

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)	18.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.366	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
EXPP	0.174	5.00	35.580		-69.044	32.732	0.540
EX S3			36.380	1050	-54.054	19.270	1.415
EX S4a	0.078	5.00	36.360	1050	-38.134	6.417	1.500
EX S4			36.300	1050	-53.936	2.002	1.540
EX S5	0.008	5.00	36.200	1050	-45.101	-18.119	1.570
EX S5a	0.028	5.00	36.150	1050	-12.680	-25.579	1.720
EX S6	0.008	5.00	36.250	1200	2.011	-22.346	1.995
EX S7	0.193	5.00	36.430	1200	47.399	-22.598	2.360
9		5.00	36.150		53.694	6.663	1.920
S1	0.015	5.00	36.390	1200	57.128	6.597	2.180
10	0.013	5.00	36.380	1200	57.252	-18.087	2.320
EX S8			36.350	1800	59.071	-22.610	2.330
Outfall			36.350		65.115	-17.501	2.780

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	EXPP	EX S3	20.147	0.600	35.040	34.965	0.075	268.6	225	5.42	45.6
1.001	EX S3	EX S4	17.268	0.600	34.965	34.760	0.205	84.2	225	5.63	44.8
2.000	EX S4a	EX S4	16.408	0.600	34.860	34.760	0.100	164.1	225	5.27	46.2
1.002	EX S4	EX S5	21.976	0.600	34.760	34.630	0.130	169.0	225	5.99	43.6
1.003	EX S5	EX S5a	33.269	0.600	34.630	34.430	0.200	166.3	225	6.54	41.9
1.004	EX S5a	EX S6	15.042	0.600	34.430	34.330	0.100	150.4	225	6.78	41.2
1.005	EX S6	EX S7	45.388	0.600	34.255	34.070	0.185	245.3	300	7.53	39.1
1.006	EX S7	EX S8	11.672	0.600	34.070	34.020	0.050	233.4	300	7.72	38.6
3.000	9	S1	3.500	0.600	34.230	34.210	0.020	175.0	300	5.05	47.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	0.793	31.5	21.5	0.315	1.190	0.174	0.0
1.001	1.425	56.7	21.2	1.190	1.315	0.174	0.0
2.000	1.018	40.5	9.8	1.275	1.315	0.078	0.0
1.002	1.003	39.9	29.8	1.315	1.345	0.252	0.0
1.003	1.011	40.2	29.5	1.345	1.495	0.260	0.0
1.004	1.064	42.3	32.1	1.495	1.695	0.288	0.0
1.005	0.999	70.6	31.4	1.695	2.060	0.296	0.0
1.006	1.025	72.4	51.2	2.060	2.030	0.489	0.0
3.000	1.185	83.8	0.0	1.620	1.880	0.000	0.0

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	S1	10	24.684	0.600	34.210	34.060	0.150	164.6	300	5.39	45.7
3.002	10	EX S8	4.875	0.600	34.060	34.020	0.040	121.9	300	5.44	45.5
1.007	EX S8	Outfall	7.914	0.600	34.020	33.570	0.450	17.6	150	7.78	38.5

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
3.001	1.223	86.4	1.9	1.880	2.020	0.015	0.0
3.002	1.423	100.6	3.5	2.020	2.030	0.028	0.0
1.007	2.413	42.6	53.9	2.180	2.630	0.517	0.0

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	18.000	Drain Down Time (mins)	240
Ratio-R	0.360	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
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	40	0	0

Node EX S8 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	34.020	Product Number	CTL-SHE-0116-7200-1600-7200
Design Depth (m)	1.600	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	7.2	Min Node Diameter (mm)	1200

Node EXPP Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	35.040	Slope (1:X)	40.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	16	Depth (m)	
Safety Factor	2.0	Width (m)	62.000	Inf Depth (m)	
Porosity	0.30	Length (m)	4.800		

Node 9 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	34.230
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	199.5	0.0	1.200	199.5	0.0	1.201	0.0	0.0

Approval Settings

Node Size	✓	Minimum Full Bore Velocity (m/s)	
Node Losses	✓	Maximum Full Bore Velocity (m/s)	3.000
Link Size	✓	Proportional Velocity	✓
Minimum Diameter (mm)	150	Return Period (years)	
Link Length	✓	Minimum Proportional Velocity (m/s)	0.750
Maximum Length (m)	100.000	Maximum Proportional Velocity (m/s)	3.000
Coordinates	✓	Surcharged Depth	✓
Accuracy (m)	1.000	Return Period (years)	
Crossings	✓	Maximum Surcharged Depth (m)	0.100
Cover Depth	✓	Flooding	✓
Minimum Cover Depth (m)		Return Period (years)	30
Maximum Cover Depth (m)	3.000	Time to Half Empty	x
Backdrops	✓	Discharge Rates	✓
Minimum Backdrop Height (m)		Discharge Volume	✓
Maximum Backdrop Height (m)	1.500	100 year 360 minute (m ³)	
Full Bore Velocity	✓		

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	EXPP	13	35.140	0.100	21.2	4.3754	0.0000	OK
15 minute winter	EX S3	14	35.038	0.073	13.0	0.0635	0.0000	OK
15 minute winter	EX S4a	10	34.933	0.073	9.5	0.1394	0.0000	OK
15 minute winter	EX S4	12	34.883	0.123	20.1	0.1065	0.0000	OK
15 minute winter	EX S5	12	34.747	0.117	21.0	0.1133	0.0000	OK
15 minute winter	EX S5a	12	34.553	0.123	23.5	0.1469	0.0000	OK
15 minute winter	EX S6	13	34.474	0.219	24.0	0.2653	0.0000	OK
15 minute winter	EX S7	12	34.454	0.384	40.2	1.0630	0.0000	SURCHARGED
60 minute winter	9	58	34.346	0.116	23.3	22.0408	0.0000	OK
15 minute winter	S1	13	34.369	0.159	33.8	0.2013	0.0000	OK
15 minute winter	10	12	34.417	0.357	32.6	0.4438	0.0000	SURCHARGED
15 minute winter	EX S8	12	34.428	0.408	39.1	1.0390	0.0000	SURCHARGED
15 minute winter	Outfall	13	33.611	0.041	7.1	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	EXPP	1.000	EX S3	13.0	0.925	0.411	0.2831	
15 minute winter	EX S3	1.001	EX S4	12.9	0.828	0.228	0.2840	
15 minute winter	EX S4a	2.000	EX S4	9.4	0.642	0.232	0.2663	
15 minute winter	EX S4	1.002	EX S5	20.2	0.938	0.506	0.4730	
15 minute winter	EX S5	1.003	EX S5a	20.8	0.968	0.518	0.7172	
15 minute winter	EX S5a	1.004	EX S6	23.2	1.061	0.548	0.3681	
15 minute winter	EX S6	1.005	EX S7	25.2	0.382	0.356	2.8494	
15 minute winter	EX S7	1.006	EX S8	39.1	0.555	0.539	0.8219	
15 minute winter	9	3.000	S1	-34.2	-1.875	-0.408	0.0725	
15 minute winter	S1	3.001	10	-32.8	-0.534	-0.379	1.3355	
15 minute winter	10	3.002	EX S8	-31.7	-0.451	-0.316	0.3433	
15 minute winter	EX S8	1.007	Outfall	7.1	1.718	0.167	0.0327	27.5

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	EXPP	14	35.239	0.199	52.0	13.6729	0.0000	OK
15 minute winter	EX S3	11	35.236	0.271	28.4	0.2349	0.0000	SURCHARGED
15 minute winter	EX S4a	12	35.232	0.372	23.3	0.7089	0.0000	SURCHARGED
15 minute winter	EX S4	11	35.210	0.450	37.5	0.3898	0.0000	SURCHARGED
15 minute winter	EX S5	12	35.116	0.486	36.9	0.4704	0.0000	SURCHARGED
15 minute winter	EX S5a	12	34.990	0.560	39.0	0.6671	0.0000	SURCHARGED
15 minute winter	EX S6	11	34.904	0.649	40.9	0.7863	0.0000	SURCHARGED
15 minute winter	EX S7	11	34.845	0.775	90.9	2.1440	0.0000	SURCHARGED
120 minute winter	9	118	34.697	0.467	39.3	88.4697	0.0000	SURCHARGED
120 minute winter	S1	118	34.697	0.487	39.8	0.6177	0.0000	SURCHARGED
120 minute winter	10	118	34.696	0.636	38.6	0.7911	0.0000	SURCHARGED
15 minute winter	EX S8	12	34.710	0.690	89.1	1.7568	0.0000	SURCHARGED
30 minute summer	Outfall	27	33.612	0.042	7.2	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	EXPP	1.000	EX S3	28.4	1.106	0.901	0.7747	
15 minute winter	EX S3	1.001	EX S4	31.2	0.962	0.551	0.6868	
15 minute summer	EX S4a	2.000	EX S4	21.6	0.758	0.535	0.6526	
15 minute winter	EX S4	1.002	EX S5	36.6	1.043	0.919	0.8740	
15 minute winter	EX S5	1.003	EX S5a	37.7	0.981	0.937	1.3231	
15 minute winter	EX S5a	1.004	EX S6	40.2	1.084	0.951	0.5982	
15 minute winter	EX S6	1.005	EX S7	42.5	0.603	0.602	3.1962	
15 minute winter	EX S7	1.006	EX S8	89.1	1.266	1.231	0.8219	
15 minute winter	9	3.000	S1	-88.8	-2.543	-1.060	0.2288	
15 minute winter	S1	3.001	10	-85.2	-1.228	-0.985	1.7000	
15 minute winter	10	3.002	EX S8	-81.4	-1.157	-0.810	0.3433	
30 minute summer	EX S8	1.007	Outfall	7.2	1.723	0.169	0.0330	81.2

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	EXPP	25	35.552	0.512	86.5	43.6362	0.0000	FLOOD RISK
30 minute winter	EX S3	23	35.517	0.552	32.3	0.4778	0.0000	SURCHARGED
15 minute winter	EX S4a	11	35.618	0.758	42.1	1.4447	0.0000	SURCHARGED
15 minute winter	EX S4	12	35.506	0.746	38.5	0.6457	0.0000	SURCHARGED
15 minute winter	EX S5	12	35.483	0.853	39.5	0.8253	0.0000	SURCHARGED
15 minute winter	EX S5a	11	35.455	1.025	42.0	1.2209	0.0000	SURCHARGED
15 minute winter	EX S6	11	35.409	1.154	44.6	1.3976	0.0000	SURCHARGED
15 minute winter	EX S7	11	35.370	1.300	132.0	3.5960	0.0000	SURCHARGED
240 minute winter	9	236	35.279	1.049	43.9	198.8992	0.0000	SURCHARGED
240 minute winter	S1	236	35.279	1.069	44.2	1.3571	0.0000	SURCHARGED
240 minute winter	10	236	35.279	1.219	42.8	1.5155	0.0000	SURCHARGED
240 minute winter	EX S8	236	35.279	1.259	48.7	3.2047	0.0000	SURCHARGED
15 minute summer	Outfall	109	33.612	0.042	7.2	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	EXPP	1.000	EX S3	36.8	1.073	1.169	0.8013	
15 minute winter	EX S3	1.001	EX S4	37.2	0.935	0.656	0.6868	
15 minute winter	EX S4a	2.000	EX S4	38.5	0.968	0.951	0.6526	
15 minute winter	EX S4	1.002	EX S5	39.2	1.019	0.984	0.8740	
15 minute winter	EX S5	1.003	EX S5a	40.3	1.013	1.003	1.3231	
15 minute winter	EX S5a	1.004	EX S6	43.8	1.102	1.037	0.5982	
15 minute winter	EX S6	1.005	EX S7	46.9	0.666	0.664	3.1962	
15 minute winter	EX S7	1.006	EX S8	127.1	1.805	1.755	0.8219	
15 minute winter	9	3.000	S1	-133.5	-2.758	-1.594	0.2465	
15 minute winter	S1	3.001	10	-126.3	-1.793	-1.461	1.7382	
15 minute winter	10	3.002	EX S8	-120.1	-1.706	-1.195	0.3433	
15 minute summer	EX S8	1.007	Outfall	7.2	1.723	0.169	0.0330	104.9