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14 Festoon Rooms		
Sunny Bank Mills Town Street		
Farsley Leeds LS28 5UJ		
Date 24/05/2018 14:10	Designed by Robert.Marshall	
File 18 05 24 tank.SRCX	Checked by	
Micro Drainage	Source Control 2017.1.2	

Model Details

Storage is Online Cover Level (m) 7.100

Cellular Storage Structure

Invert Level (m) 6.100 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	100.0	0.0	0.501	0.0	0.0
0.500	100.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0113-5000-0500-5000
Design Head (m) 0.500
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 113
Invert Level (m) 6.050
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	5.0
Flush-Flo™	0.179	5.0
Kick-Flo®	0.372	4.4
Mean Flow over Head Range	-	4.1

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	3.9	1.200	7.5	3.000	11.6	7.000	17.4
0.200	5.0	1.400	8.1	3.500	12.5	7.500	18.1
0.300	4.8	1.600	8.6	4.000	13.3	8.000	18.7
0.400	4.5	1.800	9.1	4.500	14.1	8.500	19.2
0.500	5.0	2.000	9.6	5.000	14.8	9.000	19.8
0.600	5.4	2.200	10.0	5.500	15.4	9.500	20.3
0.800	6.2	2.400	10.4	6.000	16.1		
1.000	6.9	2.600	10.8	6.500	16.8		

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.139

Time (mins)	Area
From:	To: (ha)

0	4	0.139
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<u>Summary of Results for 100 year Return Period (+30%)</u>							
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	6.500	0.400	0.0	5.0	5.0	38.0	O K
60 min Winter	6.558	0.458	0.0	5.0	5.0	43.5	O K
120 min Winter	6.566	0.466	0.0	5.1	5.1	44.3	O K
180 min Winter	6.546	0.446	0.0	5.0	5.0	42.3	O K
240 min Winter	6.514	0.414	0.0	5.0	5.0	39.3	O K
360 min Winter	6.444	0.344	0.0	5.0	5.0	32.7	O K
480 min Winter	6.365	0.265	0.0	5.0	5.0	25.2	O K
600 min Winter	6.299	0.199	0.0	5.0	5.0	18.9	O K
720 min Winter	6.245	0.145	0.0	5.0	5.0	13.7	O K
960 min Winter	6.179	0.079	0.0	4.9	4.9	7.5	O K
1440 min Winter	6.147	0.047	0.0	3.8	3.8	4.5	O K
2160 min Winter	6.128	0.028	0.0	2.8	2.8	2.7	O K
2880 min Winter	6.118	0.018	0.0	2.3	2.3	1.7	O K
4320 min Winter	6.106	0.006	0.0	1.6	1.6	0.6	O K
5760 min Winter	6.100	0.000	0.0	1.3	1.3	0.0	O K
7200 min Winter	6.100	0.000	0.0	1.1	1.1	0.0	O K
8640 min Winter	6.100	0.000	0.0	0.9	0.9	0.0	O K
10080 min Winter	6.100	0.000	0.0	0.8	0.8	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	77.804	0.0	45.3	31			
60 min Winter	49.937	0.0	58.2	58			
120 min Winter	30.956	0.0	72.2	96			
180 min Winter	23.058	0.0	80.7	136			
240 min Winter	18.577	0.0	86.7	174			
360 min Winter	13.656	0.0	95.6	250			
480 min Winter	10.974	0.0	102.5	314			
600 min Winter	9.254	0.0	108.0	374			
720 min Winter	8.046	0.0	112.7	428			
960 min Winter	6.447	0.0	120.4	520			
1440 min Winter	4.709	0.0	131.9	750			
2160 min Winter	3.432	0.0	144.2	1104			
2880 min Winter	2.739	0.0	153.4	1464			
4320 min Winter	1.989	0.0	167.1	2204			
5760 min Winter	1.583	0.0	177.4	0			
7200 min Winter	1.325	0.0	185.6	0			
8640 min Winter	1.147	0.0	192.8	0			
10080 min Winter	1.015	0.0	199.1	0			
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Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 76 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	6.375	0.275	0.0	5.0	5.0	26.1	O K
30 min Summer	6.450	0.350	0.0	5.0	5.0	33.2	O K
60 min Summer	6.497	0.397	0.0	5.0	5.0	37.7	O K
120 min Summer	6.504	0.404	0.0	5.0	5.0	38.4	O K
180 min Summer	6.490	0.390	0.0	5.0	5.0	37.1	O K
240 min Summer	6.469	0.369	0.0	5.0	5.0	35.1	O K
360 min Summer	6.423	0.323	0.0	5.0	5.0	30.7	O K
480 min Summer	6.373	0.273	0.0	5.0	5.0	25.9	O K
600 min Summer	6.330	0.230	0.0	5.0	5.0	21.8	O K
720 min Summer	6.291	0.191	0.0	5.0	5.0	18.2	O K
960 min Summer	6.232	0.132	0.0	5.0	5.0	12.5	O K
1440 min Summer	6.172	0.072	0.0	4.8	4.8	6.9	O K
2160 min Summer	6.146	0.046	0.0	3.7	3.7	4.4	O K
2880 min Summer	6.133	0.033	0.0	3.0	3.0	3.1	O K
4320 min Summer	6.118	0.018	0.0	2.3	2.3	1.7	O K
5760 min Summer	6.110	0.010	0.0	1.8	1.8	0.9	O K
7200 min Summer	6.104	0.004	0.0	1.5	1.5	0.4	O K
8640 min Summer	6.100	0.000	0.0	1.3	1.3	0.0	O K
10080 min Summer	6.100	0.000	0.0	1.2	1.2	0.0	O K
15 min Winter	6.413	0.313	0.0	5.0	5.0	29.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	115.731	0.0	30.1	17
30 min Summer	77.804	0.0	40.5	32
60 min Summer	49.937	0.0	52.0	60
120 min Summer	30.956	0.0	64.4	92
180 min Summer	23.058	0.0	72.1	126
240 min Summer	18.577	0.0	77.4	160
360 min Summer	13.656	0.0	85.3	230
480 min Summer	10.974	0.0	91.5	294
600 min Summer	9.254	0.0	96.4	356
720 min Summer	8.046	0.0	100.6	414
960 min Summer	6.447	0.0	107.5	530
1440 min Summer	4.709	0.0	117.8	750
2160 min Summer	3.432	0.0	128.7	1104
2880 min Summer	2.739	0.0	137.0	1468
4320 min Summer	1.989	0.0	149.2	2200
5760 min Summer	1.583	0.0	158.3	2912
7200 min Summer	1.325	0.0	165.7	3672
8640 min Summer	1.147	0.0	172.2	0
10080 min Summer	1.015	0.0	177.8	0
15 min Winter	115.731	0.0	33.7	17