

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)	17.000	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	x

D AND CG Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
299	1200	599	1500	1199	2100
449	1350	899	1800	1800	2700

>1800 Link+900 mm

SW CIRCULAR Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

225	375	525	750	900	1200	1500
300	450	600	825	1050	1350	1800

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
20	0.116	5.00	45.525	2400	386291.920	397019.620	2.099
21	0.063	5.00	45.825	2400	386288.109	397047.731	2.471
22	0.032	5.00	46.106	2400	386286.291	397065.152	2.796
23	0.024	5.00	46.204	2400	386280.152	397069.619	2.913
24	0.099	5.00	46.308	2700	386258.553	397142.233	3.011
25	0.106	5.00	46.110	2700	386264.071	397097.333	2.928
26	0.130	5.00	46.272	2700	386267.003	397068.137	3.164
28	0.095	5.00	46.113	1800	386201.076	397131.262	1.955
29	0.093	5.00	45.587	1800	386205.349	397089.201	1.609
30	0.053	5.00	45.951	1800	386208.318	397066.317	2.071
HB3	0.075	5.00	46.028	2700	386208.414	397061.250	3.070
104			45.941	1800	386200.733	397060.329	3.003

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	20	21	28.368	0.600	43.426	43.354	0.072	394.0	1050	5.27	50.0
1.001	21	22	17.516	0.600	43.354	43.310	0.044	398.1	1050	5.44	50.0
1.002	22	23	7.592	0.600	43.310	43.291	0.019	399.6	1050	5.52	50.0
1.003	23	26	13.232	0.600	43.291	43.258	0.033	401.0	1050	5.65	50.0
2.000	24	25	45.238	0.600	43.297	43.182	0.115	393.4	1200	5.40	50.0
2.001	25	26	29.343	0.600	43.182	43.108	0.074	396.5	1200	5.66	50.0
1.004	26	HB3	58.992	0.600	43.108	42.958	0.150	393.3	1200	6.19	50.0
3.000	28	29	42.277	0.600	44.158	43.978	0.180	234.9	300	5.69	50.0
3.001	29	30	23.076	0.600	43.978	43.880	0.098	235.5	300	6.07	50.0
3.002	30	HB3	5.068	0.600	43.880	43.858	0.022	230.4	300	6.15	50.0
1.005	HB3	104	7.736	0.600	42.958	42.938	0.020	386.8	600	6.29	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	1.730	1497.7	15.7	1.049	1.421	0.116	0.0	74	0.586
1.001	1.721	1489.9	24.3	1.421	1.746	0.179	0.0	91	0.664
1.002	1.717	1487.1	28.6	1.746	1.863	0.211	0.0	99	0.696
1.003	1.714	1484.5	31.8	1.863	1.964	0.235	0.0	104	0.717
2.000	1.880	2126.0	13.4	1.811	1.728	0.099	0.0	67	0.549
2.001	1.872	2117.4	27.8	1.728	1.964	0.205	0.0	93	0.678
1.004	1.880	2126.2	77.2	1.964	1.870	0.570	0.0	153	0.921
3.000	1.021	72.2	12.9	1.655	1.309	0.095	0.0	85	0.776
3.001	1.020	72.1	25.5	1.309	1.771	0.188	0.0	123	0.934
3.002	1.031	72.9	32.7	1.771	1.870	0.241	0.0	141	1.005
1.005	1.232	348.3	120.1	2.470	2.403	0.886	0.0	242	1.123

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	28.368	394.0	1050	SW CIRCULAR	45.525	43.426	1.049	45.825	43.354	1.421
1.001	17.516	398.1	1050	SW CIRCULAR	45.825	43.354	1.421	46.106	43.310	1.746
1.002	7.592	399.6	1050	SW CIRCULAR	46.106	43.310	1.746	46.204	43.291	1.863
1.003	13.232	401.0	1050	SW CIRCULAR	46.204	43.291	1.863	46.272	43.258	1.964
2.000	45.238	393.4	1200	SW CIRCULAR	46.308	43.297	1.811	46.110	43.182	1.728
2.001	29.343	396.5	1200	SW CIRCULAR	46.110	43.182	1.728	46.272	43.108	1.964
1.004	58.992	393.3	1200	SW CIRCULAR	46.272	43.108	1.964	46.028	42.958	1.870
3.000	42.277	234.9	300	SW CIRCULAR	46.113	44.158	1.655	45.587	43.978	1.309
3.001	23.076	235.5	300	SW CIRCULAR	45.587	43.978	1.309	45.951	43.880	1.771

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	20	2400	Manhole	D AND CG	21	2400	Manhole	D AND CG
1.001	21	2400	Manhole	D AND CG	22	2400	Manhole	D AND CG
1.002	22	2400	Manhole	D AND CG	23	2400	Manhole	D AND CG
1.003	23	2400	Manhole	D AND CG	26	2700	Manhole	D AND CG
2.000	24	2700	Manhole	D AND CG	25	2700	Manhole	D AND CG
2.001	25	2700	Manhole	D AND CG	26	2700	Manhole	D AND CG
1.004	26	2700	Manhole	D AND CG	HB3	2700	Manhole	D AND CG
3.000	28	1800	Manhole	D AND CG	29	1800	Manhole	D AND CG
3.001	29	1800	Manhole	D AND CG	30	1800	Manhole	D AND CG

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)
3.002	5.068	230.4	300	SW CIRCULAR	45.951	43.880	1.771	46.028	43.858	1.870
1.005	7.736	386.8	600	SW CIRCULAR	46.028	42.958	2.470	45.941	42.938	2.403

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
3.002	30	1800	Manhole	D AND CG	HB3	2700	Manhole	D AND CG
1.005	HB3	2700	Manhole	D AND CG	104	1800	Manhole	D AND CG

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	17.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	2 year (l/s)	25.0
Summer CV	0.750	30 year (l/s)	25.0
Winter CV	0.840	100 year (l/s)	25.0
Analysis Speed	Detailed	Check Discharge Volume	x
Skip Steady State	✓		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	45	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		

Node HB3 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	42.958	Product Number	CTL-SHE-0199-2500-2400-2500
Design Depth (m)	2.400	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	25.0	Min Node Diameter (mm)	1800

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year 15 minute summer	119.760	33.888	30 year 360 minute summer	26.939	6.932
2 year 15 minute winter	84.042	33.888	30 year 360 minute winter	17.511	6.932
2 year 30 minute summer	77.518	21.935	30 year 480 minute summer	20.981	5.545
2 year 30 minute winter	54.399	21.935	30 year 480 minute winter	13.940	5.545
2 year 60 minute summer	51.720	13.668	30 year 600 minute summer	17.039	4.661
2 year 60 minute winter	34.361	13.668	30 year 600 minute winter	11.642	4.661
2 year 120 minute summer	31.549	8.338	30 year 720 minute summer	15.093	4.045
2 year 120 minute winter	20.961	8.338	30 year 720 minute winter	10.143	4.045
2 year 180 minute summer	24.133	6.210	30 year 960 minute summer	12.278	3.233
2 year 180 minute winter	15.687	6.210	30 year 960 minute winter	8.133	3.233
2 year 240 minute summer	19.039	5.032	30 year 1440 minute summer	8.788	2.355
2 year 240 minute winter	12.649	5.032	30 year 1440 minute winter	5.906	2.355
2 year 360 minute summer	14.516	3.735	100 year +45% CC 15 minute summer	423.061	119.712
2 year 360 minute winter	9.436	3.735	100 year +45% CC 15 minute winter	296.885	119.712
2 year 480 minute summer	11.436	3.022	100 year +45% CC 30 minute summer	278.374	78.770
2 year 480 minute winter	7.598	3.022	100 year +45% CC 30 minute winter	195.350	78.770
2 year 600 minute summer	9.363	2.561	100 year +45% CC 60 minute summer	187.417	49.529
2 year 600 minute winter	6.398	2.561	100 year +45% CC 60 minute winter	124.515	49.529
2 year 720 minute summer	8.339	2.235	100 year +45% CC 120 minute summer	114.312	30.209
2 year 720 minute winter	5.605	2.235	100 year +45% CC 120 minute winter	75.946	30.209
2 year 960 minute summer	6.846	1.803	100 year +45% CC 180 minute summer	86.951	22.375
2 year 960 minute winter	4.535	1.803	100 year +45% CC 180 minute winter	56.520	22.375
2 year 1440 minute summer	4.967	1.331	100 year +45% CC 240 minute summer	68.114	18.001
2 year 1440 minute winter	3.338	1.331	100 year +45% CC 240 minute winter	45.253	18.001
30 year 15 minute summer	226.195	64.005	100 year +45% CC 360 minute summer	51.133	13.158
30 year 15 minute winter	158.733	64.005	100 year +45% CC 360 minute winter	33.238	13.158
30 year 30 minute summer	147.452	41.724	100 year +45% CC 480 minute summer	39.658	10.480
30 year 30 minute winter	103.475	41.724	100 year +45% CC 480 minute winter	26.348	10.480
30 year 60 minute summer	98.615	26.061	100 year +45% CC 600 minute summer	32.099	8.780
30 year 60 minute winter	65.517	26.061	100 year +45% CC 600 minute winter	21.932	8.780
30 year 120 minute summer	59.946	15.842	100 year +45% CC 720 minute summer	28.365	7.602
30 year 120 minute winter	39.827	15.842	100 year +45% CC 720 minute winter	19.063	7.602
30 year 180 minute summer	45.598	11.734	100 year +45% CC 960 minute summer	22.984	6.052
30 year 180 minute winter	29.640	11.734	100 year +45% CC 960 minute winter	15.225	6.052
30 year 240 minute summer	35.759	9.450	100 year +45% CC 1440 minute summer	16.353	4.383
30 year 240 minute winter	23.758	9.450	100 year +45% CC 1440 minute winter	10.990	4.383

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	20	10	43.503	0.077	17.9	0.4357	0.0000	OK
30 minute winter	21	24	43.479	0.125	21.0	0.6291	0.0000	OK
30 minute winter	22	28	43.476	0.166	24.5	0.7902	0.0000	OK
30 minute winter	23	28	43.474	0.183	26.7	0.8580	0.0000	OK
30 minute winter	24	29	43.476	0.179	14.7	1.1452	0.0000	OK
30 minute winter	25	28	43.473	0.291	35.6	1.8747	0.0000	OK
30 minute winter	26	30	43.471	0.363	45.8	2.3738	0.0000	OK
15 minute winter	28	11	44.247	0.089	14.6	0.3121	0.0000	OK
15 minute winter	29	11	44.114	0.136	28.3	0.5027	0.0000	OK
15 minute winter	30	11	44.045	0.165	35.5	0.5044	0.0000	OK
30 minute winter	HB3	27	43.477	0.519	54.4	3.2241	0.0000	OK
15 minute summer	104	1	42.938	0.000	24.3	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	20	1.000	21	17.3	0.502	0.012	1.0030	
30 minute winter	21	1.001	22	20.7	0.537	0.014	1.2424	
30 minute winter	22	1.002	23	23.9	0.574	0.016	0.7133	
30 minute winter	23	1.003	26	26.2	0.691	0.018	1.4796	
30 minute winter	24	2.000	25	13.7	0.379	0.006	7.0807	
30 minute winter	25	2.001	26	-25.0	0.394	-0.012	7.2511	
30 minute winter	26	1.004	HB3	26.6	0.291	0.013	22.1804	
15 minute winter	28	3.000	29	14.1	0.596	0.195	1.0229	
15 minute winter	29	3.001	30	27.8	0.787	0.386	0.8154	
15 minute winter	30	3.002	HB3	35.4	0.965	0.485	0.1859	
30 minute winter	HB3	Hydro-Brake®	104	24.6				81.6

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	20	59	43.750	0.324	17.3	1.8211	0.0000	OK
60 minute winter	21	56	43.751	0.397	25.9	1.9997	0.0000	OK
60 minute winter	22	49	43.749	0.439	26.5	2.0862	0.0000	OK
60 minute winter	23	50	43.749	0.458	25.2	2.1476	0.0000	OK
60 minute winter	24	56	43.752	0.455	21.9	2.9015	0.0000	OK
60 minute winter	25	58	43.752	0.570	34.1	3.6775	0.0000	OK
60 minute winter	26	50	43.748	0.640	43.7	4.1916	0.0000	OK
15 minute winter	28	10	44.283	0.125	27.7	0.4401	0.0000	OK
15 minute winter	29	11	44.194	0.216	54.0	0.8012	0.0000	OK
15 minute winter	30	11	44.124	0.244	66.9	0.7470	0.0000	OK
60 minute winter	HB3	57	43.752	0.794	54.0	4.9349	0.0000	SURCHARGED
15 minute summer	104	1	42.938	0.000	25.0	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)
60 minute winter	20	1.000	21	18.2	0.478	0.012	7.4051	
60 minute winter	21	1.001	22	22.2	0.524	0.015	5.6076	
60 minute winter	22	1.002	23	22.2	0.544	0.015	2.6678	
60 minute winter	23	1.003	26	21.9	0.659	0.015	5.0045	
60 minute winter	24	2.000	25	18.4	0.333	0.009	20.6325	
60 minute winter	25	2.001	26	17.1	0.305	0.008	16.6991	
60 minute winter	26	1.004	HB3	35.7	0.280	0.017	41.3322	
15 minute winter	28	3.000	29	26.9	0.671	0.372	1.7334	
15 minute winter	29	3.001	30	52.4	0.903	0.727	1.3371	
15 minute winter	30	3.002	HB3	66.9	1.192	0.918	0.2835	
60 minute winter	HB3	Hydro-Brake®	104	25.0				194.1

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	20	112	44.955	1.529	20.4	8.6063	0.0000	SURCHARGED
120 minute winter	21	116	44.956	1.602	24.1	8.0652	0.0000	SURCHARGED
120 minute winter	22	116	44.957	1.647	20.8	7.8302	0.0000	SURCHARGED
120 minute winter	23	116	44.958	1.667	18.1	7.8164	0.0000	SURCHARGED
120 minute winter	24	116	44.963	1.666	19.9	10.6328	0.0000	SURCHARGED
120 minute winter	25	114	44.960	1.778	33.8	11.4704	0.0000	SURCHARGED
120 minute winter	26	116	44.959	1.851	44.6	12.1175	0.0000	SURCHARGED
120 minute winter	28	116	44.960	0.802	16.7	2.8207	0.0000	SURCHARGED
120 minute winter	29	116	44.958	0.980	33.0	3.6277	0.0000	SURCHARGED
120 minute winter	30	116	44.959	1.079	42.3	3.2996	0.0000	SURCHARGED
120 minute winter	HB3	116	44.959	2.001	55.5	12.4363	0.0000	SURCHARGED
15 minute summer	104	1	42.938	0.000	25.0	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)
120 minute winter	20	1.000	21	13.9	0.437	0.009	24.4713	
120 minute winter	21	1.001	22	15.8	0.472	0.011	15.1099	
120 minute winter	22	1.002	23	14.9	0.481	0.010	6.5491	
120 minute winter	23	1.003	26	14.4	0.568	0.010	11.4144	
120 minute winter	24	2.000	25	-11.1	0.275	-0.005	50.9701	
120 minute winter	25	2.001	26	16.3	0.296	0.008	33.0610	
120 minute winter	26	1.004	HB3	21.3	0.277	0.010	66.4668	
120 minute winter	28	3.000	29	16.7	0.605	0.231	2.9771	
120 minute winter	29	3.001	30	33.0	0.815	0.457	1.6250	
120 minute winter	30	3.002	HB3	42.3	1.019	0.580	0.3569	
120 minute winter	HB3	Hydro-Brake®	104	25.0				449.3