I Prioritization Ranking

Subbasin	Estimated Permanent Infiltration		Peak RDII - 5-Year, 24-hour Design Storm											
	MGD	Rank	Peak RDII Flow Rate	Rank	Peaking Factor	Rank	gpd per manhole	Rank	gpd per LF of Pipe	Rank	gpd per IDM	Rank	Composite Score	Composite Rank
M1 & M3	0.12	7	0.93	15	4	17	1,754	18	9	17	6,365	17	17	17
M4	0.02	16	2.17	5	26	3	12,046	11	57	11	43,032	6	7	7
M5	-	-	1.77	11	-	0	160,464	1	692	1	153,700	2	3	3
M6	0.15	6	1.94	9	9	10	9,127	14	44	13	33,952	11	11	11
M7	0.58	1	-	-	-	-	-	-	-	-	-	-	-	-
M8	-0.02	-	0.80	17	10	9	3,906	15	17	15	11,386	15	14	15
M9	0.01	18	1.90	10	17	8	10,685	13	46	12	24,621	14	11	12
M10	0.22	3	2.06	7	7	13	15,624	7	62	6	29,963	13	9	9
M11	0.05	12	0.82	16	5	15	3,630	16	16	16	9,244	16	16	16
M12	-0.03	-	4.37	2	42	1	31,179	4	129	3	86,617	3	3	2
TB1	0.07	10	0.59	18	8	12	13,111	10	57	10	42,017	8	12	13
TB2	0.01	17	5.28	1	39	2	117,333	2	380	2	172,602	1	2	1
TB3	0.05	14	2.00	8	19	7	15,038	9	60	9	42,664	7	8	8
TB4	0.29	2	-	-	-	-	-	-	-	-	-	-	-	-
TB5	0.05	13	2.09	6	23	5	33,175	3	100	4	70,588	4	4	4
TB6	0.08	9	2.83	4	24	4	22,640	5	80	5	60,403	5	5	5
TB7	0.15	5	1.63	13	8	11	11,898	12	43	14	30,376	12	12	14
S1, S2, & S3	0.01	19	1.18	14	5	16	1,482	19	7	19	5,066	19	17	18
SLS1	0.16	4	1.68	12	6	14	15,413	8	62	7	36,807	10	10	10
SLS2	0.09	8	-	-	-	-	-	-	-	-	-	-	-	-
SLS3	0.06	11	0.28	19	3	18	2,258	17	9	18	5,509	18	18	19
SLS4 & SLS5	0.03	15	3.78	3	23	6	15,949	6	62	8	39,411	9	6	6

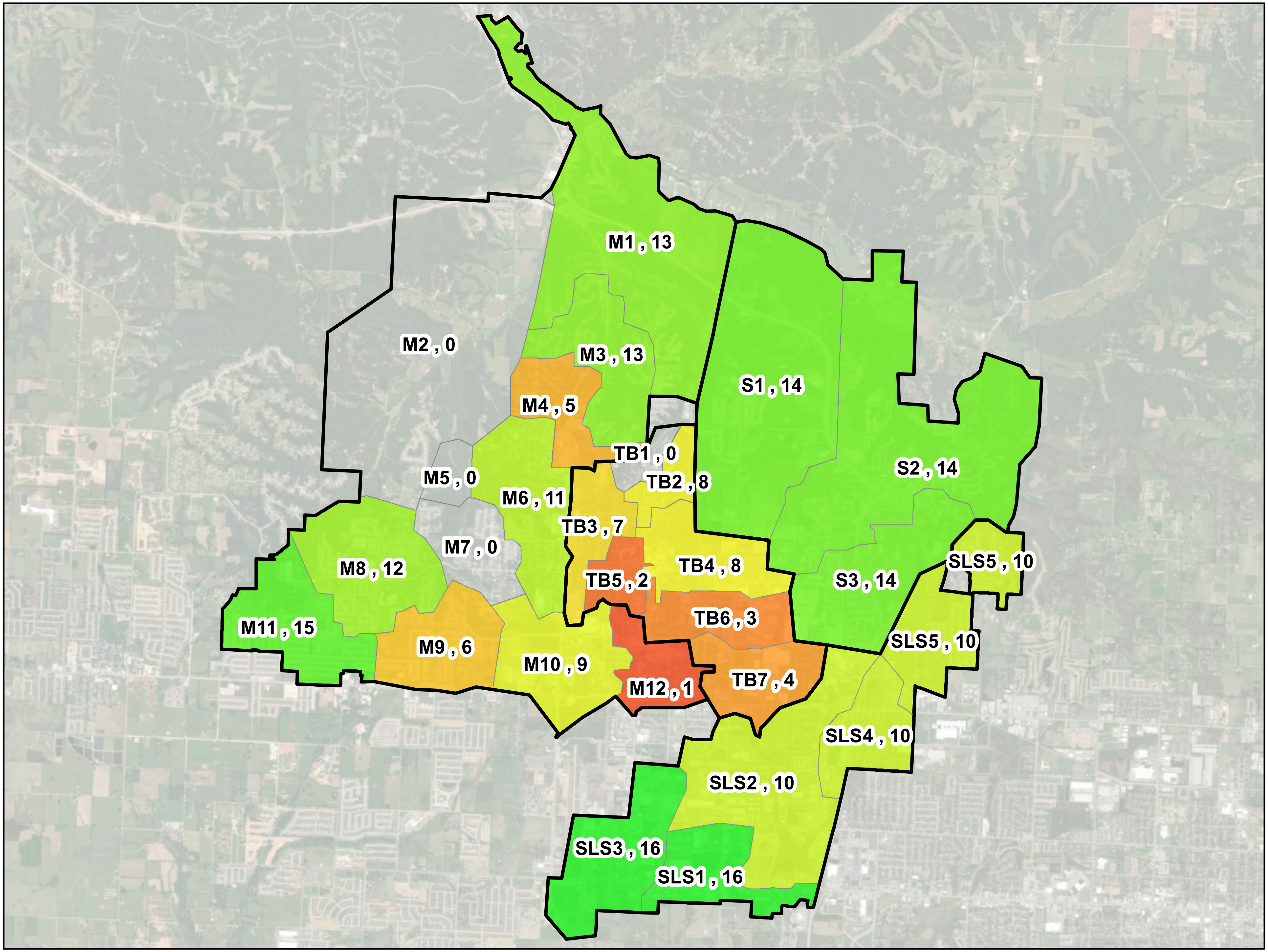
APPENDIX K

Subbasin Inflow/Infiltration Rankings Maps

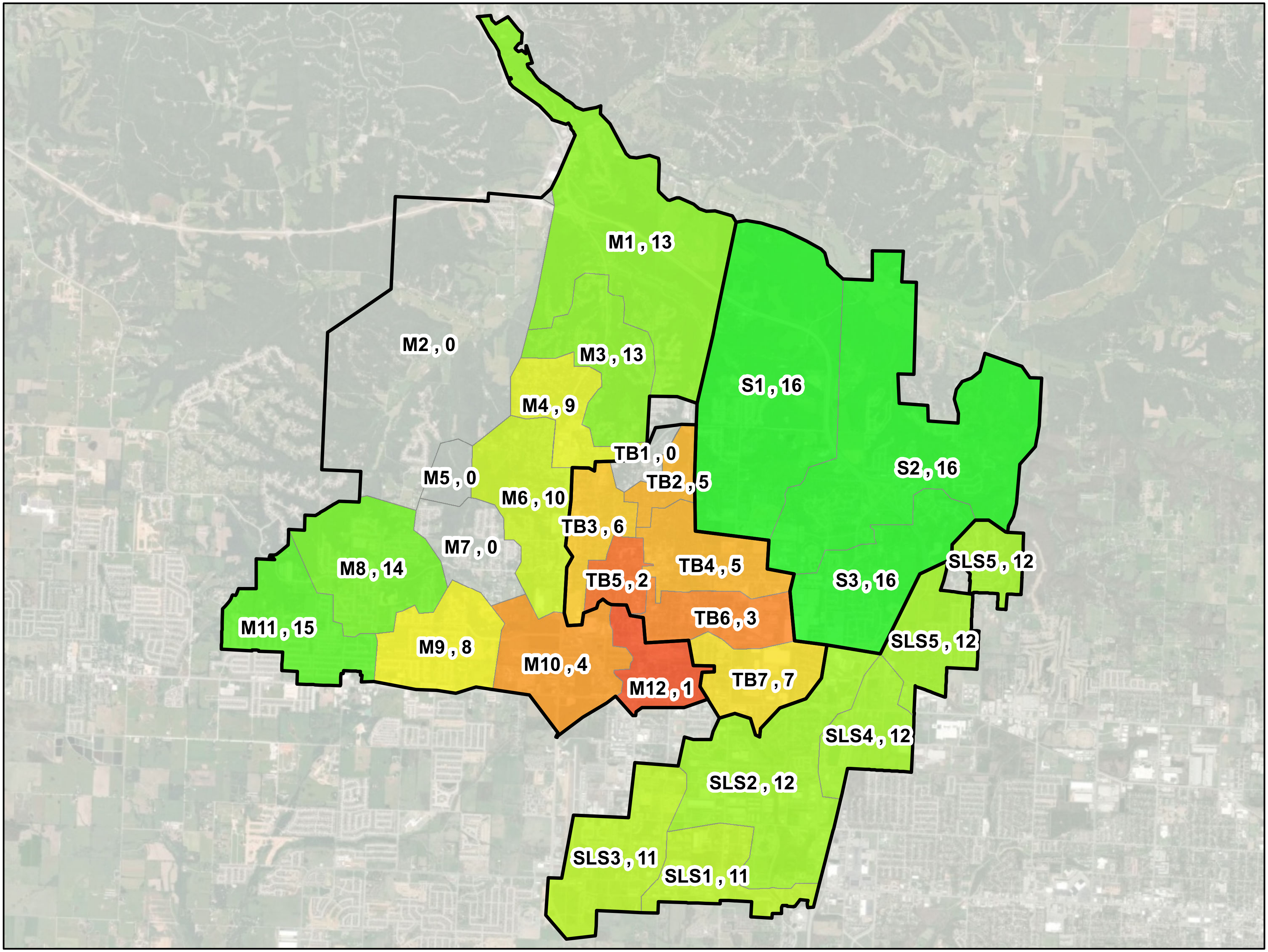
Fall/Winter Peak RDII Flow Rate Rankings



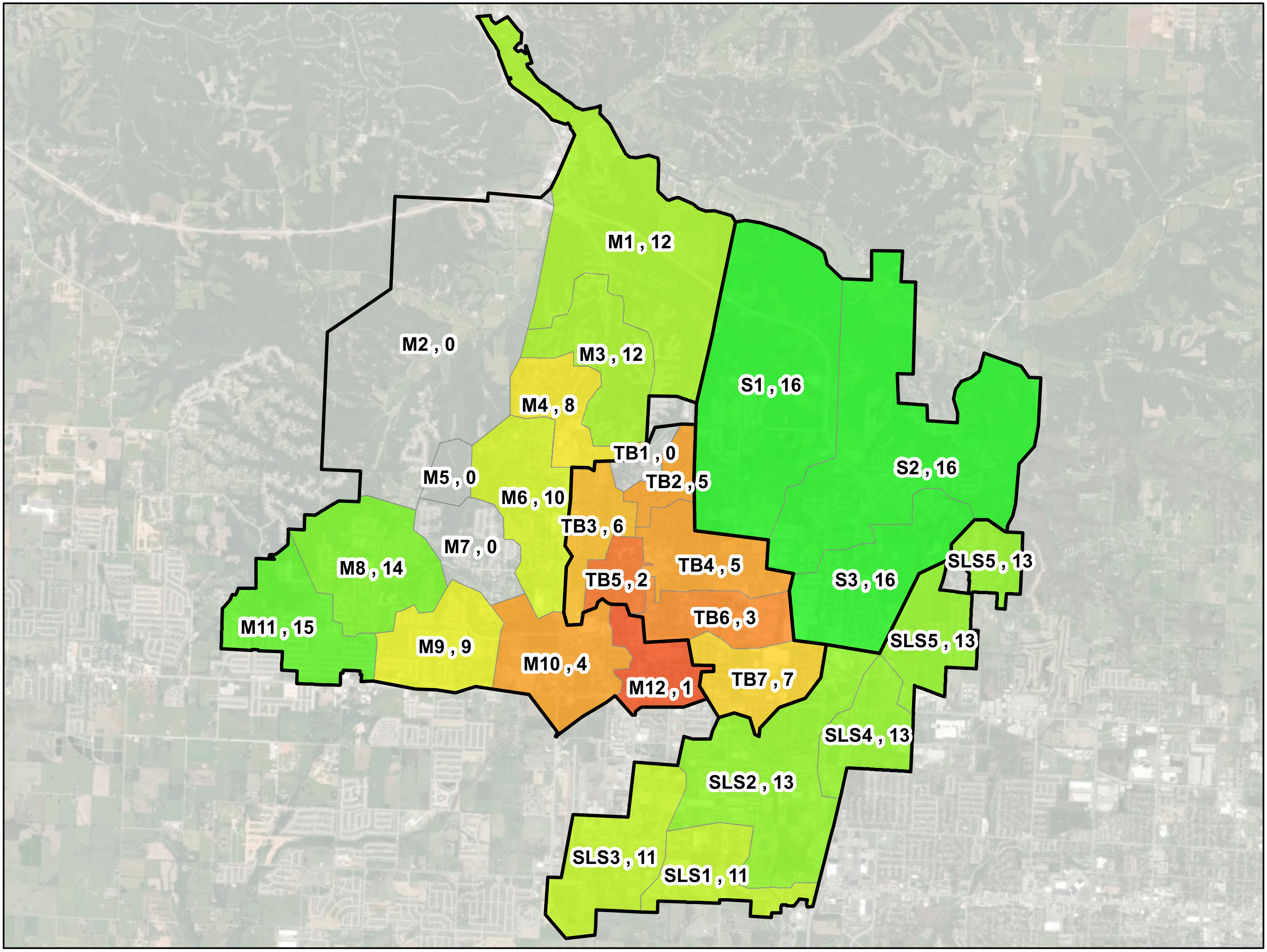
Fall/Winter Peaking Factor Rankings



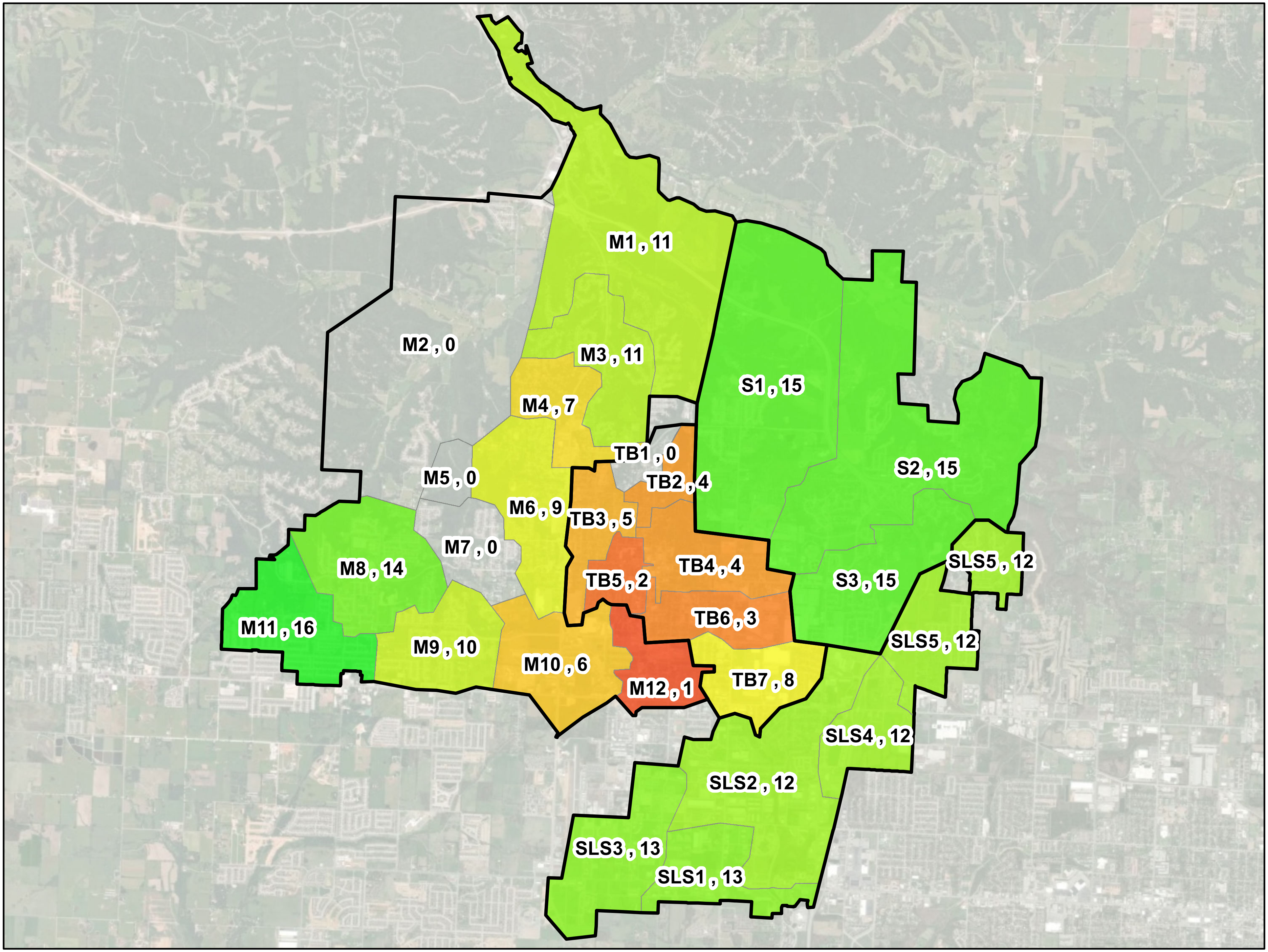
Fall/Winter Peak RDII Flow Rate per Manhole
Rankings



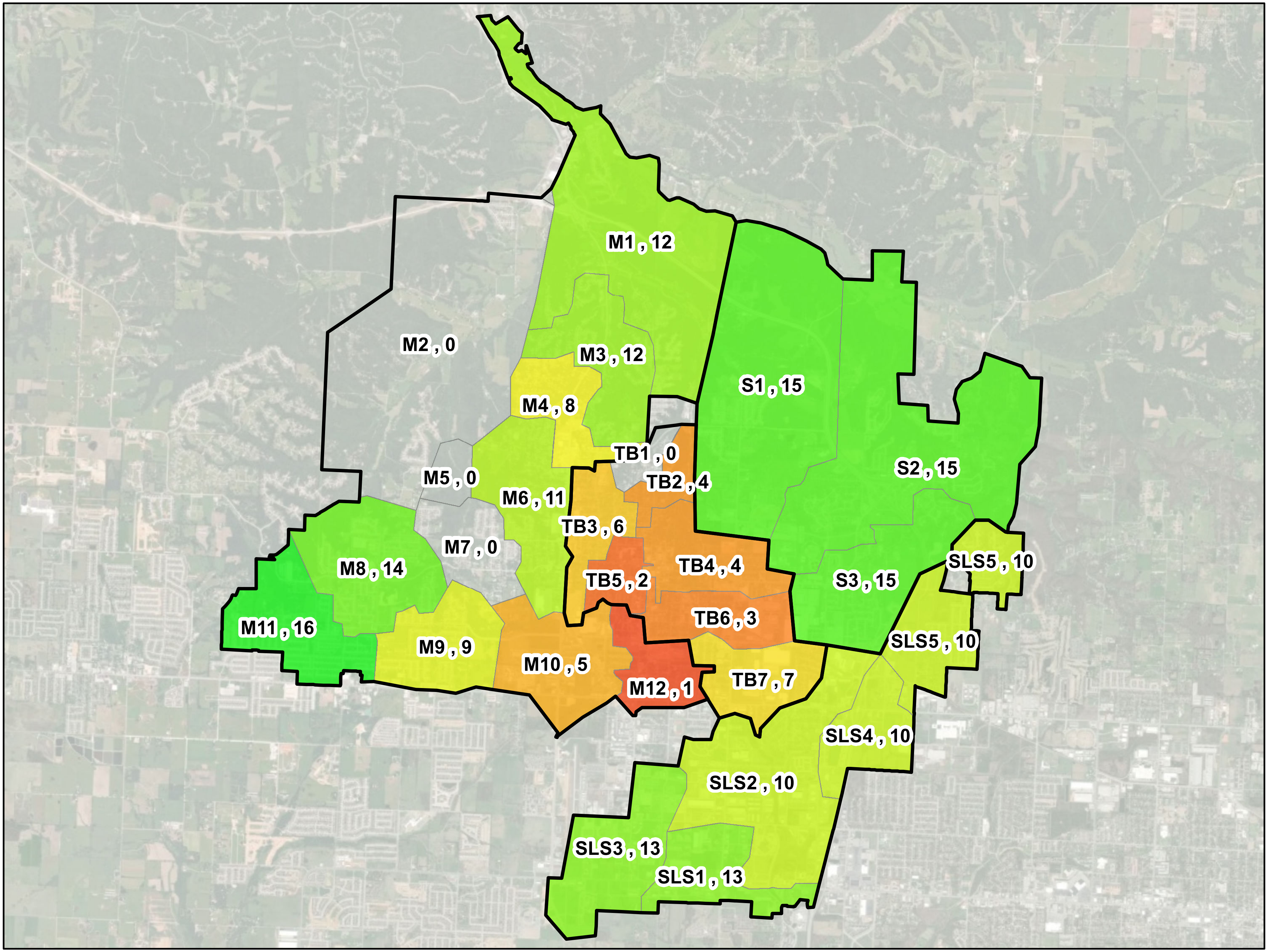
Fall/Winter Peak RDII Flow Rate per Linear
Foot of Pipe Rankings



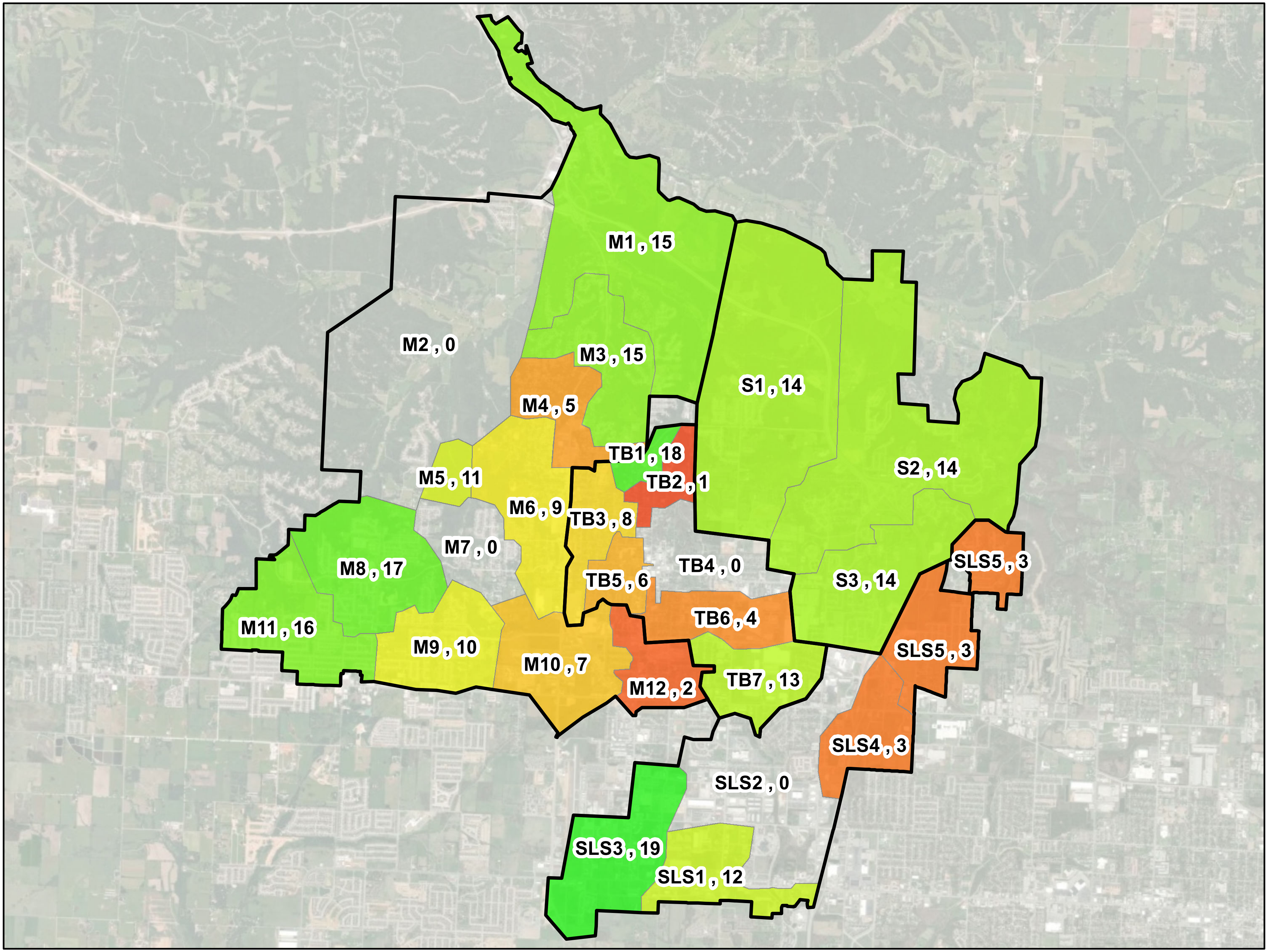
Fall/Winter Peak RDII Flow Rate per
Inch-Diameter-Mile Rankings



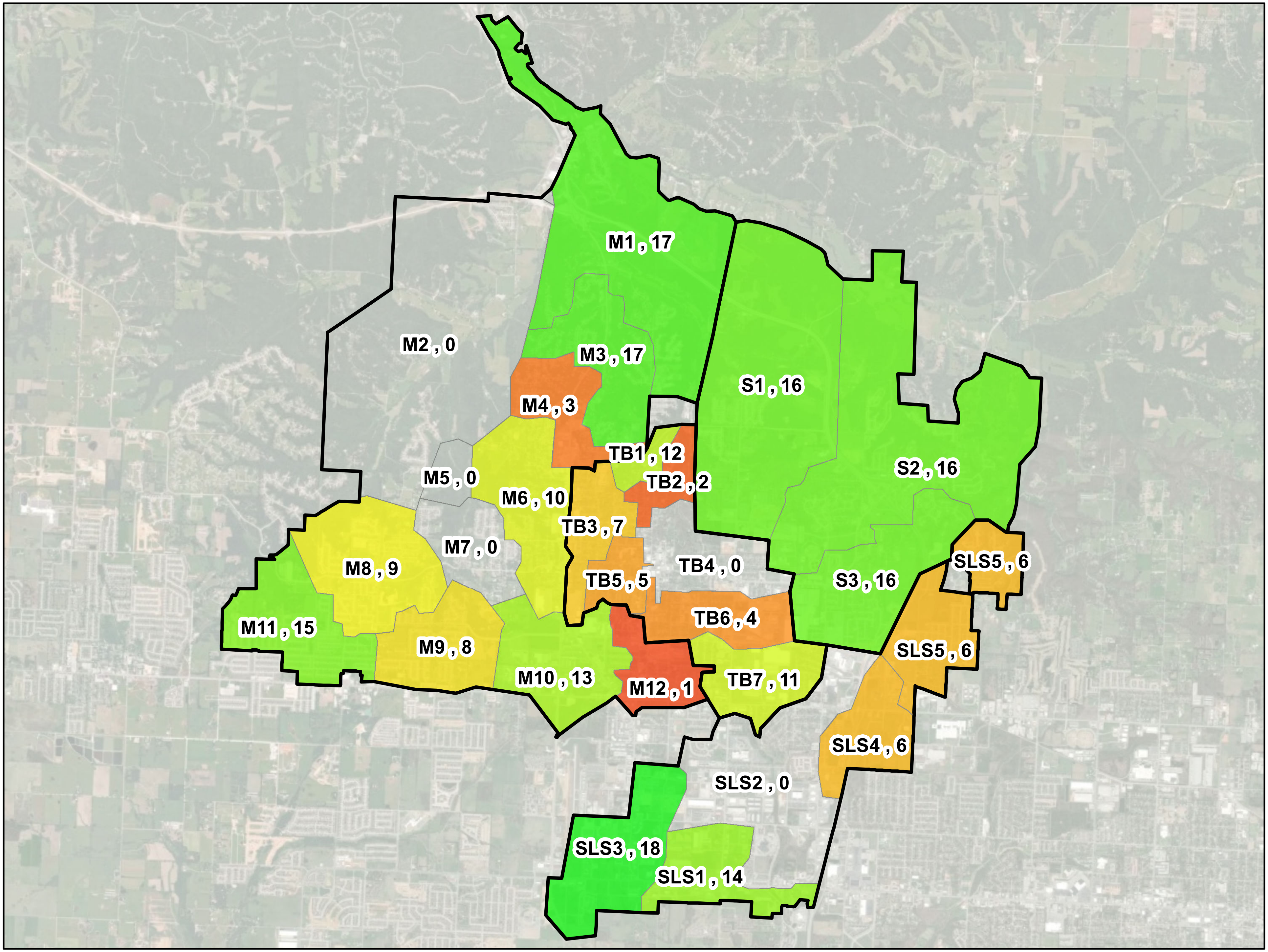
Fall/Winter Peak RDII Composite Score Rankings



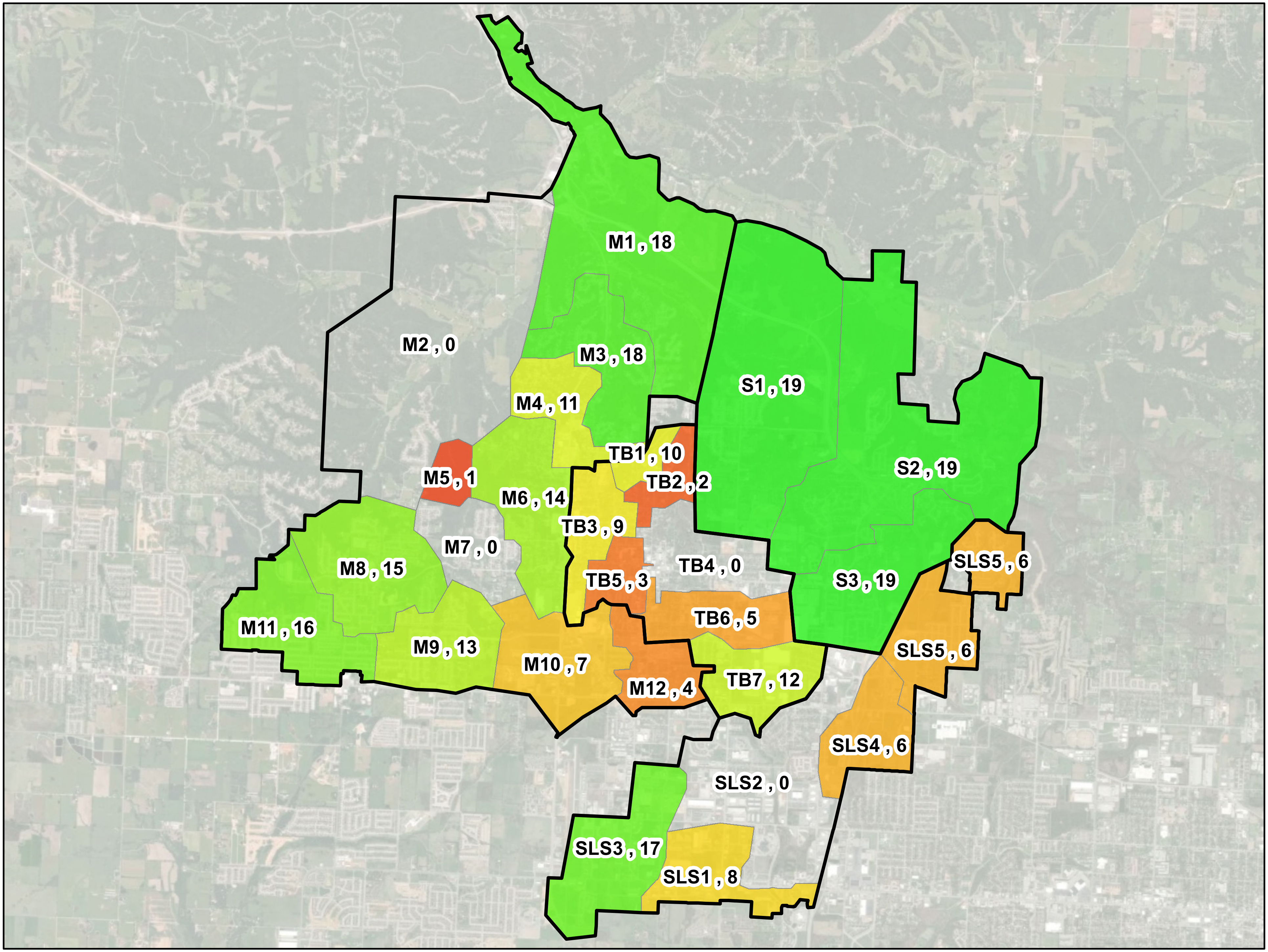
Spring Peak RDII Flow Rate Rankings



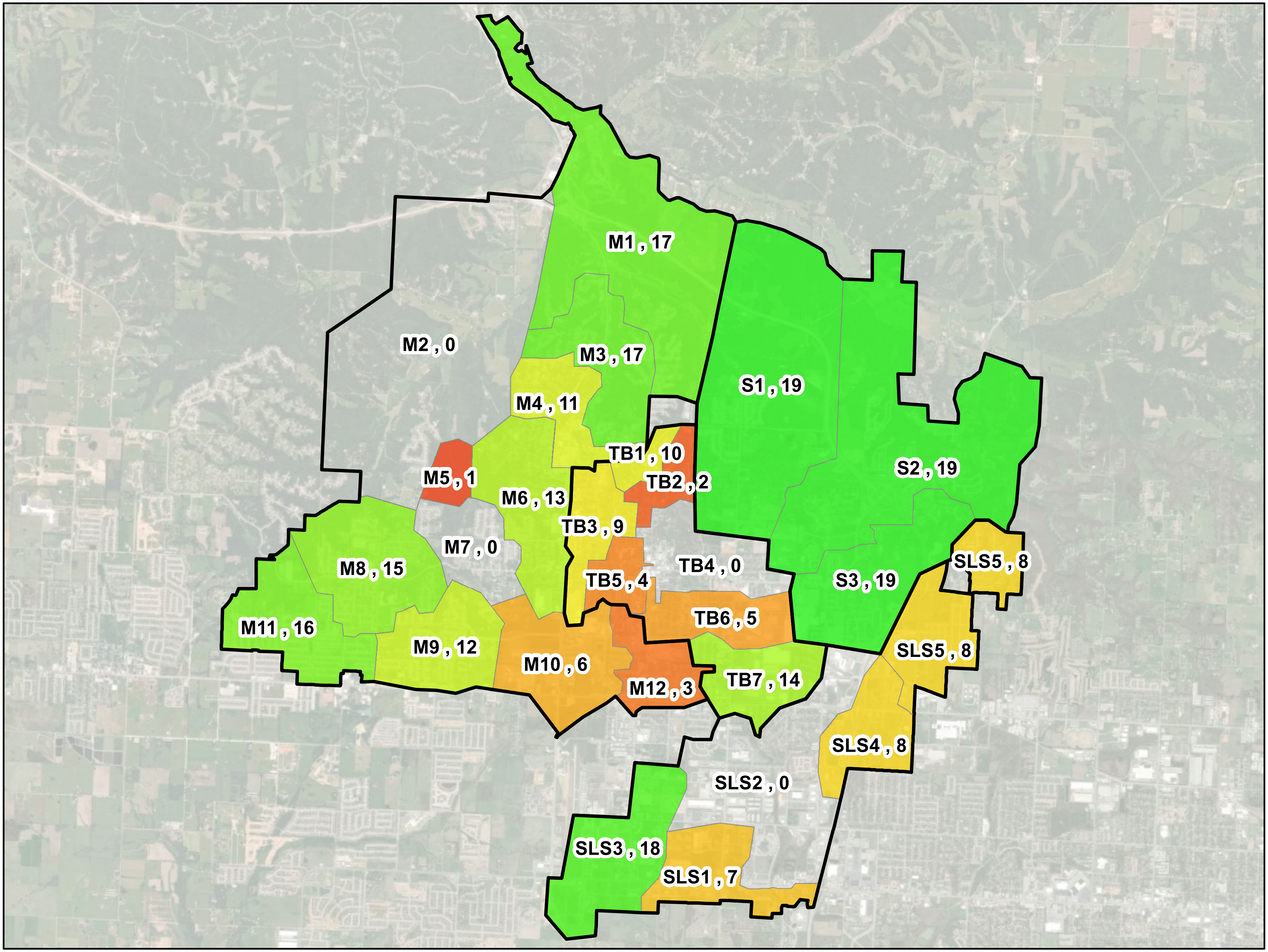
Spring Peaking Factor Rankings



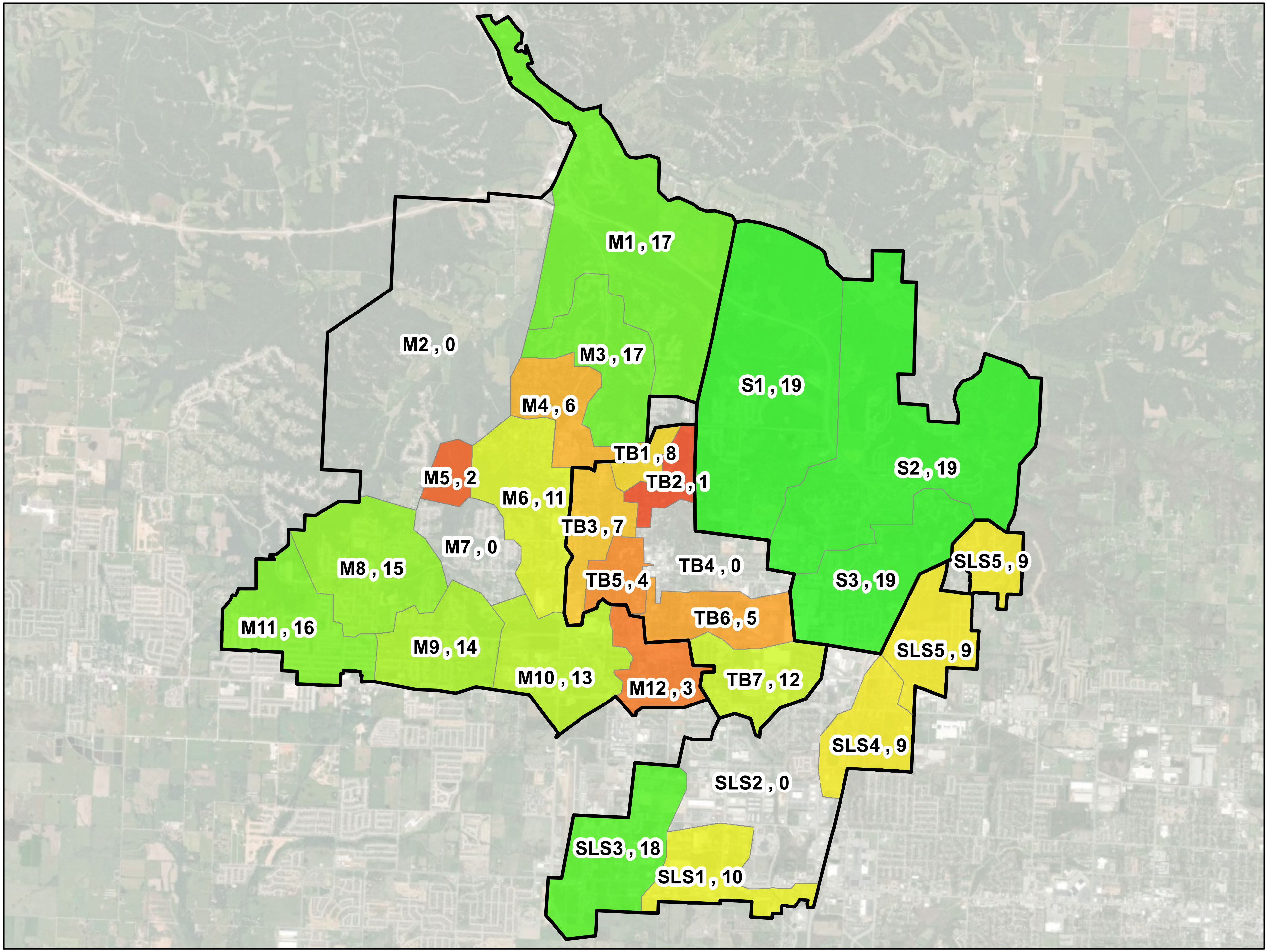
Spring Peak RDII Flow Rate per Manhole
Rankings



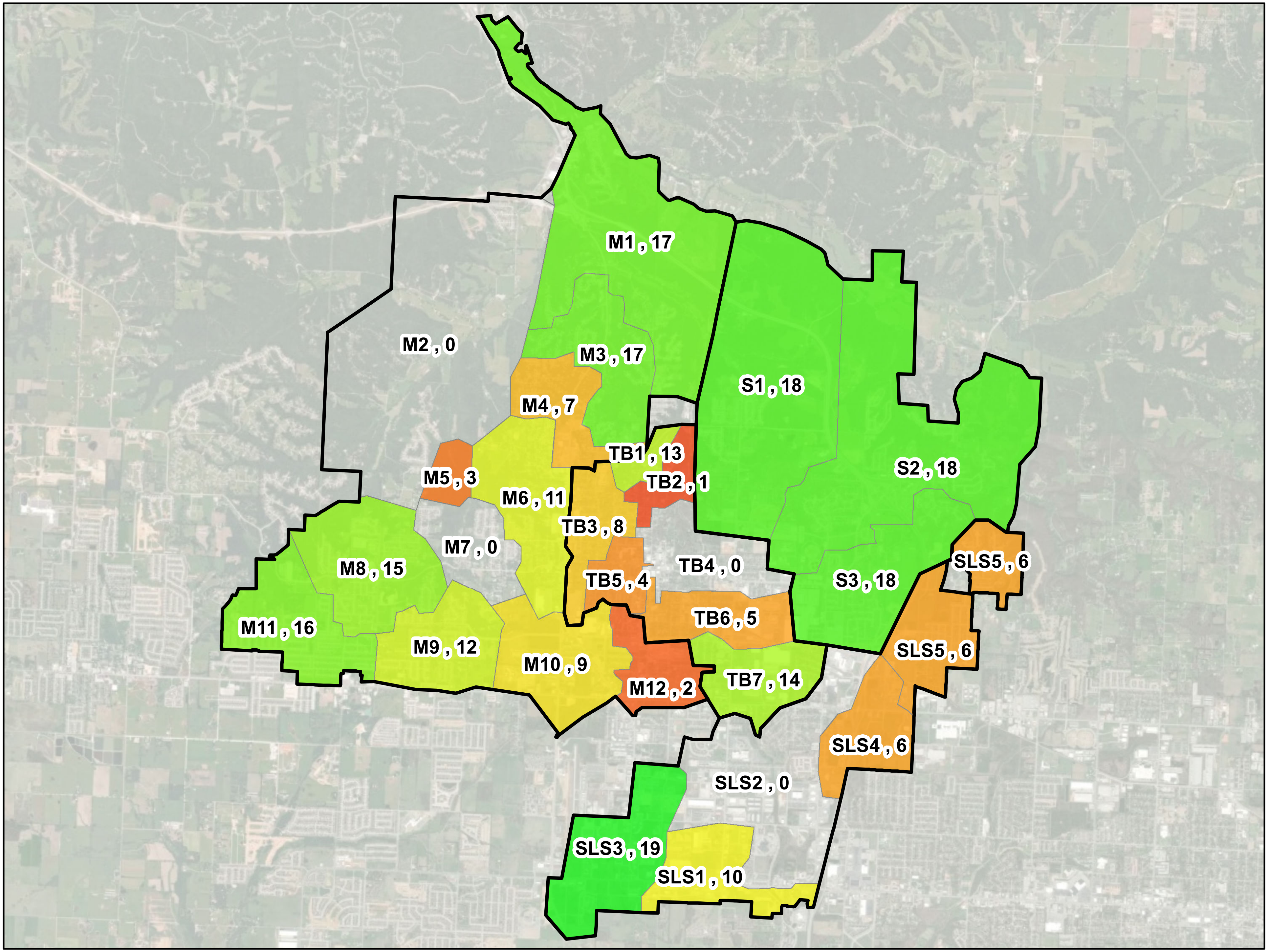
Spring Peak RDII Flow Rate per Linear Foot
of Pipe Rankings



Spring Peak RDII Flow Rate per
Inch-Diameter-Mile Rankings



Spring Peak RDII Composite Score Rankings



Overall Peak RDII Rankings