

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
0	0.016	5.00	8.000	150	-10.640	-7.845	1.000	7.000
SP1	0.000	5.00	7.800	450	-13.906	1.344	0.858	6.942
SP2	0.013	5.00	7.760	450	-12.283	4.115	0.850	6.910
SP3	0.008	5.00	7.840	1200	11.446	7.786	1.170	6.670
SP4	0.014	5.00	7.740	100	13.697	-5.633	1.150	6.590
SP5	0.012	5.00	7.670	1200	14.894	-11.423	1.115	6.555
SP6	0.019	5.00	7.650	450	-7.021	-17.055		
SP7 CONTROL	0.000	5.00	7.410	1200	17.585	-24.441	0.930	6.480
SP8	0.000	5.00	7.350	1200	18.298	-27.890	0.940	6.410
Ex	0.006	5.00	6.600	450	31.637	-29.652		
SP101	0.060	5.00	8.110	450	-20.589	32.490	1.170	6.940
SP102	0.038	5.00	8.030	450	-18.183	17.684	1.157	6.873
SP103	0.031	5.00	8.030	450	-16.926	9.953	1.192	6.838
SP104			7.830	1200	10.264	14.372	1.114	6.716
SP105	0.020	5.00	7.970	450	-16.124	5.018	1.110	6.860

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)	Design Flow (l/s)
1	0	SP2	12.072	0.600	7.000	6.910	0.090	134.1	150	5.23	50.0	
2	SP1	SP2	3.211	0.600	6.942	6.910	0.032	100.4	150	5.05	50.0	
3	SP2	SP3	24.011	0.600	6.910	6.670	0.240	100.0	150	5.63	50.0	
4	SP3	SP4	13.606	0.600	6.670	6.590	0.080	170.1	225	6.30	50.0	
5	SP4	SP5	5.912	0.600	6.590	6.555	0.035	168.9	225	6.40	50.0	
6	SP5	SP7 CONTROL	13.293	0.600	6.555	6.480	0.075	177.2	225	6.62	50.0	

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1	0.866	15.3	2.2	0.850	0.700	0.016	0.0	38	0.616
2	1.003	17.7	0.0	0.708	0.700	0.000	0.0	0	0.000
3	1.004	17.7	3.9	0.700	1.020	0.029	0.0	48	0.807
4	0.999	39.7	25.2	0.945	0.925	0.186	0.0	131	1.057
5	1.003	39.9	27.1	0.925	0.890	0.200	0.0	137	1.077
6	0.979	38.9	28.7	0.890	0.705	0.212	0.0	144	1.067

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)	Design Flow (l/s)
8	SP7 CONTROL	SP8	3.522	0.600	6.480	6.410	0.070	50.3	100	6.68	50.0	
9	SP8*	Ex	13.455	0.600	6.410	6.300	0.110	122.3	150	6.88	50.0	
10	SP6*	SP8	27.540	0.600	6.700	6.480	0.220	125.2	100	5.67	50.0	
100	SP101	SP102	15.000	0.600	6.940	6.873	0.067	225.0	225	5.29	50.0	
101	SP102	SP103	7.833	0.600	6.873	6.838	0.035	225.0	225	5.44	50.0	
102	SP103	SP104	27.547	0.600	6.838	6.716	0.122	225.0	225	5.97	50.0	
103	SP104	SP3	6.691	0.600	6.716	6.670	0.046	145.5	225	6.07	50.0	10.0
104	SP105	SP103	5.000	0.600	6.860	6.838	0.022	227.3	225	5.10	50.0	

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
8	1.089	8.6	28.7	0.830	0.840	0.212	0.0	98	1.741
9	1.181	46.9	31.3		0.150	0.231	0.0	135	1.263
10	0.686	5.4	2.6		0.770	0.019	0.0	49	0.679
100	0.867	34.5	8.1	0.945	0.932	0.060	0.0	74	0.712
101	0.867	34.5	13.3	0.932	0.967	0.098	0.0	97	0.813
102	0.867	34.5	20.2	0.967	0.889	0.149	0.0	114	0.871
103	1.082	43.0	10.0	0.889	0.945	0.149	0.0	73	0.883
104	0.863	34.3	2.7	0.885	0.967	0.020	0.0		

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1	12.072	134.1	150	Circular_Default Sewer Type	8.000	7.000	0.850	7.760	6.910	0.700
2	3.211	100.4	150	Circular_Default Sewer Type	7.800	6.942	0.708	7.760	6.910	0.700
3	24.011	100.0	150	Circular_Default Sewer Type	7.760	6.910	0.700	7.840	6.670	1.020
4	13.606	170.1	225	Circular_Default Sewer Type	7.840	6.670	0.945	7.740	6.590	0.925
5	5.912	168.9	225	Circular_Default Sewer Type	7.740	6.590	0.925	7.670	6.555	0.890
6	13.293	177.2	225	Circular_Default Sewer Type	7.670	6.555	0.890	7.410	6.480	0.705
8	3.522	50.3	100	Circular_Default Sewer Type	7.410	6.480	0.830	7.350	6.410	0.840

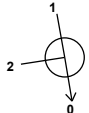
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1	0	150	Manhole	Adoptable	SP2	450	Manhole	Adoptable
2	SP1	450	Manhole	Adoptable	SP2	450	Manhole	Adoptable
3	SP2	450	Manhole	Adoptable	SP3	1200	Manhole	Adoptable
4	SP3	1200	Manhole	Adoptable	SP4	100	Manhole	Adoptable
5	SP4	100	Manhole	Adoptable	SP5	1200	Manhole	Adoptable
6	SP5	1200	Manhole	Adoptable	SP7 CONTROL	1200	Manhole	Adoptable
8	SP7 CONTROL	1200	Manhole	Adoptable	SP8	1200	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
9	13.455	122.3	150			6.410		6.600	6.300	0.150
10	27.540	125.2	100			6.700		7.350	6.480	0.770
100	15.000	225.0	225	Circular_Default Sewer Type	8.110	6.940	0.945	8.030	6.873	0.932
101	7.833	225.0	225	Circular_Default Sewer Type	8.030	6.873	0.932	8.030	6.838	0.967
102	27.547	225.0	225	Circular_Default Sewer Type	8.030	6.838	0.967	7.830	6.716	0.889
103	6.691	145.5	225	Circular_Default Sewer Type	7.830	6.716	0.889	7.840	6.670	0.945
104	5.000	227.3	225	Circular_Default Sewer Type	7.970	6.860	0.885	8.030	6.838	0.967

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
9					Ex	450	Manhole	
10					SP8	1200	Manhole	Adoptable
100	SP101	450	Manhole	Adoptable	SP102	450	Manhole	Adoptable
101	SP102	450	Manhole	Adoptable	SP103	450	Manhole	Adoptable
102	SP103	450	Manhole	Adoptable	SP104	1200	Manhole	Adoptable
103	SP104	1200	Manhole	Adoptable	SP3	1200	Manhole	Adoptable
104	SP105	450	Manhole	Adoptable	SP103	450	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
0	-10.640	-7.845	8.000	1.000	150				
						0	1	7.000	150
SP1	-13.906	1.344	7.800	0.858	450				
						0	2	6.942	150
SP2	-12.283	4.115	7.760	0.850	450				
						1	2	6.910	150
						2	1	6.910	150
						0	3	6.910	150
SP3	11.446	7.786	7.840	1.170	1200				
						1	103	6.670	225
						2	3	6.670	150
						0	4	6.670	225
SP4	13.697	-5.633	7.740	1.150	100				
						1	4	6.590	225
						0	5	6.590	225
SP5	14.894	-11.423	7.670	1.115	1200				
						1	5	6.555	225
						0	6	6.555	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
SP6	-7.021	-17.055	7.650		450					
SP7 CONTROL	17.585	-24.441	7.410	0.930	1200		1	6	6.480	225
							0	8	6.480	100
SP8	18.298	-27.890	7.350	0.940	1200		1	8	6.410	100
Ex	31.637	-29.652	6.600		450					
SP101	-20.589	32.490	8.110	1.170	450					
							0	100	6.940	225
SP102	-18.183	17.684	8.030	1.157	450		1	100	6.873	225
							0	101	6.873	225
SP103	-16.926	9.953	8.030	1.192	450		1	104	6.838	225
							2	101	6.838	225
							0	102	6.838	225
SP104	10.264	14.372	7.830	1.114	1200		1	102	6.716	225
							0	103	6.716	225
SP105	-16.124	5.018	7.970	1.110	450					
							0	104	6.860	225

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	2880
Rainfall Events	Singular	Additional Storage (m³/ha)	20.0
FSR Region	England and Wales	Starting Level (m)	
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	0.1
Summer CV	0.750	30 year (l/s)	0.2
Winter CV	0.840	100 year (l/s)	0.3
Analysis Speed	Detailed	Check Discharge Volume	x
Skip Steady State	x		

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)	0.050	Betterment (%)	0
SAAR (mm)	719	QBar	0.1
Soil Index	2	Q 1 year (l/s)	
SPR	0.30	Q 30 year (l/s)	
Region	7	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Node SP7 CONTROL7 Online Orifice Control

Flap Valve	x	Design Depth (m)	0.800	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	21.0		
Invert Level (m)	0.000	Diameter (m)	0.107		

Node SP7 CONTROLp Online ACO Q-Brake Control

Flap Valve	x	Design Depth (m)	1.000	Min Node Diameter (mm)	1200
Replaces Downstream Link	✓	Design Flow (l/s)	17.0	Orifice Diameter (m)	0.170
Invert Level (m)	0.000	Min Outlet Diameter (m)	0.220		

Node SP104 Online Orifice Control

Flap Valve	x	Design Depth (m)	1.100	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	24.0		
Invert Level (m)	6.716	Diameter (m)	0.106		

Node SP104 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	6.716
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	42

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	122.5	122.5	0.400	122.5	138.2	0.401	0.0	138.2

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	0	10	7.039	0.039	2.3	0.0133	0.0000	OK
15 minute winter	SP1	10	6.958	0.016	0.1	0.0025	0.0000	OK
15 minute winter	SP2	10	6.958	0.048	4.1	0.0223	0.0000	OK
15 minute winter	SP3	12	6.729	0.059	6.0	0.0749	0.0000	OK
15 minute winter	SP4	11	6.664	0.074	7.7	0.0186	0.0000	OK
15 minute winter	SP5	11	6.630	0.075	9.2	0.1016	0.0000	OK
	SP6							
15 minute winter	SP7 CONTROL	12	6.609	0.129	9.3	0.1459	0.0000	SURCHARGED
15 minute winter	SP8	12	6.501	0.091	8.6	0.0000	0.0000	OK

Ex

15 minute winter	SP101	10	7.015	0.075	8.5	0.0890	0.0000	OK
15 minute winter	SP102	10	6.996	0.123	13.7	0.1005	0.0000	OK
15 minute summer	SP103	10	6.981	0.143	19.9	0.0969	0.0000	OK
60 minute winter	SP104	47	6.806	0.090	11.0	10.5735	0.0000	OK
15 minute summer	SP105	10	6.981	0.121	2.7	0.0630	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	0	1	SP2	2.3	0.532	0.148	0.0515	
15 minute summer	SP1	2	SP2	-0.2	-0.071	-0.009	0.0089	
15 minute winter	SP2	3	SP3	3.9	0.733	0.222	0.1348	
15 minute winter	SP3	4	SP4	5.8	0.604	0.146	0.1333	
15 minute winter	SP4	5	SP5	7.6	0.674	0.191	0.0681	
15 minute winter	SP5	6	SP7 CONTROL	9.3	0.651	0.240	0.2299	
15 minute winter	SP7 CONTROL	8	SP8	8.6	1.121	1.009	0.0270	13.7

15 minute winter	SP101	100	SP102	8.3	0.500	0.242	0.2536	
15 minute winter	SP102	101	SP103	13.6	0.578	0.395	0.1910	
15 minute winter	SP103	102	SP104	21.2	1.502	0.615	0.4139	
60 minute winter	SP104	103	SP3	3.5	0.567	0.082	0.0434	
15 minute winter	SP105	104	SP103	2.8	0.154	0.082	0.1206	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.90%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	0	10	7.064	0.064	5.5	0.0215	0.0000	OK
15 minute winter	SP1	10	6.991	0.049	0.2	0.0078	0.0000	OK
15 minute winter	SP2	10	6.991	0.081	9.9	0.0377	0.0000	OK
30 minute winter	SP3	21	6.865	0.195	13.5	0.2473	0.0000	OK
30 minute winter	SP4	21	6.859	0.269	14.8	0.0675	0.0000	SURCHARGED
30 minute winter	SP5	21	6.852	0.297	16.2	0.4000	0.0000	SURCHARGED
	SP6							
30 minute winter	SP7 CONTROL	21	6.837	0.357	15.3	0.4032	0.0000	SURCHARGED
15 minute summer	SP8	9	6.505	0.095	14.5	0.0000	0.0000	OK

Ex

15 minute winter	SP101	11	7.293	0.353	20.8	0.4179	0.0000	SURCHARGED
15 minute winter	SP102	11	7.263	0.390	33.0	0.3185	0.0000	SURCHARGED
15 minute winter	SP103	11	7.214	0.376	49.7	0.2550	0.0000	SURCHARGED
60 minute winter	SP104	46	6.928	0.212	26.0	24.8560	0.0000	OK
15 minute winter	SP105	11	7.215	0.355	6.9	0.1844	0.0000	SURCHARGED

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	0	1	SP2	5.5	0.650	0.356	0.1014	
15 minute summer	SP1	2	SP2	-0.3	-0.093	-0.018	0.0227	
15 minute winter	SP2	3	SP3	9.8	0.907	0.550	0.3233	
30 minute summer	SP3	4	SP4	13.0	0.708	0.326	0.5026	
15 minute winter	SP4	5	SP5	13.6	0.720	0.340	0.2351	
30 minute winter	SP5	6	SP7 CONTROL	15.3	0.655	0.392	0.5287	
30 minute winter	SP7 CONTROL	8	SP8	15.2	1.945	1.779	0.0273	43.9

15 minute winter	SP101	100	SP102	20.0	0.503	0.580	0.5966	
15 minute winter	SP102	101	SP103	32.8	0.824	0.950	0.3115	
15 minute winter	SP103	102	SP104	50.3	1.603	1.460	0.9155	
60 minute winter	SP104	103	SP3	8.6	0.736	0.200	0.1765	
15 minute winter	SP105	104	SP103	6.8	0.224	0.199	0.1989	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 98.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	0	12	7.290	0.290	10.1	0.0980	0.0000	SURCHARGED
15 minute winter	SP1	12	7.261	0.319	1.2	0.0507	0.0000	SURCHARGED
15 minute winter	SP2	12	7.261	0.351	17.0	0.1631	0.0000	SURCHARGED
60 minute winter	SP3	47	7.239	0.569	19.5	0.7217	0.0000	SURCHARGED
60 minute winter	SP4	47	7.214	0.624	20.7	0.1567	0.0000	SURCHARGED
60 minute winter	SP5	47	7.198	0.643	21.9	0.8653	0.0000	SURCHARGED
	SP6							
60 minute winter	SP7 CONTROL	47	7.167	0.687	21.6	0.7766	0.0000	FLOOD RISK
15 minute summer	SP8	8	6.505	0.095	18.9	0.0000	0.0000	OK

Ex

15 minute winter	SP101	11	8.087	1.147	37.7	1.3588	0.0000	FLOOD RISK
15 minute winter	SP102	11	7.995	1.122	57.8	0.9158	0.0000	FLOOD RISK
15 minute winter	SP103	11	7.843	1.005	86.9	0.6825	0.0000	FLOOD RISK
60 minute winter	SP104	46	7.718	1.002	46.3	47.7414	0.0000	FLOOD RISK
15 minute winter	SP105	11	7.848	0.988	12.6	0.5127	0.0000	FLOOD RISK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	0	1	SP2	9.3	0.721	0.609	0.2125	
15 minute summer	SP1	2	SP2	-2.4	-0.139	-0.138	0.0565	
15 minute summer	SP2	3	SP3	15.6	0.988	0.880	0.4227	
60 minute winter	SP3	4	SP4	19.2	0.735	0.484	0.5411	
60 minute winter	SP4	5	SP5	20.5	0.756	0.515	0.2351	
60 minute winter	SP5	6	SP7 CONTROL	21.6	0.640	0.554	0.5287	
60 minute winter	SP7 CONTROL	8	SP8	21.5	2.746	2.513	0.0273	101.0

15 minute winter	SP101	100	SP102	35.1	0.882	1.017	0.5966	
15 minute winter	SP102	101	SP103	57.2	1.438	1.658	0.3115	
15 minute winter	SP103	102	SP104	86.4	2.244	2.505	1.0956	
60 minute winter	SP104	103	SP3	16.0	0.828	0.372	0.2661	
15 minute summer	SP105	104	SP103	12.5	0.314	0.364	0.1989	