

		T= 20 Minutes 175 / (T+25) n (Conc.) 0.013 n (Pvc) 0.011		Time of Concentration 10 Year Storm Event Intensity Manning's Roughness Coefficient Manning's Roughness Coefficient		City of Pontiac / Bloomfield Twp., Oakland County, Michigan Storm Sewer Calculations										Project No: Project Name: Location: Dated: Revised:		A116-21 Village at Bloomfield Telegraph Road December 21, 2016 03/31/17						
Drainage Area	From Struc. No.	To Struc. No.	Drainage Area (Acres)	Runoff Coefficient (C)	Equivalent Area (C * A)	Total Area (Sum C * A)	Time of Concentration (Minutes)	Rainfall Intensity (Inches/Hr.)	Actual Discharge (CFS)	Pipe Size (Inches)	Pipe Slope (% Slope)	Pipe Length (Feet)	Flow Velocity (Ft / Sec)	Full Pipe Capacity (CFS)	H. G. Elev. Upper End (Feet)	H. G. Elev. Lower End (Feet)	H. G. Slope (% Slope)	Theoretical Velocity (Ft / Sec)	Ground Elevation (Upper)	Change in Elevation (Feet)	Invert Elev. Upper End (Feet)	Invert Elev. Lower End (Feet)	Upper Rim to HGL (Feet)	
DRAINAGE DISTRICT #1 (STC 2)																								
A	14	13	0.41	0.85	0.349	0.349	20.00	3.89	1.355	12	0.32	114	2.566	0.74	2.015	947.10	946.94	0.145	1.73	950.00	0.36	946.50	946.14	2.90
B	13	12	0.22	0.85	0.187	0.536	20.74	3.83	2.049	12	0.34	88	2.645	0.55	2.077	946.93	946.64	0.331	2.61	950.00	0.30	946.14	945.84	3.07
C	15	12	0.18	0.85	0.153	0.153	20.00	3.89	0.595	12	0.32	71	2.566	0.46	2.015	947.09	947.07	0.028	0.76	950.00	0.23	946.50	946.27	2.91
D	12	Ex 24	0.16	0.85	0.136	0.825	21.29	3.78	3.117	15	0.24	21	2.579	0.14	3.165	946.64	946.59	0.233	2.54	950.00	0.05	945.64	945.59	3.36
E	11	10	0.13	0.85	0.111	0.111	20.00	3.89	0.430	12	0.32	66	2.566	0.43	2.015	946.40	946.39	0.015	0.55	949.80	0.21	945.80	945.59	3.40
F	10	Ex 24	0.20	0.85	0.170	0.281	20.43	3.85	1.081	12	0.32	80	2.566	0.52	2.015	946.21	946.13	0.092	1.38	949.80	0.26	945.59	945.33	3.59
-	Ex 24	Ex 23	0.17	0.85	0.145	1.250	21.43	3.77	4.709	21	0.15	171	2.551	1.12	6.137	946.33	946.18	0.088	1.96	949.80	0.26	945.04	944.78	3.47
G	8a	8	0.10	0.85	0.085	0.085	20.00	3.89	0.331	12	0.32	51	2.566	0.33	2.015	946.11	946.11	0.009	0.42	950.00	0.16	945.47	945.31	3.89
H	8	7	0.29	0.85	0.247	0.332	20.33	3.86	1.280	12	0.32	66	2.566	0.43	2.015	945.98	945.90	0.129	1.63	949.30	0.21	945.31	945.10	3.32
I	7	6	0.32	0.85	0.272	0.604	20.76	3.82	2.308	15	0.24	66	2.579	0.43	3.165	945.93	945.84	0.128	1.88	949.30	0.16	945.00	944.84	3.37
J	6	Ex 23	0.28	0.85	0.238	0.842	21.19	3.79	3.188	15	0.26	35	2.684	0.22	3.294	945.83	945.75	0.244	2.60	949.30	0.09	944.84	944.75	3.47
K	9	Ex 23	0.28	0.85	0.238	0.238	20.00	3.89	0.926	12	0.32	32	2.566	0.21	2.015	946.02	946.00	0.067	1.18	949.30	0.10	945.30	945.20	3.28
-	Ex 23	5	0.00	0.85	0.000	2.091	22.55	3.68	7.696	24	0.12	96	2.494	0.64	7.837	946.25	946.13	0.116	2.45	950.00	0.12	944.65	944.53	3.75
L	5a	5	0.03	0.85	0.026	0.026	20.00	3.89	0.099	4	1.00	84	2.181	0.64	0.190	947.15	946.93	0.272	1.14	951.50	0.84	947.50	946.66	4.35
-	5	4	0.00	0.85	0.000	2.117	23.19	3.63	7.686	24	0.12	154	2.494	1.03	7.837	946.12	945.95	0.115	2.45	950.85	0.18	944.53	944.35	4.73
-	4	3	0.00	0.85	0.000	2.117	24.22	3.56	7.525	24	0.12	168	2.494	1.12	7.837	945.93	945.75	0.111	2.40	950.55	0.20	944.35	944.15	4.62
-	3	2	0.00	0.85	0.000	2.117	25.34	3.48	7.358	24	0.12	250	2.494	1.67	7.837	945.61	945.35	0.106	2.34	949.50	0.30	944.05	943.75	3.89
M	2c	2b	0.82	0.85	0.697	0.697	20.00	3.89	2.711	16	1.00	123	5.482	0.37	7.654	947.00	946.84	0.125	1.94	951.50	1.22	947.00	945.78	4.50
N	2b	2a	0.51	0.85	0.434	1.131	20.37	3.86	4.360	18	0.18	150	2.522	0.99	4.457	946.44	946.18	0.172	2.47	949.75	0.27	945.25	944.98	3.31
O	2f	2d	0.08	0.85	0.068	0.068	20.00	3.89	0.264	10	1.00	60	4.017	0.25	2.191	947.08	947.07	0.015	0.48	951.50	0.60	947.00	946.40	4.42
P	2d	2a	0.30	0.85	0.255	0.323	20.25	3.87	1.249	12	0.32	126	2.566	0.82	2.015	946.30	946.15	0.123	1.59	949.75	0.40	945.75	945.35	3.45
Q	2e	2a	0.73	0.85	0.621	0.621	20.00	3.89	2.413	16	1.00	141	5.495	0.43	7.673	946.80	946.66	0.099	1.73	951.50	1.41	947.00	945.59	4.70
R	2a	2	0.51	0.85	0.434	2.508	21.37	3.77	9.464	24	0.18	65	3.055	0.35	9.598	946.18	946.06	0.175	3.01	949.75	0.12	944.58	944.46	3.57
S	97	2	0.29	0.85	0.247	0.247	20.00	3.89	0.959	12	0.32	33	2.566	0.21	2.015	945.47	945.44	0.072	1.22	948.75	0.11	944.75	944.64	3.28
T	98	2	0.22	0.85	0.187	0.187	20.00	3.89	0.727	12	0.32	11	2.566	0.07	2.015	945.52	945.51	0.042	0.93	948.75	0.04	944.75	944.71	3.23
-	2	1	0.00	0.85	0.000	5.058	27.01	3.36	17.017	36	0.07	310	2.497	2.07	17.647	945.93	945.73	0.065	2.41	949.00	0.22	943.55	943.33	3.07
U	1h1	1h	0.04	0.85	0.034	0.034	20.00	3.89	0.132	12	1.00	32	4.536	0.12	3.563	946.48	946.48	0.001	0.17	950.00	0.32	946.00	945.68	3.52
U	1h	1g	0.20	0.85	0.170	0.204	20.12	3.88	0.791	12	0.32	74	2.566	0.48	2.015	946.18	946.14	0.049	1.01	950.60	0.24	945.58	945.34	4.42
V	1g1	1g	1.50	0.85	1.275	1.275	20.00	3.89	4.958	16	0.50	24	3.886	0.10	5.426	948.55	948.45	0.418	3.55	951.50	0.12	947.50	947.38	2.95
-	1g	1f	0.00	0.85	0.000	1.479	20.60	3.84	5.676	18	0.32	93	3.363	0.46	5.942	946.41	946.14	0.292	3.21	951.40	0.30	945.24	944.94	4.99
W	1f1	1f	0.04	0.85	0.034	0.034	20.00	3.89	0.132	12	1.00	32	4.536	0.12	3.563	946.48	946.48	0.001	0.17	950.00	0.32	946.00	945.68	3.52
W	1f	1e	0.19	0.85	0.162	1.675	21.06	3.80	6.362	21	0.18	96	2.795	0.57	6.722	946.22	946.07	0.161	2.65	950.60	0.17	944.84	944.67	4.38
X	1e2	1e1	0.04	0.85	0.034	0.034	20.00	3.89	0.132	12	0.32	32	2.566	0.21	2.015	945.45	945.45	0.001	0.17	947.50	0.10	944.75	944.65	2.05
X	1e1	1e	0.05	0.85	0.043	0.077	20.21	3.87	0.296	12	0.32	143	2.566	0.93	2.015	945.00	944.99	0.007	0.38	947.50	0.46	944.65	944.19	2.50
Y	1e	1d	0.00	0.85	0.000	1.751	21.63	3.75	6.571	24	0.12	139	2.494	0.93	7.837	945.74	945.62	0.084	2.09	951.40	0.17	944.19	944.02	5.66
Y	1d	1c	0.79	0.85	0.672	2.423	22.56	3.68	8.914	27	0.10	177	2.463	1.20	9.794	945.78	945.63	0.083	2.24	949.00	0.18	944.01	943.83	3.22
Z	1c	1b	1.06	0.85	0.901	3.324	23.76	3.59	11.929	27	0.15	206	3.017	1.14	11.995	945.63	945.32	0.148	3.00	949.00	0.31	943.83	943.52	3.37
A1	1b	1a	1.25	0.85	1.063	4.386	24.90	3.51	15.383	30	0.15	151	3.236	0.78	15.886	945.51	945.29	0.141	3.13	949.00	0.23	943.52	943.29	3.49
A1	1a	1	0.00	0.85	0.000	4.386	25.67	3.45	15.147	30	0.14	35	3.127	0.19	15.347	945.29	945.24	0.136	3.09	950.55	0.05	943.29	943.24	5.26
B1	96	95	0.08	0.85	0.068	0.068	20.00	3.89	0.264	12	0.32	30	2.566	0.19	2.015	945.81	945.80	0.006	0.34	949.10	0.10	945.10	945.00	3.29
C1	95	1	0.24	0.85	0.204	0.272	20.19	3.87	1.053	12	0.32	11	2.566	0.07	2.015	945.77	945.76	0.087	1.34	949.10	0.04	945.00	944.96	3.33
C1	1	Ex 6	0.00	0.85	0.000	9.716	29.08	3.24	31.439	36	0.23	101	4.525	0.37	31.987	945.63	945.41	0.222	4.45	951.00	0.23	943.24	943.01	5.37
D1	101a	101	0.43	0.85	0.366	0.366	20.00	3.89	1.421	12	0.32	284	2.566	1.84	2.015	945.34	944.89	0.159	1.81	948.00	0.91	945.00	944.09	2.66
E1	101	Ex 6	0.29	0.85	0.247	0.612	21.84	3.74	2.286	12	0.32	45	2.566	0.29	2.015	944.83	944.65	0.412	2.91	948.00	0.14	943.99	943.85	3.17
F1	Ex 6a	Ex 6	6.49	0.20	1.298	1.298	20.00	3.89	5.048	18	0.24	45	2.912	0.26	5.146	943.26	943.15	0.231	2.86	945.25	0.11	942.06	941.95	1.99
-	Ex 6	STC 2	0.00	0.85	0.000	11.626	29.45	3.21	37.362	36	0.32	14	5.338	0.04	37.730	944.19	944.15	0.314	5.29	949.60	0.04	941.79	941.75	5.41

Drainage Area	From Struc. No.	To Struc. No.	Drainage Area (Acres)	Runoff Coefficient (C)	Equivalent Area (C * A)	Total Area (Sum C * A)	Time of Concentration (Minutes)	Rainfall Intensity (Inches/Hr.)	Actual Discharge (CFS)	Pipe Size (Inches)	Pipe Slope (% Slope)	Pipe Length (Feet)	Flow Velocity (Ft / Sec)	Time of Flow (Minutes)	Full Pipe Capacity (CFS)	H. G. Elev. Upper End (Feet)	H. G. Elev. Lower End (Feet)	H. G. Slope (% Slope)	Theoretical Velocity (Ft / Sec)	Ground Elevation (Upper)	Change in Elevation (Feet)	Invert Elev. Upper End (Feet)	Invert Elev. Lower End (Feet)	Upper Rim to HGL (Feet)
DRAINAGE DISTRICT #2 (STC 3)																								
A	Ex 34d	Ex 34c	0.05	0.85	0.043	0.043	20.00	3.89	0.165	12	0.32	38	2.566	0.25	2.015	946.96	946.96	0.002	0.21	949.85	0.12	946.28	946.16	2.89
B	Ex 34c	Ex 34	0.04	0.85	0.034	0.077	20.25	3.87	0.296	12	0.32	96	2.566	0.62	2.015	946.66	946.65	0.007	0.38	950.25	0.31	946.16	945.85	3.59
-	Ex 34	Ex 33	0.00	0.85	0.000	0.077	20.87	3.82	0.292	15	0.24	105	2.579	0.68	3.165	946.50	946.50	0.002	0.24	950.32	0.25	945.75	945.50	3.82
C	30	29	0.20	0.85	0.170	0.170	20.00	3.89	0.661	12	0.32	71	2.566	0.46	2.015	946.50	946.47	0.034	0.84	949.90	0.23	945.90	945.67	3.40
D	29	28	0.10	0.85	0.085	0.255	20.46	3.85	0.982	12	0.32	73	2.566	0.47	2.015	946.19	946.14	0.076	1.25	949.90	0.23	945.57	945.34	3.71
E	28	28a	0.10	0.85	0.085	0.340	20.94	3.81	1.295	12	0.32	15	2.566	0.10	2.015	946.01	945.99	0.132	1.65	949.90	0.05	945.24	945.19	3.89
-	Ex 33	28a	0.00	0.85	0.000	0.672	21.55	3.76	2.524	18	0.28	34	3.145	0.18	5.558	946.38	946.36	0.058	1.43	950.45	0.10	945.26	945.16	4.07
-	28a	Ex 32	0.00	0.85	0.000	0.340	21.03	3.80	1.293	18	0.28	78	3.117	0.42	5.509	946.16	946.15	0.015	0.73	950.05	0.21	945.16	944.95	3.89
F	27	26	0.59	0.85	0.502	0.592	20.00	3.89	1.950	12	0.32	108	2.566	0.70	2.015	945.78	945.45	0.300	2.48	949.00	0.35	945.00	944.65	3.22
G	26	Ex 40	0.23	0.85	0.196	0.697	20.70	3.83	2.669	15	0.24	102	2.579	0.66	3.165	945.48	945.31	0.171	2.17	949.90	0.24	944.55	944.31	4.42
H	66	Ex 41d	0.06	0.85	0.051	0.051	20.00	3.89	0.198	12	0.32	28	2.566	0.18	2.015	946.51	946.51	0.003	0.25	949.00	0.09	945.80	945.71	2.49
I	Ex 41d	Ex 41c	0.13	0.85	0.111	0.162	20.18	3.87	0.626	10	1.80	10	5.390	0.03	2.940	946.03	946.03	0.082	1.15	949.20	0.18	945.54	945.36	3.17
-	Ex 41c	Ex 41	0.00	0.85	0.000	0.162	20.21	3.87	0.625	12	0.33	137	2.606	0.88	2.047	945.65	945.60	0.031	0.80	950.25	0.45	945.26	944.80	4.60
J	Ex 41b	Ex 41	0.09	0.85	0.077	0.077	20.00	3.89	0.298	12	1.00	15	4.536	0.06	3.563	946.28	946.28	0.007	0.38	949.45	0.15	945.63	945.48	3.17
K	Ex 41a	Ex 41	0.09	0.85	0.077	0.077	20.00	3.89	0.298	13	1.00	13	4.785	0.05	4.411	946.34	946.34	0.005	0.32	949.45	0.13	945.60	945.47	3.11
-	Ex 41	Ex 40	0.00	0.85	0.000	0.315	21.09	3.80	1.194	12	0.32	137	2.566	0.89	2.015	945.32	945.16	0.112	1.52	950.25	0.44	944.80	944.36	4.93
L	25	Ex 40	0.20	0.85	0.170	0.170	20.00	3.89	0.661	12	0.32	25	2.566	0.16	2.015	946.23	946.22	0.034	0.84	949.50	0.08	945.50	945.42	3.27
M	24	Ex 40	0.12	0.85	0.102	0.102	20.00	3.89	0.397	12	0.32	64	2.566	0.42	2.015	946.40	946.40	0.012	0.51	949.80	0.20	945.80	945.60	3.40
-	Ex 40	Ex 32	0.00	0.85	0.000	1.284	21.98	3.73	4.781	18	0.24	115	2.912	0.66	5.146	945.39	945.15	0.207	2.71	950.25	0.28	944.23	943.95	4.86
-	Ex 32	Ex 31	0.00	0.85	0.000	1.955	22.64	3.67	7.182	24	0.42	106	4.656	0.38	14.628	945.11	945.01	0.101	2.29	950.25	0.44	943.85	943.41	5.14
N	23	22	0.31	0.85	0.264	0.264	20.00	3.89	1.025	12	0.32	66	2.566	0.43	2.015	945.94	945.89	0.083	1.30	949.30	0.21	945.30	945.09	3.36
O	22	Ex 31	0.31	0.85	0.264	0.527	20.43	3.85	2.030	12	0.33	49	2.606	0.31	2.047	945.89	945.73	0.325	2.58	949.30	0.16	945.09	944.93	3.41
P	21	20	0.28	0.85	0.238	0.238	20.00	3.89	0.926	12	0.32	66	2.566	0.43	2.015	945.63	945.59	0.067	1.18	949.00	0.21	945.00	944.79	3.37
Q	Ex 20	Ex 31	0.30	0.85	0.255	0.493	20.43	3.85	1.899	12	0.32	25	2.566	0.16	2.015	945.48	945.41	0.284	2.42	949.20	0.08	944.69	944.61	3.72
-	Ex 31	Ex 30	0.00	0.85	0.000	2.975	23.02	3.64	10.843	24	0.20	88	3.220	0.46	10.117	945.04	944.83	0.230	3.45	950.25	0.18	943.41	943.23	5.21
-	Ex 39	33	0.00	0.85	0.000	0.000	20.00	3.89	0.000	18	0.18	45	2.562	0.30	4.457	945.60	945.60	0.000	0.00	949.05	0.08	944.54	944.46	3.39
R	35	34	0.42	0.85	0.357	0.357	20.00	3.89	1.388	12	0.32	62	2.566	0.40	2.015	945.76	945.66	0.152	1.77	948.50	0.20	945.00	944.80	2.80
S	34	33	0.38	0.85	0.323	0.680	20.40	3.85	2.621	15	0.24	65	2.579	0.42	3.165	945.75	945.64	0.165	2.14	948.50	0.16	944.80	944.64	2.75
T	33	Ex 38	0.38	0.85	0.323	1.003	20.82	3.82	3.831	18	0.18	173	2.522	1.14	4.457	945.58	945.35	0.233	2.17	948.50	0.31	944.46	944.15	2.92
U	32	Ex 38	0.24	0.85	0.204	0.204	20.00	3.89	0.793	12	0.32	84	2.566	0.55	2.015	945.57	945.53	0.050	1.01	949.00	0.27	945.00	944.73	3.43
V	31	Ex 38	0.34	0.85	0.289	0.289	20.00	3.89	1.124	12	0.32	69	2.566	0.45	2.015	945.65	945.58	0.100	1.43	949.00	0.22	945.00	944.78	3.35
-	Ex 38	Ex 30	0.00	0.85	0.000	1.496	21.97	3.73	5.574	18	0.44	137	3.943	0.58	6.968	945.13	944.75	0.282	3.15	949.82	0.60	944.15	943.55	4.05
-	Ex 30	19	0.00	0.85	0.000	4.471	23.47	3.61	16.142	27	0.24	155	3.816	0.68	15.172	946.00	945.58	0.272	4.06	950.05	0.37	944.15	943.78	4.69
W	44	Ex 37	0.19	0.85	0.162	0.162	20.00	3.89	0.628	12	0.32	30	2.566	0.19	2.015	945.96	945.95	0.031	0.80	949.25	0.10	945.25	945.15	3.29
X	43	Ex 37	0.34	0.85	0.289	0.289	20.00	3.89	1.124	12	0.32	120	2.566	0.78	2.015	945.34	945.22	0.100	1.43	948.80	0.38	944.80	944.42	3.46
-	Ex 37	37	0.00	0.85	0.000	0.451	20.78	3.82	1.722	12	0.32	211	2.566	1.37	2.015	944.94	944.44	0.234	2.19	949.55	0.68	944.32	944.64	4.61
Y	41	40	0.40	0.85	0.340	0.340	20.00	3.89	1.322	12	0.32	62	2.566	0.40	2.015	945.19	945.10	0.138	1.68	948.50	0.20	944.50	944.30	3.31
Z	40	39	0.32	0.85	0.272	0.612	20.40	3.85	2.359	15	0.24	62	2.579	0.40	3.165	945.13	945.05	0.133	1.92	948.50	0.15	944.20	944.05	3.37
A1	39	38	0.30	0.85	0.255	0.867	20.80	3.82	3.313	15	0.27	62	2.735	0.38	3.357	945.05	944.88	0.263	2.70	948.50	0.17	944.05	943.88	3.45
B1	42	38	0.15	0.85	0.128	0.128	20.00	3.89	0.496	12	0.32	64	2.566	0.42	2.015	945.61	945.60	0.019	0.63	949.00	0.20	945.00	944.80	3.39
C1	38	37	0.31	0.85	0.264	1.258	21.18	3.79	4.767	18	0.21	101	2.724	0.62	4.814	944.98	944.77	0.206	2.70	948.50	0.21	943.78	943.57	3.52
D1	99	37	1.04	0.85	0.884	0.884	20.00	3.89	3.438	12	1.00	50	4.536	0.18	3.563	946.77	946.30	0.931	4.38	950.00	0.50	946.00	945.50	3.23
-	37	19	0.00	0.85	0.000	2.593	22.15	3.71	9.622	24	0.19	100	3.139	0.53	9.861	945.06	944.88	0.181	3.06	950.00	0.19	943.47	943.28	4.94
E1	36	19	0.09	0.85	0.077	0.077	20.00	3.89	0.298	12	0.32	22	2.566	0.14	2.015	945.73	945.73	0.007	0.38	949.00	0.07	945.00	944.93	3.27
-	19	18	0.00	0.85	0.000	7.140	24.15	3.56	25.423	36	0.14	86	3.531	0.41	24.956	945.58	945.46	0.145	3.80	949.60	0.12	943.18	943.06	4.02
F1	94	93	0.03	0.85	0.026	0.026	20.00	3.89	0.099	12	0.32	88	2.566	0.57	2.015	944.52	944.52	0.001	0.13	947.00	0.28	944.00	943.72	2.48
-	93	18	0.00	0.85	0.000	0.026	20.57	3.84	0.098	12	0.32	59	2.566	0.38	2.015	944.33	944.33	0.001	0.12	950.05	0.19	943.72	943.53	5.72
G1	18	17	0.20	0.85	0.170	7.336	24.55	3.53	25.905	36	0.14	103	3.531	0.49	24.956	945.47	945.32	0.151	3.86	949.00	0.14	943.06	942.92	3.53
H1	17	16	0.14	0.85	0.119	7.455	25.04	3.50	26.069	36	0.15	109	3.655	0.50	25.832	945.32	945.16	0.153	3.69	949.40	0.16	942.92	942.76	4.08
I1	90	89	0.18	0.85	0.153	0.153	20.00	3.89	0.595	12	0.32	125	2.566	0.81	2.015	944.18	944.15	0.028	0.76	947.75	0.40	943.75	943.35	3.57
J1	89a	89	0.05	0.85	0.043	0.043	20.00	3.89	0.165	12	0.32	119	2.566	0.77	2.015	944.17	944.17	0.002	0.21	947.00	0.38	943.75	943.37	