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Our Ref: 66504/LT/002

29th October 2019

Former Shredded Wheat Site, Broadwater Road, Welwyn Garden City, AL8 6UN

Dear Sir/Madam

Please see below Curtins responses to comments on the Surface Water Discharge made by Thames Water development Team in their email dated 12th August 2019.

Thames Water Comment:

The strategy lack detail only calculations which don't articulate the intended flows etc. Give a brief description of volumes, Discharge rates say 1:1, 1:10, 1:30 and 1:100. Also show and give capacity of any attenuation

Curtis Response:

Please see attached Micro Drainage calculations for discharge of Surface water at SW08 and SW23.

SW08

Attenuation is by storage tank at 392m^2
Please refer to page 8 of the Micro Drainage calculations in reference to Discharge Rates (1:1, 1:30, 1:100)

SW23

Attenuation is by storage tank at 334m2
Please refer to page 9 of the Micro Drainage calculations in reference to Discharge Rates (1:1, 1:30, 1:100)

Yours faithfully

Nigel Hickman
Senior Technician
For and on behalf of
Curtins Consulting Ltd

SW08

Curtins Consulting Limited
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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm 1

Pipe Sizes BR Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.434	Minimum Backdrop Height (m)	19.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	20.000
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)	250

Designed with Level Soffits

Network Design Table for Storm 1

« - 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	21.282	0.142	149.9	0.055	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	39.398	0.145	271.7	0.042	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	44.851	0.345	130.0	0.047	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	10.623	0.071	150.0	0.013	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	19.943	0.130	153.4	0.037	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.000	29.723	0.200	148.6	0.066	5.00	0.0	0.600	o	225	Pipe/Conduit	
3.001	6.505	0.055	118.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	24.251	0.160	151.6	0.054	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	47.066	0.320	147.1	0.039	0.00	0.0	0.600	o	300	Pipe/Conduit	
4.000	17.414	0.095	183.3	0.011	5.00	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)
1.000	50.00	5.43	84.350	0.055	0.0	0.0	0.0	0.82	14.5	7.5
1.001	50.00	6.13	83.700	0.098	0.0	0.0	0.0	0.95	67.1	13.2
2.000	50.00	5.65	83.900	0.047	0.0	0.0	0.0	1.15	45.5	6.4
1.002	50.00	6.26	83.480	0.158	0.0	0.0	0.0	1.28	90.6	21.4
1.003	50.00	6.53	83.400	0.195	0.0	0.0	0.0	1.27	89.6	26.5
3.000	50.00	5.46	83.600	0.066	0.0	0.0	0.0	1.07	42.6	8.9
3.001	50.00	5.55	83.400	0.066	0.0	0.0	0.0	1.20	47.8	8.9
1.004	50.00	6.84	83.270	0.315	0.0	0.0	0.0	1.27	90.1	42.7
1.005	50.00	7.45	83.110	0.354	0.0	0.0	0.0	1.29	91.5	47.9
4.000	50.00	5.39	84.350	0.011	0.0	0.0	0.0	0.74	13.1	1.5

Network Design Table for Storm 1

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
5.000	13.251	0.095	139.5	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit	
4.001	21.334	0.140	152.4	0.040	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.006	24.745	0.124	200.0	0.043	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.007	6.401	0.706	9.1	0.008	0.00	0.0	0.600	o	300	Pipe/Conduit	
6.000	32.240	0.215	150.0	0.057	5.00	0.0	0.600	o	150	Pipe/Conduit	
6.001	45.047	0.213	211.0	0.167	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.008	31.447	0.210	149.7	0.055	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.009	7.873	0.930	8.5	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)
5.000	50.00	5.26	84.350	0.012	0.0	0.0	0.0	0.85	15.0	1.7
4.001	50.00	5.73	84.180	0.064	0.0	0.0	0.0	1.06	42.0	8.6
1.006	50.00	7.82	82.790	0.461	0.0	0.0	0.0	1.11	78.3	62.4
1.007	50.00	7.84	82.666	0.469	0.0	0.0	0.0	5.25	371.2	63.5
6.000	50.00	5.66	83.410	0.057	0.0	0.0	0.0	0.82	14.5	7.7
6.001	50.00	6.49	82.260	0.224	0.0	0.0	0.0	0.90	35.6	30.3
1.008	50.00	8.25	81.960	0.748	0.0	0.0	0.0	1.28	90.7«	101.3
1.009	50.00	8.29	81.750	0.748	0.0	0.0	0.0	3.48	61.6«	101.3

Manhole Schedules for Storm 1

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)	Backdrop (mm)
RE	85.000	0.650	Junction	0	1.000	84.350	150				
SW01	84.800	1.100	Open Manhole	1200	1.001	83.700	300	1.000	84.208	150	358
RE	85.000	1.100	Junction	0	2.000	83.900	225				
SW02	84.800	1.320	Open Manhole	1200	1.002	83.480	300	1.001	83.555	300	75
								2.000	83.555	225	
SW03	84.800	1.400	Open Manhole		1.003	83.400	300	1.002	83.409	300	9
RE	84.800	1.200	Junction	0	3.000	83.600	225				
SW39	85.000	1.600	Open Manhole		3.001	83.400	225	3.000	83.400	225	
Junction	84.800	1.530	Junction	0	1.004	83.270	300	1.003	83.270	300	
								3.001	83.345	225	
SW04	84.800	1.690	Open Manhole	1200	1.005	83.110	300	1.004	83.110	300	
RE	85.000	0.650	Junction	0	4.000	84.350	150				
RE	85.000	0.650	Junction	0	5.000	84.350	150				
SW10	84.800	0.620	Open Manhole	1200	4.001	84.180	225	4.000	84.255	150	
								5.000	84.255	150	
SW05	84.800	2.010	Open Manhole	1200	1.006	82.790	300	1.005	82.790	300	
								4.001	84.040	225	1175
SW06	84.800	2.134	Open Manhole	1200	1.007	82.666	300	1.006	82.666	300	
RE	84.760	1.350	Junction	0	6.000	83.410	150				
SW09	84.800	2.540	Open Manhole	1200	6.001	82.260	225	6.000	83.195	150	860
SW07	84.800	2.840	Open Manhole	1200	1.008	81.960	300	1.007	81.960	300	
								6.001	82.047	225	12
SW08	84.400	2.650	Open Manhole	1200	1.009	81.750	150	1.008	81.750	300	
Outfall 1	84.290	3.470	Open Manhole	0		OUTFALL		1.009	80.820	150	

Free Flowing Outfall Details for Storm 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.009	Outfall 1	84.290	80.820	80.820	0	0

Simulation Criteria for Storm 1

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 1 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.434		

Online Controls for Storm 1

Hydro-Brake® Optimum Manhole: SW08, DS/PN: 1.009, Volume (m³): 5.1

Unit Reference	MD-SHE-0105-6500-2000-6500
Design Head (m)	2.000
Design Flow (l/s)	6.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	105
Invert Level (m)	81.750
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)	2.000	6.5	Kick-Flo®	0.937	4.6
Flush-Flo™	0.459	5.7	Mean Flow over Head Range	-	5.3

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	3.5	1.200	5.1	3.000	7.9	7.000	11.7
0.200	5.1	1.400	5.5	3.500	8.4	7.500	12.1
0.300	5.5	1.600	5.8	4.000	9.0	8.000	12.5
0.400	5.7	1.800	6.2	4.500	9.5	8.500	12.9
0.500	5.7	2.000	6.5	5.000	10.0	9.000	13.2
0.600	5.6	2.200	6.8	5.500	10.5	9.500	13.6
0.800	5.3	2.400	7.1	6.000	10.9		
1.000	4.7	2.600	7.3	6.500	11.3		

Storage Structures for Storm 1

Porous Car Park Manhole: RE, DS/PN: 1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	46.0
Max Percolation (l/s)	63.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	84.350	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: SW01, DS/PN: 1.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	42.0
Max Percolation (l/s)	58.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	83.700	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: RE, DS/PN: 2.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	40.0
Max Percolation (l/s)	55.6	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	83.900	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: SW03, DS/PN: 1.003

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	26.0
Max Percolation (l/s)	36.1	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	83.400	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: SW04, DS/PN: 1.005

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	45.0
Max Percolation (l/s)	62.5	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	83.110	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: RE, DS/PN: 4.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	6.0
Max Percolation (l/s)	8.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	84.350	Cap Volume Depth (m)	0.450

Cellular Storage Manhole: SW05, DS/PN: 1.006

Invert Level (m) 82.790 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	88.0	0.0	1.001	0.0	0.0
1.000	88.0	0.0			

Porous Car Park Manhole: SW06, DS/PN: 1.007

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.7
Membrane Percolation (mm/hr)	1000	Length (m)	30.0
Max Percolation (l/s)	30.8	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	82.000	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: RE, DS/PN: 6.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	15.0
Max Percolation (l/s)	20.8	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	83.410	Cap Volume Depth (m)	0.450

Complex Manhole: SW07, DS/PN: 1.008

Cellular Storage

Invert Level (m) 81.960 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	112.0	0.0	1.951	0.0	0.0
1.950	112.0	0.0			

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.0
Membrane Percolation (mm/hr)	1000	Length (m)	37.5
Max Percolation (l/s)	72.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	81.960	Cap Volume Depth (m)	0.450

Tank or Pond Manhole: SW08, DS/PN: 1.009

Invert Level (m) 83.775

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	75.0	0.625	75.0

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

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 1 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm) 20.000	Cv (Summer) 0.750
Region England and Wales		Ratio R 0.434	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)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	RE	60 Winter	1	+0%					84.387	-0.113
1.001	SW01	60 Winter	1	+0%					83.742	-0.258
2.000	RE	60 Winter	1	+0%					83.931	-0.194
1.002	SW02	60 Winter	1	+0%	100/360 Winter				83.536	-0.244
1.003	SW03	60 Winter	1	+0%	100/240 Winter				83.457	-0.243
3.000	RE	15 Winter	1	+0%					83.672	-0.153
3.001	SW39	15 Winter	1	+0%	100/15 Summer				83.482	-0.143
1.004	Junction	15 Winter	1	+0%					83.358	-0.212
1.005	SW04	30 Winter	1	+0%	100/15 Winter				83.193	-0.217
4.000	RE	15 Winter	1	+0%					84.378	-0.122
5.000	RE	15 Winter	1	+0%					84.384	-0.116
4.001	SW10	15 Winter	1	+0%					84.246	-0.159
1.006	SW05	60 Winter	1	+0%	100/15 Summer				82.891	-0.199
1.007	SW06	60 Winter	1	+0%	30/120 Winter				82.721	-0.245
6.000	RE	15 Winter	1	+0%	100/15 Summer				83.475	-0.085
6.001	SW09	15 Winter	1	+0%	30/15 Summer				82.401	-0.084
1.008	SW07	240 Winter	1	+0%	30/15 Summer				82.169	-0.091
1.009	SW08	240 Winter	1	+0%	1/15 Summer				82.187	0.287

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	RE	0.000	0.14		2.0	OK*	
1.001	SW01	0.000	0.05		2.9	OK	
2.000	RE	0.000	0.05		2.1	OK*	
1.002	SW02	0.000	0.08		5.2	OK	
1.003	SW03	0.000	0.08		6.3	OK	

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

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
3.000	RE	0.000	0.22		9.2	OK*	
3.001	SW39	0.000	0.28		9.3	OK	
1.004	Junction	0.000	0.19		16.7	OK*	
1.005	SW04	0.000	0.17		14.7	OK	
4.000	RE	0.000	0.08		1.1	OK*	
5.000	RE	0.000	0.12		1.7	OK*	
4.001	SW10	0.000	0.19		7.2	OK	
1.006	SW05	0.000	0.25		17.2	OK	
1.007	SW06	0.000	0.08		15.9	OK	
6.000	RE	0.000	0.39		5.7	OK*	
6.001	SW09	0.000	0.70		23.8	OK	
1.008	SW07	0.000	0.10		8.2	OK	
1.009	SW08	0.000	0.10		5.6	SURCHARGED	

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

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 1 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.434 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) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	RE	30 Winter	30	+0%					84.430	-0.070
1.001	SW01	30 Winter	30	+0%					83.787	-0.213
2.000	RE	30 Winter	30	+0%					83.966	-0.159
1.002	SW02	30 Winter	30	+0%	100/360 Winter				83.595	-0.185
1.003	SW03	30 Winter	30	+0%	100/240 Winter				83.516	-0.184
3.000	RE	15 Winter	30	+0%					83.719	-0.106
3.001	SW39	15 Winter	30	+0%	100/15 Summer				83.538	-0.087
1.004	Junction	15 Winter	30	+0%					83.440	-0.130
1.005	SW04	30 Winter	30	+0%	100/15 Winter				83.279	-0.131
4.000	RE	15 Winter	30	+0%					84.403	-0.097
5.000	RE	15 Winter	30	+0%					84.405	-0.095
4.001	SW10	15 Winter	30	+0%					84.303	-0.102
1.006	SW05	240 Winter	30	+0%	100/15 Summer				83.036	-0.054
1.007	SW06	240 Winter	30	+0%	30/120 Winter				83.036	0.070
6.000	RE	15 Winter	30	+0%	100/15 Summer				83.544	-0.016
6.001	SW09	15 Winter	30	+0%	30/15 Summer				83.158	0.673
1.008	SW07	240 Winter	30	+0%	30/15 Summer				83.035	0.775
1.009	SW08	240 Winter	30	+0%	1/15 Summer				83.194	1.294

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	RE	0.000	0.55		8.0	OK*	
1.001	SW01	0.000	0.19		11.6	OK	
2.000	RE	0.000	0.19		8.5	OK*	
1.002	SW02	0.000	0.32		21.1	OK	
1.003	SW03	0.000	0.32		25.0	OK	

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

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
3.000	RE	0.000	0.53		22.7	OK*	
3.001	SW39	0.000	0.69		22.9	OK	
1.004	Junction	0.000	0.60		53.7	OK*	
1.005	SW04	0.000	0.60		51.7	OK	
4.000	RE	0.000	0.27		3.5	OK*	
5.000	RE	0.000	0.29		4.3	OK*	
4.001	SW10	0.000	0.56		21.4	OK	
1.006	SW05	0.000	0.39		27.1	OK	
1.007	SW06	0.000	0.13		27.5	SURCHARGED	
6.000	RE	0.000	1.00		14.5	OK*	
6.001	SW09	0.000	1.99		67.7	SURCHARGED	
1.008	SW07	0.000	0.18		14.5	SURCHARGED	
1.009	SW08	0.000	0.11		5.7	SURCHARGED	

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

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	1	Number of Storage Structures	11	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.000
Region	England and Wales	Ratio R	0.434
Cv (Summer)	0.750		
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)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	RE	30 Winter	100	+40%					84.488	-0.012
1.001	SW01	30 Winter	100	+40%					83.836	-0.164
2.000	RE	15 Winter	100	+40%					84.004	-0.121
1.002	SW02	360 Winter	100	+40%	100/360 Winter				83.786	0.006
1.003	SW03	360 Winter	100	+40%	100/240 Winter				83.784	0.084
3.000	RE	15 Winter	100	+40%					83.825	0.000
3.001	SW39	360 Winter	100	+40%	100/15 Summer				83.783	0.158
1.004	Junction	360 Winter	100	+40%					83.570	0.000
1.005	SW04	360 Winter	100	+40%	100/15 Winter				83.779	0.369
4.000	RE	15 Winter	100	+40%					84.427	-0.073
5.000	RE	15 Winter	100	+40%					84.428	-0.072
4.001	SW10	15 Winter	100	+40%					84.393	-0.012
1.006	SW05	360 Winter	100	+40%	100/15 Summer				83.774	0.684
1.007	SW06	360 Winter	100	+40%	30/120 Winter				83.770	0.804
6.000	RE	15 Winter	100	+40%	100/15 Summer				83.860	0.300
6.001	SW09	15 Winter	100	+40%	30/15 Summer				84.050	1.565
1.008	SW07	360 Winter	100	+40%	30/15 Summer				83.769	1.509
1.009	SW08	480 Winter	100	+40%	1/15 Summer				83.777	1.877

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	RE	0.000	1.00		14.5	OK*	
1.001	SW01	0.000	0.42		26.2	OK	
2.000	RE	0.000	0.43		19.4	OK*	
1.002	SW02	0.000	0.19		12.8	SURCHARGED	

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

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.003	SW03	0.000	0.20		15.8	SURCHARGED	
3.000	RE	0.000	0.96		40.7	SURCHARGED*	
3.001	SW39	0.000	0.17		5.5	SURCHARGED	
1.004	Junction	0.000	0.28		25.7	SURCHARGED*	
1.005	SW04	0.000	0.33		28.8	SURCHARGED	
4.000	RE	0.000	0.51		6.6	OK*	
5.000	RE	0.000	0.52		7.8	OK*	
4.001	SW10	0.000	1.00		38.3	OK	
1.006	SW05	0.000	0.48		33.8	SURCHARGED	
1.007	SW06	0.000	0.16		32.8	SURCHARGED	
6.000	RE	0.000	1.78		25.8	SURCHARGED*	
6.001	SW09	0.000	2.84		96.4	SURCHARGED	
1.008	SW07	0.000	0.22		18.2	SURCHARGED	
1.009	SW08	0.000	0.12		6.5	SURCHARGED	

SW23

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm 2

Pipe Sizes BR Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.434	Minimum Backdrop Height (m)	19.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	20.000
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)	250

Designed with Level Soffits

Network Design Table for Storm 2

« - 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	24.942	0.175	142.5	0.021	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	36.796	0.184	200.0	0.043	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	8.574	0.039	219.8	0.003	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	21.626	0.144	150.0	0.072	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	34.518	0.250	138.1	0.113	5.00	0.0	0.600	o	225	Pipe/Conduit	
2.001	9.128	0.061	149.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	18.658	0.093	200.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.000	33.369	0.150	222.5	0.113	5.00	0.0	0.600	o	225	Pipe/Conduit	
3.001	8.821	0.365	24.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.000	40.115	0.250	160.5	0.095	5.00	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)
1.000	50.00	5.50	84.425	0.021	0.0	0.0	0.0	0.84	14.8	2.8
1.001	50.00	6.16	84.100	0.064	0.0	0.0	0.0	0.92	36.6	8.7
1.002	50.00	6.32	83.880	0.067	0.0	0.0	0.0	0.88	34.9	9.1
1.003	50.00	6.61	83.820	0.139	0.0	0.0	0.0	1.28	90.6	18.8
2.000	50.00	5.52	84.250	0.113	0.0	0.0	0.0	1.11	44.2	15.4
2.001	50.00	5.66	84.000	0.113	0.0	0.0	0.0	1.07	42.4	15.4
1.004	50.00	6.89	83.676	0.252	0.0	0.0	0.0	1.11	78.2	34.2
3.000	50.00	5.64	84.150	0.113	0.0	0.0	0.0	0.87	34.7	15.3
3.001	50.00	5.69	84.000	0.113	0.0	0.0	0.0	2.67	106.3	15.3
4.000	50.00	5.85	83.960	0.095	0.0	0.0	0.0	0.79	14.0	12.9

Network Design Table for Storm 2

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
1.005	35.378	0.350	101.1	0.032	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.000	27.993	0.187	150.0	0.009	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.006	15.840	0.150	105.6	0.009	0.00	0.0	0.600	o	300	Pipe/Conduit	
6.000	24.176	0.280	86.3	0.009	5.00	0.0	0.600	o	150	Pipe/Conduit	
6.001	11.526	0.080	144.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.007	12.834	0.130	98.7	0.023	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.008	24.643	0.850	29.0	0.043	0.00	0.0	0.600	o	300	Pipe/Conduit	
7.000	30.950	0.165	187.6	0.085	5.00	0.0	0.600	o	225	Pipe/Conduit	
7.001	38.529	0.175	220.2	0.097	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.009	30.710	0.154	199.4	0.120	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.010	5.060	0.020	253.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.011	3.985	0.340	11.7	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)
1.005	50.00	7.26	83.560	0.493	0.0	0.0	0.0	1.56	110.5	66.7
5.000	50.00	5.57	84.350	0.009	0.0	0.0	0.0	0.82	14.5	1.3
1.006	50.00	7.44	83.210	0.511	0.0	0.0	0.0	1.53	108.1	69.2
6.000	50.00	5.37	84.350	0.009	0.0	0.0	0.0	1.08	19.1	1.2
6.001	50.00	5.60	84.070	0.009	0.0	0.0	0.0	0.84	14.8	1.2
1.007	50.00	7.57	83.060	0.543	0.0	0.0	0.0	1.58	111.9	73.5
1.008	50.00	7.71	82.930	0.586	0.0	0.0	0.0	2.93	207.2	79.3
7.000	50.00	5.54	82.570	0.085	0.0	0.0	0.0	0.95	37.8	11.5
7.001	50.00	6.27	82.330	0.182	0.0	0.0	0.0	0.88	34.9	24.6
1.009	50.00	8.17	82.080	0.888	0.0	0.0	0.0	1.11	78.4«	120.3
1.010	50.00	8.31	81.840	0.888	0.0	0.0	0.0	0.63	11.1«	120.3
1.011	50.00	8.33	81.270	0.888	0.0	0.0	0.0	2.96	52.3«	120.3

Manhole Schedules for Storm 2

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)	Backdrop (mm)
RE	84.800	0.375	Junction	0	1.000	84.425	150				
SW11	84.800	0.700	Open Manhole	1200	1.001	84.100	225	1.000	84.250	150	75
SW12	84.800	0.920	Open Manhole	1200	1.002	83.880	225	1.001	83.916	225	36
SW13	84.800	0.980	Open Manhole		1.003	83.820	300	1.002	83.841	225	
RE	85.250	1.000	Junction	0	2.000	84.250	225				
SW14	85.220	1.220	Open Manhole		2.001	84.000	225	2.000	84.000	225	
Junction	84.800	1.124	Junction	0	1.004	83.676	300	1.003	83.676	300	
								2.001	83.939	225	188
RE	84.800	0.650	Junction	0	3.000	84.150	225				
SW15	85.220	1.220	Open Manhole	450	3.001	84.000	225	3.000	84.000	225	
RE	84.800	0.840	Junction	0	4.000	83.960	150				
SW16	84.800	1.240	Open Manhole	1200	1.005	83.560	300	1.004	83.583	300	23
								3.001	83.635	225	
								4.000	83.710	150	
RE	85.000	0.650	Junction	0	5.000	84.350	150				
SW17	84.800	1.590	Open Manhole	1200	1.006	83.210	300	1.005	83.210	300	
								5.000	84.163	150	803
RE	85.200	0.850	Junction	0	6.000	84.350	150				
SW41	84.800	0.730	Open Manhole	450	6.001	84.070	150	6.000	84.070	150	
SW18	84.800	1.740	Open Manhole	1200	1.007	83.060	300	1.006	83.060	300	
								6.001	83.990	150	780
SW19	84.800	1.870	Open Manhole	1200	1.008	82.930	300	1.007	82.930	300	
RE	85.050	2.480	Junction	0	7.000	82.570	225				
SW21	85.000	2.670	Open Manhole	1200	7.001	82.330	225	7.000	82.405	225	75
SW20	84.800	2.720	Open Manhole	1200	1.009	82.080	300	1.008	82.080	300	
								7.001	82.155	225	
SW22	84.800	2.960	Open Manhole	1200	1.010	81.840	150	1.009	81.926	300	236
SW23	84.800	3.530	Open Manhole	1200	1.011	81.270	150	1.010	81.820	150	550
Outfall 2	84.650	3.720	Open Manhole	0		OUTFALL		1.011	80.930	150	

Free Flowing Outfall Details for Storm 2

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.011	Outfall 2	84.650	80.930	80.930	0	0

Simulation Criteria for Storm 2

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	1	Number of Storage Structures	10	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.434		

Online Controls for Storm 2

Hydro-Brake® Optimum Manhole: SW22, DS/PN: 1.010, Volume (m³): 5.4

Unit Reference	MD-SHE-0107-6700-2000-6700
Design Head (m)	2.000
Design Flow (l/s)	6.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	106
Invert Level (m)	81.840
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)	2.000	6.7	Kick-Flo®	0.953	4.7
Flush-Flo™	0.466	6.0	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	3.6	1.200	5.3	3.000	8.1	7.000	12.1
0.200	5.3	1.400	5.7	3.500	8.7	7.500	12.5
0.300	5.8	1.600	6.0	4.000	9.3	8.000	12.9
0.400	5.9	1.800	6.4	4.500	9.8	8.500	13.3
0.500	6.0	2.000	6.7	5.000	10.3	9.000	13.7
0.600	5.9	2.200	7.0	5.500	10.8	9.500	14.0
0.800	5.5	2.400	7.3	6.000	11.3		
1.000	4.9	2.600	7.6	6.500	11.7		

Storage Structures for Storm 2

Porous Car Park Manhole: RE, DS/PN: 1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	32.0
Max Percolation (l/s)	44.4	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	84.425	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: SW11, DS/PN: 1.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	50.0
Max Percolation (l/s)	69.4	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	84.100	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: SW13, DS/PN: 1.003

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	24.0
Max Percolation (l/s)	33.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	83.820	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: Junction, DS/PN: 1.004

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	16.0
Max Percolation (l/s)	22.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	83.676	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: SW16, DS/PN: 1.005

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	35.5
Max Percolation (l/s)	98.6	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	83.560	Cap Volume Depth (m)	0.450

Porous Car Park Manhole: RE, DS/PN: 5.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	7.0
Max Percolation (l/s)	7.8	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	84.350	Cap Volume Depth (m)	0.450

Complex Manhole: SW18, DS/PN: 1.007

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	8.4
Max Percolation (l/s)	11.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	82.330	Cap Volume Depth (m)	0.450

Tank or Pond

Invert Level (m) 82.330

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	315.0	1.000	315.0	1.001	0.0

Complex Manhole: SW19, DS/PN: 1.008

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	18.4
Max Percolation (l/s)	25.6	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	82.930	Cap Volume Depth (m)	0.450

Tank or Pond

Invert Level (m) 85.005

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	15.0	0.600	75.0

Porous Car Park Manhole: RE, DS/PN: 7.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	12.6
Max Percolation (l/s)	17.5	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	82.570	Cap Volume Depth (m)	0.450

Complex Manhole: SW20, DS/PN: 1.009

Cellular Storage

Invert Level (m)	82.080	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Cellular Storage

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	112.0	0.0	0.501	0.0	0.0
0.500	112.0	0.0			

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	15.0
Membrane Percolation (mm/hr)	1000	Length (m)	30.0
Max Percolation (l/s)	125.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	82.080	Cap Volume Depth (m)	0.450

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

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 1 Number of Storage Structures 10 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.434 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) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	RE	120 Winter	1	+0%					84.443	-0.132
1.001	SW11	120 Winter	1	+0%					84.130	-0.195
1.002	SW12	120 Winter	1	+0%	100/15 Winter				83.914	-0.191
1.003	SW13	30 Winter	1	+0%	100/30 Winter				83.875	-0.245
2.000	RE	15 Winter	1	+0%					84.345	-0.130
2.001	SW14	15 Winter	1	+0%	30/15 Summer				84.107	-0.118
1.004	Junction	15 Winter	1	+0%	100/15 Summer				83.775	-0.201
3.000	RE	15 Winter	1	+0%					84.258	-0.117
3.001	SW15	15 Winter	1	+0%					84.065	-0.160
4.000	RE	15 Winter	1	+0%					84.078	-0.032
1.005	SW16	30 Winter	1	+0%	100/15 Summer				83.671	-0.189
5.000	RE	15 Winter	1	+0%					84.374	-0.126
1.006	SW17	30 Winter	1	+0%	30/15 Winter				83.331	-0.179
6.000	RE	15 Winter	1	+0%					84.375	-0.125
6.001	SW41	15 Winter	1	+0%					84.100	-0.120
1.007	SW18	1440 Winter	1	+0%	100/240 Winter				82.725	-0.635
1.008	SW19	15 Winter	1	+0%	100/120 Winter				82.959	-0.271
7.000	RE	15 Winter	1	+0%	100/15 Summer				82.652	-0.143
7.001	SW21	15 Winter	1	+0%	30/15 Summer				82.463	-0.092
1.009	SW20	60 Winter	1	+0%	100/15 Summer				82.171	-0.209
1.010	SW22	60 Winter	1	+0%	1/15 Summer				82.160	0.170
1.011	SW23	60 Winter	1	+0%					81.310	-0.110

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	RE	0.000	0.04		0.5	OK*	

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

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	SW11	0.000	0.04		1.5	OK	
1.002	SW12	0.000	0.06		1.6	OK	
1.003	SW13	0.000	0.08		6.2	OK	
2.000	RE	0.000	0.36		15.9	OK*	
2.001	SW14	0.000	0.46		16.1	OK	
1.004	Junction	0.000	0.24		18.2	OK*	
3.000	RE	0.000	0.46		15.9	OK*	
3.001	SW15	0.000	0.19		15.8	OK	
4.000	RE	0.000	0.97		13.5	OK*	
1.005	SW16	0.000	0.30		30.1	OK	
5.000	RE	0.000	0.06		0.9	OK*	
1.006	SW17	0.000	0.34		31.3	OK	
6.000	RE	0.000	0.06		1.2	OK*	
6.001	SW41	0.000	0.09		1.2	OK	
1.007	SW18	0.000	0.00		0.0	OK	
1.008	SW19	0.000	0.02		3.7	OK	
7.000	RE	0.000	0.28		10.5	OK*	
7.001	SW21	0.000	0.64		21.1	OK	
1.009	SW20	0.000	0.13		9.2	OK	
1.010	SW22	0.000	0.65		5.8	SURCHARGED	
1.011	SW23	0.000	0.16		5.8	OK	

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

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 1 Number of Storage Structures 10 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.434 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) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	RE	30 Winter	30	+0%					84.467	-0.108
1.001	SW11	60 Winter	30	+0%					84.167	-0.158
1.002	SW12	60 Winter	30	+0%	100/15 Winter				83.955	-0.150
1.003	SW13	15 Winter	30	+0%	100/30 Winter				83.933	-0.187
2.000	RE	15 Winter	30	+0%					84.422	-0.053
2.001	SW14	15 Winter	30	+0%	30/15 Summer				84.229	0.004
1.004	Junction	15 Winter	30	+0%	100/15 Summer				83.872	-0.104
3.000	RE	15 Winter	30	+0%					84.375	0.000
3.001	SW15	15 Winter	30	+0%					84.105	-0.120
4.000	RE	15 Winter	30	+0%					84.110	0.000
1.005	SW16	15 Winter	30	+0%	100/15 Summer				83.789	-0.071
5.000	RE	15 Winter	30	+0%					84.395	-0.105
1.006	SW17	15 Winter	30	+0%	30/15 Winter				83.513	0.003
6.000	RE	15 Winter	30	+0%					84.390	-0.110
6.001	SW41	15 Winter	30	+0%					84.118	-0.102
1.007	SW18	1440 Winter	30	+0%	100/240 Winter				83.085	-0.275
1.008	SW19	15 Winter	30	+0%	100/120 Winter				82.987	-0.243
7.000	RE	15 Winter	30	+0%	100/15 Summer				82.789	-0.006
7.001	SW21	15 Winter	30	+0%	30/15 Summer				82.744	0.189
1.009	SW20	120 Winter	30	+0%	100/15 Summer				82.368	-0.012
1.010	SW22	120 Winter	30	+0%	1/15 Summer				82.355	0.365
1.011	SW23	120 Winter	30	+0%					81.310	-0.110

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	RE	0.000	0.17		2.6	OK*	

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

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	SW11	0.000	0.19		6.7	OK	
1.002	SW12	0.000	0.24		6.9	OK	
1.003	SW13	0.000	0.29		23.4	OK	
2.000	RE	0.000	0.88		38.8	OK*	
2.001	SW14	0.000	1.10		38.2	SURCHARGED	
1.004	Junction	0.000	0.76		57.7	OK*	
3.000	RE	0.000	1.08		37.5	SURCHARGED*	
3.001	SW15	0.000	0.44		37.5	OK	
4.000	RE	0.000	1.86		26.0	SURCHARGED*	
1.005	SW16	0.000	0.92		93.8	OK	
5.000	RE	0.000	0.20		2.8	OK*	
1.006	SW17	0.000	1.02		93.1	SURCHARGED	
6.000	RE	0.000	0.15		2.9	OK*	
6.001	SW41	0.000	0.22		3.0	OK	
1.007	SW18	0.000	0.02		1.6	OK	
1.008	SW19	0.000	0.08		14.9	OK	
7.000	RE	0.000	0.73		27.7	OK*	
7.001	SW21	0.000	1.43		47.2	SURCHARGED	
1.009	SW20	0.000	0.13		9.4	OK	
1.010	SW22	0.000	0.66		5.9	SURCHARGED	
1.011	SW23	0.000	0.16		5.9	OK	

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

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	1	Number of Storage Structures	10	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.000
Region	England and Wales	Ratio R	0.434
Cv (Summer)	0.750		
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)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	RE	30 Winter	100	+40%					84.495	-0.080
1.001	SW11	30 Winter	100	+40%					84.212	-0.113
1.002	SW12	30 Winter	100	+40%	100/15 Winter				84.149	0.044
1.003	SW13	30 Winter	100	+40%	100/30 Winter				84.131	0.011
2.000	RE	15 Winter	100	+40%					84.475	0.000
2.001	SW14	15 Winter	100	+40%	30/15 Summer				84.377	0.152
1.004	Junction	30 Winter	100	+40%	100/15 Summer				84.086	0.110
3.000	RE	15 Winter	100	+40%					84.375	0.000
3.001	SW15	15 Winter	100	+40%					84.151	-0.074
4.000	RE	15 Winter	100	+40%					84.110	0.000
1.005	SW16	30 Winter	100	+40%	100/15 Summer				83.989	0.129
5.000	RE	15 Winter	100	+40%					84.414	-0.086
1.006	SW17	480 Winter	100	+40%	30/15 Winter				83.837	0.327
6.000	RE	15 Winter	100	+40%					84.405	-0.095
6.001	SW41	15 Winter	100	+40%					84.137	-0.083
1.007	SW18	480 Winter	100	+40%	100/240 Winter				83.833	0.473
1.008	SW19	480 Winter	100	+40%	100/120 Winter				83.830	0.600
7.000	RE	60 Winter	100	+40%	100/15 Summer				83.020	0.225
7.001	SW21	480 Winter	100	+40%	30/15 Summer				83.829	1.274
1.009	SW20	480 Winter	100	+40%	100/15 Summer				83.825	1.445
1.010	SW22	480 Winter	100	+40%	1/15 Summer				83.817	1.827
1.011	SW23	480 Winter	100	+40%					81.313	-0.107

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

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	RE	0.000	0.44		6.5	OK*	
1.001	SW11	0.000	0.49		17.1	OK	
1.002	SW12	0.000	0.57		16.1	SURCHARGED	
1.003	SW13	0.000	0.48		37.9	SURCHARGED	
2.000	RE	0.000	1.49		65.7	SURCHARGED*	
2.001	SW14	0.000	1.91		66.5	SURCHARGED	
1.004	Junction	0.000	0.98		75.2	SURCHARGED*	
3.000	RE	0.000	1.92		66.5	SURCHARGED*	
3.001	SW15	0.000	0.78		66.8	OK	
4.000	RE	0.000	2.90		40.5	SURCHARGED*	
1.005	SW16	0.000	1.08		110.0	SURCHARGED	
5.000	RE	0.000	0.38		5.5	OK*	
1.006	SW17	0.000	0.37		33.4	SURCHARGED	
6.000	RE	0.000	0.28		5.3	OK*	
6.001	SW41	0.000	0.40		5.4	OK	
1.007	SW18	0.000	0.22		20.2	SURCHARGED	
1.008	SW19	0.000	0.09		17.3	SURCHARGED	
7.000	RE	0.000	0.60		22.6	SURCHARGED*	
7.001	SW21	0.000	0.36		12.0	SURCHARGED	
1.009	SW20	0.000	0.17		12.0	SURCHARGED	
1.010	SW22	0.000	0.74		6.7	SURCHARGED	
1.011	SW23	0.000	0.18		6.7	OK	

Mr. Adam Smith
Curtins
40 Compton Street
London
EC1V 0BD

Our ref: DS6045396

0800 009 3921
Monday to Friday, 8am to 5pm

[20th April, 2018]

Wastewater Pre-planning enquiry: Confirmation of sufficient capacity

Dear Mr. Smith,

Thank you for providing information on your development *L/W Broadwater Road, Welwyn Garden City, AL7 3BQ, Existing site factory with 10,300sqm, foul discharge via 3 outfalls to Broadwater Road by gravity into 225mm foul sewer. Existing SW discharge to Broadwater Road rates unknown. Development proposal for 634 flats, foul discharge by gravity via existing connections, proposed SW 5l/s/ha for 3.9HA gives 19.5l/s* If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity to serve your development.

Thames Water requests the developer provides connection points and building programme and first occupancy for the project when apply for planning permission.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

Please note that you must keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient sewerage capacity.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you've any further questions, please contact me on 0203 5779 018 / 07747 640 273.

Yours sincerely,

David Stamateris

Development Engineer

Thames Water