



ELLIOT BOND

Calculation  
Sheet

Job ref : EBC01070 – Dobfield Rd  
Sheet :  
Made By : PD  
Date : 29 May 2023 – rev A  
Checked : PD

**PROPOSED HOUSING DEVELOPMENT  
DOBFIELD ROAD  
ROCHDALE  
OL16 3AW**

**SW DRAINAGE CALCULATIONS**

for

**PIC Dobfield Ltd**

**Date: May 2023**



ELLIOT BOND

Calculation  
Sheet

Job ref : EBC01070 – Dobfield Rd  
Sheet :  
Made By : PD  
Date : 29 May 2023 – rev A  
Checked : PD

Elliot Bond Consulting Limited – 87 Kempston Street, Liverpool L3 8HE

(page 02)

**CONTENTS****PAGE**

|                                       |         |
|---------------------------------------|---------|
| Contents Page                         | 02      |
| Introduction & Description            | 03      |
| Ground Conditions & Drainage Strategy | 04 - 05 |
| Surface Water Drainage Design         | 06 - 07 |

**APPENDIX**

Appendix A – Tedds Analysis (Soakaway Design)



ELLIOT BOND

Calculation  
Sheet

|         |                          |
|---------|--------------------------|
| Job ref | : EBC01070 – Dobfield Rd |
| Sheet   | :                        |
| Made By | : PD                     |
| Date    | : 29 May 2023 – rev A    |
| Checked | : PD                     |

(page 03)

**INTRODUCTION**

8 new detached homes are proposed on a site to the east of the Rochdale Canal, at Dobfield Rd, Rochdale. The site is currently occupied by outbuildings and an open area used as a menage. There are no public sewers on the site.

With regards to the surface water drainage strategy for the above site, a Sustainable Drainage Strategy Report was prepared by LK Group for the above site, reference: FRA20 1117, February 2020. This report should be referred to for further information. In accordance with the NPPF, PPG ID7 and Local Authority SFRA Reports and planning policies, together with United Utilities policy for new developments, foul drainage should discharge to a foul sewer if possible, and surface water drainage should discharge to SUDS systems such as soakaways and permeable pavements if the ground is suitable, if not to a nearby watercourse if present, if not to a surface water sewer if present, and only if none of these options are proven to be feasible will the surface water be allowed to discharge to the combined sewer. Surface water run-off from new developments should not exceed existing run-off rates and should provide a 50% reduction in flows, and SUDS and greenfield run-off rates should be implemented where possible.



ELLIOT BOND

Calculation  
Sheet

Job ref : EBC01070 – Dobfield Rd  
 Sheet :  
 Made By : PD  
 Date : 29 May 2023 – rev A  
 Checked : PD

(page 04)

### **GROUND CONDITIONS**

The site is underlain by sands and gravels drift deposits over the Pennine Lower Coal Measures Formation (mudstone, siltstone and sandstone solid deposits).

The sands and gravels drift deposits have adequate infiltration coefficients for soakaways and permeable pavements. Soakaway tests were carried out (by others) in accordance with BRE365 to determine infiltration coefficients, and to confirm whether the site is suitable for infiltration methods of SUDS.

### **SURFACE WATER DRAINAGE**

Three soakaway tests were carried out by Build Vision on the site on the 21/8/20 for the client, and the soakaway test results indicated infiltration rates of  $3.85$  to  $5.58 \times 10^{-5}$  m/s for the sands and gravels beneath the site. These are considered suitable for soakaways and permeable pavements.

It is therefore proposed that the roofwater from each plot will discharge to a soakaway in the rear garden area, and the individual driveways will be designed as permeable pavements incorporating permeable block paving and/or porous tarmac and a permeable sub-base. Soakaways and permeable paving will be designed to attenuate and infiltrate storms up to 100 year (plus 40% allowance for climate change) in accordance with planning policy guidance.

The site access road will be designed as an impermeable tarmac pavement, with linear soakaways designed to attenuate and infiltrate storms up to 100 year (plus 40% allowance for climate change) in accordance with planning policy guidance.

Residual overland flood routes have been assessed together with emergency access and egress routes, and the floor levels of the proposed properties are set above residual flood levels to reduce the risk to homeowners and prevent flooding of the properties. All properties are set above existing ground levels and all driveways fall away from the front of the houses down towards the proposed access road. All rear gardens are at a lower level than the floor levels in the houses. The water level in the Rochdale Canal to the west of the site is a minimum of 2.7m lower than the lowest proposed finished floor level in the new houses.

### **FOUL DRAINAGE**

With regards to the foul drainage, the EA General Binding Rules for Sewage Treatment Plants state that there should not be a sewer within 30m per plot and as there are 8 no. plots proposed, the sewer would need to be within 240m of the site. There are no public foul or combined sewers within this distance. Furthermore, access to the nearest public sewers would entail routes through private land to the east (through the business park land), or along the canal towpath, and there is a longer



ELLIOT BOND

Calculation  
Sheet

Job ref : EBC01070 – Dobfield Rd  
Sheet :  
Made By : PD  
Date : 29 May 2023 – rev A  
Checked : PD

(page 05)

route **over** the canal to the public combined sewer to the west in Belfield Mill Lane. It is therefore proposed that each house will have a package sewage treatment plant (STP) with a discharge to soakaway. All soakaways will be a minimum of 8 metres from any property.



ELLIOT BOND

Calculation  
Sheet

Job ref : EBC01070 – Dobfield Rd  
 Sheet :  
 Made By : PD  
 Date : 29 May 2023 – rev A  
 Checked : PD

(Page 06)

**SURFACE WATER DRAINAGE DESIGN:****ROOFS:**

Rear garden soakaways can be used for the roof drainage. These have been sized for the three house types, in accordance with BRE Digest 365. A return period of 100 years has been used, with a 40% allowance for climate change. A lower bound soil permeability of  $3.85 \times 10^{-5}$  m/s (from site tests), which is typical for a sandy gravel. The soakaway will be formed using proprietary buried plastic crates (each 1m x 0.5m x 0.4m high), with a min void ratio of 95%, and a geotextile filter wrap. Refer to drawing EBC01070-200.

**House type A:** Impermeable area including paths around perimeter of house =  $147\text{m}^2$ .  
 Refer to Appendix A page App-1 for soakaway size calculation (Tedds/BRE 365).

**House type B:** Impermeable area including paths around perimeter of house =  $185\text{m}^2$ .  
 Refer to Appendix A page App-2 for soakaway size calculation (Tedds/BRE 365).

**House type B1:** Impermeable area including paths around perimeter of house =  $221\text{m}^2$ .  
 Refer to Appendix A page App-3 for soakaway size calculation (Tedds/BRE 365).

**DRIVEWAYS:**

Permeable paving – design TBC.

**ACCESS ROAD (Carriageway and Footpaths both sides):**

***Carriageway:*** Impermeable area =  $655\text{m}^2$ .

***Footpaths:*** Impermeable area =  $483\text{m}^2$ .

Total =  $1148\text{m}^2$ .

Because the road soakaways are linear and encompass larger variation in ground conditions, an average soil permeability of  $4.72 \times 10^{-5}$  m/s (from site tests), is used in design. The soakaway will be formed using proprietary buried plastic crates (each 1m x 0.5m x 0.4m high), with a min void ratio of 95%, and a geotextile filter wrap. Refer to drawing EBC01070-200.

Refer to Appendix A page App-4 for road soakaway size calculation (Tedds/BRE 365).



ELLIOT BOND

Calculation  
Sheet

|         |                              |
|---------|------------------------------|
| Job ref | : EBC01070 – Dobfield Rd     |
| Sheet   | :                            |
| Made By | : PD                         |
| Date    | : <b>29</b> May 2023 – rev A |
| Checked | : PD                         |

(page 07)

**Appendix A – Tedds Analysis (BRE 365 Soakaway Designs)**

(see overleaf)

|                                                |                          |                  |                            |                                   |                             |
|------------------------------------------------|--------------------------|------------------|----------------------------|-----------------------------------|-----------------------------|
| Project<br>Dobfield Road, Rochdale - SOAKAWAYS |                          |                  |                            | Job no.<br>EBC01070               |                             |
| Calcs for<br>Type A House (Plots 2, 5, 6, 7)   |                          |                  |                            | Start page no./Revision<br>app- 1 |                             |
| Calcs by<br>PD                                 | Calcs date<br>08/05/2023 | Checked by<br>PD | Checked date<br>08/05/2023 | Approved by<br>PD                 | Approved date<br>08/05/2023 |

## SOAKAWAY DESIGN

### In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.05

#### Design rainfall intensity

|                                                      |                                    |
|------------------------------------------------------|------------------------------------|
| Location of catchment area                           | Manchester                         |
| Impermeable area drained to the system               | A = <b>147.0</b> m <sup>2</sup>    |
| Return period                                        | Period = <b>100</b> yr             |
| Ratio 60 min to 2 day rainfall of 5 yr return period | r = <b>0.360</b>                   |
| 5-year return period rainfall of 60 minutes duration | M5_60min = <b>19.0</b> mm          |
| Increase of rainfall intensity due to global warming | p <sub>climate</sub> = <b>40</b> % |

#### Soakaway / infiltration trench details

|                                              |                                                                   |
|----------------------------------------------|-------------------------------------------------------------------|
| Soakaway type                                | Rectangular                                                       |
| Minimum depth of pit (below incoming invert) | d = <b>800</b> mm                                                 |
| Width of pit                                 | w = <b>2000</b> mm                                                |
| Length of pit                                | l = <b>6000</b> mm                                                |
| Percentage free volume                       | V <sub>free</sub> = <b>95</b> %                                   |
| Soil infiltration rate                       | f = <b>39.0</b> × 10 <sup>-6</sup> m/s                            |
| Wetted area of pit 50% full                  | a <sub>s50</sub> = l × d + w × d = <b>6400000</b> mm <sup>2</sup> |

#### Table equations

|                    |                              |
|--------------------|------------------------------|
| Inflow (cl.3.3.1)  | I = M100 × A                 |
| Outflow (cl.3.3.2) | O = a <sub>s50</sub> × f × D |
| Storage (cl.3.3.3) | S = I - O                    |

| Duration,<br>D (min) | Growth<br>factor Z1 | M5<br>rainfalls<br>(mm) | Growth<br>factor Z2 | 100 year<br>rainfall,<br>M100<br>(mm) | Inflow<br>(m <sup>3</sup> ) | Outflow<br>(m <sup>3</sup> ) | Storage<br>required<br>(m <sup>3</sup> ) |
|----------------------|---------------------|-------------------------|---------------------|---------------------------------------|-----------------------------|------------------------------|------------------------------------------|
| 5                    | 0.36;               | 9.6;                    | 1.90;               | 18.2;                                 | 2.67;                       | 0.07;                        | 2.60                                     |
| 10                   | 0.51;               | 13.6;                   | 1.97;               | 26.7;                                 | 3.92;                       | 0.15;                        | 3.77                                     |
| 15                   | 0.62;               | 16.5;                   | 2.00;               | 33.0;                                 | 4.85;                       | 0.22;                        | 4.63                                     |
| 30                   | 0.79;               | 21.0;                   | 2.03;               | 42.6;                                 | 6.26;                       | 0.45;                        | 5.81                                     |
| 60                   | 1.00;               | 26.6;                   | 2.00;               | 53.1;                                 | 7.81;                       | 0.90;                        | 6.91                                     |
| 120                  | 1.22;               | 32.5;                   | 1.95;               | 63.3;                                 | 9.30;                       | 1.80;                        | 7.51                                     |
| 240                  | 1.48;               | 39.4;                   | 1.90;               | 74.6;                                 | 10.97;                      | 3.59;                        | 7.37                                     |
| 360                  | 1.67;               | 44.4;                   | 1.85;               | 82.4;                                 | 12.11;                      | 5.39;                        | 6.72                                     |
| 600                  | 1.90;               | 50.5;                   | 1.81;               | 91.3;                                 | 13.42;                      | 8.99;                        | 4.43                                     |
| 1440                 | 2.42;               | 64.4;                   | 1.71;               | 110.2;                                | 16.20;                      | 21.57;                       | 0.00                                     |

Required storage volume S<sub>req</sub> = **7.51** m<sup>3</sup>

Soakaway storage volume S<sub>act</sub> = l × d × w × V<sub>free</sub> = **9.12** m<sup>3</sup>

**PASS - Soakaway storage volume**

Time for emptying soakaway to half volume t<sub>s50</sub> = S<sub>req</sub> × 0.5 / (a<sub>s50</sub> × f) = 4hr 10min 45s

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

|                                                |                          |                  |                            |                                   |                             |
|------------------------------------------------|--------------------------|------------------|----------------------------|-----------------------------------|-----------------------------|
| Project<br>Dobfield Road, Rochdale - SOAKAWAYS |                          |                  |                            | Job no.<br>EBC01070               |                             |
| Calcs for<br>Type B House (Plots 1, 3, 4 )     |                          |                  |                            | Start page no./Revision<br>app- 2 |                             |
| Calcs by<br>PD                                 | Calcs date<br>08/05/2023 | Checked by<br>PD | Checked date<br>08/05/2023 | Approved by<br>PD                 | Approved date<br>08/05/2023 |

## SOAKAWAY DESIGN

### In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.05

#### Design rainfall intensity

Location of catchment area Manchester  
Impermeable area drained to the system  $A = 185.0 \text{ m}^2$   
Return period Period = **100 yr**  
Ratio 60 min to 2 day rainfall of 5 yr return period  $r = \mathbf{0.360}$   
5-year return period rainfall of 60 minutes duration  $M5\_60\text{min} = \mathbf{19.0 \text{ mm}}$   
Increase of rainfall intensity due to global warming  $p_{\text{climate}} = \mathbf{40 \%}$

#### Soakaway / infiltration trench details

Soakaway type Rectangular  
Minimum depth of pit (below incoming invert)  $d = \mathbf{800 \text{ mm}}$   
Width of pit  $w = \mathbf{2000 \text{ mm}}$   
Length of pit  $l = \mathbf{7000 \text{ mm}}$   
Percentage free volume  $V_{\text{free}} = \mathbf{95 \%}$   
Soil infiltration rate  $f = \mathbf{39.0 \times 10^{-6} \text{ m/s}}$   
Wetted area of pit 50% full  $a_{s50} = l \times d + w \times d = \mathbf{7200000 \text{ mm}^2}$

#### Table equations

Inflow (cl.3.3.1)  $I = M100 \times A$   
Outflow (cl.3.3.2)  $O = a_{s50} \times f \times D$   
Storage (cl.3.3.3)  $S = I - O$

| Duration,<br>D (min) | Growth<br>factor Z1 | M5<br>rainfalls<br>(mm) | Growth<br>factor Z2 | 100 year<br>rainfall,<br>M100<br>(mm) | Inflow<br>(m <sup>3</sup> ) | Outflow<br>(m <sup>3</sup> ) | Storage<br>required<br>(m <sup>3</sup> ) |
|----------------------|---------------------|-------------------------|---------------------|---------------------------------------|-----------------------------|------------------------------|------------------------------------------|
| 5                    | 0.36;               | 9.6;                    | 1.90;               | 18.2;                                 | 3.37;                       | 0.08;                        | 3.28                                     |
| 10                   | 0.51;               | 13.6;                   | 1.97;               | 26.7;                                 | 4.94;                       | 0.17;                        | 4.77                                     |
| 15                   | 0.62;               | 16.5;                   | 2.00;               | 33.0;                                 | 6.11;                       | 0.25;                        | 5.86                                     |
| 30                   | 0.79;               | 21.0;                   | 2.03;               | 42.6;                                 | 7.88;                       | 0.51;                        | 7.37                                     |
| 60                   | 1.00;               | 26.6;                   | 2.00;               | 53.1;                                 | 9.83;                       | 1.01;                        | 8.82                                     |
| 120                  | 1.22;               | 32.5;                   | 1.95;               | 63.3;                                 | 11.71;                      | 2.02;                        | 9.69                                     |
| 240                  | 1.48;               | 39.4;                   | 1.90;               | 74.6;                                 | 13.80;                      | 4.04;                        | 9.76                                     |
| 360                  | 1.67;               | 44.4;                   | 1.85;               | 82.4;                                 | 15.24;                      | 6.07;                        | 9.18                                     |
| 600                  | 1.90;               | 50.5;                   | 1.81;               | 91.3;                                 | 16.89;                      | 10.11;                       | 6.78                                     |
| 1440                 | 2.42;               | 64.4;                   | 1.71;               | 110.2;                                | 20.39;                      | 24.26;                       | 0.00                                     |

Required storage volume  $S_{\text{req}} = \mathbf{9.76 \text{ m}^3}$

Soakaway storage volume  $S_{\text{act}} = l \times d \times w \times V_{\text{free}} = \mathbf{10.64 \text{ m}^3}$

**PASS - Soakaway storage volume**

Time for emptying soakaway to half volume  $t_{s50} = S_{\text{req}} \times 0.5 / (a_{s50} \times f) = \mathbf{4\text{hr } 49\text{min } 39\text{s}}$

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

## SOAKAWAY DESIGN

### In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.05

#### Design rainfall intensity

Location of catchment area Manchester  
Impermeable area drained to the system  $A = 221.0 \text{ m}^2$   
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  $M5_{60\text{min}} = 19.0 \text{ mm}$   
Increase of rainfall intensity due to global warming  $p_{\text{climate}} = 40 \%$

#### Soakaway / infiltration trench details

Soakaway type Rectangular  
Minimum depth of pit (below incoming invert)  $d = 800 \text{ mm}$   
Width of pit  $w = 2000 \text{ mm}$   
Length of pit  $l = 8000 \text{ mm}$   
Percentage free volume  $V_{\text{free}} = 95 \%$   
Soil infiltration rate  $f = 39.0 \times 10^{-6} \text{ m/s}$   
Wetted area of pit 50% full  $a_{s50} = l \times d + w \times d = 8000000 \text{ mm}^2$

#### Table equations

Inflow (cl.3.3.1)  $I = M100 \times A$   
Outflow (cl.3.3.2)  $O = a_{s50} \times f \times D$   
Storage (cl.3.3.3)  $S = I - O$

| Duration,<br>D (min) | Growth<br>factor Z1 | M5<br>rainfalls<br>(mm) | Growth<br>factor Z2 | 100 year<br>rainfall,<br>M100<br>(mm) | Inflow<br>(m³) | Outflow<br>(m³) | Storage<br>required<br>(m³) |
|----------------------|---------------------|-------------------------|---------------------|---------------------------------------|----------------|-----------------|-----------------------------|
| 5                    | 0.36;               | 9.6;                    | 1.90;               | 18.2;                                 | 4.02;          | 0.09;           | 3.93                        |
| 10                   | 0.51;               | 13.6;                   | 1.97;               | 26.7;                                 | 5.90;          | 0.19;           | 5.71                        |
| 15                   | 0.62;               | 16.5;                   | 2.00;               | 33.0;                                 | 7.30;          | 0.28;           | 7.02                        |
| 30                   | 0.79;               | 21.0;                   | 2.03;               | 42.6;                                 | 9.41;          | 0.56;           | 8.85                        |
| 60                   | 1.00;               | 26.6;                   | 2.00;               | 53.1;                                 | 11.74;         | 1.12;           | 10.62                       |
| 120                  | 1.22;               | 32.5;                   | 1.95;               | 63.3;                                 | 13.99;         | 2.25;           | 11.74                       |
| 240                  | 1.48;               | 39.4;                   | 1.90;               | 74.6;                                 | 16.49;         | 4.49;           | 11.99                       |
| 360                  | 1.67;               | 44.4;                   | 1.85;               | 82.4;                                 | 18.21;         | 6.74;           | 11.47                       |
| 600                  | 1.90;               | 50.5;                   | 1.81;               | 91.3;                                 | 20.18;         | 11.23;          | 8.94                        |
| 1440                 | 2.42;               | 64.4;                   | 1.71;               | 110.2;                                | 24.36;         | 26.96;          | 0.00                        |

Required storage volume  $S_{\text{req}} = 11.99 \text{ m}^3$

Soakaway storage volume  $S_{\text{act}} = l \times d \times w \times V_{\text{free}} = 12.16 \text{ m}^3$

**PASS - Soakaway storage volume**

Time for emptying soakaway to half volume  $t_{s50} = S_{\text{req}} \times 0.5 / (a_{s50} \times f) = 5\text{hr } 20\text{min } 15\text{s}$

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

|                                                |                          |                  |                            |                                   |                             |
|------------------------------------------------|--------------------------|------------------|----------------------------|-----------------------------------|-----------------------------|
| Project<br>Dobfield Road, Rochdale - SOAKAWAYS |                          |                  |                            | Job no.<br>EBC01070               |                             |
| Calcs for<br>Access Road                       |                          |                  |                            | Start page no./Revision<br>app- 4 |                             |
| Calcs by<br>PD                                 | Calcs date<br>08/05/2023 | Checked by<br>PD | Checked date<br>08/05/2023 | Approved by<br>PD                 | Approved date<br>08/05/2023 |

## SOAKAWAY DESIGN

### In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.05

#### Design rainfall intensity

Location of catchment area Manchester  
Impermeable area drained to the system  $A = 1138.0 \text{ m}^2$   
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  $M5_{60\text{min}} = 19.0 \text{ mm}$   
Increase of rainfall intensity due to global warming  $p_{\text{climate}} = 40 \%$

#### Soakaway / infiltration trench details

Soakaway type Rectangular  
Minimum depth of pit (below incoming invert)  $d = 800 \text{ mm}$   
Width of pit  $w = 2000 \text{ mm}$   
Length of pit  $l = 41000 \text{ mm}$   
Percentage free volume  $V_{\text{free}} = 95 \%$   
Soil infiltration rate  $f = 47.0 \times 10^{-6} \text{ m/s}$   
Wetted area of pit 50% full  $a_{s50} = l \times d + w \times d = 34400000 \text{ mm}^2$

#### Table equations

Inflow (cl.3.3.1)  $I = M100 \times A$   
Outflow (cl.3.3.2)  $O = a_{s50} \times f \times D$   
Storage (cl.3.3.3)  $S = I - O$

| Duration,<br>D (min) | Growth<br>factor Z1 | M5<br>rainfalls<br>(mm) | Growth<br>factor Z2 | 100 year<br>rainfall,<br>M100<br>(mm) | Inflow<br>(m <sup>3</sup> ) | Outflow<br>(m <sup>3</sup> ) | Storage<br>required<br>(m <sup>3</sup> ) |
|----------------------|---------------------|-------------------------|---------------------|---------------------------------------|-----------------------------|------------------------------|------------------------------------------|
| 5                    | 0.36;               | 9.6;                    | 1.90;               | 18.2;                                 | 20.70;                      | 0.49;                        | 20.22                                    |
| 10                   | 0.51;               | 13.6;                   | 1.97;               | 26.7;                                 | 30.37;                      | 0.97;                        | 29.40                                    |
| 15                   | 0.62;               | 16.5;                   | 2.00;               | 33.0;                                 | 37.57;                      | 1.46;                        | 36.12                                    |
| 30                   | 0.79;               | 21.0;                   | 2.03;               | 42.6;                                 | 48.45;                      | 2.91;                        | 45.54                                    |
| 60                   | 1.00;               | 26.6;                   | 2.00;               | 53.1;                                 | 60.46;                      | 5.82;                        | 54.64                                    |
| 120                  | 1.22;               | 32.5;                   | 1.95;               | 63.3;                                 | 72.03;                      | 11.64;                       | 60.39                                    |
| 240                  | 1.48;               | 39.4;                   | 1.90;               | 74.6;                                 | 84.90;                      | 23.28;                       | 61.62                                    |
| 360                  | 1.67;               | 44.4;                   | 1.85;               | 82.4;                                 | 93.76;                      | 34.92;                       | 58.83                                    |
| 600                  | 1.90;               | 50.5;                   | 1.81;               | 91.3;                                 | 103.89;                     | 58.20;                       | 45.69                                    |
| 1440                 | 2.42;               | 64.4;                   | 1.71;               | 110.2;                                | 125.43;                     | 139.69;                      | 0.00                                     |

Required storage volume  $S_{\text{req}} = 61.62 \text{ m}^3$

Soakaway storage volume  $S_{\text{act}} = l \times d \times w \times V_{\text{free}} = 62.32 \text{ m}^3$

**PASS - Soakaway storage volume**

Time for emptying soakaway to half volume  $t_{s50} = S_{\text{req}} \times 0.5 / (a_{s50} \times f) = 5\text{hr } 17\text{min } 37\text{s}$

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