


Appendix G

Microdrainage Calculations

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

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	8.000	0.500	16.0	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit
1.001	57.000	0.570	100.0	0.063	0.00	0.0	0.600	o	150	Pipe/Conduit
1.002	17.600	0.180	97.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit
2.000	16.150	1.250	12.9	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit
3.000	14.800	0.310	47.7	0.008	5.00	0.0	0.600	o	150	Pipe/Conduit
1.003	19.150	0.350	54.7	0.021	0.00	0.0	0.600	o	225	Pipe/Conduit
4.000	15.900	0.500	31.8	0.242	5.00	0.0	0.600	o	375	Pipe/Conduit
4.001	6.000	0.100	60.0	0.114	0.00	0.0	0.600	o	375	Pipe/Conduit
1.004	18.760	0.150	125.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit
5.000	3.750	0.340	11.0	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit
5.001	16.660	0.500	33.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit
6.000	12.300	0.350	35.1	0.070	5.00	0.0	0.600	o	225	Pipe/Conduit
5.002	2.000	0.100	20.0	0.560	0.00	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)
1.000	0.00	5.05	75.500	0.000	0.0	0.0	0.0	2.53	44.7	0.0
1.001	0.00	6.00	75.000	0.063	0.0	0.0	0.0	1.00	17.8	0.0
1.002	0.00	6.29	74.430	0.063	0.0	0.0	0.0	1.02	18.0	0.0
2.000	0.00	5.10	75.500	0.000	0.0	0.0	0.0	2.82	49.8	0.0
3.000	0.00	5.17	74.560	0.008	0.0	0.0	0.0	1.46	25.8	0.0
1.003	0.00	6.47	74.250	0.092	0.0	0.0	0.0	1.77	70.5	0.0
4.000	0.00	5.08	74.500	0.242	0.0	0.0	0.0	3.22	356.0	0.0
4.001	0.00	5.12	74.000	0.356	0.0	0.0	0.0	2.34	258.8	0.0
1.004	0.00	6.64	73.150	0.448	0.0	0.0	0.0	1.82	288.9	0.0
5.000	0.00	5.02	74.840	0.000	0.0	0.0	0.0	3.05	53.9	0.0
5.001	0.00	5.11	74.500	0.000	0.0	0.0	0.0	3.15	347.7	0.0
6.000	0.00	5.09	74.350	0.070	0.0	0.0	0.0	2.21	88.0	0.0
5.002	0.00	5.12	74.000	0.630	0.0	0.0	0.0	4.56	725.6	0.0

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

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
5.003	50.400	0.150	336.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit
1.005	6.400	0.220	29.1	0.000	0.00	0.0	0.600	o	225	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)
5.003	0.00	5.88	73.150	0.630	0.0	0.0	0.0	1.10	175.5	0.0
1.005	0.00	6.68	72.770	1.078	0.0	0.0	0.0	2.43	96.8	0.0


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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	40.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Run Time (mins)	720
Manhole Headloss Coeff (Global)	0.500	Output Interval (mins)	6
Number of Input Hydrographs	0	Number of Storage Structures	6
Number of Online Controls	1	Number of Time/Area Diagrams	5
Number of Offline Controls	0		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	200	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	15.900	Storm Duration (mins)	360
Ratio R	0.283		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: 15, DS/PN: 1.005, Volume (m³): 14.9

Unit Reference	MD-SHE-0119-6800-1230-6800
Design Head (m)	1.230
Design Flow (l/s)	6.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	119
Invert Level (m)	72.770
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.230	6.8
Flush-Flo™	0.364	6.8
Kick-Flo®	0.775	5.5
Mean Flow over Head Range	-	5.9

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)
0.100	4.2	1.200	6.7	3.000	10.3	7.000	15.5
0.200	6.4	1.400	7.2	3.500	11.1	7.500	16.0
0.300	6.8	1.600	7.7	4.000	11.8	8.000	16.5
0.400	6.8	1.800	8.1	4.500	12.5	8.500	17.0
0.500	6.7	2.000	8.5	5.000	13.2	9.000	17.5
0.600	6.5	2.200	8.9	5.500	13.8	9.500	17.9
0.800	5.6	2.400	9.3	6.000	14.4		
1.000	6.2	2.600	9.7	6.500	14.9		

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Storage Structures for Storm

Filter Drain Manhole: S10.0, DS/PN: 1.000

Infiltration Coefficient Base (m/hr) 0.00000
Infiltration Coefficient Side (m/hr) 0.00000
Safety Factor 2.0
Porosity 0.30
Invert Level (m) 75.500
Trench Width (m) 0.5
Trench Length (m) 41.0
Pipe Diameter (m) 0.150
Pipe Depth above Invert (m) 0.000
Number of Pipes 1
Slope (1:X) 250.0
Cap Volume Depth (m) 0.000
Cap Infiltration Depth (m) 0.000

Filter Drain Manhole: S10.1, DS/PN: 1.001

Infiltration Coefficient Base (m/hr) 0.00000
Infiltration Coefficient Side (m/hr) 0.00000
Safety Factor 2.0
Porosity 0.30
Invert Level (m) 75.000
Trench Width (m) 0.5
Trench Length (m) 30.0
Pipe Diameter (m) 0.150
Pipe Depth above Invert (m) 0.000
Number of Pipes 1
Slope (1:X) 250.0
Cap Volume Depth (m) 0.000
Cap Infiltration Depth (m) 0.000

Filter Drain Manhole: S11.0, DS/PN: 2.000

Infiltration Coefficient Base (m/hr) 0.00000
Infiltration Coefficient Side (m/hr) 0.00000
Safety Factor 2.0
Porosity 0.30
Invert Level (m) 75.500
Trench Width (m) 0.5
Trench Length (m) 34.0
Pipe Diameter (m) 0.150
Pipe Depth above Invert (m) 0.000
Number of Pipes 1
Slope (1:X) 250.0
Cap Volume Depth (m) 0.000
Cap Infiltration Depth (m) 0.000