



## Soakaway calculations to BRE Digest 365

Calculation Sheet 01

1 in 30 year return period design

Project Development at Croesnewydd, Wrexham

Ref 15223

Description Serving Roof Only

|                                  |          |      |                               |       |       |
|----------------------------------|----------|------|-------------------------------|-------|-------|
| 10% allowance for climate change | M5-60min | 17   | PROPOSED NEW DEVELOPMENT      | Roads | Roofs |
|                                  | M5-60min | 18.7 | Volumetric Runoff Coefficient | 0.6   | 1     |
|                                  | r        | 0.3  |                               |       |       |
|                                  |          |      | Roads / Parking               | 0     |       |
|                                  |          |      | Hardstanding / roofs          | 487   |       |
|                                  |          |      | Total Effective Area          | 487   |       |

| Duration (min) | Z1    | M5-D (mm) | Z2   | M30-D (mm) | I (mm/hr) | Area (sq m) | Inflow (cu m) | Outflow (cu m) | Storage (cu m) |
|----------------|-------|-----------|------|------------|-----------|-------------|---------------|----------------|----------------|
| 5.0            | 0.34  | 6.36      | 1.44 | 9.2        | 110.2     | 487.0       | 4.5           | 1.5            | 2.98           |
| 10.0           | 0.495 | 9.26      | 1.47 | 13.6       | 81.4      | 487.0       | 6.6           | 3.0            | 3.62           |
| 15.0           | 0.59  | 11.03     | 1.50 | 16.5       | 66.1      | 487.0       | 8.0           | 4.5            | 3.56           |
| 30.0           | 0.78  | 14.59     | 1.52 | 22.2       | 44.4      | 487.0       | 10.8          | 9.0            | 1.85           |
| 60.0           | 1     | 18.70     | 1.54 | 28.8       | 28.8      | 487.0       | 14.0          | 17.9           | -3.93          |
| 120.0          | 1.24  | 23.19     | 1.54 | 35.6       | 17.8      | 487.0       | 17.4          | 35.9           | -18.54         |
| 240.0          | 1.55  | 28.99     | 1.52 | 44.0       | 11.0      | 487.0       | 21.4          | 71.8           | -50.37         |
| 360.0          | 1.8   | 33.66     | 1.49 | 50.3       | 8.4       | 487.0       | 24.5          | 107.7          | -83.18         |
| 600.0          | 2.13  | 39.83     | 1.47 | 58.5       | 5.8       | 487.0       | 28.5          | 179.5          | -151.00        |
| 1440.0         | 2.79  | 52.17     | 1.41 | 73.7       | 3.1       | 487.0       | 35.9          | 430.7          | -394.82        |
| 2880.0         | 3.5   | 65.45     | 1.37 | 89.8       | 1.9       | 487.0       | 43.8          | 861.5          | -817.70        |

Percolation factor (m/s) 2.89E-04 Average between SA01 & SA02

Trench: Outflow and storage based on:

|                              |        |      |
|------------------------------|--------|------|
| No of trenches               | (nr)   | 1.0  |
| Length of soakaway           | (m)    | 9.5  |
| Width of soakaway            | (m)    | 2.0  |
| Effective depth              | (m)    | 1.5  |
| Eff Area of soakaways at 50% | (sq m) | 17.3 |
| Storage per soakaway         | (cu m) | 8.55 |
| Total Storage provided       | (cu m) | 8.55 |



## CALCULATION SHEET

Project Croesnewydd  
 Project No 17255  
 Sheet No 1  
 Description Attenuation required for roofs

### STORAGE VOLUME 100 Year Return Period

30% Climate Change Allowance  
 Return Period 100 years  
 M5-60min 17 mm  
 M5-60min 22.1 mm  
 r 0.3

Outflow based on 1 in 30 yr soakaway design

**PROPOSED NEW DEVELOPMENT**  
 Volumetric run-off coefficient  
 Permeable area 0 sqm  
 Road & fpath 0 sqm  
 Roofs and Hardstanding 487 sqm  
**TOTAL EFFECTIVE AREA** 487 sqm

| Duration<br>min | Z1    | M5-D<br>mm | Z2   | M100-D<br>mm | Total Vol<br>cu m | Total out<br>cu m | Storage<br>cu m | Qmax<br>l/s |
|-----------------|-------|------------|------|--------------|-------------------|-------------------|-----------------|-------------|
| 5               | 0.34  | 7.51       | 1.85 | 13.90        | 6.77              | 1.5               | 5.28            | 22.57       |
| 10              | 0.495 | 10.94      | 1.93 | 21.06        | 10.26             | 3.0               | 7.26            | 17.09       |
| 15              | 0.59  | 13.04      | 1.96 | 25.54        | 12.44             | 4.5               | 7.95            | 13.82       |
| 30              | 0.78  | 17.24      | 2.01 | 34.61        | 16.86             | 9.0               | 7.88            | 9.36        |
| 60              | 1     | 22.10      | 2.02 | 44.68        | 21.76             | 17.9              | 3.81            | 6.04        |
| 120             | 1.24  | 27.40      | 1.99 | 54.56        | 26.57             | 35.9              | -9.33           | 3.69        |
| 240             | 1.55  | 34.26      | 1.94 | 66.31        | 32.30             | 71.8              | -39.49          | 2.24        |
| 360             | 1.8   | 39.78      | 1.89 | 75.25        | 36.65             | 107.7             | -71.03          | 1.70        |
| 600             | 2.13  | 47.07      | 1.83 | 86.31        | 42.03             | 179.5             | -137.44         | 1.17        |
| 1440            | 2.79  | 61.66      | 1.73 | 106.71       | 51.97             | 430.7             | -378.76         | 0.60        |
| 2880            | 3.5   | 77.35      | 1.63 | 126.13       | 61.42             | 861.5             | -800.03         | 0.36        |

Storage provided by soakaway is 10.35m3 thus sufficient



## Soakaway calculations to BRE Digest 365

Calculation Sheet 01

1 in 30 year return period design

Project Development at Croesnewydd, Wrexham

Ref 15223

Description Serving Access Road

|                                  |          |      |                               |       |       |
|----------------------------------|----------|------|-------------------------------|-------|-------|
| 10% allowance for climate change | M5-60min | 17   | PROPOSED NEW DEVELOPMENT      | Roads | Roofs |
|                                  | M5-60min | 18.7 | Volumetric Runoff Coefficient | 0.75  | 1     |
|                                  | r        | 0.3  |                               |       |       |
|                                  |          |      | Roads / Parking               | 378   |       |
|                                  |          |      | Hardstanding / roofs          | 0     |       |
|                                  |          |      | Total Effective Area          | 283.5 |       |

| Duration (min) | Z1    | M5-D (mm) | Z2   | M30-D (mm) | I (mm/hr) | Area (sq m) | Inflow (cu m) | Outflow (cu m) | Storage (cu m) |
|----------------|-------|-----------|------|------------|-----------|-------------|---------------|----------------|----------------|
| 5.0            | 0.34  | 6.36      | 1.44 | 9.2        | 110.2     | 283.5       | 2.6           | 1.4            | 1.24           |
| 10.0           | 0.495 | 9.26      | 1.47 | 13.6       | 81.4      | 283.5       | 3.8           | 2.7            | 1.12           |
| 15.0           | 0.59  | 11.03     | 1.50 | 16.5       | 66.1      | 283.5       | 4.7           | 4.1            | 0.59           |
| 30.0           | 0.78  | 14.59     | 1.52 | 22.2       | 44.4      | 283.5       | 6.3           | 8.2            | -1.89          |
| 60.0           | 1     | 18.70     | 1.54 | 28.8       | 28.8      | 283.5       | 8.2           | 16.4           | -8.23          |
| 120.0          | 1.24  | 23.19     | 1.54 | 35.6       | 17.8      | 283.5       | 10.1          | 32.8           | -22.67         |
| 240.0          | 1.55  | 28.99     | 1.52 | 44.0       | 11.0      | 283.5       | 12.5          | 65.5           | -53.08         |
| 360.0          | 1.8   | 33.66     | 1.49 | 50.3       | 8.4       | 283.5       | 14.3          | 98.3           | -84.05         |
| 600.0          | 2.13  | 39.83     | 1.47 | 58.5       | 5.8       | 283.5       | 16.6          | 163.9          | -147.29        |
| 1440.0         | 2.79  | 52.17     | 1.41 | 73.7       | 3.1       | 283.5       | 20.9          | 393.3          | -372.37        |
| 2880.0         | 3.5   | 65.45     | 1.37 | 89.8       | 1.9       | 283.5       | 25.5          | 786.5          | -761.07        |

Percolation factor (m/s) 2.89E-04 Average between SA01 & SA02

Trench: Outflow and storage based on:

|                              |        |      |
|------------------------------|--------|------|
| No of trenches               | (nr)   | 1.0  |
| Length of soakaway           | (m)    | 8.5  |
| Width of soakaway            | (m)    | 2.0  |
| Effective depth              | (m)    | 1.5  |
| Eff Area of soakaways at 50% | (sq m) | 15.8 |
| Storage per soakaway         | (cu m) | 7.65 |
| Total Storage provided       | (cu m) | 7.65 |



## CALCULATION SHEET

Project Croesnewydd  
 Project No 17255  
 Sheet No 1  
 Description Attenuation for Access Road

### STORAGE VOLUME 100 Year Return Period

30% Climate Change Allowance  
 Return Period 100 years  
 M5-60min 17 mm  
 M5-60min 22.1 mm  
 r 0.3

Outflow based on 1 in 30 yr soakaway design

**PROPOSED NEW DEVELOPMENT**  
 Volumetric run-off coefficient  
 Permeable area 0 sqm  
 Road & fpath 378 sqm  
 Roofs and Hardstanding 0 sqm

**TOTAL EFFECTIVE AREA** 283.5 sqm

| Duration<br>min | Z1    | M5-D<br>mm | Z2   | M100-D<br>mm | Total Vol<br>cu m | Total out<br>cu m | Storage<br>cu m | Qmax<br>l/s |
|-----------------|-------|------------|------|--------------|-------------------|-------------------|-----------------|-------------|
| 5               | 0.34  | 7.51       | 1.85 | 13.90        | 3.94              | 1.4               | 2.58            | 13.14       |
| 10              | 0.495 | 10.94      | 1.93 | 21.06        | 5.97              | 2.7               | 3.24            | 9.95        |
| 15              | 0.59  | 13.04      | 1.96 | 25.54        | 7.24              | 4.1               | 3.14            | 8.04        |
| 30              | 0.78  | 17.24      | 2.01 | 34.61        | 9.81              | 8.2               | 1.62            | 5.45        |
| 60              | 1     | 22.10      | 2.02 | 44.68        | 12.67             | 16.4              | -3.72           | 3.52        |
| 120             | 1.24  | 27.40      | 1.99 | 54.56        | 15.47             | 32.8              | -17.31          | 2.15        |
| 240             | 1.55  | 34.26      | 1.94 | 66.31        | 18.80             | 65.5              | -46.74          | 1.31        |
| 360             | 1.8   | 39.78      | 1.89 | 75.25        | 21.33             | 98.3              | -76.98          | 0.99        |
| 600             | 2.13  | 47.07      | 1.83 | 86.31        | 24.47             | 163.9             | -139.40         | 0.68        |
| 1440            | 2.79  | 61.66      | 1.73 | 106.71       | 30.25             | 393.3             | -363.02         | 0.35        |
| 2880            | 3.5   | 77.35      | 1.63 | 126.13       | 35.76             | 786.5             | -750.79         | 0.21        |

Storage provided by soakaway is 7.65m3 thus sufficient



## Soakaway calculations to BRE Digest 365

Calculation Sheet 01

1 in 30 year return period design

Project Development at Croesnewydd, Wrexham

Ref 15223

Description Serving Parking Area

|                                  |          |      |                               |       |       |
|----------------------------------|----------|------|-------------------------------|-------|-------|
| 10% allowance for climate change | M5-60min | 17   | PROPOSED NEW DEVELOPMENT      | Roads | Roofs |
|                                  | M5-60min | 18.7 | Volumetric Runoff Coefficient | 0.75  | 1     |
|                                  | r        | 0.3  |                               |       |       |
|                                  |          |      | Roads / Parking               | 900   |       |
|                                  |          |      | Hardstanding / roofs          | 0     |       |
|                                  |          |      | Total Effective Area          | 675   |       |

| Duration (min) | Z1    | M5-D (mm) | Z2   | M30-D (mm) | I (mm/hr) | Area (sq m) | Inflow (cu m) | Outflow (cu m) | Storage (cu m) |
|----------------|-------|-----------|------|------------|-----------|-------------|---------------|----------------|----------------|
| 5.0            | 0.34  | 6.36      | 1.44 | 9.2        | 110.2     | 675.0       | 6.2           | 0.6            | 5.57           |
| 10.0           | 0.495 | 9.26      | 1.47 | 13.6       | 81.4      | 675.0       | 9.2           | 1.3            | 7.90           |
| 15.0           | 0.59  | 11.03     | 1.50 | 16.5       | 66.1      | 675.0       | 11.2          | 1.9            | 9.26           |
| 30.0           | 0.78  | 14.59     | 1.52 | 22.2       | 44.4      | 675.0       | 15.0          | 3.8            | 11.21          |
| 60.0           | 1     | 18.70     | 1.54 | 28.8       | 28.8      | 675.0       | 19.4          | 7.6            | 11.85          |
| 120.0          | 1.24  | 23.19     | 1.54 | 35.6       | 17.8      | 675.0       | 24.1          | 15.1           | 8.91           |
| 240.0          | 1.55  | 28.99     | 1.52 | 44.0       | 11.0      | 675.0       | 29.7          | 30.3           | -0.61          |
| 360.0          | 1.8   | 33.66     | 1.49 | 50.3       | 8.4       | 675.0       | 34.0          | 45.4           | -11.48         |
| 600.0          | 2.13  | 39.83     | 1.47 | 58.5       | 5.8       | 675.0       | 39.5          | 75.7           | -36.28         |
| 1440.0         | 2.79  | 52.17     | 1.41 | 73.7       | 3.1       | 675.0       | 49.8          | 181.8          | -131.99        |
| 2880.0         | 3.5   | 65.45     | 1.37 | 89.8       | 1.9       | 675.0       | 60.6          | 363.5          | -302.89        |

Percolation factor (m/s) 3.74E-05 Average of SA02

Trench: Outflow and storage based on:

|                              |        |       |
|------------------------------|--------|-------|
| No of trenches               | (nr)   | 3.0   |
| Length of soakaway           | (m)    | 10.5  |
| Width of soakaway            | (m)    | 2.0   |
| Effective depth              | (m)    | 1.5   |
| Eff Area of soakaways at 50% | (sq m) | 56.3  |
| Storage per soakaway         | (cu m) | 9.45  |
| Total Storage provided       | (cu m) | 28.35 |



## CALCULATION SHEET

Project Croesnewydd  
 Project No 17255  
 Sheet No 1  
 Description Attenuation for Parking

### STORAGE VOLUME 100 Year Return Period

30% Climate Change Allowance  
 Return Period 100 years  
 M5-60min 17 mm  
 M5-60min 22.1 mm  
 r 0.3

Outflow based on 1 in 30 yr soakaway design

**PROPOSED NEW DEVELOPMENT**  
 Volumetric run-off coefficient  
 Permeable area 0 sqm  
 Road & fpath 900 sqm  
 Roofs and Hardstanding 0 sqm

**TOTAL EFFECTIVE AREA** 675 sqm

| Duration<br>min | Z1    | M5-D<br>mm | Z2   | M100-D<br>mm | Total Vol<br>cu m | Total out<br>cu m | Storage<br>cu m | Qmax<br>l/s |
|-----------------|-------|------------|------|--------------|-------------------|-------------------|-----------------|-------------|
| 5               | 0.34  | 7.51       | 1.85 | 13.90        | 9.38              | 0.6               | 8.75            | 31.28       |
| 10              | 0.495 | 10.94      | 1.93 | 21.06        | 14.21             | 1.3               | 12.95           | 23.69       |
| 15              | 0.59  | 13.04      | 1.96 | 25.54        | 17.24             | 1.9               | 15.35           | 19.15       |
| 30              | 0.78  | 17.24      | 2.01 | 34.61        | 23.36             | 3.8               | 19.58           | 12.98       |
| 60              | 1     | 22.10      | 2.02 | 44.68        | 30.16             | 7.6               | 22.58           | 8.38        |
| 120             | 1.24  | 27.40      | 1.99 | 54.56        | 36.83             | 15.1              | 21.68           | 5.11        |
| 240             | 1.55  | 34.26      | 1.94 | 66.31        | 44.76             | 30.3              | 14.47           | 3.11        |
| 360             | 1.8   | 39.78      | 1.89 | 75.25        | 50.80             | 45.4              | 5.36            | 2.35        |
| 600             | 2.13  | 47.07      | 1.83 | 86.31        | 58.26             | 75.7              | -17.48          | 1.62        |
| 1440            | 2.79  | 61.66      | 1.73 | 106.71       | 72.03             | 181.8             | -109.73         | 0.83        |
| 2880            | 3.5   | 77.35      | 1.63 | 126.13       | 85.14             | 363.5             | -278.39         | 0.49        |

Storage provided by soakaway is 28.35m3 thus sufficient