Date 13/01/2021 23:05	Designed by andyj
File 201122 SW & FW.MDX	Checked by
XP Solutions	Network 2020.1

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)	2	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	100	Maximum Backdrop Height (m)	0.000
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)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.075	4-8	0.416

Total Area Contributing (ha) = 1.491

Total Pipe Volume (m^3) = 30.990

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
S1.000	29.308	0.488	60.1	0.106	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	42.396	0.707	60.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	46.833	0.781	60.0	0.106	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)
S1.000	66.14	4.29	158.575	0.106	0.0	0.0	0.0	1.69	67.2	19.0
S1.001	63.83	4.71	158.087	0.106	0.0	0.0	0.0	1.69	67.3	19.0
S1.002	61.48	5.17	157.380	0.212	0.0	0.0	0.0	1.69	67.3	35.3

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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
S2.000	29.358	0.489	60.0	0.106	4.00	0.0	0.600	o	225	Pipe/Conduit	
S2.001	53.679	0.895	60.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.002	37.624	0.996	37.8	0.121	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	18.200	0.348	52.3	0.187	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.000	5.684	0.028	203.0	0.119	4.00	0.0	0.600	o	300	Pipe/Conduit	
S4.000	14.484	1.453	10.0	0.021	4.00	0.0	0.600	o	150	Pipe/Conduit	
S1.004	7.195	0.069	104.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.000	27.699	0.964	28.7	0.032	4.00	0.0	0.600	o	150	Pipe/Conduit	
S1.005	31.017	0.296	104.8	0.032	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.006	31.016	0.296	104.8	0.064	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.000	28.555	0.476	60.0	0.048	4.00	0.0	0.600	o	225	Pipe/Conduit	
S6.001	29.007	0.290	100.0	0.064	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.002	25.165	0.252	99.9	0.024	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)
S2.000	66.14	4.29	158.575	0.106	0.0	0.0	0.0	1.69	67.2	19.0
S2.001	63.24	4.82	158.086	0.106	0.0	0.0	0.0	1.69	67.3	19.0
S2.002	62.00	5.06	157.116	0.227	0.0	0.0	0.0	2.57	181.4	38.1
S1.003	60.81	5.31	156.120	0.626	0.0	0.0	0.0	2.18	154.0	103.1
S3.000	67.34	4.09	155.800	0.119	0.0	0.0	0.0	1.10	77.7	21.7
S4.000	67.41	4.08	157.375	0.021	0.0	0.0	0.0	3.21	56.7	3.8
S1.004	67.39	4.08	155.772	0.000	27.4	0.0	0.0	1.54	108.8	27.4
S5.000	66.40	4.24	156.850	0.032	0.0	0.0	0.0	1.89	33.3	5.8
S1.005	64.50	4.58	155.703	0.064	27.4	0.0	0.0	1.54	108.5	38.6
S1.006	62.72	4.92	155.407	0.128	27.4	0.0	0.0	1.54	108.5	49.1
S6.000	66.19	4.28	156.475	0.048	0.0	0.0	0.0	1.69	67.3	8.6
S6.001	64.12	4.65	155.999	0.112	0.0	0.0	0.0	1.31	52.0	19.4
S6.002	62.45	4.97	155.709	0.136	0.0	0.0	0.0	1.31	52.0	23.0

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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
S6.003	27.163	0.272	99.9	0.043	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.007	9.767	0.414	23.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S7.000	8.363	0.033	253.4	0.063	4.00	0.0	0.600	o	300	Pipe/Conduit	
S8.000	22.779	0.447	51.0	0.017	4.00	0.0	0.600	o	225	Pipe/Conduit	
S8.001	33.596	0.659	51.0	0.034	0.00	0.0	0.600	o	225	Pipe/Conduit	
S9.000	22.882	1.105	20.7	0.017	4.00	0.0	0.600	o	225	Pipe/Conduit	
S8.002	29.603	0.580	51.0	0.141	0.00	0.0	0.600	o	225	Pipe/Conduit	
S8.003	9.827	0.192	51.2	0.146	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.008	8.370	0.140	59.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.009	15.339	0.206	74.5	0.000	0.00	0.0	0.600	o	375	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)
S6.003	60.76	5.32	155.457	0.179	0.0	0.0	0.0	1.31	52.0	29.5
S1.007	60.52	5.37	155.110	0.307	27.4	0.0	0.0	3.25	229.8	77.7
S7.000	67.01	4.14	154.730	0.063	0.0	0.0	0.0	0.98	69.5	11.4
S8.000	66.62	4.21	156.575	0.017	0.0	0.0	0.0	1.84	73.0	3.1
S8.001	64.88	4.51	156.128	0.051	0.0	0.0	0.0	1.84	73.0	9.0
S9.000	67.07	4.13	156.575	0.017	0.0	0.0	0.0	2.89	114.8	3.1
S8.002	63.43	4.78	155.469	0.209	0.0	0.0	0.0	1.84	73.0	35.9
S8.003	62.97	4.87	154.889	0.355	0.0	0.0	0.0	1.83	72.9	60.5
S1.008	67.50	4.06	154.696	0.000	25.0	0.0	0.0	2.35	259.2	25.0
S1.009	67.13	4.12	154.506	0.000	58.4	0.0	0.0	2.10	232.1	58.4

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.106	0.106	0.106
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.106	0.106	0.106
2.000	-	-	100	0.106	0.106	0.106
2.001	-	-	100	0.000	0.000	0.000
2.002	-	-	100	0.121	0.121	0.121
1.003	-	-	100	0.187	0.187	0.187
3.000	-	-	100	0.119	0.119	0.119
4.000	-	-	100	0.021	0.021	0.021
1.004	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.032	0.032	0.032
1.005	-	-	100	0.032	0.032	0.032
1.006	-	-	100	0.064	0.064	0.064
6.000	-	-	100	0.048	0.048	0.048
6.001	-	-	100	0.064	0.064	0.064
6.002	-	-	100	0.024	0.024	0.024
6.003	-	-	100	0.043	0.043	0.043
1.007	-	-	100	0.000	0.000	0.000
7.000	-	-	100	0.063	0.063	0.063
8.000	-	-	100	0.017	0.017	0.017
8.001	-	-	100	0.034	0.034	0.034
9.000	-	-	100	0.017	0.017	0.017
8.002	-	-	100	0.141	0.141	0.141
8.003	-	-	100	0.146	0.146	0.146
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.491	1.491	1.491

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.009	S	155.230	154.300	0.000	225	0

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.350		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S1.9, DS/PN: S1.004, Volume (m³): 9.2

Unit Reference	MD-SHE-0281-5000-2000-5000
Design Head (m)	2.000
Design Flow (l/s)	50.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	281
Invert Level (m)	155.772
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	2100

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	49.9	Kick-Flo®	1.330	41.0
Flush-Flo™	0.612	49.8	Mean Flow over Head Range	-	42.9

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	8.8	1.200	45.0	3.000	60.7	7.000	91.5
0.200	29.0	1.400	42.0	3.500	65.4	7.500	94.7
0.300	45.9	1.600	44.8	4.000	69.7	8.000	97.7
0.400	48.3	1.800	47.4	4.500	73.8	8.500	100.6
0.500	49.5	2.000	49.9	5.000	77.7	9.000	103.5
0.600	49.8	2.200	52.2	5.500	81.4	9.500	106.2
0.800	49.3	2.400	54.5	6.000	84.9		
1.000	47.9	2.600	56.6	6.500	88.3		

Hydro-Brake® Optimum Manhole: S1.22, DS/PN: S1.008, Volume (m³): 6.3

Unit Reference	MD-SHE-0305-5800-1720-5800
Design Head (m)	1.720
Design Flow (l/s)	58.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	305
Invert Level (m)	154.696
Minimum Outlet Pipe Diameter (mm)	375

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Hydro-Brake® Optimum Manhole: S1.22, DS/PN: S1.008, Volume (m³): 6.3

Suggested Manhole Diameter (mm) 2100

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.720	58.0	Kick-Flo®	1.205	48.8
Flush-Flo™	0.561	58.0	Mean Flow over Head Range	-	49.3

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	9.3	1.200	49.1	3.000	75.9	7.000	114.6
0.200	31.3	1.400	52.5	3.500	81.8	7.500	118.5
0.300	53.6	1.600	56.0	4.000	87.3	8.000	122.3
0.400	56.8	1.800	59.3	4.500	92.4	8.500	126.0
0.500	57.8	2.000	62.4	5.000	97.3	9.000	129.6
0.600	57.9	2.200	65.3	5.500	101.9	9.500	133.0
0.800	56.8	2.400	68.1	6.000	106.3		
1.000	54.7	2.600	70.8	6.500	110.5		

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Storage Structures for Storm

Tank or Pond Manhole: ST1, DS/PN: S3.000

Invert Level (m) 155.800

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	130.0	1.000	130.0	1.500	130.0	1.501	0.0

Tank or Pond Manhole: ST2, DS/PN: S7.000

Invert Level (m) 154.730

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	375.0	1.000	375.0	1.001	0.0

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1.0	15 Winter	1	+0%	100/15 Summer				158.648
S1.001	S1.1	15 Winter	1	+0%	100/15 Summer				158.159
S1.002	S1.2	15 Winter	1	+0%	30/15 Summer				157.479
S2.000	S1.3	15 Winter	1	+0%	100/15 Summer				158.648
S2.001	S1.4	15 Winter	1	+0%	100/15 Summer				158.157
S2.002	S1.6	15 Winter	1	+0%	100/15 Summer				157.197
S1.003	S1.7	15 Winter	1	+0%	30/15 Summer				156.280
S3.000	ST1	60 Winter	1	+0%	30/15 Summer				155.971
S4.000	S1.8	15 Winter	1	+0%					157.397
S1.004	S1.9	15 Winter	1	+0%	1/15 Summer				156.124
S5.000	SRE1	15 Winter	1	+0%					156.887
S1.005	S1.10	15 Winter	1	+0%	100/15 Summer				155.850
S1.006	S1.11	15 Winter	1	+0%	30/15 Summer				155.566

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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)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1.0	-0.152	0.000	0.23			14.3	OK	
S1.001	S1.1	-0.153	0.000	0.22			14.0	OK	
S1.002	S1.2	-0.126	0.000	0.40			25.5	OK	
S2.000	S1.3	-0.152	0.000	0.23			14.3	OK	
S2.001	S1.4	-0.154	0.000	0.22			14.1	OK	
S2.002	S1.6	-0.219	0.000	0.16			27.1	OK	
S1.003	S1.7	-0.140	0.000	0.55			72.6	OK	
S3.000	ST1	-0.129	0.000	0.19			10.3	OK	
S4.000	S1.8	-0.128	0.000	0.05			2.8	OK	
S1.004	S1.9	0.052	0.000	0.61			40.3	SURCHARGED	
S5.000	SRE1	-0.113	0.000	0.14			4.3	OK	
S1.005	S1.10	-0.153	0.000	0.48			47.7	OK	
S1.006	S1.11	-0.141	0.000	0.55			54.1	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.
S6.000	S1.12	15 Winter	1	+0%	100/15 Summer			
S6.001	S1.13	15 Winter	1	+0%	100/15 Summer			
S6.002	S1.14	15 Winter	1	+0%	30/15 Summer			
S6.003	S1.15	15 Winter	1	+0%	30/15 Summer			
S1.007	S1.16	15 Winter	1	+0%	30/15 Summer			
S7.000	ST2	240 Winter	1	+0%	30/30 Winter			
S8.000	S1.17	15 Winter	1	+0%	100/15 Summer			
S8.001	S1.18	15 Winter	1	+0%	100/15 Summer			
S9.000	S1.19	15 Winter	1	+0%	100/15 Summer			
S8.002	S1.20	15 Winter	1	+0%	30/15 Summer			
S8.003	S1.21	15 Winter	1	+0%	1/15 Summer	100/15 Summer		
S1.008	S1.22	15 Winter	1	+0%	1/15 Summer			
S1.009	S1.23	15 Winter	1	+0%				

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	Level Exceeded
S6.000	S1.12	156.523	-0.177	0.000	0.10			6.5	OK	
S6.001	S1.13	156.079	-0.145	0.000	0.27			13.1	OK	
S6.002	S1.14	155.798	-0.136	0.000	0.33			15.8	OK	
S6.003	S1.15	155.559	-0.123	0.000	0.42			20.2	OK	
S1.007	S1.16	155.253	-0.157	0.000	0.46			73.9	OK	
S7.000	ST2	154.827	-0.203	0.000	0.09			4.5	OK	
S8.000	S1.17	156.602	-0.198	0.000	0.03			2.3	OK	
S8.001	S1.18	156.173	-0.180	0.000	0.09			5.9	OK	
S9.000	S1.19	156.598	-0.202	0.000	0.02			2.3	OK	
S8.002	S1.20	155.560	-0.134	0.000	0.34			23.0	OK	
S8.003	S1.21	155.160	0.046	0.000	0.63			37.9	SURCHARGED	3
S1.008	S1.22	155.084	0.013	0.000	0.39			56.6	SURCHARGED	
S1.009	S1.23	154.670	-0.211	0.000	0.40			56.6	OK	

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1.0	15 Winter	30	+0%	100/15 Summer				158.695
S1.001	S1.1	15 Winter	30	+0%	100/15 Summer				158.206
S1.002	S1.2	15 Winter	30	+0%	30/15 Summer				157.785
S2.000	S1.3	15 Winter	30	+0%	100/15 Summer				158.695
S2.001	S1.4	15 Winter	30	+0%	100/15 Summer				158.204
S2.002	S1.6	15 Winter	30	+0%	100/15 Summer				157.256
S1.003	S1.7	15 Winter	30	+0%	30/15 Summer				157.069
S3.000	ST1	30 Winter	30	+0%	30/15 Summer				156.390
S4.000	S1.8	15 Winter	30	+0%					157.411
S1.004	S1.9	15 Winter	30	+0%	1/15 Summer				156.437
S5.000	SRE1	15 Winter	30	+0%					156.909
S1.005	S1.10	15 Winter	30	+0%	100/15 Summer				155.946
S1.006	S1.11	15 Winter	30	+0%	30/15 Summer				155.822

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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)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1.0	-0.105	0.000	0.56			35.1	OK	
S1.001	S1.1	-0.106	0.000	0.54			34.4	OK	
S1.002	S1.2	0.180	0.000	0.95			61.2	SURCHARGED	
S2.000	S1.3	-0.105	0.000	0.56			35.1	OK	
S2.001	S1.4	-0.107	0.000	0.52			33.9	OK	
S2.002	S1.6	-0.160	0.000	0.44			73.4	OK	
S1.003	S1.7	0.649	0.000	1.37			181.9	SURCHARGED	
S3.000	ST1	0.290	0.000	0.83			44.5	SURCHARGED	
S4.000	S1.8	-0.114	0.000	0.13			7.0	OK	
S1.004	S1.9	0.365	0.000	0.75			49.4	SURCHARGED	
S5.000	SRE1	-0.091	0.000	0.33			10.6	OK	
S1.005	S1.10	-0.057	0.000	0.70			69.4	OK	
S1.006	S1.11	0.115	0.000	0.81			79.9	SURCHARGED	

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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)
S6.000	S1.12	15 Winter	30	+0%	100/15 Summer				156.552
S6.001	S1.13	15 Winter	30	+0%	100/15 Summer				156.152
S6.002	S1.14	15 Winter	30	+0%	30/15 Summer				156.044
S6.003	S1.15	15 Winter	30	+0%	30/15 Summer				155.907
S1.007	S1.16	15 Winter	30	+0%	30/15 Summer				155.643
S7.000	ST2	60 Winter	30	+0%	30/30 Winter				155.082
S8.000	S1.17	15 Winter	30	+0%	100/15 Summer				156.619
S8.001	S1.18	15 Winter	30	+0%	100/15 Summer				156.270
S9.000	S1.19	15 Winter	30	+0%	100/15 Summer				156.608
S8.002	S1.20	15 Winter	30	+0%	30/15 Summer				156.236
S8.003	S1.21	15 Winter	30	+0%	1/15 Summer	100/15 Summer			155.862
S1.008	S1.22	15 Winter	30	+0%	1/15 Summer				155.403
S1.009	S1.23	15 Winter	30	+0%					154.672

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S6.000	S1.12	-0.148	0.000	0.25			15.9	OK	
S6.001	S1.13	-0.072	0.000	0.76			36.7	OK	
S6.002	S1.14	0.110	0.000	0.81			38.9	SURCHARGED	
S6.003	S1.15	0.225	0.000	0.96			46.4	SURCHARGED	
S1.007	S1.16	0.233	0.000	0.78			125.2	SURCHARGED	
S7.000	ST2	0.052	0.000	0.64			33.6	SURCHARGED	
S8.000	S1.17	-0.181	0.000	0.08			5.6	OK	
S8.001	S1.18	-0.083	0.000	0.25			16.8	OK	
S9.000	S1.19	-0.192	0.000	0.05			5.6	OK	
S8.002	S1.20	0.542	0.000	0.81			54.8	SURCHARGED	
S8.003	S1.21	0.748	0.000	1.55			93.5	SURCHARGED	3
S1.008	S1.22	0.332	0.000	0.39			57.8	SURCHARGED	
S1.009	S1.23	-0.209	0.000	0.41			57.9	OK	

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1.0	15 Winter	100	+30%	100/15 Summer				159.449
S1.001	S1.1	15 Winter	100	+30%	100/15 Summer				159.394
S1.002	S1.2	15 Winter	100	+30%	30/15 Summer				159.312
S2.000	S1.3	15 Winter	100	+30%	100/15 Summer				159.107
S2.001	S1.4	15 Winter	100	+30%	100/15 Summer				158.908
S2.002	S1.6	15 Winter	100	+30%	100/15 Summer				158.578
S1.003	S1.7	15 Winter	100	+30%	30/15 Summer				158.287
S3.000	ST1	60 Winter	100	+30%	30/15 Summer				157.128
S4.000	S1.8	15 Winter	100	+30%					157.423
S1.004	S1.9	60 Winter	100	+30%	1/15 Summer				157.199
S5.000	SRE1	15 Winter	100	+30%					156.943
S1.005	S1.10	15 Winter	100	+30%	100/15 Summer				156.766
S1.006	S1.11	15 Winter	100	+30%	30/15 Summer				156.618

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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)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1.0	0.649	0.000	0.80			50.0	FLOOD RISK	
S1.001	S1.1	1.082	0.000	0.74			47.6	FLOOD RISK	
S1.002	S1.2	1.707	0.000	1.17			75.0	FLOOD RISK	
S2.000	S1.3	0.307	0.000	0.89			55.6	SURCHARGED	
S2.001	S1.4	0.597	0.000	0.74			48.0	SURCHARGED	
S2.002	S1.6	1.162	0.000	0.54			90.9	SURCHARGED	
S1.003	S1.7	1.867	0.000	1.84			244.6	SURCHARGED	
S3.000	ST1	1.028	0.000	0.88			46.9	SURCHARGED	
S4.000	S1.8	-0.102	0.000	0.22			11.7	OK	
S1.004	S1.9	1.127	0.000	0.76			49.8	SURCHARGED	
S5.000	SRE1	-0.057	0.000	0.56			17.8	OK	
S1.005	S1.10	0.763	0.000	0.74			72.9	SURCHARGED	
S1.006	S1.11	0.911	0.000	0.98			97.1	SURCHARGED	

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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.
S6.000	S1.12	15 Winter	100	+30%	100/15 Summer			
S6.001	S1.13	15 Winter	100	+30%	100/15 Summer			
S6.002	S1.14	15 Winter	100	+30%	30/15 Summer			
S6.003	S1.15	15 Winter	100	+30%	30/15 Summer			
S1.007	S1.16	15 Winter	100	+30%	30/15 Summer			
S7.000	ST2	180 Winter	100	+30%	30/30 Winter			
S8.000	S1.17	15 Winter	100	+30%	100/15 Summer			
S8.001	S1.18	15 Winter	100	+30%	100/15 Summer			
S9.000	S1.19	15 Winter	100	+30%	100/15 Summer			
S8.002	S1.20	15 Winter	100	+30%	30/15 Summer			
S8.003	S1.21	15 Winter	100	+30%	1/15 Summer	100/15 Summer		
S1.008	S1.22	15 Winter	100	+30%	1/15 Summer			
S1.009	S1.23	60 Summer	100	+30%				

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	Level Exceeded
S6.000	S1.12	157.296	0.596	0.000	0.39			24.7	FLOOD RISK	
S6.001	S1.13	157.283	1.059	0.000	0.88			42.6	FLOOD RISK	
S6.002	S1.14	157.136	1.202	0.000	1.02			49.1	FLOOD RISK	
S6.003	S1.15	156.873	1.191	0.000	1.37			65.9	SURCHARGED	
S1.007	S1.16	156.323	0.913	0.000	1.01			162.7	SURCHARGED	
S7.000	ST2	155.534	0.504	0.000	1.03			54.0	SURCHARGED	
S8.000	S1.17	157.456	0.656	0.000	0.18			12.0	FLOOD RISK	
S8.001	S1.18	157.493	1.140	0.000	0.34			23.6	FLOOD RISK	
S9.000	S1.19	157.387	0.587	0.000	0.16			16.5	FLOOD RISK	
S8.002	S1.20	157.450	1.756	0.000	1.13			76.6	FLOOD RISK	
S8.003	S1.21	156.672	1.558	2.240	2.10			126.8	FLOOD	3
S1.008	S1.22	155.891	0.820	0.000	0.39			57.8	SURCHARGED	
S1.009	S1.23	154.672	-0.209	0.000	0.41			57.9	OK	

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