



TOPPING ENGINEERS

CONSULTING CIVIL &
STRUCTURAL ENGINEERS

DRAINAGE CALCULATIONS

LOCATION:

Boothroyd Lane, Dewsbury WF13 2LF

CLIENT:

Horizon Care Services

DOCUMENT REF:
25156-CAL-001

REVISION/DATE:
Revision A / June 2025

Aire House
12 Victoria Avenue
Harrogate, HG1 1ED



Date 17/06/2025 11:30
File SOURCE CONTROL.SRCX

Designed by OliverG
Checked by

Innovyze Source Control 2020.1.3

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

Half Drain Time : 53 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	84.417	0.717	0.0	11.9	11.9	40.9	O K
30 min Summer	84.625	0.925	0.0	11.9	11.9	52.7	O K
60 min Summer	84.726	1.026	0.0	11.9	11.9	58.5	O K
120 min Summer	84.710	1.010	0.0	11.9	11.9	57.6	O K
180 min Summer	84.643	0.943	0.0	11.9	11.9	53.8	O K
240 min Summer	84.559	0.859	0.0	11.9	11.9	49.0	O K
360 min Summer	84.359	0.659	0.0	11.9	11.9	37.6	O K
480 min Summer	84.196	0.496	0.0	11.9	11.9	28.3	O K
600 min Summer	84.071	0.371	0.0	11.9	11.9	21.2	O K
720 min Summer	83.981	0.281	0.0	11.8	11.8	16.0	O K
960 min Summer	83.875	0.175	0.0	11.2	11.2	10.0	O K
1440 min Summer	83.813	0.113	0.0	9.1	9.1	6.4	O K
2160 min Summer	83.783	0.083	0.0	6.8	6.8	4.7	O K
2880 min Summer	83.768	0.068	0.0	5.4	5.4	3.8	O K
4320 min Summer	83.750	0.050	0.0	3.9	3.9	2.9	O K
5760 min Summer	83.741	0.041	0.0	3.2	3.2	2.3	O K
7200 min Summer	83.734	0.034	0.0	2.6	2.6	1.9	O K
8640 min Summer	83.729	0.029	0.0	2.3	2.3	1.6	O K
10080 min Summer	83.725	0.025	0.0	2.0	2.0	1.4	O K
15 min Winter	84.525	0.825	0.0	11.9	11.9	47.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	124.633	0.0	52.6	22
30 min Summer	83.789	0.0	70.7	34
60 min Summer	53.779	0.0	90.7	56
120 min Summer	33.337	0.0	112.4	90
180 min Summer	24.832	0.0	125.7	124
240 min Summer	20.006	0.0	135.0	160
360 min Summer	14.706	0.0	148.9	222
480 min Summer	11.818	0.0	159.5	282
600 min Summer	9.966	0.0	168.2	338
720 min Summer	8.665	0.0	175.4	394
960 min Summer	6.943	0.0	187.4	504
1440 min Summer	5.071	0.0	205.4	738
2160 min Summer	3.696	0.0	224.5	1100
2880 min Summer	2.949	0.0	238.9	1468
4320 min Summer	2.142	0.0	260.2	2200
5760 min Summer	1.705	0.0	276.1	2920
7200 min Summer	1.427	0.0	288.9	3648
8640 min Summer	1.235	0.0	300.1	4296
10080 min Summer	1.093	0.0	309.9	5104
15 min Winter	124.633	0.0	58.8	23

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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	84.761	1.061	0.0	11.9	11.9	60.5	O K
60 min Winter	84.886	1.186	0.0	11.9	11.9	67.6	O K
120 min Winter	84.852	1.152	0.0	11.9	11.9	65.7	O K
180 min Winter	84.746	1.046	0.0	11.9	11.9	59.6	O K
240 min Winter	84.615	0.915	0.0	11.9	11.9	52.2	O K
360 min Winter	84.300	0.600	0.0	11.9	11.9	34.2	O K
480 min Winter	84.069	0.369	0.0	11.9	11.9	21.0	O K
600 min Winter	83.928	0.228	0.0	11.6	11.6	13.0	O K
720 min Winter	83.853	0.153	0.0	11.0	11.0	8.7	O K
960 min Winter	83.813	0.113	0.0	9.1	9.1	6.4	O K
1440 min Winter	83.782	0.082	0.0	6.7	6.7	4.7	O K
2160 min Winter	83.762	0.062	0.0	4.9	4.9	3.5	O K
2880 min Winter	83.750	0.050	0.0	3.9	3.9	2.9	O K
4320 min Winter	83.737	0.037	0.0	2.9	2.9	2.1	O K
5760 min Winter	83.729	0.029	0.0	2.3	2.3	1.6	O K
7200 min Winter	83.723	0.023	0.0	1.9	1.9	1.3	O K
8640 min Winter	83.719	0.019	0.0	1.7	1.7	1.1	O K
10080 min Winter	83.716	0.016	0.0	1.5	1.5	0.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	83.789	0.0	79.1	35
60 min Winter	53.779	0.0	101.7	58
120 min Winter	33.337	0.0	126.0	96
180 min Winter	24.832	0.0	140.8	134
240 min Winter	20.006	0.0	151.2	172
360 min Winter	14.706	0.0	166.8	236
480 min Winter	11.818	0.0	178.7	290
600 min Winter	9.966	0.0	188.3	340
720 min Winter	8.665	0.0	196.5	388
960 min Winter	6.943	0.0	209.9	498
1440 min Winter	5.071	0.0	230.0	736
2160 min Winter	3.696	0.0	251.5	1100
2880 min Winter	2.949	0.0	267.5	1448
4320 min Winter	2.142	0.0	291.4	2204
5760 min Winter	1.705	0.0	309.2	2912
7200 min Winter	1.427	0.0	323.6	3672
8640 min Winter	1.235	0.0	336.1	4392
10080 min Winter	1.093	0.0	347.1	5040

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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 %	+40

Time Area Diagram

Total Area (ha) 0.225

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
	(ha)		(ha)		(ha)
0	4	4	8	8	12
	0.075		0.075		0.075

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Model Details

Storage is Online Cover Level (m) 85.500

Cellular Storage Structure

Invert Level (m) 83.700 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	60.0	60.0	1.201	0.0	105.6
1.200	60.0	105.6			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0154-1190-1231-1190
Design Head (m) 1.231
Design Flow (l/s) 11.9
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 154
Invert Level (m) 83.669
Minimum Outlet Pipe Diameter (mm) 225
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.231	11.9
Flush-Flo™	0.370	11.9
Kick-Flo®	0.808	9.8
Mean Flow over Head Range	-	10.3

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	5.5	1.200	11.8	3.000	18.2	7.000	27.3
0.200	11.2	1.400	12.6	3.500	19.5	7.500	28.2
0.300	11.8	1.600	13.5	4.000	20.8	8.000	29.1
0.400	11.9	1.800	14.2	4.500	22.0	8.500	29.9
0.500	11.7	2.000	15.0	5.000	23.2	9.000	30.8
0.600	11.5	2.200	15.7	5.500	24.3	9.500	31.6
0.800	9.9	2.400	16.3	6.000	25.3		
1.000	10.8	2.600	17.0	6.500	26.3		