Appendix H

MicroDrainage calculations

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)	100	Add Flow / Climate Change (%)	20
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200
Ratio R	0.372	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	75	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Network Design Table for Storm

« - 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)	Auto Design
S1.000	28.569	0.190	150.0	0.010	5.00	0.0	0.600	o	150	
S2.000	23.648	0.876	27.0	0.055	5.00	0.0	0.600	o	150	
S1.001	33.686	0.168	200.0	0.000	0.00	0.0	0.600	o	300	
S3.000	9.903	1.276	7.8	0.043	5.00	0.0	0.600	o	150	
S1.002	6.743	0.034	200.0	0.000	0.00	0.0	0.600	o	300	
S4.000	9.912	1.276	7.8	0.023	5.00	0.0	0.600	o	150	

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	75.00	5.58	37.360	0.010	0.0	0.0	0.4	0.82	14.5	2.5
S2.000	75.00	5.20	38.046	0.055	0.0	0.0	2.2	1.95	34.4	13.5
S1.001	75.00	6.09	37.020	0.066	0.0	0.0	2.7	1.11	78.3	16.0
S3.000	75.00	5.05	38.278	0.043	0.0	0.0	1.7	3.64	64.3	10.5
S1.002	75.00	6.19	36.852	0.108	0.0	0.0	4.4	1.11	78.3	26.4
S4.000	75.00	5.05	38.244	0.023	0.0	0.0	0.9	3.64	64.3	5.7

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)	Auto Design
S1.003	4.653	0.023	200.0	0.000	0.00	0.0	0.600	o	300	
S5.000	9.922	1.283	7.7	0.038	5.00	0.0	0.600	o	150	
S1.004	3.637	0.018	200.0	0.000	0.00	0.0	0.600	o	300	
S6.000	9.934	1.331	7.5	0.036	5.00	0.0	0.600	o	150	
S1.005	27.286	0.136	200.0	0.000	0.00	0.0	0.600	o	300	
S7.000	9.968	1.495	6.7	0.036	5.00	0.0	0.600	o	150	
S1.006	5.095	0.025	200.0	0.000	0.00	0.0	0.600	o	300	
S8.000	9.915	1.566	6.3	0.031	5.00	0.0	0.600	o	150	
S1.007	2.456	0.012	200.0	0.000	0.00	0.0	0.600	o	300	
S9.000	11.737	0.635	18.5	0.039	5.00	0.0	0.600	o	150	
S10.000	8.517	0.728	11.7	0.022	5.00	0.0	0.600	o	150	

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)
S1.003	75.00	6.26	36.818	0.132	0.0	0.0	5.4	1.11	78.3	32.1
S5.000	75.00	5.05	38.228	0.038	0.0	0.0	1.5	3.65	64.4	9.2
S1.004	75.00	6.31	36.795	0.170	0.0	0.0	6.9	1.11	78.3	41.3
S6.000	75.00	5.04	38.258	0.036	0.0	0.0	1.5	3.71	65.6	8.7
S1.005	75.00	6.73	36.777	0.205	0.0	0.0	8.3	1.11	78.3	50.0
S7.000	75.00	5.04	38.286	0.036	0.0	0.0	1.5	3.93	69.4	8.8
S1.006	75.00	6.80	36.641	0.241	0.0	0.0	9.8	1.11	78.3	58.8
S8.000	75.00	5.04	38.332	0.031	0.0	0.0	1.3	4.03	71.2	7.7
S1.007	75.00	6.84	36.616	0.273	0.0	0.0	11.1	1.11	78.3	66.5
S9.000	75.00	5.08	38.190	0.039	0.0	0.0	1.6	2.35	41.6	9.5
S10.000	75.00	5.05	38.283	0.022	0.0	0.0	0.9	2.96	52.3	5.3

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)	Auto Design
S9.001	18.298	0.803	22.8	0.000	0.00	0.0	0.600	o	225	
S11.000	4.457	0.594	7.5	0.007	5.00	0.0	0.600	o	150	
S11.001	5.824	0.822	7.1	0.000	0.00	0.0	0.600	o	150	
S11.002	26.315	0.342	77.0	0.000	0.00	0.0	0.600	o	150	
S12.000	9.814	1.566	6.3	0.035	5.00	0.0	0.600	o	150	
S11.003	11.254	0.146	77.0	0.000	0.00	0.0	0.600	o	150	
S1.008	8.550	0.043	200.0	0.000	0.00	0.0	0.600	o	375	
S13.000	9.500	0.688	13.8	0.041	5.00	0.0	0.600	o	150	
S13.001	6.622	0.288	23.0	0.000	0.00	0.0	0.600	o	150	
S14.000	9.491	0.946	10.0	0.045	5.00	0.0	0.600	o	150	
S13.002	4.895	0.213	23.0	0.000	0.00	0.0	0.600	o	150	
S15.000	9.406	1.178	8.0	0.043	5.00	0.0	0.600	o	150	

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)
S9.001	75.00	5.19	37.480	0.061	0.0	0.0	2.5	2.75	109.5	14.8
S11.000	75.00	5.02	38.655	0.007	0.0	0.0	0.3	3.70	65.4	1.6
S11.001	75.00	5.05	38.061	0.007	0.0	0.0	0.3	3.81	67.3	1.6
S11.002	75.00	5.43	37.239	0.007	0.0	0.0	0.3	1.15	20.3	1.6
S12.000	75.00	5.04	38.463	0.035	0.0	0.0	1.4	4.05	71.6	8.5
S11.003	75.00	5.59	36.897	0.042	0.0	0.0	1.7	1.15	20.3	10.1
S1.008	75.00	6.95	36.529	0.375	0.0	0.0	15.2	1.28	141.1	91.4
S13.000	75.00	5.06	38.306	0.041	0.0	0.0	1.7	2.73	48.2	10.1
S13.001	75.00	5.11	37.618	0.041	0.0	0.0	1.7	2.11	37.3	10.1
S14.000	75.00	5.05	38.276	0.045	0.0	0.0	1.8	3.20	56.5	10.9
S13.002	75.00	5.15	37.330	0.086	0.0	0.0	3.5	2.11	37.3	21.0
S15.000	75.00	5.04	38.295	0.043	0.0	0.0	1.7	3.59	63.4	10.4

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)	Auto Design
S13.003	9.535	0.408	23.4	0.000	0.00	0.0	0.600	o	150	
S1.009	5.639	0.028	200.0	0.000	0.00	0.0	0.600	o	450	
S1.010	10.730	0.156	68.8	0.000	0.00	0.0	0.600	o	450	
S1.011	27.694	0.650	42.6	0.000	0.00	0.0	0.600	o	450	
S16.000	32.572	0.543	60.0	0.083	5.00	0.0	0.600	o	225	
S16.001	30.227	0.504	60.0	0.088	0.00	0.0	0.600	o	225	
S16.002	20.933	0.349	60.0	0.061	0.00	0.0	0.600	o	225	
S16.003	8.321	0.119	70.0	0.000	0.00	0.0	0.600	o	225	
S16.004	4.010	0.055	73.0	0.000	0.00	0.0	0.600	o	225	
S16.005	2.632	0.853	3.1	0.000	0.00	0.0	0.600	o	225	
S1.012	8.544	0.043	200.0	0.000	0.00	0.0	0.600	o	450	
S1.013	11.958	0.504	23.7	0.000	0.00	0.0	0.600	o	150	

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)
S13.003	75.00	5.23	37.117	0.129	0.0	0.0	5.2	2.09	37.0	31.4
S1.009	75.00	7.02	36.411	0.504	0.0	0.0	20.5	1.43	228.1	122.8
S1.010	75.00	7.09	36.383	0.504	0.0	0.0	20.5	2.45	390.3	122.8
S1.011	75.00	7.24	36.227	0.504	0.0	0.0	20.5	3.12	496.5	122.8
S16.000	75.00	5.32	38.000	0.083	0.0	0.0	3.4	1.69	67.3	20.3
S16.001	75.00	5.62	37.457	0.171	0.0	0.0	7.0	1.69	67.3	41.8
S16.002	75.00	5.82	36.953	0.232	0.0	0.0	9.4	1.69	67.3	56.6
S16.003	75.00	5.91	36.604	0.232	0.0	0.0	9.4	1.57	62.2	56.6
S16.004	75.00	5.96	36.485	0.232	0.0	0.0	9.4	1.53	60.9	56.6
S16.005	75.00	5.96	36.430	0.232	0.0	0.0	9.4	7.50	298.3	56.6
S1.012	75.00	7.34	35.577	0.736	0.0	0.0	29.9	1.43	228.1	179.4
S1.013	75.00	7.43	35.534	0.736	0.0	0.0	29.9	2.08	36.7«	179.4

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)
S1.013	SHeadwall	36.500	35.030	0.000	1200	0

Online Controls for Storm

Hydro-Brake Optimum® Manhole: S14, DS/PN: S1.013, Volume (m³): 7.4

Unit Reference	MD-SHE-0097-5000-1600-5000
Design Head (m)	1.600
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	97
Invert Level (m)	35.534
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	5.0	Kick-Flo®	0.865	3.8
Flush-Flo™	0.425	4.7	Mean Flow over Head Range	-	4.2

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	3.1	1.200	4.4	3.000	6.7	7.000	10.0
0.200	4.3	1.400	4.7	3.500	7.2	7.500	10.3
0.300	4.6	1.600	5.0	4.000	7.7	8.000	10.7
0.400	4.7	1.800	5.3	4.500	8.1	8.500	11.0
0.500	4.7	2.000	5.5	5.000	8.5	9.000	11.3
0.600	4.6	2.200	5.8	5.500	8.9	9.500	11.6
0.800	4.1	2.400	6.0	6.000	9.3		
1.000	4.0	2.600	6.3	6.500	9.7		

2 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	0.375
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	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 20

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	2	0%	100/15 Summer				
S2.000	15 Winter	2	0%	100/15 Summer				
S1.001	15 Winter	2	0%	30/15 Summer				
S3.000	15 Winter	2	0%					
S1.002	15 Winter	2	0%					
S4.000	15 Winter	2	0%					
S1.003	15 Winter	2	0%					
S5.000	15 Winter	2	0%					
S1.004	15 Winter	2	0%					
S6.000	15 Winter	2	0%					
S1.005	15 Winter	2	0%					
S7.000	15 Winter	2	0%					
S1.006	15 Winter	2	0%					
S8.000	15 Winter	2	0%					
S1.007	15 Winter	2	0%					
S9.000	15 Winter	2	0%					
S10.000	15 Winter	2	0%					
S9.001	15 Winter	2	0%					
S11.000	15 Winter	2	0%					
S11.001	15 Winter	2	0%					

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S11.002	15 Winter	2	0%					
S12.000	15 Winter	2	0%					
S11.003	15 Winter	2	0%					
S1.008	15 Winter	2	0%	30/15 Summer				
S13.000	15 Winter	2	0%					
S13.001	15 Winter	2	0%	100/15 Summer				
S14.000	15 Winter	2	0%					
S13.002	15 Winter	2	0%					
S15.000	15 Winter	2	0%					
S13.003	15 Winter	2	0%					
S1.009	15 Winter	2	0%	100/15 Summer				
S1.010	15 Winter	2	0%	100/360 Winter				
S1.011	15 Winter	2	0%					
S16.000	15 Winter	2	0%	100/15 Summer				
S16.001	15 Winter	2	0%					
S16.002	15 Winter	2	0%					
S16.003	15 Winter	2	0%	30/15 Summer				
S16.004	15 Winter	2	0%	30/15 Summer				
S16.005	15 Winter	2	0%					
S1.012	240 Winter	2	0%	30/30 Winter				
S1.013	240 Winter	2	0%	2/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	37.395	-0.115	0.000	0.12	0.0	1.7	OK
S2.000	S2	38.101	-0.095	0.000	0.28	0.0	9.2	OK
S1.001	S2	37.101	-0.219	0.000	0.16	0.0	10.8	OK
S3.000	S4	38.313	-0.115	0.000	0.13	0.0	7.2	OK
S1.002	S3	36.966	-0.186	0.000	0.29	0.0	17.5	OK*
S4.000	S6	38.270	-0.124	0.000	0.07	0.0	3.9	OK
S1.003	S4	36.947	-0.171	0.000	0.34	0.0	21.1	OK*
S5.000	S8	38.261	-0.117	0.000	0.11	0.0	6.3	OK
S1.004	S5	36.935	-0.160	0.000	0.44	0.0	27.0	OK*
S6.000	S10	38.290	-0.118	0.000	0.10	0.0	6.0	OK
S1.005	S6	36.912	-0.165	0.000	0.41	0.0	32.4	OK*
S7.000	S12	38.317	-0.119	0.000	0.10	0.0	6.1	OK
S1.006	S7	36.817	-0.124	0.000	0.62	0.0	38.0	OK*
S8.000	S14	38.361	-0.121	0.000	0.08	0.0	5.2	OK
S1.007	S8	36.801	-0.115	0.000	0.69	0.0	42.6	OK*
S9.000	S16	38.232	-0.108	0.000	0.17	0.0	6.5	OK
S10.000	S17	38.311	-0.122	0.000	0.08	0.0	3.6	OK
S9.001	S16	37.528	-0.177	0.000	0.10	0.0	10.0	OK
S11.000	S19	38.670	-0.135	0.000	0.02	0.0	1.1	OK
S11.001	S20	38.075	-0.136	0.000	0.02	0.0	1.1	OK*
S11.002	S21	37.263	-0.126	0.000	0.06	0.0	1.1	OK
S12.000	S22	38.494	-0.119	0.000	0.09	0.0	5.8	OK
S11.003	S22	36.958	-0.089	0.000	0.34	0.0	6.8	OK*

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

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.008	S9	36.759	-0.145	0.000	0.69	0.0	58.2	OK
S13.000	S20	38.346	-0.110	0.000	0.16	0.0	6.9	OK
S13.001	S10	37.668	-0.100	0.000	0.24	0.0	6.8	OK
S14.000	S22	38.315	-0.111	0.000	0.15	0.0	7.5	OK
S13.002	S11	37.406	-0.074	0.000	0.49	0.0	14.2	OK*
S15.000	S24	38.331	-0.114	0.000	0.13	0.0	7.1	OK
S13.003	S12	37.200	-0.067	0.000	0.58	0.0	21.4	OK*
S1.009	S10	36.697	-0.164	0.000	0.72	0.0	78.6	OK
S1.010	S11	36.568	-0.265	0.000	0.35	0.0	78.8	OK
S1.011	S33	36.352	-0.325	0.000	0.17	0.0	78.8	OK*
S16.000	S33	38.072	-0.153	0.000	0.22	0.0	13.7	OK
S16.001	S34	37.555	-0.127	0.000	0.39	0.0	26.2	OK*
S16.002	S35	37.069	-0.109	0.000	0.52	0.0	34.9	OK*
S16.003	S34	36.773	-0.056	0.000	0.77	0.0	34.2	OK
S16.004	S35	36.708	-0.002	0.000	1.01	0.0	33.2	OK
S16.005	S38	36.507	-0.148	0.000	0.25	0.0	33.2	OK*
S1.012	S13	35.919	-0.108	0.000	0.04	0.0	5.4	OK
S1.013	S14	35.921	0.237	0.000	0.13	0.0	4.5	SURCHARGED

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	0.375
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	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 20

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	30	0%	100/15 Summer				
S2.000	15 Winter	30	0%	100/15 Summer				
S1.001	15 Winter	30	0%	30/15 Summer				
S3.000	15 Winter	30	0%					
S1.002	15 Winter	30	0%					
S4.000	15 Winter	30	0%					
S1.003	15 Winter	30	0%					
S5.000	15 Winter	30	0%					
S1.004	15 Winter	30	0%					
S6.000	15 Winter	30	0%					
S1.005	15 Winter	30	0%					
S7.000	15 Winter	30	0%					
S1.006	15 Winter	30	0%					
S8.000	15 Winter	30	0%					
S1.007	15 Winter	30	0%					
S9.000	15 Winter	30	0%					
S10.000	15 Winter	30	0%					
S9.001	15 Winter	30	0%					
S11.000	15 Winter	30	0%					
S11.001	15 Winter	30	0%					

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S11.002	15 Winter	30	0%					
S12.000	15 Winter	30	0%					
S11.003	15 Winter	30	0%					
S1.008	15 Winter	30	0%	30/15 Summer				
S13.000	15 Winter	30	0%					
S13.001	15 Winter	30	0%	100/15 Summer				
S14.000	15 Winter	30	0%					
S13.002	15 Winter	30	0%					
S15.000	15 Winter	30	0%					
S13.003	15 Winter	30	0%					
S1.009	15 Summer	30	0%	100/15 Summer				
S1.010	15 Winter	30	0%	100/360 Winter				
S1.011	15 Winter	30	0%					
S16.000	15 Winter	30	0%	100/15 Summer				
S16.001	15 Winter	30	0%					
S16.002	15 Winter	30	0%					
S16.003	15 Winter	30	0%	30/15 Summer				
S16.004	15 Winter	30	0%	30/15 Summer				
S16.005	15 Winter	30	0%					
S1.012	360 Winter	30	0%	30/30 Winter				
S1.013	360 Winter	30	0%	2/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	37.502	-0.008	0.000	0.23	0.0	3.2	OK
S2.000	S2	38.125	-0.071	0.000	0.54	0.0	17.5	OK
S1.001	S2	37.486	0.166	0.000	0.28	0.0	19.3	SURCHARGED
S3.000	S4	38.328	-0.100	0.000	0.24	0.0	13.6	OK
S1.002	S3	37.152	0.000	0.000	0.40	0.0	24.7	SURCHARGED*
S4.000	S6	38.280	-0.114	0.000	0.13	0.0	7.4	OK
S1.003	S4	37.118	0.000	0.000	0.47	0.0	29.1	SURCHARGED*
S5.000	S8	38.275	-0.103	0.000	0.21	0.0	12.0	OK
S1.004	S5	37.095	0.000	0.000	0.61	0.0	37.6	SURCHARGED*
S6.000	S10	38.303	-0.105	0.000	0.19	0.0	11.3	OK
S1.005	S6	37.077	0.000	0.000	0.57	0.0	44.6	SURCHARGED*
S7.000	S12	38.330	-0.106	0.000	0.19	0.0	11.5	OK
S1.006	S7	36.941	0.000	0.000	0.85	0.0	52.3	SURCHARGED*
S8.000	S14	38.372	-0.110	0.000	0.16	0.0	10.0	OK
S1.007	S8	36.916	0.000	0.000	0.96	0.0	58.9	SURCHARGED*
S9.000	S16	38.249	-0.091	0.000	0.33	0.0	12.3	OK
S10.000	S17	38.322	-0.111	0.000	0.15	0.0	6.8	OK
S9.001	S16	37.548	-0.157	0.000	0.19	0.0	19.0	OK
S11.000	S19	38.675	-0.130	0.000	0.04	0.0	2.1	OK
S11.001	S20	38.080	-0.131	0.000	0.04	0.0	2.1	OK*
S11.002	S21	37.272	-0.117	0.000	0.11	0.0	2.1	OK
S12.000	S22	38.505	-0.108	0.000	0.17	0.0	11.1	OK
S11.003	S22	36.989	-0.058	0.000	0.63	0.0	12.8	OK*

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

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.008	S9	36.938	0.034	0.000	0.97	0.0	81.6	SURCHARGED
S13.000	S20	38.363	-0.093	0.000	0.31	0.0	13.1	OK
S13.001	S10	37.690	-0.078	0.000	0.45	0.0	12.9	OK
S14.000	S22	38.331	-0.095	0.000	0.28	0.0	14.2	OK
S13.002	S11	37.480	0.000	0.000	0.92	0.0	26.5	SURCHARGED*
S15.000	S24	38.345	-0.100	0.000	0.24	0.0	13.5	OK
S13.003	S12	37.267	0.000	0.000	1.06	0.0	39.2	SURCHARGED*
S1.009	S10	36.861	0.000	0.000	1.05	0.0	113.5	OK
S1.010	S11	36.620	-0.213	0.000	0.54	0.0	119.6	OK
S1.011	S33	36.386	-0.291	0.000	0.26	0.0	120.3	OK*
S16.000	S33	38.102	-0.123	0.000	0.41	0.0	26.0	OK
S16.001	S34	37.682	0.000	0.000	0.75	0.0	50.5	SURCHARGED*
S16.002	S35	37.178	0.000	0.000	0.97	0.0	65.5	SURCHARGED*
S16.003	S34	37.118	0.289	0.000	1.47	0.0	65.3	SURCHARGED
S16.004	S35	36.860	0.150	0.000	1.98	0.0	65.4	SURCHARGED
S16.005	S38	36.543	-0.112	0.000	0.50	0.0	65.3	OK*
S1.012	S13	36.324	0.297	0.000	0.04	0.0	5.8	SURCHARGED
S1.013	S14	36.332	0.648	0.000	0.13	0.0	4.5	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	0.375
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	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 20

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	100	+20%	100/15 Summer				
S2.000	15 Winter	100	+20%	100/15 Summer				
S1.001	15 Winter	100	+20%	30/15 Summer				
S3.000	15 Winter	100	+20%					
S1.002	15 Winter	100	+20%					
S4.000	15 Winter	100	+20%					
S1.003	15 Winter	100	+20%					
S5.000	15 Winter	100	+20%					
S1.004	30 Winter	100	+20%					
S6.000	15 Winter	100	+20%					
S1.005	15 Winter	100	+20%					
S7.000	15 Winter	100	+20%					
S1.006	15 Winter	100	+20%					
S8.000	15 Winter	100	+20%					
S1.007	30 Winter	100	+20%					
S9.000	15 Winter	100	+20%					
S10.000	15 Winter	100	+20%					
S9.001	15 Winter	100	+20%					
S11.000	15 Winter	100	+20%					
S11.001	15 Winter	100	+20%					

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S11.002	15 Winter	100	+20%					
S12.000	15 Winter	100	+20%					
S11.003	15 Winter	100	+20%					
S1.008	15 Winter	100	+20%	30/15 Summer				
S13.000	15 Winter	100	+20%					
S13.001	15 Winter	100	+20%	100/15 Summer				
S14.000	15 Winter	100	+20%					
S13.002	30 Winter	100	+20%					
S15.000	15 Winter	100	+20%					
S13.003	30 Winter	100	+20%					
S1.009	480 Winter	100	+20%	100/15 Summer				
S1.010	480 Winter	100	+20%	100/360 Winter				
S1.011	360 Summer	100	+20%					
S16.000	15 Winter	100	+20%	100/15 Summer				
S16.001	30 Winter	100	+20%					
S16.002	60 Winter	100	+20%					
S16.003	15 Winter	100	+20%	30/15 Summer				
S16.004	15 Winter	100	+20%	30/15 Summer				
S16.005	480 Summer	100	+20%					
S1.012	480 Winter	100	+20%	30/30 Winter				
S1.013	480 Winter	100	+20%	2/15 Summer				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	37.922	0.412	0.000	0.30	0.0	4.1	FLOOD RISK
S2.000	S2	38.279	0.083	0.000	0.76	0.0	24.8	SURCHARGED
S1.001	S2	37.898	0.578	0.000	0.39	0.0	26.2	SURCHARGED
S3.000	S4	38.341	-0.087	0.000	0.37	0.0	21.1	OK
S1.002	S3	37.152	0.000	0.000	0.67	0.0	41.2	SURCHARGED*
S4.000	S6	38.290	-0.104	0.000	0.20	0.0	11.5	OK
S1.003	S4	37.118	0.000	0.000	0.82	0.0	50.6	SURCHARGED*
S5.000	S8	38.287	-0.091	0.000	0.32	0.0	18.6	OK
S1.004	S5	37.095	0.000	0.000	0.97	0.0	59.4	SURCHARGED*
S6.000	S10	38.314	-0.094	0.000	0.30	0.0	17.6	OK
S1.005	S6	37.077	0.000	0.000	1.02	0.0	79.7	SURCHARGED*
S7.000	S12	38.341	-0.095	0.000	0.29	0.0	17.8	OK
S1.006	S7	36.941	0.000	0.000	1.54	0.0	94.4	SURCHARGED*
S8.000	S14	38.382	-0.100	0.000	0.24	0.0	15.5	OK
S1.007	S8	36.916	0.000	0.000	1.56	0.0	95.6	SURCHARGED*
S9.000	S16	38.266	-0.074	0.000	0.51	0.0	19.2	OK
S10.000	S17	38.332	-0.101	0.000	0.23	0.0	10.6	OK
S9.001	S16	37.565	-0.140	0.000	0.30	0.0	29.5	OK
S11.000	S19	38.680	-0.125	0.000	0.07	0.0	3.3	OK
S11.001	S20	38.084	-0.127	0.000	0.06	0.0	3.2	OK*
S11.002	S21	37.281	-0.108	0.000	0.17	0.0	3.2	OK
S12.000	S22	38.516	-0.097	0.000	0.27	0.0	17.2	OK
S11.003	S22	37.047	0.000	0.000	0.90	0.0	18.3	SURCHARGED*

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

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.008	S9	37.091	0.187	0.000	1.77	0.0	149.8	SURCHARGED
S13.000	S20	38.383	-0.073	0.000	0.48	0.0	20.4	OK
S13.001	S10	38.267	0.499	0.000	0.62	0.0	17.7	SURCHARGED
S14.000	S22	38.346	-0.080	0.000	0.44	0.0	22.0	OK
S13.002	S11	37.480	0.000	0.000	1.08	0.0	31.1	SURCHARGED*
S15.000	S24	38.359	-0.086	0.000	0.38	0.0	21.0	OK
S13.003	S12	37.267	0.000	0.000	1.26	0.0	46.5	SURCHARGED*
S1.009	S10	36.951	0.090	0.000	0.27	0.0	29.2	SURCHARGED
S1.010	S11	36.950	0.117	0.000	0.13	0.0	29.2	SURCHARGED
S1.011	S33	36.677	0.000	0.000	0.11	0.0	50.3	SURCHARGED*
S16.000	S33	38.722	0.497	0.000	0.56	0.0	35.3	SURCHARGED
S16.001	S34	37.682	0.000	0.000	0.86	0.0	57.8	SURCHARGED*
S16.002	S35	37.178	0.000	0.000	0.89	0.0	60.1	SURCHARGED*
S16.003	S34	37.489	0.660	0.000	1.97	0.0	87.6	SURCHARGED
S16.004	S35	37.028	0.318	0.000	2.65	0.0	87.4	SURCHARGED
S16.005	S38	36.655	0.000	0.000	0.14	0.0	18.6	SURCHARGED*
S1.012	S13	36.948	0.921	0.000	0.05	0.0	7.1	SURCHARGED
S1.013	S14	36.947	1.263	0.000	0.14	0.0	4.7	SURCHARGED