

### Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	200.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	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)
1	0.064	5.00	92.510	2700	374174.642	437975.439	4.757
2	0.064	5.00	92.176	2700	374179.748	438002.441	4.493
3	0.064	5.00	91.626	2700	374181.023	438024.455	4.000
4	0.064	5.00	89.890	2700	374137.063	438038.673	2.190
5	0.064	5.00	91.180	2700	374180.452	438038.836	3.591
6	0.064	5.00	90.150	2700	374179.766	438082.524	2.672
HBRAKE	0.064	5.00	90.000	2700	374157.406	438082.910	2.579
8	0.000		88.642	1200	374150.757	438099.295	1.325
9			88.000	1200	374146.542	438113.320	0.769

### 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	27.481	0.600	87.753	87.683	0.070	390.0	1050	5.26	59.4
1.001	2	3	22.051	0.600	87.683	87.626	0.057	386.9	1050	5.47	58.5
1.002	3	5	14.392	0.600	87.626	87.589	0.037	387.8	1050	5.61	57.9
2.000	4	5	43.389	0.600	87.700	87.589	0.111	390.0	1050	5.42	58.7
1.003	5	6	43.693	0.600	87.589	87.478	0.111	395.0	1050	6.03	56.2
1.004	6	HBRAKE	22.363	0.600	87.478	87.421	0.057	392.3	1050	6.25	55.4
1.005	HBRAKE	8	17.683	0.600	87.421	87.317	0.104	170.0	225	6.54	54.4
1.006	8	9	14.645	0.600	87.317	87.231	0.086	170.3	225	6.79	53.5

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	1.739	1505.4	10.3	3.707	3.443	0.064	0.0	60	0.517
1.001	1.746	1511.5	20.3	3.443	2.950	0.128	0.0	83	0.635
1.002	1.743	1509.7	30.1	2.950	2.541	0.192	0.0	100	0.714
2.000	1.739	1505.4	10.2	1.140	2.541	0.064	0.0	60	0.517
1.003	1.727	1495.8	48.8	2.541	1.622	0.320	0.0	127	0.818
1.004	1.733	1500.9	57.7	1.622	1.529	0.384	0.0	138	0.860
1.005	1.000	39.7	66.0	2.354	1.100	0.448	0.0	225	1.018
1.006	0.999	39.7	65.0	1.100	0.544	0.448	0.0	225	1.017

### 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	27.481	390.0	1050	Circular	92.510	87.753	3.707	92.176	87.683	3.443
1.001	22.051	386.9	1050	Circular	92.176	87.683	3.443	91.626	87.626	2.950
1.002	14.392	387.8	1050	Circular	91.626	87.626	2.950	91.180	87.589	2.541
2.000	43.389	390.0	1050	Circular	89.890	87.700	1.140	91.180	87.589	2.541
1.003	43.693	395.0	1050	Circular	91.180	87.589	2.541	90.150	87.478	1.622
1.004	22.363	392.3	1050	Circular	90.150	87.478	1.622	90.000	87.421	1.529
1.005	17.683	170.0	225	Circular	90.000	87.421	2.354	88.642	87.317	1.100
1.006	14.645	170.3	225	Circular	88.642	87.317	1.100	88.000	87.231	0.544

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	2700	Manhole	Adoptable	2	2700	Manhole	Adoptable
1.001	2	2700	Manhole	Adoptable	3	2700	Manhole	Adoptable
1.002	3	2700	Manhole	Adoptable	5	2700	Manhole	Adoptable
2.000	4	2700	Manhole	Adoptable	5	2700	Manhole	Adoptable
1.003	5	2700	Manhole	Adoptable	6	2700	Manhole	Adoptable
1.004	6	2700	Manhole	Adoptable	HBRAKE	2700	Manhole	Adoptable
1.005	HBRAKE	2700	Manhole	Adoptable	8	1200	Manhole	Adoptable
1.006	8	1200	Manhole	Adoptable	9	1200	Manhole	Adoptable

### Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m <sup>3</sup> /ha)	20.0
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.300	1 year (l/s)	9.4
Summer CV	0.750	30 year (l/s)	9.4
Winter CV	0.840	100 year (l/s)	9.4
Analysis Speed	Normal	Check Discharge Volume	x
Skip Steady State	✓		

### 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	30	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 HBRAKE Online Hydro-Brake® Control**

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	87.421	Product Number	CTL-SHE-0130-9400-1800-9400
Design Depth (m)	1.800	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	9.4	Min Node Diameter (mm)	1500

**Results for 1 year Critical Storm Duration. Lowest mass balance: 98.74%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
15 minute winter	1	11	87.807	0.054	8.2	0.3213	0.0000	OK
60 minute winter	2	47	87.792	0.109	9.4	0.6554	0.0000	OK
60 minute winter	3	46	87.791	0.165	13.9	0.9959	0.0000	OK
60 minute winter	4	46	87.793	0.093	4.7	0.5862	0.0000	OK
60 minute winter	5	48	87.790	0.201	21.7	1.2228	0.0000	OK
60 minute winter	6	49	87.791	0.313	21.4	1.9442	0.0000	OK
60 minute winter	HBRAKE	49	87.792	0.370	14.3	2.3052	0.0000	SURCHARGED
60 minute winter	8	49	87.394	0.077	9.2	0.0866	0.0000	OK
60 minute winter	9	49	87.304	0.073	9.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )	Discharge Vol (m <sup>3</sup> )
15 minute winter	1	1.000	2	7.9	0.376	0.005	0.5853	
60 minute winter	2	1.001	3	9.3	0.416	0.006	1.4677	
60 minute winter	3	1.002	5	12.7	0.446	0.008	1.4478	
60 minute winter	4	2.000	5	4.6	0.207	0.003	3.2901	
60 minute winter	5	1.003	6	17.2	0.390	0.011	7.2126	
60 minute winter	6	1.004	HBRAKE	10.1	0.214	0.007	5.4542	
60 minute winter	HBRAKE	Hydro-Brake®	8	9.2				
60 minute winter	8	1.006	9	9.2	0.797	0.231	0.1687	48.2

**Results for 30 year Critical Storm Duration. Lowest mass balance: 98.74%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
120 minute winter	1	98	88.106	0.353	7.3	2.1164	0.0000	OK
120 minute winter	2	100	88.106	0.423	11.9	2.5413	0.0000	OK
120 minute winter	3	102	88.105	0.479	14.2	2.8984	0.0000	OK
120 minute winter	4	116	88.105	0.405	10.0	2.5571	0.0000	OK
120 minute winter	5	102	88.105	0.516	19.6	3.1377	0.0000	OK
120 minute winter	6	100	88.105	0.627	17.5	3.8906	0.0000	OK
120 minute winter	HBRAKE	100	88.105	0.684	14.1	4.2562	0.0000	SURCHARGED
15 minute winter	8	16	87.395	0.078	9.4	0.0877	0.0000	OK
30 minute summer	9	40	87.305	0.074	9.4	0.0000	0.0000	OK

  

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )	Discharge Vol (m <sup>3</sup> )
120 minute winter	1	1.000	2	5.9	0.314	0.004	7.9622	
120 minute winter	2	1.001	3	8.4	0.381	0.006	7.8133	
120 minute winter	3	1.002	5	10.1	0.396	0.007	5.7964	
120 minute winter	4	2.000	5	6.9	0.183	0.005	15.7965	
120 minute winter	5	1.003	6	12.2	0.417	0.008	20.9524	
120 minute winter	6	1.004	HBRAKE	10.0	0.227	0.007	12.6666	
120 minute winter	HBRAKE	Hydro-Brake®	8	9.4				
15 minute winter	8	1.006	9	9.4	0.802	0.236	0.1715	64.8

**Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 98.74%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
180 minute winter	1	176	88.773	1.020	9.3	6.1130	0.0000	OK
180 minute winter	2	176	88.772	1.089	15.4	6.5434	0.0000	SURCHARGED
180 minute winter	3	176	88.774	1.148	17.6	6.9437	0.0000	SURCHARGED
180 minute winter	4	176	88.768	1.068	9.6	6.7376	0.0000	SURCHARGED
180 minute winter	5	176	88.765	1.176	21.7	7.1521	0.0000	SURCHARGED
180 minute winter	6	176	88.767	1.289	16.4	7.9984	0.0000	SURCHARGED
180 minute winter	HBRAKE	176	88.766	1.345	14.1	8.3661	0.0000	SURCHARGED
60 minute winter	8	29	87.395	0.078	9.4	0.0877	0.0000	OK
180 minute summer	9	88	87.305	0.074	9.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )	Discharge Vol (m <sup>3</sup> )
180 minute winter	1	1.000	2	6.1	0.280	0.004	23.6105	
180 minute winter	2	1.001	3	8.6	0.334	0.006	19.0220	
180 minute winter	3	1.002	5	10.8	0.350	0.007	12.4151	
180 minute winter	4	2.000	5	5.3	0.164	0.003	37.4289	
180 minute winter	5	1.003	6	11.2	0.422	0.007	37.6912	
180 minute winter	6	1.004	HBRAKE	9.2	0.230	0.006	19.2911	
180 minute winter	HBRAKE	Hydro-Brake®	8	9.4				
60 minute winter	8	1.006	9	9.4	0.802	0.236	0.1715	155.9