

GLEESON STRATEGIC LAND / RYDON HOMES

Paul Slingo / Elliott Newlyn
(By email)

19 December 2018

Subject: Land South of Water Lane, Angmering – Soakage Tests
Our ref: L-19495-2.4.2-18-S698-RMH

Dear Sirs,

Further to the soakage testing carried out at the above site, we are pleased to provide this letter report which includes a brief account of the ground conditions encountered along with an assessment of soakage potential of the near surface soils at the site.

Intrusive Investigation

Idom Merebrook Ltd (Merebrook) was commissioned by Gleeson Strategic Land and Rydon Homes to carry out soakage tests in order to inform the drainage strategy for the site. Merebrook attended the site on 11 December 2018 to undertake the following exploratory holes:

- Two trial pits (MSA1 and MSA2) excavated to 2.1 meters below ground level (m bgl).

The trial pits were dug using a rubber-tyred backhoe excavator (JCB 3CX). Soakage tests were carried out in the trial pits over a maximum period of two hours, with the sides and bases squared off prior to filling with water from a 19,000 ltr road tanker.

Locations of the soakage tests are shown on the attached plan (Drawing No. 19495-304-006). Trial pit logs and soakage test results are also attached in this letter.

Ground Conditions

Ground conditions were found to comprise up to 0.4 m of topsoil underlain by superficial deposits consisting of brown very sandy gravelly clay (0.9 - 1.0 m thick), with a layer of brown clayey sandy cobbly gravel (0.6 - 0.7 m thick) below. The base of both trial pits was excavated into a white / yellow gravelly sand (0.1 and 0.2 m thick). Gravel and cobbles were described as angular to sub-rounded flint.

The sidewalls of the trial pits were observed to be stable during the soakage tests.

No groundwater was observed during the investigation.

Subject: Land South of Water Lane, Angmering – Soakage Tests
Our ref: L-19495-2.4.2-18-S698-RMH
Page: 2/2

Idom

Soakage Tests

A total of six soakage tests were undertaken in the trial pits (three in each location). The soakage tests were performed as far as possible in accordance with BRE document 365. The accompanying data sheets show that in MSA1 it was not possible to fill the pit with water due to the high infiltration rate observed during filling. In MSA2 (test 3) the water level fell by a maximum of 1550 mm over a period of two hours, whilst in tests 1 and 2, water levels fell by 1450 mm and 1350 mm, respectively, over a period of 90 minutes.

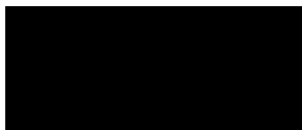
The BRE methodology for calculation of soil infiltration rate requires measurement of the volume out flowing from between 75 % and 25 % of the effective depth of the trial pit (height of water in the pit), i.e. three-quarters of the water should soak away. If, due to low levels of infiltration the water level does not fall from between 75 % to 25 % of the total water height, it may be possible to extrapolate from a curve derived from the plots of actual depth to water against time elapsed. All three tests performed in MSA2 achieved 25 % effective depth and corresponding infiltration rates of between 5.8×10^{-5} and 8.9×10^{-5} m/s were calculated.

In MSA1 water was observed to drain away very rapidly in all three tests, however, it was not possible to fill the pit with water above a depth of 1.55 m bgl. However, based on the limited data obtained for the tests in this location, infiltration rates of between 2.6×10^{-3} and 7.2×10^{-3} m/s have been calculated.

Based on the test results obtained to date, the ground conditions encountered are considered to be suitable for the use of shallow soakaways at the site. In addition to this, the feasibility of drainage via infiltration methods will depend on the design criteria and regulatory requirements, which should include consideration of the thickness of the unsaturated zone, i.e. the depth to groundwater.

We trust that the above information is helpful, however, if you have any questions, please do not hesitate to contact the undersigned.

Yours sincerely,

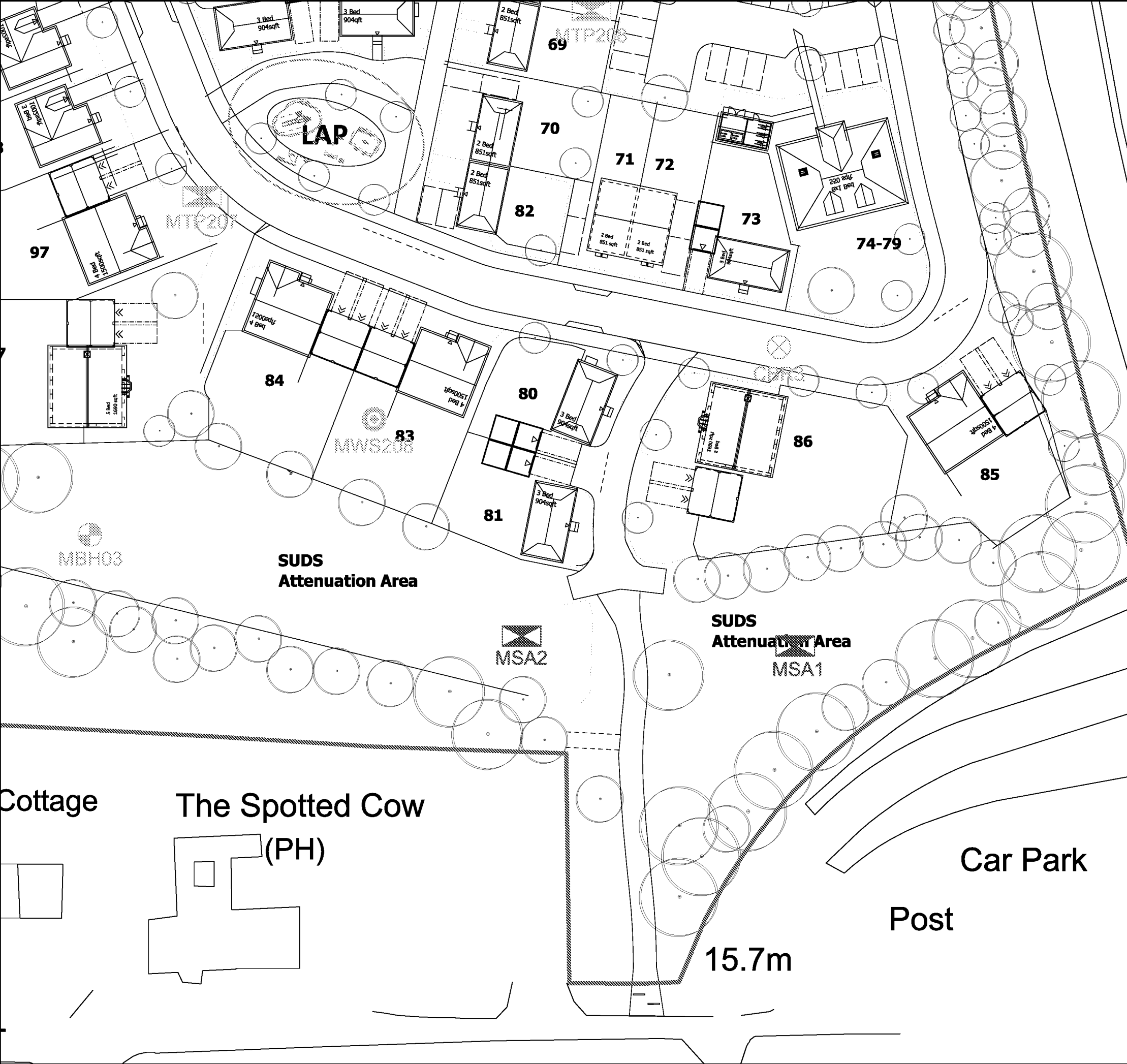


Rory Horton

For Idom Merebrook Ltd

Cc File

Enc Drawing No. 19495-304-006
Trial Pit Logs
Soakage Test Results Sheets



Legend

- MTPref: Merebrook trial pit
- MWSRef: Merebrook windowless sample hole
- CBRef: Merebrook Californian bearing ratio sample
- MBHRef: Merebrook cable percussion borehole installed for groundwater level monitoring (October/November 2016)
- MSARef: Merebrook Soakage Test Location with Reference (December 2018)

First Issue	18/12/2018		-
	TPC	RMH	RMH
Issue Details		Dwn	Chd
			App'd

Client/Project

Rydon Homes/Gleeson Strategic Land
Land South of Water Lane,
Angmering

Dwg Title

Undertaken Soakage Test Locations

Job No.	19495	Dwg No.	304-006	Revision	-
Scale	N.T.S	Date	December 2018	Frame Dimensions mm	(A3) 400 x 280
Drawn	TPC	Checked	RMH	Approved	RMH

London

Kent

Derbyshire

Cardiff

Manchester

Stirling

Birmingham

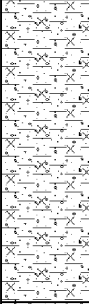
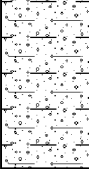
IDOM

Cromford Mills, Mill Lane, Mablethorpe, Derbyshire DE4 3RQ

t: +44(0)1773 829 888 f: +44(0)1773 829 393 e: info.derbyshire@idom.com

Project Name:	Land South of Water Lane	Project No.	19495	Co-ords: 507604.00 - 104347.00	Date
				Level:	11/12/2018

Location:	Angmering	Dimensions (m):	2.10	Scale
Equipment:	JCB 3CX	Depth	0.60	1:25
		2.10		Logged RMH

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.40			TOPSOIL. Dark brown slightly sandy clay.	
				1.40			CLAY. Dark brown very silty sandy gravelly clay. Gravel is rare angular to sub-rounded flint. Sand is medium grained.	1
				2.00			GRAVEL. Light brown clayey sandy cobbly gravel. Sand is coarse grained. Gravel and cobbles are angular to sub-rounded flint.	
				2.10			SAND. Medium dense white/yellow gravelly sand. Sand is coarse. Gravel is angular to sub-rounded flint.	2
							End of Pit at 2.100m	
								3
								4
								5

D = small disturbed sample (tub) J = organic sample (amber glass jar) V = volatile sample (amber glass vial) B = bulk bag sample HSV = hand shear vane (kPa) PP = pocket penetrometer (kg.cm2) PID = photoionisation detector (ppm)	Stability	Remarks
--	-----------	---------

Project Name:

Land South of Water Lane

Project No.

19495

Co-ords: 507565.00 - 104354.00

Level:

Date

11/12/2018

Location:

Angmering

Dimensions (m):

2.20

Depth

2.10

0.60

Scale

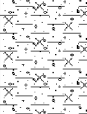
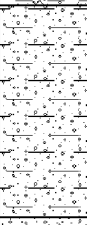
1:25

Logged

RMH

Equipment:

JCB 3CX

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.30			TOPSOIL. Dark brown slightly sandy clay.	
				0.80			CLAY. Light brown very silty sandy gravelly clay. Gravel is angular to sub-rounded flint. Sand is medium grained.	
				1.20			CLAY. Dark brown very silty sandy gravelly stiff clay. Gravel is rare angular to sub-rounded flint. Sand is medium grained.	1
				1.90			GRAVEL. Dark brown clayey sandy cobbly gravel. Gravel is angular to sub-rounded flint. Rare angular and sub-rounded flint cobbles. Becomes more clayey and cobbles more frequent with depth.	
				2.10			SAND. Medium dense white/yellow gravelly sand. Sand is coarse. Gravel is angular to sub-rounded flint.	2
							End of Pit at 2.100m	
								3
								4
								5

D = small disturbed sample (tub)
 J = organic sample (amber glass jar)
 V = volatile sample (amber glass vial)
 B = bulk bag sample
 HSV = hand shear vane (kPa)
 PP = pocket penetrometer (kg.cm2)
 PID = photoionisation detector (ppm)

Stability

Remarks

**DETERMINATION OF SOIL INFILTRATION RATE IN
ACCORDANCE WITH BRE DIGEST 365**

GENERAL INFORMATION

Site Name:	Angmering			Job No:	19495
Engineer:	Rory Horton	Date:	11/12/2018	Weather:	Sunny intervals

TEST PIT DETAILS

Trial Pit Number:		MSA1		Test 1 of 3					
Length (m):		2.1	Width (m):		0.6		Depth (m):		2.1
Depth to Groundwater (m):		N/A							
Time Filling Commenced:		09:32		Time Filling Completed:			09:35		
Depth to Water at Start of Test:			1.7						
Effective Depths:			75%:		1.80	50%:	1.90	25%:	2.00

NOTE: Soakage to at least 25% effective depth is required in order to calculate infiltration rate. If infiltration rates are slow extrapolation maybe required to determine time at which 25% effective depth would be achieved.

TEST PIT RESULTS

[illegible]

**DETERMINATION OF SOIL INFILTRATION RATE IN
ACCORDANCE WITH BRE DIGEST 365**

GENERAL INFORMATION

Site Name:	Angmering			Job No:	19495
Engineer:	Rory Horton	Date:	11/12/2018	Weather:	Sunny intervals

TEST PIT DETAILS

Trial Pit Number:		MSA1		Test 2 of 3				
Length (m):		2.1	Width (m):	0.6	Depth (m):		2.1	
Depth to Groundwater (m):		N/A						
Time Filling Commenced:		12:14		Time Filling Completed:			12:18	
Depth to Water at Start of Test:			1.65					
Effective Depths:			75%:		1.76	50%:	1.88	25%: 1.99

NOTE: Soakage to at least 25% effective depth is required in order to calculate infiltration rate. If infiltration rates are slow extrapolation maybe required to determine time at which 25% effective depth would be achieved.

TEST PIT RESULTS

[illegible]

**DETERMINATION OF SOIL INFILTRATION RATE IN
ACCORDANCE WITH BRE DIGEST 365**

GENERAL INFORMATION					
Site Name:	Angmering			Job No:	19495
Engineer:	Rory Horton	Date:	11/12/2018	Weather:	Sunny intervals

TEST PIT DETAILS							
Trial Pit Number:	MSA1		Test 3 of 3				
Length (m):	2.1	Width (m):	0.6	Depth (m):	2.1		
Depth to Groundwater (m):	N/A						
Time Filling Commenced:	13:05		Time Filling Completed:		13:10		
Depth to Water at Start of Test:	1.55						
Effective Depths:	75%:		1.69	50%:	1.83	25%:	1.96

NOTE: Soakage to at least 25% effective depth is required in order to calculate infiltration rate. If infiltration rates are slow extrapolation maybe required to determine time at which 25% effective depth would be achieved.

[illegible]

**DETERMINATION OF SOIL INFILTRATION RATE IN
ACCORDANCE WITH BRE DIGEST 365**

GENERAL INFORMATION					
Site Name:	Angmering			Job No:	19495
Engineer:	Rory Horton	Date:	11/12/2018	Weather:	Sunny intervals

TEST PIT DETAILS							
Trial Pit Number:	MSA2		Test 1 of 3				
Length (m):	2.2	Width (m):	0.6	Depth (m):	2.1		
Depth to Groundwater (m):	N/A						
Time Filling Commenced:	10:06		Time Filling Completed:		10:08		
Depth to Water at Start of Test:	0.65						
Effective Depths:	75%:		1.01	50%:	1.38	25%:	1.74

NOTE: Soakage to at least 25% effective depth is required in order to calculate infiltration rate. If infiltration rates are slow extrapolation maybe required to determine time at which 25% effective depth would be achieved.

[illegible]

DETERMINATION OF SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365

GENERAL INFORMATION					
Site Name:	Angmering			Job No:	19495
Engineer:	Rory Horton	Date:	11/12/2018	Weather:	Sunny intervals

TEST PIT DETAILS							
Trial Pit Number:	MSA2		Test 2 of 3				
Length (m):	2.2	Width (m):	0.6	Depth (m):	2.1		
Depth to Groundwater (m):	N/A						
Time Filling Commenced:	11:40		Time Filling Completed:		11:42		
Depth to Water at Start of Test:	0.6						
Effective Depths:	75%:		0.98	50%:	1.35	25%:	1.73

NOTE: Soakage to at least 25% effective depth is required in order to calculate infiltration rate. If infiltration rates are slow extrapolation maybe required to determine time at which 25% effective depth would be achieved.

[illegible]

DETERMINATION OF SOIL INFILTRATION RATE IN ACCORDANCE WITH BRE DIGEST 365

GENERAL INFORMATION				
Site Name:	<i>Angmering</i>			Job No: <i>19495</i>
Engineer:	<i>Rory Horton</i>	Date:	<i>11/12/2018</i>	Weather: <i>Sunny intervals</i>

TEST PIT DETAILS							
Trial Pit Number:	MSA2		Test 3 of 3				
Length (m):	2.2	Width (m):	0.6	Depth (m):	2.1		
Depth to Groundwater (m):	N/A						
Time Filling Commenced:	13:17		Time Filling Completed:		13:20		
Depth to Water at Start of Test:	0.45						
Effective Depths:	75%:		0.86	50%:	1.28	25%:	1.69

NOTE: Soakage to at least 25% effective depth is required in order to calculate infiltration rate. If infiltration rates are slow extrapolation maybe required to determine time at which 25% effective depth would be achieved.

TEST DATA				MSA2
Time	t (mins)	t (secs)	Depth to Water (m)	
13:20	0	0	0.450	
	0.5	30	0.460	
	1	60	0.460	
	1.5	90	0.480	
	2	120	0.490	
	3	180	0.520	
	4	240	0.560	
	5	300	0.580	
	6	360	0.600	
	7	420	0.630	
	8	480	0.660	
	9	540	0.680	
	10	600	0.700	
	12	720	0.750	
	14	840	0.790	
	16	960	0.840	
	18	1080	0.880	
	20	1200	0.930	
	25	1500	1.040	
	30	1800	1.130	
	40	2400	1.330	
	50	3000	1.490	
	60	3600	1.610	
	90	5400	1.820	
	120	7200	2.000	
				t at 75% Effective Depth: <i>1020</i> secs t at 25% Effective Depth: <i>4200</i> secs Infiltration Rate $f = V_{p75-25} / a_{p50} \times t_{p75-25}$ V _{p75-25} : <i>1.09</i> m ³ a _{p50} : <i>5.94</i> m ² t _{p75-25} : <i>3180</i> secs f = 5.77E-05 m/s