

Curtins Consulting Ltd		Page 1
.	BR1508 St Patricks	
.	Existing Drainage Network	
.	Outfall 1	
Date 15 December 2015	Designed by JH	
File BR1508-SW-OUTFALL 1-	Checked by	
XP Solutions	Network 2015.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for BR1508-SW-OUTFALL 1-A EXISTING.SWS

Pipe Sizes CA1065-SW-NT1-E Manhole Sizes CA1065-SW-NT1-E

FSR Rainfall Model - England and Wales

Return Period (years)	1	Add Flow / Climate Change (%)	0
M5-60 (mm)	18.500	Minimum Backdrop Height (m)	0.200
Ratio R	0.400	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	0.75
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Time Area Diagram for BR1508-SW-OUTFALL 1-A EXISTING.SWS

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.000	4-8	0.023	8-12	0.113	12-16	0.050	16-20	0.034	20-24	0.003

Total Area Contributing (ha) = 0.223

Total Pipe Volume (m³) = 5.014

Network Design Table for BR1508-SW-OUTFALL 1-A EXISTING.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)	Auto Design
1.000	18.871	0.000	0.0	0.042	5.00	0.0	0.600	o	150	
1.001	31.702	0.000	0.0	0.000	0.00	0.0	0.600	o	150	
2.000	20.304	0.000	0.0	0.037	5.00	0.0	0.600	o	150	
1.002	21.984	0.000	0.0	0.043	0.00	0.0	0.600	o	150	
3.000	12.975	0.000	0.0	0.035	5.00	0.0	0.600	o	150	
3.001	31.637	0.000	0.0	0.057	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)
1.000	39.47	8.39	67.405	0.042	0.0	0.0	0.0	0.09	1.6«	4.5
1.001	29.63	14.09	67.405	0.042	0.0	0.0	0.0	0.09	1.6«	4.5
2.000	38.84	8.65	67.405	0.037	0.0	0.0	0.0	0.09	1.6«	3.9
1.002	25.59	18.05	67.405	0.122	0.0	0.0	0.0	0.09	1.6«	8.5
3.000	42.33	7.33	67.405	0.035	0.0	0.0	0.0	0.09	1.6«	4.0
3.001	31.00	13.02	67.405	0.092	0.0	0.0	0.0	0.09	1.6«	7.7

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Network Design Table for BR1508-SW-OUTFALL 1-A EXISTING.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)	Auto Design
4.000	19.449	0.000	0.0	0.009	5.00	0.0	0.600	o	150	
1.003	36.729	0.020	1836.5	0.000	0.00	0.0	0.600	o	225	
1.004	19.632	0.191	102.8	0.000	0.00	0.0	0.600	o	225	

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)
4.000	39.21	8.50	67.405	0.009	0.0	0.0	0.0	0.09	1.6	1.0
1.003	23.95	20.11	67.330	0.223	0.0	0.0	0.0	0.30	11.8«	14.5
1.004	23.76	20.37	67.310	0.223	0.0	0.0	0.0	1.29	51.3	14.5

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Setting Out Information - True Coordinates (BR1508-SW-OUTFALL 1-A EXISTING.SWS)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
1.000	EX1	1240	675	472615.028	171807.897	
1.001	EX2	1240	675	472626.008	171792.550	
2.000	EX3	1240	675	472640.037	171827.449	
1.002	EX4	1240	675	472651.839	171810.928	
3.000	EX5	1240	675	472689.323	171784.918	
3.001	EX6	1240	675	472688.124	171797.838	
4.000	EX7	1240	675	472658.468	171839.436	
1.003	EX8	1240	675	472669.789	171823.621	
1.004	EX9	1240	675	472700.127	171844.323	
PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
1.004	EX10	450	450	472717.727	171853.021	

Free Flowing Outfall Details for BR1508-SW-OUTFALL 1-A EXISTING.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	EX10	68.020	67.119	0.000	450	450

Simulation Criteria for BR1508-SW-OUTFALL 1-A EXISTING.SWS

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 Coeffecient	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	0	Number of Storage Structures	0	Number of Real Time Controls	0

Synthetic Rainfall Details

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Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.500	Storm Duration (mins)	30
Ratio R	0.400		

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XP Solutions	Network 2015.1	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-OUTFALL 1-A EXISTING.SWS

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 Coefficient 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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
 Analysis Timestep Fine Inertia Status ON
 DTS 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) 1, 30, 100
 Climate Change (%) 0, 0, 0

US/MH			Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth
PN	Name	Storm							(m)	(m)
1.000	EX1 15	Winter	1	+0%	1/15 Summer	100/15 Summer			67.675	0.120
1.001	EX2 15	Winter	1	+0%	1/15 Summer				67.662	0.107
2.000	EX3 15	Winter	1	+0%	1/15 Summer	100/15 Winter			67.656	0.101
1.002	EX4 15	Winter	1	+0%	1/15 Summer				67.644	0.089
3.000	EX5 15	Winter	1	+0%	1/15 Summer	100/15 Summer			67.656	0.101
3.001	EX6 15	Winter	1	+0%	1/15 Summer				67.642	0.087
4.000	EX7 15	Winter	1	+0%	1/15 Summer				67.579	0.024
1.003	EX8 15	Winter	1	+0%	1/15 Summer				67.574	0.019
1.004	EX9 15	Winter	1	+0%					67.403	-0.132

Flooded			Pipe		Level Exceeded
PN	US/MH Name	Volume (m ³)	Flow / Cap. (l/s)	Flow (l/s)	
1.000	EX1	0.000	0.88	3.7	SURCHARGED 6
1.001	EX2	0.000	0.67	3.4	SURCHARGED
2.000	EX3	0.000	0.85	3.5	SURCHARGED 1
1.002	EX4	0.000	2.29	9.8	SURCHARGED
3.000	EX5	0.000	0.72	3.6	SURCHARGED 4
3.001	EX6	0.000	1.74	8.7	SURCHARGED
4.000	EX7	0.000	0.23	1.0	SURCHARGED
1.003	EX8	0.000	1.28	16.7	SURCHARGED
1.004	EX9	0.000	0.36	16.5	OK

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-OUTFALL 1-A EXISTING.SWS

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 Coefficient 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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
 Analysis Timestep Fine Inertia Status ON
 DTS 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) 1, 30, 100
 Climate Change (%) 0, 0, 0

US/MH		Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth
PN	Name								(m)	(m)
1.000	EX1	15 Winter	30	+0%	1/15 Summer	100/15 Summer			68.018	0.463
1.001	EX2	15 Winter	30	+0%	1/15 Summer				68.015	0.460
2.000	EX3	15 Winter	30	+0%	1/15 Summer	100/15 Winter			68.017	0.462
1.002	EX4	15 Winter	30	+0%	1/15 Summer				68.015	0.460
3.000	EX5	15 Winter	30	+0%	1/15 Summer	100/15 Summer			68.018	0.463
3.001	EX6	15 Winter	30	+0%	1/15 Summer				68.015	0.460
4.000	EX7	15 Winter	30	+0%	1/15 Summer				67.748	0.193
1.003	EX8	15 Winter	30	+0%	1/15 Summer				67.734	0.179
1.004	EX9	15 Winter	30	+0%					67.458	-0.077

		Flooded		Pipe		Status	Level Exceeded
PN	US/MH Name	Volume (m ³)	Flow / Cap. (l/s)	Overflow (l/s)	Flow (l/s)		
1.000	EX1	0.000	2.46		10.3	FLOOD RISK	6
1.001	EX2	0.000	1.98		9.9	FLOOD RISK	
2.000	EX3	0.000	2.17		8.9	FLOOD RISK	1
1.002	EX4	0.000	4.28		18.3	FLOOD RISK	
3.000	EX5	0.000	2.27		11.4	FLOOD RISK	4
3.001	EX6	0.000	3.20		16.0	FLOOD RISK	
4.000	EX7	0.000	0.61		2.5	FLOOD RISK	
1.003	EX8	0.000	2.72		35.6	FLOOD RISK	
1.004	EX9	0.000	0.76		35.4	OK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-OUTFALL 1-A EXISTING.SWS

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 Coefficient 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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
 Analysis Timestep Fine Inertia Status ON
 DTS 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) 1, 30, 100
 Climate Change (%) 0, 0, 0

US/MH		Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth
PN	Name								(m)	(m)
1.000	EX1	30 Winter	100	+0%	1/15 Summer	100/15 Summer			68.023	0.468
1.001	EX2	15 Winter	100	+0%	1/15 Summer				68.015	0.460
2.000	EX3	15 Winter	100	+0%	1/15 Summer	100/15 Winter			68.020	0.465
1.002	EX4	15 Winter	100	+0%	1/15 Summer				68.016	0.461
3.000	EX5	15 Winter	100	+0%	1/15 Summer	100/15 Summer			68.023	0.468
3.001	EX6	15 Winter	100	+0%	1/15 Summer				68.018	0.463
4.000	EX7	15 Winter	100	+0%	1/15 Summer				67.762	0.207
1.003	EX8	15 Winter	100	+0%	1/15 Summer				67.744	0.189
1.004	EX9	15 Winter	100	+0%					67.462	-0.073

		Flooded		Pipe		Level Exceeded
PN	US/MH Name	Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Flow Status	
1.000	EX1	3.066	2.84		11.9 FLOOD	6
1.001	EX2	0.000	2.28		11.4 FLOOD RISK	
2.000	EX3	0.333	2.53		10.4 FLOOD	1
1.002	EX4	0.000	4.31		18.4 FLOOD RISK	
3.000	EX5	2.567	2.81		14.2 FLOOD	4
3.001	EX6	0.000	3.22		16.1 FLOOD RISK	
4.000	EX7	0.000	0.84		3.5 FLOOD RISK	
1.003	EX8	0.000	2.82		36.9 FLOOD RISK	
1.004	EX9	0.000	0.79		36.8 OK	

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XP Solutions	Network 2015.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for BR1508-SW-OUTFALL 2-A EXISTING.SWS

Pipe Sizes CA1065-SW-NT1-E Manhole Sizes CA1065-SW-NT1-E

FSR Rainfall Model - England and Wales

Return Period (years)	1	Add Flow / Climate Change (%)	0
M5-60 (mm)	18.500	Minimum Backdrop Height (m)	0.000
Ratio R	0.400	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	0.000
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	0.75
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Time Area Diagram for BR1508-SW-OUTFALL 2-A EXISTING.SWS

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.183	4-8	0.155	8-12	0.021	12-16	0.010

Total Area Contributing (ha) = 0.369

Total Pipe Volume (m³) = 1.892

Network Design Table for BR1508-SW-OUTFALL 2-A EXISTING.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)	Auto Design
1.000	17.520	0.000	0.0	0.019	5.00	0.0	0.600	o	150	
1.001	13.146	0.000	0.0	0.018	0.00	0.0	0.600	o	150	
1.002	15.977	0.000	0.0	0.074	0.00	0.0	0.600	o	150	
1.003	16.270	0.090	180.8	0.237	0.00	0.0	0.600	o	150	
1.004	39.176	0.310	126.4	0.021	0.00	0.0	0.600	o	150	
1.005	5.000	0.038	131.6	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)
1.000	40.08	8.15	68.030	0.019	0.0	0.0	0.0	0.09	1.6«	2.1
1.001	34.89	10.51	68.030	0.037	0.0	0.0	0.0	0.09	1.6«	3.5
1.002	30.52	13.39	68.030	0.111	0.0	0.0	0.0	0.09	1.6«	9.2
1.003	30.06	13.75	68.030	0.348	0.0	0.0	0.0	0.74	13.2«	28.3
1.004	29.17	14.48	67.940	0.369	0.0	0.0	0.0	0.89	15.8«	29.1
1.005	29.06	14.58	67.630	0.369	0.0	0.0	0.0	0.87	15.5«	29.1

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Setting Out Information - True Coordinates (BR1508-SW-OUTFALL 2-A EXISTING.SWS)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
1.000	EX29D	1240	675	472677.675	171723.134	
1.001	EX29C	1240	675	472691.901	171733.361	
1.002	EX29B	1240	675	472702.604	171740.993	
1.003	EX29A	1240	675	472715.604	171750.281	
1.004	EX29	1240	675	472728.892	171759.670	
1.005	EX30	1200		472760.705	171782.533	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
1.005	EX30A	450		472764.939	171785.490	

Free Flowing Outfall Details for BR1508-SW-OUTFALL 2-A EXISTING.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.005	EX30A	68.750	67.592	0.000	450	0

Simulation Criteria for BR1508-SW-OUTFALL 2-A EXISTING.SWS

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 Coefficient	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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.500	Storm Duration (mins)	30
Ratio R	0.400		

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-OUTFALL 2-A EXISTING.SWS

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 Coefficient 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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 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 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) 1, 30, 100
 Climate Change (%) 0, 0, 0

									Water	Surcharged	Flooded
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)	Volume (m³)
1.000	EX29D	15 Winter	1	+0%	1/15 Summer	30/15 Summer			68.649	0.469	0.000
1.001	EX29C	15 Winter	1	+0%	1/15 Summer				68.646	0.466	0.000
1.002	EX29B	15 Winter	1	+0%	1/15 Summer	30/15 Summer			68.640	0.460	0.000
1.003	EX29A	15 Winter	1	+0%	1/15 Summer	30/15 Summer			68.615	0.435	0.000
1.004	EX29	15 Winter	1	+0%	1/15 Summer				68.393	0.303	0.000
1.005	EX30	15 Winter	1	+0%	1/15 Summer				67.840	0.060	0.000

				Pipe		
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status	Level Exceeded
1.000	EX29D	0.34		1.5	FLOOD RISK	23
1.001	EX29C	0.60		3.0	SURCHARGED	
1.002	EX29B	1.45		6.6	SURCHARGED	11
1.003	EX29A	1.58		19.3	FLOOD RISK	21
1.004	EX29	1.33		20.3	SURCHARGED	
1.005	EX30	1.66		20.3	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-OUTFALL 2-A EXISTING.SWS

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 Coefficient 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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 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 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) 1, 30, 100
 Climate Change (%) 0, 0, 0

US/MH			Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth	Flooded Volume
PN	Name	Storm							(m)	(m)	(m ³)
1.000	EX29D 60	Winter	30	+0%	1/15 Summer	30/15 Summer			68.897	0.717	7.190
1.001	EX29C 15	Summer	30	+0%	1/15 Summer				68.969	0.789	0.000
1.002	EX29B 15	Winter	30	+0%	1/15 Summer	30/15 Summer			68.972	0.792	2.115
1.003	EX29A 30	Winter	30	+0%	1/15 Summer	30/15 Summer			68.909	0.729	19.459
1.004	EX29 15	Winter	30	+0%	1/15 Summer				68.715	0.625	0.000
1.005	EX30 15	Winter	30	+0%	1/15 Summer				67.890	0.110	0.000

US/MH		Flow / Overflow		Pipe Flow	Level	
PN	Name	Cap.	(l/s)	(l/s)	Status	Exceeded
1.000	EX29D	3.51		15.3	FLOOD	23
1.001	EX29C	2.78		13.9	FLOOD RISK	
1.002	EX29B	3.38		15.4	FLOOD	11
1.003	EX29A	1.89		23.1	FLOOD	21
1.004	EX29	1.62		24.7	FLOOD RISK	
1.005	EX30	2.02		24.6	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-OUTFALL 2-A EXISTING.SWS

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 Coefficient 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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 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 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) 1, 30, 100
 Climate Change (%) 0, 0, 0

									Water	Surcharged	Flooded
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)	Volume (m³)
1.000	EX29D	60 Winter	100	+0%	1/15 Summer	30/15 Summer			68.902	0.722	12.009
1.001	EX29C	15 Winter	100	+0%	1/15 Summer				68.972	0.792	0.000
1.002	EX29B	15 Winter	100	+0%	1/15 Summer	30/15 Summer			68.975	0.795	4.664
1.003	EX29A	30 Winter	100	+0%	1/15 Summer	30/15 Summer			68.922	0.742	32.284
1.004	EX29	15 Summer	100	+0%	1/15 Summer				68.752	0.662	0.000
1.005	EX30	15 Winter	100	+0%	1/15 Summer				67.896	0.116	0.000

				Pipe			Level
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status	Level Exceeded	
1.000	EX29D	3.72		16.2	FLOOD	23	
1.001	EX29C	3.11		15.6	FLOOD RISK		
1.002	EX29B	3.50		16.0	FLOOD	11	
1.003	EX29A	1.90		23.2	FLOOD	21	
1.004	EX29	1.65		25.1	FLOOD RISK		
1.005	EX30	2.06		25.1	SURCHARGED		

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for BR1508-SW-OUTFALL 3-A EXISTING.SWS

Pipe Sizes CA1065-SW-NT1-E Manhole Sizes CA1065-SW-NT1-E

FSR Rainfall Model - England and Wales

Return Period (years)	1	Add Flow / Climate Change (%)	0
M5-60 (mm)	18.500	Minimum Backdrop Height (m)	0.000
Ratio R	0.400	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	0.000
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	0.75
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Time Area Diagram for BR1508-SW-OUTFALL 3-A EXISTING.SWS

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.040	4-8	0.089	8-12	0.023

Total Area Contributing (ha) = 0.152

Total Pipe Volume (m³) = 0.431

Network Design Table for BR1508-SW-OUTFALL 3-A EXISTING.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)	Auto Design
1.000	10.798	0.000	0.0	0.065	5.00	0.0	0.600	o	100	
1.001	39.045	0.080	488.1	0.087	0.00	0.0	0.600	o	100	
1.002	5.000	0.010	500.0	0.000	0.00	0.0	0.600	o	100	

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	41.59	7.59	68.120	0.065	0.0	0.0	0.0	0.07	0.5«	7.3
1.001	36.93	9.49	68.120	0.152	0.0	0.0	0.0	0.34	2.7«	15.2
1.002	36.41	9.74	68.040	0.152	0.0	0.0	0.0	0.34	2.7«	15.2

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Setting Out Information - True Coordinates (BR1508-SW-OUTFALL 3-A EXISTING.SWS)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
1.000	tmp	1240	675	472758.134	171699.574	
1.001	EX18	1240	675	472767.070	171705.636	
1.002	EX17	1200		472798.748	171728.462	
PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
1.002	EX17A	450		472802.932	171731.401	

Free Flowing Outfall Details for BR1508-SW-OUTFALL 3-A EXISTING.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.002	EX17A	70.000	68.030	0.000	450	0

Simulation Criteria for BR1508-SW-OUTFALL 3-A EXISTING.SWS

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 Coefficient	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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.500	Storm Duration (mins)	30
Ratio R	0.400		

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-OUTFALL 3-A EXISTING.SWS

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 Coefficient 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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)
1.000	tmp	15 Winter	1	+0%	1/15 Summer	30/15 Summer			69.095	0.875	0.000
1.001	EX18	15 Winter	1	+0%	1/15 Summer	30/15 Summer			69.069	0.849	0.000
1.002	EX17	15 Winter	1	+0%	1/15 Summer				68.252	0.112	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	tmp	1.44		3.4	SURCHARGED	23
1.001	EX18	3.18		8.4	SURCHARGED	12
1.002	EX17	2.52		8.4	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-OUTFALL 3-A EXISTING.SWS

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 Coefficient 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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

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

									Water	Surcharged	Flooded
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)	Volume (m³)
1.000	tmp	30 Winter	30	+0%	1/15 Summer	30/15 Summer			69.460	1.240	10.313
1.001	EX18	15 Winter	30	+0%	1/15 Summer	30/15 Summer			69.552	1.332	2.291
1.002	EX17	15 Winter	30	+0%	1/15 Summer				68.320	0.180	0.000

		Pipe		Level	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	tmp	3.77		8.9	FLOOD
1.001	EX18	3.93		10.3	FLOOD
1.002	EX17	3.12		10.3	SURCHARGED

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-OUTFALL 3-A EXISTING.SWS

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 Coefficient 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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)
1.000	tmp	60 Winter	100	+0%	1/15 Summer	30/15 Summer			69.467	1.247	16.930
1.001	EX18	15 Winter	100	+0%	1/15 Summer	30/15 Summer			69.555	1.335	4.915
1.002	EX17	15 Winter	100	+0%	1/15 Summer				68.320	0.180	0.000

PN	US/MH Name	Flow / Cap. (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	tmp	3.77	8.9	FLOOD	23
1.001	EX18	3.93	10.3	FLOOD	12
1.002	EX17	3.12	10.3	SURCHARGED	

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for BR1508-SW-OUTFALL 4-A EXISTING.SWS

Pipe Sizes CA1065-SW-NT1-E Manhole Sizes CA1065-SW-NT1-E

FSR Rainfall Model - England and Wales

Return Period (years)	1	Add Flow / Climate Change (%)	0
M5-60 (mm)	18.500	Minimum Backdrop Height (m)	0.000
Ratio R	0.400	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	0.000
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	0.75
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Time Area Diagram for BR1508-SW-OUTFALL 4-A EXISTING.SWS

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.367	4-8	0.229

Total Area Contributing (ha) = 0.596

Total Pipe Volume (m³) = 9.335

Network Design Table for BR1508-SW-OUTFALL 4-A EXISTING.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)	Auto Design
1.000	62.306	1.155	53.9	0.129	5.00	0.0	0.600	o	150	
1.001	27.145	1.240	21.9	0.020	0.00	0.0	0.600	o	150	
1.002	31.294	0.260	120.4	0.029	0.00	0.0	0.600	o	225	
1.003	26.869	0.110	244.3	0.000	0.00	0.0	0.600	o	225	
1.004	25.692	0.590	43.5	0.057	0.00	0.0	0.600	o	225	
2.000	17.862	0.150	119.1	0.170	5.00	0.0	0.600	o	225	
2.001	17.336	0.144	120.0	0.039	0.00	0.0	0.600	o	225	
2.002	3.496	0.036	97.1	0.035	0.00	0.0	0.600	o	225	
3.000	47.368	1.335	35.5	0.033	5.00	0.0	0.600	o	100	

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	47.59	5.76	68.550	0.129	0.0	0.0	0.0	1.37	24.3	16.6
1.001	46.81	5.97	67.395	0.149	0.0	0.0	0.0	2.16	38.2	18.9
1.002	45.26	6.40	66.080	0.178	0.0	0.0	0.0	1.19	47.3	21.8
1.003	43.51	6.94	65.820	0.178	0.0	0.0	0.0	0.83	33.1	21.8
1.004	42.85	7.16	65.710	0.235	0.0	0.0	0.0	1.99	79.0	27.3
2.000	49.63	5.25	65.450	0.170	0.0	0.0	0.0	1.20	47.6	22.8
2.001	48.63	5.49	65.300	0.209	0.0	0.0	0.0	1.19	47.4	27.5
2.002	48.46	5.53	65.156	0.244	0.0	0.0	0.0	1.33	52.8	32.0
3.000	48.17	5.61	66.580	0.033	0.0	0.0	0.0	1.30	10.2	4.3

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Network Design Table for BR1508-SW-OUTFALL 4-A EXISTING.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)	Auto Design
1.005	19.388	0.415	46.7	0.000	0.00	0.0	0.600	o	225	
4.000	2.941	0.029	100.0	0.013	5.00	0.0	0.600	o	100	
5.000	28.429	0.284	100.0	0.049	5.00	0.0	0.600	o	150	
5.001	32.562	0.316	103.0	0.022	0.00	0.0	0.600	o	150	
1.006	16.038	0.340	47.2	0.000	0.00	0.0	0.600	o	225	

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	42.35	7.33	65.120	0.512	0.0	0.0	0.0	1.92	76.3	58.7
4.000	50.00	5.06	64.859	0.013	0.0	0.0	0.0	0.77	6.0	1.8
5.000	48.71	5.47	65.810	0.049	0.0	0.0	0.0	1.00	17.8	6.5
5.001	46.61	6.02	65.526	0.071	0.0	0.0	0.0	0.99	17.5	9.0
1.006	41.94	7.47	64.705	0.596	0.0	0.0	0.0	1.91	75.9	67.7

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BR1508 St Patricks
Existing Drainage Network
Outfall 4

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File BR1508-SW-OUTFALL 4-
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Network 2015.1

Setting Out Information - True Coordinates (BR1508-SW-OUTFALL 4-A EXISTING.SWS)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
1.000	EX1	1240	675	472786.852	171682.117	
1.001	EX2	1240	675	472735.606	171646.678	
1.002	EX3	1240	675	472708.878	171641.942	
1.003	EX4	1200		472694.726	171669.853	
1.004	EX5	1200		472674.255	171687.257	
2.000	EX6C	1240	675	472614.768	171682.759	
2.001	EX6B	1200		472630.993	171675.290	
2.002	EX6A	1200		472648.282	171674.009	
3.000	EX6D	1240	675	472639.919	171721.102	
1.005	EX6	1200		472651.573	171675.190	
4.000	TMP1	1200		472659.616	171658.098	
5.000	EX7B	1240	675	472601.672	171673.899	
5.001	EX7A	1240	675	472624.525	171656.990	
1.006	EX7	1200		472657.084	171656.602	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
1.006	EX7C	450		472659.218	171640.706	

Free Flowing Outfall Details for BR1508-SW-OUTFALL 4-A EXISTING.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.006	EX7C	64.990	64.365	0.000	450	0

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Simulation Criteria for BR1508-SW-OUTFALL 4-A EXISTING.SWS

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.500	Storm Duration (mins)	30
Ratio R	0.400		

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-OUTFALL 4-A EXISTING.SWS

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 Coefficient 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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

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

US/MH		Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth
PN	Name								(m)	(m)
1.000	EX1	15 Winter	1	+0%	30/15 Summer	100/15 Summer			68.643	-0.057
1.001	EX2	15 Winter	1	+0%	30/15 Summer				67.470	-0.075
1.002	EX3	15 Winter	1	+0%	30/15 Summer				66.190	-0.115
1.003	EX4	15 Winter	1	+0%	30/15 Summer				65.957	-0.088
1.004	EX5	15 Winter	1	+0%	30/15 Summer				65.803	-0.132
2.000	EX6C	15 Winter	1	+0%	30/15 Summer	100/15 Summer			65.565	-0.110
2.001	EX6B	15 Winter	1	+0%	30/15 Summer				65.429	-0.096
2.002	EX6A	15 Winter	1	+0%	30/15 Summer				65.334	-0.047
3.000	EX6D	15 Winter	1	+0%	30/15 Summer				66.626	-0.054
1.005	EX6	15 Winter	1	+0%	30/15 Summer				65.282	-0.063
4.000	TMP1	15 Winter	1	+0%	30/15 Summer				64.932	-0.027
5.000	EX7B	15 Winter	1	+0%	30/15 Winter				65.873	-0.087
5.001	EX7A	15 Winter	1	+0%	30/15 Summer				65.602	-0.074
1.006	EX7	15 Winter	1	+0%	30/15 Summer				64.926	-0.004

		Flooded		Pipe		Level	
PN	US/MH Name	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Exceeded
1.000	EX1	0.000	0.68		16.1	OK	3
1.001	EX2	0.000	0.50		18.2	OK	
1.002	EX3	0.000	0.47		20.9	OK	
1.003	EX4	0.000	0.67		20.7	OK	
1.004	EX5	0.000	0.36		26.1	OK	
2.000	EX6C	0.000	0.50		21.5	OK	2
2.001	EX6B	0.000	0.61		25.9	OK	
2.002	EX6A	0.000	0.99		29.6	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-OUTFALL 4-A EXISTING.SWS

PN	US/MH Name	Flooded	Flow / Overflow		Pipe	Status	Level Exceeded
		Volume (m³)	Flow Cap.	(l/s)	Flow (l/s)		
3.000	EX6D	0.000	0.41		4.2	OK	
1.005	EX6	0.000	0.86		59.0	OK	
4.000	TMP1	0.000	0.35		1.6	OK	
5.000	EX7B	0.000	0.36		6.2	OK	
5.001	EX7A	0.000	0.51		8.6	OK	
1.006	EX7	0.000	1.00		67.2	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-OUTFALL 4-A EXISTING.SWS

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 Coefficient 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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	EX1	15 Winter	30	+0%	30/15 Summer	100/15 Summer			69.493	0.793
1.001	EX2	15 Winter	30	+0%	30/15 Summer				67.698	0.153
1.002	EX3	15 Winter	30	+0%	30/15 Summer				66.803	0.498
1.003	EX4	15 Winter	30	+0%	30/15 Summer				66.647	0.602
1.004	EX5	15 Winter	30	+0%	30/15 Summer				66.513	0.578
2.000	EX6C	15 Winter	30	+0%	30/15 Summer	100/15 Summer			66.706	1.031
2.001	EX6B	15 Winter	30	+0%	30/15 Summer				66.588	1.063
2.002	EX6A	15 Winter	30	+0%	30/15 Summer				66.434	1.054
3.000	EX6D	15 Winter	30	+0%	30/15 Summer				66.922	0.242
1.005	EX6	15 Winter	30	+0%	30/15 Summer				66.318	0.973
4.000	TMP1	15 Winter	30	+0%	30/15 Summer				65.551	0.592
5.000	EX7B	15 Winter	30	+0%	30/15 Winter				65.986	0.026
5.001	EX7A	15 Winter	30	+0%	30/15 Summer				65.823	0.147
1.006	EX7	15 Winter	30	+0%	30/15 Summer				65.541	0.611

		Flooded		Pipe		Level	
PN	US/MH Name	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Exceeded
1.000	EX1	0.000	1.26		29.9	SURCHARGED	3
1.001	EX2	0.000	0.91		33.0	SURCHARGED	
1.002	EX3	0.000	0.89		39.6	SURCHARGED	
1.003	EX4	0.000	1.27		38.9	SURCHARGED	
1.004	EX5	0.000	0.63		46.0	SURCHARGED	
2.000	EX6C	0.000	0.91		38.6	SURCHARGED	2
2.001	EX6B	0.000	1.05		44.5	SURCHARGED	
2.002	EX6A	0.000	1.65		49.4	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-OUTFALL 4-A EXISTING.SWS

PN	US/MH Name	Flooded		Pipe		Status	Level Exceeded
		Volume (m³)	Flow / Overflow Cap. (l/s)	Flow (l/s)			
3.000	EX6D	0.000	0.82	8.2		SURCHARGED	
1.005	EX6	0.000	1.38	94.8		SURCHARGED	
4.000	TMP1	0.000	0.70	3.4		SURCHARGED	
5.000	EX7B	0.000	0.83	14.2		SURCHARGED	
5.001	EX7A	0.000	1.11	18.7		SURCHARGED	
1.006	EX7	0.000	1.68	112.8		SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-OUTFALL 4-A EXISTING.SWS

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 Coefficient 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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

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

PN	US/MH		Return Period	Climate Change	First (X)		First (Y)	First (Z)	Overflow Act.	Water Level	Surcharged Depth
	Name	Storm			Surcharge	Flood				(m)	(m)
1.000	EX1	15 Winter	100	+0%	30/15 Summer	100/15 Summer				69.932	1.232
1.001	EX2	15 Winter	100	+0%	30/15 Summer					68.215	0.670
1.002	EX3	15 Winter	100	+0%	30/15 Summer					67.279	0.974
1.003	EX4	15 Winter	100	+0%	30/15 Summer					67.112	1.067
1.004	EX5	15 Winter	100	+0%	30/15 Summer					66.988	1.053
2.000	EX6C	15 Winter	100	+0%	30/15 Summer	100/15 Summer				67.152	1.477
2.001	EX6B	15 Winter	100	+0%	30/15 Summer					67.074	1.549
2.002	EX6A	15 Winter	100	+0%	30/15 Summer					66.893	1.512
3.000	EX6D	15 Winter	100	+0%	30/15 Summer					67.455	0.775
1.005	EX6	15 Winter	100	+0%	30/15 Summer					66.749	1.404
4.000	TMP1	15 Winter	100	+0%	30/15 Summer					65.814	0.855
5.000	EX7B	15 Winter	100	+0%	30/15 Winter					66.369	0.409
5.001	EX7A	15 Winter	100	+0%	30/15 Summer					66.182	0.506
1.006	EX7	15 Winter	100	+0%	30/15 Summer					65.790	0.860

PN	US/MH Name	Flooded		Pipe		Status	Level Exceeded
		Volume (m³)	Flow / Cap.	Flow (l/s)	Overflow (l/s)		
1.000	EX1	1.650	1.33	31.6		FLOOD	3
1.001	EX2	0.000	0.94	34.1		SURCHARGED	
1.002	EX3	0.000	0.93	41.3		FLOOD RISK	
1.003	EX4	0.000	1.38	42.3		SURCHARGED	
1.004	EX5	0.000	0.68	49.8		SURCHARGED	
2.000	EX6C	2.191	1.07	45.7		FLOOD	2
2.001	EX6B	0.000	1.25	53.1		FLOOD RISK	
2.002	EX6A	0.000	1.96	58.6		SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-OUTFALL 4-A EXISTING.SWS

PN	US/MH Name	Flooded		Pipe		Status	Level Exceeded
		Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)		
3.000	EX6D	0.000	0.84		8.4	FLOOD RISK	
1.005	EX6	0.000	1.53		105.0	SURCHARGED	
4.000	TMP1	0.000	0.72		3.4	SURCHARGED	
5.000	EX7B	0.000	0.90		15.3	SURCHARGED	
5.001	EX7A	0.000	1.17		19.7	SURCHARGED	
1.006	EX7	0.000	1.89		126.7	SURCHARGED	

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for BR1508-SW-OUTFALL 5-A EXISTING.SWS

Pipe Sizes CA1065-SW-NT1-E Manhole Sizes CA1065-SW-NT1-E

FSR Rainfall Model - England and Wales

Return Period (years)	1	Add Flow / Climate Change (%)	0
M5-60 (mm)	18.500	Minimum Backdrop Height (m)	0.000
Ratio R	0.400	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	0.000
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	0.75
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Time Area Diagram for BR1508-SW-OUTFALL 5-A EXISTING.SWS

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.127	4-8	0.080

Total Area Contributing (ha) = 0.207

Total Pipe Volume (m³) = 1.419

Network Design Table for BR1508-SW-OUTFALL 5-A EXISTING.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)	Auto Design
1.000	38.166	0.530	72.0	0.055	5.00	0.0	0.600	o	100	🟢
1.001	30.057	0.130	231.2	0.080	0.00	0.0	0.600	o	150	🔴
2.000	17.106	0.171	100.0	0.023	5.00	0.0	0.600	o	100	🟢
1.002	25.670	0.112	230.0	0.049	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)
1.000	47.81	5.70	66.250	0.055	0.0	0.0	0.0	0.91	7.1	7.1
1.001	45.06	6.46	65.670	0.135	0.0	0.0	0.0	0.66	11.6«	16.5
2.000	49.12	5.37	65.761	0.023	0.0	0.0	0.0	0.77	6.0	3.1
1.002	42.98	7.11	65.540	0.207	0.0	0.0	0.0	0.66	11.6«	24.1

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Setting Out Information - True Coordinates (BR1508-SW-OUTFALL 5-A EXISTING.SWS)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Layout (North)
1.000	EX500	1240	675	472594.222	171853.631	
1.001	EX501	1240	675	472585.051	171816.583	
2.000	EX502A	1240	675	472560.894	171834.960	
1.002	EX502	1240	675	472555.081	171818.872	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
1.002	EX502B	450		472530.567	171826.487	

Free Flowing Outfall Details for BR1508-SW-OUTFALL 5-A EXISTING.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.002	EX502B	66.080	65.428	0.000	450	0

Simulation Criteria for BR1508-SW-OUTFALL 5-A EXISTING.SWS

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.500	Storm Duration (mins)	30
Ratio R	0.400		

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-OUTFALL 5-A EXISTING.SWS

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 Coefficient 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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

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

										Water	Surcharged
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.		Level (m)	Depth (m)
1.000	EX500	15 Winter	1	+0%	1/15 Winter	30/15 Summer				66.366	0.016
1.001	EX501	15 Winter	1	+0%	1/15 Summer	30/15 Summer				66.018	0.198
2.000	EX502A	15 Winter	1	+0%	1/15 Winter					65.878	0.017
1.002	EX502	15 Winter	1	+0%	1/15 Summer	30/15 Summer				65.861	0.171

			<u>Flooded</u>		<u>Pipe</u>			
PN	US/MH Name	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded	
1.000	EX500	0.000	0.90		6.3	SURCHARGED	10	
1.001	EX501	0.000	1.09		12.2	SURCHARGED	10	
2.000	EX502A	0.000	0.49		2.8	SURCHARGED		
1.002	EX502	0.000	1.60		17.8	SURCHARGED	10	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-OUTFALL 5-A EXISTING.SWS

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 Coefficient 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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	EX500	15 Winter	30	+0%	1/15 Winter	30/15 Summer			67.301	0.951
1.001	EX501	15 Winter	30	+0%	1/15 Summer	30/15 Summer			66.702	0.882
2.000	EX502A	15 Winter	30	+0%	1/15 Winter				66.539	0.678
1.002	EX502	15 Winter	30	+0%	1/15 Summer	30/15 Summer			66.361	0.671

PN	US/MH Name	Flooded Volume (m ³)	Flow / Overflow Cap. (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	EX500	1.050	1.12	7.8	FLOOD	10
1.001	EX501	1.856	1.80	20.0	FLOOD	10
2.000	EX502A	0.000	1.00	5.8	FLOOD RISK	
1.002	EX502	1.051	2.66	29.5	FLOOD	10

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-OUTFALL 5-A EXISTING.SWS

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 Coefficient 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 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	EX500	15 Winter	100	+0%	1/15 Winter	30/15 Summer			67.303	0.953
1.001	EX501	15 Winter	100	+0%	1/15 Summer	30/15 Summer			66.705	0.885
2.000	EX502A	15 Winter	100	+0%	1/15 Winter				66.689	0.828
1.002	EX502	15 Winter	100	+0%	1/15 Summer	30/15 Summer			66.363	0.673

PN	US/MH Name	Flooded		Pipe		Status	Level Exceeded
		Volume (m³)	Flow / Cap. (l/s)	Flow (l/s)	Overflow (l/s)		
1.000	EX500	2.916	1.14	8.0	FLOOD	10	
1.001	EX501	4.632	1.94	21.6	FLOOD	10	
2.000	EX502A	0.000	1.36	7.9	FLOOD RISK		
1.002	EX502	3.208	2.66	29.5	FLOOD	10	

Appendix

Appendix D – Proposed SUDS Strategy

Appendix

Appendix E – Micro Drainage

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for BR1508-SW-NT 1-A_PRELIM DRAINAGE.SWS

Pipe Sizes CA1065-SW-NT1-D Manhole Sizes CA1065-SW-NT1-D

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	18.500	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	0.75
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for BR1508-SW-NT 1-A_PRELIM DRAINAGE.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	12.537	0.084	149.3	0.440	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	6.966	0.014	500.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	29.773	0.186	160.1	0.068	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	49.85	5.20	67.414	0.440	0.0	0.0	0.0	1.07	42.5«	59.4
1.001	49.01	5.40	67.330	0.440	0.0	0.0	0.0	0.58	23.0«	59.4
1.002	47.13	5.88	67.316	0.508	0.0	0.0	0.0	1.03	41.0«	64.8

Free Flowing Outfall Details for BR1508-SW-NT 1-A_PRELIM DRAINAGE.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,I (mm)	W (mm)
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1.002	EX21	68.520	67.130	0.000	1200	0
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Simulation Criteria for BR1508-SW-NT 1-A_PRELIM DRAINAGE.SWS

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 Coefficient	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 Online Controls	1	Number of Storage Structures	2
		Number of Time/Area Diagrams	0
		Number of Real Time Controls	0

Synthetic Rainfall Details

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Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.500	Storm Duration (mins)	30
Ratio R	0.400		

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Online Controls for BR1508-SW-NT 1-A_PRELIM DRAINAGE.SWS

Orifice Manhole: S102, DS/PN: 1.002, Volume (m³): 0.7

Diameter (m) 0.158 Discharge Coefficient 0.600 Invert Level (m) 67.316

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Storage Structures for BR1508-SW-NT 1-A_PRELIM DRAINAGE.SWS

Porous Car Park Manhole: S101, DS/PN: 1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	82.0
Max Percolation (l/s)	227.8	Slope (1:X)	0.0
Safety Factor	10.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	67.565	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: S102, DS/PN: 1.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.0
Membrane Percolation (mm/hr)	1000	Length (m)	39.0
Max Percolation (l/s)	65.0	Slope (1:X)	0.0
Safety Factor	10.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	67.690	Cap Volume Depth (m)	0.250

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-NT 1-A_PRELIM DRAINAGE.SWS

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 Coefficient 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 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

 Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100, 101
 Climate Change (%) 0, 0, 0, 20

PN	US/MH		Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth	Flooded Volume
	Name	Storm							(m)	(m)	(m³)
1.000	S101	30 Winter	1	+0%	30/15 Summer				67.610	-0.029	0.000
1.001	EX20	30 Winter	1	+0%	1/15 Summer				67.582	0.027	0.000
1.002	S102	30 Winter	1	+0%	1/15 Summer				67.565	0.024	0.000

PN	US/MH		Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)		Status	Level Exceeded
	Name							
1.000	S101		0.52		19.1		OK	
1.001	EX20		0.96		19.2		SURCHARGED	
1.002	S102		0.56		21.4		SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-NT 1-A_PRELIM DRAINAGE.SWS

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 Coefficient 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 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100, 101
 Climate Change (%) 0, 0, 0, 20

PN	US/MH		Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth	Flooded Volume
	Name	Storm							(m)	(m)	(m³)
1.000	S101	30 Winter	30	+0%	30/15 Summer				67.772	0.133	0.000
1.001	EX20	30 Winter	30	+0%	1/15 Summer				67.724	0.169	0.000
1.002	S102	30 Winter	30	+0%	1/15 Summer				67.696	0.155	0.000

PN	US/MH	Flow /	Overflow	Pipe	Status	Level
	Name	Cap.	(1/s)	Flow		Exceeded
1.000	S101	0.69		25.3	SURCHARGED	
1.001	EX20	1.26		25.3	SURCHARGED	
1.002	S102	0.75		28.6	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-NT 1-A_PRELIM DRAINAGE.SWS

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 Coefficient 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 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100, 101
Climate Change (%) 0, 0, 0, 20

PN	US/MH		Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth	Flooded Volume
	Name	Storm							(m)	(m)	(m³)
1.000	S101	60 Winter	100	+0%	30/15 Summer				67.854	0.215	0.000
1.001	EX20	60 Winter	100	+0%	1/15 Summer				67.797	0.242	0.000
1.002	S102	60 Winter	100	+0%	1/15 Summer				67.750	0.209	0.000

PN	US/MH	Flow /	Overflow	Pipe	Status	Level
	Name	Cap.	(1/s)	Flow		Exceeded
1.000	S101	0.79		28.8	SURCHARGED	
1.001	EX20	1.43		28.8	FLOOD RISK	
1.002	S102	0.81		31.0	SURCHARGED	

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101 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-NT 1-A_PRELIM DRAINAGE.SWS

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 Coefficient 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 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100, 101
Climate Change (%) 0, 0, 0, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	S101	60 Winter	101	+20%	30/15 Summer				68.030	0.391	0.000
1.001	EX20	60 Winter	101	+20%	1/15 Summer				67.918	0.363	0.000
1.002	S102	60 Winter	101	+20%	1/15 Summer				67.847	0.306	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S101	1.16		42.4	FLOOD RISK	
1.001	EX20	2.11		42.4	FLOOD RISK	
1.002	S102	0.92		35.0	SURCHARGED	

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for BR1508-SW-NT 2-A_PRELIM DRAINAGE.SWS

Pipe Sizes CA1065-SW-NT1-D Manhole Sizes CA1065-SW-NT1-D

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	18.500	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	0.75
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for BR1508-SW-NT 2-A_PRELIM DRAINAGE.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	22.440	0.149	150.6	0.366	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	16.268	0.090	180.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	6.628	0.680	9.7	0.078	5.00	0.0	0.600	o	150	Pipe/Conduit	
2.001	3.009	0.030	100.3	0.029	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	39.159	0.310	126.3	0.029	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)
1.000	48.76	5.46	68.179	0.366	0.0	0.0	0.0	0.82	14.4«	48.3
1.001	47.34	5.82	68.030	0.366	0.0	0.0	0.0	0.74	13.2«	48.3
2.000	50.00	5.03	68.650	0.078	0.0	0.0	0.0	3.25	57.4	10.6
2.001	50.00	5.08	67.970	0.107	0.0	0.0	0.0	1.00	17.7	14.5
1.002	44.75	6.55	67.940	0.502	0.0	0.0	0.0	0.89	15.8«	60.8

Free Flowing Outfall Details for BR1508-SW-NT 2-A_PRELIM DRAINAGE.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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1.002	EX30	69.380	67.630	0.000	1200	0
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Simulation Criteria for BR1508-SW-NT 2-A_PRELIM DRAINAGE.SWS

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 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.500	Storm Duration (mins)	30
Ratio R	0.400		

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Online Controls for BR1508-SW-NT 2-A_PRELIM DRAINAGE.SWS

Orifice Manhole: EX30, DS/PN: 1.002, Volume (m³): 0.5

Diameter (m) 0.145 Discharge Coefficient 0.600 Invert Level (m) 67.940

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Storage Structures for BR1508-SW-NT 2-A_PRELIM DRAINAGE.SWS

Complex Manhole: S201, DS/PN: 1.000

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	11.0
Membrane Percolation (mm/hr)	1000	Length (m)	84.5
Max Percolation (l/s)	258.2	Slope (1:X)	0.0
Safety Factor	10.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	68.080	Cap Volume Depth (m)	0.450

Swale Manhole: EX29, DS/PN: 2.000

Warning:- Volume should always be included unless the upstream pipe is being used for storage and/or as a carrier

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	50.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	500.0
Porosity	1.00	Cap Volume Depth (m)	0.650
Invert Level (m)	68.650	Cap Infiltration Depth (m)	0.000
Base Width (m)	0.3	Include Swale Volume	Yes

Porous Car Park Manhole: EX30, DS/PN: 1.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	13.9	Slope (1:X)	500.0
Safety Factor	10.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	67.955	Cap Volume Depth (m)	0.350

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-NT 2-A_PRELIM DRAINAGE.SWS

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 Coefficient 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 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

 Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100, 101
 Climate Change (%) 0, 0, 0, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	S201	480 Winter	1	+0%	30/60 Winter				68.226	-0.103	0.000
1.001	EX29A	15 Winter	1	+0%	30/15 Summer				68.110	-0.070	0.000
2.000	EX29	15 Winter	1	+0%	100/15 Winter				68.696	-0.104	0.000
2.001	S204	15 Winter	1	+0%	1/15 Summer				68.138	0.018	0.000
1.002	EX30	15 Winter	1	+0%	1/15 Summer				68.110	0.020	0.000

		Pipe		Level	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status
1.000	S201	0.21		2.9	OK
1.001	EX29A	0.02		0.2	OK
2.000	EX29	0.20		9.8	FLOOD RISK
2.001	S204	1.17		12.7	SURCHARGED
1.002	EX30	0.78		11.9	SURCHARGED

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-NT 2-A_PRELIM DRAINAGE.SWS

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 Coefficient 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 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

 Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100, 101
 Climate Change (%) 0, 0, 0, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	S201	120 Winter	30	+0%	30/60 Winter				68.340	0.011	0.000
1.001	EX29A	15 Winter	30	+0%	30/15 Summer				68.552	0.372	0.000
2.000	EX29	15 Winter	30	+0%	100/15 Winter				68.742	-0.058	0.000
2.001	S204	15 Winter	30	+0%	1/15 Summer				68.742	0.622	0.000
1.002	EX30	15 Winter	30	+0%	1/15 Summer				68.659	0.569	0.000

		Pipe		Level	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status
1.000	S201	0.86		11.7	SURCHARGED
1.001	EX29A	0.63		7.7	SURCHARGED
2.000	EX29	0.47		22.8	FLOOD RISK
2.001	S204	2.78		30.1	FLOOD RISK
1.002	EX30	1.32		20.2	FLOOD RISK

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-NT 2-A_PRELIM DRAINAGE.SWS

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 Coefficient 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 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

 Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100, 101
 Climate Change (%) 0, 0, 0, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	S201	120 Winter	100	+0%	30/60 Winter				68.447	0.118	0.000
1.001	EX29A	15 Summer	100	+0%	30/15 Summer				68.654	0.474	0.000
2.000	EX29	15 Winter	100	+0%	100/15 Winter				68.800	0.000	0.000
2.001	S204	15 Winter	100	+0%	1/15 Summer				68.810	0.690	0.000
1.002	EX30	15 Winter	100	+0%	1/15 Summer				68.760	0.670	0.000

		Pipe		Level	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status
1.000	S201	0.99		13.6	SURCHARGED
1.001	EX29A	0.88		10.7	FLOOD RISK
2.000	EX29	0.49		23.7	FLOOD RISK
2.001	S204	3.01		32.7	FLOOD RISK
1.002	EX30	1.39		21.3	FLOOD RISK

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101 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-NT 2-A_PRELIM DRAINAGE.SWS

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 Coefficient 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 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

 Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100, 101
 Climate Change (%) 0, 0, 0, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	S201	120 Winter	101	+20%	30/60 Winter				68.762	0.433	0.000
1.001	EX29A	15 Winter	101	+20%	30/15 Summer				68.711	0.531	0.000
2.000	EX29	15 Winter	101	+20%	100/15 Winter				68.847	0.047	0.000
2.001	S204	15 Winter	101	+20%	1/15 Summer				68.810	0.690	0.000
1.002	EX30	15 Winter	101	+20%	1/15 Summer				68.792	0.702	0.000

		Pipe			
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Level Exceeded
1.000	S201	1.07		14.6	FLOOD RISK
1.001	EX29A	1.03		12.6	FLOOD RISK
2.000	EX29	0.49		23.6	FLOOD RISK
2.001	S204	3.12		33.8	FLOOD RISK
1.002	EX30	1.43		21.9	FLOOD RISK

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for BR1508-SW-NT 3-A_PRELIM DRAINAGE.SWS

Pipe Sizes CA1065-SW-NT1-D Manhole Sizes CA1065-SW-NT1-D

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	18.500	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	0.75
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for BR1508-SW-NT 3-A_PRELIM DRAINAGE.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	62.291	1.155	53.9	0.094	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	27.159	1.240	21.9	0.040	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	31.294	0.260	120.4	0.112	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	26.869	0.110	244.3	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	32.621	0.245	133.1	0.049	5.00	0.0	0.600	o	225	Pipe/Conduit	
2.001	18.761	0.141	133.1	0.063	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.002	33.072	0.249	132.8	0.156	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.003	30.702	0.235	130.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	25.706	0.590	43.6	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	47.59	5.76	68.550	0.094	0.0	0.0	0.0	1.37	24.3	12.1
1.001	46.99	5.92	67.320	0.134	0.0	0.0	0.0	2.81	111.7	17.1
1.002	45.42	6.36	66.080	0.246	0.0	0.0	0.0	1.19	47.3	30.3
1.003	43.66	6.89	65.820	0.281	0.0	0.0	0.0	0.83	33.1«	33.2
2.000	48.67	5.48	66.580	0.049	0.0	0.0	0.0	1.13	45.0	6.5
2.001	47.59	5.76	66.335	0.112	0.0	0.0	0.0	1.13	45.0	14.4
2.002	45.81	6.24	66.194	0.268	0.0	0.0	0.0	1.13	45.0	33.3
2.003	44.30	6.69	65.945	0.268	0.0	0.0	0.0	1.14	45.4	33.3
1.004	42.99	7.11	65.710	0.563	0.0	0.0	0.0	1.99	79.0	65.6

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Free Flowing Outfall Details for BR1508-SW-NT 3-A_PRELIM DRAINAGE.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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1.004	EX6	66.800	65.120	0.000	450	0
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Simulation Criteria for BR1508-SW-NT 3-A_PRELIM DRAINAGE.SWS

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 Coefficient	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	7	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.500	Storm Duration (mins)	30
Ratio R	0.400		

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Online Controls for BR1508-SW-NT 3-A_PRELIM DRAINAGE.SWS

Orifice Manhole: EX5, DS/PN: 1.004, Volume (m³): 4.9

Diameter (m) 0.134 Discharge Coefficient 0.600 Invert Level (m) 65.710

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Storage Structures for BR1508-SW-NT 3-A_PRELIM DRAINAGE.SWS

Complex Manhole: EX1, DS/PN: 1.000

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	20.0
Max Percolation (l/s)	22.2	Slope (1:X)	500.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	68.740	Cap Volume Depth (m)	0.350

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	22.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	61.1	Slope (1:X)	500.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	68.740	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: EX2, DS/PN: 1.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.2
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	20.0	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	67.320	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: EX3, DS/PN: 1.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.8
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	16.1	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	67.000	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: S301, DS/PN: 2.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	23.5
Max Percolation (l/s)	65.3	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	66.580	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: S303, DS/PN: 2.002

Infiltration Coefficient Base (m/hr)	0.00000	Invert Level (m)	66.700
Membrane Percolation (mm/hr)	1000	Width (m)	10.0
Max Percolation (l/s)	45.0	Length (m)	16.2
Safety Factor	2.0	Slope (1:X)	500.0
Porosity	0.30	Depression Storage (mm)	5

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Porous Car Park Manhole: S303, DS/PN: 2.002

Evaporation (mm/day) 3 Cap Volume Depth (m) 0.300

Complex Manhole: S304, DS/PN: 2.003

Cellular Storage

Invert Level (m) 65.945 Safety Factor 10.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	65.0	65.0	1.200	65.0	103.7	1.201	0.0	103.7

Complex Manhole: EX5, DS/PN: 1.004

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	11.0
Max Percolation (l/s)	30.6	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	67.600	Cap Volume Depth (m)	0.300

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	16.2
Max Percolation (l/s)	45.0	Slope (1:X)	500.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	66.700	Cap Volume Depth (m)	0.350

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-NT 3-A_PRELIM DRAINAGE.SWS

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 Coefficient 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 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100, 101
 Climate Change (%) 0, 0, 0, 20

PN	US/MH		Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth	Flooded Volume
	Name	Storm							(m)	(m)	(m³)
1.000	EX1	15 Winter	1	+0%	30/15 Summer				68.626	-0.074	0.000
1.001	EX2	15 Winter	1	+0%	101/30 Winter				67.378	-0.167	0.000
1.002	EX3	15 Winter	1	+0%	30/15 Summer				66.224	-0.081	0.000
1.003	EX4	15 Winter	1	+0%	1/15 Summer				66.163	0.118	0.000
2.000	S301	30 Winter	1	+0%	100/60 Winter				66.617	-0.188	0.000
2.001	S302	15 Winter	1	+0%	30/15 Summer				66.403	-0.157	0.000
2.002	S303	15 Winter	1	+0%	30/15 Summer				66.316	-0.103	0.000
2.003	S304	30 Winter	1	+0%	30/15 Summer				66.136	-0.034	0.000
1.004	EX5	30 Winter	1	+0%	1/15 Summer				66.113	0.178	0.000

PN	US/MH Name	Pipe Flow / Overflow		Flow (l/s)	Status	Level Exceeded
		Cap.	(l/s)			
1.000	EX1	0.51		12.1	OK	
1.001	EX2	0.15		15.5	OK	
1.002	EX3	0.58		25.9	OK	
1.003	EX4	0.79		24.3	SURCHARGED	
2.000	S301	0.06		2.7	OK	
2.001	S302	0.19		7.8	OK	
2.002	S303	0.56		23.8	OK	
2.003	S304	0.35		14.8	OK	
1.004	EX5	0.30		21.7	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-NT 3-A_PRELIM DRAINAGE.SWS

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 Coefficient 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 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100, 101
 Climate Change (%) 0, 0, 0, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	EX1	15 Winter	30	+0%	30/15 Summer				68.757	0.057	0.000
1.001	EX2	15 Winter	30	+0%	101/30 Winter				67.414	-0.131	0.000
1.002	EX3	15 Winter	30	+0%	30/15 Summer				67.127	0.822	0.000
1.003	EX4	30 Winter	30	+0%	1/15 Summer				66.861	0.816	0.000
2.000	S301	30 Winter	30	+0%	100/60 Winter				66.684	-0.121	0.000
2.001	S302	15 Winter	30	+0%	30/15 Summer				66.735	0.175	0.000
2.002	S303	15 Winter	30	+0%	30/15 Summer				66.704	0.285	0.000
2.003	S304	30 Winter	30	+0%	30/15 Summer				66.647	0.477	0.000
1.004	EX5	30 Winter	30	+0%	1/15 Summer				66.650	0.715	0.000

		Pipe		Level	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status
1.000	EX1	1.03		24.4	SURCHARGED
1.001	EX2	0.36		36.9	OK
1.002	EX3	1.12		49.7	SURCHARGED
1.003	EX4	1.74		53.3	SURCHARGED
2.000	S301	0.21		8.9	OK
2.001	S302	0.45		18.3	SURCHARGED
2.002	S303	1.42		60.2	SURCHARGED
2.003	S304	0.65		27.4	SURCHARGED
1.004	EX5	0.48		34.9	SURCHARGED

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-NT 3-A_PRELIM DRAINAGE.SWS

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 Coefficient 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 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100, 101
 Climate Change (%) 0, 0, 0, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	EX1	15 Winter	100	+0%	30/15 Summer				68.783	0.083	0.000
1.001	EX2	30 Winter	100	+0%	101/30 Winter				67.434	-0.111	0.000
1.002	EX3	30 Winter	100	+0%	30/15 Summer				67.336	1.031	0.000
1.003	EX4	30 Winter	100	+0%	1/15 Summer				67.043	0.998	0.000
2.000	S301	60 Winter	100	+0%	100/60 Winter				66.817	0.012	0.000
2.001	S302	60 Winter	100	+0%	30/15 Summer				66.819	0.259	0.000
2.002	S303	60 Winter	100	+0%	30/15 Summer				66.819	0.400	0.000
2.003	S304	60 Winter	100	+0%	30/15 Summer				66.801	0.631	0.000
1.004	EX5	60 Winter	100	+0%	1/15 Summer				66.788	0.853	0.000

		Pipe		Level	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	EX1	1.04		24.7	SURCHARGED
1.001	EX2	0.36		37.3	OK
1.002	EX3	1.08		48.0	FLOOD RISK
1.003	EX4	1.84		56.5	SURCHARGED
2.000	S301	0.35		14.6	SURCHARGED
2.001	S302	0.39		15.7	SURCHARGED
2.002	S303	0.97		41.1	SURCHARGED
2.003	S304	0.71		30.2	SURCHARGED
1.004	EX5	0.52		37.7	SURCHARGED

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101 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-NT 3-A_PRELIM DRAINAGE.SWS

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 Coefficient 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 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100, 101
 Climate Change (%) 0, 0, 0, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	EX1	15 Winter	101	+20%	30/15 Summer				68.808	0.108	0.000
1.001	EX2	30 Winter	101	+20%	101/30 Winter				67.562	0.017	0.000
1.002	EX3	30 Winter	101	+20%	30/15 Summer				67.468	1.163	0.000
1.003	EX4	30 Winter	101	+20%	1/15 Summer				67.138	1.093	0.000
2.000	S301	60 Winter	101	+20%	100/60 Winter				66.924	0.119	0.000
2.001	S302	60 Winter	101	+20%	30/15 Summer				66.923	0.363	0.000
2.002	S303	60 Winter	101	+20%	30/15 Summer				66.919	0.500	0.000
2.003	S304	60 Winter	101	+20%	30/15 Summer				66.900	0.730	0.000
1.004	EX5	60 Winter	101	+20%	1/15 Summer				66.888	0.953	0.000

		Pipe		Level	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status
1.000	EX1	1.05		24.9	SURCHARGED
1.001	EX2	0.38		39.5	SURCHARGED
1.002	EX3	1.13		50.3	FLOOD RISK
1.003	EX4	1.94		59.7	SURCHARGED
2.000	S301	0.36		15.3	SURCHARGED
2.001	S302	0.40		16.3	SURCHARGED
2.002	S303	1.04		43.8	SURCHARGED
2.003	S304	0.77		32.7	SURCHARGED
1.004	EX5	0.54		39.5	SURCHARGED

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for BR1508-SW-NT 4-A_PRELIM DRAINAGE.SWS

Pipe Sizes CA1065-SW-NT1-E Manhole Sizes CA1065-SW-NT1-E

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	18.500	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	0.75
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for BR1508-SW-NT 4-A_PRELIM DRAINAGE.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	18.586	0.124	149.9	0.049	5.00	0.0	0.600	o	375	Pipe/Conduit	
1.001	21.446	0.214	100.2	0.012	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.002	20.649	0.138	149.6	0.036	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.003	19.653	0.131	150.0	0.013	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.004	33.981	0.227	149.7	0.013	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	14.470	0.146	99.1	0.048	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.006	6.382	0.043	148.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.007	4.376	0.044	100.0	0.032	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	39.603	0.718	55.2	0.023	5.00	0.0	0.600	o	100	Pipe/Conduit	
1.008	24.194	0.202	120.0	0.008	0.00	0.0	0.600	o	100	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	49.79	5.21	67.051	0.049	0.0	0.0	0.0	1.48	163.2	6.6
1.001	47.91	5.68	66.927	0.061	0.0	0.0	0.0	0.77	6.0«	7.9
1.002	47.24	5.85	66.213	0.097	0.0	0.0	0.0	1.99	562.3	12.4
1.003	46.63	6.01	66.075	0.110	0.0	0.0	0.0	1.99	561.5	13.9
1.004	44.78	6.54	65.944	0.123	0.0	0.0	0.0	1.07	42.4	14.9
1.005	44.01	6.78	65.717	0.171	0.0	0.0	0.0	1.01	17.8«	20.4
1.006	43.60	6.91	65.571	0.171	0.0	0.0	0.0	0.82	14.5«	20.4
1.007	43.37	6.98	65.528	0.203	0.0	0.0	0.0	1.00	17.8«	23.8
2.000	48.06	5.63	66.200	0.023	0.0	0.0	0.0	1.04	8.2	3.0
1.008	41.67	7.56	65.482	0.234	0.0	0.0	0.0	0.70	5.5«	26.4

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Free Flowing Outfall Details for BR1508-SW-NT 4-A_PRELIM DRAINAGE.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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1.008	S411	66.512	65.280	0.000	450	0
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Simulation Criteria for BR1508-SW-NT 4-A_PRELIM DRAINAGE.SWS

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	3	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.500	Storm Duration (mins)	30
Ratio R	0.400		

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Online Controls for BR1508-SW-NT 4-A_PRELIM DRAINAGE.SWS

Orifice Manhole: S402, DS/PN: 1.001, Volume (m³): 2.9

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) 66.927

Orifice Manhole: S405, DS/PN: 1.004, Volume (m³): 8.5

Diameter (m) 0.045 Discharge Coefficient 0.600 Invert Level (m) 65.944

Orifice Manhole: S410, DS/PN: 1.008, Volume (m³): 1.2

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) 65.482

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Storage Structures for BR1508-SW-NT 4-A_PRELIM DRAINAGE.SWS

Porous Car Park Manhole: S401, DS/PN: 1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	18.4
Max Percolation (l/s)	51.1	Slope (1:X)	500.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	67.540	Cap Volume Depth (m)	0.250

Porous Car Park Manhole: S404, DS/PN: 1.003

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	2.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	5.6	Slope (1:X)	500.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	67.500	Cap Volume Depth (m)	0.300

Cellular Storage Manhole: S407, DS/PN: 1.006

Invert Level (m)	65.625	Safety Factor	5.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	70.0	70.0	3.600	0.0	96.8	7.200	0.0	96.8
0.400	70.0	83.4	4.000	0.0	96.8	7.600	0.0	96.8
0.800	70.0	96.8	4.400	0.0	96.8	8.000	0.0	96.8
0.801	0.0	96.8	4.800	0.0	96.8	8.400	0.0	96.8
1.600	0.0	96.8	5.200	0.0	96.8	8.800	0.0	96.8
2.000	0.0	96.8	5.600	0.0	96.8	9.200	0.0	96.8
2.400	0.0	96.8	6.000	0.0	96.8	9.600	0.0	96.8
2.800	0.0	96.8	6.400	0.0	96.8	10.000	0.0	96.8
3.200	0.0	96.8	6.800	0.0	96.8			

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-NT 4-A_PRELIM DRAINAGE.SWS

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 Coefficient 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 3 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100, 101
 Climate Change (%) 0, 0, 0, 20

	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water	Surcharged	Flooded
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level (m)	Depth (m)	Volume (m³)
1.000	S401	30 Winter	1	+0%	30/15 Summer				67.210	-0.216	0.000
1.001	S402	30 Winter	1	+0%	1/15 Summer				67.208	0.181	0.000
1.002	S403	60 Winter	1	+0%	30/60 Winter				66.313	-0.500	0.000
1.003	S404	60 Winter	1	+0%	30/60 Summer				66.313	-0.362	0.000
1.004	S405	60 Winter	1	+0%	1/15 Summer				66.313	0.144	0.000
1.005	S406	15 Winter	1	+0%	30/15 Summer				65.784	-0.083	0.000
1.006	S407	120 Winter	1	+0%	1/30 Winter				65.768	0.047	0.000
1.007	S408	120 Winter	1	+0%	1/15 Summer				65.762	0.084	0.000
2.000	S409	15 Winter	1	+0%	30/15 Summer				66.242	-0.058	0.000
1.008	S410	120 Winter	1	+0%	1/15 Summer				65.758	0.176	0.000

	US/MH	Flow /	Pipe		Level
PN	Name	Cap.	Flow (1/s)	Status	Exceeded
1.000	S401	0.03	4.3	OK	
1.001	S402	0.45	2.6	SURCHARGED	
1.002	S403	0.01	4.5	OK	
1.003	S404	0.01	4.2	OK	
1.004	S405	0.06	2.5	SURCHARGED	
1.005	S406	0.41	6.8	OK	
1.006	S407	0.21	2.6	SURCHARGED	
1.007	S408	0.20	2.6	SURCHARGED	
2.000	S409	0.36	2.9	OK	
1.008	S410	0.49	2.6	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-NT 4-A_PRELIM DRAINAGE.SWS

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 Coefficient 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 3 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100, 101
 Climate Change (%) 0, 0, 0, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	S401	30 Winter	30	+0%	30/15 Summer				67.607	0.181	0.000
1.001	S402	30 Winter	30	+0%	1/15 Summer				67.613	0.586	0.000
1.002	S403	120 Winter	30	+0%	30/60 Winter				66.971	0.158	0.000
1.003	S404	120 Winter	30	+0%	30/60 Summer				66.971	0.296	0.000
1.004	S405	120 Winter	30	+0%	1/15 Summer				66.970	0.801	0.000
1.005	S406	180 Winter	30	+0%	30/15 Summer				66.068	0.201	0.000
1.006	S407	180 Winter	30	+0%	1/30 Winter				66.054	0.333	0.000
1.007	S408	180 Winter	30	+0%	1/15 Summer				66.045	0.367	0.000
2.000	S409	15 Winter	30	+0%	30/15 Summer				66.344	0.044	0.000
1.008	S410	180 Winter	30	+0%	1/15 Summer				66.039	0.457	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S401	0.06		8.0	SURCHARGED	
1.001	S402	0.72		4.2	SURCHARGED	
1.002	S403	0.02		6.9	SURCHARGED	
1.003	S404	0.01		4.6	SURCHARGED	
1.004	S405	0.10		4.1	SURCHARGED	
1.005	S406	0.36		5.9	SURCHARGED	
1.006	S407	0.31		3.8	SURCHARGED	
1.007	S408	0.29		3.8	SURCHARGED	
2.000	S409	0.81		6.5	SURCHARGED	
1.008	S410	0.71		3.8	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-NT 4-A_PRELIM DRAINAGE.SWS

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 Coefficient 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 3 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100, 101
 Climate Change (%) 0, 0, 0, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth	Flooded Volume
									(m)	(m)	(m³)
1.000	S401	60 Winter	100	+0%	30/15 Summer				67.660	0.234	0.000
1.001	S402	60 Winter	100	+0%	1/15 Summer				67.669	0.642	0.000
1.002	S403	120 Winter	100	+0%	30/60 Winter				67.412	0.599	0.000
1.003	S404	120 Winter	100	+0%	30/60 Summer				67.411	0.736	0.000
1.004	S405	120 Winter	100	+0%	1/15 Summer				67.411	1.242	0.000
1.005	S406	240 Winter	100	+0%	30/15 Summer				66.252	0.385	0.000
1.006	S407	240 Winter	100	+0%	1/30 Winter				66.236	0.515	0.000
1.007	S408	240 Winter	100	+0%	1/15 Summer				66.227	0.549	0.000
2.000	S409	15 Winter	100	+0%	30/15 Summer				66.572	0.272	0.000
1.008	S410	240 Winter	100	+0%	1/15 Summer				66.220	0.638	0.000

PN	US/MH Name	Flow / Cap.	Overflow (1/s)	Pipe	Status	Level
				Flow (1/s)		Exceeded
1.000	S401	0.04		5.9	SURCHARGED	
1.001	S402	0.74		4.3	SURCHARGED	
1.002	S403	0.02		8.1	SURCHARGED	
1.003	S404	0.01		5.1	SURCHARGED	
1.004	S405	0.12		4.8	SURCHARGED	
1.005	S406	0.42		6.8	SURCHARGED	
1.006	S407	0.35		4.3	SURCHARGED	
1.007	S408	0.33		4.3	SURCHARGED	
2.000	S409	0.94		7.5	SURCHARGED	
1.008	S410	0.83		4.4	FLOOD RISK	

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101 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for BR1508-SW-NT 4-A_PRELIM DRAINAGE.SWS

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 Coefficient 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 3 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.500 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 1, 30, 100, 101
 Climate Change (%) 0, 0, 0, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	S401	60 Winter	101	+20%	30/15 Summer				67.738	0.312	0.000
1.001	S402	60 Winter	101	+20%	1/15 Summer				67.742	0.715	0.000
1.002	S403	120 Winter	101	+20%	30/60 Winter				67.631	0.818	0.000
1.003	S404	120 Winter	101	+20%	30/60 Summer				67.630	0.955	0.000
1.004	S405	120 Winter	101	+20%	1/15 Summer				67.630	1.461	0.000
1.005	S406	240 Winter	101	+20%	30/15 Summer				66.393	0.526	0.000
1.006	S407	240 Winter	101	+20%	1/30 Winter				66.375	0.654	0.000
1.007	S408	240 Winter	101	+20%	1/15 Summer				66.365	0.687	0.000
2.000	S409	15 Winter	101	+20%	30/15 Summer				66.812	0.512	0.000
1.008	S410	240 Winter	101	+20%	1/15 Summer				66.357	0.775	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S401	0.05		6.1	SURCHARGED	
1.001	S402	0.74		4.3	SURCHARGED	
1.002	S403	0.02		8.6	SURCHARGED	
1.003	S404	0.01		5.3	SURCHARGED	
1.004	S405	0.13		5.0	FLOOD RISK	
1.005	S406	0.51		8.4	SURCHARGED	
1.006	S407	0.39		4.7	FLOOD RISK	
1.007	S408	0.36		4.8	FLOOD RISK	
2.000	S409	1.06		8.5	SURCHARGED	
1.008	S410	0.90		4.8	FLOOD RISK	

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