


Summary of Results for 100 year Return Period (+35%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	177.242	0.242	3.5	0.0	3.5	12.1	O K
30 min Summer	177.307	0.307	3.5	0.0	3.5	15.3	O K
60 min Summer	177.344	0.344	3.5	0.0	3.5	17.2	O K
120 min Summer	177.341	0.341	3.5	0.0	3.5	17.1	O K
180 min Summer	177.315	0.315	3.5	0.0	3.5	15.8	O K
240 min Summer	177.284	0.284	3.5	0.0	3.5	14.2	O K
360 min Summer	177.225	0.225	3.5	0.0	3.5	11.3	O K
480 min Summer	177.179	0.179	3.5	0.0	3.5	8.9	O K
600 min Summer	177.144	0.144	3.5	0.0	3.5	7.2	O K
720 min Summer	177.121	0.121	3.4	0.0	3.4	6.0	O K
960 min Summer	177.099	0.099	3.1	0.0	3.1	4.9	O K
1440 min Summer	177.078	0.078	2.4	0.0	2.4	3.9	O K
2160 min Summer	177.064	0.064	1.7	0.0	1.7	3.2	O K
2880 min Summer	177.056	0.056	1.4	0.0	1.4	2.8	O K
4320 min Summer	177.046	0.046	1.0	0.0	1.0	2.3	O K
5760 min Summer	177.041	0.041	0.8	0.0	0.8	2.0	O K
7200 min Summer	177.037	0.037	0.7	0.0	0.7	1.9	O K
8640 min Summer	177.034	0.034	0.6	0.0	0.6	1.7	O K
10080 min Summer	177.032	0.032	0.5	0.0	0.5	1.6	O K
15 min Winter	177.275	0.275	3.5	0.0	3.5	13.8	O K
30 min Winter	177.352	0.352	3.5	0.0	3.5	17.6	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	123.578	0.0	15.0	0.0	22
30 min Summer	81.962	0.0	19.9	0.0	34
60 min Summer	51.858	0.0	25.3	0.0	56
120 min Summer	31.719	0.0	30.9	0.0	88
180 min Summer	23.473	0.0	34.3	0.0	122
240 min Summer	18.842	0.0	36.7	0.0	154
360 min Summer	13.745	0.0	40.2	0.0	218
480 min Summer	10.993	0.0	42.8	0.0	276
600 min Summer	9.237	0.0	45.0	0.0	332
720 min Summer	8.009	0.0	46.8	0.0	386
960 min Summer	6.389	0.0	49.8	0.0	502
1440 min Summer	4.639	0.0	54.2	0.0	740
2160 min Summer	3.362	0.0	59.0	0.0	1104
2880 min Summer	2.672	0.0	62.5	0.0	1468
4320 min Summer	1.931	0.0	67.7	0.0	2204
5760 min Summer	1.531	0.0	71.6	0.0	2936
7200 min Summer	1.279	0.0	74.8	0.0	3656
8640 min Summer	1.103	0.0	77.4	0.0	4344
10080 min Summer	0.973	0.0	79.7	0.0	5136
15 min Winter	123.578	0.0	16.8	0.0	23
30 min Winter	81.962	0.0	22.3	0.0	35

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Date 09/09/2021 13:56	Designed by TWP	
File Cells.SRCX	Checked by JD	
Micro Drainage		Source Control 2017.1.2

Summary of Results for 100 year Return Period (+35%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	177.397	0.397	3.5	0.0	3.5	19.8	O K
120 min Winter	177.386	0.386	3.5	0.0	3.5	19.3	O K
180 min Winter	177.344	0.344	3.5	0.0	3.5	17.2	O K
240 min Winter	177.293	0.293	3.5	0.0	3.5	14.7	O K
360 min Winter	177.202	0.202	3.5	0.0	3.5	10.1	O K
480 min Winter	177.140	0.140	3.5	0.0	3.5	7.0	O K
600 min Winter	177.108	0.108	3.3	0.0	3.3	5.4	O K
720 min Winter	177.095	0.095	3.0	0.0	3.0	4.8	O K
960 min Winter	177.079	0.079	2.4	0.0	2.4	4.0	O K
1440 min Winter	177.064	0.064	1.8	0.0	1.8	3.2	O K
2160 min Winter	177.053	0.053	1.3	0.0	1.3	2.6	O K
2880 min Winter	177.046	0.046	1.0	0.0	1.0	2.3	O K
4320 min Winter	177.039	0.039	0.7	0.0	0.7	1.9	O K
5760 min Winter	177.034	0.034	0.6	0.0	0.6	1.7	O K
7200 min Winter	177.031	0.031	0.5	0.0	0.5	1.6	O K
8640 min Winter	177.029	0.029	0.4	0.0	0.4	1.4	O K
10080 min Winter	177.027	0.027	0.4	0.0	0.4	1.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
60 min Winter	51.858	0.0	28.3	0.0	60
120 min Winter	31.719	0.0	34.6	0.0	96
180 min Winter	23.473	0.0	38.4	0.0	134
240 min Winter	18.842	0.0	41.1	0.0	166
360 min Winter	13.745	0.0	45.0	0.0	228
480 min Winter	10.993	0.0	48.0	0.0	282
600 min Winter	9.237	0.0	50.4	0.0	328
720 min Winter	8.009	0.0	52.4	0.0	386
960 min Winter	6.389	0.0	55.8	0.0	504
1440 min Winter	4.639	0.0	60.7	0.0	740
2160 min Winter	3.362	0.0	66.1	0.0	1108
2880 min Winter	2.672	0.0	70.0	0.0	1476
4320 min Winter	1.931	0.0	75.9	0.0	2188
5760 min Winter	1.531	0.0	80.2	0.0	2856
7200 min Winter	1.279	0.0	83.8	0.0	3688
8640 min Winter	1.103	0.0	86.7	0.0	4312
10080 min Winter	0.973	0.0	89.2	0.0	5136

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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	0.379	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+35

Time Area Diagram


Total Area (ha) 0.065

Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)
0	4	0.022	4	8	0.022	8	12	0.022

It will be necessary to provide attenuation storage to limit the post-development rate of surface water runoff to permissible rates of runoff.

Ordinarily permissible rates of runoff reflect Greenfield equivalent rates however in accordance with the 'Preliminary rainfall runoff management for developments' R&D Technical Report W5-074/A/TR/1 Revision E, a joint DEFRA/EA guide, there are conditions where Greenfield equivalent flow rates are not applied to define the limiting rates. Where small sites would require impractically small controls, where the required flow rates are calculated to be less than 5l/s, a minimum flow rate of 5l/s can be used.

Consequently, in this case, it is proposed that the post-development rate of runoff is restricted to 3.5l/s for all storm events up to and including the 1 in 100 year, plus climate change, return period.

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Model Details

Storage is Online Cover Level (m) 178.000

Tank or Pond Structure

Invert Level (m) 177.000

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.000	50.0	0.400	50.0	0.410	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0096-3500-0500-3500
Design Head (m)	0.500
Design Flow (l/s)	3.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	96
Invert Level (m)	177.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

**Control Points      Head (m)    Flow (l/s)**

Design Point (Calculated)	0.500	3.5
Flush-Flo™	0.162	3.5
Kick-Flo®	0.359	3.0
Mean Flow over Head Range	-	2.9

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.1	1.200	5.2	3.000	8.1	7.000	12.1
0.200	3.5	1.400	5.6	3.500	8.7	7.500	12.6
0.300	3.3	1.600	6.0	4.000	9.2	8.000	13.0
0.400	3.2	1.800	6.3	4.500	9.8	8.500	13.4
0.500	3.5	2.000	6.7	5.000	10.3	9.000	13.8
0.600	3.8	2.200	7.0	5.500	10.7	9.500	14.1
0.800	4.3	2.400	7.3	6.000	11.2		
1.000	4.8	2.600	7.5	6.500	11.7		

Weir Overflow Control

Discharge Coef 0.544 Width (m) 2.400 Invert Level (m) 178.000