



**Vale Consultancy**  
CONSULTING CIVIL & STRUCTURAL ENGINEERS

Title:        Attenuation Tank Calculations  
Project:     Sonalyst Building  
Client:      Sonalyst Property Infrastructure  
                 Development

Document No:    001  
Project No:       7167  
Prepared By:     Freddy Payne  
Checked By:      Matt Jones

Revision:    01

Date:    12/02/2020

Vale Consultancy

29 Bocam Park  
Old Field Rd Pencoed  
Bridgend CF35 5LJ

Date 11/02/2020 12:06  
File 7167 ATTENUATION TANK C...

Micro Drainage

Sonalyst  
Unit 4 Baglan Industrial Park  
Port Talbot SA12 7DJ

Designed by F Payne  
Checked by N Clifford

Source Control 2018.1

Page 1



Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 128 minutes.

| Storm Event      | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Control (l/s) | Max Overflow (l/s) | Max Σ Outflow (l/s) | Max Volume (m³) | Status |
|------------------|---------------|---------------|------------------------|-------------------|--------------------|---------------------|-----------------|--------|
| 15 min Summer    | 4.618         | 0.568         | 0.0                    | 5.0               | 0.0                | 5.0                 | 34.5            | 0 K    |
| 30 min Summer    | 4.815         | 0.765         | 0.0                    | 5.0               | 0.0                | 5.0                 | 46.5            | 0 K    |
| 60 min Summer    | 4.987         | 0.937         | 0.0                    | 5.0               | 0.0                | 5.0                 | 57.0            | 0 K    |
| 120 min Summer   | 5.081         | 1.031         | 0.0                    | 5.0               | 0.0                | 5.0                 | 62.7            | 0 K    |
| 180 min Summer   | 5.088         | 1.038         | 0.0                    | 5.0               | 0.0                | 5.0                 | 63.1            | 0 K    |
| 240 min Summer   | 5.071         | 1.021         | 0.0                    | 5.0               | 0.0                | 5.0                 | 62.1            | 0 K    |
| 360 min Summer   | 5.024         | 0.974         | 0.0                    | 5.0               | 0.0                | 5.0                 | 59.2            | 0 K    |
| 480 min Summer   | 4.970         | 0.920         | 0.0                    | 5.0               | 0.0                | 5.0                 | 55.9            | 0 K    |
| 600 min Summer   | 4.912         | 0.862         | 0.0                    | 5.0               | 0.0                | 5.0                 | 52.4            | 0 K    |
| 720 min Summer   | 4.850         | 0.800         | 0.0                    | 5.0               | 0.0                | 5.0                 | 48.6            | 0 K    |
| 960 min Summer   | 4.698         | 0.648         | 0.0                    | 5.0               | 0.0                | 5.0                 | 39.4            | 0 K    |
| 1440 min Summer  | 4.457         | 0.407         | 0.0                    | 5.0               | 0.0                | 5.0                 | 24.8            | 0 K    |
| 2160 min Summer  | 4.256         | 0.206         | 0.0                    | 4.9               | 0.0                | 4.9                 | 12.5            | 0 K    |
| 2880 min Summer  | 4.163         | 0.113         | 0.0                    | 4.5               | 0.0                | 4.5                 | 6.8             | 0 K    |
| 4320 min Summer  | 4.106         | 0.056         | 0.0                    | 3.6               | 0.0                | 3.6                 | 3.4             | 0 K    |
| 5760 min Summer  | 4.087         | 0.037         | 0.0                    | 2.9               | 0.0                | 2.9                 | 2.3             | 0 K    |
| 7200 min Summer  | 4.077         | 0.027         | 0.0                    | 2.5               | 0.0                | 2.5                 | 1.6             | 0 K    |
| 8640 min Summer  | 4.070         | 0.020         | 0.0                    | 2.1               | 0.0                | 2.1                 | 1.2             | 0 K    |
| 10080 min Summer | 4.065         | 0.015         | 0.0                    | 1.9               | 0.0                | 1.9                 | 0.9             | 0 K    |
| 15 min Winter    | 4.696         | 0.646         | 0.0                    | 5.0               | 0.0                | 5.0                 | 39.3            | 0 K    |

| Storm Event      | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Overflow Volume (m³) | Time-Peak (mins) |
|------------------|--------------|---------------------|-----------------------|----------------------|------------------|
| 15 min Summer    | 103.207      | 0.0                 | 39.5                  | 0.0                  | 21               |
| 30 min Summer    | 71.304       | 0.0                 | 54.5                  | 0.0                  | 35               |
| 60 min Summer    | 47.182       | 0.0                 | 72.1                  | 0.0                  | 62               |
| 120 min Summer   | 30.163       | 0.0                 | 92.3                  | 0.0                  | 114              |
| 180 min Summer   | 22.844       | 0.0                 | 104.8                 | 0.0                  | 144              |
| 240 min Summer   | 18.597       | 0.0                 | 113.7                 | 0.0                  | 178              |
| 360 min Summer   | 13.866       | 0.0                 | 127.3                 | 0.0                  | 248              |
| 480 min Summer   | 11.252       | 0.0                 | 137.8                 | 0.0                  | 318              |
| 600 min Summer   | 9.559        | 0.0                 | 146.3                 | 0.0                  | 386              |
| 720 min Summer   | 8.361        | 0.0                 | 153.5                 | 0.0                  | 456              |
| 960 min Summer   | 6.761        | 0.0                 | 165.5                 | 0.0                  | 582              |
| 1440 min Summer  | 4.999        | 0.0                 | 183.5                 | 0.0                  | 812              |
| 2160 min Summer  | 3.686        | 0.0                 | 203.0                 | 0.0                  | 1148             |
| 2880 min Summer  | 2.965        | 0.0                 | 217.7                 | 0.0                  | 1496             |
| 4320 min Summer  | 2.176        | 0.0                 | 239.6                 | 0.0                  | 2204             |
| 5760 min Summer  | 1.748        | 0.0                 | 256.6                 | 0.0                  | 2912             |
| 7200 min Summer  | 1.475        | 0.0                 | 270.9                 | 0.0                  | 3648             |
| 8640 min Summer  | 1.285        | 0.0                 | 283.1                 | 0.0                  | 4384             |
| 10080 min Summer | 1.143        | 0.0                 | 293.9                 | 0.0                  | 5120             |
| 15 min Winter    | 103.207      | 0.0                 | 44.2                  | 0.0                  | 21               |

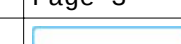
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|                                                            |                                                                  |                                                                                     |
|------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Vale Consultancy                                           |                                                                  | Page 2                                                                              |
| 29 Bocam Park<br>Old Field Rd Pencoed<br>Bridgend CF35 5LJ | Sonalyt<br>Unit 4 Baglan Industrial Park<br>Port Talbot SA12 7DJ |  |
| Date 11/02/2020 12:06<br>File 7167 ATTENUATION TANK C...   | Designed by F Payne<br>Checked by N Clifford                     |                                                                                     |
| Micro Drainage                                             |                                                                  | Source Control 2018.1                                                               |

### 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 Overflow (l/s) | Max Σ Outflow (l/s) | Max Volume (m³) | Status |
|------------------|---------------|---------------|------------------------|-------------------|--------------------|---------------------|-----------------|--------|
| 30 min Winter    | 4.922         | 0.872         | 0.0                    | 5.0               | 0.0                | 5.0                 | 53.0            | 0 K    |
| 60 min Winter    | 5.126         | 1.076         | 0.0                    | 5.0               | 0.0                | 5.0                 | 65.4            | 0 K    |
| 120 min Winter   | 5.256         | 1.206         | 0.0                    | 5.0               | 0.9                | 5.9                 | 73.0            | 0 K    |
| 180 min Winter   | 5.257         | 1.207         | 0.0                    | 5.0               | 1.1                | 6.1                 | 73.0            | 0 K    |
| 240 min Winter   | 5.233         | 1.183         | 0.0                    | 5.0               | 0.0                | 5.0                 | 71.9            | 0 K    |
| 360 min Winter   | 5.158         | 1.108         | 0.0                    | 5.0               | 0.0                | 5.0                 | 67.4            | 0 K    |
| 480 min Winter   | 5.071         | 1.021         | 0.0                    | 5.0               | 0.0                | 5.0                 | 62.1            | 0 K    |
| 600 min Winter   | 4.978         | 0.928         | 0.0                    | 5.0               | 0.0                | 5.0                 | 56.4            | 0 K    |
| 720 min Winter   | 4.879         | 0.829         | 0.0                    | 5.0               | 0.0                | 5.0                 | 50.4            | 0 K    |
| 960 min Winter   | 4.629         | 0.579         | 0.0                    | 5.0               | 0.0                | 5.0                 | 35.2            | 0 K    |
| 1440 min Winter  | 4.313         | 0.263         | 0.0                    | 5.0               | 0.0                | 5.0                 | 16.0            | 0 K    |
| 2160 min Winter  | 4.139         | 0.089         | 0.0                    | 4.3               | 0.0                | 4.3                 | 5.4             | 0 K    |
| 2880 min Winter  | 4.105         | 0.055         | 0.0                    | 3.6               | 0.0                | 3.6                 | 3.3             | 0 K    |
| 4320 min Winter  | 4.080         | 0.030         | 0.0                    | 2.6               | 0.0                | 2.6                 | 1.8             | 0 K    |
| 5760 min Winter  | 4.069         | 0.019         | 0.0                    | 2.1               | 0.0                | 2.1                 | 1.2             | 0 K    |
| 7200 min Winter  | 4.062         | 0.012         | 0.0                    | 1.8               | 0.0                | 1.8                 | 0.8             | 0 K    |
| 8640 min Winter  | 4.058         | 0.008         | 0.0                    | 1.6               | 0.0                | 1.6                 | 0.5             | 0 K    |
| 10080 min Winter | 4.054         | 0.004         | 0.0                    | 1.4               | 0.0                | 1.4                 | 0.2             | 0 K    |

| Storm Event      | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Overflow Volume (m³) | Time-Peak (mins) |
|------------------|--------------|---------------------|-----------------------|----------------------|------------------|
| 30 min Winter    | 71.304       | 0.0                 | 61.1                  | 0.0                  | 35               |
| 60 min Winter    | 47.182       | 0.0                 | 80.8                  | 0.0                  | 62               |
| 120 min Winter   | 30.163       | 0.0                 | 103.4                 | 0.2                  | 116              |
| 180 min Winter   | 22.844       | 0.0                 | 117.5                 | 0.3                  | 146              |
| 240 min Winter   | 18.597       | 0.0                 | 127.5                 | 0.0                  | 188              |
| 360 min Winter   | 13.866       | 0.0                 | 142.6                 | 0.0                  | 266              |
| 480 min Winter   | 11.252       | 0.0                 | 154.2                 | 0.0                  | 344              |
| 600 min Winter   | 9.559        | 0.0                 | 163.8                 | 0.0                  | 420              |
| 720 min Winter   | 8.361        | 0.0                 | 171.9                 | 0.0                  | 494              |
| 960 min Winter   | 6.761        | 0.0                 | 185.4                 | 0.0                  | 616              |
| 1440 min Winter  | 4.999        | 0.0                 | 205.6                 | 0.0                  | 828              |
| 2160 min Winter  | 3.686        | 0.0                 | 227.4                 | 0.0                  | 1144             |
| 2880 min Winter  | 2.965        | 0.0                 | 243.8                 | 0.0                  | 1472             |
| 4320 min Winter  | 2.176        | 0.0                 | 268.4                 | 0.0                  | 2204             |
| 5760 min Winter  | 1.748        | 0.0                 | 287.5                 | 0.0                  | 2936             |
| 7200 min Winter  | 1.475        | 0.0                 | 303.3                 | 0.0                  | 3672             |
| 8640 min Winter  | 1.285        | 0.0                 | 317.0                 | 0.0                  | 4368             |
| 10080 min Winter | 1.143        | 0.0                 | 329.2                 | 0.0                  | 5120             |

|                                                            |                                                                  |                                                                                     |
|------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Vale Consultancy                                           |                                                                  | Page 3                                                                              |
| 29 Bocam Park<br>Old Field Rd Pencoed<br>Bridgend CF35 5LJ | Sonalyt<br>Unit 4 Baglan Industrial Park<br>Port Talbot SA12 7DJ |  |
| Date 11/02/2020 12:06<br>File 7167 ATTENUATION TANK C...   | Designed by F Payne<br>Checked by N Clifford                     |                                                                                     |
| Micro Drainage                                             | Source Control 2018.1                                            |                                                                                     |

#### 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)            | 18.000            | Shortest Storm (mins) | 15    |
| Ratio R               | 0.299             | Longest Storm (mins)  | 10080 |
| Summer Storms         | Yes               | Climate Change %      | +30   |

#### Time Area Diagram

Total Area (ha) 0.204

| Time (mins) | Area  | Time (mins) | Area  |
|-------------|-------|-------------|-------|
| From: To:   | (ha)  | From: To:   | (ha)  |
| 0 4         | 0.102 | 4 8         | 0.102 |

|                                                            |                                                                  |                                                                                     |
|------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Vale Consultancy                                           |                                                                  | Page 4                                                                              |
| 29 Bocam Park<br>Old Field Rd Pencoed<br>Bridgend CF35 5LJ | Sonalyt<br>Unit 4 Baglan Industrial Park<br>Port Talbot SA12 7DJ |  |
| Date 11/02/2020 12:06<br>File 7167 ATTENUATION TANK C...   | Designed by F Payne<br>Checked by N Clifford                     |                                                                                     |
| Micro Drainage                                             | Source Control 2018.1                                            |                                                                                     |

### Model Details

Storage is Online Cover Level (m) 5.830

### Cellular Storage Structure

Invert Level (m) 4.050 Safety Factor 2.0  
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95  
Infiltration Coefficient Side (m/hr) 0.00000

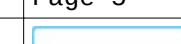
| Depth (m) | Area (m <sup>2</sup> ) | Inf. Area (m <sup>2</sup> ) | Depth (m) | Area (m <sup>2</sup> ) | Inf. Area (m <sup>2</sup> ) |
|-----------|------------------------|-----------------------------|-----------|------------------------|-----------------------------|
| 0.000     | 64.0                   | 0.0                         | 1.201     | 0.0                    | 0.0                         |
| 0.100     | 64.0                   | 0.0                         | 1.400     | 0.0                    | 0.0                         |
| 0.200     | 64.0                   | 0.0                         | 1.500     | 0.0                    | 0.0                         |
| 0.300     | 64.0                   | 0.0                         | 1.600     | 0.0                    | 0.0                         |
| 0.400     | 64.0                   | 0.0                         | 1.700     | 0.0                    | 0.0                         |
| 0.500     | 64.0                   | 0.0                         | 1.800     | 0.0                    | 0.0                         |
| 0.600     | 64.0                   | 0.0                         | 1.900     | 0.0                    | 0.0                         |
| 0.700     | 64.0                   | 0.0                         | 2.000     | 0.0                    | 0.0                         |
| 0.800     | 64.0                   | 0.0                         | 2.100     | 0.0                    | 0.0                         |
| 0.900     | 64.0                   | 0.0                         | 2.200     | 0.0                    | 0.0                         |
| 1.000     | 64.0                   | 0.0                         | 2.300     | 0.0                    | 0.0                         |
| 1.100     | 64.0                   | 0.0                         | 2.400     | 0.0                    | 0.0                         |
| 1.200     | 64.0                   | 0.0                         | 2.500     | 0.0                    | 0.0                         |

### Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0102-5000-1250-5000  
Design Head (m) 1.250  
Design Flow (l/s) 5.0  
Flush-Flo™ Calculated  
Objective Minimise upstream storage  
Application Surface  
Sump Available Yes  
Diameter (mm) 102  
Invert Level (m) 4.000  
Minimum Outlet Pipe Diameter (mm) 150  
Suggested Manhole Diameter (mm) 1200

| Control Points            | Head (m) | Flow (l/s) |
|---------------------------|----------|------------|
| Design Point (Calculated) | 1.250    | 5.0        |
| Flush-Flo™                | 0.370    | 5.0        |
| Kick-Flo®                 | 0.772    | 4.0        |
| Mean Flow over Head Range | -        | 4.4        |

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

|                                                            |                                                                  |                                                                                     |
|------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Vale Consultancy                                           |                                                                  | Page 5                                                                              |
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| Date 11/02/2020 12:06<br>File 7167 ATTENUATION TANK C...   | Designed by F Payne<br>Checked by N Clifford                     |                                                                                     |
| Micro Drainage                                             | Source Control 2018.1                                            |                                                                                     |

#### Hydro-Brake® Optimum Outflow Control

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|-----------|------------|-----------|------------|-----------|------------|-----------|------------|
| 0.100     | 3.4        | 1.200     | 4.9        | 3.000     | 7.5        | 7.000     | 11.2       |
| 0.200     | 4.7        | 1.400     | 5.3        | 3.500     | 8.1        | 7.500     | 11.6       |
| 0.300     | 5.0        | 1.600     | 5.6        | 4.000     | 8.6        | 8.000     | 12.0       |
| 0.400     | 5.0        | 1.800     | 5.9        | 4.500     | 9.1        | 8.500     | 12.3       |
| 0.500     | 4.9        | 2.000     | 6.2        | 5.000     | 9.6        | 9.000     | 12.7       |
| 0.600     | 4.7        | 2.200     | 6.5        | 5.500     | 10.0       | 9.500     | 13.0       |
| 0.800     | 4.1        | 2.400     | 6.8        | 6.000     | 10.4       |           |            |
| 1.000     | 4.5        | 2.600     | 7.0        | 6.500     | 10.9       |           |            |

#### Weir Overflow Control

Discharge Coef 0.544 Width (m) 1.200 Invert Level (m) 5.250