STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	19.600	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
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)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

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	Auto Design
1.000	16.800	0.210	80.0	0.006	4.00	0.0	0.600	o	100	Pipe/Conduit	
1.001	7.700	0.096	80.2	0.004	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.002	4.800	0.060	80.0	0.005	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.003	5.600	0.070	80.0	0.005	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.004	16.100	0.201	80.1	0.006	0.00	0.0	0.600	o	100	Pipe/Conduit	
2.000	5.500	0.375	14.7	0.008	4.00	0.0	0.600	o	150	Pipe/Conduit	
1.005	5.300	0.132	40.2	0.006	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.006	21.900	0.614	35.7	0.019	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.007	21.300	1.115	19.1	0.013	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.000	15.500	0.258	60.1	0.007	4.00	0.0	0.600	o	100	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	50.00	4.33	99.060	0.006	0.0	0.0	0.0	0.86	6.8	0.8
1.001	50.00	4.47	98.850	0.010	0.0	0.0	0.0	0.86	6.8	1.4
1.002	50.00	4.57	98.754	0.015	0.0	0.0	0.0	0.86	6.8	2.0
1.003	50.00	4.68	98.694	0.020	0.0	0.0	0.0	0.86	6.8	2.7
1.004	50.00	4.99	98.624	0.026	0.0	0.0	0.0	0.86	6.8	3.5
2.000	50.00	4.03	98.748	0.008	0.0	0.0	0.0	2.64	46.7	1.1
1.005	50.00	5.04	98.373	0.040	0.0	0.0	0.0	1.59	28.2	5.4
1.006	50.00	5.26	98.241	0.059	0.0	0.0	0.0	1.69	29.9	8.0
1.007	50.00	5.41	97.627	0.072	0.0	0.0	0.0	2.32	40.9	9.7
3.000	50.00	4.26	98.640	0.007	0.0	0.0	0.0	1.00	7.8	0.9

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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	Auto Design
3.001	12.500	0.470	26.6	0.006	0.00	0.0	0.600	o	100	Pipe/Conduit	
4.000	17.200	0.593	29.0	0.009	4.00	0.0	0.600	o	100	Pipe/Conduit	
3.002	1.500	0.125	12.0	0.008	0.00	0.0	0.600	o	100	Pipe/Conduit	
3.003	14.100	1.175	12.0	0.012	0.00	0.0	0.600	o	150	Pipe/Conduit	
5.000	17.800	1.213	14.7	0.011	4.00	0.0	0.600	o	150	Pipe/Conduit	
5.001	11.500	0.144	79.9	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit	
5.002	4.100	0.051	80.4	0.006	0.00	0.0	0.600	o	150	Pipe/Conduit	
5.003	8.000	0.100	80.0	0.006	0.00	0.0	0.600	o	150	Pipe/Conduit	
6.000	9.600	0.120	80.0	0.004	4.00	0.0	0.600	o	100	Pipe/Conduit	
6.001	7.400	0.093	79.6	0.005	0.00	0.0	0.600	o	100	Pipe/Conduit	
6.002	8.800	0.110	80.0	0.006	0.00	0.0	0.600	o	100	Pipe/Conduit	
6.003	21.300	0.266	80.1	0.006	0.00	0.0	0.600	o	100	Pipe/Conduit	
5.004	4.600	0.057	80.7	0.007	0.00	0.0	0.600	o	150	Pipe/Conduit	
7.000	20.200	0.253	79.8	0.009	4.00	0.0	0.600	o	100	Pipe/Conduit	
5.005	12.500	0.156	80.1	0.006	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)
3.001	50.00	4.40	98.382	0.013	0.0	0.0	0.0	1.50	11.8	1.8
4.000	50.00	4.20	98.505	0.009	0.0	0.0	0.0	1.44	11.3	1.2
3.002	50.00	4.41	97.912	0.030	0.0	0.0	0.0	2.24	17.6	4.1
3.003	50.00	4.49	97.737	0.042	0.0	0.0	0.0	2.92	51.7	5.7
5.000	50.00	4.11	98.350	0.011	0.0	0.0	0.0	2.64	46.7	1.5
5.001	50.00	4.28	97.137	0.019	0.0	0.0	0.0	1.13	19.9	2.6
5.002	50.00	4.34	96.993	0.025	0.0	0.0	0.0	1.12	19.8	3.4
5.003	50.00	4.46	96.942	0.031	0.0	0.0	0.0	1.12	19.9	4.2
6.000	50.00	4.19	97.481	0.004	0.0	0.0	0.0	0.86	6.8	0.5
6.001	50.00	4.33	97.361	0.009	0.0	0.0	0.0	0.86	6.8	1.2
6.002	50.00	4.50	97.268	0.015	0.0	0.0	0.0	0.86	6.8	2.0
6.003	50.00	4.91	97.158	0.021	0.0	0.0	0.0	0.86	6.8	2.8
5.004	50.00	4.98	96.842	0.059	0.0	0.0	0.0	1.12	19.8	8.0
7.000	50.00	4.39	97.088	0.009	0.0	0.0	0.0	0.86	6.8	1.2
5.005	50.00	5.17	96.785	0.074	0.0	0.0	0.0	1.12	19.9	10.0

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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	Auto Design
8.000	12.300	0.204	60.3	0.009	4.00	0.0	0.600	o	100	Pipe/Conduit	
5.006	10.100	0.067	150.7	0.008	0.00	0.0	0.600	o	150	Pipe/Conduit	
9.000	10.400	0.130	80.0	0.005	4.00	0.0	0.600	o	100	Pipe/Conduit	
10.000	10.300	0.129	79.8	0.004	4.00	0.0	0.600	o	100	Pipe/Conduit	
9.001	6.900	0.086	80.2	0.009	0.00	0.0	0.600	o	100	Pipe/Conduit	
9.002	17.200	0.115	149.6	0.010	0.00	0.0	0.600	o	150	Pipe/Conduit	
11.000	9.500	0.119	79.8	0.006	4.00	0.0	0.600	o	100	Pipe/Conduit	
12.000	6.000	0.075	80.0	0.004	4.00	0.0	0.600	o	100	Pipe/Conduit	
11.001	8.800	0.110	80.0	0.006	0.00	0.0	0.600	o	100	Pipe/Conduit	
9.003	10.500	0.393	26.7	0.007	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.008	1.100	0.150	7.3	0.013	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.009	3.600	0.024	150.0	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)
8.000	50.00	4.21	96.883	0.009	0.0	0.0	0.0	0.99	7.8	1.2
5.006	50.00	5.37	96.629	0.091	0.0	0.0	0.0	0.82	14.4	12.3
9.000	50.00	4.20	97.286	0.005	0.0	0.0	0.0	0.86	6.8	0.7
10.000	50.00	4.20	97.285	0.004	0.0	0.0	0.0	0.86	6.8	0.5
9.001	50.00	4.34	97.156	0.018	0.0	0.0	0.0	0.86	6.8	2.4
9.002	50.00	4.68	97.020	0.028	0.0	0.0	0.0	0.82	14.5	3.8
11.000	50.00	4.18	97.184	0.006	0.0	0.0	0.0	0.86	6.8	0.8
12.000	50.00	4.12	97.140	0.004	0.0	0.0	0.0	0.86	6.8	0.5
11.001	50.00	4.35	97.065	0.016	0.0	0.0	0.0	0.86	6.8	2.2
9.003	50.00	4.77	96.905	0.051	0.0	0.0	0.0	1.96	34.6	6.9
1.008	50.00	5.42	96.512	0.269	0.0	0.0	0.0	3.74	66.2	36.4
1.009	50.00	5.47	96.287	0.269	0.0	0.0	0.0	1.07	42.4	36.4

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.600	Storm Duration (mins)	30
Ratio R	0.400		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: 37, DS/PN: 1.009, Volume (m³): 1.9

Unit Reference	MD-SHE-0068-2000-0950-2000
Design Head (m)	0.950
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	68
Invert Level (m)	96.287
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.950	2.0
Flush-Flo™	0.292	2.0
Kick-Flo®	0.596	1.6
Mean Flow over Head Range	-	1.8

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)
0.100	1.7	1.200	2.2	3.000	3.4	7.000	5.0
0.200	2.0	1.400	2.4	3.500	3.6	7.500	5.2
0.300	2.0	1.600	2.5	4.000	3.9	8.000	5.4
0.400	2.0	1.800	2.7	4.500	4.1	8.500	5.5
0.500	1.9	2.000	2.8	5.000	4.3	9.000	5.7
0.600	1.6	2.200	2.9	5.500	4.5	9.500	5.8
0.800	1.8	2.400	3.1	6.000	4.7		
1.000	2.0	2.600	3.2	6.500	4.9		

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Storage Structures for Storm

Porous Car Park Manhole: 31, DS/PN: 9.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	29.8
Membrane Percolation (mm/hr)	1000	Length (m)	29.8
Max Percolation (l/s)	246.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	97.250	Cap Volume Depth (m)	0.325

Cellular Storage Manhole: 36, DS/PN: 1.008

Invert Level (m)	96.562	Safety Factor	3.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	115.5	115.5	0.801	0.0	149.9
0.800	115.5	149.9			

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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 Coeffiecient 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 2
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 19.600 Cv (Winter) 1.000

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

Profile(s) Summer and Winter
Duration(s) (mins) 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	30 Summer	1	+0%	100/30 Summer				99.086
1.001	2	30 Summer	1	+0%	30/30 Summer				98.884
1.002	3	30 Summer	1	+0%	30/30 Summer				98.797
1.003	4	30 Summer	1	+0%	30/30 Summer				98.743
1.004	5	30 Summer	1	+0%	30/30 Summer				98.678
2.000	6	30 Summer	1	+0%					98.766
1.005	7	30 Summer	1	+0%	100/30 Summer				98.424
1.006	8	30 Summer	1	+0%	100/30 Summer				98.296
1.007	9	30 Summer	1	+0%	100/30 Summer				97.679
3.000	10	30 Summer	1	+0%					98.666
3.001	11	30 Summer	1	+0%	100/30 Summer				98.410
4.000	12	30 Summer	1	+0%					98.530
3.002	13	30 Summer	1	+0%	30/30 Summer				97.960
3.003	14	30 Summer	1	+0%	100/120 Summer				97.773
5.000	15	30 Summer	1	+0%					98.370
5.001	16	30 Summer	1	+0%	30/30 Summer				97.178
5.002	17	30 Summer	1	+0%	30/30 Summer				97.045
5.003	18	30 Summer	1	+0%	30/30 Summer				96.994
6.000	19	30 Summer	1	+0%	100/30 Summer				97.503

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.074	0.000	0.15		1.0	OK	
1.001	2	-0.066	0.000	0.25		1.5	OK	
1.002	3	-0.057	0.000	0.37		2.2	OK	
1.003	4	-0.051	0.000	0.48		2.9	OK	
1.004	5	-0.046	0.000	0.57		3.7	OK	
2.000	6	-0.132	0.000	0.03		1.3	OK	
1.005	7	-0.099	0.000	0.25		5.6	OK	
1.006	8	-0.095	0.000	0.29		8.2	OK	
1.007	9	-0.098	0.000	0.26		9.9	OK	
3.000	10	-0.074	0.000	0.15		1.2	OK	
3.001	11	-0.072	0.000	0.18		2.0	OK	
4.000	12	-0.075	0.000	0.14		1.5	OK	
3.002	13	-0.052	0.000	0.46		4.6	OK	
3.003	14	-0.114	0.000	0.13		6.2	OK	
5.000	15	-0.130	0.000	0.04		1.8	OK	
5.001	16	-0.109	0.000	0.16		2.9	OK	
5.002	17	-0.098	0.000	0.27		3.7	OK	
5.003	18	-0.098	0.000	0.26		4.5	OK	
6.000	19	-0.078	0.000	0.11		0.7	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
6.001	20	30 Summer	1	+0%	30/30 Summer				97.393
6.002	21	30 Summer	1	+0%	30/30 Summer				97.309
6.003	22	30 Summer	1	+0%	30/30 Summer				97.205
5.004	23	30 Summer	1	+0%	30/30 Summer				96.923
7.000	24	30 Summer	1	+0%	30/30 Summer				97.121
5.005	25	30 Summer	1	+0%	30/30 Summer				96.868
8.000	26	30 Summer	1	+0%	30/30 Summer				96.914
5.006	27	120 Winter	1	+0%	1/60 Summer				96.796
9.000	28	30 Summer	1	+0%	100/30 Summer				97.310
10.000	29	30 Summer	1	+0%	100/30 Summer				97.307
9.001	30	30 Summer	1	+0%	30/30 Summer				97.203
9.002	31	30 Summer	1	+0%	30/120 Summer				97.066
11.000	32	30 Summer	1	+0%	100/30 Summer				97.211
12.000	33	30 Summer	1	+0%	30/240 Summer				97.162
11.001	34	30 Summer	1	+0%	30/120 Summer				97.109
9.003	35	30 Summer	1	+0%	30/30 Summer				96.950
1.008	36	120 Winter	1	+0%	1/30 Summer				96.794
1.009	37	120 Winter	1	+0%	1/30 Summer				96.794

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
6.001	20	-0.068	0.000	0.22		1.3	OK	
6.002	21	-0.059	0.000	0.34		2.2	OK	
6.003	22	-0.053	0.000	0.45		3.0	OK	
5.004	23	-0.069	0.000	0.56		8.4	OK	
7.000	24	-0.067	0.000	0.23		1.5	OK	
5.005	25	-0.067	0.000	0.59		10.6	OK	
8.000	26	-0.069	0.000	0.20		1.5	OK	
5.006	27	0.017	0.000	0.37		4.8	SURCHARGED	
9.000	28	-0.076	0.000	0.13		0.8	OK	
10.000	29	-0.078	0.000	0.10		0.7	OK	
9.001	30	-0.053	0.000	0.45		2.7	OK	
9.002	31	-0.104	0.000	0.20		2.7	OK	
11.000	32	-0.073	0.000	0.16		1.0	OK	
12.000	33	-0.078	0.000	0.11		0.7	OK	
11.001	34	-0.056	0.000	0.40		2.5	OK	
9.003	35	-0.105	0.000	0.20		6.0	OK	
1.008	36	0.132	0.000	0.10		2.4	SURCHARGED	
1.009	37	0.282	0.000	0.07		2.0	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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 Coeffiecient 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 2
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 19.600 Cv (Winter) 1.000

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

Profile(s) Summer and Winter
Duration(s) (mins) 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	30 Summer	30	+0%	100/30 Summer				99.103
1.001	2	30 Summer	30	+0%	30/30 Summer				98.955
1.002	3	30 Summer	30	+0%	30/30 Summer				98.930
1.003	4	30 Summer	30	+0%	30/30 Summer				98.892
1.004	5	30 Summer	30	+0%	30/30 Summer				98.819
2.000	6	30 Summer	30	+0%					98.778
1.005	7	30 Summer	30	+0%	100/30 Summer				98.455
1.006	8	30 Summer	30	+0%	100/30 Summer				98.338
1.007	9	30 Summer	30	+0%	100/30 Summer				97.718
3.000	10	30 Summer	30	+0%					98.683
3.001	11	30 Summer	30	+0%	100/30 Summer				98.431
4.000	12	30 Summer	30	+0%					98.545
3.002	13	30 Summer	30	+0%	30/30 Summer				98.066
3.003	14	30 Summer	30	+0%	100/120 Summer				97.798
5.000	15	30 Summer	30	+0%					98.382
5.001	16	30 Summer	30	+0%	30/30 Summer				97.314
5.002	17	30 Summer	30	+0%	30/30 Summer				97.295
5.003	18	30 Summer	30	+0%	30/30 Summer				97.285
6.000	19	30 Summer	30	+0%	100/30 Summer				97.516

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.057	0.000	0.37		2.4	OK	
1.001	2	0.005	0.000	0.61		3.8	SURCHARGED	
1.002	3	0.076	0.000	0.79		4.7	SURCHARGED	
1.003	4	0.098	0.000	1.02		6.1	SURCHARGED	
1.004	5	0.095	0.000	1.21		7.8	SURCHARGED	
2.000	6	-0.120	0.000	0.09		3.3	OK	
1.005	7	-0.068	0.000	0.58		13.1	OK	
1.006	8	-0.053	0.000	0.73		20.6	OK	
1.007	9	-0.059	0.000	0.67		25.8	OK	
3.000	10	-0.057	0.000	0.38		2.8	OK	
3.001	11	-0.051	0.000	0.47		5.2	OK	
4.000	12	-0.060	0.000	0.34		3.7	OK	
3.002	13	0.054	0.000	1.21		11.9	SURCHARGED	
3.003	14	-0.089	0.000	0.35		16.6	OK	
5.000	15	-0.118	0.000	0.10		4.5	OK	
5.001	16	0.027	0.000	0.42		7.5	SURCHARGED	
5.002	17	0.152	0.000	0.55		7.7	SURCHARGED	
5.003	18	0.193	0.000	0.47		8.1	SURCHARGED	
6.000	19	-0.065	0.000	0.26		1.6	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
6.001	20	30 Summer	30	+0%	30/30 Summer				97.481
6.002	21	30 Summer	30	+0%	30/30 Summer				97.465
6.003	22	30 Summer	30	+0%	30/30 Summer				97.426
5.004	23	30 Summer	30	+0%	30/30 Summer				97.264
7.000	24	240 Winter	30	+0%	30/30 Summer				97.259
5.005	25	240 Winter	30	+0%	30/30 Summer				97.258
8.000	26	240 Winter	30	+0%	30/30 Summer				97.255
5.006	27	240 Winter	30	+0%	1/60 Summer				97.255
9.000	28	30 Summer	30	+0%	100/30 Summer				97.325
10.000	29	30 Summer	30	+0%	100/30 Summer				97.320
9.001	30	30 Summer	30	+0%	30/30 Summer				97.281
9.002	31	240 Winter	30	+0%	30/120 Summer				97.251
11.000	32	240 Winter	30	+0%	100/30 Summer				97.253
12.000	33	240 Winter	30	+0%	30/240 Summer				97.253
11.001	34	240 Winter	30	+0%	30/120 Summer				97.253
9.003	35	240 Winter	30	+0%	30/30 Summer				97.252
1.008	36	240 Winter	30	+0%	1/30 Summer				97.252
1.009	37	240 Winter	30	+0%	1/30 Summer				97.250

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
6.001	20	0.020	0.000	0.58		3.5	SURCHARGED	
6.002	21	0.097	0.000	0.79		4.9	SURCHARGED	
6.003	22	0.168	0.000	0.88		5.7	SURCHARGED	
5.004	23	0.272	0.000	0.98		14.7	SURCHARGED	
7.000	24	0.071	0.000	0.10		0.7	SURCHARGED	
5.005	25	0.323	0.000	0.28		5.0	SURCHARGED	
8.000	26	0.272	0.000	0.09		0.7	SURCHARGED	
5.006	27	0.476	0.000	0.46		5.9	SURCHARGED	
9.000	28	-0.061	0.000	0.32		2.0	OK	
10.000	29	-0.065	0.000	0.26		1.6	OK	
9.001	30	0.025	0.000	1.14		7.0	SURCHARGED	
9.002	31	0.081	0.000	0.10		1.4	SURCHARGED	
11.000	32	-0.031	0.000	0.07		0.5	OK	
12.000	33	0.013	0.000	0.05		0.3	SURCHARGED	
11.001	34	0.088	0.000	0.19		1.2	SURCHARGED	
9.003	35	0.197	0.000	0.10		3.1	SURCHARGED	
1.008	36	0.590	0.000	0.11		2.7	SURCHARGED	
1.009	37	0.738	0.000	0.07		2.0	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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 Coeffiecient 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 2
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 1.000
M5-60 (mm) 19.600 Cv (Winter) 1.000

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

Profile(s) Summer and Winter
Duration(s) (mins) 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	30 Summer	100	+40%	100/30 Summer				99.353
1.001	2	30 Summer	100	+40%	30/30 Summer				99.328
1.002	3	30 Summer	100	+40%	30/30 Summer				99.293
1.003	4	30 Summer	100	+40%	30/30 Summer				99.238
1.004	5	30 Summer	100	+40%	30/30 Summer				99.130
2.000	6	30 Summer	100	+40%					98.788
1.005	7	30 Summer	100	+40%	100/30 Summer				98.663
1.006	8	30 Summer	100	+40%	100/30 Summer				98.586
1.007	9	120 Summer	100	+40%	100/30 Summer				98.048
3.000	10	30 Summer	100	+40%					98.712
3.001	11	30 Summer	100	+40%	100/30 Summer				98.621
4.000	12	30 Summer	100	+40%					98.569
3.002	13	30 Summer	100	+40%	30/30 Summer				98.374
3.003	14	120 Summer	100	+40%	100/120 Summer				97.959
5.000	15	30 Summer	100	+40%					98.394
5.001	16	120 Summer	100	+40%	30/30 Summer				98.025
5.002	17	120 Summer	100	+40%	30/30 Summer				98.016
5.003	18	120 Summer	100	+40%	30/30 Summer				98.011
6.000	19	120 Summer	100	+40%	100/30 Summer				98.044

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.193	0.000	0.59		3.8	FLOOD RISK	
1.001	2	0.378	0.000	0.67		4.1	FLOOD RISK	
1.002	3	0.439	0.000	1.04		6.1	FLOOD RISK	
1.003	4	0.444	0.000	1.37		8.2	SURCHARGED	
1.004	5	0.406	0.000	1.65		10.6	SURCHARGED	
2.000	6	-0.110	0.000	0.16		6.0	OK	
1.005	7	0.140	0.000	0.80		18.3	SURCHARGED	
1.006	8	0.195	0.000	1.01		28.6	SURCHARGED	
1.007	9	0.271	0.000	0.61		23.6	SURCHARGED	
3.000	10	-0.028	0.000	0.69		5.2	OK	
3.001	11	0.139	0.000	0.76		8.4	SURCHARGED	
4.000	12	-0.036	0.000	0.62		6.7	OK	
3.002	13	0.362	0.000	1.97		19.4	SURCHARGED	
3.003	14	0.072	0.000	0.31		14.6	SURCHARGED	
5.000	15	-0.106	0.000	0.19		8.2	OK	
5.001	16	0.738	0.000	0.29		5.3	FLOOD RISK	
5.002	17	0.873	0.000	0.45		6.4	FLOOD RISK	
5.003	18	0.919	0.000	0.44		7.5	FLOOD RISK	
6.000	19	0.463	0.000	0.21		1.3	FLOOD RISK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
6.001	20	120 Summer	100	+40%	30/30 Summer				98.041
6.002	21	120 Summer	100	+40%	30/30 Summer				98.035
6.003	22	120 Summer	100	+40%	30/30 Summer				98.023
5.004	23	120 Summer	100	+40%	30/30 Summer				98.000
7.000	24	120 Summer	100	+40%	30/30 Summer				97.988
5.005	25	120 Summer	100	+40%	30/30 Summer				97.989
8.000	26	120 Summer	100	+40%	30/30 Summer				97.974
5.006	27	120 Summer	100	+40%	1/60 Summer				97.964
9.000	28	480 Winter	100	+40%	100/30 Summer				97.544
10.000	29	480 Winter	100	+40%	100/30 Summer				97.544
9.001	30	480 Winter	100	+40%	30/30 Summer				97.543
9.002	31	480 Winter	100	+40%	30/120 Summer				97.542
11.000	32	120 Summer	100	+40%	100/30 Summer				97.737
12.000	33	120 Summer	100	+40%	30/240 Summer				97.735
11.001	34	120 Summer	100	+40%	30/120 Summer				97.732
9.003	35	120 Summer	100	+40%	30/30 Summer				97.718
1.008	36	120 Summer	100	+40%	1/30 Summer				97.936
1.009	37	120 Summer	100	+40%	1/30 Summer				97.934

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
6.001	20	0.580	0.000	0.40		2.5	FLOOD RISK	
6.002	21	0.667	0.000	0.59		3.7	FLOOD RISK	
6.003	22	0.765	0.000	0.66		4.3	FLOOD RISK	
5.004	23	1.008	0.000	0.82		12.3	FLOOD RISK	
7.000	24	0.800	0.000	0.34		2.2	FLOOD RISK	
5.005	25	1.054	0.000	0.86		15.5	FLOOD RISK	
8.000	26	0.991	0.000	0.29		2.2	FLOOD RISK	
5.006	27	1.185	0.000	1.51		19.4	FLOOD RISK	
9.000	28	0.158	0.000	0.06		0.4	FLOOD RISK	
10.000	29	0.159	0.000	0.05		0.3	FLOOD RISK	
9.001	30	0.287	0.000	0.24		1.4	FLOOD RISK	
9.002	31	0.372	0.000	0.15		2.1	FLOOD RISK	
11.000	32	0.453	0.000	0.32		2.0	FLOOD RISK	
12.000	33	0.495	0.000	0.20		1.2	FLOOD RISK	
11.001	34	0.567	0.000	0.69		4.3	FLOOD RISK	
9.003	35	0.663	0.000	0.32		9.8	SURCHARGED	
1.008	36	1.274	0.000	0.42		10.1	SURCHARGED	
1.009	37	1.422	0.000	0.09		2.5	FLOOD RISK	

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