

## Soil infiltration test

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C T Lewis - Trojan Close, Crymlyn Burrows, Swansea. SA1 8QA

## Soil infiltration test for soakaways at:

Site address: C T Lewis, Trojan Close, Swansea

Job No: 1570

Test date: 30<sup>th</sup> June 2026

Weather: Dry

### Design brief

Ground investigation to determine ground permeability for surface infiltration blanket for extended yard parking area at the site address. Tests undertaken in accordance with BRE365 (Soakaway Design Guide).

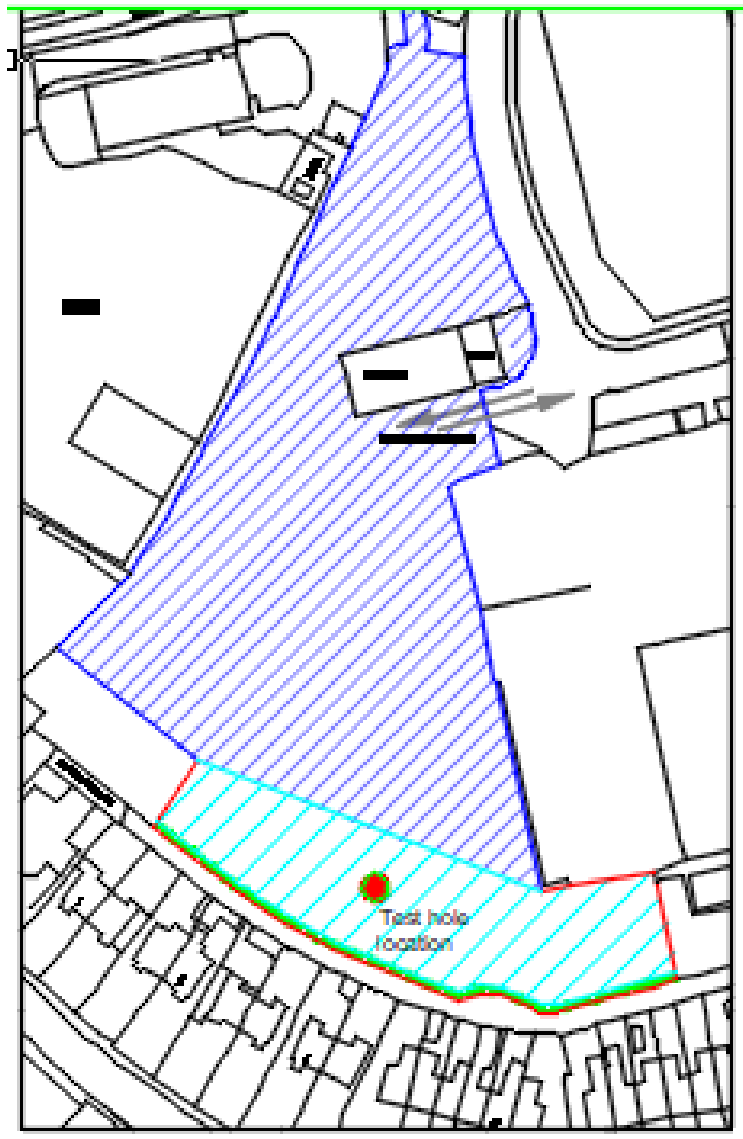


Figure 1-Site plan showing application area and test hole location

## Ground excavation

Located in the Crumlin Burrows industrial estate, an existing brown field level site occupied by an established transport and lorry parking business. A test hole was excavated for infiltration testing, the ground makeup was determined as made ground comprising crushed stone over gravel soils and rubble over underlying sand stratum to excavation depth with ground water encountered at 1.4m. The British Geological Survey maps for the area confirm the superficial deposits for the area as being Blown Sand. No evidence of ground contamination was encountered during excavation.

## Summary of test procedure

Trial pit excavated using excavator with 400mm wide bucket at the centre of the development area, and to a depth of 1.4m. Gauge rod placed into pit with markings indicating 25% and 75% levels prior to filling with water from an IBC container containing 1000 litres of clean water. Pit filled with water and water levels monitored from 75% to 25% for three consecutive tests to obtain a mean value for calculation.

The results are tabulated in the Test Logs below.

## Test hole photographs



Figure 2- Test hole location



*Figure 3- Test hole excavation*



*Figure 4 – Excavated soil, note high sand content*



*Figure 6 - Test hole filling*



*Figure 7 - Test hole filling*

## Soakaway Percolation Test to BRE365 – Test Log

Job No: 1570

Site Address: C T Lewis, Trojan Close, Swansea

Test date: 30/6/26

Test hole ID: Test hole 1

Carried out by: MOD

### Site ground composition:

| Level | Depth | Soil description                                  |
|-------|-------|---------------------------------------------------|
| 0     | -100  | Crushed stone & gravel surface dressing           |
| -100  | -400  | Made ground – gravel soils with stones and rubble |
| -400  | -1400 | Sand                                              |
|       |       |                                                   |
|       |       |                                                   |

|                          |                                  |
|--------------------------|----------------------------------|
| <b>Water table level</b> | Water encountered at -1400 depth |
|--------------------------|----------------------------------|

| Trial Pit        |                                             |                  |
|------------------|---------------------------------------------|------------------|
|                  | Recommended dimension                       | Actual dimension |
| Trial pit width  | 300mm                                       | 400              |
| Trial pit length | 1200mm                                      | 1000             |
| Trial pit depth  | Invert depth + 500mm, if unknown say 1500mm | 1400             |

Based on the above recommended trial pit dimensions the amount of water required for each test will be 0.4m<sup>2</sup>, filling must be done rapidly from a container with at least the volume of water specified. Filling with a hose will take too long and result in unfavourable test results. Water must be clean otherwise this will also have a detrimental effect on the test results.

|               | Time      |       |       |       |            |
|---------------|-----------|-------|-------|-------|------------|
|               | Fill (1m) | 75%   | 25%   | Empty | 75% to 25% |
| <b>Test 1</b> | 10.35am   | 11.00 | 12.30 |       | 90         |
| <b>Test 2</b> | 13.30pm   | 14.05 | 15.50 |       | 105        |
| <b>Test 3</b> | 15.50pm   | 16.32 | 18.47 |       | 135        |

Note: For realistic soakaway sizes the time between fill and empty should be less than 24 hrs.

## Soil infiltration rate

### Design rainfall (the Wallingford procedure)

#### Design rainfall in accordance with the Wallingford Procedure

##### Design rainfall intensity

|                                                       |                                                                             |
|-------------------------------------------------------|-----------------------------------------------------------------------------|
| Location of catchment area;                           | Swansea                                                                     |
| Storm duration;                                       | D = 5 min                                                                   |
| Return period;                                        | Period = 100 yr                                                             |
| Ratio 60 min to 2 day rainfall of 5 yr return period; | r = 0.280                                                                   |
| 5-year return period rainfall of 60 minutes duration; | M5_60min = 18.0 mm                                                          |
| Increase of rainfall intensity due to global warming; | p <sub>climate</sub> = 30 %                                                 |
| Factor Z1 (Wallingford procedure);                    | Z1 = 0.33                                                                   |
| Rainfall for 5min storm with 5 year return period;    | M5_5min <sub>i</sub> = Z1 × M5_60min × (1 + p <sub>climate</sub> ) = 7.8 mm |
| Factor Z2 (Wallingford procedure);                    | Z2 = 1.86                                                                   |
| Rainfall for 5min storm with 100 year return period;  | M100_5min = Z2 × M5_5min <sub>i</sub> = 14.5 mm                             |
| Design rainfall intensity;                            | I <sub>max</sub> = M100_5min / D = 173.8 mm/hr                              |

### Infiltration blanket design

#### Plane infiltration system design in accordance with CIRIA C753 SUDS

##### Design rainfall intensity

|                                                       |                                      |
|-------------------------------------------------------|--------------------------------------|
| Location of catchment area;                           | Swansea                              |
| Area drained to the system;                           | A = 2400 m <sup>2</sup>              |
| Return period;                                        | Period = 100 yr                      |
| Ratio 60 min to 2 day rainfall of 5 yr return period; | r = 0.360                            |
| 5-year return period rainfall of 60 minutes duration; | M5_60min = 19.0 mm                   |
| Increase of rainfall intensity due to global warming; | p <sub>climate</sub> = 30 %          |
| Base area of blanket;                                 | A <sub>b</sub> = 2400 m <sup>2</sup> |
| Porosity;                                             | n = 0.9                              |
| Drainage ratio;                                       | R = A / A <sub>b</sub> = 1.0         |

##### Soil infiltration rate (BRE digest 365)

|                                                    |                                                                                                                                                           |
|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Length of trial pit;                               | l <sub>trial</sub> = 1000 mm                                                                                                                              |
| Width of trial pit;                                | b <sub>trial</sub> = 450 mm                                                                                                                               |
| Depth of trial pit (below invert);                 | d <sub>trial</sub> = 1400 mm                                                                                                                              |
| Free volume (if fill used);                        | V <sub>trial</sub> = 100 %;                                                                                                                               |
| 75% depth of pit;                                  | d <sub>75</sub> = (d <sub>trial</sub> × 0.75) = 1050.00 mm                                                                                                |
| 50% depth of pit;                                  | d <sub>50</sub> = (d <sub>trial</sub> × 0.50) = 700.00 mm                                                                                                 |
| 25% depth of pit;                                  | d <sub>25</sub> = (d <sub>trial</sub> × 0.25) = 350.00 mm                                                                                                 |
| Test 1 - time to fall from 75% depth to 25% depth; | T1 = 90 min                                                                                                                                               |
| Test 2 - time to fall from 75% depth to 25% depth; | T2 = 105 min                                                                                                                                              |
| Test 3 - time to fall from 75% depth to 25% depth; | T3 = 135 min                                                                                                                                              |
| Longest time to fall from 75% depth to 25% depth;  | t <sub>lg</sub> = max(T1, T2, T3) = 135 min                                                                                                               |
| Storage volume from 75% to 25% depth;              | V <sub>p75_25</sub> = (l <sub>trial</sub> × b <sub>trial</sub> × (d <sub>75</sub> - d <sub>25</sub> )) × V <sub>trial</sub> = 0.32 m <sup>3</sup>         |
| Internal surface area to 50% depth;                | a <sub>p50</sub> = ((l <sub>trial</sub> × b <sub>trial</sub> ) + (l <sub>trial</sub> + b <sub>trial</sub> ) × 2 × d <sub>50</sub> ) = 2.48 m <sup>2</sup> |
| Surface area of soakaway to 50% storage depth;     | A <sub>s50</sub> = 2 × (l <sub>trial</sub> + b <sub>trial</sub> ) × d <sub>trial</sub> / 2 = 2.030 m <sup>2</sup>                                         |

Soil infiltration rate;  $f = V_{p75\_25} / (a_{p50} \times t_{lg}) = 15.7 \times 10^{-6} \text{ m/s}$   
Factor of safety; **FOS = 1.5**  
Infiltration coefficient;  $q = f / \text{FOS} = 10.5 \times 10^{-6} \text{ m/s}$

#### Table equations

Rainfall intensity;  $i = M100 / D$   
Minimum depth required (Eq. 25.1);  $H = D / n \times (R \times i - q)$

| Duration, D (min) | Growth factor Z1 | M5 rainfalls (mm) | Growth factor Z2 | 100 year rainfall, M100 (mm) | Intensity, i (mm/hr) | Depth (mm) |
|-------------------|------------------|-------------------|------------------|------------------------------|----------------------|------------|
| 5;                | 0.36;            | 8.9;              | 1.88;            | 16.7;                        | 200.97;              | 15;        |
| 10;               | 0.51;            | 12.6;             | 1.95;            | 24.6;                        | 147.50;              | 20;        |
| 15;               | 0.62;            | 15.3;             | 1.99;            | 30.5;                        | 122.05;              | 23;        |
| 30;               | 0.79;            | 19.5;             | 2.03;            | 39.5;                        | 79.07;               | 23;        |
| 60;               | 1.00;            | 24.7;             | 2.01;            | 49.7;                        | 49.68;               | 13;        |
| 120;              | 1.22;            | 30.1;             | 1.97;            | 59.3;                        | 29.67;               | 0;         |
| 240;              | 1.48;            | 36.6;             | 1.92;            | 70.1;                        | 17.52;               | 0;         |
| 360;              | 1.67;            | 41.2;             | 1.88;            | 77.5;                        | 12.92;               | 0;         |
| 600;              | 1.90;            | 46.9;             | 1.83;            | 86.1;                        | 8.61;                | 0;         |
| 1440;             | 2.42;            | 59.8;             | 1.74;            | 104.2;                       | 4.34;                | 0;         |

Min depth of blanket req'd;  $H_{\max} = 23 \text{ mm}$

Time to empty blanket to half volume - Eq.25.6(1);  $t_{s50} = n \times H_{\max} / (2 \times q) = 16 \text{ min } 49 \text{ s}$

**PASS - Infiltration system discharge time less than or equal to 24 hours**

## Summary & conclusion

The soils at the site consist of made ground of crushed stone over granular soils with stones and rubble over underlying sand stratum providing very good levels of infiltration. Testing determined an infiltration value of  $15.7 \times 10^{-6} \text{ m/s}$  or  $1.57 \times 10^{-5}$  including a factor of safety of 1.5, which is considered a good infiltration value. This value is considered acceptable indicating the ground is free draining. It is not intended to introduce impermeable surfaces into the yard area, the ground will be retained as permeable hard standing, therefore the infiltration capacity of the ground as an infiltration blanket is sufficient for the 1 in 100 + 30% for global warming rainfall event.