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)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.433	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

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.243	4-8	0.784	8-12	0.047

Total Area Contributing (ha) = 2.075

Total Pipe Volume (m³) = 78.664

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	26.274	0.115	228.5	0.135	6.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	18.043	0.080	225.5	0.066	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	29.762	0.130	228.9	0.081	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	24.703	0.535	46.2	0.000	6.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	49.719	0.210	236.8	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	50.00	6.42	74.090	0.135	0.0	0.0	0.0	1.04	73.2	18.3
1.001	49.48	6.71	73.975	0.201	0.0	0.0	0.0	1.04	73.7	26.9
1.002	47.76	7.19	73.895	0.282	0.0	0.0	0.0	1.03	73.2	36.5
2.000	50.00	6.18	74.300	0.000	0.0	0.0	0.0	2.32	164.0	0.0
1.003	45.14	8.00	73.765	0.282	0.0	0.0	0.0	1.02	71.9	36.5

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
3.000	39.600	0.495	80.0	0.080	6.00	0.0	0.600	Q90	-7	Pipe/Conduit	
1.004	26.393	0.115	229.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	13.930	0.060	232.2	0.148	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.006	18.854	0.075	251.4	0.074	0.00	0.0	0.600	o	375	Pipe/Conduit	
4.000	20.741	0.070	296.3	0.118	6.00	0.0	0.600	o	300	Pipe/Conduit	
4.001	10.226	0.360	28.4	0.117	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.007	10.459	1.159	9.0	0.074	0.00	0.0	0.600	o	375	Pipe/Conduit	
5.000	32.843	0.200	164.2	0.045	6.00	0.0	0.600	o	225	Pipe/Conduit	
5.001	30.046	1.350	22.3	0.061	0.00	0.0	0.600	o	225	Pipe/Conduit	
5.002	24.929	0.029	859.6	0.245	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.008	16.845	0.051	330.3	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.009	21.826	0.067	325.8	0.175	0.00	0.0	0.600	o	600	Pipe/Conduit	
6.000	15.020	0.090	166.9	0.039	6.00	0.0	0.600	o	225	Pipe/Conduit	
6.001	19.486	0.085	229.2	0.069	0.00	0.0	0.600	o	300	Pipe/Conduit	
6.002	19.720	0.085	232.0	0.025	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)
3.000	50.00	6.22	74.465	0.080	0.0	0.0	0.0	2.99	1237.3	10.8
1.004	43.92	8.43	73.555	0.362	0.0	0.0	0.0	1.03	73.1	43.1
1.005	43.33	8.66	73.440	0.510	0.0	0.0	0.0	1.03	72.6	59.8
1.006	42.62	8.93	73.305	0.584	0.0	0.0	0.0	1.14	125.7	67.4
4.000	50.00	6.38	73.660	0.118	0.0	0.0	0.0	0.91	64.2	16.0
4.001	50.00	6.44	73.590	0.235	0.0	0.0	0.0	2.96	209.3	31.8
1.007	42.55	8.96	73.155	0.893	0.0	0.0	0.0	6.06	669.5	102.9
5.000	50.00	6.54	73.575	0.045	0.0	0.0	0.0	1.02	40.5	6.1
5.001	49.45	6.72	73.375	0.106	0.0	0.0	0.0	2.79	110.8	14.2
5.002	47.65	7.22	72.025	0.351	0.0	0.0	0.0	0.82	232.6	45.3
1.008	42.04	9.17	71.996	1.244	0.0	0.0	0.0	1.33	377.3	141.6
1.009	41.39	9.44	71.945	1.419	0.0	0.0	0.0	1.34	379.9	159.1
6.000	50.00	6.25	73.925	0.039	0.0	0.0	0.0	1.01	40.1	5.3
6.001	50.00	6.56	73.760	0.108	0.0	0.0	0.0	1.03	73.1	14.6
6.002	48.85	6.88	73.675	0.133	0.0	0.0	0.0	1.03	72.7	17.6

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
7.000	11.684	0.210	55.6	0.000	6.00	0.0	0.600	o	225	Pipe/Conduit	
6.003	24.526	0.200	122.6	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
6.004	13.717	0.045	304.8	0.228	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.010	34.897	0.108	323.1	0.160	0.00	0.0	0.600	o	600	Pipe/Conduit	
8.000	33.558	0.325	103.3	0.035	6.00	0.0	0.600	o	225	Pipe/Conduit	
1.011	13.279	0.210	63.2	0.100	0.00	0.0	0.600	o	600	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)
7.000	50.00	6.11	73.875	0.000	0.0	0.0	0.0	1.76	69.9	0.0
6.003	47.97	7.13	73.515	0.133	0.0	0.0	0.0	1.63	180.6	17.6
6.004	47.21	7.35	73.315	0.361	0.0	0.0	0.0	1.03	114.0	46.2
1.010	40.41	9.87	71.878	1.940	0.0	0.0	0.0	1.35	381.5	212.3
8.000	50.00	6.43	73.875	0.035	0.0	0.0	0.0	1.29	51.2	4.7
1.011	40.25	9.95	71.770	2.075	0.0	0.0	0.0	3.07	866.9	226.2

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdr (mm)
SMH1	75.410	1.320	Open Manhole	1350	1.000	74.090	300				
SMH2	75.410	1.435	Open Manhole	1350	1.001	73.975	300	1.000	73.975	300	
SMH3	75.375	1.480	Open Manhole	1200	1.002	73.895	300	1.001	73.895	300	
SMH4	75.500	1.200	Open Manhole	1200	2.000	74.300	300				
SMH5	75.450	1.685	Open Manhole	1200	1.003	73.765	300	1.002	73.765	300	
								2.000	73.765	300	
ACO 900	75.415	0.950	Junction		3.000	74.465	-7				
SMH6	75.400	1.845	Open Manhole	1200	1.004	73.555	300	1.003	73.555	300	
								3.000	73.970	-7	10
SMH7	75.325	1.885	Open Manhole	1200	1.005	73.440	300	1.004	73.440	300	
SMH8	75.415	2.110	Open Manhole	1350	1.006	73.305	375	1.005	73.380	300	
SMH9	75.100	1.440	Open Manhole	1200	4.000	73.660	300				
INTERCEPTOR	75.260	1.670	Open Manhole	1200	4.001	73.590	300	4.000	73.590	300	
SMH10	75.000	1.845	Open Manhole	1350	1.007	73.155	375	1.006	73.230	375	
								4.001	73.230	300	
SMH13	75.000	1.425	Open Manhole	1200	5.000	73.575	225				
SMH14	74.960	1.585	Open Manhole	1200	5.001	73.375	225	5.000	73.375	225	
TANK	74.895	2.870	Open Manhole	50	5.002	72.025	600	5.001	72.025	225	
SMH15	74.905	2.909	Open Manhole	1500	1.008	71.996	600	1.007	71.996	375	
								5.002	71.996	600	
SMH17	74.875	2.930	Open Manhole	1500	1.009	71.945	600	1.008	71.945	600	
SMH18	75.350	1.425	Open Manhole	1200	6.000	73.925	225				
SMH19	75.400	1.640	Open Manhole	1200	6.001	73.760	300	6.000	73.835	225	
SMH20	75.400	1.725	Open Manhole	1200	6.002	73.675	300	6.001	73.675	300	
SMH21	75.300	1.425	Open Manhole	1200	7.000	73.875	225				
SMH22	75.120	1.605	Open Manhole	1350	6.003	73.515	375	6.002	73.590	300	
								7.000	73.665	225	
SMH23	74.890	1.575	Open Manhole	1350	6.004	73.315	375	6.003	73.315	375	
SMH24	74.895	3.017	Open Manhole	2700	1.010	71.878	600	1.009	71.878	600	
								6.004	73.270	375	11
SMH25	75.000	1.125	Open Manhole	1200	8.000	73.875	225				
SMH26	75.000	3.230	Open Manhole	2100	1.011	71.770	600	1.010	71.770	600	
								8.000	73.550	225	14
	74.520	2.960	Open Manhole	0		OUTFALL		1.011	71.560	600	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SMH1	521475.905	209192.815	521475.905	209192.815	Required	
SMH2	521464.552	209216.510	521464.552	209216.510	Required	
SMH3	521456.330	209232.571	521456.330	209232.571	Required	
SMH4	521428.518	209205.935	521428.518	209205.935	Required	
SMH5	521426.636	209230.566	521426.636	209230.566	Required	
ACO 900	521416.286	209232.034			No Entry	
SMH6	521377.111	209226.248	521377.111	209226.248	Required	
SMH7	521379.117	209199.932	521379.117	209199.932	Required	
SMH8	521380.166	209186.042	521380.166	209186.042	Required	
SMH9	521362.461	209192.432	521362.461	209192.432	Required	
INTERCEPTOR	521374.476	209175.525	521374.476	209175.525	Required	
SMH10	521380.398	209167.189	521380.398	209167.189	Required	
SMH13	521310.546	209185.291	521310.546	209185.291	Required	
SMH14	521337.587	209203.932	521337.587	209203.932	Required	
TANK	521357.466	209181.402	521357.466	209181.402	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SMH15	521371.907	209161.082	521371.907	209161.082	Required	
SMH17	521381.586	209147.296	521381.586	209147.296	Required	
SMH18	521467.123	209155.753	521467.123	209155.753	Required	
SMH19	521461.540	209141.809	521461.540	209141.809	Required	
SMH20	521443.525	209134.379	521443.525	209134.379	Required	
SMH21	521435.181	209154.927	521435.181	209154.927	Required	
SMH22	521427.612	209146.026	521427.612	209146.026	Required	
SMH23	521407.641	209131.788	521407.641	209131.788	Required	
SMH24	521394.128	209129.433	521394.128	209129.433	Required	
SMH25	521338.473	209089.602	521338.473	209089.602	Required	
SMH26	521365.329	209109.724	521365.329	209109.724	Required	
	521371.241	209097.834			No Entry	

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)
1.011		74.520	71.560	0.000	0	0

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	1
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)	20.000	Storm Duration (mins)	30
Ratio R	0.433		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: SMH26, DS/PN: 1.011, Volume (m³): 21.6

Unit Reference	MD-SHE-0402-1220-3000-1220
Design Head (m)	3.000
Design Flow (l/s)	122.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	402
Invert Level (m)	71.770
Minimum Outlet Pipe Diameter (mm)	450
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	3.000	121.6
Flush-Flo™	0.898	121.3
Kick-Flo®	1.956	98.8
Mean Flow over Head Range	-	104.7

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	11.0	1.200	119.7	3.000	121.6	7.000	183.9
0.200	39.5	1.400	117.4	3.500	131.1	7.500	190.2
0.300	76.4	1.600	113.8	4.000	139.9	8.000	196.3
0.400	109.1	1.800	107.4	4.500	148.2	8.500	202.3
0.500	114.5	2.000	99.9	5.000	156.0	9.000	208.0
0.600	117.9	2.200	104.6	5.500	163.5	9.500	213.6
0.800	121.0	2.400	109.1	6.000	170.6		
1.000	121.1	2.600	113.5	6.500	177.4		

Storage Structures for Storm

Cellular Storage Manhole: TANK, DS/PN: 5.002

Invert Level (m) 72.025 Safety Factor 2.0
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	286.5	286.5	1.500	0.0	414.5
1.400	286.5	414.5			

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	1
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	0.433
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	50.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
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.
1.000	SMH1	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
1.001	SMH2	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
1.002	SMH3	15 Winter	1	+0%	30/15 Summer	100/15 Winter		
2.000	SMH4	15 Summer	1	+0%	100/15 Summer			
1.003	SMH5	15 Winter	1	+0%	30/15 Summer			
3.000	ACO 900	15 Winter	1	+0%				
1.004	SMH6	15 Winter	1	+0%	30/15 Summer			
1.005	SMH7	15 Winter	1	+0%	30/15 Summer			
1.006	SMH8	15 Winter	1	+0%	30/15 Summer			
4.000	SMH9	15 Winter	1	+0%	100/15 Summer			
4.001	INTERCEPTOR	15 Winter	1	+0%	100/15 Summer			
1.007	SMH10	15 Winter	1	+0%	100/15 Summer			
5.000	SMH13	15 Winter	1	+0%	100/30 Winter			
5.001	SMH14	15 Winter	1	+0%	100/30 Summer			
5.002	TANK	30 Winter	1	+0%	30/15 Winter			
1.008	SMH15	15 Winter	1	+0%	30/15 Summer			
1.009	SMH17	15 Winter	1	+0%	30/15 Summer			
6.000	SMH18	15 Winter	1	+0%	100/15 Summer			

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

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
1.000	SMH1	74.196	-0.194	0.000	0.27			17.7	OK
1.001	SMH2	74.108	-0.167	0.000	0.40			25.1	OK
1.002	SMH3	74.049	-0.146	0.000	0.51			34.0	OK
2.000	SMH4	74.300	-0.300	0.000	0.00			0.0	OK
1.003	SMH5	73.915	-0.150	0.000	0.49			32.9	OK
3.000	ACO 900	74.504	-0.861	0.000	0.01			10.6	OK
1.004	SMH6	73.728	-0.127	0.000	0.62			40.9	OK
1.005	SMH7	73.664	-0.076	0.000	0.90			54.1	OK
1.006	SMH8	73.511	-0.169	0.000	0.58			60.6	OK
4.000	SMH9	73.767	-0.193	0.000	0.28			15.5	OK
4.001	INTERCEPTOR	73.680	-0.210	0.000	0.20			29.5	OK
1.007	SMH10	73.274	-0.256	0.000	0.22			92.6	OK
5.000	SMH13	73.634	-0.166	0.000	0.15			5.9	OK
5.001	SMH14	73.428	-0.172	0.000	0.13			13.1	OK
5.002	TANK	72.203	-0.422	0.000	0.13		39	18.3	OK
1.008	SMH15	72.335	-0.261	0.000	0.19			52.9	OK
1.009	SMH17	72.317	-0.228	0.000	0.23			66.2	OK
6.000	SMH18	73.982	-0.168	0.000	0.15			5.2	OK

PN	US/MH Name	Level Exceeded
1.000	SMH1	4
1.001	SMH2	2
1.002	SMH3	
2.000	SMH4	
1.003	SMH5	
3.000	ACO 900	
1.004	SMH6	
1.005	SMH7	
1.006	SMH8	
4.000	SMH9	
4.001	INTERCEPTOR	
1.007	SMH10	
5.000	SMH13	
5.001	SMH14	
5.002	TANK	
1.008	SMH15	
1.009	SMH17	
6.000	SMH18	

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	SMH19	15 Winter	1	+0%	100/15 Summer				73.854
6.002	SMH20	15 Winter	1	+0%	100/15 Summer				73.778
7.000	SMH21	15 Summer	1	+0%	100/15 Summer				73.875
6.003	SMH22	15 Winter	1	+0%	100/15 Summer				73.596
6.004	SMH23	15 Winter	1	+0%	30/15 Summer				73.499
1.010	SMH24	15 Winter	1	+0%	30/15 Summer				72.290
8.000	SMH25	15 Winter	1	+0%	100/30 Winter				73.922
1.011	SMH26	15 Winter	1	+0%	30/15 Summer				72.238

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
6.001	SMH19	-0.206	0.000	0.21			13.4	OK	
6.002	SMH20	-0.197	0.000	0.26			16.3	OK	
7.000	SMH21	-0.225	0.000	0.00			0.0	OK	
6.003	SMH22	-0.294	0.000	0.10			16.3	OK	
6.004	SMH23	-0.191	0.000	0.48			42.5	OK	
1.010	SMH24	-0.188	0.000	0.35			111.0	OK	
8.000	SMH25	-0.178	0.000	0.10			4.6	OK	
1.011	SMH26	-0.132	0.000	0.25			113.0	OK	

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	1
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	0.433
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	50.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
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.
1.000	SMH1	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
1.001	SMH2	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
1.002	SMH3	15 Winter	30	+0%	30/15 Summer	100/15 Winter		
2.000	SMH4	15 Winter	30	+0%	100/15 Summer			
1.003	SMH5	15 Winter	30	+0%	30/15 Summer			
3.000	ACO 900	15 Winter	30	+0%				
1.004	SMH6	15 Winter	30	+0%	30/15 Summer			
1.005	SMH7	15 Winter	30	+0%	30/15 Summer			
1.006	SMH8	15 Winter	30	+0%	30/15 Summer			
4.000	SMH9	15 Winter	30	+0%	100/15 Summer			
4.001	INTERCEPTOR	15 Winter	30	+0%	100/15 Summer			
1.007	SMH10	15 Winter	30	+0%	100/15 Summer			
5.000	SMH13	15 Winter	30	+0%	100/30 Winter			
5.001	SMH14	15 Winter	30	+0%	100/30 Summer			
5.002	TANK	30 Winter	30	+0%	30/15 Winter			
1.008	SMH15	15 Summer	30	+0%	30/15 Summer			
1.009	SMH17	15 Summer	30	+0%	30/15 Summer			
6.000	SMH18	15 Winter	30	+0%	100/15 Summer			

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

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
1.000	SMH1	74.642	0.252	0.000	0.54			35.7	SURCHARGED
1.001	SMH2	74.555	0.280	0.000	0.77			49.0	SURCHARGED
1.002	SMH3	74.468	0.273	0.000	1.07			71.0	SURCHARGED
2.000	SMH4	74.313	-0.287	0.000	0.00			0.2	OK
1.003	SMH5	74.330	0.265	0.000	0.99			66.8	SURCHARGED
3.000	ACO 900	74.557	-0.808	0.000	0.03			25.9	OK
1.004	SMH6	74.130	0.275	0.000	1.34			87.8	SURCHARGED
1.005	SMH7	73.953	0.213	0.000	1.92			115.7	SURCHARGED
1.006	SMH8	73.720	0.040	0.000	1.29			134.7	SURCHARGED
4.000	SMH9	73.842	-0.118	0.000	0.68			38.1	OK
4.001	INTERCEPTOR	73.748	-0.142	0.000	0.53			79.1	OK
1.007	SMH10	73.381	-0.149	0.000	0.56			237.6	OK
5.000	SMH13	73.671	-0.129	0.000	0.38			14.4	OK
5.001	SMH14	73.468	-0.132	0.000	0.35			36.2	OK
5.002	TANK	72.822	0.197	0.000	0.55		36	77.4	SURCHARGED
1.008	SMH15	73.062	0.466	0.000	0.49			133.2	SURCHARGED
1.009	SMH17	73.248	0.703	0.000	0.44			128.0	SURCHARGED
6.000	SMH18	74.018	-0.132	0.000	0.36			12.6	OK

PN	US/MH Name	Level Exceeded
1.000	SMH1	4
1.001	SMH2	2
1.002	SMH3	
2.000	SMH4	
1.003	SMH5	
3.000	ACO 900	
1.004	SMH6	
1.005	SMH7	
1.006	SMH8	
4.000	SMH9	
4.001	INTERCEPTOR	
1.007	SMH10	
5.000	SMH13	
5.001	SMH14	
5.002	TANK	
1.008	SMH15	
1.009	SMH17	
6.000	SMH18	

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	SMH19	15 Winter	30	+0%	100/15 Summer				73.929
6.002	SMH20	15 Winter	30	+0%	100/15 Summer				73.868
7.000	SMH21	15 Summer	30	+0%	100/15 Summer				73.875
6.003	SMH22	15 Winter	30	+0%	100/15 Summer				73.791
6.004	SMH23	15 Winter	30	+0%	30/15 Summer				73.730
1.010	SMH24	15 Summer	30	+0%	30/15 Summer				73.351
8.000	SMH25	15 Winter	30	+0%	100/30 Winter				73.949
1.011	SMH26	15 Summer	30	+0%	30/15 Summer				73.343

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
6.001	SMH19	-0.131	0.000	0.59			37.4	OK	
6.002	SMH20	-0.107	0.000	0.73			46.0	OK	
7.000	SMH21	-0.225	0.000	0.00			0.0	OK	
6.003	SMH22	-0.099	0.000	0.30			47.4	OK	
6.004	SMH23	0.040	0.000	1.36			121.5	SURCHARGED	
1.010	SMH24	0.873	0.000	0.42			134.8	SURCHARGED	
8.000	SMH25	-0.151	0.000	0.24			11.4	OK	
1.011	SMH26	0.973	0.000	0.26			121.0	SURCHARGED	

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	1
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	0.433
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	50.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
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.
1.000	SMH1	15 Winter	100	+30%	30/15 Summer	100/15 Summer		
1.001	SMH2	15 Winter	100	+30%	30/15 Summer	100/15 Summer		
1.002	SMH3	15 Summer	100	+30%	30/15 Summer	100/15 Winter		
2.000	SMH4	15 Winter	100	+30%	100/15 Summer			
1.003	SMH5	15 Winter	100	+30%	30/15 Summer			
3.000	ACO 900	60 Winter	100	+30%				
1.004	SMH6	60 Winter	100	+30%	30/15 Summer			
1.005	SMH7	60 Winter	100	+30%	30/15 Summer			
1.006	SMH8	60 Winter	100	+30%	30/15 Summer			
4.000	SMH9	60 Winter	100	+30%	100/15 Summer			
4.001	INTERCEPTOR	60 Winter	100	+30%	100/15 Summer			
1.007	SMH10	60 Winter	100	+30%	100/15 Summer			
5.000	SMH13	60 Winter	100	+30%	100/30 Winter			
5.001	SMH14	60 Winter	100	+30%	100/30 Summer			
5.002	TANK	60 Winter	100	+30%	30/15 Winter			
1.008	SMH15	60 Winter	100	+30%	30/15 Summer			
1.009	SMH17	60 Winter	100	+30%	30/15 Summer			
6.000	SMH18	60 Winter	100	+30%	100/15 Summer			

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

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
1.000	SMH1	75.418	1.028	7.994	0.87			57.1	FLOOD
1.001	SMH2	75.410	1.135	0.341	1.02			65.0	FLOOD
1.002	SMH3	75.356	1.161	0.000	1.46			97.1	FLOOD RISK
2.000	SMH4	75.117	0.517	0.000	0.02			3.5	SURCHARGED
1.003	SMH5	75.118	1.053	0.000	1.33			90.2	SURCHARGED
3.000	ACO 900	75.036	-0.329	0.000	0.02			23.9	OK
1.004	SMH6	75.036	1.181	0.000	1.39			91.1	SURCHARGED
1.005	SMH7	74.999	1.259	0.000	2.14			128.9	SURCHARGED
1.006	SMH8	74.917	1.237	0.000	1.42			148.5	SURCHARGED
4.000	SMH9	74.843	0.883	0.000	0.63			35.1	SURCHARGED
4.001	INTERCEPTOR	74.835	0.945	0.000	0.47			70.4	SURCHARGED
1.007	SMH10	74.826	1.296	0.000	0.57			241.9	SURCHARGED
5.000	SMH13	74.763	0.963	0.000	0.35			13.4	SURCHARGED
5.001	SMH14	74.755	1.155	0.000	0.31			31.8	SURCHARGED
5.002	TANK	74.739	2.114	0.000	0.64		74	89.3	SURCHARGED
1.008	SMH15	74.734	2.138	0.000	0.45			122.8	SURCHARGED
1.009	SMH17	74.721	2.176	0.000	0.42			123.3	SURCHARGED
6.000	SMH18	74.741	0.591	0.000	0.33			11.6	SURCHARGED

PN	US/MH Name	Level Exceeded
1.000	SMH1	4
1.001	SMH2	2
1.002	SMH3	
2.000	SMH4	
1.003	SMH5	
3.000	ACO 900	
1.004	SMH6	
1.005	SMH7	
1.006	SMH8	
4.000	SMH9	
4.001	INTERCEPTOR	
1.007	SMH10	
5.000	SMH13	
5.001	SMH14	
5.002	TANK	
1.008	SMH15	
1.009	SMH17	
6.000	SMH18	

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	SMH19	60 Winter	100	+30%	100/15 Summer				74.736
6.002	SMH20	60 Winter	100	+30%	100/15 Summer				74.730
7.000	SMH21	60 Winter	100	+30%	100/15 Summer				74.721
6.003	SMH22	60 Winter	100	+30%	100/15 Summer				74.721
6.004	SMH23	60 Winter	100	+30%	30/15 Summer				74.716
1.010	SMH24	60 Winter	100	+30%	30/15 Summer				74.705
8.000	SMH25	60 Winter	100	+30%	100/30 Winter				74.685
1.011	SMH26	60 Winter	100	+30%	30/15 Summer				74.679

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
6.001	SMH19	0.676	0.000	0.51			32.5	SURCHARGED	
6.002	SMH20	0.755	0.000	0.63			39.9	SURCHARGED	
7.000	SMH21	0.621	0.000	0.04			2.1	SURCHARGED	
6.003	SMH22	0.831	0.000	0.26			40.3	SURCHARGED	
6.004	SMH23	1.026	0.000	1.20			107.2	SURCHARGED	
1.010	SMH24	2.227	0.000	0.39			125.8	SURCHARGED	
8.000	SMH25	0.585	0.000	0.22			10.4	SURCHARGED	
1.011	SMH26	2.309	0.000	0.26			121.0	SURCHARGED	