STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SWS V4.SWS

Pipe Sizes 1048-79 - V3 Manhole Sizes 1048-79 - V3

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.341	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	15.000
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

Designed with Level Soffits

Time Area Diagram for SWS V4.SWS

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.592	4-8	1.433	8-12	0.050

Total Area Contributing (ha) = 3.075

Total Pipe Volume (m³) = 2543.196

Network Design Table for SWS V4.SWS

« - Indicates pipe capacity < flow

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	45.102	1.756	25.7	0.140	5.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	21.475	0.826	26.0	0.127	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	33.271	0.588	56.6	0.069	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	46.90	5.29	154.261	0.140	0.0	0.0	0.0	2.59	103.1	17.8
2.000	47.47	5.14	153.331	0.127	0.0	0.0	0.0	2.58	102.4	16.3
1.001	45.93	5.55	152.430	0.336	0.0	0.0	0.0	2.09	148.0	41.8

Network Design Table for SWS V4.SWS

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
1.002	25.990	0.500	52.0	0.103	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	73.397	0.237	309.7	0.037	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.000	13.864	0.173	80.1	0.110	5.00	0.0	0.600	o	225	Pipe/Conduit	
3.001	14.443	0.181	79.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.000	34.976	0.437	80.0	0.110	5.00	0.0	0.600	o	225	Pipe/Conduit	
4.001	49.970	1.790	27.9	0.046	0.00	0.0	0.600	o	225	Pipe/Conduit	
3.002	22.209	0.592	37.5	0.083	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.003	63.445	1.690	37.5	0.149	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.004	27.308	0.861	31.7	0.107	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.004	57.253	0.114	502.2	0.123	0.00	0.0	0.600	o	600	Pipe/Conduit	
5.000	25.498	1.562	16.3	0.062	5.00	0.0	0.600	o	150	Pipe/Conduit	
5.001	20.973	1.269	16.5	0.127	0.00	0.0	0.600	o	225	Pipe/Conduit	
6.000	30.900	0.568	54.4	0.076	5.00	0.0	0.600	o	225	Pipe/Conduit	
6.001	10.931	0.194	56.3	0.095	0.00	0.0	0.600	o	225	Pipe/Conduit	
5.002	26.856	0.839	32.0	0.032	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)
1.002	45.24	5.75	151.842	0.439	0.0	0.0	0.0	2.19	154.5	53.8
1.003	41.90	6.82	151.192	0.476	0.0	0.0	0.0	1.15	182.9	54.0
3.000	47.40	5.16	154.677	0.110	0.0	0.0	0.0	1.46	58.1	14.1
3.001	46.78	5.32	154.504	0.110	0.0	0.0	0.0	1.47	58.3	14.1
4.000	46.50	5.40	156.550	0.110	0.0	0.0	0.0	1.46	58.2	13.9
4.001	45.31	5.73	156.113	0.156	0.0	0.0	0.0	2.49	98.8	19.1
3.002	44.82	5.88	154.248	0.349	0.0	0.0	0.0	2.58	182.0	42.4
3.003	43.49	6.29	153.656	0.498	0.0	0.0	0.0	2.57	182.0	58.6
3.004	42.98	6.45	151.966	0.605	0.0	0.0	0.0	2.80	198.0	70.4
1.004	39.53	7.70	150.805	1.204	0.0	0.0	0.0	1.08	305.3	128.9
5.000	47.36	5.17	155.838	0.062	0.0	0.0	0.0	2.51	44.3	8.0
5.001	46.95	5.28	154.201	0.189	0.0	0.0	0.0	3.23	128.6	24.0
6.000	46.90	5.29	153.694	0.076	0.0	0.0	0.0	1.78	70.7	9.7
6.001	46.52	5.39	153.126	0.171	0.0	0.0	0.0	1.75	69.4	21.5
5.002	45.93	5.55	152.857	0.392	0.0	0.0	0.0	2.79	197.1	48.8

Network Design Table for SWS V4.SWS

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
5.003	19.152	0.591	32.4	0.099	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.004	12.161	0.436	27.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	99.919	0.822	121.6	0.090	0.00	0.0	0.600	o	600	Pipe/Conduit	
7.000	36.515	0.122	299.3	0.116	5.00	0.0	0.600	o	900	Pipe/Conduit	
8.000	24.747	0.083	298.2	0.011	5.00	0.0	0.600	o	900	Pipe/Conduit	
7.001	7.716	0.026	296.8	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	
7.002	10.410	0.035	297.4	0.032	0.00	0.0	0.600	o	900	Pipe/Conduit	
9.000	4.230	0.021	201.4	0.016	5.00	0.0	0.600	o	300	Pipe/Conduit	
7.003	5.000	0.050	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
7.004	32.412	0.779	41.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
7.005	39.792	1.863	21.4	0.137	0.00	0.0	0.600	o	225	Pipe/Conduit	
7.006	41.364	0.815	50.8	0.057	0.00	0.0	0.600	o	225	Pipe/Conduit	
7.007	21.924	0.590	37.2	0.081	0.00	0.0	0.600	o	300	Pipe/Conduit	
7.008	12.686	0.693	18.3	0.664	0.00	0.0	0.600	o	375	Pipe/Conduit	
7.009	11.681	0.652	17.9	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
7.010	42.500	0.085	500.0	0.176	0.00	0.0	0.600	[]	-1	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	45.53	5.67	152.018	0.491	0.0	0.0	0.0	2.77	195.9	60.5
5.004	45.29	5.74	151.427	0.491	0.0	0.0	0.0	2.99	211.2	60.5
1.005	37.75	8.45	150.691	1.785	0.0	0.0	0.0	2.21	624.2	182.5
7.000	46.73	5.34	157.700	0.116	0.0	0.0	0.0	1.81	1148.9	14.7
8.000	47.13	5.23	157.661	0.011	0.0	0.0	0.0	1.81	1151.1	1.4
7.001	46.46	5.41	157.578	0.127	0.0	0.0	0.0	1.81	1153.8	16.0
7.002	46.12	5.50	157.552	0.159	0.0	0.0	0.0	1.81	1152.5	19.9
9.000	47.77	5.06	158.138	0.016	0.0	0.0	0.0	1.10	78.0	2.1
7.003	45.82	5.59	157.517	0.175	0.0	0.0	0.0	1.00	17.8«	21.7
7.004	44.64	5.93	157.417	0.175	0.0	0.0	0.0	1.56	27.6	21.7
7.005	43.87	6.17	156.563	0.312	0.0	0.0	0.0	2.84	113.1	37.1
7.006	42.71	6.54	154.700	0.369	0.0	0.0	0.0	1.84	73.2	42.7
7.007	42.29	6.68	153.810	0.450	0.0	0.0	0.0	2.59	182.9	51.5
7.008	42.15	6.73	153.145	1.114	0.0	0.0	0.0	4.25	469.6	127.2
7.009	42.02	6.78	152.452	1.114	0.0	0.0	0.0	4.30	474.7	127.2
7.010	41.47	6.97	149.812	1.290	0.0	0.0	0.0	3.65	206056.7	144.9

Network Design Table for SWS V4.SWS

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
7.011	3.034	0.008	379.3	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
1.006	26.549	0.401	66.2	0.000	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)
7.011	41.37	7.01	149.727	1.290	0.0	0.0	0.0	1.43	632.2	144.9
1.006	46.65	5.36	149.669	0.000	7.1	0.0	0.0	1.24	21.9	7.1

Free Flowing Outfall Details for SWS V4.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.006	33	151.366	149.268	0.000	0	0

Simulation Criteria for SWS V4.SWS

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
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	2	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)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.341		

Online Controls for SWS V4.SWS

Hydro-Brake® Optimum Manhole: S5, DS/PN: 7.003, Volume (m³): 14.0

Unit Reference	MD-SHE-0048-1500-2200-1500
Design Head (m)	2.200
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	48
Invert Level (m)	157.517
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.200	1.5
Flush-Flo™	0.212	0.9
Kick-Flo®	0.428	0.7
Mean Flow over Head Range	-	1.1

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	0.8	1.200	1.1	3.000	1.7	7.000	2.6
0.200	0.9	1.400	1.2	3.500	1.9	7.500	2.6
0.300	0.9	1.600	1.3	4.000	2.0	8.000	2.7
0.400	0.8	1.800	1.4	4.500	2.1	8.500	2.8
0.500	0.8	2.000	1.4	5.000	2.2	9.000	2.9
0.600	0.8	2.200	1.5	5.500	2.3	9.500	2.9
0.800	1.0	2.400	1.6	6.000	2.4		
1.000	1.1	2.600	1.6	6.500	2.5		

Hydro-Brake® Optimum Manhole: 32, DS/PN: 1.006, Volume (m³): 41.2

Unit Reference	MD-SHE-0103-7100-2600-7100
Design Head (m)	2.600
Design Flow (l/s)	7.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	103
Invert Level (m)	149.669
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Hydro-Brake® Optimum Manhole: 32, DS/PN: 1.006, Volume (m³): 41.2

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.600	7.1
Flush-Flo™	0.455	5.5
Kick-Flo®	0.923	4.4
Mean Flow over Head Range	-	5.5

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	3.4	1.200	4.9	3.000	7.6	7.000	11.3
0.200	4.9	1.400	5.3	3.500	8.2	7.500	11.7
0.300	5.3	1.600	5.6	4.000	8.7	8.000	12.1
0.400	5.5	1.800	6.0	4.500	9.2	8.500	12.4
0.500	5.5	2.000	6.3	5.000	9.7	9.000	12.8
0.600	5.4	2.200	6.6	5.500	10.1	9.500	13.1
0.800	5.0	2.400	6.8	6.000	10.5		
1.000	4.5	2.600	7.1	6.500	10.9		

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SWS V4.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
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	2	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	0.341
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
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
Return Period(s) (years)	2, 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)
1.000	1	15 Winter	2	+0%	100/15 Winter				154.334
2.000	2	15 Winter	2	+0%	100/15 Summer				153.403
1.001	3	15 Winter	2	+0%	100/15 Summer				152.560
1.002	4	15 Winter	2	+0%	100/15 Summer				151.990
1.003	5	15 Winter	2	+0%	100/15 Summer				151.395
3.000	6	15 Winter	2	+0%	100/15 Summer				154.770
3.001	7	15 Winter	2	+0%	100/15 Summer				154.596
4.000	EX8	15 Winter	2	+0%	100/15 Summer				156.639
4.001	EX9	15 Winter	2	+0%	100/15 Summer				156.190
3.002	10	15 Winter	2	+0%	100/15 Summer				154.368
3.003	11	15 Winter	2	+0%	100/15 Summer				153.792
3.004	12	15 Winter	2	+0%	30/15 Summer				152.114
1.004	13	15 Winter	2	+0%	30/15 Summer				151.149
5.000	14	15 Winter	2	+0%					155.888
5.001	15	15 Winter	2	+0%	100/15 Summer				154.275
6.000	16	15 Winter	2	+0%	100/15 Summer				153.760
6.001	17	15 Winter	2	+0%	100/15 Summer				153.230
5.002	18	15 Winter	2	+0%	100/15 Summer				152.975

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SWS V4.SWS

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
1.000	1	-0.152	0.000	0.23			22.5	OK	
2.000	2	-0.153	0.000	0.22			20.6	OK	
1.001	3	-0.170	0.000	0.38			52.0	OK	
1.002	4	-0.152	0.000	0.48			66.5	OK	
1.003	5	-0.247	0.000	0.40			68.2	OK	
3.000	6	-0.132	0.000	0.35			17.8	OK	
3.001	7	-0.133	0.000	0.35			17.6	OK	
4.000	EX8	-0.136	0.000	0.32			17.5	OK	
4.001	EX9	-0.148	0.000	0.25			23.9	OK	
3.002	10	-0.180	0.000	0.33			52.9	OK	
3.003	11	-0.164	0.000	0.42			72.9	OK	
3.004	12	-0.152	0.000	0.49			87.2	OK	
1.004	13	-0.256	0.000	0.60			163.6	OK	
5.000	14	-0.100	0.000	0.24			10.0	OK	
5.001	15	-0.151	0.000	0.23			27.4	OK	
6.000	16	-0.159	0.000	0.18			12.2	OK	
6.001	17	-0.121	0.000	0.43			25.1	OK	
5.002	18	-0.182	0.000	0.32			56.8	OK	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SWS V4.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
5.003	19	15 Winter	2	+0%	100/15 Summer			
5.004	20	15 Winter	2	+0%	100/15 Summer			
1.005	21	15 Winter	2	+0%	100/15 Summer			
7.000	S1	360 Winter	2	+0%	100/60 Winter			
8.000	S2	360 Winter	2	+0%	100/60 Winter			
7.001	S3	360 Winter	2	+0%	100/60 Winter			
7.002	S4	360 Winter	2	+0%	100/60 Summer			
9.000	Tank2	30 Winter	2	+0%	100/60 Summer			
7.003	S5	360 Winter	2	+0%	2/15 Summer			
7.004	S6	360 Summer	2	+0%				
7.005	25	15 Winter	2	+0%	100/15 Summer			
7.006	26	15 Winter	2	+0%	100/15 Summer			
7.007	27	15 Winter	2	+0%	100/15 Summer			
7.008	28	15 Winter	2	+0%	100/15 Summer			
7.009	29	15 Winter	2	+0%	100/15 Summer			
7.010	30	1440 Winter	2	+0%	100/960 Winter			
7.011	31	1440 Winter	2	+0%	2/240 Winter			
1.006	32	1440 Winter	2	+0%	2/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
5.003	19	152.154	-0.164	0.000	0.42			70.6	OK
5.004	20	151.565	-0.162	0.000	0.43			71.0	OK
1.005	21	150.958	-0.333	0.000	0.40			233.4	OK
7.000	S1	158.059	-0.541	0.000	0.00			3.0	OK
8.000	S2	158.060	-0.501	0.000	0.00			0.3	OK
7.001	S3	158.060	-0.418	0.000	0.01			6.8	OK
7.002	S4	158.080	-0.372	0.000	0.01			5.8	OK
9.000	Tank2	158.171	-0.267	0.000	0.03			1.3	OK
7.003	S5	158.092	0.425	0.000	0.06			0.9	SURCHARGED
7.004	S6	157.435	-0.132	0.000	0.03			0.9	OK
7.005	25	156.628	-0.160	0.000	0.18			19.7	OK
7.006	26	154.799	-0.126	0.000	0.39			27.4	OK
7.007	27	153.910	-0.200	0.000	0.24			38.5	OK
7.008	28	153.304	-0.216	0.000	0.38			123.0	OK
7.009	29	152.614	-0.213	0.000	0.39			122.5	OK
7.010	30	150.647	-1.565	0.000	0.00			14.1	OK
7.011	31	150.647	0.170	0.000	0.08			29.4	SURCHARGED
1.006	32	150.660	0.841	0.000	0.26			5.4	SURCHARGED

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SWS V4.SWS

PN	US/MH Name	Level Exceeded
5.003	19	
5.004	20	
1.005	21	
7.000	S1	
8.000	S2	
7.001	S3	
7.002	S4	
9.000	Tank2	
7.003	S5	
7.004	S6	
7.005	25	
7.006	26	
7.007	27	
7.008	28	
7.009	29	
7.010	30	
7.011	31	
1.006	32	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SWS V4.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
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	2	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	0.341
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
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
Return Period(s) (years)	2, 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)
1.000	1	15 Winter	30	+0%	100/15 Winter				154.365
2.000	2	15 Winter	30	+0%	100/15 Summer				153.433
1.001	3	15 Winter	30	+0%	100/15 Summer				152.630
1.002	4	15 Winter	30	+0%	100/15 Summer				152.084
1.003	5	15 Winter	30	+0%	100/15 Summer				151.605
3.000	6	15 Winter	30	+0%	100/15 Summer				154.813
3.001	7	15 Winter	30	+0%	100/15 Summer				154.639
4.000	EX8	15 Winter	30	+0%	100/15 Summer				156.679
4.001	EX9	15 Winter	30	+0%	100/15 Summer				156.228
3.002	10	15 Winter	30	+0%	100/15 Summer				154.431
3.003	11	15 Winter	30	+0%	100/15 Summer				153.880
3.004	12	15 Winter	30	+0%	30/15 Summer				152.322
1.004	13	15 Winter	30	+0%	30/15 Summer				151.449
5.000	14	15 Winter	30	+0%					155.909
5.001	15	15 Winter	30	+0%	100/15 Summer				154.316
6.000	16	15 Winter	30	+0%	100/15 Summer				153.787
6.001	17	15 Winter	30	+0%	100/15 Summer				153.297
5.002	18	15 Winter	30	+0%	100/15 Summer				153.045

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SWS V4.SWS

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
1.000	1	-0.121	0.000	0.43			42.6	OK	
2.000	2	-0.123	0.000	0.42			39.0	OK	
1.001	3	-0.100	0.000	0.76			102.5	OK	
1.002	4	-0.058	0.000	0.97			134.7	OK	
1.003	5	-0.037	0.000	0.79			135.6	OK	
3.000	6	-0.089	0.000	0.67			33.7	OK	
3.001	7	-0.090	0.000	0.65			33.2	OK	
4.000	EX8	-0.096	0.000	0.60			33.1	OK	
4.001	EX9	-0.110	0.000	0.50			47.1	OK	
3.002	10	-0.117	0.000	0.66			106.3	OK	
3.003	11	-0.076	0.000	0.87			151.5	OK	
3.004	12	0.056	0.000	1.01			180.7	SURCHARGED	
1.004	13	0.044	0.000	1.20			326.2	SURCHARGED	
5.000	14	-0.079	0.000	0.45			19.0	OK	
5.001	15	-0.110	0.000	0.52			60.5	OK	
6.000	16	-0.132	0.000	0.35			23.1	OK	
6.001	17	-0.054	0.000	0.92			54.0	OK	
5.002	18	-0.112	0.000	0.70			124.5	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SWS V4.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
5.003	19	15 Winter	30	+0%	100/15 Summer			
5.004	20	15 Winter	30	+0%	100/15 Summer			
1.005	21	1440 Winter	30	+0%	100/15 Summer			
7.000	S1	360 Winter	30	+0%	100/60 Winter			
8.000	S2	360 Winter	30	+0%	100/60 Winter			
7.001	S3	360 Winter	30	+0%	100/60 Winter			
7.002	S4	360 Winter	30	+0%	100/60 Summer			
9.000	Tank2	360 Winter	30	+0%	100/60 Summer			
7.003	S5	360 Winter	30	+0%	2/15 Summer			
7.004	S6	360 Winter	30	+0%				
7.005	25	15 Summer	30	+0%	100/15 Summer			
7.006	26	15 Winter	30	+0%	100/15 Summer			
7.007	27	15 Winter	30	+0%	100/15 Summer			
7.008	28	15 Winter	30	+0%	100/15 Summer			
7.009	29	15 Winter	30	+0%	100/15 Summer			
7.010	30	1440 Winter	30	+0%	100/960 Winter			
7.011	31	1440 Winter	30	+0%	2/240 Winter			
1.006	32	1440 Winter	30	+0%	2/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
5.003	19	152.246	-0.072	0.000	0.92			156.5	OK
5.004	20	151.659	-0.068	0.000	0.94			155.4	OK
1.005	21	151.274	-0.017	0.000	0.05			30.7	OK
7.000	S1	158.381	-0.219	0.000	0.01			5.4	OK
8.000	S2	158.380	-0.181	0.000	0.00			0.4	OK
7.001	S3	158.381	-0.097	0.000	0.01			4.7	OK
7.002	S4	158.380	-0.072	0.000	0.01			4.9	OK
9.000	Tank2	158.377	-0.061	0.000	0.03			1.3	OK
7.003	S5	158.382	0.715	0.000	0.07			1.0	SURCHARGED
7.004	S6	157.436	-0.131	0.000	0.04			1.0	OK
7.005	25	156.665	-0.123	0.000	0.43			45.8	OK
7.006	26	154.870	-0.055	0.000	0.92			64.3	OK
7.007	27	153.972	-0.138	0.000	0.56			90.7	OK
7.008	28	153.403	-0.117	0.000	0.81			263.3	OK
7.009	29	152.716	-0.111	0.000	0.83			260.9	OK
7.010	30	151.292	-0.920	0.000	0.00			20.0	OK
7.011	31	151.292	0.815	0.000	0.05			18.5	SURCHARGED
1.006	32	151.370	1.551	0.000	0.27			5.6	SURCHARGED

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SWS V4.SWS

PN	US/MH Name	Level Exceeded
5.003	19	
5.004	20	
1.005	21	
7.000	S1	
8.000	S2	
7.001	S3	
7.002	S4	
9.000	Tank2	
7.003	S5	
7.004	S6	
7.005	25	
7.006	26	
7.007	27	
7.008	28	
7.009	29	
7.010	30	
7.011	31	
1.006	32	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SWS V4.SWS

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
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	2	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	0.341
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	450.0
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
Return Period(s) (years)	2, 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)
1.000	1	15 Winter	100	+30%	100/15 Winter				154.573
2.000	2	15 Winter	100	+30%	100/15 Summer				154.134
1.001	3	15 Winter	100	+30%	100/15 Summer				153.834
1.002	4	15 Winter	100	+30%	100/15 Summer				153.183
1.003	5	1440 Winter	100	+30%	100/15 Summer				152.506
3.000	6	15 Winter	100	+30%	100/15 Summer				156.103
3.001	7	15 Winter	100	+30%	100/15 Summer				155.949
4.000	EX8	15 Winter	100	+30%	100/15 Summer				156.938
4.001	EX9	15 Winter	100	+30%	100/15 Summer				156.594
3.002	10	15 Winter	100	+30%	100/15 Summer				155.821
3.003	11	15 Winter	100	+30%	100/15 Summer				155.428
3.004	12	15 Winter	100	+30%	30/15 Summer				153.373
1.004	13	1440 Winter	100	+30%	30/15 Summer				152.523
5.000	14	15 Winter	100	+30%					155.937
5.001	15	15 Winter	100	+30%	100/15 Summer				154.688
6.000	16	15 Winter	100	+30%	100/15 Summer				154.454
6.001	17	15 Winter	100	+30%	100/15 Summer				154.307
5.002	18	15 Winter	100	+30%	100/15 Summer				154.001

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SWS V4.SWS

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
1.000	1	0.087	0.000	0.72			71.1	SURCHARGED	
2.000	2	0.578	0.000	0.64			59.9	SURCHARGED	
1.001	3	1.104	0.000	1.08			146.8	SURCHARGED	
1.002	4	1.041	0.000	1.36			188.9	FLOOD RISK	
1.003	5	0.864	0.000	0.08			13.4	FLOOD RISK	
3.000	6	1.201	0.000	0.91			46.1	FLOOD RISK	
3.001	7	1.220	0.000	0.94			48.1	SURCHARGED	
4.000	EX8	0.163	0.000	0.99			54.4	SURCHARGED	
4.001	EX9	0.256	0.000	0.78			73.5	SURCHARGED	
3.002	10	1.273	0.000	0.88			141.6	SURCHARGED	
3.003	11	1.472	0.000	1.11			192.6	FLOOD RISK	
3.004	12	1.107	0.000	1.27			226.6	FLOOD RISK	
1.004	13	1.118	0.000	0.13			34.0	FLOOD RISK	
5.000	14	-0.051	0.000	0.76			32.0	OK	
5.001	15	0.262	0.000	0.82			96.1	SURCHARGED	
6.000	16	0.535	0.000	0.52			34.5	SURCHARGED	
6.001	17	0.956	0.000	1.27			74.4	SURCHARGED	
5.002	18	0.844	0.000	0.98			174.5	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SWS V4.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
5.003	19	15 Winter	100	+30%	100/15 Summer			
5.004	20	1440 Winter	100	+30%	100/15 Summer			
1.005	21	1440 Winter	100	+30%	100/15 Summer			
7.000	S1	600 Winter	100	+30%	100/60 Winter			
8.000	S2	600 Winter	100	+30%	100/60 Winter			
7.001	S3	600 Winter	100	+30%	100/60 Winter			
7.002	S4	600 Winter	100	+30%	100/60 Summer			
9.000	Tank2	600 Winter	100	+30%	100/60 Summer			
7.003	S5	600 Winter	100	+30%	2/15 Summer			
7.004	S6	600 Winter	100	+30%				
7.005	25	15 Winter	100	+30%	100/15 Summer			
7.006	26	15 Winter	100	+30%	100/15 Summer			
7.007	27	15 Winter	100	+30%	100/15 Summer			
7.008	28	15 Winter	100	+30%	100/15 Summer			
7.009	29	15 Winter	100	+30%	100/15 Summer			
7.010	30	1440 Winter	100	+30%	100/960 Winter			
7.011	31	1440 Winter	100	+30%	2/240 Winter			
1.006	32	1440 Winter	100	+30%	2/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
5.003	19	153.252	0.934	0.000	1.27			215.4	SURCHARGED
5.004	20	152.508	0.781	0.000	0.08			13.9	SURCHARGED
1.005	21	152.529	1.238	0.000	0.09			50.3	FLOOD RISK
7.000	S1	159.614	1.014	0.000	0.01			6.2	FLOOD RISK
8.000	S2	159.614	1.053	0.000	0.00			0.6	SURCHARGED
7.001	S3	159.614	1.136	0.000	0.01			7.2	SURCHARGED
7.002	S4	159.614	1.162	0.000	0.01			6.0	SURCHARGED
9.000	Tank2	159.614	1.176	0.000	0.04			1.8	FLOOD RISK
7.003	S5	159.615	1.948	0.000	0.10			1.5	FLOOD RISK
7.004	S6	157.440	-0.127	0.000	0.06			1.5	OK
7.005	25	156.828	0.040	0.000	0.69			74.4	SURCHARGED
7.006	26	156.121	1.196	0.000	1.33			92.2	FLOOD RISK
7.007	27	154.710	0.600	0.000	0.81			130.0	SURCHARGED
7.008	28	154.339	0.819	0.000	1.25			405.9	SURCHARGED
7.009	29	153.243	0.416	0.000	1.28			403.9	SURCHARGED
7.010	30	152.488	0.276	0.000	0.00			32.4	SURCHARGED
7.011	31	152.488	2.011	0.000	0.03			11.2	SURCHARGED
1.006	32	152.545	2.726	0.000	0.35			7.3	SURCHARGED

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SWS V4.SWS

PN	US/MH Name	Level Exceeded
5.003	19	
5.004	20	
1.005	21	
7.000	S1	
8.000	S2	
7.001	S3	
7.002	S4	
9.000	Tank2	
7.003	S5	
7.004	S6	
7.005	25	
7.006	26	
7.007	27	
7.008	28	
7.009	29	
7.010	30	
7.011	31	
1.006	32	