Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 626 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	12.359	0.859	0.0	31.0	31.0	979.7	O K
30 min Summer	12.513	1.013	0.0	31.0	31.0	1169.4	O K
60 min Summer	12.603	1.103	0.0	31.0	31.0	1381.6	O K
120 min Summer	12.697	1.197	0.0	31.0	31.0	1605.2	O K
180 min Summer	12.794	1.294	0.0	31.0	31.0	1733.2	O K
240 min Summer	12.855	1.355	0.0	31.0	31.0	1814.6	O K
360 min Summer	12.917	1.417	0.0	31.0	31.0	1900.2	O K
480 min Summer	12.939	1.439	0.0	31.0	31.0	1930.4	O K
600 min Summer	12.940	1.440	0.0	31.0	31.0	1931.3	O K
720 min Summer	12.935	1.435	0.0	31.0	31.0	1924.8	O K
960 min Summer	12.891	1.391	0.0	31.0	31.0	1863.4	O K
1440 min Summer	12.793	1.293	0.0	31.0	31.0	1732.9	O K
2160 min Summer	12.662	1.162	0.0	31.0	31.0	1520.0	O K
2880 min Summer	12.580	1.080	0.0	31.0	31.0	1326.9	O K
4320 min Summer	12.350	0.850	0.0	31.0	31.0	969.2	O K
5760 min Summer	12.118	0.618	0.0	31.0	31.0	704.1	O K
7200 min Summer	11.959	0.459	0.0	30.6	30.6	523.4	O K
8640 min Summer	11.854	0.354	0.0	29.6	29.6	403.9	O K
10080 min Summer	11.786	0.286	0.0	28.4	28.4	326.6	O K
15 min Winter	12.466	0.966	0.0	31.0	31.0	1100.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	162.544	0.0	988.0	26
30 min Summer	97.903	0.0	1191.9	40
60 min Summer	58.969	0.0	1457.1	70
120 min Summer	35.518	0.0	1756.5	128
180 min Summer	26.403	0.0	1959.1	186
240 min Summer	21.393	0.0	2116.7	246
360 min Summer	15.903	0.0	2360.3	364
480 min Summer	12.885	0.0	2549.6	482
600 min Summer	10.945	0.0	2706.6	570
720 min Summer	9.579	0.0	2841.8	622
960 min Summer	7.646	0.0	3022.6	750
1440 min Summer	5.565	0.0	3293.7	1016
2160 min Summer	4.051	0.0	3623.6	1404
2880 min Summer	3.233	0.0	3856.1	1792
4320 min Summer	2.335	0.0	4172.0	2548
5760 min Summer	1.854	0.0	4427.7	3232
7200 min Summer	1.550	0.0	4626.2	3896
8640 min Summer	1.339	0.0	4793.7	4584
10080 min Summer	1.183	0.0	4936.1	5248
15 min Winter	162.544	0.0	1107.8	26

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	12.575	1.075	0.0	31.0	31.0	1315.6	O K
60 min Winter	12.677	1.177	0.0	31.0	31.0	1557.5	O K
120 min Winter	12.858	1.358	0.0	31.0	31.0	1819.6	O K
180 min Winter	12.966	1.466	0.0	31.0	31.0	1967.8	O K
240 min Winter	13.033	1.533	0.0	31.0	31.0	2063.3	O K
360 min Winter	13.107	1.607	0.0	31.0	31.0	2172.0	O K
480 min Winter	13.139	1.639	0.0	31.0	31.0	2219.9	O K
600 min Winter	13.148	1.648	0.0	31.0	31.0	2233.9	O K
720 min Winter	13.144	1.644	0.0	31.0	31.0	2226.8	O K
960 min Winter	13.087	1.587	0.0	31.0	31.0	2142.2	O K
1440 min Winter	12.973	1.473	0.0	31.0	31.0	1977.5	O K
2160 min Winter	12.754	1.254	0.0	31.0	31.0	1681.5	O K
2880 min Winter	12.596	1.096	0.0	31.0	31.0	1364.8	O K
4320 min Winter	12.225	0.725	0.0	31.0	31.0	826.3	O K
5760 min Winter	11.935	0.435	0.0	30.5	30.5	496.1	O K
7200 min Winter	11.785	0.285	0.0	28.4	28.4	325.4	O K
8640 min Winter	11.727	0.227	0.0	25.8	25.8	259.1	O K
10080 min Winter	11.704	0.204	0.0	23.0	23.0	232.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	97.903	0.0	1335.5	40
60 min Winter	58.969	0.0	1632.8	68
120 min Winter	35.518	0.0	1967.8	126
180 min Winter	26.403	0.0	2194.6	184
240 min Winter	21.393	0.0	2371.0	242
360 min Winter	15.903	0.0	2643.6	356
480 min Winter	12.885	0.0	2855.4	468
600 min Winter	10.945	0.0	3030.9	578
720 min Winter	9.579	0.0	3181.8	682
960 min Winter	7.646	0.0	3383.4	782
1440 min Winter	5.565	0.0	3682.4	1088
2160 min Winter	4.051	0.0	4058.8	1548
2880 min Winter	3.233	0.0	4319.4	1940
4320 min Winter	2.335	0.0	4674.8	2644
5760 min Winter	1.854	0.0	4959.6	3288
7200 min Winter	1.550	0.0	5182.1	3896
8640 min Winter	1.339	0.0	5370.2	4488
10080 min Winter	1.183	0.0	5531.1	5152

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 317700 168950 ST 17700 68950
C (1km)	-0.024
D1 (1km)	0.379
D2 (1km)	0.327
D3 (1km)	0.308
E (1km)	0.281
F (1km)	2.522
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 3.320

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.106	4	8	1.107	8	12	1.107

Model Details

Storage is Online Cover Level (m) 13.500

Complex Structure

Cellular Storage

Invert Level (m)	11.500	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	1200.0	0.0	1.201	0.0	0.0
1.200	1200.0	0.0			

Tank or Pond

Invert Level (m) 12.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1169.8	1.000	1708.0	1.001	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0226-3100-2000-3100
Design Head (m)	2.000
Design Flow (l/s)	31.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	226
Invert Level (m)	11.500
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	31.0
Flush-Flo™	0.593	31.0
Kick-Flo®	1.275	25.0
Mean Flow over Head Range	-	26.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Hydro-Brake® Optimum Outflow Control

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.6	1.200	26.8	3.000	37.6	7.000	56.7
0.200	22.5	1.400	26.1	3.500	40.5	7.500	58.6
0.300	28.7	1.600	27.8	4.000	43.2	8.000	60.5
0.400	30.2	1.800	29.5	4.500	45.8	8.500	62.3
0.500	30.8	2.000	31.0	5.000	48.2	9.000	64.0
0.600	31.0	2.200	32.4	5.500	50.4	9.500	65.8
0.800	30.5	2.400	33.8	6.000	52.6		
1.000	29.4	2.600	35.1	6.500	54.7		

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 623 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	17.510	1.010	0.0	26.2	26.2	825.4	O K
30 min Summer	17.594	1.094	0.0	26.2	26.2	985.2	O K
60 min Summer	17.686	1.186	0.0	26.2	26.2	1163.8	O K
120 min Summer	17.830	1.330	0.0	26.2	26.2	1352.4	O K
180 min Summer	17.908	1.408	0.0	26.2	26.2	1455.1	O K
240 min Summer	17.954	1.454	0.0	26.2	26.2	1518.3	O K
360 min Summer	18.001	1.501	0.0	26.2	26.2	1583.2	O K
480 min Summer	18.014	1.514	0.0	26.2	26.2	1603.0	O K
600 min Summer	18.012	1.512	0.0	26.2	26.2	1600.1	O K
720 min Summer	18.007	1.507	0.0	26.2	26.2	1592.6	O K
960 min Summer	17.969	1.469	0.0	26.2	26.2	1538.3	O K
1440 min Summer	17.891	1.391	0.0	26.2	26.2	1431.8	O K
2160 min Summer	17.765	1.265	0.0	26.2	26.2	1270.3	O K
2880 min Summer	17.652	1.152	0.0	26.2	26.2	1097.2	O K
4320 min Summer	17.471	0.971	0.0	26.2	26.2	784.3	O K
5760 min Summer	17.181	0.681	0.0	26.2	26.2	549.7	O K
7200 min Summer	16.989	0.489	0.0	26.0	26.0	394.5	O K
8640 min Summer	16.865	0.365	0.0	25.2	25.2	294.8	O K
10080 min Summer	16.787	0.287	0.0	24.1	24.1	232.1	O K
15 min Winter	17.564	1.064	0.0	26.2	26.2	927.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	162.544	0.0	840.1	26
30 min Summer	97.903	0.0	1012.8	41
60 min Summer	58.969	0.0	1231.9	70
120 min Summer	35.518	0.0	1484.6	128
180 min Summer	26.403	0.0	1655.7	186
240 min Summer	21.393	0.0	1788.8	246
360 min Summer	15.903	0.0	1994.7	362
480 min Summer	12.885	0.0	2154.8	480
600 min Summer	10.945	0.0	2287.6	560
720 min Summer	9.579	0.0	2402.1	614
960 min Summer	7.646	0.0	2555.5	742
1440 min Summer	5.565	0.0	2786.1	1008
2160 min Summer	4.051	0.0	3057.3	1428
2880 min Summer	3.233	0.0	3253.6	1816
4320 min Summer	2.335	0.0	3521.8	2552
5760 min Summer	1.854	0.0	3734.2	3232
7200 min Summer	1.550	0.0	3901.9	3896
8640 min Summer	1.339	0.0	4043.9	4576
10080 min Summer	1.183	0.0	4165.6	5248
15 min Winter	162.544	0.0	941.5	26

Summary of Results for 100 year Return Period (+30%)

	Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30	min Winter	17.658	1.158	0.0	26.2	26.2	1108.8	O K
60	min Winter	17.799	1.299	0.0	26.2	26.2	1313.1	O K
120	min Winter	17.962	1.462	0.0	26.2	26.2	1529.4	O K
180	min Winter	18.047	1.547	0.0	26.2	26.2	1650.9	O K
240	min Winter	18.100	1.600	0.0	26.2	26.2	1728.8	O K
360	min Winter	18.157	1.657	0.0	26.2	26.2	1815.7	O K
480	min Winter	18.180	1.680	0.0	26.2	26.2	1852.2	O K
600	min Winter	18.185	1.685	0.0	26.2	26.2	1860.3	O K
720	min Winter	18.180	1.680	0.0	26.2	26.2	1851.2	O K
960	min Winter	18.132	1.632	0.0	26.2	26.2	1776.6	O K
1440	min Winter	18.036	1.536	0.0	26.2	26.2	1634.9	O K
2160	min Winter	17.869	1.369	0.0	26.2	26.2	1403.6	O K
2880	min Winter	17.672	1.172	0.0	26.2	26.2	1136.5	O K
4320	min Winter	17.310	0.810	0.0	26.2	26.2	654.3	O K
5760	min Winter	16.956	0.456	0.0	25.9	25.9	368.2	O K
7200	min Winter	16.785	0.285	0.0	24.0	24.0	230.0	O K
8640	min Winter	16.717	0.217	0.0	21.9	21.9	175.2	O K
10080	min Winter	16.693	0.193	0.0	19.4	19.4	156.1	O K

	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30	min Winter	97.903	0.0	1134.5	40
60	min Winter	58.969	0.0	1380.1	68
120	min Winter	35.518	0.0	1663.1	126
180	min Winter	26.403	0.0	1854.6	184
240	min Winter	21.393	0.0	2003.7	240
360	min Winter	15.903	0.0	2234.1	356
480	min Winter	12.885	0.0	2413.2	468
600	min Winter	10.945	0.0	2561.8	576
720	min Winter	9.579	0.0	2689.7	680
960	min Winter	7.646	0.0	2861.0	776
1440	min Winter	5.565	0.0	3117.0	1084
2160	min Winter	4.051	0.0	3424.3	1544
2880	min Winter	3.233	0.0	3644.3	1964
4320	min Winter	2.335	0.0	3945.7	2648
5760	min Winter	1.854	0.0	4182.6	3288
7200	min Winter	1.550	0.0	4370.6	3888
8640	min Winter	1.339	0.0	4529.8	4416
10080	min Winter	1.183	0.0	4667.0	5144

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 317700 168950 ST 17700 68950
C (1km)	-0.024
D1 (1km)	0.379
D2 (1km)	0.327
D3 (1km)	0.308
E (1km)	0.281
F (1km)	2.522
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 2.799

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.933	4	8	0.933	8	12	0.933

Model Details

Storage is Online Cover Level (m) 18.500

Complex Structure

Cellular Storage

Invert Level (m)	16.500	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	850.0	0.0	1.201	0.0	0.0
1.200	850.0	0.0			

Tank or Pond

Invert Level (m) 17.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1041.5	1.000	1860.0	1.100	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0209-2620-2000-2620
Design Head (m)	2.000
Design Flow (l/s)	26.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	209
Invert Level (m)	16.500
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	26.2
Flush-Flo™	0.584	26.2
Kick-Flo®	1.254	21.0
Mean Flow over Head Range	-	22.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Hydro-Brake® Optimum Outflow Control

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.1	1.200	22.1	3.000	31.8	7.000	47.9
0.200	20.2	1.400	22.1	3.500	34.3	7.500	49.5
0.300	24.3	1.600	23.5	4.000	36.5	8.000	51.1
0.400	25.5	1.800	24.9	4.500	38.7	8.500	52.6
0.500	26.1	2.000	26.2	5.000	40.7	9.000	54.1
0.600	26.2	2.200	27.4	5.500	42.6	9.500	55.5
0.800	25.7	2.400	28.6	6.000	44.4		
1.000	24.6	2.600	29.7	6.500	46.2		

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	28.242	0.242	34.1	1210.3	O K
30 min Summer	28.287	0.287	36.8	1442.7	O K
60 min Summer	28.339	0.339	37.5	1708.6	O K
120 min Summer	28.395	0.395	37.7	1997.1	O K
180 min Summer	28.427	0.427	37.7	2165.3	O K
240 min Summer	28.448	0.448	37.7	2277.0	O K
360 min Summer	28.473	0.473	37.7	2410.3	O K
480 min Summer	28.486	0.486	37.7	2475.9	O K
600 min Summer	28.494	0.494	37.7	2518.7	O K
720 min Summer	28.499	0.499	37.7	2549.4	O K
960 min Summer	28.497	0.497	37.7	2538.4	O K
1440 min Summer	28.485	0.485	37.7	2474.4	O K
2160 min Summer	28.457	0.457	37.7	2324.7	O K
2880 min Summer	28.425	0.425	37.7	2155.8	O K
4320 min Summer	28.360	0.360	37.6	1816.0	O K
5760 min Summer	28.308	0.308	37.1	1547.5	O K
7200 min Summer	28.270	0.270	36.5	1351.6	O K
8640 min Summer	28.246	0.246	34.7	1230.1	O K
10080 min Summer	28.229	0.229	32.1	1143.9	O K
15 min Winter	28.270	0.270	36.5	1355.7	O K
30 min Winter	28.322	0.322	37.3	1619.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	162.544	0.0	960.5	26
30 min Summer	97.903	0.0	1191.2	40
60 min Summer	58.969	0.0	1632.5	70
120 min Summer	35.518	0.0	1987.4	128
180 min Summer	26.403	0.0	2226.4	186
240 min Summer	21.393	0.0	2411.3	244
360 min Summer	15.903	0.0	2694.9	362
480 min Summer	12.885	0.0	2913.0	462
600 min Summer	10.945	0.0	3091.5	516
720 min Summer	9.579	0.0	3243.2	578
960 min Summer	7.646	0.0	3439.3	702
1440 min Summer	5.565	0.0	3712.7	974
2160 min Summer	4.051	0.0	4311.4	1376
2880 min Summer	3.233	0.0	4580.3	1768
4320 min Summer	2.335	0.0	4908.9	2516
5760 min Summer	1.854	0.0	5342.1	3232
7200 min Summer	1.550	0.0	5570.3	3896
8640 min Summer	1.339	0.0	5751.8	4592
10080 min Summer	1.183	0.0	5882.1	5344
15 min Winter	162.544	0.0	1096.9	26
30 min Winter	97.903	0.0	1353.7	40

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	28.380	0.380	37.7	1921.5	O K
120 min Winter	28.443	0.443	37.7	2252.2	O K
180 min Winter	28.480	0.480	37.7	2447.9	O K
240 min Winter	28.505	0.505	37.7	2580.8	O K
360 min Winter	28.536	0.536	37.7	2745.8	O K
480 min Winter	28.553	0.553	37.7	2836.0	O K
600 min Winter	28.562	0.562	37.7	2882.7	O K
720 min Winter	28.565	0.565	37.7	2901.7	O K
960 min Winter	28.558	0.558	37.7	2860.9	O K
1440 min Winter	28.535	0.535	37.7	2740.6	O K
2160 min Winter	28.488	0.488	37.7	2486.5	O K
2880 min Winter	28.436	0.436	37.7	2214.2	O K
4320 min Winter	28.339	0.339	37.5	1707.8	O K
5760 min Winter	28.271	0.271	36.6	1356.5	O K
7200 min Winter	28.237	0.237	33.3	1183.6	O K
8640 min Winter	28.215	0.215	29.7	1072.9	O K
10080 min Winter	28.199	0.199	26.7	991.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	58.969	0.0	1841.8	68
120 min Winter	35.518	0.0	2238.7	126
180 min Winter	26.403	0.0	2505.6	182
240 min Winter	21.393	0.0	2712.1	240
360 min Winter	15.903	0.0	3028.3	354
480 min Winter	12.885	0.0	3270.9	466
600 min Winter	10.945	0.0	3469.3	574
720 min Winter	9.579	0.0	3637.3	674
960 min Winter	7.646	0.0	3853.4	758
1440 min Winter	5.565	0.0	4150.5	1062
2160 min Winter	4.051	0.0	4837.6	1500
2880 min Winter	3.233	0.0	5140.9	1908
4320 min Winter	2.335	0.0	5518.8	2644
5760 min Winter	1.854	0.0	5990.7	3296
7200 min Winter	1.550	0.0	6248.4	3968
8640 min Winter	1.339	0.0	6455.3	4672
10080 min Winter	1.183	0.0	6609.2	5416

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 317700 168950 ST 17700 68950
C (1km)	-0.024
D1 (1km)	0.379
D2 (1km)	0.327
D3 (1km)	0.308
E (1km)	0.281
F (1km)	2.522
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 4.050

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.350	4	8	1.350	8	12	1.350

Model Details

Storage is Online Cover Level (m) 29.000

Tank or Pond Structure

Invert Level (m) 28.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	4903.6	1.000	5732.0	1.001	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0261-3790-1000-3790
Design Head (m)	1.000
Design Flow (l/s)	37.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	261
Invert Level (m)	28.000
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	37.9
Flush-Flo™	0.409	37.7
Kick-Flo®	0.760	33.2
Mean Flow over Head Range	-	30.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	8.4	1.200	41.3	3.000	64.3	7.000	97.2
0.200	26.9	1.400	44.5	3.500	69.3	7.500	100.5
0.300	37.0	1.600	47.5	4.000	74.0	8.000	103.7
0.400	37.7	1.800	50.3	4.500	78.4	8.500	106.8
0.500	37.4	2.000	52.9	5.000	82.5	9.000	109.9
0.600	36.6	2.200	55.4	5.500	86.4	9.500	112.8
0.800	34.0	2.400	57.8	6.000	90.1		
1.000	37.9	2.600	60.0	6.500	93.7		

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 205 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	25.493	0.493	43.1	1009.5	O K
30 min Summer	25.601	0.601	93.5	1167.9	O K
60 min Summer	25.709	0.709	94.6	1325.4	Flood Risk
120 min Summer	25.779	0.779	95.3	1430.2	Flood Risk
180 min Summer	25.801	0.801	95.5	1463.3	Flood Risk
240 min Summer	25.809	0.809	95.6	1475.5	Flood Risk
360 min Summer	25.802	0.802	95.5	1463.9	Flood Risk
480 min Summer	25.779	0.779	95.3	1430.4	Flood Risk
600 min Summer	25.751	0.751	95.0	1388.7	Flood Risk
720 min Summer	25.722	0.722	94.7	1345.9	Flood Risk
960 min Summer	25.652	0.652	94.0	1242.5	O K
1440 min Summer	25.557	0.557	93.0	1105.6	O K
2160 min Summer	25.519	0.519	61.9	1051.1	O K
2880 min Summer	25.450	0.450	42.6	917.9	O K
4320 min Summer	25.285	0.285	40.3	574.6	O K
5760 min Summer	25.168	0.168	38.8	336.1	O K
7200 min Summer	25.092	0.092	37.8	183.5	O K
8640 min Summer	25.054	0.054	37.3	107.0	O K
10080 min Summer	25.046	0.046	34.1	90.6	O K
15 min Winter	25.569	0.569	93.2	1122.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	162.544	0.0	26
30 min Summer	97.903	0.0	38
60 min Summer	58.969	0.0	64
120 min Summer	35.518	0.0	114
180 min Summer	26.403	0.0	146
240 min Summer	21.393	0.0	178
360 min Summer	15.903	0.0	246
480 min Summer	12.885	0.0	316
600 min Summer	10.945	0.0	384
720 min Summer	9.579	0.0	450
960 min Summer	7.646	0.0	578
1440 min Summer	5.565	0.0	820
2160 min Summer	4.051	0.0	1244
2880 min Summer	3.233	0.0	1704
4320 min Summer	2.335	0.0	2428
5760 min Summer	1.854	0.0	3120
7200 min Summer	1.550	0.0	3752
8640 min Summer	1.339	0.0	4408
10080 min Summer	1.183	0.0	5136
15 min Winter	162.544	0.0	25

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	25.702	0.702	94.5	1315.7	Flood Risk
60 min Winter	25.831	0.831	95.8	1508.0	Flood Risk
120 min Winter	25.925	0.925	96.8	1651.2	Flood Risk
180 min Winter	25.945	0.945	97.0	1681.4	Flood Risk
240 min Winter	25.952	0.952	97.1	1692.9	Flood Risk
360 min Winter	25.935	0.935	96.9	1666.1	Flood Risk
480 min Winter	25.896	0.896	96.5	1606.7	Flood Risk
600 min Winter	25.849	0.849	96.0	1535.8	Flood Risk
720 min Winter	25.801	0.801	95.5	1463.2	Flood Risk
960 min Winter	25.693	0.693	94.4	1302.2	O K
1440 min Winter	25.555	0.555	93.0	1103.1	O K
2160 min Winter	25.517	0.517	59.9	1048.2	O K
2880 min Winter	25.410	0.410	42.0	833.7	O K
4320 min Winter	25.182	0.182	39.0	365.0	O K
5760 min Winter	25.055	0.055	37.3	110.4	O K
7200 min Winter	25.043	0.043	32.2	85.6	O K
8640 min Winter	25.037	0.037	27.7	73.7	O K
10080 min Winter	25.033	0.033	24.7	65.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	97.903	0.0	38
60 min Winter	58.969	0.0	64
120 min Winter	35.518	0.0	118
180 min Winter	26.403	0.0	158
240 min Winter	21.393	0.0	192
360 min Winter	15.903	0.0	268
480 min Winter	12.885	0.0	342
600 min Winter	10.945	0.0	414
720 min Winter	9.579	0.0	484
960 min Winter	7.646	0.0	614
1440 min Winter	5.565	0.0	840
2160 min Winter	4.051	0.0	1304
2880 min Winter	3.233	0.0	1800
4320 min Winter	2.335	0.0	2508
5760 min Winter	1.854	0.0	3008
7200 min Winter	1.550	0.0	3632
8640 min Winter	1.339	0.0	4400
10080 min Winter	1.183	0.0	5136

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 317700 168950 ST 17700 68950
C (1km)	-0.024
D1 (1km)	0.379
D2 (1km)	0.327
D3 (1km)	0.308
E (1km)	0.281
F (1km)	2.522
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 3.519

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.173	4	8	1.173	8	12	1.173

Model Details

Storage is Online Cover Level (m) 26.000

Complex Structure

Infiltration Basin

Invert Level (m) 25.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.12762 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.12762

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	452.8	1.000	727.0	1.001	0.0

Cellular Storage

Invert Level (m) 25.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.12762 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.12762

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	168.0	168.0	0.501	0.0	194.5
0.500	168.0	194.5			

Cellular Storage

Invert Level (m) 25.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.12762 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.12762

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	1444.0	1444.0	0.501	0.0	1520.0
0.500	1444.0	1520.0			

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.12762	Width (m)	52.7
Membrane Percolation (mm/hr)	1000	Length (m)	52.7
Max Percolation (l/s)	771.5	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	25.500	Cap Volume Depth (m)	0.500