

**Design Settings**

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	40	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.500
Ratio-R	0.400	Preferred Cover Depth (m)	0.600
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

**Nodes**

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Depth/Area 1	0.043	4.00	1.000		93.362	64.133	1.873
Hardstanding Areas	0.148	4.00	1.000	1200	68.219	69.484	0.855
Underground Tank			1.000		101.491	68.104	2.085
2			1.000	1200	127.706	66.198	2.147
Permeable Area Contribution 1	0.100	360.00	1.000	1200			0.825
Permeable Area Contribution 2	0.035	360.00	1.000	1200			0.700

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)
1.001	Depth/Area 1	Underground Tank	5.000	0.600	-0.873	-0.935	0.062	80.0	150	30.00	50.0
2.001	Hardstanding Areas	Underground Tank	5.000	0.600	0.145	0.083	0.062	80.0	225	30.00	50.0
1.002	Underground Tank	2	5.000	0.600	-1.085	-1.147	0.062	80.0	300	30.00	50.0
2.000	Permeable Area Contribution 1	Hardstanding Areas	5.000	0.600	0.175	0.145	0.030	166.7	225	30.00	50.0
1.000	Permeable Area Contribution 2	Depth/Area 1	5.000	0.600	0.300	-0.823	1.123	4.5	100	30.00	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)
1.001	1.125	19.9	14.8	1.723	1.785	0.078	0.0	96	1.230
2.001	1.463	58.2	47.1	0.630	0.692	0.248	0.0	154	1.624
1.002	1.759	124.3	61.9	1.785	1.847	0.326	0.0	150	1.758
2.000	1.010	40.1	19.0	0.600	0.630	0.100	0.0	109	0.995
1.000	3.690	29.0	6.6	0.600	1.723	0.035	0.0	32	2.991

### 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)
1.001	5.000	80.0	150	Circular	1.000	-0.873	1.723	1.000	-0.935	1.785
2.001	5.000	80.0	225	Circular	1.000	0.145	0.630	1.000	0.083	0.692
1.002	5.000	80.0	300	Circular	1.000	-1.085	1.785	1.000	-1.147	1.847
2.000	5.000	166.7	225	Circular	1.000	0.175	0.600	1.000	0.145	0.630
1.000	5.000	4.5	100	Circular	1.000	0.300	0.600	1.000	-0.823	1.723

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.001	Depth/Area 1		Junction		Underground Tank		Junction	
2.001	Hardstanding Areas	1200	Manhole	Adoptable	Underground Tank		Junction	
1.002	Underground Tank		Junction		2	1200	Manhole	Adoptable
2.000	Permeable Area Contribution 1	1200	Manhole	Adoptable	Hardstanding Areas	1200	Manhole	Adoptable
1.000	Permeable Area Contribution 2	1200	Manhole	Adoptable	Depth/Area 1		Junction	

### Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Depth/Area 1	93.362	64.133	1.000	1.873		 1	1.000	-0.823	100
						0	1.001	-0.873	150
Hardstanding Areas	68.219	69.484	1.000	0.855	1200	 1	2.000	0.145	225
						0	2.001	0.145	225

### Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Underground Tank	101.491	68.104	1.000	2.085			1 2	2.001 -0.935	225 150
2	127.706	66.198	1.000	2.147	1200		1	1.002 -1.147	300 300
Permeable Area Contribution 1			1.000	0.825	1200		0	2.000	0.175 225
Permeable Area Contribution 2			1.000	0.700	1200		0	1.000	0.300 100

### Simulation Settings

Rainfall Methodology	FSR	Summer CV	0.750	Drain Down Time (mins)	240
FSR Region	England and Wales	Winter CV	0.840	Additional Storage (m <sup>3</sup> /ha)	20.0
M5-60 (mm)	20.000	Analysis Speed	Normal	Check Discharge Rate(s)	x
Ratio-R	0.400	Skip Steady State	x	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 %)
1	40	0	0	30	40	0	0
2	40	0	0	100	40	0	0

**Node Underground Tank Online Hydro-Brake® Control**

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.002	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0059-1700-1200-1700
Invert Level (m)	-1.085	Min Outlet Diameter (m)	0.075
Design Depth (m)	1.200	Min Node Diameter (mm)	1200
Design Flow (l/s)	1.7		

**Node Underground Tank Depth/Area Storage Structure**

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	-1.085
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )
0.000	150.0	0.0	1.200	150.0	0.0	1.201	0.0	0.0

**Node Depth/Area 1 Carpark Storage Structure**

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	10.000	Depth (m)	0.400
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	-0.873	Length (m)	43.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	500.0		

**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

**Results for 1 year +40% CC Critical Storm Duration. Lowest mass balance: 97.99%**

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
720 minute winter	Depth/Area 1	705	-0.773	0.100	2.1	7.3853	0.0000	OK
15 minute winter	Hardstanding Areas	10	0.272	0.127	31.0	0.5824	0.0000	OK
720 minute winter	Underground Tank	705	-0.773	0.312	5.7	44.4486	0.0000	SURCHARGED
15 minute summer	2	1	-1.147	0.000	1.2	0.0000	0.0000	OK
15 minute winter	Permeable Area Contribution 1	10	0.272	0.097	1.7	0.3442	0.0000	OK
240 minute winter	Permeable Area Contribution 2	212	0.308	0.008	0.4	0.0179	0.0000	OK

Link Event (Outflow)	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> )
960 minute winter	Depth/Area 1	1.001	Underground Tank	6.0	0.551	0.299	0.0731	
15 minute winter	Hardstanding Areas	2.001	Underground Tank	31.1	1.421	0.535	0.1094	
180 minute winter	Underground Tank	Hydro-Brake® 2		1.4				30.6
15 minute summer	Permeable Area Contribution 1	2.000	Hardstanding Areas	-2.1	0.358	-0.053	0.0983	
720 minute winter	Permeable Area Contribution 2	1.000	Depth/Area 1	0.4	1.298	0.014	0.0104	

**Results for 2 year +40% CC Critical Storm Duration. Lowest mass balance: 97.99%**

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
720 minute winter	Depth/Area 1	720	-0.705	0.168	1.4	16.2112	0.0000	SURCHARGED
15 minute winter	Hardstanding Areas	10	0.295	0.150	40.1	0.6885	0.0000	OK
720 minute winter	Underground Tank	720	-0.705	0.380	5.4	54.1521	0.0000	SURCHARGED
15 minute summer	2	1	-1.147	0.000	1.3	0.0000	0.0000	OK
15 minute winter	Permeable Area Contribution 1	10	0.295	0.120	1.8	0.4277	0.0000	OK
240 minute winter	Permeable Area Contribution 2	232	0.309	0.009	0.5	0.0196	0.0000	OK

Link Event (Outflow)	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	Depth/Area 1	1.001	Underground Tank	6.2	0.999	0.313	0.0311	
15 minute winter	Hardstanding Areas	2.001	Underground Tank	40.1	1.505	0.689	0.1331	
120 minute summer	Underground Tank	Hydro-Brake®	2	1.4				27.1
15 minute summer	Permeable Area Contribution 1	2.000	Hardstanding Areas	2.6	0.380	0.065	0.1241	
240 minute winter	Permeable Area Contribution 2	1.000	Depth/Area 1	0.5	1.298	0.017	0.0139	

**Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 97.99%**

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
720 minute winter	Depth/Area 1	765	-0.319	0.554	3.9	46.3761	0.0000	SURCHARGED
15 minute winter	Hardstanding Areas	10	0.453	0.308	76.0	1.4152	0.0000	SURCHARGED
720 minute winter	Underground Tank	765	-0.319	0.766	7.4	109.1652	0.0000	SURCHARGED
15 minute summer	2	1	-1.147	0.000	1.4	0.0000	0.0000	OK
15 minute winter	Permeable Area Contribution 1	10	0.453	0.278	4.4	0.9885	0.0000	SURCHARGED
360 minute winter	Permeable Area Contribution 2	304	0.312	0.012	0.9	0.0258	0.0000	OK

Link Event (Outflow)	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	Depth/Area 1	1.001	Underground Tank	11.2	1.163	0.564	0.0572	
15 minute winter	Hardstanding Areas	2.001	Underground Tank	75.3	1.893	1.294	0.1965	
15 minute summer	Underground Tank	Hydro-Brake®	2	1.4				21.3
15 minute summer	Permeable Area Contribution 1	2.000	Hardstanding Areas	7.8	0.454	0.194	0.1989	
360 minute winter	Permeable Area Contribution 2	1.000	Depth/Area 1	0.9	1.293	0.031	0.0209	



**Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 97.99%**

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
960 minute winter	Depth/Area 1	960	0.076	0.949	4.3	46.5572	0.0000	SURCHARGED
15 minute winter	Hardstanding Areas	10	0.558	0.413	98.7	1.8973	0.0000	SURCHARGED
960 minute winter	Underground Tank	960	0.076	1.161	8.7	165.3954	0.0000	SURCHARGED
15 minute summer	2	1	-1.147	0.000	1.4	0.0000	0.0000	OK
15 minute winter	Permeable Area Contribution 1	10	0.558	0.383	6.9	1.3614	0.0000	SURCHARGED
360 minute winter	Permeable Area Contribution 2	336	0.314	0.014	1.2	0.0296	0.0000	OK

Link Event (Outflow)	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	Depth/Area 1	1.001	Underground Tank	13.8	1.201	0.696	0.0850	
15 minute winter	Hardstanding Areas	2.001	Underground Tank	97.3	2.446	1.672	0.1968	
960 minute winter	Underground Tank	Hydro-Brake® 2		1.7				93.5
15 minute summer	Permeable Area Contribution 1	2.000	Hardstanding Areas	-9.5	0.495	-0.238	0.1989	
360 minute winter	Permeable Area Contribution 2	1.000	Depth/Area 1	1.2	1.293	0.041	0.0212	