SANITARY SEWER MAP

SCALE: 1" = 150'

0 75' 150' 300'

North

ENGINEERING SOLUTIONS
ENGINEERING & SURVEYING
50 SE 30TH STREET
LEE'S SUMMIT, MO 64082
P:(816) 623-9888 F:(816)623-9849

Professional Registration
Missouri
Engineering 2005002186-D
Surveying 2005008319-D
Kansas
Engineering E-1695
Surveying LS-218
Oklahoma
Engineering 6254
Nebraska
Engineering CA2821

Part of the Southeast $\frac{1}{4}$
Section 27, Township 48 North, Range 31 West
Lee's Summit, Jackson County, Missouri

Project: WOODLAND OAKS LSMO
Issue Date: February 25, 2020

Existing Sanitary Sewer Map

Preliminary Development Plans for:
Lots 1 thru 42
WOODLAND OAKS
Lee's Summit, Jackson County, Missouri

STATE OF MISSOURI
MATTHEW J. SCHLICHT
NUMBER 2006019708
PROFESSIONAL ENGINEER

Matthew J. Schlicht
MO PE 2006019708
KS PE 19071
OK PE 25226
NE PE E-14335

REVISIONS

City Comments 3-24-20

City Comments 3-31-20

C.300

Existing Woodland Shores Sanitary Sewer Capacity Analysis: Projected 50-Year Peak Flow based on Extrapolation of Recorded Data

D.S. Str.	U.S. Str.	U.S. Str. Area	Branch Area	Cum. Area	Peak Flow	Cum. Peak Flow	FL IN	FL OUT	Length	Slope	Dia	n	Line Capacity	Excess Capacity	Segment Condition	HGL	Rim El.	Surcharge Depth	U.S. Str.
26-273	26-274	1.78	0	1.78	0.035	0.035	941.15	945.00	237.16	1.62%	0.67	0.014	1.439	1.405	GRAVITY	945.67	956.92	0.00	26-274
26-271	26-273	2.19	5.2	7.39	0.145	0.180	939.63	940.95	219.69	0.60%	0.67	0.014	0.876	0.696	GRAVITY	941.62	952.87	0.00	26-273
26-270	26-271	1.61	1.34	2.95	0.058	0.238	937.97	939.13	192.77	0.60%	0.67	0.014	0.876	0.639	GRAVITY	939.80	956.52	0.00	26-271
26-269	26-270	0.01		0.01	0.000	0.238	936.76	937.70	156.05	0.60%	0.67	0.014	0.877	0.639	GRAVITY	938.37	944.26	0.00	26-270
26-268	26-269	0.84		0.84	0.016	0.254	935.33	936.26	155.8	0.60%	0.67	0.014	0.873	0.618	GRAVITY	936.93	953.2	0.00	26-269
26-267	26-268	0.97		0.97	0.019	0.273	930.60	934.83	211.33	2.00%	0.67	0.014	1.598	1.325	GRAVITY	935.50	950.1	0.00	26-268
26-266	26-267	1.34		1.34	0.026	0.300	929.40	930.40	167.43	0.60%	0.67	0.014	0.873	0.573	GRAVITY	931.07	942.61	0.00	26-267
26-265	26-266	0.01		0.01	0.000	0.300	928.26	929.20	156.76	0.60%	0.67	0.014	0.875	0.575	GRAVITY	929.87	937.07	0.00	26-266
26-264	26-265	1.82		1.82	0.036	0.336	926.70	928.06	226.47	0.60%	0.67	0.014	0.876	0.540	GRAVITY	928.73	943.5	0.00	26-265
26-262	26-264	1.7		1.7	0.033	0.369	922.08	924.86	145.6	1.91%	0.67	0.014	1.561	1.192	GRAVITY	925.53	935.4	0.00	26-264
26-261	26-262	1.43	0.81	2.24	0.044	0.413	919.94	921.08	285.68	0.40%	0.67	0.014	0.714	0.301	GRAVITY	921.75	929.81	0.00	26-262
26-260	26-261	1.25		1.25	0.025	0.437	919.03	919.74	177.07	0.40%	0.67	0.014	0.715	0.278	GRAVITY	920.41	930.3	0.00	26-261
26-259	26-260	1.75		1.75	0.034	0.472	918.08	918.53	111.51	0.40%	0.67	0.014	0.718	0.246	GRAVITY	919.20	936.74	0.00	26-260
26-258	26-259	0.01		0.01	0.000	0.472	917.48	917.58	25.39	0.39%	0.67	0.014	0.709	0.237	GRAVITY	918.25	922.57	0.00	26-259
26-253	26-258	0.01		0.01	0.000	0.472	916.92	917.28	89.74	0.40%	0.67	0.014	0.716	0.243	GRAVITY	917.95	921.75	0.00	26-258
26-238	26-253	0.37		0.37	0.007	0.479	916.17	916.42	61.32	0.41%	0.67	0.014	0.721	0.242	GRAVITY	917.09	925.37	0.00	26-253
26-237	26-238	1.77	12.19	13.96	0.274	0.753	915.06	915.82	155.42	0.49%	0.83	0.014	1.399	0.646	GRAVITY	916.65	923.27	0.00	26-238
26-236	26-237	0.01		0.01	0.000	0.753	914.40	914.76	81.53	0.44%	0.83	0.014	1.330	0.576	GRAVITY	915.59	924.26	0.00	26-237
26-235	26-236	1.17		1.17	0.023	0.776	914.00	914.25	72.25	0.35%	0.83	0.014	1.177	0.401	GRAVITY	915.08	936.02	0.00	26-236
26-234	26-235	0.01		0.01	0.000	0.777	913.27	913.80	135.75	0.39%	0.83	0.014	1.251	0.474	GRAVITY	914.64	932.6	0.01	26-235
26-233	26-234	1.62		1.62	0.032	0.808	912.42	912.87	83.25	0.54%	0.83	0.014	1.471	0.663	GRAVITY	914.11	924.09	0.41	26-234
26-232	26-233	1.77		1.77	0.035	0.843	911.71	911.91	48.96	0.41%	0.83	0.014	1.279	0.436	GRAVITY	913.66	927.24	0.92	26-233
26-192	26-232	0.01	3.36	3.37	0.066	0.909	910.72	911.35	71.09	0.89%	0.83	0.014	1.884	0.975	GRAVITY	913.46	920.61	1.28	26-232
26-174	26-192	0.01		0.01	0.000	0.909	910.44	910.72	138.65	0.20%	0.67	0.014	0.508	-0.402	SURCHARGE	912.67	920.5	1.28	26-192
26-173	26-174	1.31	1.51	2.82	0.055	0.965	909.08	910.29	175.24	0.69%	0.67	0.014	0.939	-0.026	SURCHARGE	911.78	933.94	0.82	26-174
26-170	26-173	0.9		0.9	0.018	0.982	907.29	908.78	255.05	0.58%	0.67	0.014	0.864	-0.119	SURCHARGE	910.50	924.38	1.05	26-173
26-169	26-170	2.17	1.64	3.81	0.075	1.057	906.27	907.09	167.06	0.49%	0.67	0.014	0.792	-0.266	SURCHARGE	908.57	923.04	0.81	26-170
26-168	26-169	0.96		0.96	0.019	1.076	905.37	906.12	117.73	0.64%	0.67	0.014	0.902	-0.174	SURCHARGE	907.11	923.32	0.32	26-169
26-167	26-168	0.72		0.72	0.014	1.090	904.12	905.17	78.86	1.33%	0.67	0.014	1.304	0.214	GRAVITY	905.84	921.47	0.00	26-168
26-166	26-167	0.01	19.65	19.66	0.386	1.476	903.00	903.96	14.36	6.69%	0.67	0.014	2.921	1.446	GRAVITY	904.63	916.68	0.00	26-167
26-002PS	26-166	0.01		0.01	0.000	1.476	902.00	902.90	7.37	12.21%	0.67	0.014	3.948	2.472	GRAVITY	903.57	916.07	0.00	26-166
				55.57															

Flow Test		
Recorder	MH 26-168	
Peak Flow	0.84	5-yr
Peak Flow	1.09	50-yr
Acreage	55.57	
Peak Flow	0.020	cfs/ac

Peak Wet Weather Flow Rate Calculation: Woodland Shores

Given a 2.78 in. Rain and an Intensity = 1.25 in/hr => Calc. Duration = 2.22 hrs

FYI: The given rainfall data equates to a 5-year storm event.

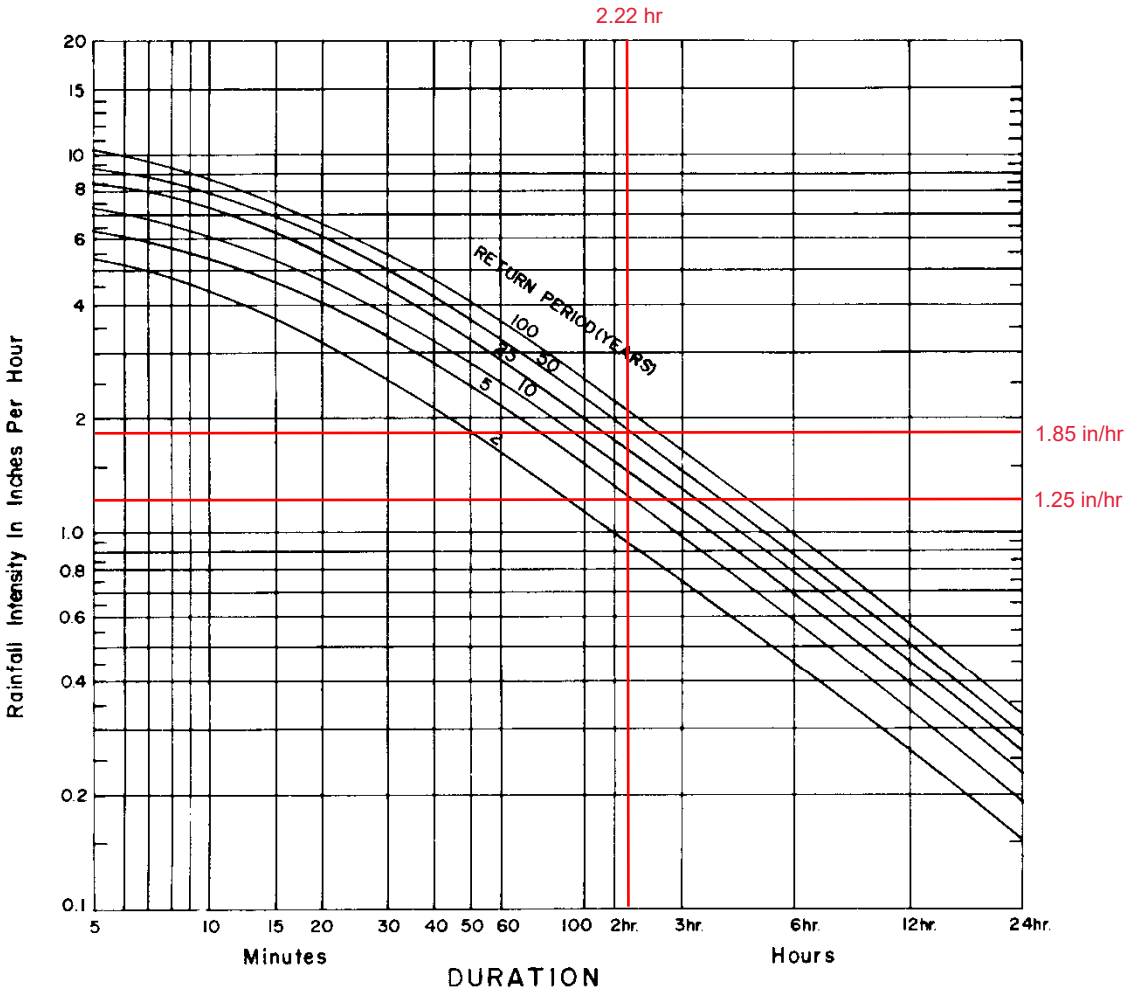
The objective is to determine the 50-year rainfall intensity for the given event

so a multiplier may be determined along with the 50-year I&I flow component.

The peak hourly dry weather diurnal flow is 0.24 cfs. The peak wet weather flow during event = 0.84 cfs

yielding an I&I contribution of 0.60 cfs. The 50-year intensity = 1.85 in/hr. Multiplier = 1.85/1.25 = 1.48.

The 50-year Wet Weather Peak Flow = 0.20 + (1.48 x 0.60) = 1.09 cfs.



REFERENCES

1. NOAA Technical Memorandum NWS HYDRO-35 National Oceanic and Atmospheric Administration Of The National Weather Service, Department Of Commerce Silver Spring, Md., June 1977.
2. Technical Paper No. 40, Rainfall Frequency Atlas For Durations From 30 Minutes To 24 Hours And Return Periods From 1yr To 100 Yrs. U.S. Weather Bureau, Department Of Commerce, Washington, D.C., January 1963.
3. Design Of Urban Highway Drainage-State Of The Art FHWA-TS-79-225 U.S. Department Of Transportation Federal Highway Administration, Washington, D.C., August 1979.

Figure 5602-1: Intensity-Duration-Frequency (IDF) Curves for Kansas City, Missouri (1896 to 1972)

MBFE Above Sanitary HGL - Projected 50-Year Peak Flow								
Lot Number	Station	Stub Length	FL @ Main	FL @ EOS	MBFE	Surcharge Depth	FL Elev	Delta
39	0+44.31	17.92	904.71	905.74	908.74	0.00	904.71	4.03
40	1+43.63	67.45	905.57	907.59	910.59	0.32	905.89	4.70
41	1+58.63	70	905.67	907.74	910.74	0.32	905.99	4.75
42	3+22.85	18	906.74	907.77	910.77	0.81	907.55	3.22
61	3+76.90	51.83	907.00	908.71	911.71	0.81	907.81	3.90
62	4+18.39	44.54	907.42	908.98	911.98	1.05	908.47	3.51
43	4+23.39	19.86	907.45	908.52	911.52	1.05	908.50	3.02
44	5+22.13	33.29	908.02	909.36	912.36	1.05	909.07	3.29
63	5+43.13	17.82	908.14	909.17	912.17	1.05	909.19	2.98
45	6+24.44	14.40	908.61	909.57	912.57	1.05	909.66	2.91
46	7+13.04	14.01	909.48	910.43	913.43	0.82	910.30	3.13
64	7+50.00	35.35	909.73	911.11	914.11	0.82	910.55	3.56
47	0+80.00	10	910.67	911.54	914.54	1.28	911.95	2.59
48	0+85.00	10	910.69	911.56	914.56	1.28	911.97	2.59
110	2+36.1	7.5	913.38	914.20	917.20	0.01	913.39	3.81
109	2+73.32	7.5	913.53	914.35	917.35	0.01	913.54	3.81
115	4+80.93	7.5	914.69	915.51	918.51	0.00	914.69	3.82
114	4+84.93	7.5	914.71	915.53	918.53	0.00	914.71	3.82
116	6+06.9	7.5	915.6	916.42	919.42	0.00	915.60	3.82
117	0+21.42	10	916.26	917.13	920.13	0.00	916.26	3.87
119	2+55.19	10	918.24	919.11	922.11	0.00	918.24	3.87
120	2+50.19	10	918.22	919.09	922.09	0.00	918.22	3.87
137	3+57.5	57	919.15	920.96	923.96	0.00	919.15	4.81
121	4+88.72	10	919.68	920.55	923.55	0.00	919.68	3.87
122	5+18.72	10	920	920.87	923.87	0.00	920.00	3.87
136	5+61.52	51.58	920.17	921.87	924.87	0.00	920.17	4.70
123	6+13.07	10.00	920.38	921.25	924.25	0.00	920.38	3.87
135	6+23.96	52.27	920.42	922.14	925.14	0.00	920.42	4.72
124	7+19.58	10.00	920.80	921.67	924.67	0.00	920.80	3.87
129	1+91.82	41.34	926.98	928.48	931.48	0.00	926.98	4.50
134	2+24.58	54.46	928.05	929.81	932.81	0.00	928.05	4.76
130	2+62.55	76.09	928.28	930.47	933.47	0.00	928.28	5.19
133	3+43.54	30	927.89	929.16	932.16	0.00	927.89	4.27
131	3+49.57	95.3	927.93	930.51	933.51	0.00	927.93	5.58
133	4+50.23	10	928.73	929.60	932.60	0.00	928.73	3.87
132	4+57.02	10	928.77	929.64	932.64	0.00	928.77	3.87
138	5+24.54	10	929.17	930.04	933.04	0.00	929.17	3.87
139	5+35.33	10	929.44	930.31	933.31	0.00	929.44	3.87
144	6+27.04	10	929.99	930.86	933.86	0.00	929.99	3.87
145	6+31.90	10	930.02	930.89	933.89	0.00	930.02	3.87
146	7+04.68	64.76	930.77	932.74	935.74	0.00	930.77	4.97
147	7+50.87	102.6	931.69	934.41	937.41	0.00	931.69	5.72
148	8+00.76	96.63	932.69	935.29	938.29	0.00	932.69	5.60
143	8+13.16	34.74	932.94	934.30	937.30	0.00	932.94	4.36
149	8+56.53	52.7	933.81	935.53	938.53	0.00	933.81	4.72
150	9+15.07	10	935.37	936.24	939.24	0.00	935.37	3.87
142	9+99.52	54.02	935.88	937.63	940.63	0.00	935.88	4.75
152	11+53.58	10	937.3	938.17	941.17	0.00	937.30	3.87
151	11+58.58	10	937.33	938.20	941.20	0.00	937.33	3.87
156	12+62.20	10	938.23	939.10	942.10	0.00	938.23	3.87
157	12+67.2	10	938.26	939.13	942.13	0.00	938.26	3.87
165	0+45.72	10	939.90	940.77	943.77	0.00	939.90	3.87
164	1+32.09	10	940.42	941.29	944.29	0.00	940.42	3.87
158	1+55.38	53.21	940.56	942.30	945.30	0.00	940.56	4.73
163	1+93.70	10	940.79	941.66	944.66	0.00	940.79	3.87
159	2+31.65	63.58	941.34	943.29	946.29	0.00	941.34	4.94
160	2+91.32	59.98	942.31	944.18	947.18	0.00	942.31	4.87

MBFE Above Sanitary HGL - Projected 50-Year Peak Flow								
Lot Number	Station	Stub Length	FL @ Main	FL @ EOS	MBFE	Surcharge Depth	FL Elev	Delta
162	3+22.46	10	942.81	943.68	946.68	0.00	942.81	3.87
161	3+89.56	56.34	943.90	945.70	948.70	0.00	943.90	4.80

Lot Number: Platted Lot Number

Station: Location provided on As-Built Plans

Stub Length: Length of 4 Inch Service Line on As-Built Plans

FL @ Main: Flowline of sanitary sewer main calculated from As-Built Plans

FL @ EOS: Flowline of Service Stub at End of Designed Length

MBFE: FL @ End of Stub plus 3 feet, per APWA

Surcharge Depth: Depth of sanitary flow in sanitary main at the connection point, from study by Engineering Solutions

FL Elev: Flowline Elevation at service line connection with Surcharge Depth added

Delta: Difference in elevation from MBFE and FL Elev