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)
40	0.112	5.00	45.631	1800	386165.986	397010.930	1.456
41	0.040	5.00	45.641	1800	386150.617	397028.850	1.366
42	0.019	5.00	45.560	1800	386156.749	397021.508	1.920
43	0.180	5.00	45.941	2700	386207.917	396902.917	3.035
44	0.128	5.00	45.761	2700	386165.172	396947.786	3.011
45	0.051	5.00	45.761	2700	386141.909	396972.921	3.097
46	0.110	5.00	45.615	2700	386123.560	396988.035	3.011
HB4	0.076	5.00	45.927	3000	386136.315	397004.506	3.375
107			45.630	2000	386129.161	397012.817	3.140

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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	40	42	14.043	0.600	44.175	43.640	0.535	26.2	375	5.07	50.0
2.000	41	42	9.566	0.600	44.275	43.640	0.635	15.1	375	5.03	50.0
1.001	42	HB4	26.582	0.600	43.640	43.527	0.113	235.2	375	5.44	50.0
3.000	43	44	61.971	0.600	42.906	42.750	0.156	397.3	1350	5.51	50.0
3.001	44	45	34.248	0.600	42.750	42.664	0.086	398.2	1350	5.80	50.0
3.002	45	46	23.772	0.600	42.664	42.604	0.060	396.2	1350	5.99	50.0
3.003	46	HB4	20.832	0.600	42.604	42.552	0.052	400.6	1350	6.17	50.0
1.002	HB4	107	10.966	0.600	42.552	42.490	0.062	176.9	450	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	3.548	391.9	15.2	1.081	1.545	0.112	0.0	49	1.739
2.000	4.688	517.8	5.4	0.991	1.545	0.040	0.0	27	1.561
1.001	1.177	130.0	23.2	1.545	2.025	0.171	0.0	107	0.896
3.000	2.011	2878.8	24.4	1.685	1.661	0.180	0.0	85	0.642
3.001	2.009	2875.2	41.7	1.661	1.747	0.308	0.0	110	0.753
3.002	2.014	2882.6	48.7	1.747	1.661	0.359	0.0	119	0.790
3.003	2.003	2866.6	63.6	1.661	2.025	0.469	0.0	135	0.851
1.002	1.525	242.6	97.0	2.925	2.690	0.716	0.0	197	1.443

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	14.043	26.2	375	SW CIRCULAR	45.631	44.175	1.081	45.560	43.640	1.545
2.000	9.566	15.1	375	SW CIRCULAR	45.641	44.275	0.991	45.560	43.640	1.545
1.001	26.582	235.2	375	SW CIRCULAR	45.560	43.640	1.545	45.927	43.527	2.025
3.000	61.971	397.3	1350	SW CIRCULAR	45.941	42.906	1.685	45.761	42.750	1.661
3.001	34.248	398.2	1350	SW CIRCULAR	45.761	42.750	1.661	45.761	42.664	1.747
3.002	23.772	396.2	1350	SW CIRCULAR	45.761	42.664	1.747	45.615	42.604	1.661
3.003	20.832	400.6	1350	SW CIRCULAR	45.615	42.604	1.661	45.927	42.552	2.025
1.002	10.966	176.9	450	SW CIRCULAR	45.927	42.552	2.925	45.630	42.490	2.690

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	40	1800	Manhole	D AND CG	42	1800	Manhole	D AND CG
2.000	41	1800	Manhole	D AND CG	42	1800	Manhole	D AND CG
1.001	42	1800	Manhole	D AND CG	HB4	3000	Manhole	D AND CG
3.000	43	2700	Manhole	D AND CG	44	2700	Manhole	D AND CG
3.001	44	2700	Manhole	D AND CG	45	2700	Manhole	D AND CG
3.002	45	2700	Manhole	D AND CG	46	2700	Manhole	D AND CG
3.003	46	2700	Manhole	D AND CG	HB4	3000	Manhole	D AND CG
1.002	HB4	3000	Manhole	D AND CG	107	2000	Manhole	D AND CG

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
FSR Region	England and Wales	Skip Steady State	✓
M5-60 (mm)	17.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	✓
Winter CV	0.840	1 year (l/s)	5.2

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Simulation Settings

30 year (l/s)	11.5	Check Discharge Volume	x
100 year (l/s)	15.1		

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	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 HB4 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	42.552	Product Number	CTL-SHE-0108-5200-1000-5200
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.2	Min Node Diameter (mm)	1200

Node HB4 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	43.100	Product Number	CTL-SHE-0107-6600-1900-6600
Design Depth (m)	1.900	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	6.6	Min Node Diameter (mm)	1200

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	92.521	26.180	1 year 240 minute winter	10.165	4.043
1 year 15 minute winter	64.927	26.180	1 year 360 minute summer	11.775	3.030
1 year 30 minute summer	60.022	16.984	1 year 360 minute winter	7.654	3.030
1 year 30 minute winter	42.121	16.984	1 year 480 minute summer	9.342	2.469
1 year 60 minute summer	40.398	10.676	1 year 480 minute winter	6.207	2.469
1 year 60 minute winter	26.839	10.676	1 year 600 minute summer	7.682	2.101
1 year 120 minute summer	24.980	6.602	1 year 600 minute winter	5.249	2.101
1 year 120 minute winter	16.596	6.602	1 year 720 minute summer	6.859	1.838
1 year 180 minute summer	19.271	4.959	1 year 720 minute winter	4.609	1.838
1 year 180 minute winter	12.527	4.959	1 year 960 minute summer	5.653	1.489
1 year 240 minute summer	15.301	4.043	1 year 960 minute winter	3.745	1.489

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Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 1440 minute summer	4.127	1.106	30 year 1440 minute winter	5.906	2.355
1 year 1440 minute winter	2.773	1.106	100 year +45% CC 15 minute summer	423.061	119.712
30 year 15 minute summer	226.195	64.005	100 year +45% CC 15 minute winter	296.885	119.712
30 year 15 minute winter	158.733	64.005	100 year +45% CC 30 minute summer	278.374	78.770
30 year 30 minute summer	147.452	41.724	100 year +45% CC 30 minute winter	195.350	78.770
30 year 30 minute winter	103.475	41.724	100 year +45% CC 60 minute summer	187.417	49.529
30 year 60 minute summer	98.615	26.061	100 year +45% CC 60 minute winter	124.515	49.529
30 year 60 minute winter	65.517	26.061	100 year +45% CC 120 minute summer	114.312	30.209
30 year 120 minute summer	59.946	15.842	100 year +45% CC 120 minute winter	75.946	30.209
30 year 120 minute winter	39.827	15.842	100 year +45% CC 180 minute summer	86.951	22.375
30 year 180 minute summer	45.598	11.734	100 year +45% CC 180 minute winter	56.520	22.375
30 year 180 minute winter	29.640	11.734	100 year +45% CC 240 minute summer	68.114	18.001
30 year 240 minute summer	35.759	9.450	100 year +45% CC 240 minute winter	45.253	18.001
30 year 240 minute winter	23.758	9.450	100 year +45% CC 360 minute summer	51.133	13.158
30 year 360 minute summer	26.939	6.932	100 year +45% CC 360 minute winter	33.238	13.158
30 year 360 minute winter	17.511	6.932	100 year +45% CC 480 minute summer	39.658	10.480
30 year 480 minute summer	20.981	5.545	100 year +45% CC 480 minute winter	26.348	10.480
30 year 480 minute winter	13.940	5.545	100 year +45% CC 600 minute summer	32.099	8.780
30 year 600 minute summer	17.039	4.661	100 year +45% CC 600 minute winter	21.932	8.780
30 year 600 minute winter	11.642	4.661	100 year +45% CC 720 minute summer	28.365	7.602
30 year 720 minute summer	15.093	4.045	100 year +45% CC 720 minute winter	19.063	7.602
30 year 720 minute winter	10.143	4.045	100 year +45% CC 960 minute summer	22.984	6.052
30 year 960 minute summer	12.278	3.233	100 year +45% CC 960 minute winter	15.225	6.052
30 year 960 minute winter	8.133	3.233	100 year +45% CC 1440 minute summer	16.353	4.383
30 year 1440 minute summer	8.788	2.355	100 year +45% CC 1440 minute winter	10.990	4.383

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	40	10	44.222	0.047	13.3	0.1908	0.0000	OK
15 minute winter	41	10	44.301	0.026	4.8	0.0799	0.0000	OK
15 minute winter	42	11	43.741	0.101	20.2	0.2779	0.0000	OK
120 minute winter	43	96	43.052	0.146	6.9	1.0120	0.0000	OK
60 minute winter	44	61	43.051	0.301	21.5	1.9780	0.0000	OK
120 minute winter	45	114	43.051	0.387	9.4	2.3417	0.0000	OK
120 minute winter	46	98	43.052	0.448	7.5	2.8903	0.0000	OK
120 minute winter	HB4	98	43.052	0.500	9.8	3.7611	0.0000	SURCHARGED
15 minute summer	107	1	42.490	0.000	5.2	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	40	1.000	42	13.2	0.886	0.034	0.2223	
15 minute winter	41	2.000	42	4.8	0.399	0.009	0.1295	
15 minute winter	42	1.001	HB4	19.8	0.849	0.152	0.6206	
120 minute winter	43	3.000	44	6.9	0.333	0.002	9.8669	
60 minute winter	44	3.001	45	13.5	0.391	0.005	9.7118	
120 minute winter	45	3.002	46	7.3	0.283	0.003	8.9119	
120 minute winter	46	3.003	HB4	6.0	0.148	0.002	9.3049	
120 minute winter	HB4	Hydro-Brake®	107	5.2				79.3
120 minute winter	HB4	Hydro-Brake®	107	0.0				0.0

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	40	10	44.247	0.072	32.6	0.2946	0.0000	OK
15 minute winter	41	10	44.313	0.038	11.6	0.1204	0.0000	OK
15 minute winter	42	10	43.805	0.165	49.4	0.4536	0.0000	OK
120 minute winter	43	116	43.471	0.565	20.6	3.9065	0.0000	OK
120 minute winter	44	108	43.468	0.718	24.6	4.7244	0.0000	OK
120 minute winter	45	106	43.469	0.805	21.8	4.8731	0.0000	OK
120 minute winter	46	106	43.470	0.866	25.3	5.5887	0.0000	OK
120 minute winter	HB4	112	43.470	0.918	22.7	6.9008	0.0000	SURCHARGED
15 minute summer	107	1	42.490	0.000	5.2	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	40	1.000	42	32.4	1.093	0.083	0.4325	
15 minute winter	41	2.000	42	11.5	0.659	0.022	0.2521	
15 minute winter	42	1.001	HB4	48.5	1.077	0.373	1.1975	
120 minute winter	43	3.000	44	14.8	0.306	0.005	41.3888	
120 minute winter	44	3.001	45	15.4	0.384	0.005	28.3607	
120 minute winter	45	3.002	46	-17.1	0.318	-0.006	22.0256	
120 minute winter	46	3.003	HB4	-15.8	0.167	-0.006	20.8202	
120 minute winter	HB4	Hydro-Brake®	107	5.2				100.1
120 minute winter	HB4	Hydro-Brake®	107	6.0				56.2

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	40	172	45.178	1.003	14.6	4.0955	0.0000	SURCHARGED
180 minute winter	41	172	45.178	0.903	5.2	2.8272	0.0000	SURCHARGED
180 minute winter	42	172	45.178	1.538	22.3	4.2176	0.0000	SURCHARGED
180 minute winter	43	172	45.176	2.270	24.6	15.6932	0.0000	SURCHARGED
180 minute winter	44	172	45.179	2.429	36.4	15.9746	0.0000	SURCHARGED
180 minute winter	45	172	45.179	2.515	23.7	15.2264	0.0000	SURCHARGED
180 minute winter	46	172	45.177	2.573	29.8	16.6130	0.0000	SURCHARGED
180 minute winter	HB4	168	45.176	2.624	32.6	19.7322	0.0000	SURCHARGED
15 minute summer	107	1	42.490	0.000	5.2	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)
180 minute winter	40	1.000	42	14.6	0.888	0.037	1.5489	
180 minute winter	41	2.000	42	5.2	0.398	0.010	1.0551	
180 minute winter	42	1.001	HB4	22.7	0.873	0.175	2.9319	
180 minute winter	43	3.000	44	11.4	0.313	0.004	88.3701	
180 minute winter	44	3.001	45	-19.7	0.400	-0.007	48.8373	
180 minute winter	45	3.002	46	18.6	0.289	0.006	33.8987	
180 minute winter	46	3.003	HB4	21.4	0.172	0.007	29.7062	
180 minute winter	HB4	Hydro-Brake®	107	8.2				149.0
180 minute winter	HB4	Hydro-Brake®	107	6.9				123.9

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