

Cole Easdon Consultants						Page 1																																																																																																																																																																																																																																																																																		
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Date July 2017 File 5753 - ATTENUATION TANK...			Designed by RT Checked by AD																																																																																																																																																																																																																																																																																					
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<u>Summary of Results for 100 year Return Period (+40%)</u> Half Drain Time : 12 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>5.507</td><td>0.307</td><td>0.0</td><td>5.0</td><td>5.0</td><td>5.3</td><td>0 K</td></tr><tr><td>30 min Summer</td><td>5.540</td><td>0.340</td><td>0.0</td><td>5.0</td><td>5.0</td><td>5.8</td><td>0 K</td></tr><tr><td>60 min Summer</td><td>5.521</td><td>0.321</td><td>0.0</td><td>5.0</td><td>5.0</td><td>5.5</td><td>0 K</td></tr><tr><td>120 min Summer</td><td>5.426</td><td>0.226</td><td>0.0</td><td>5.0</td><td>5.0</td><td>3.9</td><td>0 K</td></tr><tr><td>180 min Summer</td><td>5.342</td><td>0.142</td><td>0.0</td><td>5.0</td><td>5.0</td><td>2.4</td><td>0 K</td></tr><tr><td>240 min Summer</td><td>5.291</td><td>0.091</td><td>0.0</td><td>5.0</td><td>5.0</td><td>1.6</td><td>0 K</td></tr><tr><td>360 min Summer</td><td>5.256</td><td>0.056</td><td>0.0</td><td>4.2</td><td>4.2</td><td>0.9</td><td>0 K</td></tr><tr><td>480 min Summer</td><td>5.240</td><td>0.040</td><td>0.0</td><td>3.5</td><td>3.5</td><td>0.7</td><td>0 K</td></tr><tr><td>600 min Summer</td><td>5.231</td><td>0.031</td><td>0.0</td><td>2.9</td><td>2.9</td><td>0.5</td><td>0 K</td></tr><tr><td>720 min Summer</td><td>5.224</td><td>0.024</td><td>0.0</td><td>2.6</td><td>2.6</td><td>0.4</td><td>0 K</td></tr><tr><td>960 min Summer</td><td>5.215</td><td>0.015</td><td>0.0</td><td>2.1</td><td>2.1</td><td>0.3</td><td>0 K</td></tr><tr><td>1440 min Summer</td><td>5.204</td><td>0.004</td><td>0.0</td><td>1.5</td><td>1.5</td><td>0.1</td><td>0 K</td></tr><tr><td>2160 min Summer</td><td>5.200</td><td>0.000</td><td>0.0</td><td>1.1</td><td>1.1</td><td>0.0</td><td>0 K</td></tr><tr><td>2880 min Summer</td><td>5.200</td><td>0.000</td><td>0.0</td><td>0.9</td><td>0.9</td><td>0.0</td><td>0 K</td></tr><tr><td>4320 min 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Summer</td><td>83.789</td><td>0.0</td><td>11.6</td><td>23</td></tr><tr><td>60 min Summer</td><td>53.779</td><td>0.0</td><td>15.0</td><td>40</td></tr><tr><td>120 min Summer</td><td>33.337</td><td>0.0</td><td>18.5</td><td>72</td></tr><tr><td>180 min Summer</td><td>24.832</td><td>0.0</td><td>20.7</td><td>102</td></tr><tr><td>240 min Summer</td><td>20.006</td><td>0.0</td><td>22.2</td><td>128</td></tr><tr><td>360 min Summer</td><td>14.706</td><td>0.0</td><td>24.5</td><td>186</td></tr><tr><td>480 min Summer</td><td>11.818</td><td>0.0</td><td>26.2</td><td>246</td></tr><tr><td>600 min Summer</td><td>9.966</td><td>0.0</td><td>27.7</td><td>306</td></tr><tr><td>720 min Summer</td><td>8.665</td><td>0.0</td><td>28.9</td><td>368</td></tr><tr><td>960 min Summer</td><td>6.943</td><td>0.0</td><td>30.8</td><td>488</td></tr><tr><td>1440 min Summer</td><td>5.071</td><td>0.0</td><td>33.8</td><td>734</td></tr><tr><td>2160 min Summer</td><td>3.696</td><td>0.0</td><td>36.9</td><td>0</td></tr><tr><td>2880 min Summer</td><td>2.949</td><td>0.0</td><td>39.3</td><td>0</td></tr><tr><td>4320 min Summer</td><td>2.142</td><td>0.0</td><td>42.8</td><td>0</td></tr><tr><td>5760 min Summer</td><td>1.705</td><td>0.0</td><td>45.4</td><td>0</td></tr><tr><td>7200 min Summer</td><td>1.427</td><td>0.0</td><td>47.5</td><td>0</td></tr><tr><td>8640 min Summer</td><td>1.235</td><td>0.0</td><td>49.4</td><td>0</td></tr><tr><td>10080 min Summer</td><td>1.093</td><td>0.0</td><td>51.0</td><td>0</td></tr><tr><td>15 min Winter</td><td>124.633</td><td>0.0</td><td>9.6</td><td>15</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	5.507	0.307	0.0	5.0	5.0	5.3	0 K	30 min Summer	5.540	0.340	0.0	5.0	5.0	5.8	0 K	60 min Summer	5.521	0.321	0.0	5.0	5.0	5.5	0 K	120 min Summer	5.426	0.226	0.0	5.0	5.0	3.9	0 K	180 min Summer	5.342	0.142	0.0	5.0	5.0	2.4	0 K	240 min Summer	5.291	0.091	0.0	5.0	5.0	1.6	0 K	360 min Summer	5.256	0.056	0.0	4.2	4.2	0.9	0 K	480 min Summer	5.240	0.040	0.0	3.5	3.5	0.7	0 K	600 min Summer	5.231	0.031	0.0	2.9	2.9	0.5	0 K	720 min Summer	5.224	0.024	0.0	2.6	2.6	0.4	0 K	960 min Summer	5.215	0.015	0.0	2.1	2.1	0.3	0 K	1440 min Summer	5.204	0.004	0.0	1.5	1.5	0.1	0 K	2160 min Summer	5.200	0.000	0.0	1.1	1.1	0.0	0 K	2880 min Summer	5.200	0.000	0.0	0.9	0.9	0.0	0 K	4320 min Summer	5.200	0.000	0.0	0.6	0.6	0.0	0 K	5760 min Summer	5.200	0.000	0.0	0.5	0.5	0.0	0 K	7200 min Summer	5.200	0.000	0.0	0.4	0.4	0.0	0 K	8640 min Summer	5.200	0.000	0.0	0.4	0.4	0.0	0 K	10080 min Summer	5.200	0.000	0.0	0.3	0.3	0.0	0 K	15 min Winter	5.557	0.357	0.0	5.0	5.0	6.1	0 K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	124.633	0.0	8.6	14	30 min Summer	83.789	0.0	11.6	23	60 min Summer	53.779	0.0	15.0	40	120 min Summer	33.337	0.0	18.5	72	180 min Summer	24.832	0.0	20.7	102	240 min Summer	20.006	0.0	22.2	128	360 min Summer	14.706	0.0	24.5	186	480 min Summer	11.818	0.0	26.2	246	600 min Summer	9.966	0.0	27.7	306	720 min Summer	8.665	0.0	28.9	368	960 min Summer	6.943	0.0	30.8	488	1440 min Summer	5.071	0.0	33.8	734	2160 min Summer	3.696	0.0	36.9	0	2880 min Summer	2.949	0.0	39.3	0	4320 min Summer	2.142	0.0	42.8	0	5760 min Summer	1.705	0.0	45.4	0	7200 min Summer	1.427	0.0	47.5	0	8640 min Summer	1.235	0.0	49.4	0	10080 min Summer	1.093	0.0	51.0	0	15 min Winter	124.633	0.0	9.6	15
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Date July 2017 File 5753 - ATTENUATION TANK...			Designed by RT Checked by AD				
Elstree Computing Ltd			Source Control 2016.1				
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	5.588	0.388	0.0	5.0	5.0	6.6	0 K
60 min Winter	5.546	0.346	0.0	5.0	5.0	5.9	0 K
120 min Winter	5.388	0.188	0.0	5.0	5.0	3.2	0 K
180 min Winter	5.284	0.084	0.0	4.9	4.9	1.4	0 K
240 min Winter	5.257	0.057	0.0	4.3	4.3	1.0	0 K
360 min Winter	5.235	0.035	0.0	3.2	3.2	0.6	0 K
480 min Winter	5.224	0.024	0.0	2.6	2.6	0.4	0 K
600 min Winter	5.217	0.017	0.0	2.2	2.2	0.3	0 K
720 min Winter	5.211	0.011	0.0	1.9	1.9	0.2	0 K
960 min Winter	5.204	0.004	0.0	1.5	1.5	0.1	0 K
1440 min Winter	5.200	0.000	0.0	1.1	1.1	0.0	0 K
2160 min Winter	5.200	0.000	0.0	0.8	0.8	0.0	0 K
2880 min Winter	5.200	0.000	0.0	0.6	0.6	0.0	0 K
4320 min Winter	5.200	0.000	0.0	0.5	0.5	0.0	0 K
5760 min Winter	5.200	0.000	0.0	0.4	0.4	0.0	0 K
7200 min Winter	5.200	0.000	0.0	0.3	0.3	0.0	0 K
8640 min Winter	5.200	0.000	0.0	0.3	0.3	0.0	0 K
10080 min Winter	5.200	0.000	0.0	0.2	0.2	0.0	0 K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	83.789	0.0	13.0	24			
60 min Winter	53.779	0.0	16.8	44			
120 min Winter	33.337	0.0	20.7	76			
180 min Winter	24.832	0.0	23.1	100			
240 min Winter	20.006	0.0	24.9	128			
360 min Winter	14.706	0.0	27.4	186			
480 min Winter	11.818	0.0	29.4	248			
600 min Winter	9.966	0.0	31.0	304			
720 min Winter	8.665	0.0	32.3	368			
960 min Winter	6.943	0.0	34.5	484			
1440 min Winter	5.071	0.0	37.8	0			
2160 min Winter	3.696	0.0	41.4	0			
2880 min Winter	2.949	0.0	44.0	0			
4320 min Winter	2.142	0.0	47.9	0			
5760 min Winter	1.705	0.0	50.9	0			
7200 min Winter	1.427	0.0	53.2	0			
8640 min Winter	1.235	0.0	55.3	0			
10080 min Winter	1.093	0.0	57.1	0			
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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) 0.037

Time (mins)		Area
From:	To:	(ha)
0	4	0.037

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Model Details

Storage is Online Cover Level (m) 6.000

Cellular Storage Structure

Invert Level (m) 5.200 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	18.0	18.0	0.401	0.0	24.8
0.400	18.0	24.8			

Hydro-Brake Optimum® Outflow Control

Unit Reference MD-SHE-0113-5000-0450-5000
Design Head (m) 0.450
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 113
Invert Level (m) 5.150
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.450	5.0
Flush-Flo™	0.173	5.0
Kick-Flo®	0.341	4.4
Mean Flow over Head Range	-	4.1

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	3.9	1.200	7.9	3.000	12.2	7.000	18.4
0.200	5.0	1.400	8.5	3.500	13.1	7.500	19.0
0.300	4.7	1.600	9.0	4.000	14.0	8.000	19.7
0.400	4.7	1.800	9.6	4.500	14.8	8.500	20.3
0.500	5.2	2.000	10.1	5.000	15.5	9.000	20.9
0.600	5.7	2.200	10.5	5.500	16.3	9.500	21.4
0.800	6.5	2.400	11.0	6.000	17.0		
1.000	7.3	2.600	11.4	6.500	17.7		