

Appendix E – Proposed Site Plan



Appendix F – Historic Flood Map



Legend

- Approximate Site Boundary
- Historic Flood Outlines

00.250.50.75 km

N

Figure

Historic Flooding

Job

Unit A Finlan Road, Stakehill Industrial Estate,
Middleton, M24 2SJ

Client

UBS Triton Property Fund

Appendix:	Revision	Date
F	2	11 April 2023
Drawn by	Checked by	Scale
LA	RS	1:15,000

Job No.

90720.5547

Bing Maps

DeltaSimons

Site Plan Provided by Client.

Appendix G – ICP SUDS Calculations

Delta-Simons		Page 1
Suite 4A Portland Street Manchester, M1 3BE		
Date 24/04/2023 11:06 File	Designed by ella.brown Checked by	
Innovyze	Source Control 2020.1.3	
ICP SUDS Mean Annual Flood Input Return Period (years)2Soil0.450 Area (ha) 2.170Urban0.000 SAAR (mm) 1043Region NumberRegion 4 Results1/s QBAR Rural15.2 QBAR Urban15.2 Q2 years13.6 Q1 year12.6 Q30 years29.8 Q100 years39.1		
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Appendix H – Quick Storage Estimates

Quick Storage Estimate

Micro Drainage

Variables

FEH Rainfall

Return Period (years) 30

Version 2013 Point ...

Site GB 389280 408031 SD 89280 08031

Cv (Summer) 0.750

Cv (Winter) 0.840

Impermeable Area (ha) 2.170

Maximum Allowable Discharge (l/s) 15.2

Infiltration Coefficient (m/hr) 0.00000

Safety Factor 2.0

Climate Change (%) 25

Analyse OK Cancel Help

Enter Climate Change between -100 and 600

Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 879 m³ and 1478 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Enter Climate Change between -100 and 600

Quick Storage Estimate

Micro Drainage

Variables

FEH Rainfall

Return Period (years) 100

Version 2013 Point

Site GB 389280 408031 SD 89280 08031

Cv (Summer) 0.750

Cv (Winter) 0.840

Impermeable Area (ha) 2.170

Maximum Allowable Discharge (l/s) 15.2

Infiltration Coefficient (m/hr) 0.00000

Safety Factor 2.0

Climate Change (%) 30

Analyse OK Cancel Help

Select required Rainfall Model from the list

Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 1366 m³ and 2123 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Select required Rainfall Model from the list

Appendix I – Microdrainage Calculations

Delta-Simons

Page 1

Suite 4A
Portland Street
Manchester, M1 3BE

Date 24/04/2023 11:24
File 90720.554774_1-30-25-CC...

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Source Control 2020.1.3

Micro Drainage

Summary of Results for 30 year Return Period (+25%)

Half Drain Time : 565 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	8.868	0.268	0.0	15.1	15.1	340.8	O K
30 min Summer	8.963	0.363	0.0	15.1	15.1	462.2	O K
60 min Summer	9.067	0.467	0.0	15.1	15.1	594.7	O K
120 min Summer	9.149	0.549	0.0	15.1	15.1	698.7	O K
180 min Summer	9.198	0.598	0.0	15.1	15.1	761.4	O K
240 min Summer	9.230	0.630	0.0	15.1	15.1	802.6	O K
360 min Summer	9.267	0.667	0.0	15.1	15.1	849.1	O K
480 min Summer	9.283	0.683	0.0	15.1	15.1	869.8	O K
600 min Summer	9.293	0.693	0.0	15.1	15.1	882.1	O K
720 min Summer	9.299	0.699	0.0	15.1	15.1	889.6	O K
960 min Summer	9.303	0.703	0.0	15.1	15.1	894.5	O K
1440 min Summer	9.291	0.691	0.0	15.1	15.1	880.2	O K
2160 min Summer	9.257	0.657	0.0	15.1	15.1	836.7	O K
2880 min Summer	9.215	0.615	0.0	15.1	15.1	783.0	O K
4320 min Summer	9.113	0.513	0.0	15.1	15.1	653.6	O K
5760 min Summer	9.025	0.425	0.0	15.1	15.1	541.0	O K
7200 min Summer	8.953	0.353	0.0	15.1	15.1	449.2	O K
8640 min Summer	8.896	0.296	0.0	15.1	15.1	376.9	O K
10080 min Summer	8.853	0.253	0.0	15.1	15.1	322.4	O K
15 min Winter	8.901	0.301	0.0	15.1	15.1	382.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	86.941	0.0	327.5	26
30 min Summer	59.451	0.0	454.3	40
60 min Summer	38.905	0.0	618.8	70
120 min Summer	23.685	0.0	755.5	128
180 min Summer	17.757	0.0	850.5	186
240 min Summer	14.491	0.0	926.0	244
360 min Summer	10.897	0.0	1045.0	362
480 min Summer	8.910	0.0	1139.5	458
600 min Summer	7.624	0.0	1218.6	512
720 min Summer	6.713	0.0	1287.2	574
960 min Summer	5.491	0.0	1402.2	704
1440 min Summer	4.131	0.0	1575.4	984
2160 min Summer	3.114	0.0	1814.3	1404
2880 min Summer	2.553	0.0	1982.0	1820
4320 min Summer	1.931	0.0	2243.0	2596
5760 min Summer	1.588	0.0	2475.2	3336
7200 min Summer	1.367	0.0	2662.7	4032
8640 min Summer	1.212	0.0	2829.8	4680
10080 min Summer	1.096	0.0	2978.8	5352
15 min Winter	86.941	0.0	369.0	26

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Page 2



Summary of Results for 30 year Return Period (+25%)

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
30 min Winter	9.008	0.408	0.0	15.1	15.1	520.0	O K
60 min Winter	9.127	0.527	0.0	15.1	15.1	670.2	O K
120 min Winter	9.221	0.621	0.0	15.1	15.1	790.8	O K
180 min Winter	9.277	0.677	0.0	15.1	15.1	861.8	O K
240 min Winter	9.314	0.714	0.0	15.1	15.1	909.3	O K
360 min Winter	9.359	0.759	0.0	15.1	15.1	966.1	O K
480 min Winter	9.381	0.781	0.0	15.1	15.1	994.8	O K
600 min Winter	9.391	0.791	0.0	15.1	15.1	1007.2	O K
720 min Winter	9.393	0.793	0.0	15.1	15.1	1009.9	O K
960 min Winter	9.395	0.795	0.0	15.2	15.2	1012.7	O K
1440 min Winter	9.373	0.773	0.0	15.1	15.1	983.6	O K
2160 min Winter	9.313	0.713	0.0	15.1	15.1	908.0	O K
2880 min Winter	9.243	0.643	0.0	15.1	15.1	818.1	O K
4320 min Winter	9.072	0.472	0.0	15.1	15.1	600.9	O K
5760 min Winter	8.937	0.337	0.0	15.1	15.1	429.4	O K
7200 min Winter	8.845	0.245	0.0	15.1	15.1	312.5	O K
8640 min Winter	8.792	0.192	0.0	14.7	14.7	244.5	O K
10080 min Winter	8.773	0.173	0.0	13.7	13.7	220.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	59.451	0.0	510.7	40
60 min Winter	38.905	0.0	694.3	68
120 min Winter	23.685	0.0	847.2	126
180 min Winter	17.757	0.0	953.6	182
240 min Winter	14.491	0.0	1038.1	240
360 min Winter	10.897	0.0	1171.3	354
480 min Winter	8.910	0.0	1277.0	462
600 min Winter	7.624	0.0	1365.4	566
720 min Winter	6.713	0.0	1442.0	614
960 min Winter	5.491	0.0	1570.2	748
1440 min Winter	4.131	0.0	1761.9	1060
2160 min Winter	3.114	0.0	2032.7	1520
2880 min Winter	2.553	0.0	2220.6	1968
4320 min Winter	1.931	0.0	2514.7	2732
5760 min Winter	1.588	0.0	2773.0	3456
7200 min Winter	1.367	0.0	2983.3	4040
8640 min Winter	1.212	0.0	3170.9	4592
10080 min Winter	1.096	0.0	3339.5	5248

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 389280 408031 SD 89280 08031
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+25

Time Area Diagram

Total Area (ha) 2.170

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4 0.723	4	8 0.723	8	12 0.723

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Model Details

Storage is Online Cover Level (m) 10.000

Cellular Storage Structure

Invert Level (m) 8.600 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	1340.0	0.0	0.801	0.0	0.0
0.800	1340.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0178-1520-0800-1520
Design Head (m)	0.800
Design Flow (l/s)	15.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	178
Invert Level (m)	8.600
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

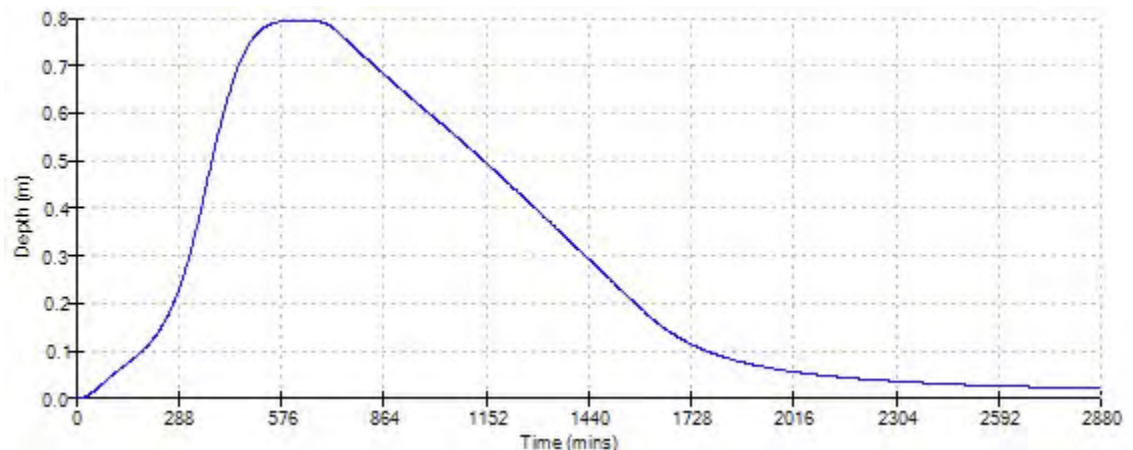
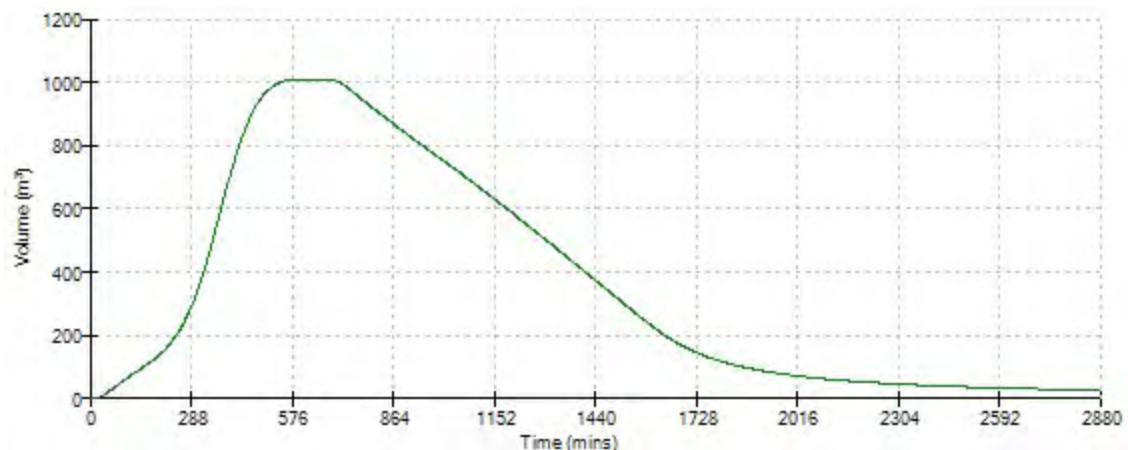
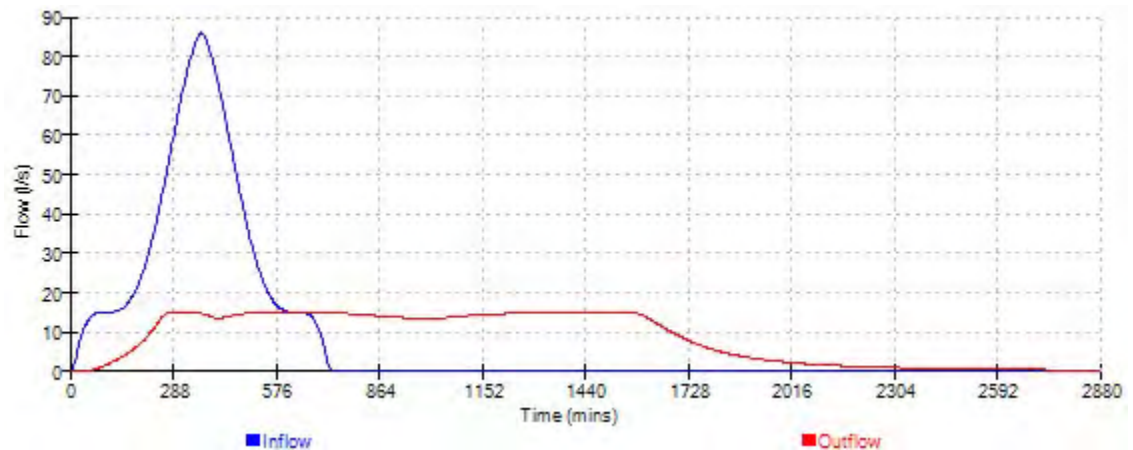
Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	15.2
Flush-Flo™	0.292	15.1
Kick-Flo®	0.590	13.2
Mean Flow over Head Range	-	12.6

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

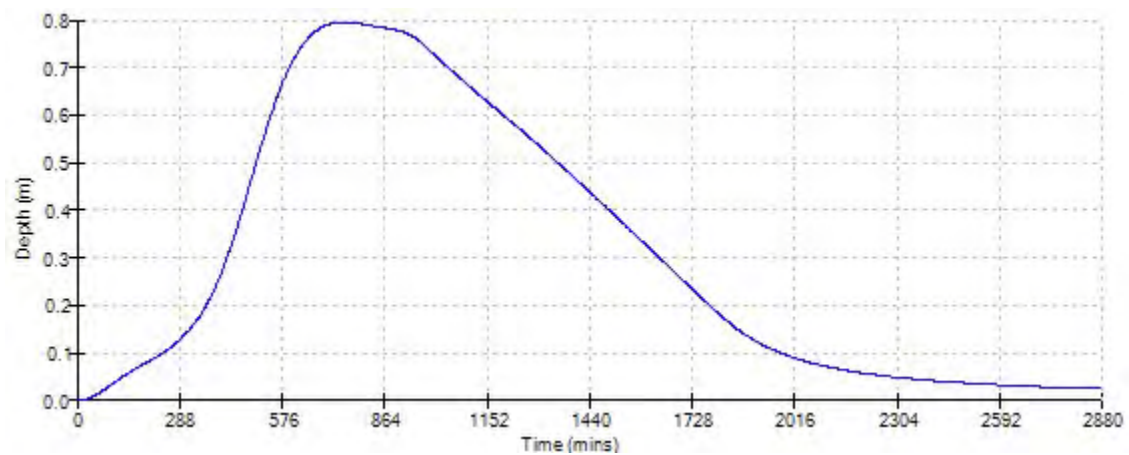
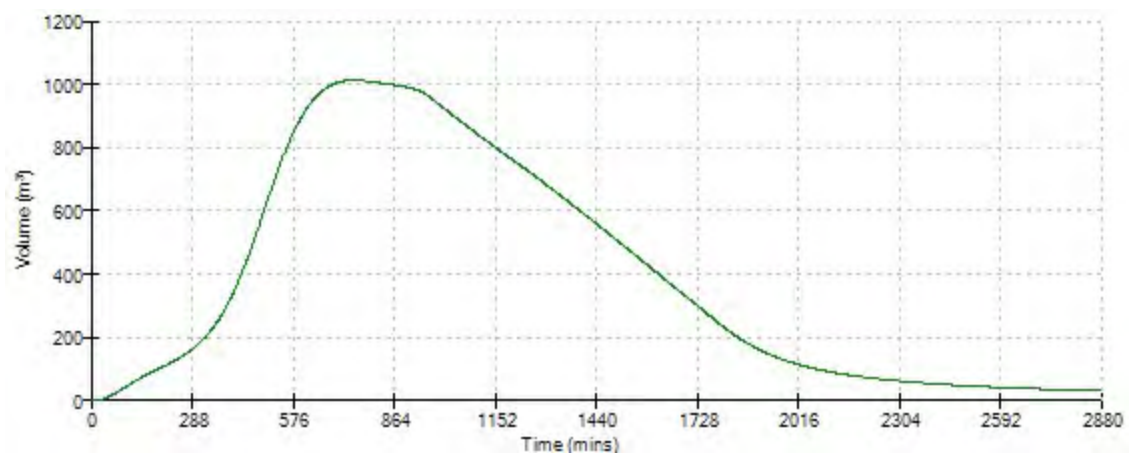
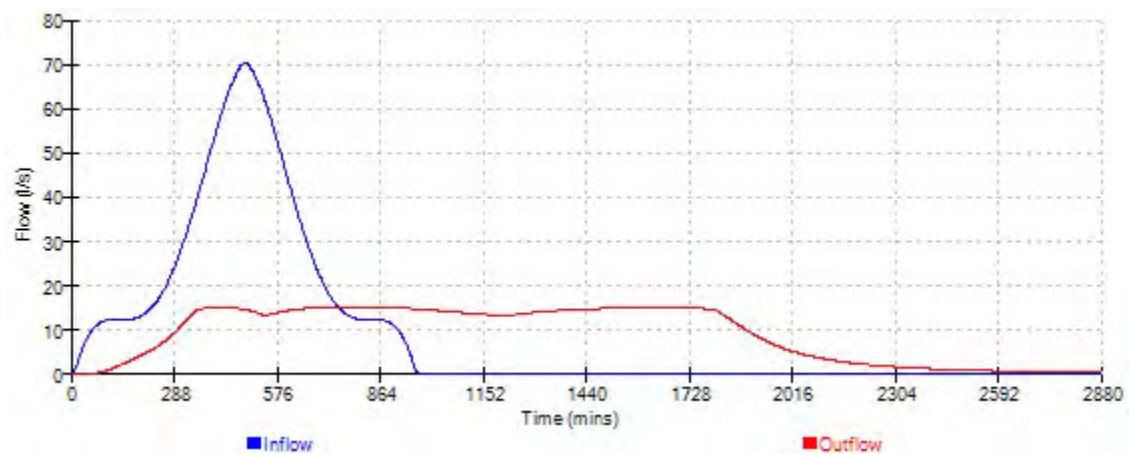
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.3	1.200	18.4	3.000	28.6	7.000	43.0
0.200	14.8	1.400	19.8	3.500	30.8	7.500	44.5
0.300	15.1	1.600	21.1	4.000	32.8	8.000	45.9
0.400	14.9	1.800	22.4	4.500	34.7	8.500	47.0
0.500	14.4	2.000	23.5	5.000	36.5	9.000	48.4
0.600	13.3	2.200	24.6	5.500	38.3	9.500	49.8
0.800	15.2	2.400	25.7	6.000	39.9		
1.000	16.9	2.600	26.7	6.500	41.5		

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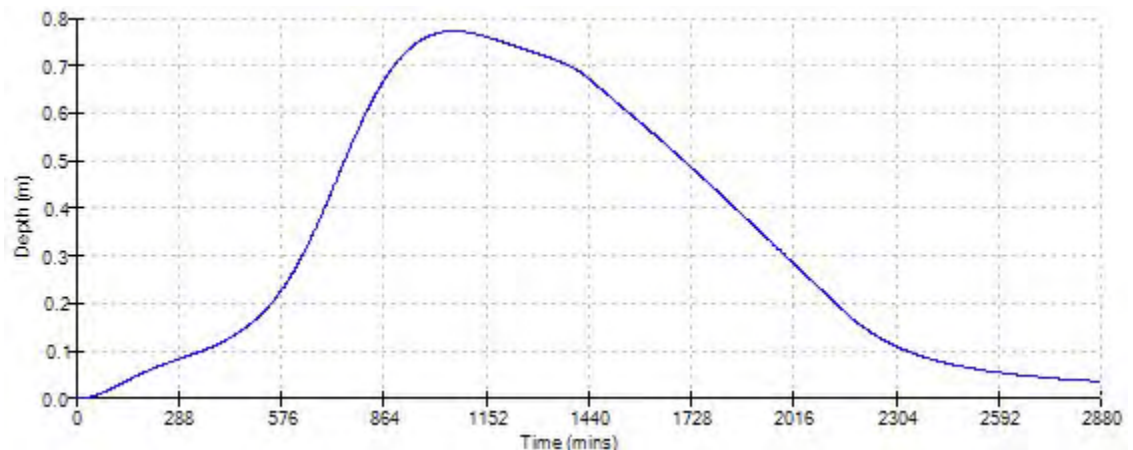
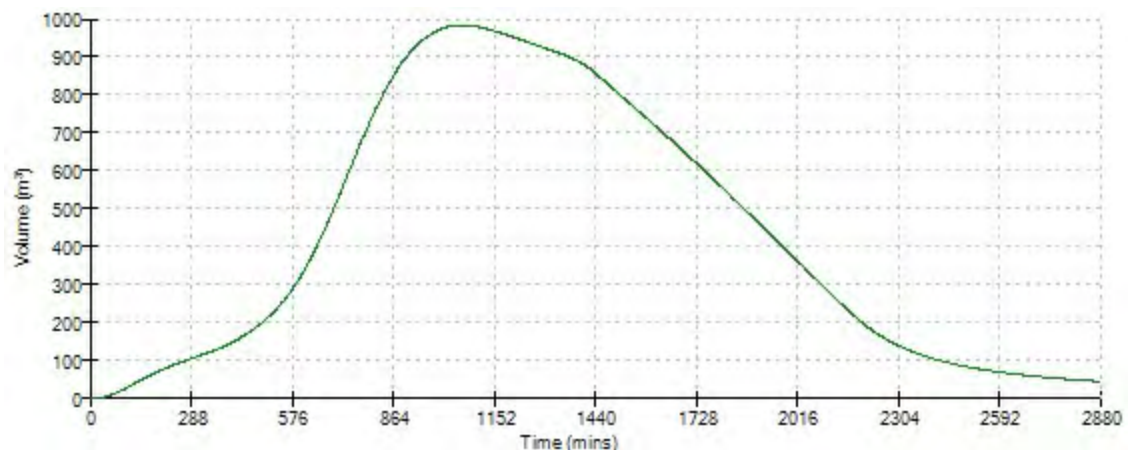
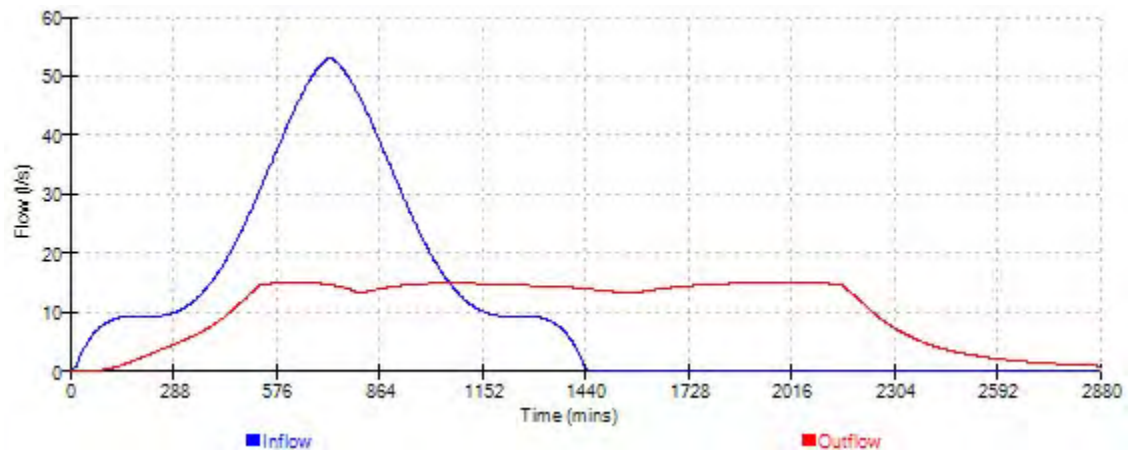
Event: 720 min Winter



Event: 960 min Winter



Event: 1440 min Winter



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Innovyze Source Control 2020.1.3																																																																																																																																																																																																																																																																																			
Summary of Results for 100 year Return Period (+30%) Half Drain Time : 650 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max Σ Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>8.975</td><td>0.375</td><td>0.0</td><td>15.1</td><td>15.1</td><td>477.9</td><td>O K</td></tr><tr><td>30 min Summer</td><td>9.115</td><td>0.515</td><td>0.0</td><td>15.1</td><td>15.1</td><td>655.9</td><td>O K</td></tr><tr><td>60 min Summer</td><td>9.274</td><td>0.674</td><td>0.0</td><td>15.1</td><td>15.1</td><td>857.9</td><td>O K</td></tr><tr><td>120 min Summer</td><td>9.390</td><td>0.790</td><td>0.0</td><td>15.1</td><td>15.1</td><td>1005.3</td><td>O K</td></tr><tr><td>180 min Summer</td><td>10.061</td><td>1.461</td><td>0.0</td><td>20.2</td><td>20.2</td><td>1080.9</td><td>FLOOD</td></tr><tr><td>240 min Summer</td><td>10.110</td><td>1.510</td><td>0.0</td><td>20.6</td><td>20.6</td><td>1129.2</td><td>FLOOD</td></tr><tr><td>360 min Summer</td><td>10.162</td><td>1.562</td><td>0.0</td><td>20.9</td><td>20.9</td><td>1181.0</td><td>FLOOD</td></tr><tr><td>480 min Summer</td><td>10.182</td><td>1.582</td><td>0.0</td><td>21.0</td><td>21.0</td><td>1201.8</td><td>FLOOD</td></tr><tr><td>600 min Summer</td><td>10.196</td><td>1.596</td><td>0.0</td><td>21.1</td><td>21.1</td><td>1215.1</td><td>FLOOD</td></tr><tr><td>720 min Summer</td><td>10.202</td><td>1.602</td><td>0.0</td><td>21.1</td><td>21.1</td><td>1221.5</td><td>FLOOD</td></tr><tr><td>960 min Summer</td><td>10.203</td><td>1.603</td><td>0.0</td><td>21.1</td><td>21.1</td><td>1222.8</td><td>FLOOD</td></tr><tr><td>1440 min Summer</td><td>10.182</td><td>1.582</td><td>0.0</td><td>21.0</td><td>21.0</td><td>1201.8</td><td>FLOOD</td></tr><tr><td>2160 min Summer</td><td>10.124</td><td>1.524</td><td>0.0</td><td>20.6</td><td>20.6</td><td>1143.1</td><td>FLOOD</td></tr><tr><td>2880 min Summer</td><td>10.063</td><td>1.463</td><td>0.0</td><td>20.2</td><td>20.2</td><td>1082.8</td><td>FLOOD</td></tr><tr><td>4320 min Summer</td><td>9.393</td><td>0.793</td><td>0.0</td><td>15.1</td><td>15.1</td><td>1009.8</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>9.304</td><td>0.704</td><td>0.0</td><td>15.1</td><td>15.1</td><td>895.6</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>9.214</td><td>0.614</td><td>0.0</td><td>15.1</td><td>15.1</td><td>781.6</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>9.110</td><td>0.510</td><td>0.0</td><td>15.1</td><td>15.1</td><td>649.7</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>9.030</td><td>0.430</td><td>0.0</td><td>15.1</td><td>15.1</td><td>547.7</td><td>O K</td></tr><tr><td>15 min Winter</td><td>9.022</td><td>0.422</td><td>0.0</td><td>15.1</td><td>15.1</td><td>536.7</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>120.989</td><td>0.0</td><td>462.7</td><td>26</td></tr><tr><td>30 min Summer</td><td>83.407</td><td>0.0</td><td>642.7</td><td>41</td></tr><tr><td>60 min Summer</td><td>55.162</td><td>0.0</td><td>881.3</td><td>70</td></tr><tr><td>120 min Summer</td><td>33.318</td><td>0.0</td><td>1066.0</td><td>128</td></tr><tr><td>180 min Summer</td><td>24.866</td><td>62.0</td><td>1194.3</td><td>186</td></tr><tr><td>240 min Summer</td><td>20.212</td><td>110.4</td><td>1294.9</td><td>244</td></tr><tr><td>360 min Summer</td><td>15.079</td><td>162.2</td><td>1449.3</td><td>360</td></tr><tr><td>480 min Summer</td><td>12.243</td><td>183.0</td><td>1568.7</td><td>428</td></tr><tr><td>600 min Summer</td><td>10.411</td><td>196.2</td><td>1666.8</td><td>490</td></tr><tr><td>720 min Summer</td><td>9.117</td><td>202.7</td><td>1750.6</td><td>554</td></tr><tr><td>960 min Summer</td><td>7.387</td><td>204.0</td><td>1888.0</td><td>684</td></tr><tr><td>1440 min Summer</td><td>5.500</td><td>183.0</td><td>2093.3</td><td>962</td></tr><tr><td>2160 min Summer</td><td>4.082</td><td>124.3</td><td>2379.9</td><td>1372</td></tr><tr><td>2880 min Summer</td><td>3.305</td><td>63.9</td><td>2567.9</td><td>1784</td></tr><tr><td>4320 min Summer</td><td>2.465</td><td>0.0</td><td>2866.2</td><td>2676</td></tr><tr><td>5760 min Summer</td><td>2.008</td><td>0.0</td><td>3132.0</td><td>3464</td></tr><tr><td>7200 min Summer</td><td>1.716</td><td>0.0</td><td>3344.4</td><td>4264</td></tr><tr><td>8640 min Summer</td><td>1.512</td><td>0.0</td><td>3532.6</td><td>4944</td></tr><tr><td>10080 min Summer</td><td>1.360</td><td>0.0</td><td>3699.9</td><td>5648</td></tr><tr><td>15 min Winter</td><td>120.989</td><td>0.0</td><td>520.1</td><td>26</td></tr></table>			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	8.975	0.375	0.0	15.1	15.1	477.9	O K	30 min Summer	9.115	0.515	0.0	15.1	15.1	655.9	O K	60 min Summer	9.274	0.674	0.0	15.1	15.1	857.9	O K	120 min Summer	9.390	0.790	0.0	15.1	15.1	1005.3	O K	180 min Summer	10.061	1.461	0.0	20.2	20.2	1080.9	FLOOD	240 min Summer	10.110	1.510	0.0	20.6	20.6	1129.2	FLOOD	360 min Summer	10.162	1.562	0.0	20.9	20.9	1181.0	FLOOD	480 min Summer	10.182	1.582	0.0	21.0	21.0	1201.8	FLOOD	600 min Summer	10.196	1.596	0.0	21.1	21.1	1215.1	FLOOD	720 min Summer	10.202	1.602	0.0	21.1	21.1	1221.5	FLOOD	960 min Summer	10.203	1.603	0.0	21.1	21.1	1222.8	FLOOD	1440 min Summer	10.182	1.582	0.0	21.0	21.0	1201.8	FLOOD	2160 min Summer	10.124	1.524	0.0	20.6	20.6	1143.1	FLOOD	2880 min Summer	10.063	1.463	0.0	20.2	20.2	1082.8	FLOOD	4320 min Summer	9.393	0.793	0.0	15.1	15.1	1009.8	O K	5760 min Summer	9.304	0.704	0.0	15.1	15.1	895.6	O K	7200 min Summer	9.214	0.614	0.0	15.1	15.1	781.6	O K	8640 min Summer	9.110	0.510	0.0	15.1	15.1	649.7	O K	10080 min Summer	9.030	0.430	0.0	15.1	15.1	547.7	O K	15 min Winter	9.022	0.422	0.0	15.1	15.1	536.7	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	120.989	0.0	462.7	26	30 min Summer	83.407	0.0	642.7	41	60 min Summer	55.162	0.0	881.3	70	120 min Summer	33.318	0.0	1066.0	128	180 min Summer	24.866	62.0	1194.3	186	240 min Summer	20.212	110.4	1294.9	244	360 min Summer	15.079	162.2	1449.3	360	480 min Summer	12.243	183.0	1568.7	428	600 min Summer	10.411	196.2	1666.8	490	720 min Summer	9.117	202.7	1750.6	554	960 min Summer	7.387	204.0	1888.0	684	1440 min Summer	5.500	183.0	2093.3	962	2160 min Summer	4.082	124.3	2379.9	1372	2880 min Summer	3.305	63.9	2567.9	1784	4320 min Summer	2.465	0.0	2866.2	2676	5760 min Summer	2.008	0.0	3132.0	3464	7200 min Summer	1.716	0.0	3344.4	4264	8640 min Summer	1.512	0.0	3532.6	4944	10080 min Summer	1.360	0.0	3699.9	5648	15 min Winter	120.989	0.0	520.1	26
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																																																																																																																																																																																																																																																																												
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Delta-Simons							Page 2
Suite 4A Portland Street Manchester, M1 3BE							
Date 24/04/2023 11:27 File 90720.554774_1-100-30-C...				Designed by ella.brown Checked by			
Innovyze				Source Control 2020.1.3			
Summary of Results for 100 year Return Period (+30%)							
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
30 min Winter	9.179	0.579	0.0	15.1	15.1	737.5	O K
60 min Winter	9.357	0.757	0.0	15.1	15.1	963.6	O K
120 min Winter	10.103	1.503	0.0	20.5	20.5	1122.8	FLOOD
180 min Winter	10.198	1.598	0.0	21.1	21.1	1217.1	FLOOD
240 min Winter	10.259	1.659	0.0	21.5	21.5	1278.7	FLOOD
360 min Winter	10.329	1.729	0.0	21.9	21.9	1348.5	FLOOD
480 min Winter	10.360	1.760	0.0	22.1	22.1	1379.3	FLOOD
600 min Winter	10.369	1.769	0.0	22.2	22.2	1388.8	FLOOD
720 min Winter	10.373	1.773	0.0	22.2	22.2	1392.6	FLOOD
960 min Winter	10.371	1.771	0.0	22.2	22.2	1390.6	FLOOD
1440 min Winter	10.330	1.730	0.0	21.9	21.9	1349.9	FLOOD
2160 min Winter	10.231	1.631	0.0	21.3	21.3	1250.4	FLOOD
2880 min Winter	10.131	1.531	0.0	20.7	20.7	1150.2	FLOOD
4320 min Winter	9.965	1.365	0.0	19.6	19.6	1019.4	Flood Risk
5760 min Winter	9.270	0.670	0.0	15.1	15.1	853.1	O K
7200 min Winter	9.096	0.496	0.0	15.1	15.1	631.1	O K
8640 min Winter	8.961	0.361	0.0	15.1	15.1	459.7	O K
10080 min Winter	8.869	0.269	0.0	15.1	15.1	341.9	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	83.407	0.0	720.2	40			
60 min Winter	55.162	0.0	988.0	68			
120 min Winter	33.318	104.0	1195.2	126			
180 min Winter	24.866	198.2	1338.8	182			
240 min Winter	20.212	259.8	1451.3	240			
360 min Winter	15.079	329.7	1624.0	352			
480 min Winter	12.243	360.5	1757.4	460			
600 min Winter	10.411	370.0	1866.9	558			
720 min Winter	9.117	373.7	1960.2	582			
960 min Winter	7.387	371.7	2112.8	734			
1440 min Winter	5.500	331.1	2337.2	1042			
2160 min Winter	4.082	231.6	2666.4	1484			
2880 min Winter	3.305	131.3	2876.9	1908			
4320 min Winter	2.465	0.0	3209.8	2724			
5760 min Winter	2.008	0.0	3508.6	3744			
7200 min Winter	1.716	0.0	3746.8	4464			
8640 min Winter	1.512	0.0	3958.1	5096			
10080 min Winter	1.360	0.0	4147.2	5648			
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Delta-Simons		Page 3
Suite 4A Portland Street Manchester, M1 3BE		
Date 24/04/2023 11:27 File 90720.554774_1-100-30-C...	Designed by ella.brown Checked by	
Innovyze Source Control 2020.1.3		

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 389280 408031 SD 89280 08031
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+30

Time Area Diagram

Total Area (ha) 2.170

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4 0.723	4	8 0.723	8	12 0.723

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Delta-Simons		Page 4
Suite 4A Portland Street Manchester, M1 3BE		
Date 24/04/2023 11:27 File 90720.554774_1-100-30-C...	Designed by ella.brown Checked by	
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Model Details

Storage is Online Cover Level (m) 10.000

Cellular Storage Structure

Invert Level (m) 8.600 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	1340.0	0.0	0.801	0.0	0.0
0.800	1340.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0178-1520-0800-1520
Design Head (m)	0.800
Design Flow (l/s)	15.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	178
Invert Level (m)	8.600
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

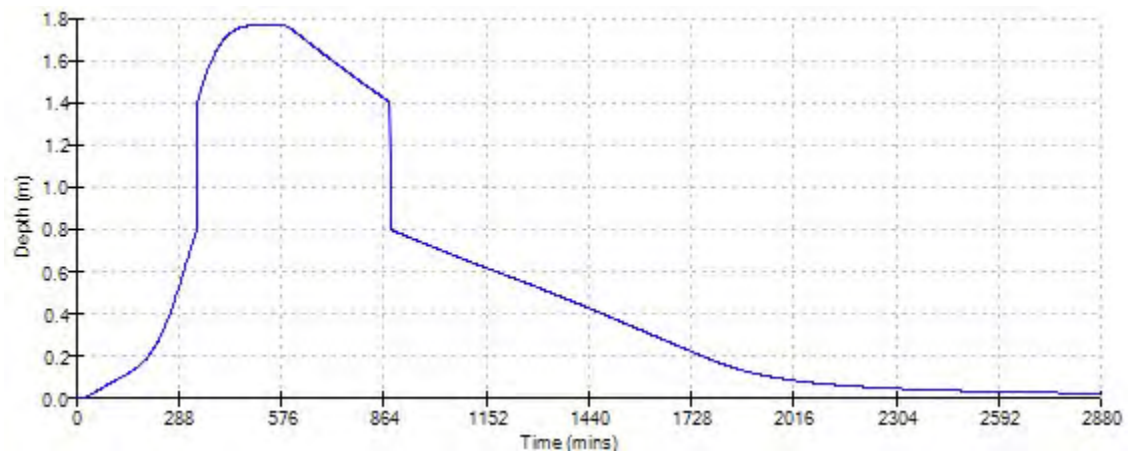
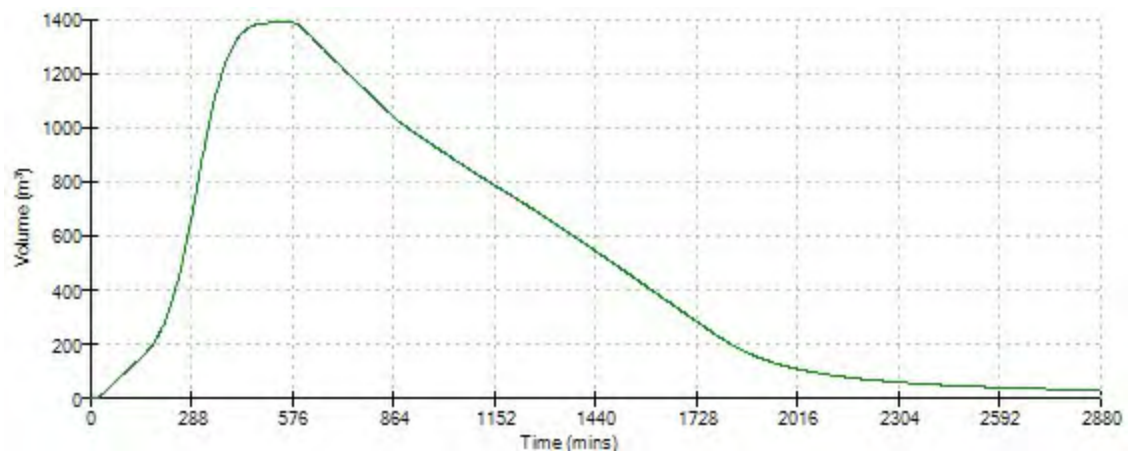
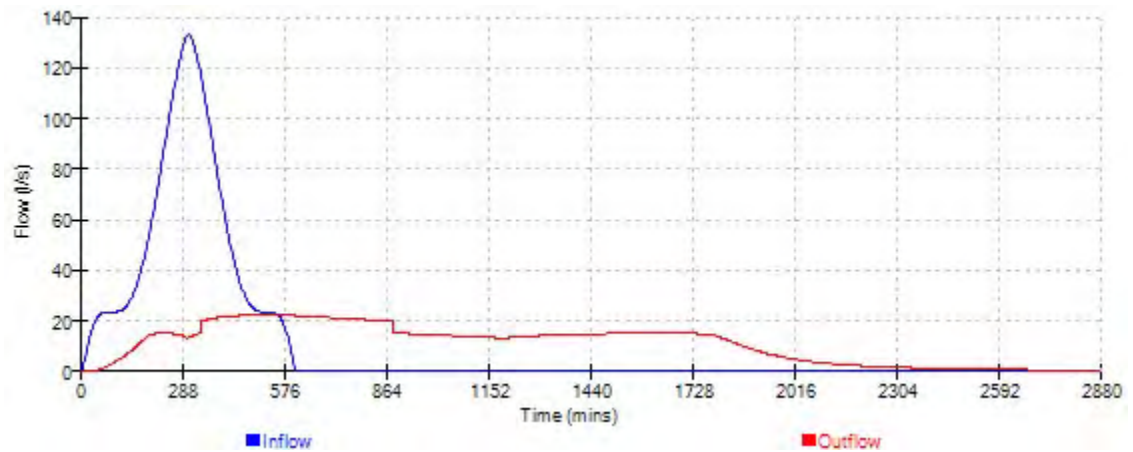
Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	15.2
Flush-Flo™	0.292	15.1
Kick-Flo®	0.590	13.2
Mean Flow over Head Range	-	12.6

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

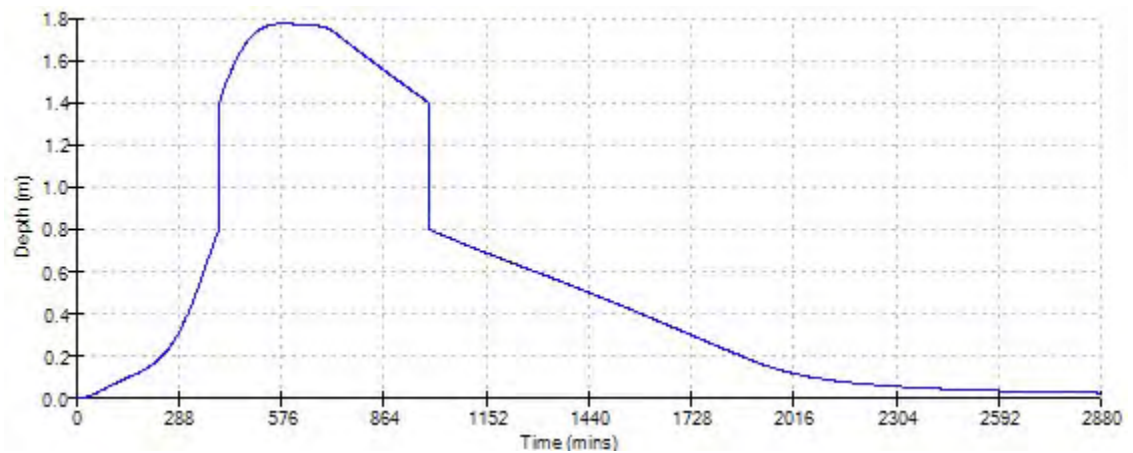
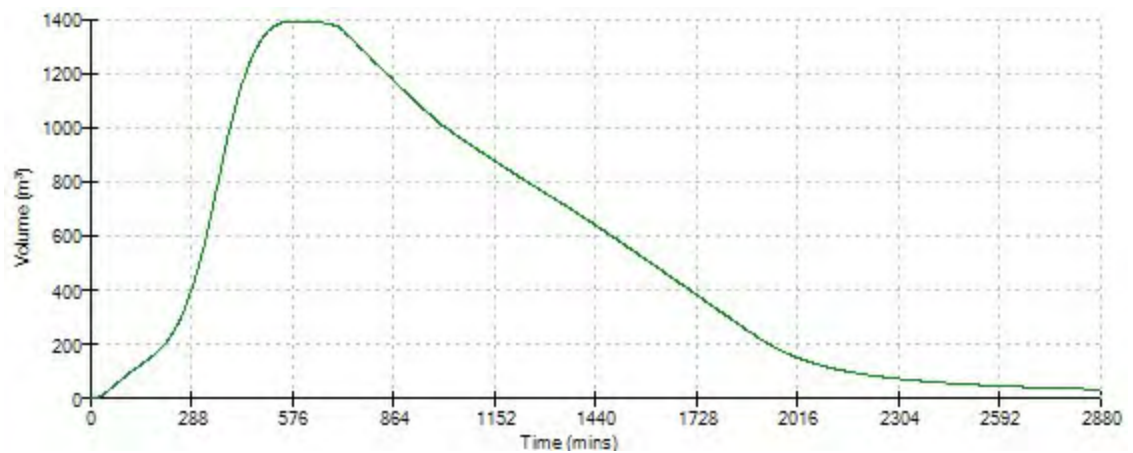
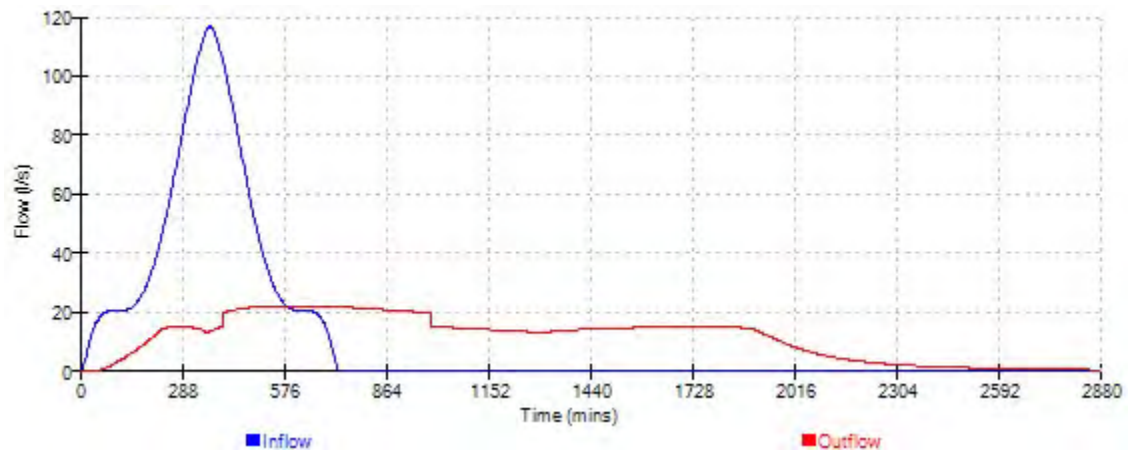
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.3	1.200	18.4	3.000	28.6	7.000	43.0
0.200	14.8	1.400	19.8	3.500	30.8	7.500	44.5
0.300	15.1	1.600	21.1	4.000	32.8	8.000	45.9
0.400	14.9	1.800	22.4	4.500	34.7	8.500	47.0
0.500	14.4	2.000	23.5	5.000	36.5	9.000	48.4
0.600	13.3	2.200	24.6	5.500	38.3	9.500	49.8
0.800	15.2	2.400	25.7	6.000	39.9		
1.000	16.9	2.600	26.7	6.500	41.5		

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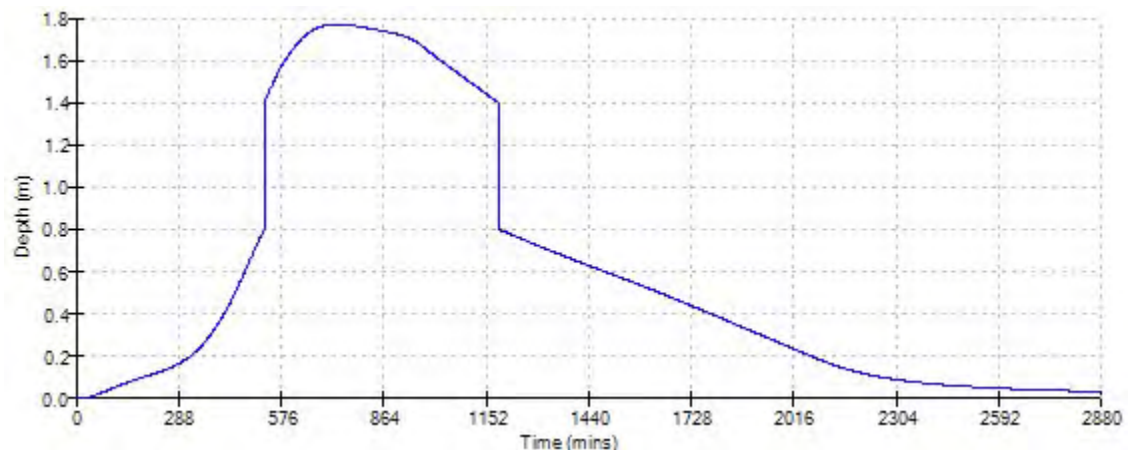
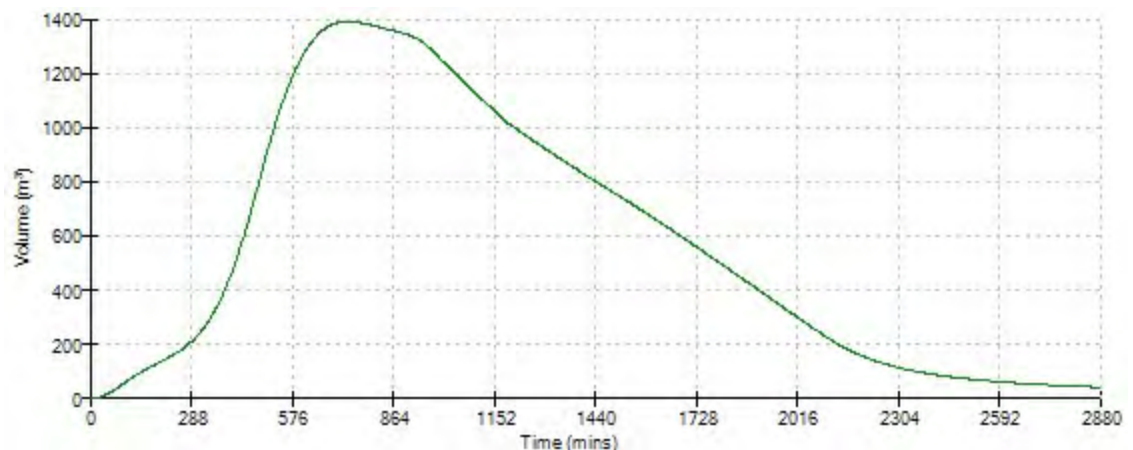
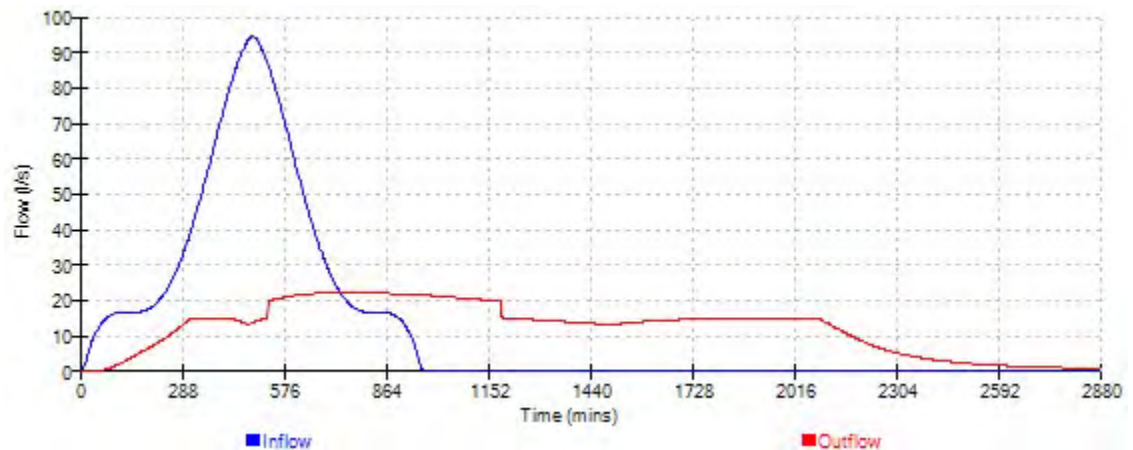
Event: 600 min Winter



Event: 720 min Winter



Event: 960 min Winter



Appendix J – Conceptual Drainage Sketch



Proposed Geocellular Storage Crate measuring 44 m (L) x 30.5 m (W) x 0.8 m (D), with a 95% void ratio thereby providing up to 1,019.92 m³ of attenuation.

Hydrobrake (or similar) flow control device to restrict surface water discharge to 15.2 l/s.

Surface water runoff to discharge to 450 mm surface water sewer.

LEGEND

Proposed Geocellular Tank
44 m (L) 30.5 m (W) 0.8 m (D) tank with a void ratio of 95% provides 1,019.92 m³ of attenuation

Approximate Route of Existing Public Surface Water Sewer

Indicative Proposed Indicative Surface Water Drainage Route

Approximate Existing Public Foul Water Sewer

Approximate Existing Public Combined Sewer

Proposed Flow Control Device (Hydrobrake or similar)

- NOTES
1. All dimensions in millimetres and all levels in metres above ordnance datum unless shown otherwise.

2. This drawing provides a Concept Drainage Sketch and is not intended for detailed design. Detailed drainage design will be required at the detailed design stage.

3. The Concept Drainage Sketch is based on the Proposed Development Plan (drawing ref - 0127-P100) provided by the Client.

4. Route of existing public sewers are indicative and based on plans provided by United Utilities. The location of existing public sewers should be verified on-Site.

5. Attenuation to be provided in the form of underground geocellular storage crates. Dimensions of proposed geocellular storage crates are to be confirmed at the detailed design stage.

6. Routes and dimensions of proposed surface water drainage to be confirmed at the detailed design stage. Where appropriate, it may be possible to utilise existing drainage runs, subject to further investigation at the detailed design stage.

7. Surface water runoff to discharge into existing 450 mm surface water sewer beneath Finland Road, subject to agreement with the United Utilities.

8. Proprietary treatment to be specified at the detailed design stage and installed and maintained as per relevant supplier's instructions.

9. Further consideration of proposed ground levels will be required at the detailed design stage.

Site Plan Provided by Client

Appendix K – Maintenance Schedules

Attenuation Storage Tank Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Ref. Table 21.3, CIRIA C753 'The SuDS Manual'