

Design Settings

Rainfall Methodology	FSR	CV	0.750	Minimum Backdrop Height (m)	1.000
Return Period (years)	100	Time of Entry (mins)	5.00	Preferred Cover Depth (m)	0.900
Additional Flow (%)	40	Maximum Time of Concentration (mins)	30.00	Include Intermediate Ground	✓
FSR Region	England and Wales	Maximum Rainfall (mm/hr)	50.0	Enforce best practice design rules	x
M5-60 (mm)	17.000	Minimum Velocity (m/s)	1.00		
Ratio-R	0.300	Connection Type	Level Soffits		

1 STANDARD Link Type

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

Available Diameters (mm)
100 | 150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.065	5.00	91.095	1200	298993.330	516085.657	1.125
2	0.073	5.00	91.240	1350	299013.436	516102.976	1.501
3	0.163	5.00	91.750	1350	298969.455	516155.544	2.367
4	0.190	5.00	91.046	1200	298965.206	516076.629	1.200
5	0.075	5.00	90.945	1200	298943.492	516101.855	1.235
6			90.925	1350	298926.853	516121.105	1.786
7	0.094	5.00	90.510	1350	298915.382	516111.185	1.409
8			90.122	1500	298900.912	516127.387	1.350
9	0.426	5.00	88.775	1350	298869.774	516070.153	1.350
10			89.695	1350	298904.035	516100.778	2.383
11			89.225	1800	298889.703	516117.694	2.136
11_OUT			89.090	1350	298887.157	516115.507	2.021

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	26.537	0.600	89.970	89.814	0.156	170.0	225	5.44	50.0
1.001	2	3	68.540	0.600	89.739	89.458	0.281	244.0	300	6.58	50.0
1.002	3	6	54.781	0.600	89.383	89.214	0.169	324.1	375	7.50	50.0
2.000	4	5	33.284	0.600	89.846	89.710	0.136	244.7	300	5.55	50.0
2.001	5	6	25.444	0.600	89.710	89.289	0.421	60.4	300	5.76	50.0
1.003	6	7	15.165	0.600	89.139	89.101	0.038	399.1	450	7.75	50.0
1.004	7	8	21.723	0.600	89.101	88.772	0.329	66.0	450	7.89	50.0
1.005	8	11	14.819	0.600	88.772	88.100	0.672	22.1	225	7.98	50.0
3.000	9	10	45.953	0.600	87.425	87.312	0.113	406.7	450	5.76	50.0
3.001	10	11	22.171	0.600	87.312	87.164	0.148	150.0	150	6.22	50.0
1.006	11	11_OUT	3.356	0.600	87.089	87.069	0.020	170.0	225	8.03	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	1.000	39.7	12.3	0.900	1.201	0.065	0.0	86	0.883
1.001	1.002	70.8	26.2	1.201	1.992	0.138	0.0	126	0.929
1.002	1.001	110.5	57.1	1.992	1.336	0.301	0.0	192	1.009
2.000	1.000	70.7	36.0	0.900	0.935	0.190	0.0	151	1.004
2.001	2.026	143.2	50.3	0.935	1.336	0.265	0.0	123	1.855
1.003	1.011	160.8	107.4	1.336	0.959	0.566	0.0	269	1.080
1.004	2.505	398.3	125.2	0.959	0.900	0.660	0.0	173	2.228
1.005	2.798	111.3	125.2	1.125	0.900	0.660	0.0	225	2.849
3.000	1.002	159.3	80.8	0.900	1.933	0.426	0.0	227	1.006
3.001	0.818	14.5	80.8	2.233	1.911	0.426	0.0	150	0.833
1.006	1.000	39.7	206.1	1.911	1.796	1.086	0.0	225	1.018

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	26.537	170.0	225	1 STANDARD	91.095	89.970	0.900	91.240	89.814	1.201
1.001	68.540	244.0	300	1 STANDARD	91.240	89.739	1.201	91.750	89.458	1.992
1.002	54.781	324.1	375	1 STANDARD	91.750	89.383	1.992	90.925	89.214	1.336
2.000	33.284	244.7	300	1 STANDARD	91.046	89.846	0.900	90.945	89.710	0.935
2.001	25.444	60.4	300	1 STANDARD	90.945	89.710	0.935	90.925	89.289	1.336
1.003	15.165	399.1	450	1 STANDARD	90.925	89.139	1.336	90.510	89.101	0.959
1.004	21.723	66.0	450	1 STANDARD	90.510	89.101	0.959	90.122	88.772	0.900
1.005	14.819	22.1	225	1 STANDARD	90.122	88.772	1.125	89.225	88.100	0.900
3.000	45.953	406.7	450	1 STANDARD	88.775	87.425	0.900	89.695	87.312	1.933
3.001	22.171	150.0	150	1 STANDARD	89.695	87.312	2.233	89.225	87.164	1.911
1.006	3.356	170.0	225	1 STANDARD	89.225	87.089	1.911	89.090	87.069	1.796

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	1 STANDARD	2	1350	Manhole	1 STANDARD
1.001	2	1350	Manhole	1 STANDARD	3	1350	Manhole	1 STANDARD
1.002	3	1350	Manhole	1 STANDARD	6	1350	Manhole	1 STANDARD
2.000	4	1200	Manhole	1 STANDARD	5	1200	Manhole	1 STANDARD
2.001	5	1200	Manhole	1 STANDARD	6	1350	Manhole	1 STANDARD
1.003	6	1350	Manhole	1 STANDARD	7	1350	Manhole	1 STANDARD
1.004	7	1350	Manhole	1 STANDARD	8	1500	Manhole	1 STANDARD
1.005	8	1500	Manhole	1 STANDARD	11	1800	Manhole	1 STANDARD
3.000	9	1350	Manhole	1 STANDARD	10	1350	Manhole	1 STANDARD
3.001	10	1350	Manhole	1 STANDARD	11	1800	Manhole	1 STANDARD
1.006	11	1800	Manhole	1 STANDARD	11_OUT	1350	Manhole	1 STANDARD

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	298993.330	516085.657	91.095	1.125	1200		0	1.000	89.970	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
2	299013.436	516102.976	91.240	1.501	1350		1	1.000	89.814	225
3	298969.455	516155.544	91.750	2.367	1350		0	1.001	89.739	300
							1	1.001	89.458	300
4	298965.206	516076.629	91.046	1.200	1200		0	1.002	89.383	375
							0	2.000	89.846	300
5	298943.492	516101.855	90.945	1.235	1200		1	2.000	89.710	300
							0	2.001	89.710	300
6	298926.853	516121.105	90.925	1.786	1350		1	2.001	89.289	300
							2	1.002	89.214	375
7	298915.382	516111.185	90.510	1.409	1350		0	1.003	89.139	450
							1	1.003	89.101	450
8	298900.912	516127.387	90.122	1.350	1500		0	1.004	89.101	450
							1	1.004	88.772	450
9	298869.774	516070.153	88.775	1.350	1350		0	1.005	88.772	225
							0	3.000	87.425	450
10	298904.035	516100.778	89.695	2.383	1350		1	3.000	87.312	450
							0	3.001	87.312	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
11	298889.703	516117.694	89.225	2.136	1800		1	3.001	87.164	150
							2	1.005	88.100	225
							0	1.006	87.089	225
11_OUT	298887.157	516115.507	89.090	2.021	1350		1	1.006	87.069	225

Simulation Settings

Rainfall Methodology	FSR	Ratio-R	0.300	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
FSR Region	England and Wales	Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
M5-60 (mm)	17.000	Winter CV	0.840	Drain Down Time (mins)	240	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 %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0	30	0	0	0	100	40	0	0

Node 10 Online Hydro-Brake® Control

Flap Valve	x	Design Flow (l/s)	8.0	Min Outlet Diameter (m)	0.150
Replaces Downstream Link	✓	Objective	(HE) Minimise upstream storage	Min Node Diameter (mm)	1200
Invert Level (m)	87.312	Sump Available	✓		
Design Depth (m)	1.500	Product Number	CTL-SHE-0124-8000-1500-8000		

Node 8 Online Hydro-Brake® Control

Flap Valve	x	Design Flow (l/s)	12.3	Min Outlet Diameter (m)	0.225
Replaces Downstream Link	✓	Objective	(HE) Minimise upstream storage	Min Node Diameter (mm)	1500
Invert Level (m)	88.772	Sump Available	✓		
Design Depth (m)	1.350	Product Number	CTL-SHE-0155-1230-1350-1230		

Node 7 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	89.101
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	216

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	255.0	0.0	1.000	255.0	0.0	1.001	0.0	0.0

Node 10 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	87.312
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	268

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	180.0	0.0	1.000	180.0	0.0	1.001	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	90.034	0.064	7.1	0.1466	0.0000	OK
15 minute winter	2	11	89.829	0.090	14.6	0.2165	0.0000	OK
15 minute winter	3	11	89.518	0.135	30.2	0.3778	0.0000	OK
15 minute winter	4	10	89.959	0.113	20.6	0.4837	0.0000	OK
15 minute winter	5	11	89.803	0.093	28.2	0.2186	0.0000	OK
15 minute summer	6	10	89.316	0.177	54.2	0.2540	0.0000	OK
60 minute winter	7	49	89.229	0.128	50.8	31.3222	0.0000	OK
120 minute winter	8	94	89.327	0.555	53.4	0.9806	0.0000	SURCHARGED
15 minute winter	9	8	87.658	0.233	46.2	1.8011	0.0000	OK
120 minute winter	10	88	87.474	0.162	17.4	27.9154	0.0000	SURCHARGED
180 minute winter	11	120	87.212	0.123	19.1	0.3139	0.0000	OK
180 minute winter	11_OUT	120	87.177	0.108	19.1	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)
15 minute winter	1	1.000	2	6.8	0.746	0.172	0.2427	
15 minute winter	2	1.001	3	13.6	0.785	0.192	1.1989	
15 minute winter	3	1.002	6	29.3	0.883	0.265	1.8227	
15 minute winter	4	2.000	5	20.1	0.946	0.284	0.7073	
15 minute winter	5	2.001	6	28.1	1.552	0.196	0.4602	
15 minute winter	6	1.003	7	57.4	1.809	0.357	0.5184	
60 minute winter	7	1.004	8	62.1	0.565	0.156	2.1072	
60 minute winter	8	Hydro-Brake®	11	12.3				
15 minute winter	9	3.000	10	53.1	1.677	0.333	1.9230	
120 minute winter	10	Hydro-Brake®	11	6.8				
180 minute winter	11	1.006	11_OUT	19.1	0.926	0.480	0.0691	144.3

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	90.075	0.105	17.2	0.2412	0.0000	OK
15 minute winter	2	10	89.890	0.151	35.9	0.3632	0.0000	OK
15 minute winter	3	11	89.619	0.236	77.5	0.6638	0.0000	OK
15 minute winter	4	10	90.035	0.189	50.2	0.8115	0.0000	OK
15 minute winter	5	11	89.865	0.155	68.9	0.3642	0.0000	OK
120 minute winter	6	112	89.535	0.396	55.1	0.5674	0.0000	OK
120 minute winter	7	112	89.535	0.434	91.3	106.4379	0.0000	OK
120 minute winter	8	104	89.549	0.777	61.1	1.3729	0.0000	SURCHARGED
180 minute winter	9	140	87.748	0.323	31.4	2.4988	0.0000	OK
180 minute winter	10	140	87.748	0.436	29.6	75.1216	0.0000	SURCHARGED
720 minute winter	11	450	87.216	0.127	19.9	0.3229	0.0000	OK
720 minute winter	11_OUT	450	87.180	0.111	19.9	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	1	1.000	2	16.7	0.946	0.419	0.4699	
15 minute winter	2	1.001	3	35.7	0.965	0.505	2.5387	
15 minute winter	3	1.002	6	76.2	1.142	0.690	3.6580	
15 minute winter	4	2.000	5	49.1	1.177	0.695	1.3881	
15 minute winter	5	2.001	6	68.2	1.942	0.477	0.8944	
15 minute winter	6	1.003	7	144.7	2.204	0.900	1.3193	
360 minute summer	7	1.004	8	64.2	0.546	0.161	3.0814	
600 minute winter	8	Hydro-Brake®	11	12.3				
15 minute winter	9	3.000	10	111.3	1.932	0.699	3.3451	
180 minute winter	10	Hydro-Brake®	11	8.0				
720 minute winter	11	1.006	11_OUT	19.9	0.936	0.501	0.0714	518.4

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.42%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	90.124	0.154	30.9	0.3530	0.0000	OK
180 minute winter	2	176	90.105	0.366	18.7	0.8803	0.0000	SURCHARGED
180 minute winter	3	176	90.105	0.722	40.8	2.0288	0.0000	SURCHARGED
15 minute winter	4	10	90.188	0.342	90.2	1.4700	0.0000	SURCHARGED
180 minute winter	5	176	90.106	0.396	36.0	0.9292	0.0000	SURCHARGED
180 minute winter	6	176	90.106	0.967	70.7	1.3839	0.0000	SURCHARGED
180 minute winter	7	176	90.106	1.005	81.6	245.1519	0.0000	SURCHARGED
180 minute winter	8	176	90.105	1.333	61.4	2.3562	0.0000	FLOOD RISK
240 minute winter	9	224	88.720	1.295	47.6	10.0275	0.0000	FLOOD RISK
240 minute winter	10	224	88.720	1.408	45.5	173.1003	0.0000	SURCHARGED
240 minute winter	11	224	87.216	0.127	20.0	0.3232	0.0000	OK
240 minute winter	11_OUT	224	87.180	0.111	20.0	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	1	1.000	2	29.9	1.071	0.753	0.7566	
15 minute winter	2	1.001	3	62.3	0.989	0.880	4.3726	
15 minute winter	3	1.002	6	132.9	1.210	1.203	6.0029	
15 minute winter	4	2.000	5	87.2	1.264	1.233	2.1667	
15 minute winter	5	2.001	6	121.9	2.083	0.851	1.5677	
15 minute winter	6	1.003	7	252.7	2.426	1.571	2.4022	
15 minute summer	7	1.004	8	65.3	0.753	0.164	3.4271	
15 minute winter	8	Hydro-Brake®	11	12.3				
15 minute winter	9	3.000	10	196.7	2.098	1.235	6.6053	
15 minute winter	10	Hydro-Brake®	11	8.0				
240 minute winter	11	1.006	11_OUT	20.0	0.936	0.502	0.0716	495.5