

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)	20.000	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

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	✓
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	20.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.400	Check Discharge Rate(s)	✓
Summer CV	0.750	Check Discharge Volume	✓
Winter CV	0.840	100 year 360 minute (m³)	
Analysis Speed	Normal		

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

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		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m³)	

Node 12 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	29.949	Product Number	CTL-SHE-0056-1300-0851-1300
Design Depth (m)	0.851	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.3	Min Node Diameter (mm)	1200

Node 19 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	29.946	Product Number	CTL-SHE-0036-7000-1354-7000
Design Depth (m)	1.354	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.7	Min Node Diameter (mm)	1200

Node 6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	30.235
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	59.0	0.0	0.500	59.0	0.0	0.501	0.0	0.0

Node 12 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	29.949
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	42.0	0.0	0.500	42.0	0.0	0.501	0.0	0.0

Node 9 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	30.600	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	
Safety Factor	2.0	Width (m)	3.000	Inf Depth (m)	
Porosity	1.00	Length (m)	35.000		

Node 19 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	29.946
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	30.0	0.0	0.800	30.0	0.0	0.801	0.0	0.0

Node 16 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	30.265
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	20.0	0.0	0.500	20.0	0.0	0.501	0.0	0.0

Node 15 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	30.730	Slope (1:X)	500.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.450
Safety Factor	2.0	Width (m)	4.800	Inf Depth (m)	
Porosity	0.30	Length (m)	16.800		

Node 17 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	30.890	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	165	Depth (m)	0.450
Safety Factor	2.0	Width (m)	4.800	Inf Depth (m)	
Porosity	0.30	Length (m)	9.600		

Node 18 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	30.910	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	105	Depth (m)	0.450
Safety Factor	2.0	Width (m)	4.800	Inf Depth (m)	
Porosity	0.30	Length (m)	21.600		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991	30 year 360 minute summer	31.221	8.034
1 year 15 minute winter	76.857	30.991	30 year 360 minute winter	20.295	8.034
1 year 30 minute summer	71.439	20.215	30 year 480 minute summer	24.324	6.428
1 year 30 minute winter	50.133	20.215	30 year 480 minute winter	16.160	6.428
1 year 60 minute summer	48.435	12.800	30 year 600 minute summer	19.756	5.404
1 year 60 minute winter	32.179	12.800	30 year 600 minute winter	13.498	5.404
1 year 120 minute summer	30.053	7.942	30 year 720 minute summer	17.490	4.687
1 year 120 minute winter	19.966	7.942	30 year 720 minute winter	11.754	4.687
1 year 180 minute summer	23.233	5.979	30 year 960 minute summer	14.215	3.743
1 year 180 minute winter	15.102	5.979	30 year 960 minute winter	9.416	3.743
1 year 240 minute summer	18.475	4.882	30 year 1440 minute summer	10.161	2.723
1 year 240 minute winter	12.274	4.882	30 year 1440 minute winter	6.829	2.723
1 year 360 minute summer	14.169	3.646	100 year +40% CC 15 minute summer	488.233	138.153
1 year 360 minute winter	9.210	3.646	100 year +40% CC 15 minute winter	342.620	138.153
1 year 480 minute summer	11.185	2.956	100 year +40% CC 30 minute summer	320.551	90.705
1 year 480 minute winter	7.431	2.956	100 year +40% CC 30 minute winter	224.948	90.705
1 year 600 minute summer	9.182	2.511	100 year +40% CC 60 minute summer	214.603	56.713
1 year 600 minute winter	6.274	2.511	100 year +40% CC 60 minute winter	142.577	56.713
1 year 720 minute summer	8.203	2.199	100 year +40% CC 120 minute summer	129.587	34.246
1 year 720 minute winter	5.513	2.199	100 year +40% CC 120 minute winter	86.094	34.246
1 year 960 minute summer	6.768	1.782	100 year +40% CC 180 minute summer	97.729	25.149
1 year 960 minute winter	4.483	1.782	100 year +40% CC 180 minute winter	63.526	25.149
1 year 1440 minute summer	4.949	1.326	100 year +40% CC 240 minute summer	75.977	20.078
1 year 1440 minute winter	3.326	1.326	100 year +40% CC 240 minute winter	50.477	20.078
30 year 15 minute summer	268.706	76.035	100 year +40% CC 360 minute summer	56.677	14.585
30 year 15 minute winter	188.566	76.035	100 year +40% CC 360 minute winter	36.841	14.585
30 year 30 minute summer	174.929	49.499	100 year +40% CC 480 minute summer	43.979	11.622
30 year 30 minute winter	122.757	49.499	100 year +40% CC 480 minute winter	29.219	11.622
30 year 60 minute summer	116.589	30.811	100 year +40% CC 600 minute summer	35.604	9.738
30 year 60 minute winter	77.459	30.811	100 year +40% CC 600 minute winter	24.327	9.738
30 year 120 minute summer	70.438	18.615	100 year +40% CC 720 minute summer	31.433	8.424
30 year 120 minute winter	46.797	18.615	100 year +40% CC 720 minute winter	21.125	8.424
30 year 180 minute summer	53.298	13.715	100 year +40% CC 960 minute summer	25.432	6.697
30 year 180 minute winter	34.645	13.715	100 year +40% CC 960 minute winter	16.847	6.697
30 year 240 minute summer	41.604	10.995	100 year +40% CC 1440 minute summer	18.055	4.839
30 year 240 minute winter	27.641	10.995	100 year +40% CC 1440 minute winter	12.134	4.839

Results for 1 year Critical Storm Duration. Lowest mass balance: 94.01%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	30.780	0.030	1.6	0.0124	0.0000	OK
15 minute winter	2	11	30.672	0.034	3.2	0.0195	0.0000	OK
120 minute summer	3	66	30.379	0.384	2.2	0.0591	0.0000	SURCHARGED
15 minute winter	4	10	30.304	0.054	4.6	0.0371	0.0000	OK
120 minute summer	7	66	30.378	0.263	3.7	0.0405	0.0000	SURCHARGED
60 minute winter	8	41	30.252	0.039	2.6	0.0255	0.0000	OK
15 minute winter	10	10	30.844	0.044	3.2	0.0271	0.0000	OK
15 minute winter	11	11	30.713	0.039	4.9	0.0219	0.0000	OK
180 minute winter	12	148	30.183	0.234	4.2	9.7043	0.0000	SURCHARGED
180 minute winter	13	148	29.963	0.029	1.2	0.0082	0.0000	OK
180 minute winter	14	144	29.944	0.032	1.2	0.0091	0.0000	OK
120 minute winter	14_OUT	92	29.932	0.032	1.7	0.0361	0.0000	OK
60 minute winter	6	43	30.267	0.039	3.5	1.8425	0.0000	OK
60 minute winter	5	37	30.378	0.489	1.4	0.1384	0.0000	OK
180 minute winter	9	148	30.183	0.098	1.9	0.0278	0.0000	OK
15 minute winter	15	11	30.528	0.028	1.4	0.0149	0.0000	OK
15 minute winter	16	12	30.317	0.052	6.4	1.0420	0.0000	OK
360 minute winter	17	328	30.247	0.117	1.3	0.0571	0.0000	OK
360 minute winter	18	328	30.247	0.219	1.6	0.1054	0.0000	OK
360 minute winter	19	328	30.247	0.301	1.8	8.9750	0.0000	SURCHARGED
360 minute winter	20	576	29.949	0.019	0.4	0.0215	0.0000	OK
120 minute winter	OUTFALL	92	29.900	0.031	1.7	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	1	1.000	2	1.6	0.452	0.039	0.0646	
15 minute winter	2	1.001	4	3.1	0.563	0.050	0.1538	
120 minute summer	3	2.000	5	-1.3	0.354	-0.015	0.1631	
15 minute winter	4	1.002	6	4.7	1.084	0.118	0.0176	
120 minute summer	7	3.000	5	-2.7	0.448	-0.023	0.1028	
60 minute winter	8	1.004	9	2.5	0.566	0.063	0.1356	
15 minute winter	10	4.000	11	3.2	0.640	0.080	0.1054	
15 minute winter	11	4.001	12	4.8	1.056	0.064	0.1108	
180 minute winter	12	Hydro-Brake®	13	1.2				
180 minute winter	13	1.007	14	1.2	0.389	0.031	0.0120	
180 minute winter	14	1.008	14_OUT	1.2	0.363	0.038	0.0102	
120 minute winter	14_OUT	1.009	OUTFALL	1.7	0.494	0.042	0.0176	24.8
60 minute winter	6	1.003	8	2.1	0.480	0.054	0.0117	
60 minute winter	5	2.001	6	1.3	0.413	0.034	0.0724	
180 minute winter	9	1.005	12	1.9	0.292	0.048	0.6484	
15 minute winter	15	5.000	16	1.3	0.379	0.033	0.1908	
15 minute winter	16	5.001	17	4.8	0.612	0.119	0.1781	
360 minute winter	17	5.002	18	1.3	0.409	0.033	0.5173	
360 minute winter	18	5.003	19	1.4	0.367	0.035	0.5434	
360 minute winter	19	Hydro-Brake®	20	0.4				
360 minute winter	20	5.005	14_OUT	0.4	0.292	0.014	0.0192	

Results for 30 year Critical Storm Duration. Lowest mass balance: 94.01%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	30.796	0.046	3.8	0.0190	0.0000	OK
15 minute winter	2	10	30.690	0.052	7.5	0.0299	0.0000	OK
180 minute winter	3	180	30.437	0.442	1.1	0.0680	0.0000	SURCHARGED
180 minute winter	4	180	30.437	0.187	2.7	0.1275	0.0000	OK
180 minute winter	7	180	30.437	0.322	1.8	0.0495	0.0000	SURCHARGED
180 minute winter	8	180	30.437	0.224	4.6	0.1472	0.0000	OK
15 minute winter	10	10	30.869	0.069	8.0	0.0429	0.0000	OK
15 minute winter	11	10	30.736	0.062	12.1	0.0346	0.0000	OK
180 minute winter	12	180	30.437	0.488	9.2	20.2065	0.0000	SURCHARGED
15 minute summer	13	83	29.963	0.029	1.2	0.0082	0.0000	OK
960 minute winter	14	930	29.944	0.032	1.2	0.0091	0.0000	OK
960 minute winter	14_OUT	915	29.932	0.032	1.7	0.0367	0.0000	OK
180 minute winter	6	180	30.437	0.209	5.1	11.3933	0.0000	OK
180 minute winter	5	180	30.437	0.548	2.1	0.1550	0.0000	OK
180 minute winter	9	180	30.437	0.352	4.5	0.0995	0.0000	SURCHARGED
360 minute winter	15	352	30.571	0.071	0.5	0.0381	0.0000	OK
360 minute winter	16	344	30.571	0.306	2.4	6.0830	0.0000	SURCHARGED
360 minute winter	17	352	30.571	0.441	2.5	0.2163	0.0000	SURCHARGED
360 minute winter	18	352	30.571	0.543	2.7	0.2619	0.0000	SURCHARGED
360 minute winter	19	352	30.571	0.625	3.4	18.6756	0.0000	SURCHARGED
360 minute winter	20	352	29.950	0.020	0.5	0.0221	0.0000	OK
960 minute winter	OUTFALL	915	29.901	0.032	1.7	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	1	1.000	2	3.7	0.582	0.094	0.1209	
15 minute winter	2	1.001	4	7.4	0.743	0.120	0.2804	
180 minute winter	3	2.000	5	1.2	0.181	0.014	0.1631	
180 minute winter	4	1.002	6	2.7	0.510	0.067	0.1372	
180 minute winter	7	3.000	5	1.0	0.448	0.008	0.1028	
180 minute winter	8	1.004	9	4.5	0.573	0.113	0.8427	
15 minute winter	10	4.000	11	7.9	0.824	0.197	0.2032	
15 minute winter	11	4.001	12	11.8	1.365	0.157	0.2674	
180 minute winter	12	Hydro-Brake®	13	1.2				
15 minute summer	13	1.007	14	1.2	0.390	0.031	0.0121	
960 minute winter	14	1.008	14_OUT	1.2	0.365	0.038	0.0104	
960 minute winter	14_OUT	1.009	OUTFALL	1.7	0.499	0.043	0.0181	88.8
180 minute winter	6	1.003	8	3.7	0.538	0.093	0.1002	
180 minute winter	5	2.001	6	1.8	0.372	0.045	0.5428	
180 minute winter	9	1.005	12	3.7	0.310	0.093	0.9143	
360 minute winter	15	5.000	16	0.5	0.189	0.013	0.9981	
360 minute winter	16	5.001	17	1.9	0.429	0.048	0.8983	
360 minute winter	17	5.002	18	2.0	0.370	0.050	0.6837	
360 minute winter	18	5.003	19	2.6	0.411	0.065	0.5457	
360 minute winter	19	Hydro-Brake®	20	0.5				
360 minute winter	20	5.005	14_OUT	0.5	0.205	0.016	0.0198	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 94.01%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	30.813	0.063	6.9	0.0259	0.0000	OK
360 minute winter	2	352	30.780	0.142	1.8	0.0809	0.0000	OK
360 minute winter	3	352	30.784	0.789	0.9	0.1215	0.0000	SURCHARGED
360 minute winter	4	352	30.781	0.531	2.7	0.3624	0.0000	FLOOD RISK
360 minute winter	7	352	30.785	0.670	0.9	0.1032	0.0000	SURCHARGED
360 minute winter	8	360	30.777	0.564	5.6	0.3714	0.0000	FLOOD RISK
15 minute winter	10	10	30.895	0.095	14.5	0.0591	0.0000	OK
360 minute winter	11	352	30.779	0.105	3.0	0.0587	0.0000	OK
360 minute winter	12	352	30.779	0.830	6.1	21.2501	0.0000	SURCHARGED
360 minute winter	13	352	29.963	0.029	1.3	0.0083	0.0000	OK
360 minute winter	14	352	29.945	0.033	1.3	0.0093	0.0000	OK
360 minute winter	14_OUT	352	29.934	0.034	1.9	0.0388	0.0000	OK
360 minute winter	6	352	30.782	0.554	8.4	28.2379	0.0000	FLOOD RISK
360 minute winter	5	352	30.780	0.891	1.8	0.2522	0.0000	SURCHARGED
360 minute winter	9	352	30.779	0.694	5.7	17.1110	0.0000	FLOOD RISK
600 minute winter	15	585	31.112	0.612	3.7	9.1468	0.0000	FLOOD RISK
600 minute winter	16	585	31.112	0.847	3.3	10.2341	0.0000	SURCHARGED
600 minute winter	17	570	31.112	0.982	1.9	3.4745	0.0000	SURCHARGED
600 minute winter	18	570	31.112	1.083	2.1	6.4486	0.0000	SURCHARGED
600 minute winter	19	570	31.111	1.165	3.0	24.3970	0.0000	SURCHARGED
600 minute winter	20	585	29.952	0.022	0.7	0.0251	0.0000	OK
360 minute winter	OUTFALL	352	29.902	0.033	1.9	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	1	1.000	2	6.8	0.686	0.170	0.1865	
360 minute winter	2	1.001	4	1.8	0.417	0.029	0.9154	
360 minute winter	3	2.000	5	1.5	0.063	0.018	0.1631	
360 minute winter	4	1.002	6	2.4	0.485	0.059	0.1481	
360 minute winter	7	3.000	5	0.9	0.448	0.008	0.1028	
360 minute winter	8	1.004	9	-4.7	0.489	-0.116	0.8432	
15 minute winter	10	4.000	11	14.3	0.964	0.358	0.3152	
360 minute winter	11	4.001	12	3.0	0.745	0.040	0.7062	
360 minute winter	12	Hydro-Brake®	13	1.3				
360 minute winter	13	1.007	14	1.3	0.390	0.032	0.0124	
360 minute winter	14	1.008	14_OUT	1.3	0.366	0.039	0.0109	
360 minute winter	14_OUT	1.009	OUTFALL	1.9	0.516	0.048	0.0195	59.4
360 minute winter	6	1.003	8	-5.4	0.477	-0.137	0.1020	
360 minute winter	5	2.001	6	1.8	0.315	0.045	0.8205	
360 minute winter	9	1.005	12	-4.9	0.240	-0.124	0.9143	
600 minute winter	15	5.000	16	-3.2	0.224	-0.080	1.5694	
600 minute winter	16	5.001	17	-1.5	0.372	-0.038	0.8983	
600 minute winter	17	5.002	18	1.6	0.337	0.039	0.6837	
600 minute winter	18	5.003	19	2.0	0.439	0.051	0.5457	
600 minute winter	19	Hydro-Brake®	20	0.7				
600 minute winter	20	5.005	14_OUT	0.7	0.230	0.020	0.0226	