

The Civil Engineering Practice										Page 1																																																																																																																																																																																																																
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<u>STORM SEWER DESIGN by the Modified Rational Method</u> <u>Design Criteria for NETWORK 7.SWS</u> Pipe Sizes NETWORK 9 Manhole Sizes NETWORK 9 FSR Rainfall Model - England and Wales <table><tr><td>Return Period (years)</td><td>2</td><td>PIMP (%)</td><td>100</td></tr><tr><td>M5-60 (mm)</td><td>19.600</td><td>Add Flow / Climate Change (%)</td><td>0</td></tr><tr><td>Ratio R</td><td>0.350</td><td>Minimum Backdrop Height (m)</td><td>0.500</td></tr><tr><td>Maximum Rainfall (mm/hr)</td><td>50</td><td>Maximum Backdrop Height (m)</td><td>1.000</td></tr><tr><td>Maximum Time of Concentration (mins)</td><td>30</td><td>Min Design Depth for Optimisation (m)</td><td>1.200</td></tr><tr><td>Foul Sewage (l/s/ha)</td><td>0.000</td><td>Min Vel for Auto Design only (m/s)</td><td>0.75</td></tr><tr><td>Volumetric Runoff Coeff.</td><td>0.750</td><td>Min Slope for Optimisation (1:X)</td><td>500</td></tr></table> Designed with Level Soffits												Return Period (years)	2	PIMP (%)	100	M5-60 (mm)	19.600	Add Flow / Climate Change (%)	0	Ratio R	0.350	Minimum Backdrop Height (m)	0.500	Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.000	Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200	Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	0.75	Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500																																																																																																																																																																																			
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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	Auto Design																																																																																																																																																																																																															
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<u>Network Design Table for NETWORK 7.SWS</u>												
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	Auto Design	
1.005	2.675	0.178	15.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit		
5.000	4.044	0.039	103.7	0.002	5.00	0.0	0.600	o	100	Pipe/Conduit		
5.001	9.985	0.181	55.2	0.002	0.00	0.0	0.600	o	100	Pipe/Conduit		
6.000	8.188	0.080	102.4	0.003	5.00	0.0	0.600	o	100	Pipe/Conduit		
6.001	2.404	0.023	104.5	0.003	0.00	0.0	0.600	o	100	Pipe/Conduit		
6.002	12.080	0.117	103.3	0.003	0.00	0.0	0.600	o	100	Pipe/Conduit		
5.002	8.379	0.184	45.5	0.001	0.00	0.0	0.600	o	100	Pipe/Conduit		
7.000	21.033	0.204	103.1	0.010	5.00	0.0	0.600	o	100	Pipe/Conduit		
5.003	9.954	0.097	102.6	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit		
8.000	16.410	0.159	103.2	0.010	5.00	0.0	0.600	o	100	Pipe/Conduit		
8.001	5.371	0.142	37.8	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit		
5.004	2.046	0.020	102.3	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit		
1.006	1.824	0.010	182.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit		
<u>Network Results Table</u>												
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)		
1.005	50.00	5.72	15.357	0.028	0.0	0.0	0.0	2.00	15.7	3.8		
5.000	50.00	5.09	15.700	0.002	0.0	0.0	0.0	0.75	5.9	0.3		
5.001	50.00	5.25	15.661	0.004	0.0	0.0	0.0	1.04	8.2	0.5		
6.000	50.00	5.18	15.700	0.003	0.0	0.0	0.0	0.76	6.0	0.4		
6.001	50.00	5.23	15.620	0.006	0.0	0.0	0.0	0.75	5.9	0.8		
6.002	50.00	5.50	15.597	0.009	0.0	0.0	0.0	0.76	5.9	1.2		
5.002	50.00	5.62	15.480	0.014	0.0	0.0	0.0	1.15	9.0	1.9		
7.000	50.00	5.46	15.500	0.010	0.0	0.0	0.0	0.76	5.9	1.4		
5.003	50.00	5.84	15.296	0.024	0.0	0.0	0.0	0.76	6.0	3.2		
8.000	50.00	5.36	15.500	0.010	0.0	0.0	0.0	0.76	5.9	1.4		
8.001	50.00	5.43	15.341	0.010	0.0	0.0	0.0	1.26	9.9	1.4		
5.004	50.00	5.88	15.199	0.034	0.0	0.0	0.0	0.76	6.0	4.6		
1.006	50.00	5.93	15.129	0.062	0.0	0.0	0.0	0.74	13.1	8.4		
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<u>PIPELINE SCHEDULES for NETWORK 7.SWS</u> <u>Upstream Manhole</u> <table><tr><th>PN</th><th>Hyd Sect</th><th>Diam (mm)</th><th>MH Name</th><th>C.Level (m)</th><th>I.Level (m)</th><th>D.Depth (m)</th><th>MH Connection</th><th>MH DIAM., L*W (mm)</th></tr><tr><td>1.000</td><td>o</td><td>100</td><td>1</td><td>16.600</td><td>16.000</td><td>0.500</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.001</td><td>o</td><td>100</td><td>2</td><td>16.600</td><td>15.876</td><td>0.624</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.002</td><td>o</td><td>100</td><td>3</td><td>16.450</td><td>15.806</td><td>0.544</td><td>Open Manhole</td><td>1200</td></tr><tr><td>2.000</td><td>o</td><td>100</td><td>8</td><td>16.350</td><td>15.750</td><td>0.500</td><td>Open Manhole</td><td>1200</td></tr><tr><td>1.003</td><td>o</td><td>100</td><td>4</td><td>16.450</td><td>15.653</td><td>0.697</td><td>Open 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<u>Summary of Critical Results by Maximum Level (Rank 1) for NETWORK 7.SWS</u>								
<u>Simulation Criteria</u>								
Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000								
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000								
Hot Start Level (mm) 0 Inlet Coefficient 0.800								
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000								
Foul Sewage per hectare (l/s) 0.000								
Number of Input Hydrographs 0 Number of Storage Structures 0								
Number of Online Controls 0 Number of Time/Area Diagrams 0								
Number of Offline Controls 0 Number of Real Time Controls 0								
<u>Synthetic Rainfall Details</u>								
Rainfall Model FSR Ratio R 0.350								
Region England and Wales Cv (Summer) 0.750								
M5-60 (mm) 19.500 Cv (Winter) 0.840								
Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF								
Analysis Timestep Fine Inertia Status OFF								
DTS Status ON								
Profile(s) Summer and Winter								
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440								
Return Period(s) (years) 100								
Climate Change (%) 40								
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<u>Summary of Critical Results by Maximum Level (Rank 1) for NETWORK 7.SWS</u>								
PN	US/MH Name	Surcharged Flooded		Flow / Cap.	Overflow (l/s)	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)			Flow (l/s)		
1.000	1	-0.100	0.000	0.00		0.0	OK	
1.001	2	-0.060	0.000	0.34		1.9	OK	
1.002	3	-0.068	0.000	0.23		2.5	OK	
2.000	8	-0.042	0.000	0.62		3.4	OK	
1.003	4	0.008	0.000	0.99		5.5	SURCHARGED	
3.000	9	-0.044	0.000	0.59		3.4	OK	
1.004	5	0.034	0.000	0.65		8.0	SURCHARGED	
4.000	10	0.132	0.000	0.95		5.5	SURCHARGED	
1.005	6	0.158	0.000	1.09		12.8	SURCHARGED	
5.000	11	-0.030	0.000	0.23		1.1	OK	
5.001	12	0.007	0.000	0.30		2.3	SURCHARGED	
6.000	16	-0.007	0.000	0.30		1.6	OK	
6.001	17	0.066	0.000	0.71		3.0	SURCHARGED	
6.002	18	0.084	0.000	0.77		4.3	SURCHARGED	
5.002	13	0.180	0.000	0.58		4.8	SURCHARGED	
7.000	19	0.220	0.000	0.70		4.0	FLOOD RISK	
5.003	14	0.331	0.000	1.31		7.2	SURCHARGED	
8.000	20	0.071	0.000	0.84		4.8	SURCHARGED	
8.001	21	0.150	0.000	0.45		3.9	FLOOD RISK	
5.004	15	0.265	0.000	2.81		11.1	SURCHARGED	
1.006	7	0.127	0.000	2.18		23.7	SURCHARGED	
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