

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Inverts
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	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)	Depth (m)	Invert Level (m)
SW1	0.025	10.00	211.650	450	0.950	210.700
SW2	0.021	5.00	211.800	1200	1.410	210.390
SW3	0.011	5.00	211.550	1200	1.750	209.800
SW4	0.019	10.00	211.400	450	0.900	210.500
SW5	0.018	5.00	211.400	1200	1.700	209.700
SW6	0.012	10.00	211.400	450	0.900	210.500
SW7	0.015	10.00	211.000	1200	1.500	209.500
SW8	0.009	10.00	211.500	450	1.500	210.000
SW9	0.012	10.00	211.150	450	1.150	210.000
SW10			210.850	1200	1.450	209.400
COM1			210.350	450	1.350	209.000

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)
1.000	SW1	SW2	3.100	0.600	210.700	210.390	0.310	10.0	150	10.02	38.0
1.001	SW2	SW3	16.100	0.600	210.390	209.800	0.590	27.3	225	10.12	37.8
2.000	SW4	SW3	8.200	0.600	210.500	209.800	0.700	11.7	150	10.05	38.0
1.002	SW3	SW5	6.400	0.600	209.800	209.700	0.100	64.0	225	10.19	37.7
3.000	SW6	SW5	12.500	0.600	210.500	209.700	0.800	15.6	150	10.08	37.9
1.003	SW5	SW7	11.900	0.600	209.700	209.500	0.200	59.5	225	10.30	37.5
4.000	SW9	SW7	7.400	0.600	210.000	209.500	0.500	14.8	150	10.05	38.0
5.000	SW8	SW7	4.800	0.600	210.000	209.500	0.500	9.6	150	10.02	38.0
1.004	SW7	SW10	9.100	0.600	209.500	209.400	0.100	91.0	225	10.42	37.3
1.005	SW10	COM1	14.800	0.600	209.400	209.000	0.400	37.0	150	10.56	0.0

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)
1.000	3.204	56.6	2.6	0.800	1.260	0.025	0.0	22	1.639
1.001	2.514	100.0	4.7	1.185	1.525	0.046	0.0	33	1.297
2.000	2.960	52.3	2.0	0.750	1.600	0.019	0.0	20	1.410
1.002	1.637	65.1	7.8	1.525	1.475	0.076	0.0	52	1.111
3.000	2.561	45.3	1.2	0.750	1.550	0.012	0.0	17	1.123
1.003	1.698	67.5	10.8	1.475	1.275	0.106	0.0	60	1.248
4.000	2.632	46.5	1.2	1.000	1.350	0.012	0.0	17	1.129
5.000	3.271	57.8	0.9	1.350	1.350	0.009	0.0	13	1.203
1.004	1.371	54.5	14.4	1.275	1.225	0.142	0.0	79	1.161
1.005	1.660	29.3	0.0	1.300	1.200	0.142	0.0	0	0.000

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)
1.000	3.100	10.0	150	Circular	211.650	210.700	0.800	211.800	210.390	1.260
1.001	16.100	27.3	225	Circular	211.800	210.390	1.185	211.550	209.800	1.525
2.000	8.200	11.7	150	Circular	211.400	210.500	0.750	211.550	209.800	1.600
1.002	6.400	64.0	225	Circular	211.550	209.800	1.525	211.400	209.700	1.475
3.000	12.500	15.6	150	Circular	211.400	210.500	0.750	211.400	209.700	1.550
1.003	11.900	59.5	225	Circular	211.400	209.700	1.475	211.000	209.500	1.275
4.000	7.400	14.8	150	Circular	211.150	210.000	1.000	211.000	209.500	1.350
5.000	4.800	9.6	150	Circular	211.500	210.000	1.350	211.000	209.500	1.350
1.004	9.100	91.0	225	Circular	211.000	209.500	1.275	210.850	209.400	1.225
1.005	14.800	37.0	150	Circular	210.850	209.400	1.300	210.350	209.000	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	SW1	450	Manhole	Adoptable	SW2	1200	Manhole	Adoptable
1.001	SW2	1200	Manhole	Adoptable	SW3	1200	Manhole	Adoptable
2.000	SW4	450	Manhole	Adoptable	SW3	1200	Manhole	Adoptable
1.002	SW3	1200	Manhole	Adoptable	SW5	1200	Manhole	Adoptable
3.000	SW6	450	Manhole	Adoptable	SW5	1200	Manhole	Adoptable
1.003	SW5	1200	Manhole	Adoptable	SW7	1200	Manhole	Adoptable
4.000	SW9	450	Manhole	Adoptable	SW7	1200	Manhole	Adoptable
5.000	SW8	450	Manhole	Adoptable	SW7	1200	Manhole	Adoptable
1.004	SW7	1200	Manhole	Adoptable	SW10	1200	Manhole	Adoptable
1.005	SW10	1200	Manhole	Adoptable	COM1	450	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW1	211.650	0.950	450	 0	1.000	210.700	150
SW2	211.800	1.410	1200		1.000	210.390	150
SW3	211.550	1.750	1200	 0 1 2	1.001	210.390	225
					2.000	209.800	150
					1.001	209.800	225
SW4	211.400	0.900	450	 0	1.002	209.800	225
					2.000	210.500	150
SW5	211.400	1.700	1200	 1 2 0	3.000	209.700	150
					1.002	209.700	225
					1.003	209.700	225
SW6	211.400	0.900	450	 0	3.000	210.500	150

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW7	211.000	1.500	1200		1	5.000	209.500
					2	4.000	209.500
					3	1.003	209.500
					0	1.004	209.500
SW8	211.500	1.500	450		0	5.000	210.000
SW9	211.150	1.150	450		0	4.000	210.000
SW10	210.850	1.450	1200		1	1.004	209.400
COM1	210.350	1.350	450		1	1.005	209.000

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
Rainfall Events	Singular	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	17.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.300	Starting Level (m)	
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	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	40	0	0
100	45	0	0

Node SW10 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	209.400	Product Number	CTL-SHE-0079-3000-1200-3000
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.0	Min Node Diameter (mm)	1200

Node SW1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	210.700	Slope (1:X)	150.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.700
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.35	Length (m)	8.300		

Node SW4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	210.500	Slope (1:X)	150.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.700
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.35	Length (m)	9.300		

Node SW6 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	210.500	Slope (1:X)	150.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.700
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.35	Length (m)	4.100		

Node SW8 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	210.000	Slope (1:X)	150.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	120	Depth (m)	0.700
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.35	Length (m)	4.400		

Node SW9 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	210.000	Slope (1:X)	150.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	120	Depth (m)	0.700
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.35	Length (m)	3.000		

Node SW7 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	209.500	Slope (1:X)	150.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.700
Safety Factor	2.0	Width (m)	10.000	Inf Depth (m)	
Porosity	0.35	Length (m)	7.500		

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	SW1	14	210.718	0.018	1.8	0.1030	0.0000	OK
15 minute winter	SW2	11	210.420	0.030	3.8	0.0427	0.0000	OK
15 minute winter	SW3	11	209.849	0.049	6.2	0.0620	0.0000	OK
15 minute winter	SW4	14	210.517	0.017	1.4	0.0869	0.0000	OK
15 minute winter	SW5	11	209.755	0.055	8.7	0.0742	0.0000	OK
15 minute winter	SW6	14	210.515	0.015	0.9	0.0639	0.0000	OK
60 minute winter	SW7	49	209.695	0.195	11.0	4.7256	0.0000	OK
15 minute winter	SW8	14	210.012	0.012	0.7	0.0399	0.0000	OK
15 minute winter	SW9	14	210.015	0.015	0.9	0.0615	0.0000	OK
60 minute winter	SW10	48	209.695	0.295	10.6	0.3339	0.0000	SURCHARGED
60 minute winter	COM1	50	209.032	0.032	2.9	0.0000	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	SW1	1.000	SW2	1.8	1.167	0.032	0.0057	
15 minute winter	SW2	1.001	SW3	3.8	0.816	0.038	0.0767	
15 minute winter	SW3	1.002	SW5	6.1	0.887	0.094	0.0447	
15 minute winter	SW4	2.000	SW3	1.4	0.582	0.027	0.0248	
15 minute winter	SW5	1.003	SW7	8.8	1.099	0.130	0.1943	
15 minute winter	SW6	3.000	SW5	0.9	0.357	0.020	0.0417	
60 minute winter	SW7	1.004	SW10	10.6	0.403	0.194	0.3474	
15 minute winter	SW8	5.000	SW7	0.7	0.288	0.012	0.0433	
15 minute winter	SW9	4.000	SW7	0.9	0.238	0.019	0.0675	
60 minute winter	SW10	1.005	COM1	2.9	1.045	0.098	0.0409	12.6

Results for 30 year +40% CC 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	SW1	14	210.735	0.035	6.3	0.3406	0.0000	OK
120 minute winter	SW2	118	210.480	0.090	6.1	0.1290	0.0000	OK
120 minute winter	SW3	118	210.480	0.680	10.1	0.8551	0.0000	SURCHARGED
15 minute winter	SW4	13	210.531	0.031	4.8	0.2656	0.0000	OK
120 minute winter	SW5	118	210.480	0.780	13.5	1.0478	0.0000	SURCHARGED
15 minute winter	SW6	14	210.526	0.026	3.0	0.1924	0.0000	OK
120 minute winter	SW7	118	210.480	0.980	16.2	19.0387	0.0000	SURCHARGED
120 minute winter	SW8	118	210.480	0.480	5.5	7.2497	0.0000	SURCHARGED
120 minute winter	SW9	118	210.480	0.480	3.9	5.1131	0.0000	SURCHARGED
120 minute winter	SW10	118	210.480	1.080	9.2	1.2210	0.0000	SURCHARGED
15 minute winter	COM1	97	209.032	0.032	2.9	0.0000	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)
30 minute winter	SW1	1.000	SW2	6.1	1.569	0.108	0.0128	
15 minute winter	SW2	1.001	SW3	13.1	1.074	0.131	0.3596	
15 minute winter	SW3	1.002	SW5	21.2	1.183	0.326	0.2545	
15 minute winter	SW4	2.000	SW3	4.7	0.615	0.091	0.0827	
15 minute winter	SW5	1.003	SW7	29.9	1.260	0.443	0.4733	
15 minute winter	SW6	3.000	SW5	3.0	0.362	0.066	0.1229	
60 minute winter	SW7	1.004	SW10	10.6	0.460	0.194	0.3619	
30 minute winter	SW8	5.000	SW7	-5.8	-0.382	-0.101	0.0845	
30 minute winter	SW9	4.000	SW7	-3.8	0.296	-0.082	0.1303	
30 minute winter	SW10	1.005	COM1	2.9	1.050	0.100	0.0413	33.1

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.56%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	SW1	172	210.753	0.053	3.5	0.7788	0.0000	OK
180 minute winter	SW2	172	210.753	0.363	6.4	0.5189	0.0000	SURCHARGED
180 minute winter	SW3	172	210.753	0.953	10.6	1.1979	0.0000	SURCHARGED
180 minute winter	SW4	172	210.753	0.253	5.3	7.3757	0.0000	SURCHARGED
180 minute winter	SW5	172	210.753	1.053	13.7	1.4140	0.0000	SURCHARGED
180 minute winter	SW6	172	210.753	0.253	3.2	3.5093	0.0000	SURCHARGED
180 minute winter	SW7	172	210.753	1.252	15.3	19.4015	0.0000	FLOOD RISK
180 minute winter	SW8	172	210.753	0.753	8.1	10.7149	0.0000	SURCHARGED
180 minute winter	SW9	172	210.753	0.753	5.7	7.5282	0.0000	SURCHARGED
180 minute winter	SW10	172	210.752	1.352	9.6	1.5291	0.0000	FLOOD RISK
180 minute winter	COM1	172	209.033	0.033	3.1	0.0000	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)
30 minute winter	SW1	1.000	SW2	8.3	1.702	0.146	0.0263	
15 minute winter	SW2	1.001	SW3	17.3	1.120	0.173	0.3892	
15 minute winter	SW3	1.002	SW5	26.7	1.140	0.410	0.2545	
30 minute winter	SW4	2.000	SW3	6.4	0.567	0.122	0.0852	
15 minute summer	SW5	1.003	SW7	37.0	1.289	0.548	0.4733	
30 minute winter	SW6	3.000	SW5	4.0	0.352	0.089	0.1258	
15 minute summer	SW7	1.004	SW10	11.5	0.527	0.211	0.3619	
60 minute winter	SW8	5.000	SW7	-13.0	-0.741	-0.226	0.0845	
60 minute winter	SW9	4.000	SW7	-8.9	-0.503	-0.190	0.1303	
180 minute winter	SW10	1.005	COM1	3.1	1.070	0.107	0.0433	68.1