



Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	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

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S2.0	0.024	5.00	51.414	450	385164.796	398978.958	0.750
S1.0	0.015	5.00	51.235	450	385180.664	398967.857	0.750
PERF PIPE START			51.400		385183.838	398961.993	0.982
S1.1	0.038	5.00	51.400	450	385193.181	398941.772	1.205
S2.1	0.000	5.00	50.954	600	385191.741	398935.646	1.215
S3.0	0.055	5.00	51.155	1200	385204.592	398929.054	1.501
S4.0	0.077	5.00	51.027	1200	385228.401	398906.884	1.762
S5.0	0.043	5.00	51.307	1200	385267.852	398929.715	2.270
S6.0			51.458	1200	385261.849	398940.087	2.491
OUTFALL			51.340	1200	385269.298	398944.398	2.459
S4.1			50.857	450	385239.077	398892.033	1.395
RG1	0.035	5.00	50.780		385242.245	398900.407	1.055
RG2	0.018	5.00	52.000		385202.952	398978.424	0.905

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)
2.000	S2.0	S2.1	51.009	0.600	50.664	49.814	0.850	60.0	150	5.65	50.0
1.001	S1.0	PERF PIPE START	6.668	0.600	50.485	50.418	0.067	100.0	150	5.37	50.0
1.002	PERF PIPE START	S1.1	22.275	0.600	50.418	50.195	0.223	100.0	150	5.74	50.0
1.003	S1.1	S2.1	6.293	0.600	50.195	49.815	0.380	16.6	150	5.78	50.0
1.004_1	S2.1	S3.0	14.443	0.600	49.739	49.654	0.085	170.0	225	6.02	50.0
1.005_1	S3.0	S4.0	32.533	0.600	49.654	49.265	0.389	83.6	225	6.40	50.0
1.006	S4.0	S5.0	45.581	0.600	49.265	49.037	0.228	199.9	225	7.23	50.0
1.004	S5.0	S6.0	11.984	0.600	49.037	48.967	0.070	171.2	225	7.43	0.0
1.005	S6.0	OUTFALL	8.607	0.600	48.967	48.881	0.086	100.1	150	7.57	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)
2.000	1.301	23.0	3.3	0.600	0.990	0.024	0.0	38	0.919
1.001	1.005	17.8	4.5	0.600	0.832	0.033	0.0	51	0.838
1.002	1.005	17.8	4.5	0.832	1.055	0.033	0.0	51	0.838
1.003	2.487	44.0	9.6	1.055	0.989	0.071	0.0	48	2.002
1.004_1	1.000	39.7	12.9	0.990	1.276	0.095	0.0	88	0.896
1.005_1	1.431	56.9	20.3	1.276	1.537	0.150	0.0	93	1.313
1.006	0.921	36.6	35.5	1.537	2.045	0.262	0.0	180	1.045
1.004	0.996	39.6	0.0	2.045	2.266	0.305	0.0	0	0.000
1.005	1.004	17.7	0.0	2.341	2.309	0.305	0.0	0	0.000

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)
3.001	S4.1	S4.0	18.290	0.350	49.462	49.339	0.123	148.7	150	5.43	50.0
3.000	RG1	S4.1	8.953	0.600	49.725	49.462	0.263	34.0	150	5.09	50.0
1.000	RG2	S1.0	24.666	0.600	51.095	50.485	0.610	40.4	150	5.26	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)
3.001	0.879	15.5	4.7	1.245	1.538	0.035	0.0	57	0.772
3.000	1.731	30.6	4.7	0.905	1.245	0.035	0.0	40	1.256
1.000	1.587	28.0	2.4	0.755	0.600	0.018	0.0	30	0.972

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)
2.000	51.009	60.0	150	Circular	51.414	50.664	0.600	50.954	49.814	0.990
1.001	6.668	100.0	150	Circular	51.235	50.485	0.600	51.400	50.418	0.832
1.002	22.275	100.0	150	Circular	51.400	50.418	0.832	51.400	50.195	1.055
1.003	6.293	16.6	150	Circular	51.400	50.195	1.055	50.954	49.815	0.989
1.004_1	14.443	170.0	225	Circular	50.954	49.739	0.990	51.155	49.654	1.276
1.005_1	32.533	83.6	225	Circular	51.155	49.654	1.276	51.027	49.265	1.537
1.006	45.581	199.9	225	Circular	51.027	49.265	1.537	51.307	49.037	2.045
1.004	11.984	171.2	225	Circular	51.307	49.037	2.045	51.458	48.967	2.266
1.005	8.607	100.1	150	Circular	51.458	48.967	2.341	51.340	48.881	2.309
3.001	18.290	148.7	150	FilterCarrier	50.857	49.462	1.245	51.027	49.339	1.538
3.000	8.953	34.0	150	Circular	50.780	49.725	0.905	50.857	49.462	1.245
1.000	24.666	40.4	150	Circular	52.000	51.095	0.755	51.235	50.485	0.600

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.000	S2.0	450	Manhole	Adoptable	S2.1	600	Manhole	Adoptable
1.001	S1.0	450	Manhole	Adoptable	PERF PIPE START		Junction	
1.002	PERF PIPE START		Junction		S1.1	450	Manhole	Adoptable
1.003	S1.1	450	Manhole	Adoptable	S2.1	600	Manhole	Adoptable
1.004_1	S2.1	600	Manhole	Adoptable	S3.0	1200	Manhole	Adoptable
1.005_1	S3.0	1200	Manhole	Adoptable	S4.0	1200	Manhole	Adoptable
1.006	S4.0	1200	Manhole	Adoptable	S5.0	1200	Manhole	Adoptable
1.004	S5.0	1200	Manhole	Adoptable	S6.0	1200	Manhole	Adoptable
1.005	S6.0	1200	Manhole	Adoptable	OUTFALL	1200	Manhole	Adoptable
3.001	S4.1	450	Manhole	Adoptable	S4.0	1200	Manhole	Adoptable
3.000	RG1		Junction		S4.1	450	Manhole	Adoptable
1.000	RG2		Junction		S1.0	450	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S2.0	385164.796	398978.958	51.414	0.750	450		0	2.000	50.664	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1.0	385180.664	398967.857	51.235	0.750	450		1 1.000	50.485	150
PERF PIPE START	385183.838	398961.993	51.400	0.982			0 1.001 1 1.001	50.485 50.418	150
S1.1	385193.181	398941.772	51.400	1.205	450		0 1.002 1 1.002	50.418 50.195	150
S2.1	385191.741	398935.646	50.954	1.215	600		0 1.003 1 2.000 2 1.003	50.195 49.814 49.815	150
S3.0	385204.592	398929.054	51.155	1.501	1200		0 1.004_1 1 1.004_1	49.739 49.654	225
S4.0	385228.401	398906.884	51.027	1.762	1200		0 1.005_1 1 3.001 2 1.005_1	49.654 49.339 49.265	225
S5.0	385267.852	398929.715	51.307	2.270	1200		0 1.006 1 1.006	49.265 49.037	225
S6.0	385261.849	398940.087	51.458	2.491	1200		0 1.004 1 1.004	49.037 48.967	225
OUTFALL	385269.298	398944.398	51.340	2.459	1200		0 1.005 1 1.005	48.967 48.881	150
S4.1	385239.077	398892.033	50.857	1.395	450		0 3.000 1 3.001	49.462 49.462	150
RG1	385242.245	398900.407	50.780	1.055			0 3.000	49.725	150
RG2	385202.952	398978.424	52.000	0.905			0 1.000	51.095	150

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
FSR Region	England and Wales	Skip Steady State	x
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)	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	45	0	0

Node S5.0 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	49.037	Product Number	CTL-SHE-0093-5000-1900-5000
Design Depth (m)	1.900	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node S1.1 Online Orifice Control

Flap Valve	x	Invert Level (m)	50.195	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.030		

Node RG1 Online Orifice Control

Flap Valve	x	Replaces Downstream Link	✓	Diameter (m)	0.022
Downstream Link	3.000	Invert Level (m)	49.725	Discharge Coefficient	0.600

Node RG2 Online Orifice Control

Flap Valve	x	Invert Level (m)	51.095	Discharge Coefficient	0.600
Replaces Downstream Link	✓	Diameter (m)	0.022		

Node S2.1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.359
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	128

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	240.0	0.0	0.500	240.0	0.0	0.501	0.0	0.0

Node S2.1 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	2.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	49.814	Surround Shape	Trench
Safety Factor	2.0	Time to half empty (mins)		Diameter (mm)	600

Node S4.0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

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	250.0	0.0	0.300	250.0	0.0	0.301	0.0	0.0

Node S5.0 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	50.890	Slope (1:X)	40.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.300
Safety Factor	2.0	Width (m)	42.500	Inf Depth (m)	
Porosity	0.30	Length (m)	10.000		

Node S1.0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.842
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

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	327.0	0.0	0.300	327.0	0.0	0.301	0.0	0.0

Node S1.1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	51.025
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

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	380.0	0.0	0.300	380.0	0.0	0.301	0.0	0.0

Node RG1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	49.875
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

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	73.0	0.0	0.905	73.0	0.0	0.906	0.0	0.0

Node S4.0 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	3.001
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	49.339	Surround Shape	Trench
Safety Factor	2.0	Time to half empty (mins)		Diameter (mm)	1000

Node RG2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	51.095
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	76



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	47.0	0.0	0.905	47.0	0.0	0.906	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 97.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S2.0	11	50.699	0.035	2.9	0.0282	0.0000	OK
30 minute winter	S1.0	26	50.844	0.359	2.2	0.4926	0.0000	SURCHARGED
30 minute winter	PERF PIPE START	21	50.848	0.430	2.5	0.0000	0.0000	SURCHARGED
30 minute winter	S1.1	24	50.849	0.654	3.5	0.5167	0.0000	SURCHARGED
60 minute winter	S2.1	59	49.902	0.163	2.8	0.1080	0.0000	OK
60 minute winter	S3.0	60	49.902	0.248	6.1	0.4625	0.0000	SURCHARGED
60 minute winter	S4.0	59	49.902	0.637	10.7	3.9289	0.0000	SURCHARGED
60 minute winter	S5.0	59	49.899	0.862	8.2	1.3022	0.0000	SURCHARGED
60 minute winter	S6.0	30	49.020	0.053	4.3	0.0597	0.0000	OK
15 minute winter	OUTFALL	51	48.931	0.050	4.3	0.0000	0.0000	OK
60 minute winter	S4.1	59	49.901	0.439	2.6	0.0698	0.0000	SURCHARGED
60 minute winter	RG1	60	49.958	0.233	2.1	1.9878	0.0000	SURCHARGED
60 minute winter	RG2	48	51.172	0.077	1.1	1.1151	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	S2.0	2.000	S2.1	2.8	0.877	0.120	0.1600	
30 minute winter	S1.0	1.001	PERF PIPE START	1.4	0.533	0.080	0.1174	
30 minute winter	PERF PIPE START	1.002	S1.1	-1.5	0.136	-0.083	0.3921	
30 minute winter	S1.1	Orifice	S2.1	1.5				
60 minute winter	S2.1	1.004_1	S3.0	2.8	0.506	0.070	0.5103	
60 minute winter	S3.0	1.005_1	S4.0	6.1	0.545	0.107	1.2939	
60 minute winter	S4.0	1.006	S5.0	6.5	0.324	0.177	1.8128	
60 minute winter	S5.0	Hydro-Brake®	S6.0	4.3				
60 minute winter	S6.0	1.005	OUTFALL	4.3	0.803	0.241	0.0459	27.3
60 minute winter	S4.1	3.001	S4.0	-2.2	0.385	-0.142	0.3220	
60 minute winter	RG1	Orifice	S4.1	0.4				
60 minute winter	RG2	Orifice	S1.0	0.3				

Results for 30 year Critical Storm Duration. Lowest mass balance: 97.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S2.0	10	50.720	0.056	7.0	0.0448	0.0000	OK
60 minute winter	S1.0	60	50.905	0.420	6.6	6.4420	0.0000	SURCHARGED
60 minute winter	PERF PIPE START	59	50.905	0.487	4.1	0.0000	0.0000	SURCHARGED
15 minute winter	S1.1	10	50.942	0.747	11.1	0.5898	0.0000	SURCHARGED
120 minute winter	S2.1	112	50.371	0.632	6.2	3.7519	0.0000	SURCHARGED
120 minute winter	S3.0	112	50.370	0.716	7.5	1.3354	0.0000	SURCHARGED
120 minute winter	S4.0	112	50.369	1.104	14.3	20.1753	0.0000	SURCHARGED
120 minute winter	S5.0	112	50.367	1.330	5.9	2.0082	0.0000	SURCHARGED
15 minute winter	S6.0	7	49.020	0.053	4.3	0.0597	0.0000	OK
120 minute summer	OUTFALL	50	48.931	0.050	4.3	0.0000	0.0000	OK
120 minute winter	S4.1	112	50.369	0.907	1.2	0.1443	0.0000	SURCHARGED
240 minute winter	RG1	240	50.337	0.612	2.3	10.5408	0.0000	SURCHARGED
120 minute winter	RG2	90	51.307	0.212	1.7	3.0666	0.0000	SURCHARGED

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	S2.0	2.000	S2.1	6.8	1.076	0.298	0.5999	
60 minute winter	S1.0	1.001	PERF PIPE START	-4.1	0.465	-0.229	0.1174	
60 minute winter	PERF PIPE START	1.002	S1.1	-4.1	-0.235	-0.233	0.3921	
15 minute winter	S1.1	Orifice	S2.1	1.6				
120 minute winter	S2.1	1.004_1	S3.0	2.9	0.499	0.073	0.5744	
120 minute winter	S3.0	1.005_1	S4.0	7.2	0.502	0.126	1.2939	
120 minute winter	S4.0	1.006	S5.0	4.8	0.327	0.132	1.8128	
120 minute winter	S5.0	Hydro-Brake®	S6.0	4.3				
15 minute winter	S6.0	1.005	OUTFALL	4.3	0.803	0.241	0.0459	40.0
120 minute winter	S4.1	3.001	S4.0	1.3	0.442	0.082	0.3220	
240 minute winter	RG1	Orifice	S4.1	0.7				
120 minute winter	RG2	Orifice	S1.0	0.5				

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 97.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S2.0	10	50.744	0.080	13.1	0.0640	0.0000	OK
180 minute winter	S1.0	180	51.035	0.550	6.0	19.2639	0.0000	FLOOD RISK
180 minute winter	PERF PIPE START	180	51.035	0.617	3.5	0.0000	0.0000	SURCHARGED
15 minute winter	S1.1	13	51.036	0.841	20.7	2.0308	0.0000	SURCHARGED
180 minute winter	S2.1	176	50.727	0.988	15.9	34.1223	0.0000	FLOOD RISK
180 minute winter	S3.0	176	50.727	1.073	12.4	2.0002	0.0000	SURCHARGED
180 minute winter	S4.0	172	50.726	1.461	17.0	32.6821	0.0000	SURCHARGED
180 minute winter	S5.0	172	50.723	1.686	5.7	2.5463	0.0000	SURCHARGED
180 minute winter	S6.0	172	49.023	0.056	4.7	0.0632	0.0000	OK
180 minute winter	OUTFALL	172	48.934	0.053	4.7	0.0000	0.0000	OK
180 minute winter	S4.1	172	50.726	1.264	0.9	0.2010	0.0000	FLOOD RISK
240 minute winter	RG1	240	50.768	1.043	4.1	20.2498	0.0000	FLOOD RISK
120 minute winter	RG2	96	51.534	0.439	3.2	6.3673	0.0000	SURCHARGED

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	S2.0	2.000	S2.1	12.9	1.189	0.560	0.6932	
180 minute winter	S1.0	1.001	PERF PIPE START	-3.4	0.415	-0.193	0.1174	
180 minute winter	PERF PIPE START	1.002	S1.1	-3.5	-0.199	-0.197	0.3921	
15 minute winter	S1.1	Orifice	S2.1	1.7				
180 minute winter	S2.1	1.004_1	S3.0	-12.0	0.493	-0.303	0.5744	
180 minute winter	S3.0	1.005_1	S4.0	7.9	0.490	0.138	1.2939	
180 minute winter	S4.0	1.006	S5.0	4.7	0.330	0.129	1.8128	
180 minute winter	S5.0	Hydro-Brake®	S6.0	4.7				
180 minute winter	S6.0	1.005	OUTFALL	4.7	0.824	0.267	0.0495	108.2
180 minute winter	S4.1	3.001	S4.0	-0.8	0.380	-0.048	0.3220	
240 minute winter	RG1	Orifice	S4.1	0.5				
120 minute winter	RG2	Orifice	S1.0	0.7				