DATRYS

Development at Bronfedw

Betws Garmon, Gwynedd

Porosity Report, Rev A

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Porosity Report, rev A

Client:	Arwel Griffiths
Report Status:	**Final**
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Reviewed By:	Jonathan Allen
Approved By:	Adam Caldwell
Date:	July 2021
Rev A	**November 2023 (by Levente Inzce)**

Contents Page

1. INTRODUCTION

In accordance with your instructions, Datrys undertook porosity tests for at Bronfedw, Betws Garmon on the 12th of November 2023.

In carrying out these tests Datrys did not encounter any complications, services & utilities or below ground structures. All tests were completed as proposed and results were recorded for evaluation and future design purposes.

The intention of the testing was to identify ground permeability for potential use of a soakaway and drainage field.

2. GENERAL OVERVIEW

The site is located south east of Llyn Cwellyn in Betws Garmon at National Grid Reference SH 57080 54344.

The purpose of the investigation was to undertake Soil Infiltration tests in accordance with BS 6297:2007+ A1:2008.

On the 12th of November four trial pits were undertaken to depths of 0.4-0.45m which represents the invert level of the infiltration pipe. A further smaller 300mm square hole to a depth of 300mm below this invert was then excavated for the purposes of testing. The trial pits were undertaken within the site as indicated within the attached plan (**Appendix A**).

The pits indicated that there is topsoil overlaying brown, well graded, sightly silty, slightly sandy sub-angular GRAVEL with occasional cobbles to the termination of the pit. Groundwater was not encountered. All trial pits were stable with no sign of collapse.

The purpose of this report is to ascertain the infiltration values of the underlying strata for the design of surface water soakaways and drainage field within the proposed development.

3. SITE CONDITIONS

The weather at the time of the investigation was rainy and overcast.

The site topography consists of a fall down from north east to south west of approximately 1.5m. The site topography is consistent and ties in with the adjacent access road connecting to the site from the A4085.

The pits indicated that there is topsoil overlaying brown, well graded, sightly silty, slightly sandy sub-angular GRAVEL with occasional cobbles to the termination of the pit. No ground water was encountered. British Geological Survey Maps indicate that the bedrock formation within the site is categorised as Nant Ffrancon Subgroup, which could vary from siltstone to sandstone thus having a variable permeability.

Figure A – Google Earth Abstract of Site

4. SOIL INFILTRATION RESULTS

Three porosity tests were undertaken within each pit with the results given below;

Porosity Pit 1			
	Depth (m)	Soil Infiltration Rate (m/s)	Vp Rate (s/mm)
Test 1	0.3	8.91x10-5	3.74
Test 2	0.3	3.80x10-5	8.76
Test 3	0.3	2.34x10-5	14.26

Porosity Pit 2			
	Depth (m)	Soil Infiltration Rate (m/s)	Vp Rate (s/mm)
Test 1	0.3	1.49x10-4	2.23
Test 2	0.3	4.84x10-5	6.89
Test 3	0.3	4.02x10-5	8.29

Porosity Pit 3			
	Depth (m)	Soil Infiltration Rate (m/s)	Vp Rate (s/mm)
Test 1	0.3	3.58x10-5	9.30
Test 2	0.3	2.57x10-5	12.97
Test 3	0.3	1.68x10-5	19.87

Porosity Pit 4			
	Depth (m)	Soil Infiltration Rate (m/s)	Vp Rate (s/mm)
Test 1	0.3	7.75x10-5	4.30
Test 2	0.3	6.20x10-5	5.37
Test 3	0.3	5.59x10-5	5.97

5. CONCLUSIONS

Our findings indicate that the brown, well graded, slightly silty, slightly sandy sub-angular GRAVEL with occasional cobbles is considered to have sufficient permeability (above 1x10-6m/s) therefore the site is suitable for infiltration.

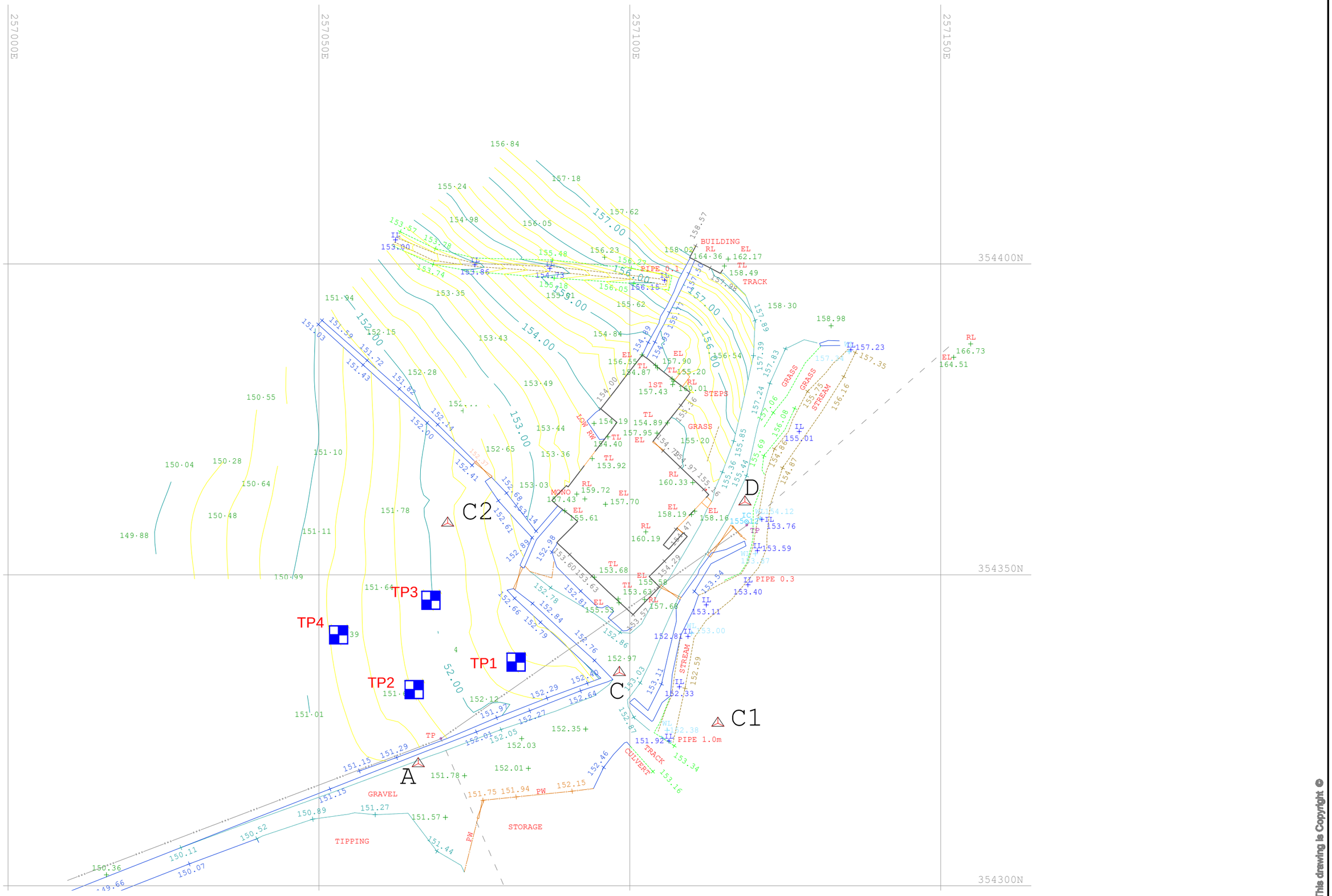
The tests indicate the strata is suitable for surface water disposal.

In terms of consideration for foul disposal, the results indicate that the rate decreases with further testing but the rate exceeds 12m/s, the threshold at which is too quick for drainage field design. The slowest rate for both TP1 and TP3 is slower than 12m/s but the material doesn't offer suitable rate when in dry conditions. TP2 and TP4 the Vp rate is below 12m/s.

Consequently the use of a Drainage Field will require filter sand surround to artificially slow down infiltration. Discussions with Building Regulations have indicated that 700mm of sand will be required, similar to the drainage mound detail within the Building Regulations, Part H.

APPENDIX

APPENDIX A – POROSITY PIT LOCATION PLAN



TITLE: Porosity Pit Location Plan	PROJECT: Bron Fedw Uchaf, Rhydd Ddu	DATRYS MODELU DYLUNIO PEIRIANNEG MODEL DESIGN ENGINEERING		
		Job No. 21147	DATE 12.11.2023	SCALE NOT TO SCALE
		ACAD Ref. -	CHECKED	PASSED
		DRAWN LI	DRG No.	REV P1

APPENDIX B – TRIAL PIT TESTING RESULT LOGS

Porosity Results Summary

Porosity Results				
	Depth (m)	Soil Infiltration Rate (m/s)	Vp Rate (m/s)	Comments
TP1	0.7	**2.34E-05**	**14.26**	
TP2	0.7	**4.02E-05**	**8.29**	
TP3	0.7	**1.68E-05**	**19.87**	
TP4	0.7	**5.59E-05**	**5.97**	

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Project: 21147
Title: *Bron Fedw Uchaf*
Date: 12/11/2023
Ref: Trial Pit 1, Porosity Test 1
Test Date: 12/11/2023

Trial Pit Dimensions: Length (m) 0.35 Width (m) 0.3 Depth (m) 0.3

Time (mins)	Depth to water (m)	Rate of change (m/min)	Actual Water Depth (m)
0	0.000		0.280
2	0.050	0.01500	0.250
4	0.090	0.02000	0.210
9	0.170	0.01600	0.130
14	0.230	0.01200	0.070
18	0.280	0.01250	0.020

Max effective storage depth	0.28	m
Volume Outflow, Vp75-25	0.01	m3
Surface Area, ap50	0.29	m2
Time Taken, tp75-25	10	min
Soil Infiltration Rate, f	**8.91E-05**	**m/s**

75% depth (m)	0.21	Calc 75% time (min)	4
25% depth (m)	0.07	Calc 25% time (min)	14

Vp	**3.74**	**s/mm**

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Project: 21147
Title: *Bron Fedw Uchaf*
Date: 12/11/2023
Ref: Trial Pit 1, Porosity Test 2
Test Date: 12/11/2023

Trial Pit Dimensions: Length (m) 0.35 Width (m) 0.3 Depth (m) 0.3

Time (mins)	Depth to water (m)	Rate of change (m/min)	Actual Water Depth (m)
0	0.000		0.280
9	0.070	0.00556	0.230
12	0.090	0.00667	0.210
18	0.130	0.00667	0.170
23	0.160	0.00600	0.140
30	0.210	0.00714	0.090
35	0.230	0.00400	0.070
42	0.280	0.00714	0.020

Max effective storage depth	0.28	m
Volume Outflow, Vp75-25	0.01	m3
Surface Area, ap50	0.29	m2
Time Taken, tp75-25	22	min
Soil Infiltration Rate, f	**3.80E-05**	**m/s**

75% depth (m)	0.21	Calc 75% time (min)	12
25% depth (m)	0.07	Calc 25% time (min)	34

Vp	**8.76**	**s/mm**

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Title: *Bron Fedw Uchaf*
Date: 12/11/2023
Ref: Trial Pit 1, Porosity Test 3
Test Date: 12/11/2023

Trial Pit Dimensions: Length (m) 0.35 Width (m) 0.3 Depth (m) 0.3

Time (mins)	Depth to water (m)	Rate of change (m/min)	Actual Water Depth (m)
0	0.000		0.280
8	0.090	0.00875	0.210
20	0.130	0.00333	0.170
29	0.160	0.00333	0.140
36	0.200	0.00571	0.100
46	0.230	0.00300	0.070
69	0.280	0.00217	0.020

Max effective storage depth	0.28	m
Volume Outflow, Vp75-25	0.01	m3
Surface Area, ap50	0.29	m2
Time Taken, tp75-25	37	min
Soil Infiltration Rate, f	**2.34E-05**	**m/s**

75% depth (m)	0.21	Calc 75% time (min)	12
25% depth (m)	0.07	Calc 25% time (min)	48

Vp	**14.26**	**s/mm**

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Date: 12/11/2023
Ref: Trial Pit 2, Porosity Test 1
Test Date: 12/11/2023

Trial Pit Dimensions: Length (m) 0.3 Width (m) 0.3 Depth (m) 0.3

Time (mins)	Depth to water (m)	Rate of change (m/min)	Actual Water Depth (m)
0	0.000		0.300
2	0.090	0.04500	0.210
5	0.180	0.03000	0.120
7	0.200	0.01000	0.100
11	0.300	0.02500	0.000

Max effective storage depth	0.30	m
Volume Outflow, Vp75-25	0.01	m3
Surface Area, ap50	0.27	m2
Time Taken, tp75-25	6	min
Soil Infiltration Rate, f	**1.49E-04**	**m/s**

75% depth (m)	0.23	Calc 75% time (min)	2
25% depth (m)	0.08	Calc 25% time (min)	8

Vp	**2.23**	**s/mm**

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Date: 12/11/2023
Ref: Trial Pit 2, Porosity Test 2
Test Date: 12/11/2023

Trial Pit Dimensions: Length (m) 0.3 Width (m) 0.3 Depth (m) 0.3

Time (mins)	Depth to water (m)	Rate of change (m/min)	Actual Water Depth (m)
0	0.000		0.300
6	0.110	0.01833	0.190
12	0.130	0.00333	0.170
19	0.220	0.01286	0.080
28	0.240	0.00222	0.060
31	0.280	0.01333	0.020

Max effective storage depth	0.30	m
Volume Outflow, Vp75-25	0.01	m3
Surface Area, ap50	0.27	m2
Time Taken, tp75-25	17	min
Soil Infiltration Rate, f	**4.84E-05**	**m/s**

75% depth (m)	0.23	Calc 75% time (min)	6
25% depth (m)	0.08	Calc 25% time (min)	23

Vp	**6.89**	**s/mm**

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Ref: Trial Pit 2, Porosity Test 3
Test Date: 12/11/2023

Trial Pit Dimensions: Length (m) 0.3 Width (m) 0.3 Depth (m) 0.3

Time (mins)	Depth to water (m)	Rate of change (m/min)	Actual Water Depth (m)
0	0.000		0.300
3	0.030	0.01000	0.270
14	0.110	0.00727	0.190
22	0.150	0.00500	0.150
29	0.200	0.00714	0.100
37	0.280	0.01000	0.020

Max effective storage depth	0.30	m
Volume Outflow, Vp75-25	0.01	m3
Surface Area, ap50	0.27	m2
Time Taken, tp75-25	21	min
Soil Infiltration Rate, f	**4.02E-05**	**m/s**

75% depth (m)	0.23	Calc 75% time (min)	10
25% depth (m)	0.08	Calc 25% time (min)	31

Vp	**8.29**	**s/mm**

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Project: 21147
Title: *Bron Fedw Uchaf*
Date: 12/11/2023
Ref: Trial Pit 3, Porosity Test 1
Test Date: 12/11/2023

Trial Pit Dimensions: Length (m) 0.4 Width (m) 0.4 Depth (m) 0.28

Time (mins)	Depth to water (m)	Rate of change (m/min)	Actual Water Depth (m)
0	0.000		0.280
4	0.050	0.01250	0.230
16	0.100	0.00417	0.180
22	0.120	0.00333	0.160
34	0.170	0.00417	0.110
51	0.280	0.00647	0.000

Max effective storage depth	0.28	m
Volume Outflow, Vp75-25	0.02	m3
Surface Area, ap50	0.38	m2
Time Taken, tp75-25	27	min
Soil Infiltration Rate, f	**3.58E-05**	**m/s**

75% depth (m)	0.21	Calc 75% time (min)	11
25% depth (m)	0.07	Calc 25% time (min)	39

Vp	**9.30**	**s/mm**

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Project: 21147
Title: *Bron Fedw Uchaf*
Date: 12/11/2023
Ref: Trial Pit 3, Porosity Test 2
Test Date: 12/11/2023

Trial Pit Dimensions: Length (m) 0.4 Width (m) 0.4 Depth (m) 0.17

Time (mins)	Depth to water (m)	Rate of change (m/min)	Actual Water Depth (m)
0	0.000		0.170
11	0.040	0.00364	0.130
21	0.070	0.00300	0.100
30	0.100	0.00333	0.070
40	0.120	0.00200	0.050
50	0.130	0.00100	0.040
56	0.170	0.00667	0.000

Max effective storage depth	0.17	m
Volume Outflow, Vp75-25	0.01	m3
Surface Area, ap50	0.30	m2
Time Taken, tp75-25	30	min
Soil Infiltration Rate, f	**2.57E-05**	**m/s**

75% depth (m)	0.13	Calc 75% time (min)	13
25% depth (m)	0.04	Calc 25% time (min)	43

Vp	**12.97**	**s/mm**

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Ref: Trial Pit 3, Porosity Test 3
Test Date: 12/11/2023

Trial Pit Dimensions: Length (m) 0.4 Width (m) 0.4 Depth (m) 0.17

Time (mins)	Depth to water (m)	Rate of change (m/min)	Actual Water Depth (m)
0	0.000		0.170
12	0.050	0.00417	0.120
26	0.065	0.00107	0.105
47	0.090	0.00119	0.080
61	0.120	0.00214	0.050

Max effective storage depth	0.17	m
Volume Outflow, Vp75-25	0.01	m3
Surface Area, ap50	0.30	m2
Time Taken, tp75-25	46	min
Soil Infiltration Rate, f	**1.68E-05**	**m/s**

75% depth (m)	0.13	Calc 75% time (min)	17
25% depth (m)	0.04	Calc 25% time (min)	63

Vp	**19.87**	**s/mm**

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Project: 21147
Title: *Bron Fedw Uchaf*
Date: 12/11/2023
Ref: Trial Pit 4, Porosity Test 1
Test Date: 12/11/2023

Trial Pit Dimensions: Length (m) 0.4 Width (m) 0.3 Depth (m) 0.3

Time (mins)	Depth to water (m)	Rate of change (m/min)	Actual Water Depth (m)
0	0.000		0.300
4	0.180	0.04500	0.120
14	0.220	0.00400	0.080
25	0.300	0.00727	0.000

Max effective storage depth	0.30	m
Volume Outflow, Vp75-25	0.02	m3
Surface Area, ap50	0.33	m2
Time Taken, tp75-25	12	min
Soil Infiltration Rate, f	**7.75E-05**	**m/s**

75% depth (m)	0.23	Calc 75% time (min)	3
25% depth (m)	0.08	Calc 25% time (min)	15

Vp	**4.30**	**s/mm**

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Project: 21147
Title: *Bron Fedw Uchaf*
Date: 12/11/2023
Ref: Trial Pit 4, Porosity Test 2
Test Date: 12/11/2023

Trial Pit Dimensions: Length (m) 0.4 Width (m) 0.3 Depth (m) 0.3

Time (mins)	Depth to water (m)	Rate of change (m/min)	Actual Water Depth (m)
0	0.000		0.300
3	0.040	0.01333	0.260
5	0.090	0.02500	0.210
12	0.150	0.00857	0.150
19	0.180	0.00429	0.120
23	0.230	0.01250	0.070
27	0.300	0.01750	0.000

Max effective storage depth	0.30	m
Volume Outflow, Vp75-25	0.02	m3
Surface Area, ap50	0.33	m2
Time Taken, tp75-25	15	min
Soil Infiltration Rate, f	**6.20E-05**	**m/s**

75% depth (m)	0.23	Calc 75% time (min)	6
25% depth (m)	0.08	Calc 25% time (min)	21

Vp	**5.37**	**s/mm**

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Project: 21147
Title: *Bron Fedw Uchaf*
Date: 12/11/2023
Ref: Trial Pit 4, Porosity Test 3
Test Date: 12/11/2023

Trial Pit Dimensions: Length (m) 0.4 Width (m) 0.3 Depth (m) 0.3

Time (mins)	Depth to water (m)	Rate of change (m/min)	Actual Water Depth (m)
0	0.000		0.300
6	0.070	0.01167	0.230
12	0.130	0.01000	0.170
22	0.210	0.00800	0.090
32	0.300	0.00900	0.000

Max effective storage depth	0.30	m
Volume Outflow, Vp75-25	0.02	m3
Surface Area, ap50	0.33	m2
Time Taken, tp75-25	16	min
Soil Infiltration Rate, f	**5.59E-05**	**m/s**

75% depth (m)	0.23	Calc 75% time (min)	7
25% depth (m)	0.08	Calc 25% time (min)	23

Vp	**5.97**	**s/mm**