Southgate House
Southgate
Wakefield WF1 1TL

Date 20/07/2022 09:05
File 7891-FinalCalcsConstruction.MDX

Designed by tomm
Checked by

Micro Drainage | Network 2020.1.3

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for 7891 - SW - N1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	19.000	Volumetric Runoff Coeff.	0.750	Min Design Depth for Optimisation (m)	1.200
Ratio R	0.325	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	0	Add Flow / Climate Change (%)	40	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.200		

Designed with Level Soffits

Network Design Table for 7891 - SW - N1

- Indicates pipe length does not match coordinates

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type

Network Results Table

Network Design Table for 7891 - SW - N1

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)

Network Design Table for 7891 - SW - N1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type
1.000	19.922	1.712	11.6	0.197	5.00	0.0	0.600	o	225	Pipe/Conduit
2.000	31.661	0.211	150.1	0.055	5.00	0.0	0.600	o	150	Pipe/Conduit
1.001	43.092	0.172	250.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
3.000	10.927	0.846	12.9	0.028	5.00	0.0	0.600	o	150	Pipe/Conduit
1.002	45.240	0.181	250.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	0.00	5.09	100.774	0.197	0.0	0.0	0.0	3.86	153.4	0.0
2.000	0.00	5.65	100.073	0.055	0.0	0.0	0.0	0.82	14.5	0.0
1.001	0.00	6.37	98.987	0.252	0.0	0.0	0.0	0.99	70.0	0.0
3.000	0.00	5.06	100.570	0.028	0.0	0.0	0.0	2.82	49.8	0.0
1.002	0.00	7.13	98.815	0.280	0.0	0.0	0.0	0.99	70.0	0.0

Network Design Table for 7891 - SW - N1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type
4.000	3.995	0.027	148.0	0.091	5.00	0.0	0.600	o	225	Pipe/Conduit
1.003	10.666	0.143	74.6	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
5.000	26.642	0.107	250.0	0.123	5.00	0.0	0.600	o	225	Pipe/Conduit
5.001	22.961	0.092	250.0	0.180	0.00	0.0	0.600	o	300	Pipe/Conduit
5.002	10.081	0.040	252.0	0.100	0.00	0.0	0.600	o	300	Pipe/Conduit
5.003	22.615	0.090	251.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
5.004	13.330	0.751	17.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
4.000	0.00	5.06	99.435	0.091	0.0	0.0	0.0	1.07	42.6	0.0
1.003	0.00	7.22	98.559	0.371	0.0	0.0	0.0	2.10	231.9	0.0
5.000	0.00	5.54	99.646	0.123	0.0	0.0	0.0	0.82	32.7	0.0
5.001	0.00	5.93	99.464	0.303	0.0	0.0	0.0	0.99	70.0	0.0
5.002	0.00	6.10	99.373	0.403	0.0	0.0	0.0	0.99	69.7	0.0
5.003	0.00	6.48	99.333	0.403	0.0	0.0	0.0	0.99	69.8	0.0
5.004	0.00	6.54	99.243	0.403	0.0	0.0	0.0	3.75	265.0	0.0

Network Design Table for 7891 - SW - N1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type
1.004	26.918	0.783	34.4	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
1.005	33.752	0.135	250.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
6.000	9.364	0.936	10.0	0.293	5.00	0.0	0.600	o	300	Pipe/Conduit
1.006	18.903	0.076	248.7	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit
7.000	8.999	0.900	10.0	0.312	5.00	0.0	0.600	o	300	Pipe/Conduit
8.000	40.741	0.822	49.6	0.382	5.00	0.0	0.600	o	300	Pipe/Conduit

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.004	0.00	7.36	98.416	0.774	0.0	0.0	0.0	3.10	342.3	0.0
1.005	0.00	7.85	97.633	0.774	0.0	0.0	0.0	1.14	126.1	0.0
6.000	0.00	5.03	98.509	0.293	0.0	0.0	0.0	5.00	353.4	0.0
1.006	0.00	8.10	97.423	1.067	0.0	0.0	0.0	1.28	204.3	0.0
7.000	0.00	5.03	98.397	0.312	0.0	0.0	0.0	5.00	353.4	0.0
8.000	0.00	5.30	99.936	0.382	0.0	0.0	0.0	2.24	158.2	0.0

Network Design Table for 7891 - SW - N1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type
9.000	45.133	0.387	116.6	0.072	5.00	0.0	0.600	o	150	Pipe/Conduit
8.001	22.399	0.094	238.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
10.000	6.014	0.690	8.7	0.023	5.00	0.0	0.600	o	150	Pipe/Conduit
8.002	24.349	0.058	419.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit
8.003	26.653	0.151	176.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
9.000	0.00	5.81	99.651	0.072	0.0	0.0	0.0	0.93	16.4	0.0
8.001	0.00	6.18	98.486	0.455	0.0	0.0	0.0	1.01	71.7	0.0
10.000	0.00	5.03	99.954	0.023	0.0	0.0	0.0	3.43	60.7	0.0
8.002	0.00	6.71	98.358	0.478	0.0	0.0	0.0	0.76	53.8	0.0
8.003	0.00	7.09	98.300	0.478	0.0	0.0	0.0	1.18	83.4	0.0

Network Design Table for 7891 - SW - N1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type
11.000	6.928	0.776	8.9	0.186	5.00	0.0	0.600	o	225	Pipe/Conduit
12.000	13.552	0.580	23.4	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit
8.004	17.724	0.652	27.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
1.007	13.230#	0.053	249.6	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit
13.000	31.860#	0.091	350.1	0.000	5.00	0.0	0.600	o	450	Pipe/Conduit

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
11.000	0.00	5.03	99.715	0.186	0.0	0.0	0.0	4.41	175.2	0.0
12.000	0.00	5.11	99.424	0.000	0.0	0.0	0.0	2.09	37.0	0.0
8.004	0.00	7.17	98.074	0.663	0.0	0.0	0.0	3.49	385.1	0.0
1.007	0.00	8.26	97.334	2.043	0.0	0.0	0.0	1.41	305.9	0.0
13.000	0.00	5.49	96.280	0.000	0.0	0.0	0.0	1.08	171.9	0.0

Network Design Table for 7891 - SW - N1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type
1.008	40.677	0.323	125.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit
1.009	84.796	0.561	151.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.008	0.00	9.01	96.179	2.043	0.0	0.0	0.0	0.89	15.8	0.0
1.009	0.00	10.75	95.856	2.043	0.0	0.0	0.0	0.82	14.4	0.0

Free Flowing Outfall Details for 7891 - SW - N1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.009	MH57	97.260	95.295	0.000	1200	0

Online Controls for 7891 - SW - N1

Hydro-Brake® Optimum Manhole: MH9, DS/PN: 1.008, Volume (m³): 18.9

Unit Reference	MD-SHE-0100-6000-2081-6000	Sump Available	Yes
Design Head (m)	2.081	Diameter (mm)	100
Design Flow (l/s)	6.0	Invert Level (m)	96.179
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.081	6.0	Kick-Flo®	0.892	4.0
Flush-Flo™	0.438	5.1	Mean Flow over Head Range	-	4.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.3	0.600	5.0	1.600	5.3	2.600	6.7	5.000	9.1	7.500	11.0
0.200	4.6	0.800	4.5	1.800	5.6	3.000	7.1	5.500	9.5	8.000	11.3
0.300	4.9	1.000	4.3	2.000	5.9	3.500	7.7	6.000	9.9	8.500	11.7
0.400	5.1	1.200	4.6	2.200	6.2	4.000	8.1	6.500	10.3	9.000	12.0
0.500	5.1	1.400	5.0	2.400	6.4	4.500	8.6	7.000	10.6	9.500	12.3

Storage Structures for 7891 - SW - N1

Tank or Pond Manhole: 28, DS/PN: 13.000

Invert Level (m) 96.280

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	575.0	1.000	575.0	2.000	575.0	3.000	0.0	4.000	0.0	5.000	0.0
0.200	575.0	1.200	575.0	2.200	0.0	3.200	0.0	4.200	0.0		
0.400	575.0	1.400	575.0	2.400	0.0	3.400	0.0	4.400	0.0		
0.600	575.0	1.600	575.0	2.600	0.0	3.600	0.0	4.600	0.0		
0.800	575.0	1.800	575.0	2.800	0.0	3.800	0.0	4.800	0.0		

Summary of Results for 360 minute 100 year Winter (7891 - SW - N1)

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep 2.5 Second Increment (Extended) Inertia Status ON
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	MH1	100.819	-0.180	0.000	0.09			12.6	OK
2.000	MH14	100.124	-0.099	0.000	0.25			3.5	OK
1.001	MH2	99.087	-0.200	0.000	0.25			16.1	OK
3.000	MH16	100.589	-0.131	0.000	0.04			1.8	OK
1.002	MH3	98.921	-0.194	0.000	0.27			17.8	OK
4.000	MH33	99.503	-0.157	0.000	0.20			5.8	OK
1.003	MH4	98.659	-0.275	0.000	0.16			23.6	OK
5.000	17	99.723	-0.148	0.000	0.26			7.9	OK
5.001	MH18	99.579	-0.185	0.000	0.31			19.3	OK
5.002	MH19	99.517	-0.155	0.000	0.47			25.7	OK
5.003	MH20	99.467	-0.165	0.000	0.42			25.7	OK
5.004	MH21	99.311	-0.232	0.000	0.12			25.7	OK
1.004	MH5	98.518	-0.273	0.000	0.17			49.4	OK
1.005	MH6	98.136	0.128	0.000	0.44			49.4	SURCHARGED
6.000	MH34	98.564	-0.245	0.000	0.08			18.7	OK
1.006	MH7	98.168	0.295	0.000	0.42			68.1	SURCHARGED
7.000	MH35	98.455	-0.242	0.000	0.08			19.9	OK
8.000	MH23	100.017	-0.219	0.000	0.17			24.4	OK
9.000	MH29	99.706	-0.095	0.000	0.29			4.6	OK
8.001	MH24	98.628	-0.158	0.000	0.46			29.0	OK
10.000	MH31	99.971	-0.133	0.000	0.03			1.5	OK

Summary of Results for 360 minute 100 year Winter (7891 - SW - N1)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
8.002	MH25	98.532	-0.126	0.000	0.64			30.5	OK
8.003	MH26	98.433	-0.167	0.000	0.41			30.5	OK
11.000	MH37	99.761	-0.179	0.000	0.10			11.8	OK
12.000	MH39	99.424	-0.150	0.000	0.00			0.0	OK
8.004	MH27	98.165	-0.284	0.000	0.13			42.3	OK
1.007	MH8	98.168	0.309	0.000	0.60			130.3	SURCHARGED
13.000	28	98.003	1.273	0.000	0.04			6.6	SURCHARGED
1.008	MH9	98.195	1.866	0.000	0.37			5.7	SURCHARGED
1.009	MH10	95.921	-0.085	0.000	0.40			5.7	OK