

Job name: Marsh Lane Shepley

Job No: B26074

Note No: TN001 P02

Date: 27/06/2025

Prepared by: Louis Keane

Subject: Infiltration testing

1. Introduction

1.1 General

1.1.1 JNP Group were instructed by Halstead Homes to undertake infiltration testing for soakaway design as part of the drainage strategy for land off Marsh Lane, Shepley, HD8 8AS.

2. Ground Conditions

2.1 Exploratory Hole Locations

2.1.1 The locations of the exploratory holes are shown on JNP Group Drawing No. B26074-JNP-XX-XX-DR-G-7003. Soakaway Pit Locations, dated 25th June 2025 and is shown in Appendix A.

2.2 Strata Encountered

2.2.1 The ground conditions encountered during the intrusive investigation were generally consistent with the published geological map. A variable thickness of made ground and topsoil was found to be underlain by granular strata of the Grenoside Sandstone.

2.2.2 A summary of the stratigraphy encountered during the investigation is presented in the following table and described in the following sections, but for full details and descriptions, reference should be made to the exploratory hole records presented in Appendix B.

Table 2.1 Stratigraphy Encountered

Stratum	Depth to Top (m bgl)	Depth to Base (m bgl)	Thickness (m)
Made ground (including Topsoil) All exploratory holes	Ground level	0.25 – 0.50	0.25 – 0.50
Grenoside Sandstone All exploratory holes	0.25 – 0.50	Not proven	Not proven

2.3 Topsoil and Made Ground

- 2.3.1 Made ground was encountered within TP01 to a depth of 0.20 m (bgl).
- 2.3.2 The made ground consisted of a hardcore gravel consisting of concrete, brick, slate, sandstone and limestone.
- 2.3.3 Topsoil was encountered in all exploratory holes, including beneath the made ground within TP01. The topsoil encountered on site consisted of light grey, medium grained sand with frequent roots and rootlets noted throughout.

2.4 Grenoside Sandstone

- 2.4.1 Soils inferred to be of the Grenoside Sandstone were encountered within all exploratory holes. The strata consisted of light greyish, yellow brown, gravelly clayey sand. The proportion of clay, sand and gravel varied between exploratory holes. The gravel fraction consisted medium to coarse, angular to sub-angular medium grained sandstone.

3. Infiltration Tests for Soakaway Feasibility

3.1 Background

3.1.1 In order to test the feasibility of utilising soakaways at the site, JNP Group has carried out infiltration tests in the following trial pits:

- TP01 in the entrance to the site in an area of proposed permeable paving;
- TP02 to the west of the northern border of the site, in an area of proposed permeable paving;
- TP03 to the east of the northern border of the site, in an area of proposed permeable paving;
- TP04 on the southern border of the site, in an area of a proposed soakaway for plot 6.
- TP05 on the southern border of the site, in an area of a proposed soakaway for plot 7.
- TP06 on the southern border of the site, in an area of a proposed soakaway for plot 8.

3.2 Methodology

- 3.2.1 The pits were excavated on 16th of June 2025 by a third party. The pits were filled with water to a depth commensurate with the proposed soakaway depth via a tanker / bowser to ensure that water inflow was rapid and did not have an adverse effect on infiltration rates.

3.2.2 Divers were utilised to gain water pressure data at 5 second intervals as well as manual dips of the water level over time intervals to determine the infiltration rates.

3.3 Pit Dimensions

3.3.1 The pits were excavated on 16th of June 2025 by a third party. The pit dimensions are listed below as length x width x depth;

- TP01 – 1.0 m x 0.6 m x 0.9 m;
- TP02 – 1.2 m x 0.6 m x 1.0 m;
- TP03 – 1.2 m x 0.6 m x 0.9 m;
- TP04 – 1.8 m x 0.6 m x 1.6 m;
- TP05 – 1.4 m x 0.6 m x 1.6 m;
- TP06 – 1.6 m x 0.6 m x 1.6 m.

3.4 Results

3.4.1 The infiltration rates were then calculated in accordance with the methodology given in BRE 365:2016 and gave the following results;

Location	Shallow Permeable Paving / Deep Soakaway	Test Number			Rate used in design
		1	2	3	
TP01*	Shallow permeable paving	N/A	N/A	$3.4 \times 10^{-6} \text{ ms}^{-1}$	$5 \times 10^{-6} \text{ ms}^{-1}$
TP02**	Shallow permeable paving	$1.0 \times 10^{-5} \text{ ms}^{-1}$	$5.4 \times 10^{-6} \text{ ms}^{-1}$	$5.7 \times 10^{-6} \text{ ms}^{-1}$	
TP03*	Shallow permeable paving	N/A	N/A	$3.8 \times 10^{-6} \text{ ms}^{-1}$	
TP04	Deep Soakaway	$6.6 \times 10^{-5} \text{ ms}^{-1}$	$5.1 \times 10^{-5} \text{ ms}^{-1}$	$4.2 \times 10^{-5} \text{ ms}^{-1}$	
TP05**	Deep Soakaway	$2.7 \times 10^{-5} \text{ ms}^{-1}$	$1.8 \times 10^{-5} \text{ ms}^{-1}$	$1.2 \times 10^{-5} \text{ ms}^{-1}$	
TP06	Deep Soakaway	$4.2 \times 10^{-5} \text{ ms}^{-1}$	$1.9 \times 10^{-5} \text{ ms}^{-1}$	$2.0 \times 10^{-5} \text{ ms}^{-1}$	

*Divers left overnight to complete test.

**Tests unable to be completed due to time constraints – data has been extrapolated to gain result.

3.4.1 Three fills were achieved in all holes apart from TP01 and TP03 (permeable paving), where time constraints prevented completion of the three tests. The results of all three tests in each hole have been overlaid (Appendix C).

3.5 Interpretation

- 3.5.1 The soakaway tests have been carried out at the anticipated depths of the full-size soakaways, in the locations of the proposed soakaways. Infiltration rates were moderate to low, between 3.4×10^{-6} m/s and 5.4×10^{-6} m/s within the shallow trial pits, and between 1.2×10^{-5} m/s and 4.2×10^{-5} m/s within the deep soakaway trial pits.
- 3.5.2 Note that the results of all three tests in TP01 and TP03 have been overlain and show that the data from the tests which were not fully completed follow a similar trend to the tests that did complete.
- 3.5.3 The infiltration rate used for the drainage design (ref. B26074-JNP-XX-XX-DR-C-2001 P02, April 2025) was 5×10^{-6} m/s which was higher than the rate determined for the shallow permeable paving but lower than the rate determined for the deeper soakaways.
- 3.5.4 The drainage design has been re-run and this shows that the soakaways function as planned but there is a slight amount of flooding from the permeable paving. The design of this has therefore been slightly modified, deepening of the sub-base below the currently proposed 250mm to 400mm to provide additional storage. A revised drainage layout and calculations are included in Appendix D.
- 3.5.5 If proposed soakaways are to be constructed at a significantly different depths than the tests, then the above calculated rates are not applicable, and JNP Group recommends that further soakaway testing is undertaken at the revised depths of the full-size soakaways. From the foregoing results, infiltration drainage is suitable at the site. It should be noted that other factors also need to be considered such as the depth to the water table, potential for mobilisation of contamination, potential for re-emergence etc. which should be assessed as part of a drainage strategy.

Document Issue Record

Technical Note No	Rev	Date	Prepared	Reviewed	Approved
001	-	24/06/2025	LK	SLL	SLL

List of Appendices

Appendix A Exploratory Hole Location Plan

Appendix B Exploratory Hole Records

Appendix C Soakaway Results Sheets

Appendix D Drainage Layout and Calculations

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Appendix A

Exploratory Hole Location Plan



HAZARD IDENTIFICATION BOX

This table is provided to assist the Principal Contractor to fulfil their obligations under the CDM Regulations 2015

Hazard Ref	Hazard Type (Construction/Maintenance/ Cleaning/Demolition/Adaptation)	Hazard Description	Mitigation Measures/ Residual Risk
1			



Health & Safety Note

The details on this drawing have been prepared on the assumption that a competent contractor will be carrying out the works. If the contractor(s) considers that there is insufficient Health and Safety information on this drawing, this should immediately be brought to the attention of the designer.

Rev.	Date	Description	Dm / Chk'd / App'd
	25/06/2025	First Issue	LK/LC/SLL

Suitability: S2 - Suitable for Information



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Client: Halstead Homes (Yorkshire) Ltd

Job: Marsh Lane, Shepley

Title: Soakaway Pit Locations

Classification: FI_60_20
Scale @ A3: As Shown

Project - Originator - Volume/System - Level/Location - Type - Discipline - Number
B26074 - JNP-XX-XX- DR-G- 7003

Revision: -

Document/Drawing Number

Appendix B

Exploratory Hole Records

Trial Pit Log

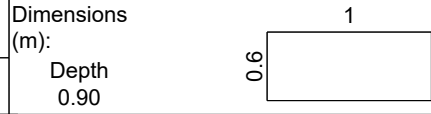
Project Name: Marsh Lane, Shepley

Project No.
B26074

Co-ords: 418709.00 - 409413.00
Level: 236.60

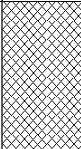
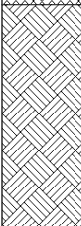

Date
16/06/2025

Location: Shepley



Scale
1:10
Logged
LK

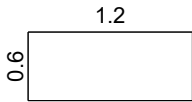
Client: Halstead Homes (Yorksire) Ltd

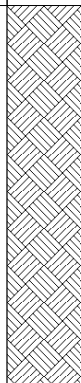
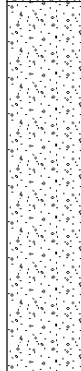
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20	236.40		Hardcore gravel MADE GROUND consisting concrete, brick, slate, sandstone and limestone. MADE GROUND
				0.50	236.10		Light grey medium grained SAND with frequent roots and rootlets. TOPSOIL
				0.90	235.70		Light orange brown slightly clayey medium grained SAND. GRENSIDE SANDSTONE
							----- End of pit at 0.90 m

Remarks: Trial pit formed for soakaway testing for permeable paving design.

Stability: Sides collapse when water is added for soakaway testing.

Trial Pit Log


Project Name: Marsh Lane, Shepley	Project No. B26074	Co-ords: 418730.00 - 409422.00 Level: 235.62	Date 16/06/2025
Location: Shepley	Dimensions (m): Depth 1.00		Scale 1:10 Logged LK
Client: Halstead Homes (Yorksire) Ltd			

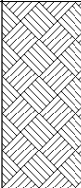
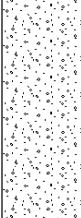
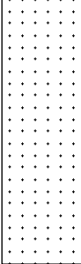
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.50	235.12		Light greyish brown slightly gravelly medium grained SAND. TOPSOIL
				1.00	234.62		Dark brown, yellowish gravelly medium grained SAND. Gravel consists coarse to medium, angular to sub-angular sandstone. GRENOSIDE SANDSTONE
							End of pit at 1.00 m

Remarks: Trial pit formed for soakaway testing for permeable paving design.

Stability: Sides collapse when water is added for soakaway testing.

Trial Pit Log

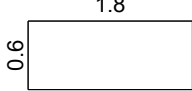
Project Name: Marsh Lane, Shepley	Project No. B26074	Co-ords: 418754.00 - 409446.00 Level: 234.62	Date 16/06/2025
Location: Shepley	Dimensions (m): Depth 0.90		Scale 1:10 Logged LK
Client: Halstead Homes (Yorksire) Ltd			

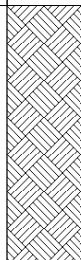
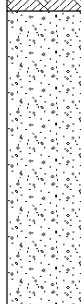
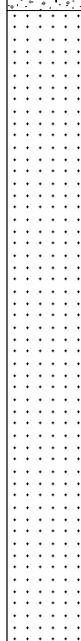
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.25	234.37		Light grey, slightly gravelly medium grained SAND. TOPSOIL
				0.55	234.07		Light yellowish grey brown medium grained SAND. GRENOSIDE SANDSTONE
				0.90	233.72		Yellow grey weathered SANDSTONE recovered as a gravel GRENOSIDE SANDSTONE
							End of pit at 0.90 m

Remarks: Trial pit formed for soakaway testing for permeable paving design.

Stability: Sides collapse when water is added for soakaway testing.

Trial Pit Log

Project Name: Marsh Lane, Shepley	Project No. B26074	Co-ords: 418743.00 - 409407.00 Level: 235.40	Date 16/06/2025
Location: Shepley		Dimensions (m): Depth 1.60	Scale 1:10 Logged LK
Client: Halstead Homes (Yorksire) Ltd			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.35	235.05		Light grey brown medium grained SAND. Frequent roots and rootlets noted throughout. TOPSOIL
				0.75	234.65		Light greyish brown gravelly medium grained SAND. Gravel is medium to coarse, angular to sub-angular sandstone. GRENOSE SANDSTONE
				1.60	233.80		Yellow grey weathered SANDSTONE recovered as a gravel GRENOSE SANDSTONE
							End of pit at 1.60 m

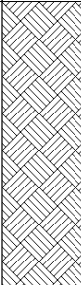
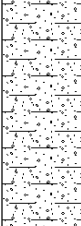
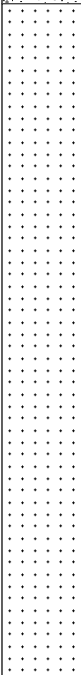
Remarks: Trial pit formed for soakaway testing for soakaway design.

Stability: Sides collapse when water is added for soakaway testing.

Trial Pit Log

Project Name: Marsh Lane, Shepley	Project No. B26074	Co-ords: 418769.00 - 409431.00 Level: 234.20	Date 16/06/2025
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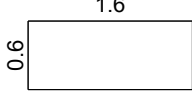
Location: Shepley	Dimensions (m): Depth 1.60	1.4 	Scale 1:10 Logged LK
Client: Halstead Homes (Yorksire) Ltd			

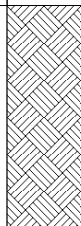
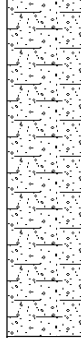
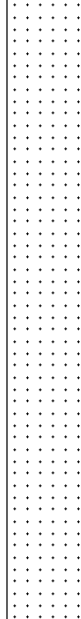
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.38	233.82		Light grey, yellow brown, slightly gravelly medium grained SAND. Frequent roots and rootlets noted throughout. TOPSOIL
				0.70	233.50		Light greyish yellow brown gravelly slightly clayey SAND. Gravel is medium to coarse, angular to sub-angular medoum grained sandstone. GRENSIDE SANDSTONE
				1.60	232.60		Yellow grey weathered SANDSTONE recovered as a gravel GRENSIDE SANDSTONE
							----- End of pit at 1.60 m

Remarks: Trial pit formed for soakaway testing for soakaway design.

Stability: Sides collapse when water is added for soakaway testing.

Trial Pit Log

Project Name: Marsh Lane, Shepley	Project No. B26074	Co-ords: 418781.00 - 409440.00 Level: 233.50	Date 16/06/2025
Location: Shepley	Dimensions (m): Depth 1.60		Scale 1:10 Logged LK
Client: Halstead Homes (Yorksire) Ltd			

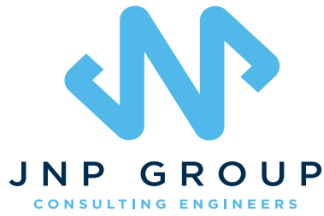
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30	233.20		Light greyish brown medium grained SAND. Frequent roots and rootlets noted throughout. TOPSOIL
				0.75	232.75		Light greyish yellow brown slightly gravelly slightly clayey SAND. Gravel is medium to corae, GRENSIDE SANDSTONE
				1.60	231.90		Yellow grey weathered SANDSTONE recovered as a gravel GRENSIDE SANDSTONE
							End of pit at 1.60 m

Remarks: Trial pit formed for soakaway testing for soakaway design.

Stability: Sides collapse when water is added for soakaway testing.

Appendix C

Soakaway Results Sheet



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SOIL INFILTRATION TEST

Project:

Marsh Lane, Shepley

Project No:

B26074

Test Location: TP01

Test No: Test 1

Date: 18 Jun 2025

Water level during test:

Water level pressure transducer used to obtain values. See graph below.

Trial pit dimensions	
Depth (m)	0.90
length (m)	1.00
width (m)	0.60

$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

f = soil infiltration rate

V_{p75-25} = volume of water from 75% to 25% effective depth

a_{s50} = internal surface area at 50% effective depth

t_{p75-25} = time for the water level to fall

from 75% to 25% effective depth

time at 75% effective depth (mins)

N/A

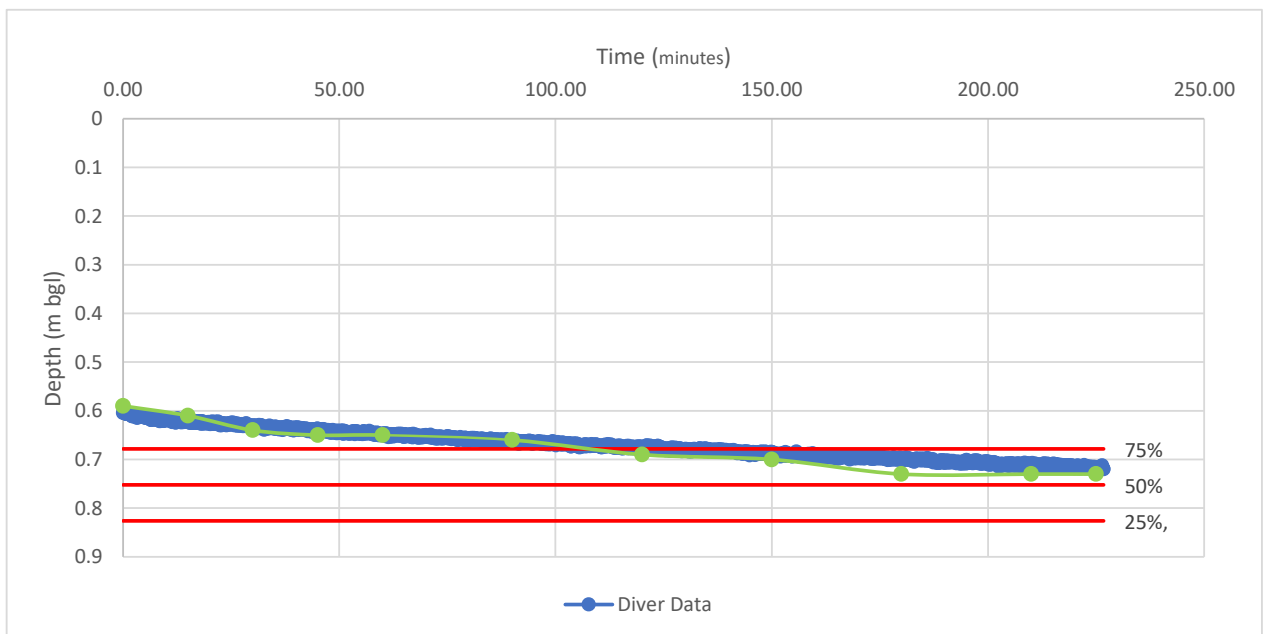
time at 25% effective depth (mins)

N/A

Test incomplete - Infiltration rate could not be determined

Calculated Soil Infiltration Rate =

N/A





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SOIL INFILTRATION TEST

Project:

Marsh Lane, Shepley

Project No:

B26074

Test Location: TP01

Test No: Test 2

Date: 18 Jun 2025

Water level during test:

Water level pressure transducer used to obtain values. See graph below.

Trial pit Dimensions	
Depth (m)	0.90
length (m)	1.00
width (m)	0.60

$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

f = soil infiltration rate

V_{p75-25} = volume of water from 75% to 25% effective depth

a_{s50} = internal surface area at 50% effective depth

t_{p75-25} = time for the water level to fall

from 75% to 25% effective depth

time at 75% effective depth (mins)

N/A

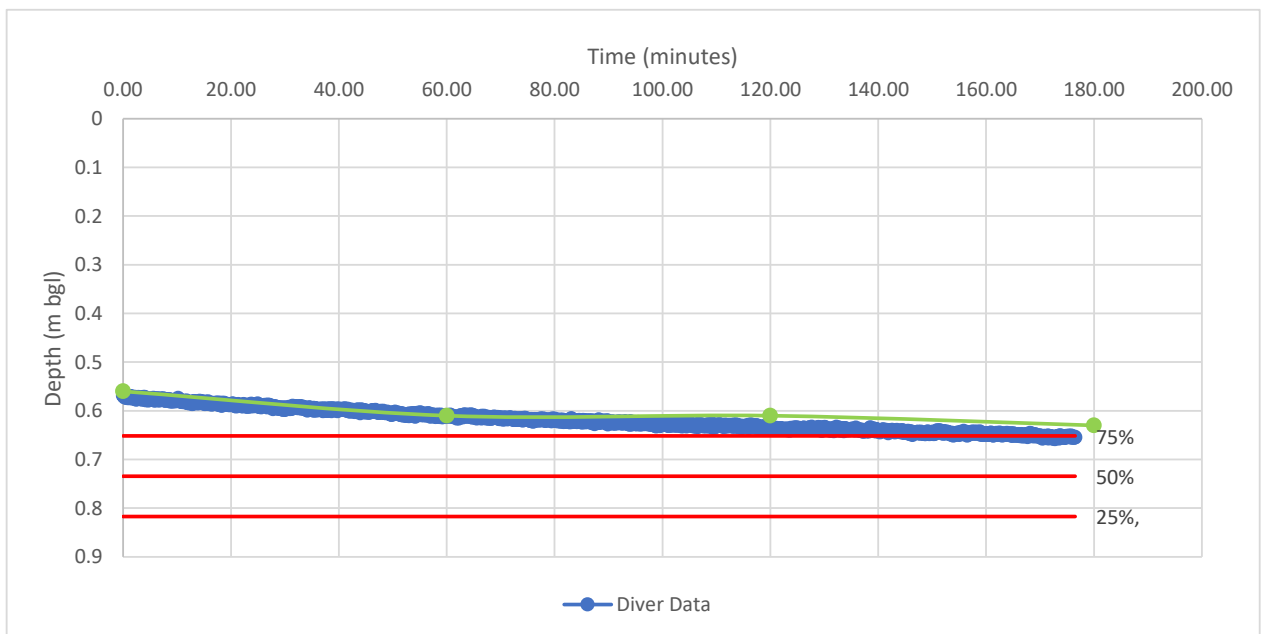
time at 25% effective depth (mins)

N/A

Test incomplete - Infiltration rate could not be determined

Calculated Soil Infiltration Rate =

N/A





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SOIL INFILTRATION TEST

Project:

Marsh Lane, Shepley

Project No:

B26074

Test Location: TP01

Test No: Test 3

Date: 18 Jun 2025

Water level during test:

Water level pressure transducer used to obtain values. See graph below.

Trial pit dimensions	
Depth (m)	0.90
length (m)	1.00
width (m)	0.60

$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

f = soil infiltration rate

V_{p75-25} = volume of water from 75% to 25% effective depth

a_{s50} = internal surface area at 50% effective depth

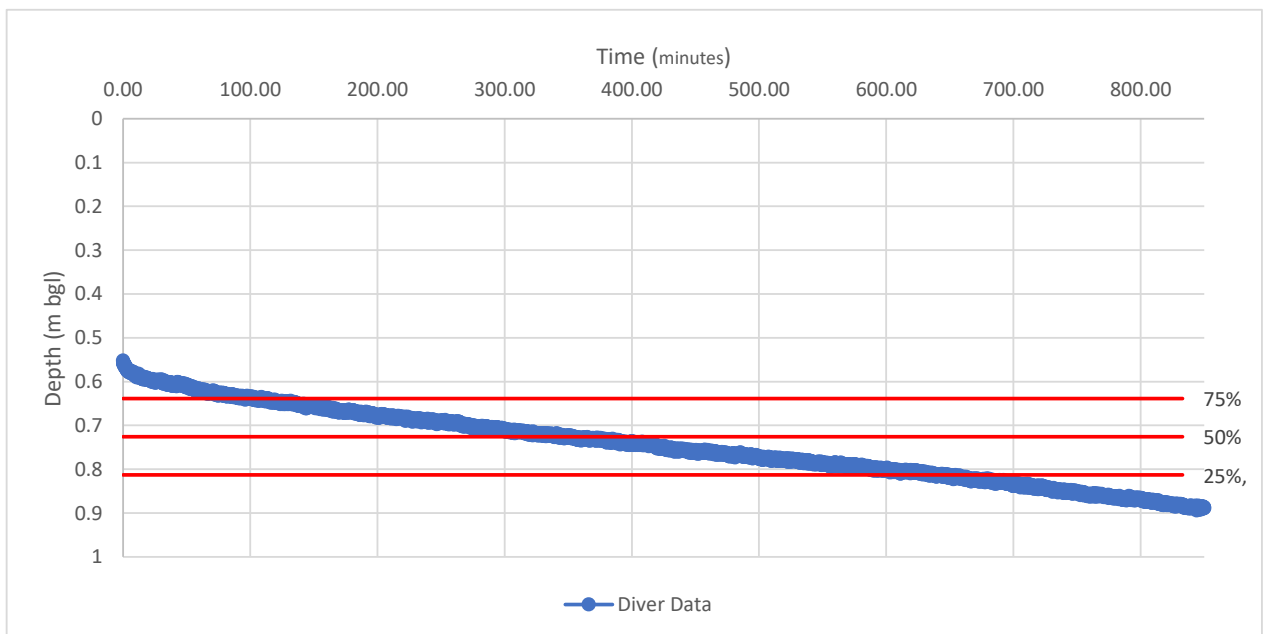
t_{p75-25} = time for the water level to fall

from 75% to 25% effective depth

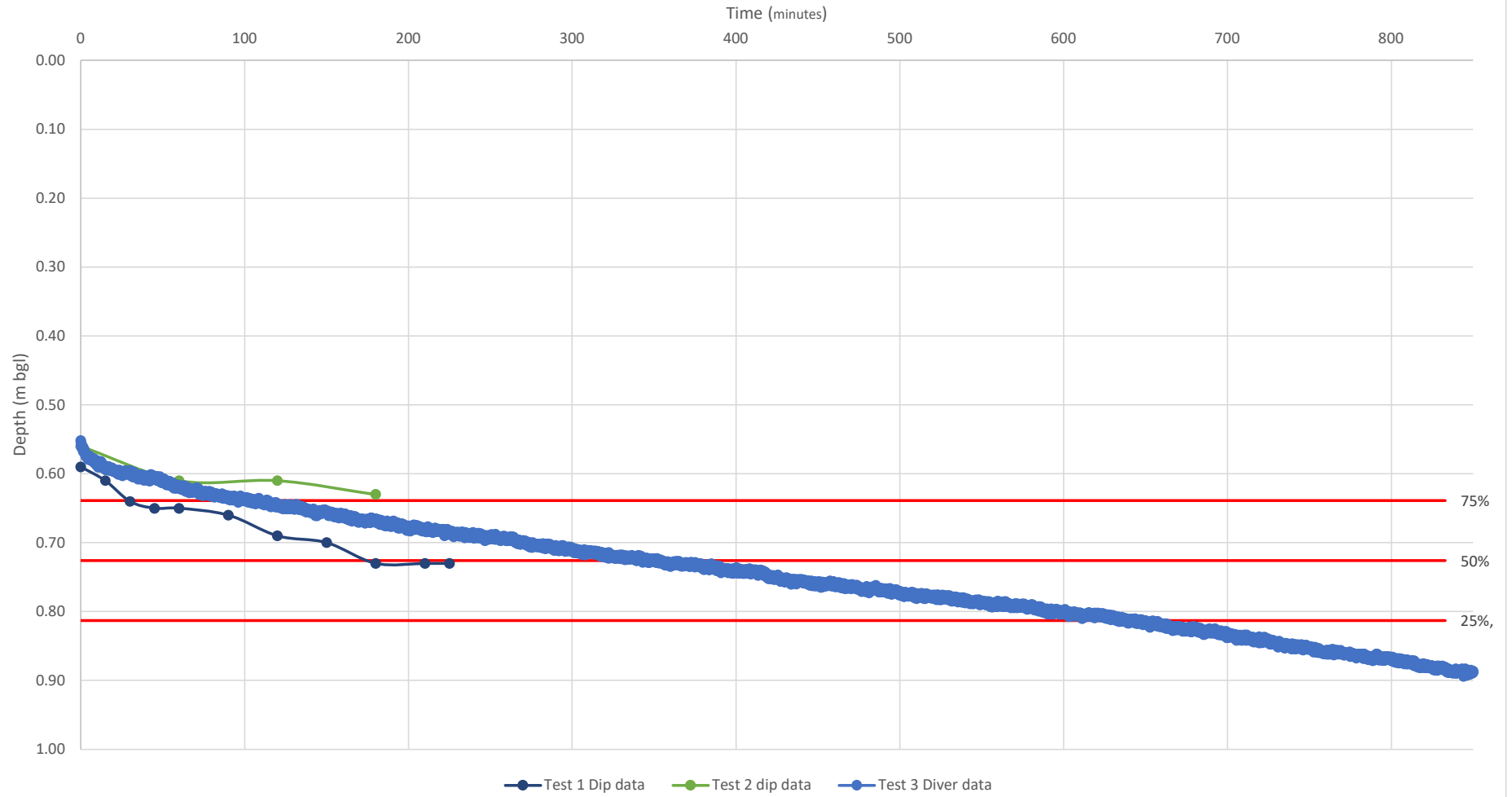
time at 75% effective depth (mins) 101.83

time at 25% effective depth (mins) 642.75

Calculated Soil Infiltration Rate = 3.4E-06 m/sec



TP01 - Trend of Permeable Paving Soakaways



MBP2

Meadowhall Business Park
Carbrook Hall Road
Sheffield, S9 2EQ

Project:

Marsh Lane, Shepley

Project No:

B26074

Tel 01926 889955

geoenvironmental@jnpgroup.co.uk

Test Location: TP02

Test No: 1

Date: 18 Jun 2025

Water level during test

Time mins	Depth m bgl
0	0.520
1	0.520
2	0.540
3	0.540
4	0.540
5	0.540
10	0.560
15	0.570
20	0.580
30	0.600
45	0.620
60	0.640
90	0.690
120	0.720
150	0.750
180	0.800
240	0.880

Trial pit dimensions

depth (m)	1.00
length (m)	1.20
width (m)	0.60

$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

f = soil infiltration rate

V_{p75-25} = volume of water from 75% to 25% effective depth

a_{s50} = internal surface area at 50% effective depth

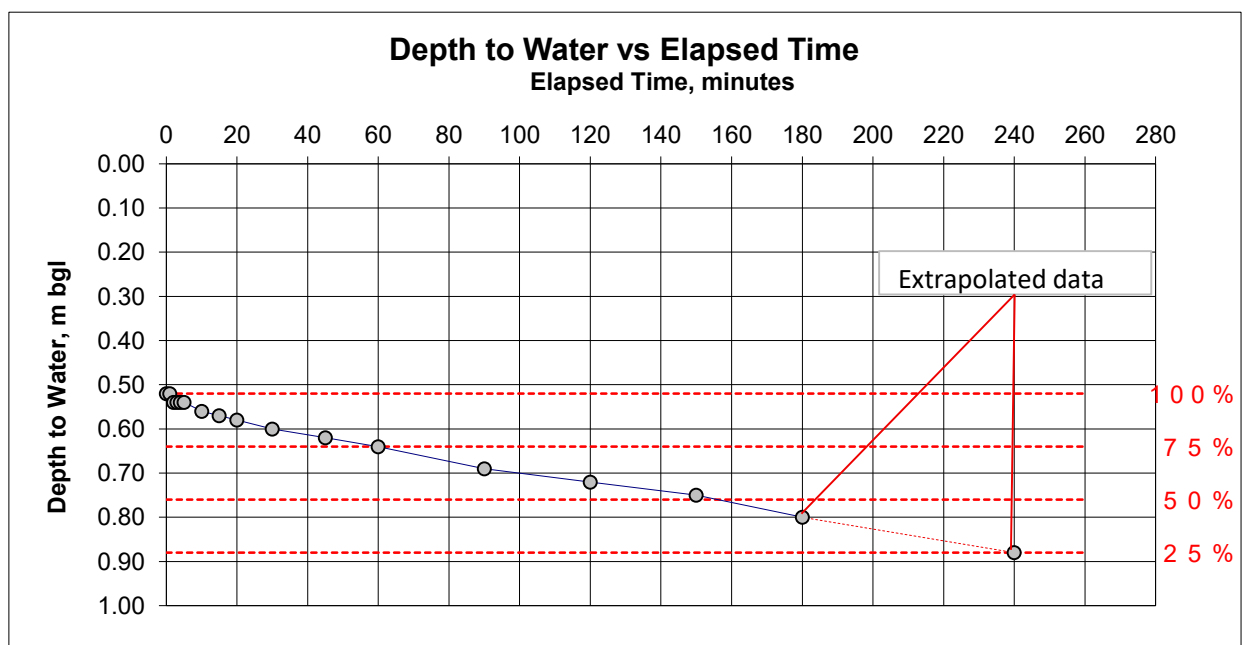
t_{p75-25} = time for the water level to fall from 75% to 25% effective depth

time at 75% effective depth (mins) 60

time at 25% effective depth (mins) 240

(from graph)

Calculated Soil Infiltration Rate = 1.0E-05 m/sec





Test Location: TP02

Test No: 2

Date: 18 Jun 2025

Water level during test

Time mins	Depth m bgl
0	0.500
1	0.530
2	0.530
3	0.540
4	0.540
5	0.540
10	0.550
20	0.570
30	0.570
60	0.620
90	0.660
120	0.730
150	0.740
400	0.880

Trial pit dimensions

depth (m)	1.00
length (m)	1.20
width (m)	0.60

$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

f = soil infiltration rate

V_{p75-25} = volume of water from 75% to 25% effective depth

a_{s50} = internal surface area at 50% effective depth

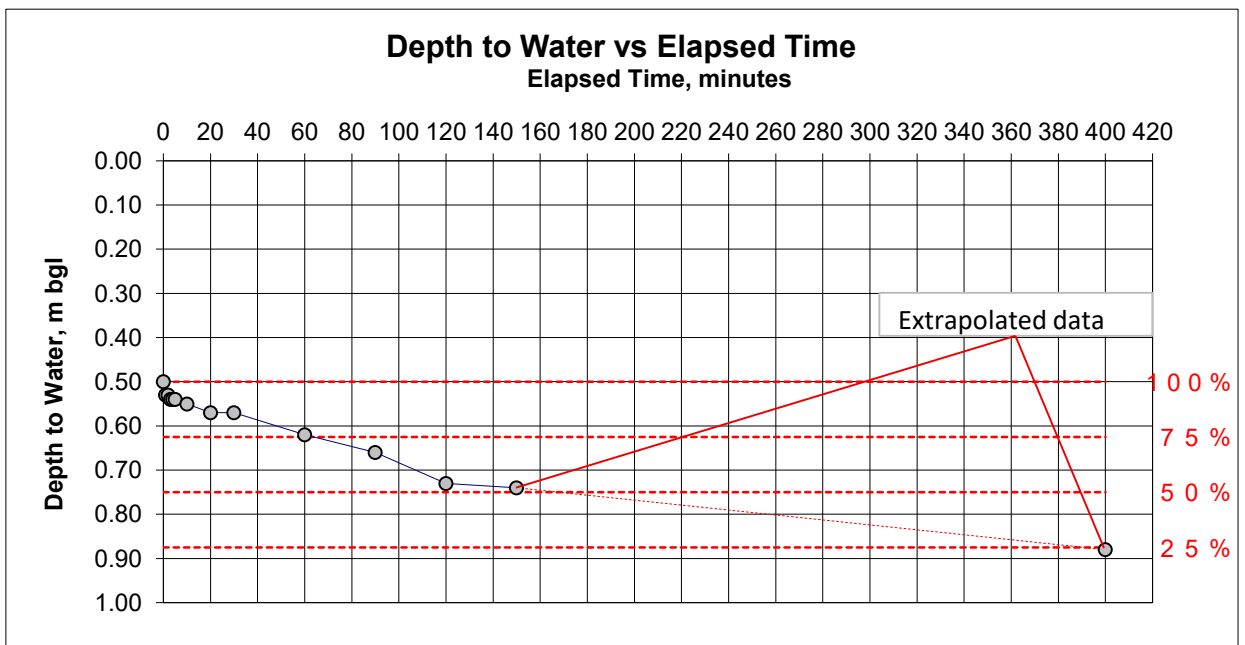
t_{p75-25} = time for the water level to fall from 75% to 25% effective depth

time at 75% effective depth (mins) 60

time at 25% effective depth (mins) 400

(from graph)

Calculated Soil Infiltration Rate = 5.4E-06 m/sec



Test Location: TP02

Test No: 3

Date: 18 Jun 2025

Water level during test

Time mins	Depth m bgl
0	0.480
1	0.480
2	0.490
3	0.490
4	0.490
5	0.490
10	0.530
20	0.530
30	0.550
60	0.580
90	0.650
120	0.680
400	0.870

Trial pit dimensions

depth (m)	1.00
length (m)	1.20
width (m)	0.60

$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

f = soil infiltration rate

V_{p75-25} = volume of water from 75% to 25% effective depth

a_{s50} = internal surface area at 50% effective depth

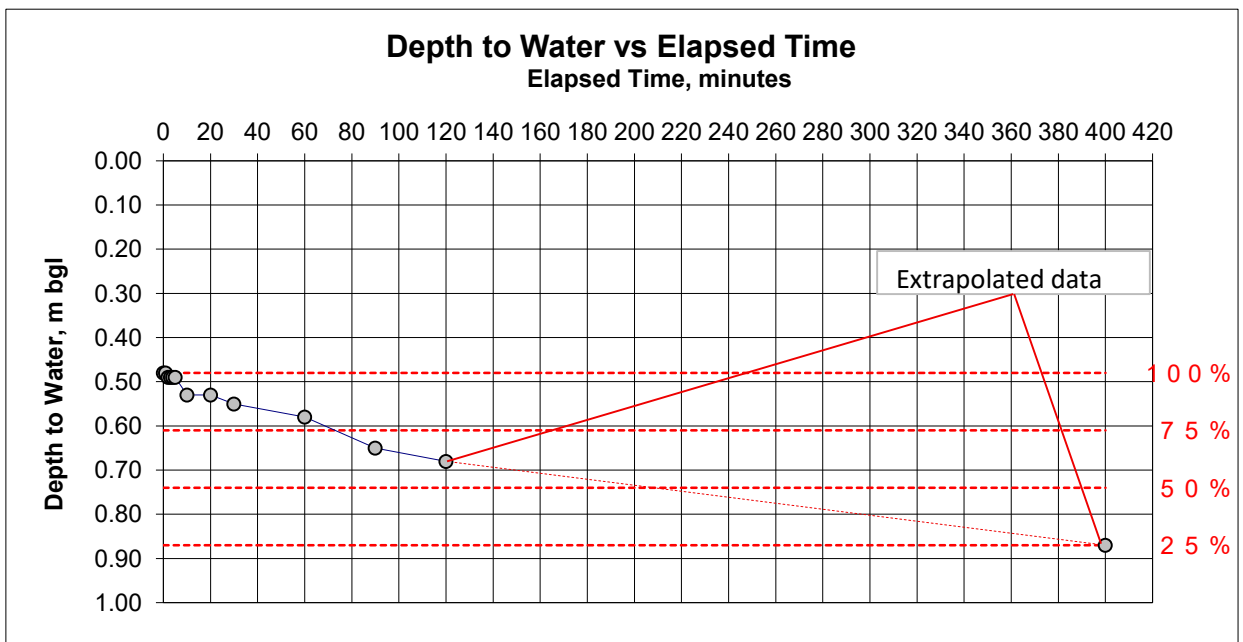
t_{p75-25} = time for the water level to fall from 75% to 25% effective depth

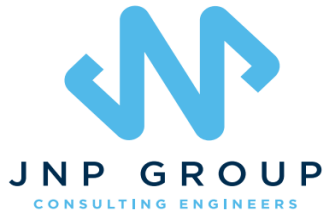
time at 75% effective depth (mins) 70

time at 25% effective depth (mins) 400

(from graph)

Calculated Soil Infiltration Rate = 5.7E-06 m/sec





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SOIL INFILTRATION TEST

Project:

Marsh Lane, Shepley

Project No:

B26074

Test Location: TP03

Test No: Test 1

Date: 17 Jun 2025

Water level during test:

Water level pressure transducer used to obtain values. See graph below.

Trial pit dimensions	
Depth (m)	0.90
length (m)	1.20
width (m)	0.60

$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

f = soil infiltration rate

V_{p75-25} = volume of water from 75% to 25% effective depth

a_{s50} = internal surface area at 50% effective depth

t_{p75-25} = time for the water level to fall
 from 75% to 25% effective depth

time at 75% effective depth (mins)

N/A

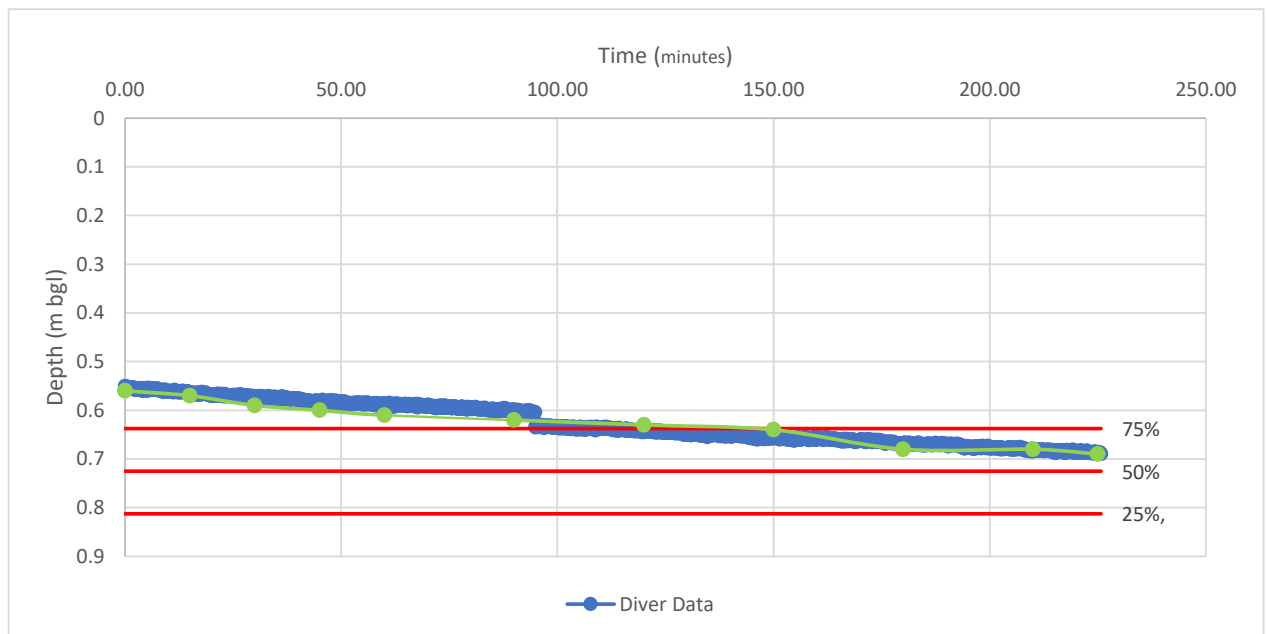
time at 25% effective depth (mins)

N/A

Test incomplete - Infiltration rate could not be determined

Calculated Soil Infiltration Rate =

N/A





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SOIL INFILTRATION TEST

Project:

Marsh Lane, Shepley

Project No:

B26074

Test Location: TP03

Test No: Test 2

Date: 17 Jun 2025

Water level during test:

Water level pressure transducer used to obtain values. See graph below.

Trial pit Dimensions

Depth (m)	0.90
length (m)	1.20
width (m)	0.60

$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

f = soil infiltration rate

V_{p75-25} = volume of water from 75% to 25% effective depth

a_{s50} = internal surface area at 50% effective depth

t_{p75-25} = time for the water level to fall

from 75% to 25% effective depth

time at 75% effective depth (mins)

N/A

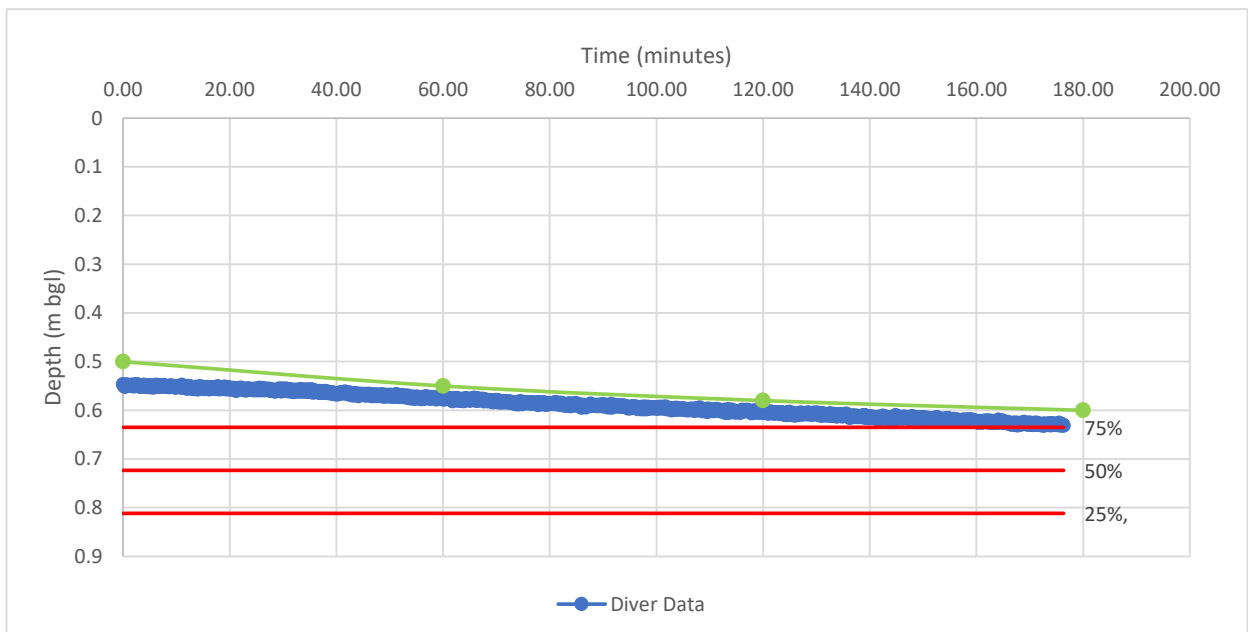
time at 25% effective depth (mins)

N/A

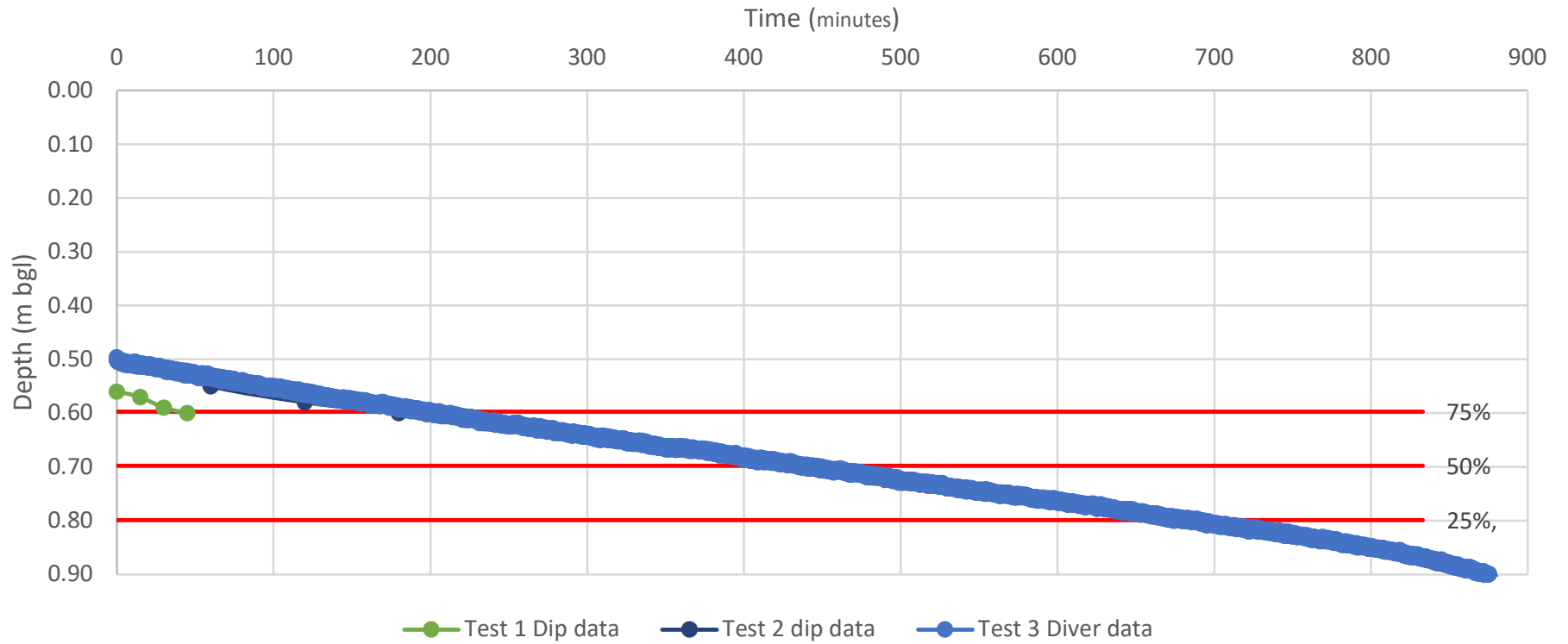
Test incomplete - Infiltration rate could not be determined

Calculated Soil Infiltration Rate =

N/A



TP03 - Trend of Permeable Paving Soakaways





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SOIL INFILTRATION TEST

Project:

Marsh Lane, Shepley

Project No:

B26074

Test Location: TP04

Test No: Test 1

Date: 17 Jun 2025

Water level during test:

Water level pressure transducer used to obtain values. See graph below.

Trial pit dimensions	
Depth (m)	1.60
length (m)	1.80
width (m)	0.60

$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

f = soil infiltration rate

V_{p75-25} = volume of water from 75% to 25% effective depth

a_{s50} = internal surface area at 50% effective depth

t_{p75-25} = time for the water level to fall

from 75% to 25% effective depth

time at 75% effective depth (mins)

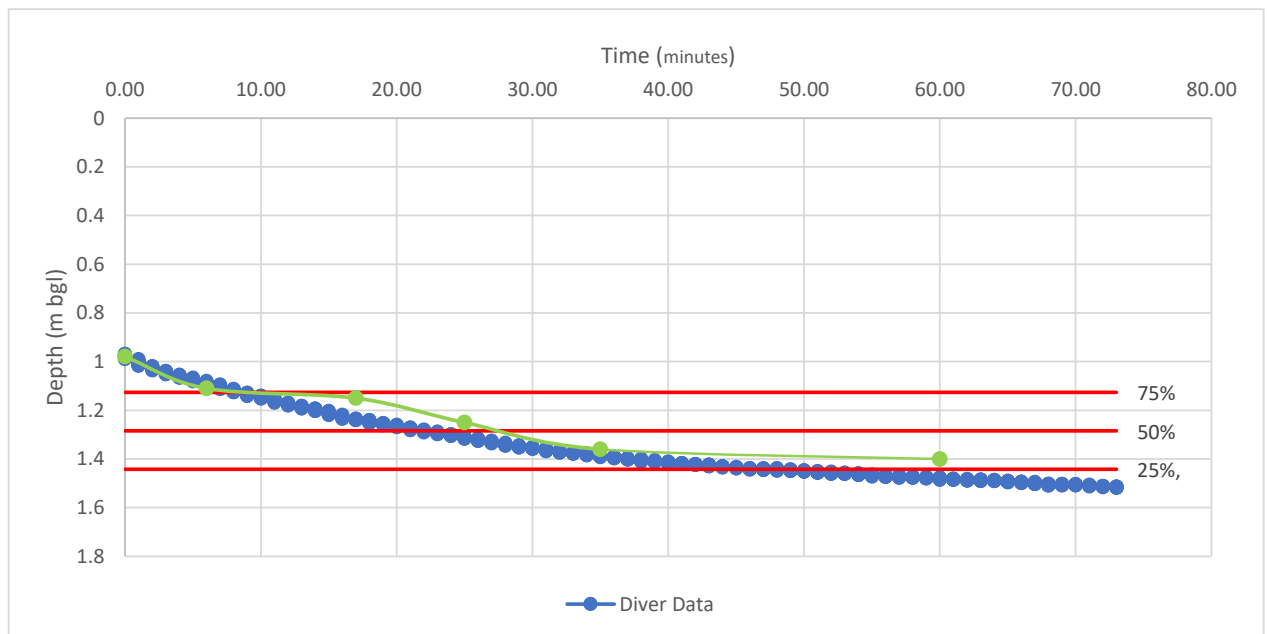
8.00

time at 25% effective depth (mins)

47.00

Calculated Soil Infiltration Rate =

6.6E-05 m/sec





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SOIL INFILTRATION TEST

Project:

Marsh Lane, Shepley

Project No:

B26074

Test Location: TP04

Test No: Test 2

Date: 17 Jun 2025

Water level during test:

Water level pressure transducer used to obtain values. See graph below.

Trial pit Dimensions

Depth (m)	1.60
length (m)	1.80
width (m)	0.60

$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

f = soil infiltration rate

V_{p75-25} = volume of water from 75% to 25% effective depth

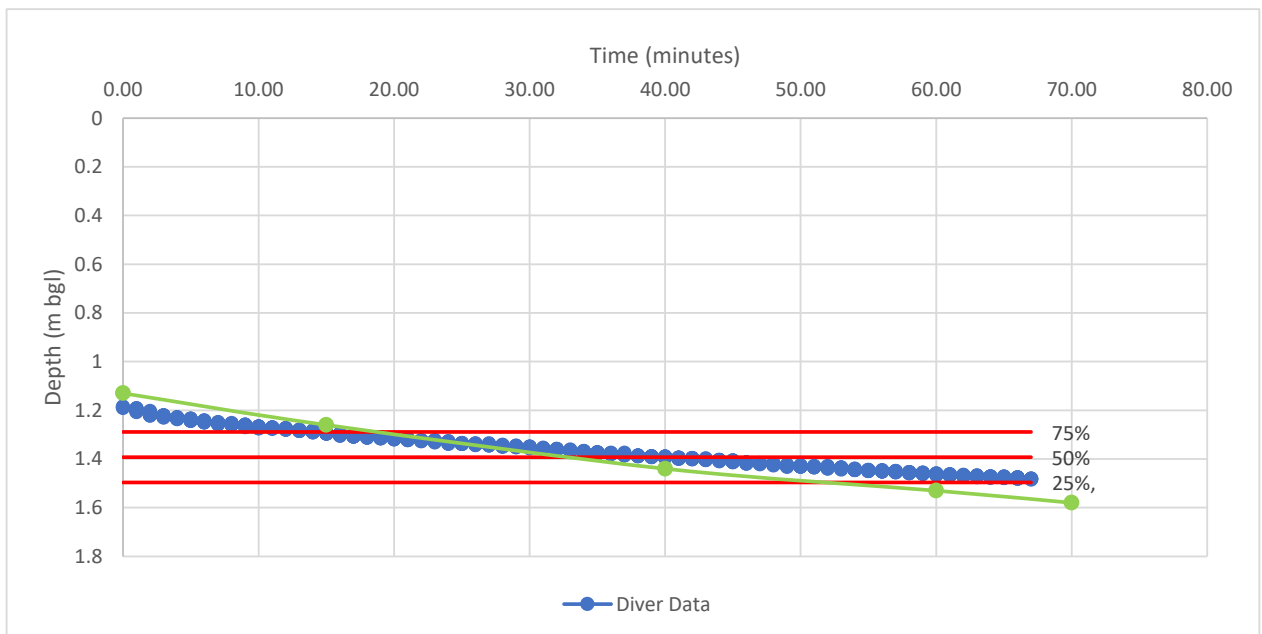
a_{s50} = internal surface area at 50% effective depth

t_{p75-25} = time for the water level to fall
 from 75% to 25% effective depth

time at 75% effective depth (mins) 14.00

time at 25% effective depth (mins) 67.00

Calculated Soil Infiltration Rate = 5.1E-05 m/sec





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SOIL INFILTRATION TEST

Project:

Marsh Lane, Shepley

Project No:

B26074

Test Location: TP04

Test No: Test 3

Date: 17 Jun 2025

Water level during test:

Water level pressure transducer used to obtain values. See graph below.

Trial pit dimensions	
Depth (m)	1.60
length (m)	1.80
width (m)	0.60

$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

f = soil infiltration rate

V_{p75-25} = volume of water from 75% to 25% effective depth

a_{s50} = internal surface area at 50% effective depth

t_{p75-25} = time for the water level to fall

from 75% to 25% effective depth

time at 75% effective depth (mins)

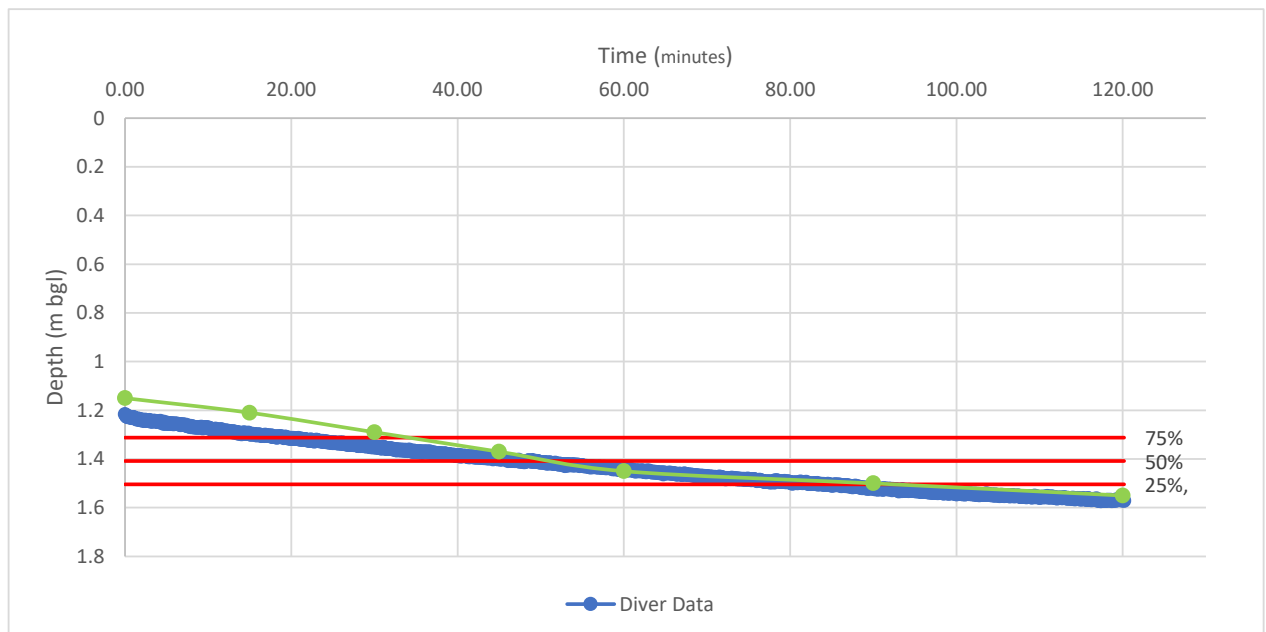
19.33

time at 25% effective depth (mins)

84.00

Calculated Soil Infiltration Rate =

4.2E-05 m/sec





Test Location: TP05

Test No: 1

Date: 17 Jun 2025

Water level during test

Time mins	Depth m bgl
0	0.780
1	0.830
2	0.850
3	0.900
4	0.920
5	0.930
10	0.930
15	0.940
20	0.970
30	1.000
45	1.060
60	1.130
90	1.290
110	1.400

Trial pit dimensions

depth (m)	1.60
length (m)	1.40
width (m)	0.60

$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

f = soil infiltration rate

V_{p75-25} = volume of water from 75% to 25% effective depth

a_{s50} = internal surface area at 50% effective depth

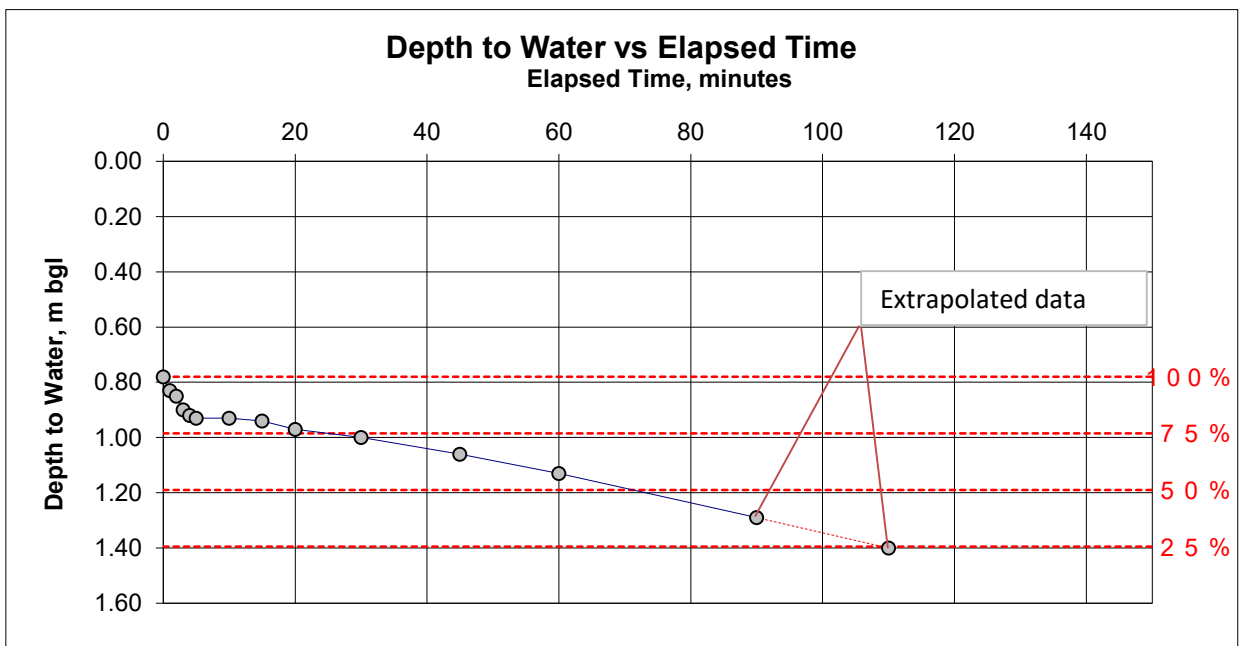
t_{p75-25} = time for the water level to fall from 75% to 25% effective depth

time at 75% effective depth (mins) 25

time at 25% effective depth (mins) 110

(from graph)

Calculated Soil Infiltration Rate = 2.7E-05 m/sec





Test Location: TP05

Test No: 2

Date: 17 Jun 2025

Water level during test

Time mins	Depth m bgl
0	0.760
1	0.790
2	0.820
3	0.830
4	0.840
5	0.850
15	0.850
20	0.900
60	1.050
90	1.110
110	1.200
170	1.400

Trial pit dimensions

depth (m)	1.60
length (m)	1.40
width (m)	0.60

$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

f = soil infiltration rate

V_{p75-25} = volume of water from 75% to 25% effective depth

a_{s50} = internal surface area at 50% effective depth

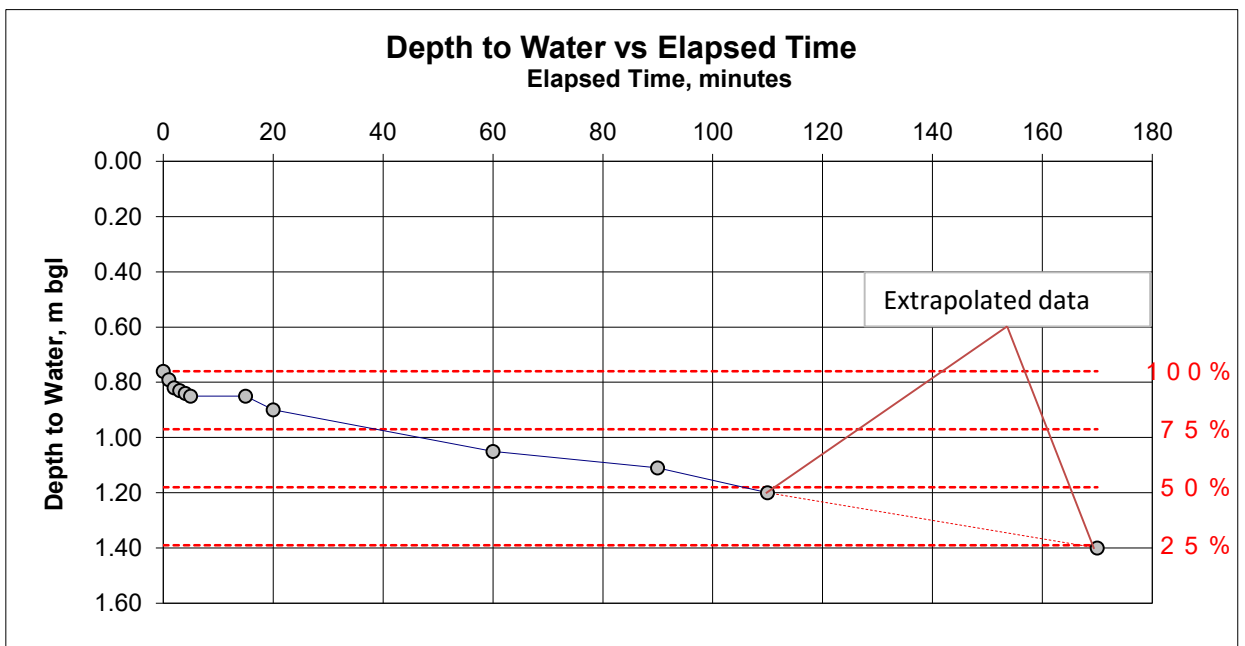
t_{p75-25} = time for the water level to fall from 75% to 25% effective depth

time at 75% effective depth (mins) 60

time at 25% effective depth (mins) 170

(from graph)

Calculated Soil Infiltration Rate = 1.8E-05 m/sec



Test Location: TP05

Test No: 3

Date: 17 Jun 2025

Water level during test

Time mins	Depth m bgl
0	0.740
1	0.730
2	0.750
3	0.760
4	0.760
5	0.760
10	0.780
15	0.790
20	0.820
30	0.820
45	0.900
60	0.950
90	1.020
120	1.080
150	1.150
200	1.250
260	1.400

Trial pit dimensions

depth (m)	1.60
length (m)	1.40
width (m)	0.60

$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

f = soil infiltration rate

V_{p75-25} = volume of water from 75% to 25% effective depth

a_{s50} = internal surface area at 50% effective depth

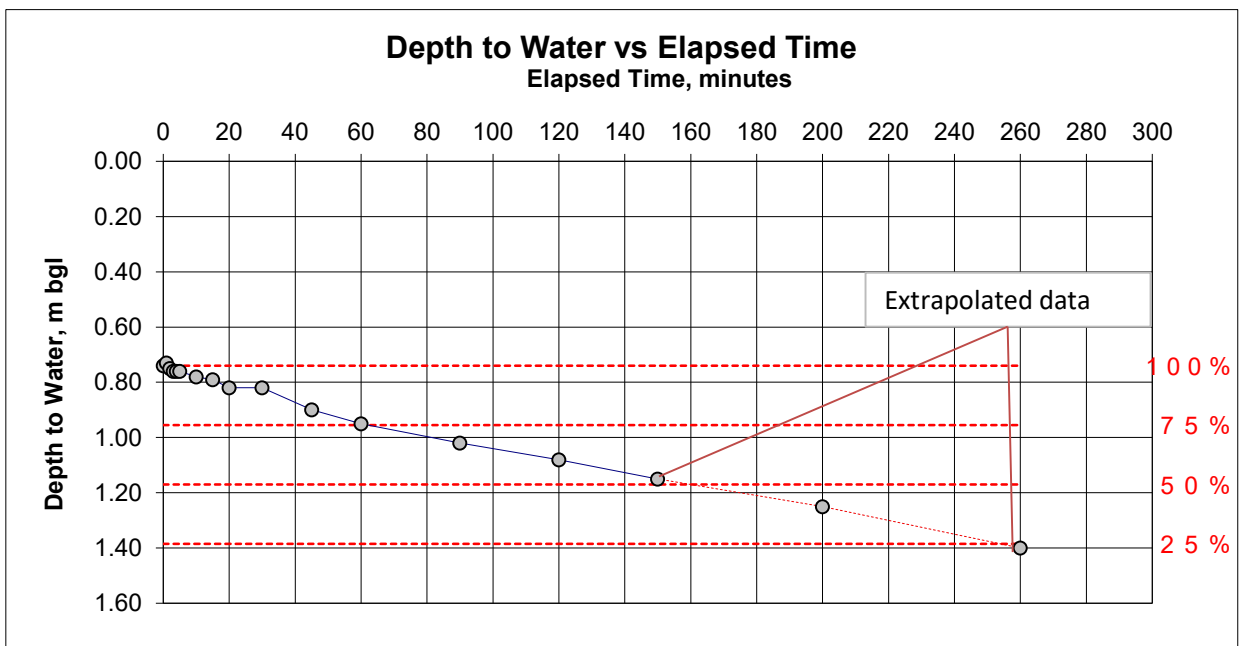
t_{p75-25} = time for the water level to fall from 75% to 25% effective depth

time at 75% effective depth (mins) 70

time at 25% effective depth (mins) 260

(from graph)

Calculated Soil Infiltration Rate = 1.2E-05 m/sec





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SOIL INFILTRATION TEST

Project:

Marsh Lane, Shepley

Project No:

B26074

Test Location: TP06

Test No: Test 3

Date: 17 Jun 2025

Water level during test:

Water level pressure transducer used to obtain values. See graph below.

Trial pit dimensions

Depth (m)	1.60
length (m)	1.60
width (m)	0.60

$$f = \frac{V_{p75-25}}{a_{s50} \times t_{p75-25}}$$

f = soil infiltration rate

V_{p75-25} = volume of water from 75% to 25% effective depth

a_{s50} = internal surface area at 50% effective depth

t_{p75-25} = time for the water level to fall

from 75% to 25% effective depth

time at 75% effective depth (mins)

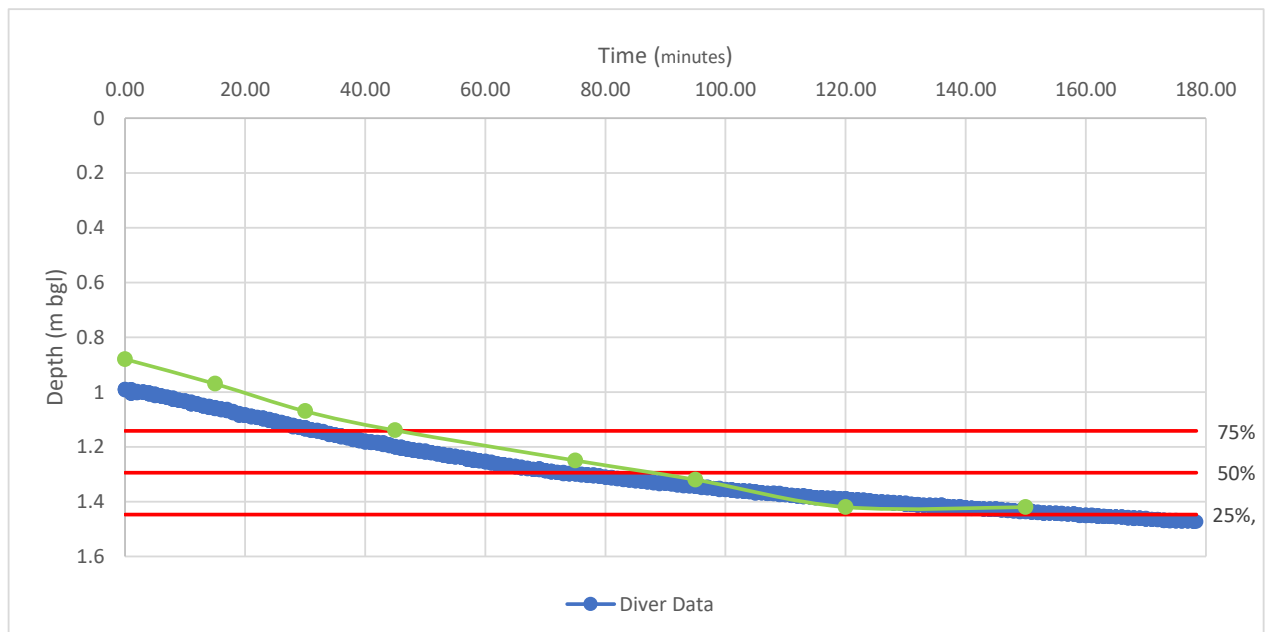
32.00

time at 25% effective depth (mins)

158.00

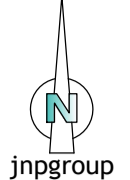
Calculated Soil Infiltration Rate =

2.0E-05 m/sec



Appendix D

Drainage Layout and Calculations



General Notes

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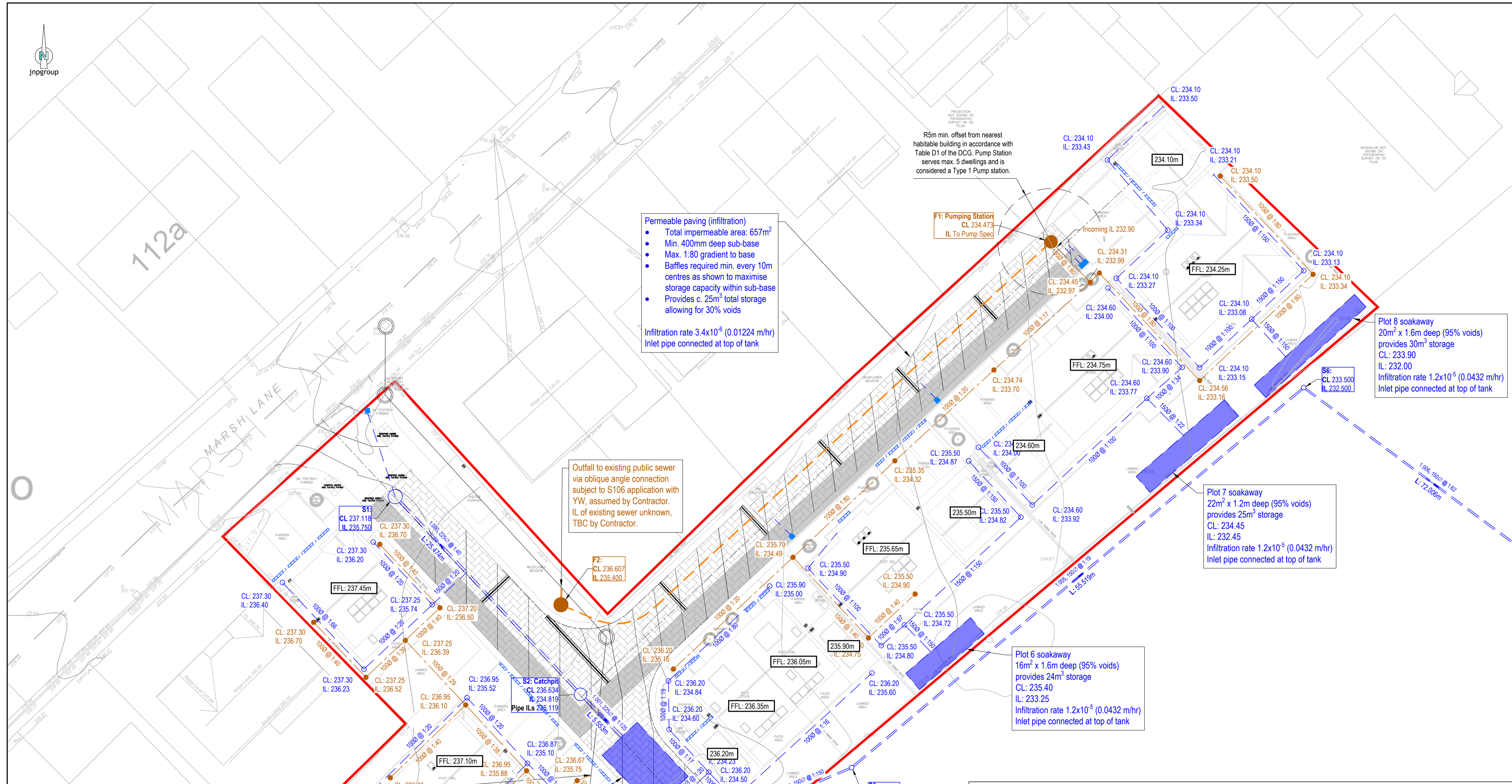
Health & Safety Note

The details on this drawing have been prepared on the assumption that a competent contractor will be carrying out the works. If the contractor(s) considers that there is insufficient Health and Safety information on this drawing, this should immediately be brought to the attention of the designer.

HAZARD IDENTIFICATION BOX

This table is provided to assist the Principal Contractor to fulfil their obligations under the CDM Regulations 2015

Hazard Ref	Hazard Type	Hazard Description	Mitigation Measures/ Residual Risk
▲	Construction/Excavation/Overhead Cables		



SW2 - Manhole Schedule

Manhole Reference	Cover Level (m)	Invert Level (M)	Depth to Invert (m)	Manhole Size / Type (mm)	Clear Opening	Cover Classification	Eastings	Northings
S1	237.118	235.750	1.368	1350 / Type C	1200x675	D400	418694.060	409421.893
S2	236.634	234.819	1.815	1200 / Catchpit	600x600	D400	418711.487	409403.313
S3	236.316	234.043	2.273	1200 / Type B	600x600	D400	418720.800	409393.426
S4	236.132	233.994	2.138	1200 / Type B	600x600	B125	418728.059	409392.681
S5	235.551	233.930	1.622	450 / PPIC	450x450	B125	418736.969	409396.427
S6	233.500	232.500	1.000	450 / PPIC	450x450	B125	418779.468	409432.151
S7	232.738	231.337	1.401	450 / PPIC	450x450	B125	418837.319	409389.277
S8	231.103	229.753	1.350	450 / PPIC	450x450	B125	418870.754	409334.023
S9	229.031	227.681	1.350	450 / PPIC	450x450	B125	418915.612	409285.164

FW1 - Manhole Schedule

Manhole Reference	Cover Level (m)	Invert Level (M)	Depth to Invert (m)	Manhole Size / Type (mm)	Clear Opening	Cover Classification	Eastings	Northings
F1	234.473	TBC	TBC	TBC / Pump Station	TBC	D400	418755.708	409445.860
F2	236.607	235.400	1.207	1350 / Type C	1200x675	B125	418709.638	409411.739

Rev.	Date	Description	Drawn/Checked/Approved
P05	26/06/2025	Design infiltration rates updated in accordance with test results. Permeable paving updated to suit.	SH / SLL
P04	18/06/2025	Pump station location revised and foul drainage updated to suit. Hydrobrake discharge rate revised to provide minimum flow control orifice size of 75mm as requested by LLFA - tank size revised to suit. S2 specified as catchpit manhole.	LC / JTH / SLL
P03	30/04/2025	Manhole schedule provided. Foul Manhole references updated. CL and IL of Manhole F2 revised.	LC / JTH / SLL
P02	16/04/2025	Minor updates to levels	LC / JTH / SLL
P01	31/03/2025	First issue for comment	LC / JTH / SLL

Submittal: S3 - Suitable for Review & Comment

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Client: Halstead Homes (Yorkshire) Ltd

Job: Marsh Lane, Shepley

Title: Drainage Layout

Classification: FI_60_20

Scale @ A1: 1:250

Project - Originator - Volume/System - Level/Location - Type - Discipline - Number

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	5	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.500
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	2.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	500.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Road Perm Paving	0.004		234.400		29.925	60.845	0.530
Plot 8 Soakaway	0.029	5.00	233.900		57.587	51.620	1.900
Plot 7 Soakaway	0.025	5.00	234.450		80.207	41.085	2.000
Plot 6 Soakaway	0.024	5.00	235.400		103.601	27.296	2.000
Attenuation Tank 1	0.079	5.00	236.300	1350	37.492	28.427	2.250
Plots 1-5 Soakaway	0.079	5.00	236.400		47.236	21.255	2.257
					22.870	35.921	2.800

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	Attenuation Tank	1	1.043	0.600	234.050	234.043	0.007	149.0	225	5.02	76.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.069	42.5	21.7	2.025	2.032	0.079	0.0	114	1.074

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	1.043	149.0	225	1 STANDARD	236.300	234.050	2.025	236.300	234.043	2.032

Link	US Node	Node Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	Attenuation Tank	Junction	1	1350	Manhole	1 STANDARD

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Road Perm Paving	29.925	60.845	234.400	0.530		◦			
Plot 8 Soakaway	57.587	51.620	233.900	1.900		◦			

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
Plot 7 Soakaway	80.207	41.085	234.450	2.000		◦				
Plot 6 Soakaway	103.601	27.296	235.400	2.000		◦				
Attenuation Tank	37.492	28.427	236.300	2.250		↘				
1	47.236	21.255	236.300	2.257	1350	1	1	1.000	234.050	225
Plots 1-5 Soakaway	22.870	35.921	236.400	2.800		1	1	1.000	234.043	225
						◦				

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	1 year (l/s)	0.6
Rainfall Events	Singular	Drain Down Time (mins)	240	30 year (l/s)	1.1
Summer CV	1.000	Additional Storage (m ³ /ha)	20.0	100 year (l/s)	1.4
Winter CV	1.000	Starting Level (m)		Check Discharge Volume	x
Analysis Speed	Normal	Check Discharge Rate(s)	✓		

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.75
Greenfield Method	IH124	Growth Factor 100 year	2.08
Positively Drained Area (ha)	0.235	Betterment (%)	0
SAAR (mm)	1004	QBar	0.7
Soil Index	2	Q 1 year (l/s)	0.6
SPR	0.30	Q 30 year (l/s)	1.1
Region	3	Q 100 year (l/s)	1.4
Growth Factor 1 year	0.86		

Node 1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	234.043	Product Number	CTL-SHE-0079-3000-1200-3000
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.0	Min Node Diameter (mm)	1200

Node Road Perm Paving Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.01224	Invert Level (m)	233.870	Slope (1:X)	80.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	310	Depth (m)	0.400
Safety Factor	2.0	Width (m)	3.500	Inf Depth (m)	
Porosity	0.30	Length (m)	10.000		

Node Plot 8 Soakaway Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.04320	Safety Factor	2.0	Invert Level (m)	232.000
Side Inf Coefficient (m/hr)	0.04320	Porosity	1.00	Time to half empty (mins)	1310

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	20.0	20.0	1.600	20.0	48.8	1.601	0.0	48.8

Node Plot 7 Soakaway Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.04320	Safety Factor	2.0	Invert Level (m)	232.450
Side Inf Coefficient (m/hr)	0.04320	Porosity	1.00	Time to half empty (mins)	1084

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	22.0	22.0	1.200	22.0	53.2	1.201	0.0	53.2

Node Plot 6 Soakaway Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.04320	Safety Factor	2.0	Invert Level (m)	233.400
Side Inf Coefficient (m/hr)	0.04320	Porosity	1.00	Time to half empty (mins)	1171

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	16.0	16.0	1.600	16.0	47.5	1.601	0.0	47.5

Node Attenuation Tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	234.050
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	124

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	32.0	0.0	1.200	32.0	0.0	1.201	0.0	0.0

Node Plots 1-5 Soakaway Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.04320	Safety Factor	2.0	Invert Level (m)	233.600
Side Inf Coefficient (m/hr)	0.04320	Porosity	0.95	Time to half empty (mins)	2430

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	65.0	65.0	1.600	65.0	70.0	1.601	0.0	70.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
960 minute winter	Road Perm Paving	585	233.996	0.126	0.1	0.6894	0.0000	OK
960 minute summer	Plot 8 Soakaway	660	232.320	0.319	0.8	6.4867	0.0000	OK
600 minute summer	Plot 7 Soakaway	420	232.678	0.228	0.9	5.0740	0.0000	OK
960 minute summer	Plot 6 Soakaway	645	233.730	0.330	0.6	5.3656	0.0000	OK
120 minute summer	Attenuation Tank	76	234.227	0.177	6.9	5.4976	0.0000	OK
120 minute summer	1	76	234.227	0.184	2.8	0.2628	0.0000	OK
960 minute summer	Plots 1-5 Soakaway	675	233.872	0.271	2.1	16.9158	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
960 minute winter	Road Perm Paving	Infiltration		0.1				
960 minute summer	Plot 8 Soakaway	Infiltration		0.2				
600 minute summer	Plot 7 Soakaway	Infiltration		0.2				
960 minute summer	Plot 6 Soakaway	Infiltration		0.1				
120 minute summer	Attenuation Tank	1.000	1	2.8	0.282	0.066	0.0356	
120 minute summer	1	Hydro-Brake®		2.7				13.6
960 minute summer	Plots 1-5 Soakaway	Infiltration		0.4				

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
600 minute summer	Road Perm Paving	420	234.066	0.196	0.3	1.4392	0.0000	OK
960 minute winter	Plot 8 Soakaway	900	232.713	0.713	1.0	14.4811	0.0000	OK
600 minute winter	Plot 7 Soakaway	480	232.956	0.506	1.1	11.2575	0.0000	OK
720 minute winter	Plot 6 Soakaway	675	234.118	0.718	1.0	11.6651	0.0000	OK
60 minute winter	Attenuation Tank	58	234.594	0.544	17.3	16.9308	0.0000	SURCHARGED
60 minute summer	1	54	234.593	0.550	7.0	0.7875	0.0000	OK
960 minute winter	Plots 1-5 Soakaway	885	234.249	0.649	2.6	40.4570	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
600 minute summer	Road Perm Paving	Infiltration		0.1				
960 minute winter	Plot 8 Soakaway	Infiltration		0.2				
600 minute winter	Plot 7 Soakaway	Infiltration		0.2				
720 minute winter	Plot 6 Soakaway	Infiltration		0.2				
60 minute winter	Attenuation Tank	1.000	1	8.7	0.407	0.204	0.0415	
60 minute summer	1	Hydro-Brake®		2.9				25.3
960 minute winter	Plots 1-5 Soakaway	Infiltration		0.4				

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
480 minute summer	Road Perm Paving	456	234.244	0.374	0.6	3.3356	0.0000	OK
1440 minute winter	Plot 8 Soakaway	1140	233.481	1.481	1.3	30.0764	0.0000	OK
1440 minute summer	Plot 7 Soakaway	1050	233.516	1.066	1.7	23.7270	0.0000	OK
1440 minute winter	Plot 6 Soakaway	1110	234.851	1.450	1.1	23.5554	0.0000	OK
120 minute winter	Attenuation Tank	114	235.219	1.169	19.0	36.3718	0.0000	SURCHARGED
120 minute winter	1	116	235.219	1.176	8.3	1.6834	0.0000	OK
1440 minute summer	Plots 1-5 Soakaway	1440	235.054	1.453	5.3	90.5730	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
480 minute summer	Road Perm Paving	Infiltration		0.1				
1440 minute winter	Plot 8 Soakaway	Infiltration		0.3				
1440 minute summer	Plot 7 Soakaway	Infiltration		0.3				
1440 minute winter	Plot 6 Soakaway	Infiltration		0.3				
120 minute winter	Attenuation Tank	1.000	1	8.3	0.359	0.195	0.0415	
120 minute winter	1	Hydro-Brake®		3.0				53.9
1440 minute summer	Plots 1-5 Soakaway	Infiltration		0.4				