

Topping Engineers Ltd

Aire House

12 Victoria Avenue

Harrogate, HG1 1ED

Date 09/09/2022 10:05

File SOURCE 011021.SRCX

Innovyze

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Designed by Jamess

Checked by

Source Control 2019.1

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 2316 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	92.665	0.665	0.0	0.0	0.0	376.0	O K
30 min Summer	92.893	0.893	0.0	0.0	0.0	504.8	O K
60 min Summer	93.137	1.137	0.0	4.2	4.2	643.0	O K
120 min Summer	93.389	1.389	0.0	5.2	5.2	785.0	O K
180 min Summer	93.536	1.536	0.0	5.2	5.2	868.4	O K
240 min Summer	93.637	1.637	0.0	5.2	5.2	925.1	O K
360 min Summer	93.778	1.778	0.0	5.2	5.2	1005.2	O K
480 min Summer	93.883	1.883	0.0	5.2	5.2	1064.5	O K
600 min Summer	93.965	1.965	0.0	5.2	5.2	1110.6	O K
720 min Summer	94.027	2.027	0.0	5.2	5.2	1145.9	O K
960 min Summer	94.114	2.114	0.0	5.2	5.2	1195.2	O K
1440 min Summer	94.204	2.204	0.0	5.2	5.2	1245.9	O K
2160 min Summer	94.249	2.249	0.0	5.2	5.2	1271.1	O K
2880 min Summer	94.274	2.274	0.0	5.2	5.2	1285.3	O K
4320 min Summer	94.289	2.289	0.0	5.2	5.2	1294.0	O K
5760 min Summer	94.271	2.271	0.0	5.2	5.2	1283.8	O K
7200 min Summer	94.233	2.233	0.0	5.2	5.2	1262.5	O K
8640 min Summer	94.185	2.185	0.0	5.2	5.2	1234.9	O K
10080 min Summer	94.128	2.128	0.0	5.2	5.2	1202.8	O K
15 min Winter	92.745	0.745	0.0	0.0	0.0	421.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	125.006	0.0	0.0	27
30 min Summer	83.918	0.0	0.0	42
60 min Summer	53.779	0.0	78.4	72
120 min Summer	33.289	0.0	231.5	130
180 min Summer	24.779	0.0	324.1	190
240 min Summer	19.956	0.0	389.4	250
360 min Summer	14.657	0.0	485.4	368
480 min Summer	11.773	0.0	557.8	488
600 min Summer	9.924	0.0	614.2	608
720 min Summer	8.626	0.0	657.4	726
960 min Summer	6.909	0.0	682.9	964
1440 min Summer	5.043	0.0	611.5	1442
2160 min Summer	3.673	0.0	1018.8	1868
2880 min Summer	2.930	0.0	1114.1	2224
4320 min Summer	2.126	0.0	1089.2	2992
5760 min Summer	1.692	0.0	1386.4	3808
7200 min Summer	1.416	0.0	1475.9	4616
8640 min Summer	1.225	0.0	1552.7	5448
10080 min Summer	1.084	0.0	1619.7	6256
15 min Winter	125.006	0.0	0.0	27

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Micro Drainage

Innovyze

Source Control 2019.1

Summary of Results for 100 year Return Period (+40%)

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	93.000	1.000	0.0	0.0	0.0	565.3	O K
60 min Winter	93.270	1.270	0.0	5.0	5.0	717.9	O K
120 min Winter	93.558	1.558	0.0	5.2	5.2	880.5	O K
180 min Winter	93.727	1.727	0.0	5.2	5.2	976.1	O K
240 min Winter	93.843	1.843	0.0	5.2	5.2	1041.8	O K
360 min Winter	94.009	2.009	0.0	5.2	5.2	1135.7	O K
480 min Winter	94.127	2.127	0.0	5.2	5.2	1202.1	O K
600 min Winter	94.214	2.214	0.0	5.2	5.2	1251.3	O K
720 min Winter	94.281	2.281	0.0	5.2	5.2	1289.3	O K
960 min Winter	94.377	2.377	0.0	5.2	5.2	1343.5	O K
1440 min Winter	94.480	2.480	0.0	5.2	5.2	1402.1	O K
2160 min Winter	94.545	2.545	0.0	5.3	5.3	1428.9	O K
2880 min Winter	94.557	2.557	0.0	5.3	5.3	1430.4	O K
4320 min Winter	94.514	2.514	0.0	5.3	5.3	1420.1	O K
5760 min Winter	94.449	2.449	0.0	5.2	5.2	1384.6	O K
7200 min Winter	94.364	2.364	0.0	5.2	5.2	1336.5	O K
8640 min Winter	94.269	2.269	0.0	5.2	5.2	1282.6	O K
10080 min Winter	94.165	2.165	0.0	5.2	5.2	1224.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	83.918	0.0	0.0	42
60 min Winter	53.779	0.0	155.6	70
120 min Winter	33.289	0.0	327.0	128
180 min Winter	24.779	0.0	430.3	186
240 min Winter	19.956	0.0	502.9	246
360 min Winter	14.657	0.0	607.8	362
480 min Winter	11.773	0.0	682.8	480
600 min Winter	9.924	0.0	725.8	596
720 min Winter	8.626	0.0	725.4	714
960 min Winter	6.909	0.0	694.4	944
1440 min Winter	5.043	0.0	635.2	1394
2160 min Winter	3.673	0.0	1206.2	2032
2880 min Winter	2.930	0.0	1298.8	2304
4320 min Winter	2.126	0.0	1163.0	3204
5760 min Winter	1.692	0.0	1620.6	4112
7200 min Winter	1.416	0.0	1720.7	5040
8640 min Winter	1.225	0.0	1806.3	5888
10080 min Winter	1.084	0.0	1880.5	6760

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<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>19.000</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.353</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+40</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 1.604 <table> <thead> <tr> <th>Time (mins)</th> <th>Area</th> <th>Time (mins)</th> <th>Area</th> <th>Time (mins)</th> <th>Area</th> </tr> <tr> <th>From:</th> <th>To:</th> <th>From:</th> <th>To:</th> <th>From:</th> <th>To:</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>4 0.535</td> <td>4</td> <td>8 0.535</td> <td>8</td> <td>12 0.535</td> </tr> </tbody> </table>			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	0.353	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+40	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	From:	To:	From:	To:	From:	To:	0	4 0.535	4	8 0.535	8	12 0.535
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Model Details

Storage is Online Cover Level (m) 95.000

Cellular Storage Structure

Invert Level (m) 92.000 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	595.0	595.0	2.600	0.0	855.0
2.500	595.0	855.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0101-6000-2000-6000
 Design Head (m) 2.000
 Design Flow (l/s) 6.0
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 101
 Invert Level (m) 93.000
 Minimum Outlet Pipe Diameter (mm) 150
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	6.0
Flush-Flo™	0.438	5.2
Kick-Flo®	0.900	4.1
Mean Flow over Head Range	-	4.8

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	3.3	1.200	4.7	3.000	7.3	7.000	10.8
0.200	4.7	1.400	5.1	3.500	7.8	7.500	11.2
0.300	5.1	1.600	5.4	4.000	8.3	8.000	11.5
0.400	5.2	1.800	5.7	4.500	8.8	8.500	11.9
0.500	5.2	2.000	6.0	5.000	9.2	9.000	12.2
0.600	5.1	2.200	6.3	5.500	9.7	9.500	12.5
0.800	4.7	2.400	6.5	6.000	10.1		
1.000	4.3	2.600	6.8	6.500	10.5		

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