

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 Soffits
M5-60 (mm)	14.000	Minimum Backdrop Height (m)	9.999
Ratio-R	0.200	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)
1	0.090	5.00	137.535	1200	400647.948	340251.654	1.655
2	0.090	5.00	137.250	1200	400639.386	340279.191	1.620
3	0.000		137.720	1200	400644.084	340283.847	2.120
4	0.177	5.00	141.240	1200	400695.710	340295.248	2.560
5	0.120	5.00	138.825	1200	400658.465	340291.279	3.325
6	0.060	5.00	138.460	1200	400655.242	340309.789	3.060
7	0.085	5.00	139.875	1200	400693.365	340353.628	1.875
8	0.063	5.00	138.500	1200	400654.140	340352.012	3.250
9	0.142	5.00	137.825	1200	400652.180	340365.826	2.675
9a	0.000	5.00	136.650	1500	400625.510	340365.789	2.525
HW2	0.000	5.00	136.000	1200	400620.995	340379.014	2.050
HW3	0.000	5.00	136.000	1200	400611.589	340391.302	2.150
9b	0.000	5.00	136.000	1200	400608.096	340363.640	2.251
HW4	0.000	5.00	136.000	1200	400603.000	340358.400	2.291
9c			136.000	1200	400604.878	340391.023	2.210

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	1	2	28.837	0.600	135.880	135.630	0.250	115.3	300	5.33	33.7
1.001	2	3	6.614	0.600	135.630	135.600	0.030	220.5	300	5.43	33.5
1.002	3	5	16.188	0.600	135.600	135.550	0.050	323.8	300	5.74	32.9
2.000	4	5	37.456	0.600	138.680	135.550	3.130	12.0	300	5.14	34.1
1.003	5	6	18.789	0.600	135.500	135.400	0.100	187.9	300	6.02	32.3
1.004	6	8	42.237	0.600	135.400	135.250	0.150	281.6	300	6.77	31.0
3.000	7	8	39.258	0.600	138.000	135.250	2.750	14.3	300	5.16	34.1
1.005	8	9	13.952	0.600	135.250	135.150	0.100	139.5	300	6.95	30.7

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	1.463	103.4	8.2	1.355	1.320	0.090	0.0	57	0.881
1.001	1.055	74.5	16.3	1.320	1.820	0.180	0.0	95	0.850
1.002	0.868	61.4	16.0	1.820	2.975	0.180	0.0	105	0.734
2.000	4.569	322.9	16.4	2.260	2.975	0.177	0.0	45	2.425
1.003	1.143	80.8	41.8	3.025	2.760	0.477	0.0	153	1.153
1.004	0.932	65.9	45.1	2.760	2.950	0.537	0.0	183	1.001
3.000	4.182	295.6	7.8	1.575	2.950	0.085	0.0	33	1.826
1.005	1.329	93.9	57.0	2.950	2.375	0.685	0.0	169	1.391

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)
1.006	9	9a	26.670	0.600	135.150	134.500	0.650	41.0	300	7.13	30.4
1.007	9a	HW2	13.974	0.600	134.125	133.950	0.175	79.9	675	7.21	30.3
1.008	HW2	HW3	15.475	0.600	133.950	133.850	0.100	154.7	675	7.33	30.1
1.009	HW3	9c	6.717	0.600	133.850	133.790	0.060	111.9	675	7.38	30.1
1.010	9c	9b	27.571	0.600	133.790	133.749	0.041	672.5	675	7.83	29.4
1.011	9b	HW4	7.309	0.600	133.749	133.709	0.040	182.7	675	7.90	29.3

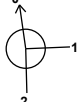
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.006	2.461	174.0	68.2	2.375	1.850	0.827	0.0	130	2.317
1.007	2.934	1050.0	67.9	1.850	1.375	0.827	0.0	114	1.686
1.008	2.104	753.0	67.5	1.375	1.475	0.827	0.0	135	1.328
1.009	2.476	886.1	67.4	1.475	1.535	0.827	0.0	124	1.492
1.010	1.003	358.9	65.8	1.535	1.576	0.827	0.0	194	0.772
1.011	1.935	692.5	65.6	1.576	1.616	0.827	0.0	139	1.241

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	28.837	115.3	300	Circular_Default Sewer Type	137.535	135.880	1.355	137.250	135.630	1.320
1.001	6.614	220.5	300	Circular_Default Sewer Type	137.250	135.630	1.320	137.720	135.600	1.820
1.002	16.188	323.8	300	Circular_Default Sewer Type	137.720	135.600	1.820	138.825	135.550	2.975
2.000	37.456	12.0	300	Circular_Default Sewer Type	141.240	138.680	2.260	138.825	135.550	2.975
1.003	18.789	187.9	300	Circular_Default Sewer Type	138.825	135.500	3.025	138.460	135.400	2.760
1.004	42.237	281.6	300	Circular_Default Sewer Type	138.460	135.400	2.760	138.500	135.250	2.950
3.000	39.258	14.3	300	Circular_Default Sewer Type	139.875	138.000	1.575	138.500	135.250	2.950
1.005	13.952	139.5	300	Circular_Default Sewer Type	138.500	135.250	2.950	137.825	135.150	2.375
1.006	26.670	41.0	300	Circular_Default Sewer Type	137.825	135.150	2.375	136.650	134.500	1.850
1.007	13.974	79.9	675	Circular_Default Sewer Type	136.650	134.125	1.850	136.000	133.950	1.375
1.008	15.475	154.7	675	Circular_Default Sewer Type	136.000	133.950	1.375	136.000	133.850	1.475
1.009	6.717	111.9	675	Circular_Default Sewer Type	136.000	133.850	1.475	136.000	133.790	1.535
1.010	27.571	672.5	675	Circular_Default Sewer Type	136.000	133.790	1.535	136.000	133.749	1.576
1.011	7.309	182.7	675	Circular_Default Sewer Type	136.000	133.749	1.576	136.000	133.709	1.616

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.001	2	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	5	1200	Manhole	Adoptable
2.000	4	1200	Manhole	Adoptable	5	1200	Manhole	Adoptable
1.003	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
1.004	6	1200	Manhole	Adoptable	8	1200	Manhole	Adoptable
3.000	7	1200	Manhole	Adoptable	8	1200	Manhole	Adoptable
1.005	8	1200	Manhole	Adoptable	9	1200	Manhole	Adoptable
1.006	9	1200	Manhole	Adoptable	9a	1500	Manhole	Adoptable
1.007	9a	1500	Manhole	Adoptable	HW2	1200	Manhole	Adoptable
1.008	HW2	1200	Manhole	Adoptable	HW3	1200	Manhole	Adoptable
1.009	HW3	1200	Manhole	Adoptable	9c	1200	Manhole	Adoptable
1.010	9c	1200	Manhole	Adoptable	9b	1200	Manhole	Adoptable
1.011	9b	1200	Manhole	Adoptable	HW4	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	400647.948	340251.654	137.535	1.655	1200				
						0	1.000	135.880	300
2	400639.386	340279.191	137.250	1.620	1200				
						0	1.001	135.630	300
3	400644.084	340283.847	137.720	2.120	1200				
						0	1.002	135.600	300
4	400695.710	340295.248	141.240	2.560	1200				
						0	2.000	138.680	300
5	400658.465	340291.279	138.825	3.325	1200				
						1	2.000	135.550	300
						2	1.002	135.550	300
						0	1.003	135.500	300
6	400655.242	340309.789	138.460	3.060	1200				
						1	1.003	135.400	300
						0	1.004	135.400	300
7	400693.365	340353.628	139.875	1.875	1200				
						0	3.000	138.000	300
8	400654.140	340352.012	138.500	3.250	1200				
						1	3.000	135.250	300
						2	1.004	135.250	300
						0	1.005	135.250	300
9	400652.180	340365.826	137.825	2.675	1200				
						1	1.005	135.150	300
						0	1.006	135.150	300
9a	400625.510	340365.789	136.650	2.525	1500				
						1	1.006	134.500	300
						0	1.007	134.125	675
HW2	400620.995	340379.014	136.000	2.050	1200				
						1	1.007	133.950	675
						0	1.008	133.950	675
HW3	400611.589	340391.302	136.000	2.150	1200				
						1	1.008	133.850	675
						0	1.009	133.850	675
9b	400608.096	340363.640	136.000	2.251	1200				
						1	1.010	133.749	675
						0	1.011	133.749	675

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
HW4	400603.000	340358.400	136.000	2.291	1200	 1	1.011	133.709	675
9c	400604.878	340391.023	136.000	2.210	1200	 1	1.009	133.790	675
						0	1.010	133.790	675

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	✓
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	14.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.200	Check Discharge Rate(s)	✓
Summer CV	0.750	Check Discharge Volume	✓
Winter CV	0.840	100 year 360 minute (m³)	
Analysis Speed	Normal		

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)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m³)	

Node 9b Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	133.749	Product Number	CTL-SHE-0128-8000-1250-8000
Design Depth (m)	1.250	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.0	Min Node Diameter (mm)	1200

Node 9c Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	133.850
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	225

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	148.0	0.0	1.600	513.0	0.0	1.601	0.0	0.0

Node 9a Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	134.600
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	90

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	150.0	0.0	0.800	150.0	0.0	0.801	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 77.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	135.932	0.052	7.1	0.1161	0.0000	OK
15 minute winter	2	11	135.729	0.099	14.0	0.2224	0.0000	OK
15 minute winter	3	11	135.702	0.102	13.7	0.1152	0.0000	OK
15 minute winter	4	10	138.722	0.042	14.0	0.1060	0.0000	OK
15 minute winter	5	11	135.654	0.154	36.4	0.2846	0.0000	OK
15 minute winter	6	11	135.577	0.177	40.7	0.2691	0.0000	OK
15 minute winter	7	10	138.031	0.031	6.7	0.0631	0.0000	OK
15 minute winter	8	11	135.417	0.167	51.4	0.2535	0.0000	OK
15 minute winter	9	11	135.278	0.128	60.7	0.2814	0.0000	OK
15 minute winter	9a	12	134.243	0.118	60.1	0.2079	0.0000	OK
240 minute winter	HW2	176	134.093	0.143	20.7	0.1619	0.0000	OK
360 minute winter	HW3	256	134.095	0.245	19.0	0.2772	0.0000	OK
240 minute winter	9b	176	134.093	0.344	8.3	0.3893	0.0000	OK
240 minute winter	HW4	176	133.759	0.050	7.9	0.0000	0.0000	OK
240 minute winter	9c	176	134.093	0.303	27.9	43.1925	0.0000	OK

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 winter	1	1.000	2	6.9	0.503	0.067	0.4095	
15 minute winter	2	1.001	3	13.7	0.667	0.184	0.1368	
15 minute winter	3	1.002	5	13.8	0.690	0.225	0.3450	
15 minute winter	4	2.000	5	13.9	1.665	0.043	0.5129	
15 minute winter	5	1.003	6	36.2	0.912	0.448	0.7464	
15 minute winter	6	1.004	8	40.3	0.967	0.612	1.7618	
15 minute winter	7	3.000	8	6.6	0.701	0.022	0.8633	
15 minute winter	8	1.005	9	50.5	1.470	0.538	0.4815	
15 minute winter	9	1.006	9a	60.1	2.183	0.346	0.7353	
15 minute winter	9a	1.007	HW2	60.4	1.283	0.058	0.6592	
240 minute winter	HW2	1.008	HW3	20.7	0.841	0.027	1.3224	
360 minute winter	HW3	1.009	9c	26.3	0.539	0.030	0.9058	
240 minute winter	9b	1.011	HW4	7.9	0.641	0.011	0.0902	118.9
240 minute winter	9c	1.010	9b	8.3	0.250	0.023	4.6640	

Results for 30 year Critical Storm Duration. Lowest mass balance: 77.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	135.960	0.080	16.8	0.1784	0.0000	OK
15 minute winter	2	12	135.945	0.315	33.3	0.7063	0.0000	SURCHARGED
15 minute winter	3	12	135.937	0.337	28.7	0.3810	0.0000	SURCHARGED
15 minute winter	4	10	138.744	0.064	33.0	0.1612	0.0000	OK
15 minute winter	5	12	135.922	0.422	75.9	0.7817	0.0000	SURCHARGED
15 minute winter	6	12	135.811	0.411	81.5	0.6255	0.0000	SURCHARGED
15 minute winter	7	10	138.047	0.047	15.9	0.0954	0.0000	OK
15 minute winter	8	12	135.548	0.298	104.7	0.4528	0.0000	OK
15 minute winter	9	11	135.360	0.210	127.8	0.4598	0.0000	OK
480 minute winter	9a	408	134.581	0.456	31.4	0.8058	0.0000	OK
480 minute winter	HW2	400	134.582	0.632	70.2	0.7152	0.0000	OK
480 minute winter	HW3	408	134.615	0.765	36.8	0.8648	0.0000	SURCHARGED
480 minute winter	9b	384	134.576	0.827	10.9	0.9351	0.0000	SURCHARGED
30 minute winter	HW4	80	133.759	0.050	8.0	0.0000	0.0000	OK
480 minute winter	9c	384	134.576	0.786	51.2	168.4656	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 winter	1	1.000	2	16.5	0.592	0.160	1.2070	
15 minute winter	2	1.001	3	28.7	0.741	0.386	0.4658	
15 minute winter	3	1.002	5	31.9	0.679	0.520	1.1399	
15 minute winter	4	2.000	5	32.8	1.689	0.101	1.5182	
15 minute winter	5	1.003	6	72.8	1.034	0.901	1.3231	
15 minute winter	6	1.004	8	81.7	1.160	1.241	2.9726	
15 minute winter	7	3.000	8	15.7	0.832	0.053	1.4993	
15 minute winter	8	1.005	9	103.9	1.704	1.106	0.8516	
15 minute winter	9	1.006	9a	127.4	2.567	0.732	1.3224	
480 minute winter	9a	1.007	HW2	70.2	1.013	0.067	4.2165	
480 minute winter	HW2	1.008	HW3	36.8	0.683	0.049	5.4537	
480 minute winter	HW3	1.009	9c	51.2	0.521	0.058	2.3978	
480 minute winter	9b	1.011	HW4	8.0	0.643	0.012	0.0908	285.0
480 minute winter	9c	1.010	9b	10.9	0.139	0.030	9.8422	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 77.79%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	1	20	137.189	1.309	29.4	2.9040	0.0000	SURCHARGED
30 minute summer	2	20	137.175	1.545	53.0	3.4641	0.0000	FLOOD RISK
30 minute summer	3	20	137.157	1.557	42.8	1.7609	0.0000	SURCHARGED
15 minute winter	4	10	138.766	0.086	58.5	0.2152	0.0000	OK
30 minute summer	5	20	137.124	1.624	128.8	3.0094	0.0000	SURCHARGED
30 minute summer	6	20	136.870	1.470	123.8	2.2389	0.0000	SURCHARGED
15 minute winter	7	10	138.062	0.062	28.1	0.1261	0.0000	OK
30 minute summer	8	20	136.242	0.992	162.0	1.5067	0.0000	SURCHARGED
30 minute summer	9	20	135.803	0.653	196.1	1.4327	0.0000	SURCHARGED
960 minute winter	9a	645	135.107	0.982	239.7	77.7946	0.0000	SURCHARGED
720 minute winter	HW2	540	135.518	1.568	272.2	1.7738	0.0000	SURCHARGED
360 minute winter	HW3	344	135.665	1.815	415.0	2.0530	0.0000	SURCHARGED
960 minute winter	9b	675	135.043	1.294	10.4	1.4636	0.0000	SURCHARGED
15 minute winter	HW4	118	133.759	0.050	8.0	0.0000	0.0000	OK
960 minute winter	9c	675	135.045	1.255	415.4	341.0531	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)
30 minute summer	1	1.000	2	25.0	0.600	0.242	2.0307	
30 minute summer	2	1.001	3	42.8	0.740	0.574	0.4658	
30 minute summer	3	1.002	5	47.7	0.678	0.778	1.1399	
15 minute winter	4	2.000	5	58.2	1.754	0.180	1.6288	
30 minute summer	5	1.003	6	110.1	1.564	1.363	1.3231	
30 minute summer	6	1.004	8	124.4	1.766	1.888	2.9743	
15 minute winter	7	3.000	8	27.9	0.978	0.094	1.5874	
30 minute summer	8	1.005	9	160.8	2.283	1.711	0.9825	
30 minute summer	9	1.006	9a	195.3	2.774	1.123	1.8780	
960 minute winter	9a	1.007	HW2	-229.7	0.920	-0.219	4.9884	
720 minute winter	HW2	1.008	HW3	-272.2	-0.763	-0.361	5.5242	
360 minute winter	HW3	1.009	9c	263.6	0.804	0.297	2.3978	
960 minute winter	9b	1.011	HW4	8.0	0.643	0.012	0.0908	486.7
960 minute winter	9c	1.010	9b	10.4	0.162	0.029	9.8422	