

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)	18.500	Minimum Backdrop Height (m)	0.200
Ratio-R	0.348	Preferred Cover Depth (m)	0.500
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

1 STANDARD Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
374	1200	749	1500
499	1350	900	1800

>900 Link+900 mm

Max Depth (m)	Diameter (mm)	Max Depth (m)	Diameter (mm)
1.500	1050	99.999	1350

1 STANDARD Link Type

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

Available Diameters (mm)

100 | 150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
✓ RE100	0.012	5.00	71.930	Manhole	1 STANDARD	100	385040.999	402434.196	0.600
✓ 101	0.006	5.00	72.430	Manhole	1 STANDARD	450	385054.576	402457.719	1.372
✓ 102	0.005	5.00	72.390	Manhole	1 STANDARD	450	385082.326	402441.747	1.652
✓ 103	0.005	5.00	72.250	Manhole	1 STANDARD	450	385110.076	402425.776	1.882
✓ RE104	0.007	5.00	74.470	Manhole	1 STANDARD	450	385087.635	402452.158	1.000
✓ 105			72.610	Manhole	1 STANDARD	450	385110.572	402447.853	1.474
✓ 106	0.013	5.00	72.270	Manhole	1 STANDARD	450	385112.649	402445.120	1.350
✓ 107	0.016	5.00	71.650	Manhole	1 STANDARD	450	385120.093	402445.277	1.527
✓ OUTFALL			70.300	Manhole	1 STANDARD	1200	385137.500	402444.623	1.350

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	Velocity Equation	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)	Rain (mm/h)
1.000	RE100	101	27.160	0.600	Colebrook-White	71.330	71.058	0.272	100.0	100	1 STANDARD	5.59	49
1.001	101	102	32.018	0.600	Colebrook-White	71.058	70.738	0.320	100.0	100	1 STANDARD	6.28	42
1.002	102	103	32.018	0.600	Colebrook-White	70.738	70.418	0.320	100.0	100	1 STANDARD	6.98	40
1.003	103	107	21.923	0.600	Colebrook-White	70.368	70.123	0.245	89.5	150	1 STANDARD	7.32	39
2.000	RE104	105	23.338	0.600	Colebrook-White	73.470	71.136	2.334	10.0	100	1 STANDARD	5.16	48
2.001	105	106	3.433	0.600	Colebrook-White	71.136	70.970	0.166	20.7	100	1 STANDARD	5.19	48
2.002	106	107	7.446	0.600	Colebrook-White	70.920	70.300	0.620	12.0	150	1 STANDARD	5.23	48
1.004	107	OUTFALL	17.419	0.600	Colebrook-White	70.123	68.950	1.173	14.9	150	1 STANDARD	7.43	39

Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)	Notes
1.272	0.012	0.0	33	0.629	Velocity is less than the specified minimum Downstream Depth is more than twice the s
1.552	0.018	0.0	40	0.695	Velocity is less than the specified minimum Upstream Depth is more than twice the spe
1.732	0.023	0.0	45	0.733	Velocity is less than the specified minimum Upstream Depth is more than twice the spe
1.732	0.028	0.0	41	0.782	Upstream Depth is more than twice the specified minimum Downstream Depth is more
1.374	0.007	0.0	14	1.231	Downstream Depth is more than twice the specified minimum
1.374	0.007	0.0	18	0.965	Upstream Depth is more than twice the specified minimum Downstream Depth is more
1.200	0.020	0.0	23	1.520	Upstream Depth is more than twice the specified minimum Downstream Depth is more
1.377	0.064	0.0	39	1.892	Upstream Depth is more than twice the specified minimum Downstream Depth is more

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	27.160	100.0	100	1 STANDARD	71.930	71.330	0.500	72.430	71.058	1.272
1.001	32.018	100.0	100	1 STANDARD	72.430	71.058	1.272	72.390	70.738	1.552
1.002	32.018	100.0	100	1 STANDARD	72.390	70.738	1.552	72.250	70.418	1.732
1.003	21.923	89.5	150	1 STANDARD	72.250	70.368	1.732	71.650	70.123	1.377
2.000	23.338	10.0	100	1 STANDARD	74.470	73.470	0.900	72.610	71.136	1.374
2.001	3.433	20.7	100	1 STANDARD	72.610	71.136	1.374	72.270	70.970	1.200
2.002	7.446	12.0	150	1 STANDARD	72.270	70.920	1.200	71.650	70.300	1.200
1.004	17.419	14.9	150	1 STANDARD	71.650	70.123	1.377	70.300	68.950	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	RE100	100	Manhole	1 STANDARD	101	450	Manhole	1 STANDARD
1.001	101	450	Manhole	1 STANDARD	102	450	Manhole	1 STANDARD
1.002	102	450	Manhole	1 STANDARD	103	450	Manhole	1 STANDARD
1.003	103	450	Manhole	1 STANDARD	107	450	Manhole	1 STANDARD
2.000	RE104	450	Manhole	1 STANDARD	105	450	Manhole	1 STANDARD
2.001	105	450	Manhole	1 STANDARD	106	450	Manhole	1 STANDARD
2.002	106	450	Manhole	1 STANDARD	107	450	Manhole	1 STANDARD
1.004	107	450	Manhole	1 STANDARD	OUTFALL	1200	Manhole	1 STANDARD

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections	Link	IL (m)	Dia (mm)	Link Type
100	385040.999	402434.196	71.930	0.600	100	Manhole	1 STANDARD		0	1.000	71.330	100 1 STANDARD
1	385054.576	402457.719	72.430	1.372	450	Manhole	1 STANDARD		1	1.000	71.058	100 1 STANDARD
2	385082.326	402441.747	72.390	1.652	450	Manhole	1 STANDARD		0	1.001	71.058	100 1 STANDARD
3	385110.076	402425.776	72.250	1.882	450	Manhole	1 STANDARD		1	1.001	70.738	100 1 STANDARD
104	385087.635	402452.158	74.470	1.000	450	Manhole	1 STANDARD		0	1.002	70.738	100 1 STANDARD
5	385110.572	402447.853	72.610	1.474	450	Manhole	1 STANDARD		1	1.002	70.418	100 1 STANDARD
6	385112.649	402445.120	72.270	1.350	450	Manhole	1 STANDARD		0	1.003	70.368	150 1 STANDARD
7	385120.093	402445.277	71.650	1.527	450	Manhole	1 STANDARD		0	2.000	73.470	100 1 STANDARD
7	385120.093	402445.277	71.650	1.527	450	Manhole	1 STANDARD		1	2.000	71.136	100 1 STANDARD
7	385120.093	402445.277	71.650	1.527	450	Manhole	1 STANDARD		0	2.001	71.136	100 1 STANDARD
7	385120.093	402445.277	71.650	1.527	450	Manhole	1 STANDARD		1	2.001	70.970	100 1 STANDARD
7	385120.093	402445.277	71.650	1.527	450	Manhole	1 STANDARD		0	2.002	70.920	150 1 STANDARD
7	385120.093	402445.277	71.650	1.527	450	Manhole	1 STANDARD		1	2.002	70.300	150 1 STANDARD
7	385120.093	402445.277	71.650	1.527	450	Manhole	1 STANDARD		2	1.003	70.123	150 1 STANDARD
7	385120.093	402445.277	71.650	1.527	450	Manhole	1 STANDARD		0	1.004	70.123	150 1 STANDARD
7	385120.093	402445.277	71.650	1.527	450	Manhole	1 STANDARD		1	1.004	68.950	150 1 STANDARD

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	18.500	Drain Down Time (mins)	240
Ratio-R	0.348	Additional Storage (m³/ha)	20.0
Summer CV	0.750	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	40	0	0

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

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 (m³)	
Full Bore Velocity	✓		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	96.449	27.292	1 year 1440 minute summer	5.154	1.381
1 year 15 minute winter	67.684	27.292	1 year 1440 minute winter	3.464	1.381
1 year 30 minute summer	64.005	18.111	30 year 15 minute summer	236.029	66.788
1 year 30 minute winter	44.915	18.111	30 year 15 minute winter	165.635	66.788
1 year 60 minute summer	44.383	11.729	30 year 30 minute summer	157.319	44.516
1 year 60 minute winter	29.487	11.729	30 year 30 minute winter	110.399	44.516
1 year 120 minute summer	28.260	7.468	30 year 60 minute summer	107.642	28.447
1 year 120 minute winter	18.775	7.468	30 year 60 minute winter	71.515	28.447
1 year 180 minute summer	22.198	5.712	30 year 120 minute summer	66.830	17.661
1 year 180 minute winter	14.429	5.712	30 year 120 minute winter	44.400	17.661
1 year 240 minute summer	17.859	4.719	30 year 180 minute summer	51.368	13.219
1 year 240 minute winter	11.865	4.719	30 year 180 minute winter	33.390	13.219
1 year 360 minute summer	13.948	3.589	30 year 240 minute summer	40.530	10.711
1 year 360 minute winter	9.066	3.589	30 year 240 minute winter	26.927	10.711
1 year 480 minute summer	11.136	2.943	30 year 360 minute summer	30.813	7.929
1 year 480 minute winter	7.398	2.943	30 year 360 minute winter	20.029	7.929
1 year 600 minute summer	9.224	2.523	30 year 480 minute summer	24.236	6.405
1 year 600 minute winter	6.302	2.523	30 year 480 minute winter	16.102	6.405
1 year 720 minute summer	8.302	2.225	30 year 600 minute summer	19.829	5.424
1 year 720 minute winter	5.579	2.225	30 year 600 minute winter	13.549	5.424
1 year 960 minute summer	6.931	1.825	30 year 720 minute summer	17.660	4.733
1 year 960 minute winter	4.591	1.825	30 year 720 minute winter	11.868	4.733

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year 960 minute summer	14.487	3.815	100 year +40% CC 240 minute summer	74.150	19.596
30 year 960 minute winter	9.597	3.815	100 year +40% CC 240 minute winter	49.263	19.596
30 year 1440 minute summer	10.489	2.811	100 year +40% CC 360 minute summer	55.980	14.406
30 year 1440 minute winter	7.049	2.811	100 year +40% CC 360 minute winter	36.388	14.406
100 year +40% CC 15 minute summer	426.885	120.794	100 year +40% CC 480 minute summer	43.831	11.583
100 year +40% CC 15 minute winter	299.568	120.794	100 year +40% CC 480 minute winter	29.120	11.583
100 year +40% CC 30 minute summer	287.368	81.315	100 year +40% CC 600 minute summer	35.728	9.772
100 year +40% CC 30 minute winter	201.662	81.315	100 year +40% CC 600 minute winter	24.411	9.772
100 year +40% CC 60 minute summer	197.898	52.299	100 year +40% CC 720 minute summer	31.717	8.501
100 year +40% CC 60 minute winter	131.479	52.299	100 year +40% CC 720 minute winter	21.316	8.501
100 year +40% CC 120 minute summer	123.042	32.516	100 year +40% CC 960 minute summer	25.882	6.815
100 year +40% CC 120 minute winter	81.746	32.516	100 year +40% CC 960 minute winter	17.145	6.815
100 year +40% CC 180 minute summer	94.337	24.276	100 year +40% CC 1440 minute summer	18.590	4.982
100 year +40% CC 180 minute winter	61.321	24.276	100 year +40% CC 1440 minute winter	12.494	4.982

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE100	10	71.363	0.033	1.5	0.0136	0.0000	OK
15 minute winter	101	11	71.099	0.041	2.1	0.0101	0.0000	OK
15 minute winter	102	12	70.784	0.046	2.7	0.0102	0.0000	OK
15 minute winter	103	12	70.410	0.042	3.1	0.0090	0.0000	OK
15 minute winter	RE104	10	73.485	0.015	0.9	0.0044	0.0000	OK
15 minute winter	105	11	71.154	0.018	0.9	0.0028	0.0000	OK
15 minute winter	106	10	70.943	0.023	2.4	0.0080	0.0000	OK
15 minute winter	107	11	70.164	0.041	7.3	0.0152	0.0000	OK
15 minute winter	OUTFALL	11	68.990	0.040	7.3	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	RE100	1.000	101	1.4	0.556	0.240	0.0718	
15 minute winter	101	1.001	102	2.1	0.666	0.353	0.1045	
15 minute winter	102	1.002	103	2.6	0.738	0.432	0.1131	
15 minute winter	103	1.003	107	3.1	0.806	0.166	0.0867	
15 minute winter	RE104	2.000	105	0.9	1.071	0.045	0.0191	
15 minute winter	105	2.001	106	0.9	0.927	0.063	0.0032	
15 minute winter	106	2.002	107	2.4	1.466	0.047	0.0122	
15 minute winter	107	1.004	OUTFALL	7.3	1.887	0.157	0.0673	3.6

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE100	10	71.385	0.055	3.6	0.0223	0.0000	OK
15 minute winter	101	11	71.130	0.072	5.3	0.0177	0.0000	OK
15 minute winter	102	12	70.829	0.091	6.6	0.0200	0.0000	OK
15 minute winter	103	12	70.436	0.068	7.5	0.0144	0.0000	OK
15 minute winter	RE104	10	73.492	0.022	2.1	0.0067	0.0000	OK
15 minute winter	105	10	71.164	0.028	2.1	0.0045	0.0000	OK
15 minute winter	106	10	70.956	0.036	6.0	0.0128	0.0000	OK
15 minute winter	107	11	70.191	0.068	17.8	0.0249	0.0000	OK
15 minute winter	OUTFALL	11	69.015	0.065	17.9	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	RE100	1.000	101	3.5	0.683	0.583	0.1403	
15 minute winter	101	1.001	102	5.2	0.803	0.866	0.2134	
15 minute winter	102	1.002	103	6.2	0.875	1.030	0.2280	
15 minute winter	103	1.003	107	7.5	1.016	0.397	0.1686	
15 minute winter	RE104	2.000	105	2.1	1.339	0.108	0.0364	
15 minute winter	105	2.001	106	2.0	1.176	0.153	0.0060	
15 minute winter	106	2.002	107	6.0	1.893	0.116	0.0236	
15 minute winter	107	1.004	OUTFALL	17.9	2.393	0.385	0.1302	8.9

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE100	12	71.667	0.337	6.6	0.1374	0.0000	FLOOD RISK
15 minute winter	101	13	71.500	0.442	8.6	0.1092	0.0000	SURCHARGED
15 minute winter	102	13	71.080	0.342	9.0	0.0752	0.0000	SURCHARGED
15 minute winter	103	11	70.449	0.081	10.3	0.0171	0.0000	OK
15 minute winter	RE104	10	73.500	0.030	3.8	0.0090	0.0000	OK
15 minute winter	105	10	71.176	0.040	3.8	0.0063	0.0000	OK
15 minute winter	106	10	70.970	0.050	10.8	0.0175	0.0000	OK
15 minute winter	107	10	70.215	0.092	29.3	0.0339	0.0000	OK
15 minute winter	OUTFALL	10	69.036	0.086	29.0	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)
15 minute winter	RE100	1.000	101	5.5	0.745	0.904	0.2125	
15 minute winter	101	1.001	102	6.5	0.839	1.082	0.2505	
15 minute winter	102	1.002	103	8.1	1.031	1.335	0.2434	
15 minute winter	103	1.003	107	10.2	1.147	0.542	0.2291	
15 minute winter	RE104	2.000	105	3.8	1.551	0.195	0.0569	
15 minute winter	105	2.001	106	3.7	1.366	0.277	0.0093	
15 minute winter	106	2.002	107	10.8	2.208	0.208	0.0363	
15 minute winter	107	1.004	OUTFALL	29.0	2.675	0.625	0.1893	16.3