

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)	20.000	Minimum Backdrop Height (m)	9.990
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)
1	0.150	5.00	115.884	1200	443743.802	296077.679	1.629
2	0.130	5.00	115.381	1200	443743.003	296125.330	2.271
3	0.065	5.00	115.218	1200	443737.218	296138.596	2.218
4	0.018	5.00	115.007	1200	443729.342	296159.033	2.142
5	0.088	5.00	114.827	1200	443728.084	296175.778	2.342
6	0.139	5.00	114.318	1200	443731.603	296198.650	2.103
7	0.113	5.00	113.607	1200	443728.812	296224.841	2.095
8	0.172	5.00	112.943	1200	443726.083	296250.077	1.743
9	0.000	5.00	111.569	1200	443720.403	296302.295	1.319
11	0.073	5.00	111.612	1200	443673.222	296303.826	1.462
12	0.000	5.00	111.588	1200	443665.215	296298.288	1.448
13	0.000	5.00	111.613	1500	443642.874	296301.623	1.493
14			111.470	1200	443666.807	296316.532	1.470

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	47.658	0.600	114.255	113.260	0.995	47.9	300	5.61	50.0
1.001	2	3	14.472	0.600	113.110	113.000	0.110	131.6	450	5.75	50.0
1.002	3	4	21.902	0.600	113.000	112.865	0.135	162.2	450	5.96	50.0
1.003	4	5	16.792	0.600	112.865	112.560	0.305	55.1	450	6.13	50.0
1.004	5	6	23.141	0.600	112.485	112.215	0.270	85.7	450	6.36	50.0
1.005	6	7	26.339	0.600	112.215	111.512	0.703	37.5	450	6.57	50.0
1.006	7	8	25.383	0.600	111.512	111.200	0.312	81.4	450	6.78	50.0
1.007	8	9	52.526	0.600	111.200	110.400	0.800	65.7	450	7.21	50.0
1.008	9	11	47.206	0.600	110.250	110.150	0.100	472.1	600	7.42	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	2.277	161.0	20.3	1.329	1.821	0.150	0.0	72	1.577
1.001	1.771	281.6	37.9	1.821	1.768	0.280	0.0	110	1.247
1.002	1.593	253.4	46.8	1.768	1.692	0.345	0.0	130	1.225
1.003	2.744	436.4	49.2	1.692	1.817	0.363	0.0	101	1.839
1.004	2.197	349.4	61.1	1.892	1.653	0.451	0.0	126	1.666
1.005	3.329	529.5	80.0	1.653	1.645	0.590	0.0	117	2.429
1.006	2.255	358.6	95.3	1.645	1.293	0.703	0.0	158	1.919
1.007	2.512	399.5	118.6	1.293	0.719	0.875	0.0	167	2.201
1.008	1.114	314.9	118.6	0.719	0.862	0.875	0.0	255	1.038

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)
1.010	11	12	9.736	0.600	110.150	110.140	0.010	973.6	600	7.67	50.0
1.011	12	13	22.589	0.600	110.140	110.120	0.020	1129.5	600	7.75	50.0
1.012	13	14	28.197	0.600	110.120	110.000	0.120	235.0	225	8.28	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)
1.010	0.772	218.3	128.5	0.862	0.848	0.948	0.0	331	0.802
1.011	0.716	202.4	128.5	0.848	0.893	0.948	0.0	348	0.756
1.012	0.848	33.7	0.0	1.268	1.245	0.948	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	47.658	47.9	300	Circular_Default Sewer Type	115.884	114.255	1.329	115.381	113.260	1.821
1.001	14.472	131.6	450	Circular_Default Sewer Type	115.381	113.110	1.821	115.218	113.000	1.768
1.002	21.902	162.2	450	Circular_Default Sewer Type	115.218	113.000	1.768	115.007	112.865	1.692
1.003	16.792	55.1	450	Circular_Default Sewer Type	115.007	112.865	1.692	114.827	112.560	1.817
1.004	23.141	85.7	450	Circular_Default Sewer Type	114.827	112.485	1.892	114.318	112.215	1.653
1.005	26.339	37.5	450	Circular_Default Sewer Type	114.318	112.215	1.653	113.607	111.512	1.645
1.006	25.383	81.4	450	Circular_Default Sewer Type	113.607	111.512	1.645	112.943	111.200	1.293
1.007	52.526	65.7	450	Circular_Default Sewer Type	112.943	111.200	1.293	111.569	110.400	0.719
1.008	47.206	472.1	600	Circular_Default Sewer Type	111.569	110.250	0.719	111.612	110.150	0.862
1.010	9.736	973.6	600	Circular_Default Sewer Type	111.612	110.150	0.862	111.588	110.140	0.848
1.011	22.589	1129.5	600	Circular_Default Sewer Type	111.588	110.140	0.848	111.613	110.120	0.893
1.012	28.197	235.0	225	Circular_Default Sewer Type	111.613	110.120	1.268	111.470	110.000	1.245

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	4	1200	Manhole	Adoptable
1.003	4	1200	Manhole	Adoptable	5	1200	Manhole	Adoptable
1.004	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
1.005	6	1200	Manhole	Adoptable	7	1200	Manhole	Adoptable
1.006	7	1200	Manhole	Adoptable	8	1200	Manhole	Adoptable
1.007	8	1200	Manhole	Adoptable	9	1200	Manhole	Adoptable
1.008	9	1200	Manhole	Adoptable	11	1200	Manhole	Adoptable
1.010	11	1200	Manhole	Adoptable	12	1200	Manhole	Adoptable
1.011	12	1200	Manhole	Adoptable	13	1500	Manhole	Adoptable
1.012	13	1500	Manhole	Adoptable	14	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	443743.802	296077.679	115.884	1.629	1200		0	1.000	114.255	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
2	443743.003	296125.330	115.381	2.271	1200		1	1.000	113.260	300
3	443737.218	296138.596	115.218	2.218	1200		0	1.001	113.110	450
							1	1.001	113.000	450
4	443729.342	296159.033	115.007	2.142	1200		0	1.002	113.000	450
							1	1.002	112.865	450
5	443728.084	296175.778	114.827	2.342	1200		0	1.003	112.865	450
							1	1.003	112.560	450
6	443731.603	296198.650	114.318	2.103	1200		0	1.004	112.485	450
							1	1.004	112.215	450
7	443728.812	296224.841	113.607	2.095	1200		0	1.005	112.215	450
							1	1.005	111.512	450
8	443726.083	296250.077	112.943	1.743	1200		0	1.006	111.512	450
							1	1.006	111.200	450
9	443720.403	296302.295	111.569	1.319	1200		0	1.007	111.200	450
							1	1.007	110.400	450
11	443673.222	296303.826	111.612	1.462	1200		0	1.008	110.250	600
							1	1.008	110.150	600
12	443665.215	296298.288	111.588	1.448	1200		0	1.010	110.150	600
							1	1.010	110.140	600
13	443642.874	296301.623	111.613	1.493	1500		0	1.011	110.140	600
							1	1.011	110.120	600
14	443666.807	296316.532	111.470	1.470	1200		0	1.012	110.120	225
							1	1.012	110.000	225

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	✓
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	20.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.400	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 %)
2	0	10	0
30	0	10	0
100	40	10	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 13 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	110.120	Product Number	CTL-SHE-0140-9300-1100-9300
Design Depth (m)	1.100	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	9.3	Min Node Diameter (mm)	1200

Node 13 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	110.120
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	367.0	0.0	1.500	875.0	0.0

Results for 2 year +10% A Critical Storm Duration. Lowest mass balance: 99.62%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	114.343	0.088	30.1	0.2788	0.0000	OK
15 minute winter	2	10	113.262	0.152	55.4	0.3633	0.0000	OK
15 minute winter	3	10	113.167	0.167	67.8	0.2964	0.0000	OK
15 minute winter	4	11	112.998	0.133	70.5	0.1746	0.0000	OK
15 minute winter	5	11	112.650	0.165	87.9	0.3237	0.0000	OK
15 minute winter	6	11	112.358	0.143	114.6	0.3694	0.0000	OK
15 minute winter	7	11	111.721	0.209	136.5	0.4842	0.0000	OK
15 minute winter	8	11	111.402	0.202	169.7	0.6654	0.0000	OK
15 minute summer	9	11	110.797	0.547	163.3	0.6187	0.0000	OK
15 minute winter	11	10	110.741	0.591	246.5	1.3179	0.0000	OK
15 minute winter	12	10	110.732	0.592	261.6	0.6698	0.0000	OK
240 minute winter	13	188	110.435	0.315	35.2	133.0298	0.0000	SURCHARGED
240 minute winter	14	188	110.078	0.078	9.1	0.0000	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	29.3	1.729	0.182	0.8084	
15 minute winter	2	1.001	3	54.9	1.094	0.195	0.7273	
15 minute winter	3	1.002	4	67.1	1.465	0.265	1.0071	
15 minute winter	4	1.003	5	71.3	1.946	0.163	0.6157	
15 minute winter	5	1.004	6	88.4	1.844	0.253	1.1107	
15 minute winter	6	1.005	7	115.2	2.008	0.218	1.5175	
15 minute winter	7	1.006	8	137.2	1.951	0.383	1.7860	
15 minute winter	8	1.007	9	170.3	2.258	0.426	5.3467	
15 minute summer	9	1.008	11	193.3	0.939	0.614	12.7620	
15 minute winter	11	1.010	12	261.6	1.197	1.199	2.7350	
15 minute winter	12	1.011	13	276.3	2.583	1.365	3.2042	
240 minute winter	13	1.012	14	9.1	0.724	0.270	0.3545	162.7

Results for 30 year +10% A Critical Storm Duration. Lowest mass balance: 99.62%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	114.381	0.126	57.1	0.3968	0.0000	OK
15 minute winter	2	10	113.336	0.226	105.3	0.5405	0.0000	OK
15 minute winter	3	10	113.242	0.241	129.3	0.4288	0.0000	OK
15 minute winter	4	11	113.057	0.192	134.7	0.2523	0.0000	OK
15 minute winter	5	10	112.727	0.242	166.5	0.4737	0.0000	OK
15 minute winter	6	10	112.427	0.212	218.4	0.5479	0.0000	OK
15 minute winter	7	11	111.840	0.328	259.5	0.7606	0.0000	OK
15 minute summer	8	10	111.546	0.346	309.1	1.1424	0.0000	OK
15 minute winter	9	9	111.171	0.921	327.8	1.0411	0.0000	FLOOD RISK
15 minute winter	11	9	111.022	0.872	368.1	1.9441	0.0000	SURCHARGED
15 minute winter	12	9	110.963	0.823	375.8	0.9306	0.0000	SURCHARGED
240 minute winter	13	236	110.702	0.582	62.7	272.0404	0.0000	SURCHARGED
360 minute winter	14	528	110.079	0.079	9.3	0.0000	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	55.9	2.051	0.347	1.2988	
15 minute winter	2	1.001	3	104.6	1.258	0.371	1.2038	
15 minute winter	3	1.002	4	127.9	1.701	0.505	1.6518	
15 minute winter	4	1.003	5	135.1	2.277	0.309	0.9967	
15 minute winter	5	1.004	6	167.7	2.096	0.480	1.8536	
15 minute winter	6	1.005	7	219.0	2.205	0.414	2.5973	
15 minute winter	7	1.006	8	261.2	2.112	0.728	3.1547	
15 minute summer	8	1.007	9	313.1	2.334	0.784	7.5959	
15 minute winter	9	1.008	11	340.3	1.229	1.081	13.2969	
15 minute winter	11	1.010	12	375.8	1.496	1.722	2.7424	
15 minute winter	12	1.011	13	397.1	2.847	1.962	3.6212	
240 minute winter	13	1.012	14	9.3	0.728	0.275	0.3600	218.5

Results for 100 year +40% CC +10% A Critical Storm Duration. Lowest mass balance: 99.62%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	12	114.464	0.209	103.7	0.6604	0.0000	OK
15 minute winter	2	12	114.198	1.088	194.1	2.5995	0.0000	SURCHARGED
15 minute winter	3	12	114.136	1.136	211.6	2.0169	0.0000	SURCHARGED
15 minute winter	4	12	114.013	1.148	216.0	1.5111	0.0000	SURCHARGED
15 minute winter	5	12	113.898	1.413	270.2	2.7657	0.0000	SURCHARGED
15 minute winter	6	12	113.679	1.464	335.8	3.7837	0.0000	SURCHARGED
15 minute winter	7	12	113.272	1.760	398.8	4.0803	0.0000	FLOOD RISK
15 minute winter	8	12	112.711	1.511	503.4	4.9900	0.0000	FLOOD RISK
15 minute summer	9	8	111.299	1.049	483.0	1.1866	0.0000	FLOOD RISK
480 minute winter	11	464	111.190	1.040	69.1	2.3187	0.0000	SURCHARGED
480 minute winter	12	456	111.191	1.051	69.3	1.1888	0.0000	FLOOD RISK
360 minute winter	13	352	111.189	1.069	85.4	587.9847	0.0000	SURCHARGED
15 minute summer	14	138	110.079	0.079	9.3	0.0000	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	104.2	2.256	0.647	2.9279	
15 minute winter	2	1.001	3	169.4	1.371	0.602	2.2930	
15 minute winter	3	1.002	4	204.3	1.825	0.806	3.4702	
15 minute winter	4	1.003	5	215.3	2.206	0.493	2.6606	
15 minute winter	5	1.004	6	262.8	2.033	0.752	3.6665	
15 minute winter	6	1.005	7	336.6	2.126	0.636	4.1732	
15 minute winter	7	1.006	8	401.3	2.533	1.119	4.0218	
15 minute winter	8	1.007	9	499.2	3.151	1.250	8.3224	
15 minute summer	9	1.008	11	483.4	1.716	1.535	13.2969	
480 minute winter	11	1.010	12	69.3	0.454	0.318	2.7424	
480 minute winter	12	1.011	13	68.5	0.920	0.339	6.3628	
360 minute winter	13	1.012	14	9.3	0.728	0.275	0.3597	265.2