

Tulip Engineering Consultancy Ltd					Page 1
34 Culfor Road Loughor Swansea, SA4 6TY			Owen Jones Way Bryn		
Date 17/11/2021 12:17 File Plot 1.SRCX			Designed by GT Checked by		
Innovyze			Source Control 2019.1		
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	112.354	0.254	0.4	3.6	O K
30 min Summer	112.465	0.365	0.4	5.1	O K
60 min Summer	112.588	0.488	0.4	6.8	O K
120 min Summer	112.692	0.592	0.4	8.3	O K
180 min Summer	112.721	0.621	0.5	8.7	O K
240 min Summer	112.737	0.637	0.5	8.9	O K
360 min Summer	112.750	0.650	0.5	9.1	O K
480 min Summer	112.752	0.652	0.5	9.1	O K
600 min Summer	112.747	0.647	0.5	9.1	O K
720 min Summer	112.739	0.639	0.5	8.9	O K
960 min Summer	112.715	0.615	0.4	8.6	O K
1440 min Summer	112.656	0.556	0.4	7.8	O K
2160 min Summer	112.570	0.470	0.4	6.6	O K
2880 min Summer	112.492	0.392	0.4	5.5	O K
4320 min Summer	112.340	0.240	0.4	3.4	O K
5760 min Summer	112.216	0.116	0.4	1.6	O K
7200 min Summer	112.158	0.058	0.4	0.8	O K
8640 min Summer	112.128	0.028	0.4	0.4	O K
10080 min Summer	112.111	0.011	0.3	0.2	O K
15 min Winter	112.388	0.288	0.4	4.0	O K
30 min Winter	112.515	0.415	0.4	5.8	O K
60 min Winter	112.659	0.559	0.4	7.8	O K
120 min Winter	112.787	0.687	0.5	9.6	O K
180 min Winter	112.831	0.731	0.5	10.2	O K
240 min Winter	112.848	0.748	0.5	10.5	O K
360 min Winter	112.861	0.761	0.5	10.7	O K
480 min Winter	112.856	0.756	0.5	10.6	O K
600 min Winter	112.842	0.742	0.5	10.4	O K
720 min Winter	112.824	0.724	0.5	10.1	O K
960 min Winter	112.778	0.678	0.5	9.5	O K
1440 min Winter	112.679	0.579	0.4	8.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	99.545	0.0	3.9	18	
30 min Summer	73.555	0.0	5.8	33	
60 min Summer	52.120	0.0	8.2	62	
120 min Summer	35.186	0.0	11.1	120	
180 min Summer	27.272	0.0	12.9	162	
240 min Summer	22.736	0.0	14.3	194	
360 min Summer	17.514	0.0	16.5	260	
480 min Summer	14.508	0.0	18.3	330	
600 min Summer	12.514	0.0	19.7	402	
720 min Summer	11.077	0.0	20.9	470	
960 min Summer	9.118	0.0	23.0	608	
1440 min Summer	6.912	0.0	26.1	880	
2160 min Summer	5.253	0.0	29.8	1276	
2880 min Summer	4.330	0.0	32.7	1672	
4320 min Summer	3.318	0.0	37.6	2460	
5760 min Summer	2.767	0.0	41.8	3056	
7200 min Summer	2.415	0.0	45.6	3744	
8640 min Summer	2.160	0.0	49.0	4408	
10080 min Summer	1.965	0.0	52.0	5136	
15 min Winter	99.545	0.0	4.4	18	
30 min Winter	73.555	0.0	6.5	32	
60 min Winter	52.120	0.0	9.2	60	
120 min Winter	35.186	0.0	12.4	118	
180 min Winter	27.272	0.0	14.4	172	
240 min Winter	22.736	0.0	16.0	220	
360 min Winter	17.514	0.0	18.5	278	
480 min Winter	14.508	0.0	20.5	356	
600 min Winter	12.514	0.0	22.1	434	
720 min Winter	11.077	0.0	23.4	508	
960 min Winter	9.118	0.0	25.7	656	
1440 min Winter	6.912	0.0	29.3	940	
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2160 min Winter	5.253	0.0	33.4	1364
2880 min Winter	4.330	0.0	36.7	1788
4320 min Winter	3.318	0.0	42.1	2376
5760 min Winter	2.767	0.0	46.8	2992
7200 min Winter	2.415	0.0	51.1	3672
8640 min Winter	2.160	0.0	54.9	0
10080 min Winter	1.965	0.0	58.2	0

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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
2160 min Winter	112.544	0.444	0.4	6.2	O K
2880 min Winter	112.421	0.321	0.4	4.5	O K
4320 min Winter	112.176	0.076	0.4	1.1	O K
5760 min Winter	112.114	0.014	0.3	0.2	O K
7200 min Winter	112.101	0.001	0.3	0.0	O K
8640 min Winter	112.100	0.000	0.3	0.0	O K
10080 min Winter	112.100	0.000	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
2160 min Winter	5.253	0.0	33.4	1364
2880 min Winter	4.330	0.0	36.7	1788
4320 min Winter	3.318	0.0	42.1	2376
5760 min Winter	2.767	0.0	46.8	2992
7200 min Winter	2.415	0.0	51.1	3672
8640 min Winter	2.160	0.0	54.9	0
10080 min Winter	1.965	0.0	58.2	0

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120 min Summer	112.692	0.592	0.4	8.3	O K
180 min Summer	112.721	0.621	0.5	8.7	O K
240 min Summer	112.737	0.637	0.5	8.9	O K
360 min Summer	112.750	0.650	0.5	9.1	O K
480 min Summer	112.752	0.652	0.5	9.1	O K
600 min Summer	112.747	0.647	0.5	9.1	O K
720 min Summer	112.739	0.639	0.5	8.9	O K
960 min Summer	112.715	0.615	0.4	8.6	O K
1440 min Summer	112.656	0.556	0.4	7.8	O K
2160 min Summer	112.570	0.470	0.4	6.6	O K
2880 min Summer	112.492	0.392	0.4	5.5	O K
4320 min Summer	112.340	0.240	0.4	3.4	O K
5760 min Summer	112.216	0.116	0.4	1.6	O K
7200 min Summer	112.158	0.058	0.4	0.8	O K
8640 min Summer	112.128	0.028	0.4	0.4	O K
10080 min Summer	112.111	0.011	0.3	0.2	O K
15 min Winter	112.388	0.288	0.4	4.0	O K
30 min Winter	112.515	0.415	0.4	5.8	O K
60 min Winter	112.659	0.559	0.4	7.8	O K
120 min Winter	112.787	0.687	0.5	9.6	O K
180 min Winter	112.831	0.731	0.5	10.2	O K
240 min Winter	112.848	0.748	0.5	10.5	O K
360 min Winter	112.861	0.761	0.5	10.7	O K
480 min Winter	112.856	0.756	0.5	10.6	O K
600 min Winter	112.842	0.742	0.5	10.4	O K
720 min Winter	112.824	0.724	0.5	10.1	O K
960 min Winter	112.778	0.678	0.5	9.5	O K
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Rainfall Details

Rainfall Model	FSR	Ratio R	0.200	Cv (Winter)	0.840
Return Period (years)	100	Summer Storms	Yes	Shortest Storm (mins)	15
Region	England and Wales	Winter Storms	Yes	Longest Storm (mins)	10080
M5-60 (mm)	19.800	Cv (Summer)	0.750	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.021

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

0	4	0.021
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Unit Reference	MD-SHE-0033-5000-0850-5000	Sump Available	Yes
Design Head (m)	0.850	Diameter (mm)	33
Design Flow (l/s)	0.5	Invert Level (m)	112.050
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	75
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.850	0.5	Kick-Flo®	0.298	0.3
Flush-Flo™	0.149	0.4	Mean Flow over Head Range	-	0.4

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)	Depth (m)	Flow (l/s)
0.100	0.4	0.800	0.5	2.000	0.7	4.000	1.0	7.000	1.3
0.200	0.4	1.000	0.5	2.200	0.8	4.500	1.0	7.500	1.3
0.300	0.3	1.200	0.6	2.400	0.8	5.000	1.1	8.000	1.4
0.400	0.4	1.400	0.6	2.600	0.8	5.500	1.1	8.500	1.4
0.500	0.4	1.600	0.7	3.000	0.9	6.000	1.2	9.000	1.4
0.600	0.4	1.800	0.7	3.500	0.9	6.500	1.2	9.500	1.5

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Model Details

Storage is Offline Cover Level (m) 113.200 Dividing Weir Level (m) 112.100

Tank or Pond Structure

Invert Level (m) 112.100

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	14.0	1.200	14.0	2.400	14.0	3.600	14.0	4.800	14.0
0.200	14.0	1.400	14.0	2.600	14.0	3.800	14.0	5.000	14.0
0.400	14.0	1.600	14.0	2.800	14.0	4.000	14.0		
0.600	14.0	1.800	14.0	3.000	14.0	4.200	14.0		
0.800	14.0	2.000	14.0	3.200	14.0	4.400	14.0		
1.000	14.0	2.200	14.0	3.400	14.0	4.600	14.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0033-5000-0850-5000	Sump Available	Yes
Design Head (m)	0.850	Diameter (mm)	33
Design Flow (l/s)	0.5	Invert Level (m)	112.050
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	75
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.850	0.5	Kick-Flo®	0.298	0.3
Flush-Flo™	0.149	0.4	Mean Flow over Head Range		0.4

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)	Depth (m)	Flow (l/s)
0.100	0.4	0.800	0.5	2.000	0.7	4.000	1.0	7.000	1.3
0.200	0.4	1.000	0.5	2.200	0.8	4.500	1.0	7.500	1.3
0.300	0.3	1.200	0.6	2.400	0.8	5.000	1.1	8.000	1.4
0.400	0.4	1.400	0.6	2.600	0.8	5.500	1.1	8.500	1.4
0.500	0.4	1.600	0.7	3.000	0.9	6.000	1.2	9.000	1.4
0.600	0.4	1.800	0.7	3.500	0.9	6.500	1.2	9.500	1.5

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Region	England and Wales	Winter Storms	Yes	Longest Storm (mins)	10080
M5-60 (mm)	19.800	Cv (Summer)	0.750	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.021

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

0	4	0.021
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