

TECHNICAL MEMORANDUM

To: Daniel Garcia, P.E.

From: Mike Swan

Date: February 4, 2019

Subject: City of Maywood Sewer System Hydraulic Model



Introduction

The purpose of this technical memorandum is to summarize the development of a hydraulic model created for the City of Maywood sewer collection system including the methodology used for development and calibration of the model and conclusions and recommendations regarding existing capacity deficiencies, if any, as well as recommendations for further action.

The City of Maywood's sewer collection system is comprised of approximately 119,250 linear feet (approximately 22.6 miles) of pipelines with diameters from 8-inch through 15-inch, broken down as shown in Table 1.

**Table 1
Pipe Diameter Breakdown**

Pipe Diameter	Linear Feet
8-inch	101,888
10-inch	10,579
12-inch	3,676
15-inch	3,108
Total	119,251

Source: City of Maywood Sewer GIS and CCTV

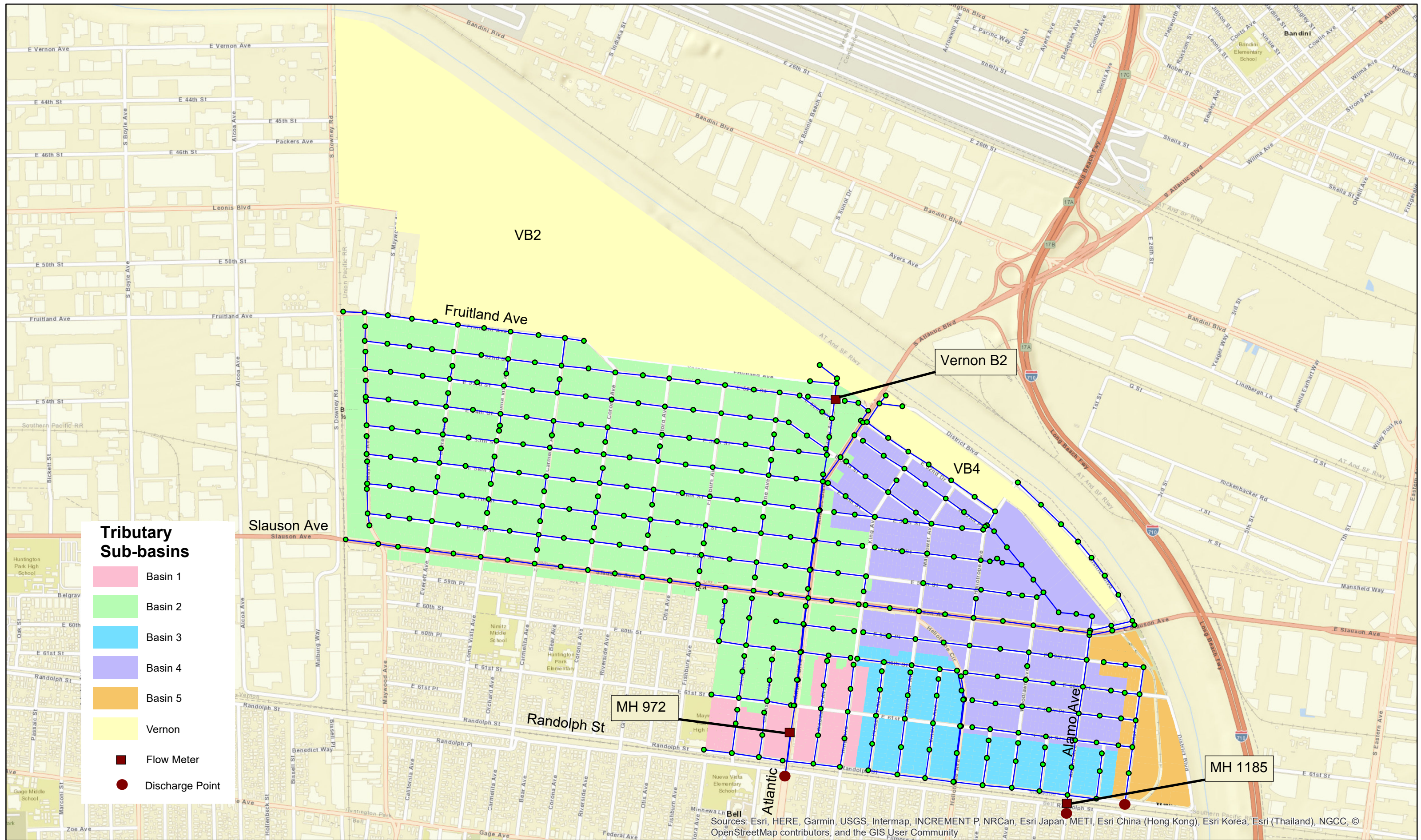
The system sewers all by gravity with no sewer lift stations. However, there is an inverted siphon on Randolph Street where the sewer in Randolph siphons under a County storm drain at Heliotrope Avenue. The Maywood sewer system discharges to two Los Angeles County Sanitation District (LACSD) trunk sewer lines and one other point. The major LACSD trunk line collecting sewage from the City is the Wright Road Trunk that runs north-south through the City in Cudahay Avenue and Atlantic Blvd. The City collection system has multiple connections to this line from both the east and west. This trunk sewer also collects sewage from the City of Vernon at its upstream terminus at District Blvd. near the Maywood/Vernon boundary. Most of the rest of the City sewer system discharges to LACSD's Wilcox Avenue Trunk Sewer at that trunk sewer's upstream terminus at Alamo Avenue and Randolph Street. A small portion of the City sewer system discharges directly to the City of Bell collection system at Walker Avenue at the far eastern portion of the City. The City sewer collection system and these discharge points are shown on Figure 1. This figure also shows the tributary basins set up for modeling and calibration purposes (calibration will be described below).

Figure 1 shows various tributary sub-basins color coded with five basins in the City labeled Basin 1 through 5. In addition there are two City of Vernon basins labeled VB2 and VB4. Maywood Basin 1 and 2 and VB2 are tributary to the Wright Road Trunk in Atlantic Blvd (MH 972). Maywood Basin 3 and 4 and VB4 are tributary to the Wilcox Avenue Trunk on Alamo Avenue (MH 1185). A small area in the eastern portion of the City, Basin 5, sewers to Walker Avenue and then southerly in Walker where it connects to the City of Bell's local sewer collection system at the City limit.

Model Construction

The City of Maywood provided GIS shape files containing the layout of the existing sewer collection lines including manholes and connectivity between pipes and manholes. Certain elements of the GIS data were imported into the InfoSewer software by Innovyze to create a hydraulic model. The data for the manholes utilized included the manhole number (for identification) and the invert elevation with some invert elevation data missing. The GIS data for the pipes utilized in the model was the upstream manhole, downstream manhole, upstream invert, downstream invert and pipe length. The pipe slope is then calculated in the model using the up- and downstream inverts and the length. After model construction, a check was conducted and numerous errors resulted such as missing invert elevations, missing pipe lengths, and pipes with upstream inverts lower than downstream inverts (negative slopes from the actual flow direction). These issues were resolved in some cases by assigning logical inverts where practical (for example averaging the slope between known inverts to obtain a missing invert in the middle, etc.). Missing pipe lengths were estimated based on CCTV data provided by Interwest staff. The remaining model issues were discussed with and provided to Interwest staff to obtain additional corrections and for the unresolved issues, logical assumptions for editing the data were made. Notations were made in the model GIS files indicating which data was assumed so it can be corrected at a later date. Recommended actions for correction are included later in this technical memorandum.

It should be noted that LACSD owns and maintains an 18- to 24-inch diameter trunk that runs through the City of Maywood from Cudahay Avenue and District Blvd. down Cudahay Avenue and Atlantic Blvd. in a southerly direction and continuing down Atlantic Blvd. into the City of Bell. The City also has a parallel 8-inch sewer in Atlantic Blvd. with connections to the LACSD trunk at various locations.



Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community

Figure 1
Tributary Sub-basins

Model Calibration

Flow monitoring data was available from LACSD for two locations that capture the majority of flow from the City of Maywood collection system. These locations are shown on Figure 1. In analyzing the tributary areas it was determined that portions of the City of Vernon are also tributary to these flow monitoring locations. These Vernon tributary areas outside Maywood are shown in separate colors on Figure 1. The flow monitoring data provided by LACSD for MH 972 on the Wright Road Trunk was collected during a seven-day period from June 20 to June 27, 2013 and the flow monitoring data for MH 1185 on the Wilcox Avenue Trunk was collected during a seven-day period from June 26 to July 3, 2013. Based on the data provided from LACSD for their two flow monitoring locations, the tributary areas shown on Figure 1, and land use GIS data by parcel provided by the City, Excel tables of land use by flow monitoring site tributary areas were generated and summarized by land use category. Because there were areas within the City of Vernon tributary to the two flow monitoring locations, a sewer system schematic map from the City of Vernon was obtained and the tributary boundaries for those areas (VB2 and VB4) were developed. This land use data was then compiled by parcel from County Assessor's Parcel data. The parcel land use data for the two Vernon basins was then compiled along with the the Maywood data and totaled by flow monitoring location.

Different typical flow factors for the residential, commercial, industrial and institutional land use categories were then utilized to attempt to get as close a match as possible to average daily flow from the flow monitoring data. An iterative, trial and error method was used within Excel to attempt to match average flow monitoring data as close as possible by adjusting the land use flow factors up and down. During this exercise it became apparent that close calibration could not be obtained due to the fact that using the same factors on both areas resulted in one area being higher than the flow monitoring data and one being lower.

Because there was such a large area with predominately industrial-type land uses that was primarily only in Vernon, it was felt that obtaining flow monitoring for this large area (VB2) was important. A location was selected where the flow from VB2 entered the LACSD sewer and co-mingled with Maywood flows and a flow monitoring study was conducted by National Plant Services under contract to the City of Maywood. Data from that study for a seven-day period from October 16 to October 23, 2018, was provided to Psomas. It would have been ideal to have the data from all three flow monitoring locations collected during the same period of time but it is felt that the model calibrated fairly well with this limited data, even though the LACSD data is over five years old and the two sets of data are five years separated. Now that the model is constructed it can be easily refined in the future if more extensive flow monitoring data is obtained by adjusting land use flow factors and/or peaking factors to match the new data.

It should be noted that there were some issues with the data from the Vernon basin flow monitoring in that almost every day of the seven-day data collection period from around 10:00 AM to 1:30 PM, there were either negative flows or lower than typical flows being recorded, which were obviously erroneous. This could have been caused by rags or debris fouling the recording device or something of this nature. Nonetheless, that erroneous data was adjusted to reflect more typical diurnal curves for the types of land use in the tributary area and it then appeared to be reasonable.

After analyzing the flow monitoring data from the Vernon location (Vernon B2), that flow was subtracted out and treated as a point load. Then the flow factors for each particular land use category in the remaining area were adjusted and the model calibrated much better. For the small VB4 area, flows by parcel were developed using the land use and the respective recommended flow factors. These flow factors by land use are shown in Table 2 with the factors for the first four land uses including Commercial, Industrial, Warehouse and Municipal in gallons per day (GPD) per acre and the remaining residential factors in GPD per dwelling unit.

Table 2
Average Dry Weather Flow Factors by Land Use

Land Use Code	GPD/unit
Commercial	2500
Industrial	2700
Warehouse	300
Municipal	2500
Apartment	230
Condominium	265
Duplex	265
Triplex	265
Quad	265
SF Residential	290

The land use and flows by parcel were then loaded to the appropriate manhole in the collection system and the hydraulic model was run. A peak dry weather to average dry weather factor of 1.9 was utilized to closely match the flow monitoring data. If additional flow monitoring data is obtained a more refined peaking factor could be applied or even adjusted to be higher in pipe reaches with smaller tributary areas and lower in downstream pipes, but lacking additional data the straight peaking factor of 1.9 is deemed appropriate.

Flow monitoring data by date and averages of the average and peak dry weather flow are shown in Table 3 along with the average and peak flow from the model using the land use factors from Table 2. As can be seen from Table 3, the Average FM values compare very well with the the Model Results for each of the two tributary basin locations (MH 972 and MH 1185).

Table 3
Flow Monitoring Data and Model Result Flow Comparison

MH 972 - Basin 2 & VB2 (MGD)			
Date	Peak	Avg	Peak to Avg
6/20-6/21	2.48	1.29	1.92
6/21-6/22	2.41	1.27	1.90
6/22-6/23	1.90	0.99	1.92
6/23-6/24	2.44	1.03	2.38
6/24-6/25	2.39	1.39	1.72
6/26-6/26	2.60	1.56	1.66
Average FM	2.37	1.25	1.92
Model Results	2.51	1.32	1.90
MH 1185 - Basin 3, 4 & VB4 (MGD)			
Date	Peak	Avg	Peak to Avg
6/26-6/27	1.38	0.72	1.91
6/27-6/28	1.17	0.68	1.73
6/28-6/29	1.44	0.75	1.92
6/30-7/01	1.37	0.77	1.77
7/01-7/02	1.40	0.73	1.90
7/02-7/03	1.38	0.77	1.79
Average FM	1.36	0.74	1.84
Model Results	1.30	0.68	1.90

Conclusions

No wet weather flow monitoring data was available for the study area. Lacking that information, which can be expensive and hit-and-miss to obtain due to frequent periods with little or no significant rainfall events in southern California, this preliminary sewer collection system analysis utilizes typical conservative depth-to-Diameter ratios to determine if modeled flow triggers a capacity constraint in a particular sewer pipe segment. These limits are expressed in terms of d/D ratio, based on pipe diameter and peak dry weather flow as shown in Table 4. These rather conservative D/d ratios should allow for sufficient capacity in the top portion of the pipes for wet weather flow from a reasonable amount of infiltration and inflow.

Table 4
Capacity Deficiency Trigger by Pipe Size

Pipe Diameter	D/d Ratio
12" and smaller	0.50
15" and larger	0.75

Model results are shown in Table A-1 in the Appendix for peak flow conditions. Figure 2 shows the model results graphically with the sewer segments (all 8- to 10-inch pipes) highlighted in orange for d/D between 0.50 and 0.75 and red for the one segment above 0.75. The reaches with d/D ratios above 0.55 all have slopes that have been estimated due to the lack of invert data at one or both ends of the pipeline.

To determine the hydraulic model flows at the downstream end of the City (MH 972), the existing LACSD trunk sewer in Cudahay Avenue and Atlantic Blvd. is modeled and the output is included in Table A-1. However, the slopes of some of the LACSD trunk sewer segments were estimated so the d/D shown could be different, but the flows are accurate per the model. It should be noted that none of the reaches in the LACSD trunk are even approaching capacity limits, though. For model loading purposes there are also a few sewer lines that are owned and maintained by the City of Vernon that are included in the model, which are depicted on Figure 2 in a different color.

As shown on Figure 2, all but two capacity deficient pipe segments are in the 0.50 to 0.61 range. The two 8-inch diameter sewers that may be critical in terms of high d/D are a 335-foot pipe segment on East 55th Street that connects to the City's 8-inch diameter line in Atlantic Blvd. that shows a d/D of 0.76, and an 87-foot pipe segment in the middle of Maywood Park that shows a d/D of 0.66. These segments are felt to be critical as those D/d ratios mean there is only about 2 inches of space between the peak dry weather flow height and the top of the pipe and as the flow approaches the top of the pipe the area of the pipe reduces more significantly so they cannot handle much more flow.

Recommendations

As noted previously, invert elevations were not available for all manholes or there were manholes with obvious errors in invert elevations that could be caused by survey datum differences between different sets of plans or just erroneous data in the City's Sewer GIS. To develop the hydraulic model, assumptions were made based on discussions between Psomas and Interwest staff, so that all sewer segments sloped in the correct direction. To confirm slopes where these assumptions were made and to confirm some of the modeled capacity deficiencies, it is recommended that a substantial number of sewer manholes be surveyed for both rim and invert elevations. These manholes recommended to be surveyed are shown on Figure 3.

Additionally, it is recommended that a more comprehensive flow monitoring program be conducted to fine tune the model calibration for land use flow factors, basin model flow calibration, peak-to-average flow calibration, and wet weather flow monitoring. For the wet weather flow monitoring to determine wet weather flow characteristics, the two flow monitoring locations previously monitored by LACSD should be adequate since all the tributary sub-basins in the City collection system flow to these two points (also including the two sub-basins from the City of Vernon), except for the very small easterly portion of the City that sewers directly into the City of Bell system. Additional flow monitoring locations should be the one location where the City of Vernon was flow monitored (Vernon B2 from Figure 1) and two locations to be selected to capture typical residential neighborhoods one in Basin 2 and one in Basin 3 or 4. All five locations should be monitored over the same continuous two-week period.

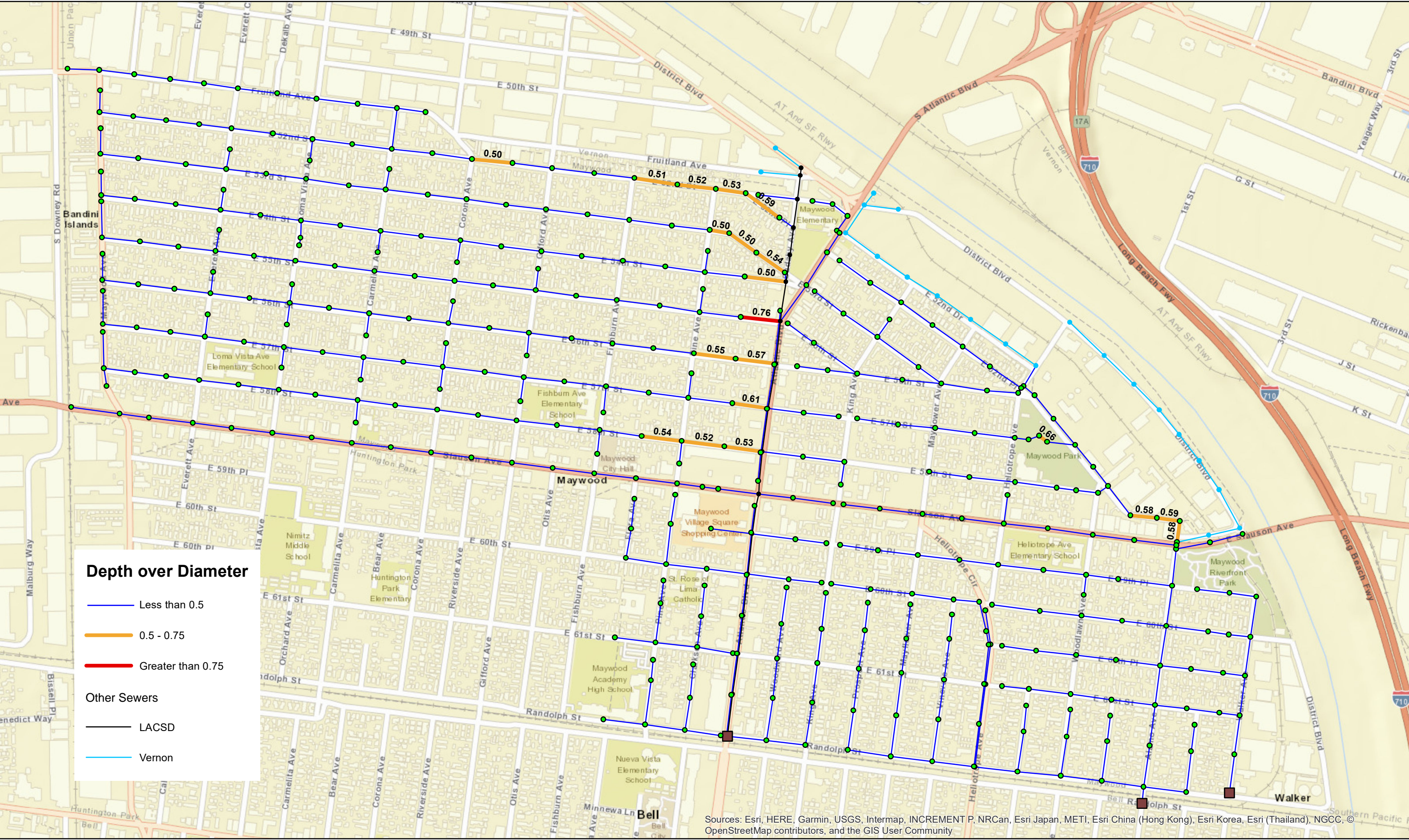


Figure 2
Capacity Deficient Pipes

Insert Figure 3 – Recommended MHs to be surveyed for rim and invert elevations (to follow)

However, for the two LACSD locations, it is recommended the flow monitors be left in for an extended period to capture at least one or two significant rain events. If the timing cannot be coordinated such that the two LACSD flow monitors capture a rain event, then they should be removed and placed during the rainy season of the following year.

APPENDIX A

Table A-1
Maywood Sewer Model Output
Peak Flow Simulation

ID	From ID	To ID	Diameter (in)	Length (ft)	Slope	Total Flow (gpd)	Velocity (ft/s)	d/D
GM-1	M-17	M-16	8	382	0.009	1,482	0.65	0.033
GM-10	M-13	M-12	8	326	0.004	33,058	1.20	0.180
GM-100	M-41	M-40	8	331	0.003	37,420	1.12	0.206
GM-101	M-40	M-39	8	333	0.003	50,106	1.30	0.227
GM-102	M-39	M-102	8	329	0.003	69,015	1.46	0.262
GM-103	M-45	M-54	8	348	0.003	47,403	1.30	0.219
GM-104	M-77	M-76	8	342	0.004	199,853	2.11	0.437
GM-105	M-76	M-75	8	342	0.004	215,971	2.03	0.477
GM-106	M-75	M-390	8	340	0.003	225,908	2.01	0.499
GM-107	M-391	M-392	8	271	0.004	242,433	2.13	0.504
GM-108	M-390	M-391	8	163	0.003	232,403	2.04	0.504
GM-109	M-392	M-162	8	276	0.003	246,507	1.99	0.539
GM-11	M-12	M-11	10	326	0.004	38,821	1.22	0.145
GM-110	M-57	M-59	8	326	0.003	101,204	1.55	0.331
GM-111	M-59	M-60	8	332	0.003	117,710	1.66	0.351
GM-112	M-60	M-61	8	328	0.003	126,826	1.71	0.364
GM-113	M-61	M-66	8	330	0.004	141,666	1.96	0.356
GM-114	M-66	M-67	8	329	0.004	151,743	1.95	0.376
GM-115	M-67	M-403	8	330	0.006	169,828	2.30	0.362
GM-116	M-403	M-404	8	329	0.005	183,746	2.27	0.388
GM-117	M-404	M-77	8	337	0.004	199,853	2.10	0.438
GM-118	M-54	M-55	8	351	0.003	66,402	1.38	0.266
GM-119	M-55	M-56	8	345	0.003	80,476	1.46	0.294
GM-12	M-11	M-10	10	326	0.004	54,056	1.35	0.171
GM-120	M-56	M-57	8	330	0.003	92,202	1.52	0.315
GM-121	M-47	M-48	8	269	0.003	18,388	0.92	0.144
GM-122	M-410	M-164	8	147	0.027	275,323	4.57	0.313
GM-123	M-73	M-74	8	340	0.004	257,100	2.20	0.513
GM-124	M-74	M-167	8	341	0.004	266,076	2.22	0.525
GM-125	M-167	M-168	8	237	0.004	273,673	2.24	0.534
GM-126	M-168	M-410	8	348	0.003	273,673	1.99	0.587
GM-127	M-52	M-63	8	240	0.004	99,220	1.69	0.307
GM-128	M-63	M-62	8	326	0.004	118,788	1.81	0.332
GM-129	M-62	M-411	8	330	0.004	131,242	1.91	0.344
GM-13	M-10	M-376	10	326	0.004	61,907	1.41	0.183
GM-130	M-411	M-68	8	330	0.004	167,855	1.97	0.403
GM-131	M-68	M-69	8	375	0.005	176,944	2.17	0.390
GM-132	M-69	M-70	8	285	0.003	210,045	1.85	0.504
GM-133	M-70	M-71	8	330	0.004	218,202	2.11	0.467
GM-134	M-71	M-72	8	340	0.004	228,875	2.14	0.480
GM-135	M-72	M-73	8	341	0.004	238,859	2.17	0.491
GM-136	M-48	M-49	8	269	0.003	31,305	1.08	0.186
GM-137	M-49	M-50	8	269	0.003	44,703	1.20	0.222
GM-138	M-51	M-52	8	247	0.001	81,171	0.94	0.407
GM-139	M-50	M-51	8	269	0.003	63,669	1.33	0.265

Table A-1
Maywood Sewer Model Output
Peak Flow Simulation

ID	From ID	To ID	Diameter (in)	Length (ft)	Slope	Total Flow (gpd)	Velocity (ft/s)	d/D
GM-14	M-376	M-375	10	326	0.004	68,882	1.45	0.192
GM-140	M-407	M-378	8	241	0.008	2,750	0.75	0.045
GM-141	M-383	M-384	8	326	0.003	19,427	0.94	0.148
GM-142	M-384	M-385	8	326	0.003	20,723	0.96	0.152
GM-143	M-385	M-386	8	326	0.003	23,100	0.99	0.160
GM-144	M-387	M-386	8	230	0.003	3,390	0.56	0.064
GM-145	M-378	M-379	8	281	0.003	5,508	0.64	0.081
GM-146	M-379	M-380	8	281	0.003	6,285	0.67	0.086
GM-147	M-380	M-381	8	281	0.003	6,770	0.69	0.089
GM-148	M-382	M-383	8	326	0.003	15,228	0.87	0.131
GM-149	M-381	M-382	8	281	0.003	10,184	0.77	0.108
GM-15	M-375	M-374	10	326	0.004	75,602	1.50	0.201
GM-150	M-236	M-268	8	292	0.003	11,726	0.79	0.117
GM-151	M-262	M-257	8	337	0.007	53,499	1.75	0.193
GM-152	M-268	M-261	8	289	0.002	25,141	0.86	0.188
GM-153	M-261	M-262	8	340	0.002	41,253	1.11	0.221
GM-154	M-252	M-253	8	269	0.004	9,560	0.86	0.096
GM-155	M-253	M-254	12	335	0.004	9,560	0.78	0.059
GM-157	M-249	M-250	12	271	0.003	28,197	1.01	0.104
GM-158	M-246	M-248	12	260	0.003	25,358	0.93	0.102
GM-16	M-374	M-373	10	326	0.004	83,408	1.53	0.212
GM-161	M-228	M-413	8	282	0.006	0	0.00	0.000
GM-162	M-238	M-267	8	291	0.002	11,904	0.70	0.129
GM-163	M-265	M-263	8	338	0.002	60,176	1.18	0.278
GM-164	M-267	M-266	8	289	0.001	26,452	0.82	0.200
GM-165	M-266	M-265	8	340	0.002	44,567	1.10	0.236
GM-166	M-241	M-271	8	211	0.005	13,729	1.02	0.110
GM-167	M-288	M-289	8	340	0.001	58,832	0.76	0.377
GM-168	M-399	M-288	8	340	0.003	43,664	1.28	0.208
GM-169	M-271	M-399	8	330	0.003	27,527	1.10	0.168
GM-17	M-16	M-15	8	237	0.004	7,128	0.76	0.086
GM-170	M-273	M-272	8	286	0.003	18,903	0.98	0.141
GM-171	M-301	M-290	8	339	0.004	61,388	1.43	0.245
GM-172	M-287	M-301	8	336	0.004	49,757	1.34	0.221
GM-173	M-272	M-287	8	296	0.003	35,234	1.17	0.191
GM-174	M-286	M-285	8	207	0.002	18,118	0.83	0.152
GM-175	M-292	M-291	8	339	0.002	69,300	1.23	0.298
GM-176	M-284	M-292	8	341	0.002	51,855	1.13	0.257
GM-177	M-285	M-284	8	332	0.002	34,993	1.01	0.211
GM-178	M-239	M-240	8	350	0.005	10,052	0.96	0.093
GM-18	M-15	M-14	8	349	0.004	15,057	0.95	0.123
GM-181	M-278	M-279	8	329	0.003	11,259	0.83	0.110
GM-183	M-240	M-274	8	350	0.004	20,194	1.04	0.142
GM-184	M-274	M-275	8	348	0.003	26,386	1.11	0.163
GM-185	M-275	M-425	8	217	0.001	30,859	0.73	0.243

Table A-1
Maywood Sewer Model Output
Peak Flow Simulation

ID	From ID	To ID	Diameter (in)	Length (ft)	Slope	Total Flow (gpd)	Velocity (ft/s)	d/D
GM-188	M-295	M-294	8	213	0.002	12,599	0.77	0.126
GM-189	M-294	M-299	8	339	0.002	32,386	1.02	0.199
GM-19	M-1	M-2	8	259	0.003	17,515	0.91	0.140
GM-190	M-296	M-297	8	214	0.004	17,634	1.07	0.126
GM-191	M-297	M-298	8	341	0.000	35,921	0.61	0.308
GM-192	M-280	M-283	8	129	0.006	8,380	0.95	0.083
GM-193	M-283	M-310	8	353	0.005	18,224	1.15	0.123
GM-194	M-310	M-311	8	351	0.004	26,490	1.16	0.158
GM-195	M-311	M-312	8	349	0.001	36,118	0.83	0.248
GM-196	M-281	M-282	8	180	0.006	12,265	1.07	0.098
GM-197	M-282	M-329	8	346	0.003	22,296	1.05	0.150
GM-198	M-329	M-328	8	343	0.004	39,957	1.32	0.192
GM-199	M-328	M-325	8	342	0.010	51,751	1.93	0.176
GM-2	M-373	M-369	10	337	0.004	91,829	1.58	0.222
GM-20	M-124	M-122	8	342	0.003	195,796	1.84	0.478
GM-200	M-316	M-313	8	265	0.004	0	0.00	0.000
GM-201	M-313	M-312	8	264	0.000	15,494	0.34	0.256
GM-202	M-304	M-303	8	214	0.009	9,278	1.13	0.079
GM-203	M-303	M-302	8	340	0.002	19,215	0.83	0.159
GM-204	M-309	M-308	8	214	0.001	13,439	0.51	0.176
GM-205	M-308	M-307	8	341	0.001	28,328	0.63	0.255
GM-207	M-289	M-290	8	351	0.001	61,185	0.71	0.405
GM-208	M-290	M-291	8	351	0.002	124,337	1.49	0.397
GM-209	M-291	M-435	8	334	0.003	193,637	1.83	0.476
GM-21	M-122	M-123	8	341	0.003	202,573	1.93	0.474
GM-210	M-300	M-299	10	351	0.003	284,195	2.09	0.409
GM-211	M-299	M-298	10	350	0.003	318,346	2.10	0.446
GM-212	M-298	M-302	10	350	0.003	355,985	2.16	0.475
GM-213	M-302	M-306	10	350	0.003	376,376	2.23	0.484
GM-214	M-335	M-334	10	273	0.004	16,058	0.98	0.093
GM-215	M-334	M-333	10	296	0.004	26,134	1.13	0.117
GM-216	M-333	M-324	10	346	0.004	43,319	1.31	0.150
GM-217	M-324	M-323	10	346	0.006	58,906	1.62	0.160
GM-218	M-337	M-338	8	352	0.003	80,934	1.41	0.302
GM-219	M-338	M-332	8	360	0.003	86,583	1.44	0.313
GM-22	M-123	M-367	8	342	0.005	219,082	2.29	0.441
GM-220	M-332	M-331	8	270	0.003	109,741	1.51	0.359
GM-221	M-225	M-394	8	300	0.003	15,226	0.86	0.133
GM-222	M-394	M-393	8	386	0.003	41,957	1.22	0.209
GM-223	M-393	M-395	8	344	0.003	57,951	1.35	0.245
GM-224	M-395	M-337	8	354	0.007	73,163	1.93	0.224
GM-225	M-223	M-396	8	313	0.004	14,925	0.98	0.119
GM-226	M-396	M-408	8	296	0.006	18,072	1.20	0.118
GM-227	M-226	M-227	8	255	0.012	19,108	1.58	0.102
GM-228	M-227	M-413	8	292	0.012	25,481	1.72	0.117

Table A-1
Maywood Sewer Model Output
Peak Flow Simulation

ID	From ID	To ID	Diameter (in)	Length (ft)	Slope	Total Flow (gpd)	Velocity (ft/s)	d/D
GM-229	M-222	M-221	8	296	0.004	12,889	0.94	0.111
GM-23	M-367	M-365	8	342	0.003	228,198	1.83	0.542
GM-230	M-221	M-220	8	346	0.004	37,563	1.29	0.186
GM-231	M-220	M-219	8	330	0.011	46,578	1.99	0.161
GM-232	M-219	M-359	8	329	0.003	53,344	1.26	0.243
GM-233	M-359	M-340	10	370	0.005	58,600	1.50	0.168
GM-234	M-340	M-341	10	371	0.002	86,023	1.35	0.236
GM-235	M-341	M-342	10	350	0.003	94,375	1.47	0.238
GM-236	M-342	M-415	10	349	0.000	102,113	0.60	0.485
GM-237	M-242	M-270	12	260	0.004	14,085	0.91	0.069
GM-238	M-270	M-416	12	261	0.006	23,951	1.26	0.080
GM-239	M-247	M-248	15	333	0.005	4,624	0.67	0.030
GM-24	M-365	M-366	8	340	0.003	239,297	2.03	0.518
GM-240	M-248	M-416	15	341	0.005	34,288	1.21	0.077
GM-241	M-416	M-260	15	280	0.014	58,239	2.09	0.077
GM-242	M-245	M-244	8	234	0.005	7,187	0.82	0.082
GM-243	M-243	M-412	8	338	0.001	23,694	0.69	0.209
GM-244	M-412	M-234	8	338	0.004	64,005	1.47	0.248
GM-245	M-234	M-235	8	339	0.010	71,648	2.15	0.205
GM-246	M-244	M-243	8	240	0.001	10,255	0.55	0.137
GM-247	M-414	M-237	8	293	0.004	8,063	0.80	0.090
GM-248	M-237	M-235	8	293	0.004	11,680	0.90	0.107
GM-249	M-232	M-233	8	231	0.004	4,189	0.67	0.065
GM-250	M-233	M-412	8	326	0.004	35,641	1.27	0.182
GM-251	M-215	M-397	8	332	0.002	12,632	0.79	0.123
GM-252	M-397	M-360	8	335	0.001	20,669	0.70	0.189
GM-253	M-216	M-398	8	291	0.003	20,085	0.92	0.153
GM-254	M-398	M-361	8	292	0.000	28,405	0.55	0.281
GM-255	M-206	M-207	8	309	0.005	16,091	1.07	0.119
GM-256	M-207	M-208	8	316	0.003	26,929	1.03	0.173
GM-257	M-417	M-199	8	330	0.002	62,500	1.19	0.283
GM-258	M-208	M-417	8	331	0.002	40,508	1.05	0.228
GM-26	M-5	M-6	8	332	0.003	89,881	1.55	0.304
GM-263	M-217	M-218	8	349	0.005	39,339	1.42	0.181
GM-265	M-201	M-202	8	266	0.000	62,855	0.61	0.468
GM-268	M-203	M-204	8	93	0.003	70,199	1.39	0.276
GM-269	M-150	M-151	8	255	0.003	9,040	0.80	0.098
GM-27	M-4	M-5	8	331	0.009	71,295	2.10	0.208
GM-270	M-195	M-209	8	324	0.004	49,561	1.39	0.216
GM-271	M-209	M-211	8	303	0.008	121,345	2.29	0.285
GM-272	M-211	M-189	8	293	0.006	136,779	2.15	0.326
GM-273	M-151	M-152	8	253	0.003	16,175	0.95	0.129
GM-274	M-152	M-195	8	360	0.003	49,561	1.23	0.234
GM-275	M-141	M-149	8	290	0.002	6,559	0.57	0.098
GM-276	M-149	M-152	8	428	0.002	18,778	0.84	0.155

Table A-1
Maywood Sewer Model Output
Peak Flow Simulation

ID	From ID	To ID	Diameter (in)	Length (ft)	Slope	Total Flow (gpd)	Velocity (ft/s)	d/D
GM-277	M-153	M-154	8	270	0.003	17,070	0.88	0.141
GM-278	M-194	M-209	8	333	0.003	58,651	1.29	0.256
GM-279	M-154	M-155	8	273	0.003	32,564	1.12	0.186
GM-28	M-6	M-7	8	331	0.003	104,934	1.49	0.350
GM-280	M-155	M-194	8	345	0.005	54,271	1.57	0.211
GM-281	M-159	M-158	8	303	0.006	19,327	1.20	0.124
GM-282	M-192	M-191	8	296	0.003	64,471	1.34	0.267
GM-283	M-191	M-188	8	331	0.008	71,344	1.99	0.216
GM-284	M-193	M-192	8	312	0.003	53,264	1.26	0.242
GM-285	M-157	M-193	8	312	0.003	37,866	1.14	0.204
GM-286	M-158	M-157	8	300	0.006	28,955	1.35	0.151
GM-287	M-177	M-181	8	315	0.003	1,176	0.41	0.038
GM-288	M-185	M-186	8	300	0.005	29,575	1.28	0.159
GM-289	M-186	M-187	8	189	0.002	29,575	0.95	0.196
GM-29	M-7	M-8	8	331	0.002	116,053	1.49	0.378
GM-290	M-184	M-185	8	354	0.004	23,378	1.12	0.149
GM-291	M-181	M-182	8	300	0.003	4,706	0.63	0.074
GM-292	M-182	M-183	8	302	0.002	12,093	0.77	0.122
GM-293	M-183	M-184	8	354	0.004	22,507	1.12	0.144
GM-294	M-172	M-173	8	163	0.005	1,263	0.49	0.036
GM-295	M-174	M-175	8	163	0.004	1,263	0.46	0.037
GM-296	M-173	M-174	8	147	0.005	1,263	0.49	0.036
GM-297	M-176	M-160	8	172	0.004	15,128	0.98	0.121
GM-298	M-418	M-142	8	353	0.004	18,816	1.05	0.133
GM-299	M-160	M-418	8	336	0.004	15,128	0.99	0.120
GM-3	M-369	M-370	10	341	0.004	96,791	1.60	0.228
GM-30	M-8	M-405	8	331	0.003	127,864	1.69	0.369
GM-303	M-187	M-190	10	102	0.002	237,698	1.66	0.426
GM-304	M-347	M-346	10	212	0.002	408,829	1.92	0.581
GM-305	M-346	M-345	10	213	0.002	408,829	1.90	0.586
GM-306	M-345	M-344	10	181	0.002	408,829	1.91	0.585
GM-307	M-205	M-204	10	214	0.004	338,014	2.36	0.426
GM-308	M-204	M-347	10	282	0.004	408,829	2.49	0.473
GM-309	M-196	M-197	10	259	0.002	247,015	1.69	0.433
GM-31	M-405	M-126	8	332	0.003	138,901	1.75	0.383
GM-310	M-197	M-205	10	214	0.002	338,014	1.95	0.493
GM-311	M-190	M-196	10	296	0.002	237,698	1.67	0.424
GM-312	M-358	M-357	8	304	0.003	723	0.36	0.031
GM-313	M-351	M-344	8	246	0.002	30,528	0.95	0.200
GM-314	M-350	M-351	8	253	0.003	30,528	1.16	0.174
GM-315	M-353	M-352	8	325	0.002	25,560	0.98	0.173
GM-316	M-352	M-350	8	350	0.002	30,528	1.03	0.189
GM-317	M-354	M-353	8	301	0.003	20,593	0.94	0.153
GM-318	M-356	M-355	8	305	0.003	10,658	0.80	0.109
GM-319	M-355	M-354	8	299	0.003	15,625	0.89	0.132

Table A-1
Maywood Sewer Model Output
Peak Flow Simulation

ID	From ID	To ID	Diameter (in)	Length (ft)	Slope	Total Flow (gpd)	Velocity (ft/s)	d/D
GM-32	M-126	M-125	8	328	0.003	153,006	1.78	0.405
GM-320	M-357	M-356	8	317	0.003	5,690	0.64	0.083
GM-321	M-64	M-63	8	179	0.005	1,100	0.49	0.033
GM-322	M-386	M-411	8	339	0.000	27,039	0.47	0.304
GM-323	M-65	M-61	8	180	0.005	2,200	0.60	0.045
GM-324	M-84	M-85	8	173	0.006	3,207	0.72	0.052
GM-325	M-90	M-91	8	40	0.009	1,650	0.67	0.035
GM-326	M-91	M-87	8	78	0.009	2,200	0.73	0.040
GM-327	M-53	M-56	8	176	0.003	1,557	0.44	0.045
GM-328	M-58	M-39	8	176	0.003	6,503	0.68	0.087
GM-329	M-38	M-37	8	178	0.003	12,681	0.82	0.121
GM-33	M-125	M-124	8	332	0.003	167,053	1.87	0.418
GM-330	M-44	M-43	8	245	0.004	2,560	0.57	0.052
GM-331	M-42	M-34	8	288	0.003	10,023	0.77	0.107
GM-332	M-27	M-26	8	266	0.003	3,954	0.58	0.069
GM-333	M-25	M-1	8	301	0.003	3,650	0.56	0.067
GM-334	M-406	M-1	8	146	0.003	2,544	0.51	0.056
GM-335	M-32	M-31	8	176	0.003	2,200	0.49	0.052
GM-336	M-22	M-21	8	176	0.006	3,710	0.74	0.056
GM-337	M-18	M-19	8	191	0.005	0	0.00	0.000
GM-338	M-98	M-99	8	190	0.004	3,207	0.63	0.057
GM-339	M-97	M-99	8	190	0.006	4,120	0.76	0.059
GM-34	M-2	M-3	8	257	0.003	29,893	1.07	0.182
GM-340	M-107	M-106	8	188	0.000	4,167	0.31	0.111
GM-341	M-105	M-104	8	188	0.002	4,045	0.52	0.076
GM-342	M-9	M-8	8	190	0.005	0	0.00	0.000
GM-343	M-111	M-110	8	191	0.005	2,750	0.65	0.050
GM-344	M-402	M-409	8	188	0.005	1,100	0.48	0.033
GM-345	M-121	M-120	8	188	0.003	1,100	0.40	0.037
GM-346	M-368	M-123	8	190	0.005	563	0.38	0.025
GM-347	M-214	M-215	8	189	0.002	1,548	0.42	0.046
GM-35	M-3	M-4	8	257	0.003	41,833	1.18	0.215
GM-350	M-156	M-155	8	133	0.004	2,353	0.56	0.050
GM-352	M-179	M-178	8	130	0.029	0	0.00	0.000
GM-353	M-180	M-178	8	279	0.003	0	0.00	0.000
GM-354	M-178	M-177	8	279	0.004	0	0.00	0.000
GM-355	M-166	M-165	12	325	0.004	13,134	0.90	0.067
GM-356	M-146	M-145	8	178	0.007	2,780	0.70	0.048
GM-357	M-134	M-137	8	176	0.008	2,200	0.70	0.041
GM-358	M-388	M-171	18	266	0.002	0	0.00	0.000
GM-359	M-169	M-170	12	483	0.009	0	0.00	0.000
GM-36	M-26	M-24	8	281	0.003	15,014	0.86	0.131
GM-360	M-133	M-132	8	180	0.008	1,557	0.64	0.035
GM-361	M-83	M-81	8	180	0.005	2,657	0.63	0.050
GM-362	M-117	M-116	8	189	0.004	3,021	0.61	0.056

Table A-1
Maywood Sewer Model Output
Peak Flow Simulation

ID	From ID	To ID	Diameter (in)	Length (ft)	Slope	Total Flow (gpd)	Velocity (ft/s)	d/D
GM-363	M-113	M-114	8	190	0.003	3,300	0.58	0.061
GM-364	M-109	M-110	8	187	0.005	2,200	0.62	0.045
GM-365	M-364	M-363	8	190	0.005	0	0.00	0.000
GM-366	M-401	M-365	8	188	0.002	1,192	0.33	0.045
GM-369	M-349	M-348	8	268	0.004	0	0.00	0.000
GM-37	M-127	M-120	8	340	0.003	172,230	1.88	0.426
GM-370	M-348	M-343	8	271	0.005	0	0.00	0.000
GM-371	M-343	M-419	15	310	0.002	541,469	2.04	0.368
GM-372	M-312	M-305	15	339	0.002	877,509	2.26	0.492
GM-373	M-305	M-306	15	347	0.002	888,127	2.29	0.492
GM-374	M-325	M-312	15	330	0.002	815,361	2.24	0.468
GM-375	M-323	M-325	15	325	0.002	737,672	2.14	0.448
GM-376	M-419	M-323	15	335	0.002	656,448	2.08	0.420
GM-377	M-307	M-306	8	350	0.003	30,588	1.10	0.181
GM-378	M-316	M-315	8	276	0.007	0	0.00	0.000
GM-379	M-339	M-322	8	256	0.004	0	0.00	0.000
GM-38	M-120	M-128	8	342	0.003	182,129	1.90	0.440
GM-380	M-327	M-317	8	182	0.027	0	0.00	0.000
GM-381	M-327	M-326	8	262	0.004	0	0.00	0.000
GM-382	M-326	M-325	8	258	0.005	21,820	1.17	0.137
GM-383	M-321	M-320	8	288	0.003	18,492	0.94	0.143
GM-384	M-314	M-420	8	319	0.003	113,127	1.65	0.344
GM-385	M-315	M-314	8	343	0.003	96,079	1.54	0.321
GM-386	M-317	M-315	8	320	0.003	63,744	1.31	0.269
GM-387	M-318	M-317	8	318	0.003	45,422	1.25	0.218
GM-388	M-320	M-319	8	292	0.003	23,526	1.05	0.156
GM-389	M-319	M-318	8	331	0.002	27,340	0.97	0.183
GM-39	M-363	M-362	8	341	0.006	206,405	2.48	0.396
GM-391	M-377	M-47	8	182	0.003	6,806	0.69	0.089
GM-392	M-46	M-45	8	275	0.005	15,961	1.06	0.119
GM-393	M-33	M-28	8	251	0.003	0	0.00	0.000
GM-394	M-162	M-161	8	83	0.004	246,507	2.28	0.483
GM-396	M-251	M-250	12	334	0.003	21,374	0.94	0.090
GM-397	M-250	M-254	12	343	0.007	53,966	1.67	0.115
GM-398	M-255	M-256	8	42	0.002	63,526	1.26	0.275
GM-399	M-254	M-255	12	277	0.026	63,526	2.78	0.091
GM-4	M-370	M-371	10	341	0.004	102,240	1.63	0.234
GM-40	M-128	M-363	8	339	0.005	190,145	2.22	0.405
GM-400	M-257	M-256	8	336	0.003	115,325	1.66	0.347
GM-401	M-263	M-257	8	331	0.004	60,176	1.45	0.240
GM-402	M-175	M-176	8	18	0.005	15,128	1.07	0.114
GM-403	M-188	M-187	8	28	0.007	208,123	2.59	0.386
GM-404	M-189	M-188	8	59	0.007	136,779	2.26	0.313
GM-406	M-339	M-318	8	179	0.022	0	0.00	0.000
GM-407	M-322	M-323	8	246	0.006	22,318	1.25	0.133

Table A-1
Maywood Sewer Model Output
Peak Flow Simulation

ID	From ID	To ID	Diameter (in)	Length (ft)	Slope	Total Flow (gpd)	Velocity (ft/s)	d/D
GM-408	M-306	M-426	15	136	0.017	1,295,092	5.68	0.330
GM-409	M-171	M-170	18	70	0.004	0	0.00	0.000
GM-41	M-362	M-361	8	333	0.002	217,465	1.50	0.614
GM-410	M-360	M-408	24	351	0.003	2,145,745	3.23	0.363
GM-411	M-361	M-360	24	359	0.003	1,860,106	3.11	0.336
GM-412	M-140	M-361	24	371	0.003	1,614,235	2.99	0.312
GM-413	M-142	M-140	24	352	0.003	1,348,552	2.93	0.278
GM-414	M-161	M-142	24	341	0.001	1,081,129	1.71	0.349
GM-415	M-164	M-163	21	226	0.003	581,507	2.39	0.214
GM-416	M-163	M-161	21	223	0.004	581,507	2.48	0.208
GM-417	M-170	M-165	21	195	0.003	286,544	1.84	0.156
GM-418	M-165	M-164	21	237	0.002	300,778	1.71	0.170
GM-419	M-143	M-421	8	446	0.004	5,756	0.74	0.076
GM-42	M-20	M-19	8	329	0.003	63,115	1.40	0.253
GM-421	M-422	M-423	8	351	0.004	17,822	1.04	0.130
GM-422	M-421	M-422	8	356	0.004	10,752	0.89	0.102
GM-423	M-408	M-413	24	332	0.003	2,297,187	3.29	0.376
GM-424	M-258	M-256	24	350	0.003	2,513,772	3.37	0.395
GM-425	M-259	M-258	24	335	0.003	2,513,772	3.37	0.395
GM-426	M-455	M-259	24	324	0.003	2,431,554	3.34	0.388
GM-427	M-235	M-455	24	337	0.003	2,412,199	3.33	0.387
GM-428	M-413	M-235	24	332	0.003	2,327,280	3.30	0.379
GM-434	M-428	M-429	8	326	0.004	0	0.00	0.000
GM-435	M-427	M-428	8	325	0.003	11,055	0.79	0.112
GM-435A	M-428	M-455	8	4	0.685	19,355	6.38	0.040
GM-436	M-260	M-429	10	47	0.010	58,239	1.98	0.138
GM-436A	M-429	M-259	8	4	0.043	82,219	3.75	0.153
GM-437	M-344	M-415	10	31	0.038	439,357	5.74	0.269
GM-438	M-415	M-343	15	32	0.028	541,469	5.27	0.187
GM-44	M-106	M-108	8	330	0.004	105,179	1.71	0.317
GM-441	M-425	M-433	8	214	0.003	34,225	1.19	0.186
GM-442	M-433	M-438	8	218	0.004	35,850	1.24	0.186
GM-443	M-438	M-434	8	246	0.003	41,027	1.24	0.205
GM-445	M-439	M-435	8	334	0.004	59,121	1.42	0.240
GM-446	M-434	M-439	8	348	0.003	51,123	1.34	0.225
GM-449	M-443	M-332	8	108	0.012	0	0.00	0.000
GM-45	M-110	M-112	8	326	0.004	137,466	1.82	0.369
GM-450	M-445	M-359	10	316	0.001	0	0.00	0.000
GM-453	M-202	M-448	8	349	0.002	68,014	1.25	0.290
GM-454	M-448	M-203	8	85	0.002	68,014	1.25	0.290
GM-455	M-446	M-246	12	257	0.003	0	0.00	0.000
GM-456	M-444	M-249	12	270	0.001	0	0.00	0.000
GM-458	M-331	M-419	8	430	0.003	109,741	1.52	0.356
GM-459	M-279	M-300	8	336	0.003	26,561	1.08	0.166
GM-46	M-108	M-110	8	328	0.003	117,447	1.64	0.354

Table A-1
Maywood Sewer Model Output
Peak Flow Simulation

ID	From ID	To ID	Diameter (in)	Length (ft)	Slope	Total Flow (gpd)	Velocity (ft/s)	d/D
GM-460	M-218	M-201	8	379	0.000	53,750	0.57	0.437
GM-461	M-450	M-451	8	98	0.001	90,999	0.94	0.444
GM-462	M-451	M-452	8	87	0.000	90,999	0.58	0.656
GM-463	M-199	M-450	8	144	0.005	62,500	1.60	0.229
GM-464	M-452	M-197	8	218	0.003	90,999	1.54	0.309
GM-465	M-19	M-440	8	329	0.003	81,077	1.40	0.303
GM-466	M-440	M-106	8	329	0.002	92,585	1.31	0.352
GM-467	M-224	M-449	8	227	0.003	0	0.00	0.000
GM-468	M-449	M-427	8	333	0.003	0	0.00	0.000
GM-469	M-430	M-256	8	336	0.008	0	0.00	0.000
GM-47	M-409	M-127	8	341	0.004	165,499	1.90	0.411
GM-473	M-366	M-360	8	329	0.003	247,149	2.05	0.527
GM-475	M-435	M-300	8	10	0.097	252,758	6.98	0.217
GM-477	M-400	M-423	8	241	0.004	0	0.00	0.000
GM-478	M-453	M-278	8	285	0.002	2,755	0.44	0.066
GM-48	M-112	M-409	8	322	0.004	154,262	1.91	0.387
GM-49	M-24	M-23	8	278	0.003	29,249	1.06	0.180
GM-5	M-371	M-372	10	339	0.004	109,025	1.66	0.242
GM-50	M-23	M-21	8	279	0.003	45,862	1.20	0.225
GM-51	M-21	M-20	8	331	0.009	56,842	1.95	0.187
GM-517	M-423	M-360	8	13	0.317	17,822	4.77	0.046
GM-52	M-28	M-29	8	293	0.003	43,740	1.19	0.219
GM-53	M-118	M-119	8	340	0.004	219,439	2.21	0.452
GM-54	M-119	M-129	8	340	0.005	232,785	2.33	0.455
GM-55	M-129	M-130	8	340	0.005	242,356	2.36	0.465
GM-56	M-130	M-139	8	340	0.003	260,323	2.04	0.552
GM-57	M-139	M-140	8	335	0.003	265,683	2.01	0.567
GM-58	M-100	M-99	8	328	0.003	100,135	1.49	0.339
GM-59	M-99	M-96	8	332	0.003	120,280	1.70	0.352
GM-6	M-372	M-230	10	337	0.004	109,025	1.66	0.242
GM-60	M-96	M-104	8	328	0.003	130,896	1.68	0.377
GM-61	M-104	M-103	8	332	0.003	152,730	1.78	0.405
GM-62	M-103	M-116	8	330	0.003	166,694	1.78	0.434
GM-63	M-116	M-115	8	333	0.003	178,328	1.91	0.432
GM-64	M-115	M-114	8	329	0.004	189,365	2.11	0.420
GM-65	M-114	M-118	8	342	0.003	205,797	1.97	0.471
GM-66	M-29	M-30	8	293	0.003	54,578	1.27	0.245
GM-67	M-30	M-31	8	293	0.003	66,088	1.35	0.270
GM-68	M-31	M-100	8	333	0.009	88,690	2.20	0.235
GM-69	M-34	M-35	8	310	0.003	33,821	1.11	0.193
GM-7	M-231	M-408	10	333	0.005	126,711	1.89	0.245
GM-70	M-135	M-136	8	340	0.004	211,209	2.16	0.447
GM-71	M-136	M-137	8	341	0.004	224,137	2.16	0.468
GM-72	M-137	M-138	8	340	0.004	239,562	2.25	0.478
GM-73	M-138	M-142	8	335	0.001	248,607	1.36	0.755

Table A-1
Maywood Sewer Model Output
Peak Flow Simulation

ID	From ID	To ID	Diameter (in)	Length (ft)	Slope	Total Flow (gpd)	Velocity (ft/s)	d/D
GM-74	M-101	M-88	8	330	0.002	94,245	1.41	0.338
GM-75	M-88	M-89	8	330	0.003	107,567	1.66	0.329
GM-76	M-89	M-92	8	329	0.003	119,496	1.63	0.361
GM-77	M-92	M-93	8	331	0.003	132,839	1.76	0.368
GM-78	M-93	M-94	8	331	0.004	143,326	1.87	0.373
GM-79	M-94	M-95	8	330	0.005	152,806	2.05	0.366
GM-8	M-230	M-231	10	126	0.016	126,711	2.95	0.180
GM-80	M-95	M-132	8	330	0.004	166,221	1.98	0.398
GM-81	M-132	M-131	8	340	0.004	184,191	2.03	0.422
GM-82	M-131	M-135	8	340	0.004	193,625	1.96	0.451
GM-83	M-35	M-36	8	314	0.003	50,641	1.24	0.237
GM-84	M-36	M-37	8	312	0.003	58,083	1.29	0.253
GM-85	M-37	M-101	8	331	0.009	79,835	2.19	0.219
GM-86	M-43	M-41	8	329	0.003	19,833	0.94	0.149
GM-87	M-78	M-148	8	339	0.003	196,737	1.91	0.466
GM-88	M-148	M-147	8	342	0.005	211,930	2.24	0.436
GM-89	M-147	M-145	8	340	0.004	222,874	2.16	0.466
GM-9	M-14	M-13	8	326	0.004	23,706	1.09	0.153
GM-90	M-145	M-144	8	342	0.005	240,989	2.30	0.472
GM-91	M-144	M-161	8	332	0.004	253,115	2.23	0.503
GM-92	M-102	M-87	8	330	0.003	81,105	1.43	0.299
GM-93	M-87	M-86	8	331	0.003	92,878	1.55	0.311
GM-94	M-86	M-85	8	329	0.003	106,843	1.56	0.344
GM-95	M-85	M-82	8	331	0.003	123,686	1.72	0.356
GM-96	M-82	M-81	8	329	0.003	137,100	1.79	0.373
GM-97	M-81	M-80	8	332	0.004	157,199	1.96	0.385
GM-98	M-80	M-79	8	328	0.004	169,689	2.06	0.393
GM-99	M-79	M-78	8	344	0.004	181,546	2.02	0.420