

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	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	1.000	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)
SW1	0.030	5.00	53.300	1800	2.300
SW2	0.009	5.00	51.700	1800	4.076
SW3	0.095	5.00	51.100	1800	4.263
SW4	0.000	5.00	50.100	1800	4.789
SW5		5.00	50.000	1800	4.646
SW6	0.020	5.00	49.900	1800	4.701
SW7	0.080	5.00	49.400	1800	4.620
SW9		5.00	47.100	1800	4.795
SW10	0.100	5.00	46.300	1800	4.038
SW11			46.500	1800	5.038
SW7a			50.400	1800	5.400
SW7b		5.00	50.800	1800	5.400
SW8	0.000		47.200	1800	4.915

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	25.900	0.600	51.000	49.124	1.876	13.8	300	5.10	50.0
1.001	SW2	SW3	7.900	0.600	47.624	46.837	0.787	10.0	900	5.11	50.0
1.002	SW3	SW4	12.910	0.600	46.837	46.812	0.025	516.4	900	5.27	50.0
1.003	SW4	SW6	1.800	0.600	45.311	45.199	0.112	16.1	900	5.28	50.0
1.004	SW6	SW7	6.700	0.600	45.199	44.780	0.419	16.0	900	5.29	50.0
1.005	SW7	SW8	31.000	0.600	44.780	42.285	2.495	12.4	900	5.35	50.0
1.006	SW8	SW10	11.500	0.600	42.285	42.262	0.023	500.0	900	5.49	50.0
1.007	SW10	SW11	8.000	0.600	42.262	41.462	0.800	10.0	900	5.50	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)
1.000	4.252	300.6	5.4	2.000	2.276	0.030	0.0	28	1.664
1.001	9.917	6309.0	7.0	3.176	3.363	0.039	0.0	22	1.727
1.002	1.372	872.6	24.2	3.363	2.388	0.134	0.0	101	0.615
1.003	7.835	4984.3	24.2	3.889	3.801	0.134	0.0	44	2.103
1.004	7.855	4996.9	27.8	3.801	3.720	0.154	0.0	47	2.216
1.005	8.912	5669.9	42.3	3.720	4.015	0.234	0.0	54	2.748
1.006	1.394	886.9	42.3	4.015	3.138	0.234	0.0	131	0.735
1.007	9.936	6321.0	60.4	3.138	4.138	0.334	0.0	60	3.280

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)
2.000	SW5	SW4	21.300	0.600	45.354	45.311	0.043	500.0	900	5.25	50.0
3.000	SW7b	SW7a	6.500	0.600	45.400	45.000	0.400	16.3	900	5.01	50.0
3.001	SW7a	SW7	10.900	0.600	45.000	44.781	0.219	49.8	900	5.05	50.0
4.000	SW9	SW8	8.600	0.600	42.305	42.285	0.020	430.0	900	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)
2.000	1.394	886.9	0.0	3.746	3.889	0.000	0.0	0	0.000
3.000	7.792	4956.8	0.0	4.500	4.500	0.000	0.0	0	0.000
3.001	4.446	2828.7	0.0	4.500	3.719	0.000	0.0	0	0.000
4.000	1.504	957.0	0.0	3.895	4.015	0.000	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	25.900	13.8	300	Circular	53.300	51.000	2.000	51.700	49.124	2.276
1.001	7.900	10.0	900	Circular	51.700	47.624	3.176	51.100	46.837	3.363
1.002	12.910	516.4	900	Circular	51.100	46.837	3.363	50.100	46.812	2.388
1.003	1.800	16.1	900	Circular	50.100	45.311	3.889	49.900	45.199	3.801
1.004	6.700	16.0	900	Circular	49.900	45.199	3.801	49.400	44.780	3.720
1.005	31.000	12.4	900	Circular	49.400	44.780	3.720	47.200	42.285	4.015
1.006	11.500	500.0	900	Circular	47.200	42.285	4.015	46.300	42.262	3.138
1.007	8.000	10.0	900	Circular	46.300	42.262	3.138	46.500	41.462	4.138
2.000	21.300	500.0	900	Circular	50.000	45.354	3.746	50.100	45.311	3.889
3.000	6.500	16.3	900	Circular	50.800	45.400	4.500	50.400	45.000	4.500
3.001	10.900	49.8	900	Circular	50.400	45.000	4.500	49.400	44.781	3.719

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	SW1	1800	Manhole	Adoptable	SW2	1800	Manhole	Adoptable
1.001	SW2	1800	Manhole	Adoptable	SW3	1800	Manhole	Adoptable
1.002	SW3	1800	Manhole	Adoptable	SW4	1800	Manhole	Adoptable
1.003	SW4	1800	Manhole	Adoptable	SW6	1800	Manhole	Adoptable
1.004	SW6	1800	Manhole	Adoptable	SW7	1800	Manhole	Adoptable
1.005	SW7	1800	Manhole	Adoptable	SW8	1800	Manhole	Adoptable
1.006	SW8	1800	Manhole	Adoptable	SW10	1800	Manhole	Adoptable
1.007	SW10	1800	Manhole	Adoptable	SW11	1800	Manhole	Adoptable
2.000	SW5	1800	Manhole	Adoptable	SW4	1800	Manhole	Adoptable
3.000	SW7b	1800	Manhole	Adoptable	SW7a	1800	Manhole	Adoptable
3.001	SW7a	1800	Manhole	Adoptable	SW7	1800	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)
4.000	8.600	430.0	900	Circular	47.100	42.305	3.895	47.200	42.285	4.015

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
4.000	SW9	1800	Manhole	Adoptable	SW8	1800	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW1	53.300	2.300	1800				
					0	1.000	51.000 300
SW2	51.700	4.076	1800		1	1.000	49.124 300
					0	1.001	47.624 900
SW3	51.100	4.263	1800		1	1.001	46.837 900
					0	1.002	46.837 900
SW4	50.100	4.789	1800		1	2.000	45.311 900
					2	1.002	46.812 900
					0	1.003	45.311 900
SW5	50.000	4.646	1800				
					0	2.000	45.354 900
SW6	49.900	4.701	1800		1	1.003	45.199 900
					0	1.004	45.199 900
SW7	49.400	4.620	1800		1	3.001	44.781 900
					2	1.004	44.780 900
					0	1.005	44.780 900
SW9	47.100	4.795	1800				
					0	4.000	42.305 900
SW10	46.300	4.038	1800		1	1.006	42.262 900
					0	1.007	42.262 900
SW11	46.500	5.038	1800		1	1.007	41.462 900



Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW7a	50.400	5.400	1800	1	3.000	45.000	900
				0	3.001	45.000	900
SW7b	50.800	5.400	1800	0	3.000	45.400	900
				1	4.000	42.285	900
				2	1.005	42.285	900
SW8	47.200	4.915	1800	0	1.006	42.285	900

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	1.000	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	0	0	0
100	45	0	0

Node SW10 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	42.262	Product Number	CTL-SHE-0063-3100-3500-3100
Design Depth (m)	3.500	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	3.1	Min Node Diameter (mm)	1200

Node SW4 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	45.311	Product Number	CTL-SHE-0065-3500-4000-3500
Design Depth (m)	4.000	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.5	Min Node Diameter (mm)	1200

Approval Settings

Node Size	✓	Minimum Full Bore Velocity (m/s)	
Node Losses	✓	Maximum Full Bore Velocity (m/s)	3.000
Link Size	✓	Proportional Velocity	✓
Minimum Diameter (mm)	150	Return Period (years)	
Link Length	✓	Minimum Proportional Velocity (m/s)	0.750
Maximum Length (m)	100.000	Maximum Proportional Velocity (m/s)	3.000
Coordinates	✓	Surcharged Depth	✓
Accuracy (m)	1.000	Return Period (years)	
Crossings	✓	Maximum Surcharged Depth (m)	0.100
Cover Depth	✓	Flooding	✓
Minimum Cover Depth (m)		Return Period (years)	30
Maximum Cover Depth (m)	3.000	Time to Half Empty	x
Backdrops	✓	Discharge Rates	✓
Minimum Backdrop Height (m)		Discharge Volume	✓
Maximum Backdrop Height (m)	1.500	100 year 360 minute (m ³)	
Full Bore Velocity	✓		

Results for 1 year Critical Storm Duration. Lowest mass balance: 46.66%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW1	10	51.028	0.028	5.4	0.0786	0.0000	OK
15 minute summer	SW2	10	47.647	0.023	6.9	0.0593	0.0000	OK
15 minute summer	SW3	10	46.939	0.102	23.9	0.3041	0.0000	OK
60 minute summer	SW4	62	45.904	0.593	16.2	1.5095	0.0000	OK
60 minute summer	SW5	62	45.904	0.550	7.1	1.4000	0.0000	OK
15 minute summer	SW6	10	45.222	0.023	5.4	0.0599	0.0000	OK
15 minute summer	SW7	10	44.818	0.038	19.7	0.1108	0.0000	OK
480 minute summer	SW9	416	43.697	1.392	7.3	3.5434	0.0000	SURCHARGED
480 minute summer	SW10	416	43.703	1.441	7.8	4.3818	0.0000	SURCHARGED
15 minute summer	SW11	1	41.462	0.000	1.7	0.0000	0.0000	OK
15 minute summer	SW7a	1	45.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	SW7b	1	45.400	0.000	0.0	0.0000	0.0000	OK
480 minute summer	SW8	416	43.704	1.419	8.6	3.6108	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW1	1.000	SW2	5.3	1.630	0.018	0.0844	
15 minute summer	SW2	1.001	SW3	6.9	0.363	0.001	0.1709	
15 minute summer	SW3	1.002	SW4	23.4	0.678	0.027	0.4489	
60 minute summer	SW4	Hydro-Brake®	SW6	1.8				
60 minute summer	SW5	2.000	SW4	-7.1	-0.075	-0.008	9.0441	
15 minute summer	SW6	1.004	SW7	5.4	0.970	0.001	0.0436	
15 minute summer	SW7	1.005	SW8	19.5	0.934	0.003	5.7132	
480 minute summer	SW9	4.000	SW8	7.8	-0.033	0.008	5.4505	
480 minute summer	SW10	Hydro-Brake®	SW11	2.1				66.4
15 minute summer	SW7a	3.001	SW7	0.0	0.000	0.000	0.0472	
15 minute summer	SW7b	3.000	SW7a	0.0	0.000	0.000	0.0000	
480 minute summer	SW8	1.006	SW10	7.5	0.074	0.008	7.2884	

Results for 30 year Critical Storm Duration. Lowest mass balance: 46.66%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW1	10	51.043	0.043	13.2	0.1214	0.0000	OK
15 minute summer	SW2	10	47.658	0.034	17.0	0.0885	0.0000	OK
120 minute summer	SW3	108	47.511	0.674	25.1	2.0158	0.0000	OK
120 minute summer	SW4	108	47.511	2.200	25.1	5.5995	0.0000	SURCHARGED
120 minute summer	SW5	108	47.511	2.157	14.0	5.4900	0.0000	SURCHARGED
360 minute summer	SW6	472	45.724	0.525	199.3	1.3796	0.0000	OK
360 minute summer	SW7	368	45.687	0.907	593.0	2.6229	0.0000	SURCHARGED
360 minute summer	SW9	360	46.133	3.828	2243.8	9.7421	0.0000	SURCHARGED
360 minute summer	SW10	432	45.946	3.684	1475.8	11.1997	0.0000	SURCHARGED
15 minute summer	SW11	1	41.462	0.000	2.1	0.0000	0.0000	OK
360 minute summer	SW7a	520	45.678	0.678	106.8	1.7259	0.0000	OK
360 minute summer	SW7b	384	45.670	0.270	49.0	0.6868	0.0000	OK
360 minute summer	SW8	408	46.647	4.362	1609.7	11.1019	0.0000	SURCHARGED
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW1	1.000	SW2	13.1	2.127	0.043	0.1592	
15 minute summer	SW2	1.001	SW3	16.9	0.469	0.003	0.3247	
120 minute summer	SW3	1.002	SW4	25.1	0.693	0.029	6.7012	
120 minute summer	SW4	Hydro-Brake®	SW6	2.7				
120 minute summer	SW5	2.000	SW4	-14.0	-0.084	-0.016	13.4994	
360 minute summer	SW6	1.004	SW7	-183.4	0.876	-0.037	3.3575	
360 minute summer	SW7	1.005	SW8	-420.9	-0.665	-0.074	19.6366	
360 minute summer	SW9	4.000	SW8	-1373.9	-2.168	-1.436	5.4505	
360 minute summer	SW10	Hydro-Brake®	SW11	3.1				90.7
360 minute summer	SW7a	3.001	SW7	-103.9	-0.178	-0.037	6.2082	
360 minute summer	SW7b	3.000	SW7a	-49.0	-0.150	-0.010	2.1174	
360 minute summer	SW8	1.006	SW10	908.1	1.433	1.024	7.2884	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 46.66%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW1	10	51.059	0.059	24.8	0.1664	0.0000	OK
240 minute summer	SW2	160	49.938	2.314	477.2	5.9897	0.0000	SURCHARGED
600 minute summer	SW3	360	50.488	3.651	804.6	10.9162	0.0000	SURCHARGED
720 minute summer	SW4	435	50.045	4.734	156.5	12.0483	0.0000	FLOOD RISK
120 minute winter	SW5	116	49.967	4.613	200.1	11.7407	0.0000	FLOOD RISK
120 minute summer	SW6	76	46.037	0.838	199.9	2.2052	0.0000	OK
60 minute summer	SW7	48	45.911	1.131	705.7	3.2694	0.0000	SURCHARGED
360 minute winter	SW9	288	46.817	4.512	852.0	11.4832	0.0000	FLOOD RISK
960 minute summer	SW10	780	46.246	3.984	2023.3	12.1119	0.0000	FLOOD RISK
15 minute summer	SW11	1	41.462	0.000	2.9	0.0000	0.0000	OK
120 minute summer	SW7a	76	45.959	0.959	143.1	2.4407	0.0000	SURCHARGED
60 minute summer	SW7b	41	45.931	0.531	86.6	1.3513	0.0000	OK
960 minute winter	SW8	930	47.051	4.766	1843.6	12.1304	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW1	1.000	SW2	24.6	2.550	0.082	0.2496	
240 minute summer	SW2	1.001	SW3	-477.2	-0.753	-0.076	5.0068	
600 minute summer	SW3	1.002	SW4	-32.8	0.529	-0.038	8.1820	
720 minute summer	SW4	Hydro-Brake®	SW6	3.6				
120 minute winter	SW5	2.000	SW4	-200.1	-0.316	-0.226	13.4994	
120 minute summer	SW6	1.004	SW7	490.3	1.041	0.098	4.1650	
60 minute summer	SW7	1.005	SW8	565.8	1.132	0.100	19.6470	
360 minute winter	SW9	4.000	SW8	-852.0	-1.344	-0.890	5.4505	
960 minute summer	SW10	Hydro-Brake®	SW11	3.2				181.4
120 minute summer	SW7a	3.001	SW7	299.0	0.534	0.106	6.8803	
60 minute summer	SW7b	3.000	SW7a	-86.6	-0.247	-0.017	3.2548	
960 minute winter	SW8	1.006	SW10	614.8	0.970	0.693	7.2884	