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N. J. Caine Ltd
Southend
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Herefordshire
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30th October 2019

E15241 – Letter report regarding the soakaway investigation at Land adjacent to B4360, Cobnash, Leominster HR6 9RA.

Background

Environmental Management Solutions Limited (EMS) have been commissioned by Mr Nick Caine (the Client) to undertake soakaway testing in two locations on site. This work was undertaken as part of a development proposal of three residential properties.

The main site comprises a grassed field currently used for grazing. The site is approximately 0.49 ha in size and rectangular in shape. The field slopes from south west to the north east. Ground water is expected to drain towards the road to the north and from anecdotal data the field to the north of the road is susceptible to flooding and it has a noticeably lower elevation than the site.

All boundaries are marked with post and wire fences. Hedges and trees line the western and southern boundaries.

Site walkover photos are included in Appendix C and a site plan is included in Appendix A.

BGS geological mapping for the site area indicates no superficial deposits are present on site. The Raglan Mudstone Formation - sandstone sedimentary bedrock is present below the site. It was deposited in a fluvial environment.

Scope of Works

On 18th October 2019, four trial pits were excavated at the site by EMS. Two soakaway pits SA01 and SA02 were tested at depths of 1.55 m and 1.30 m respectively targeting more

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gravelly strata at least one metre above the water table. The other two trial pits were excavated for logging purposes and to identify the depth of the water table (TP01 and TP02). These four pits were positioned in the vicinity of two locations identified as potential sites for the soakaways on the Proposed Development Plan provided by Border Oak Design and Construction Ltd. (the Agent).

All trial pits were excavated using a hydraulic excavator and infilled with arisings on completion.

The locations of the trial pits are shown on the exploratory hole location plan included with the site plans in Appendix A. Details of the trial pits, including a description of the strata encountered, trial pit depths, and notes on any groundwater entries are included on the trial pit logs (Appendix B). Photographs of the trial pits are included in Appendix C. All soil was logged in accordance to BS 5930:2015

Soakaway tests, in broad accordance with BRE Digest 365: 2016 (Soakaway Design) were undertaken in the two trial pits as detailed above. Details of the soakaway tests, and the soakaway test results, are included as Appendix D.

Ground Conditions

MADE GROUND (Reworked Topsoil)

Grassed reworked topsoil generally comprising gravelly very silty clay becoming very gravelly clay was present in all soakaway pits on site. Pottery and plastic waste was found in the matrix. It is present from the surface to 0.3 m at the northern end of the site at TP02 and SA02. Deeper Made Ground is present at SA01 and TP01 at 1.50 m and 2.20 m respectively.

Alluvium

This was located beneath the MADE GROUND. This material largely comprised of soft sandy very gravelly CLAY occurs between 0.30 m and 2.60 m

Raglan Mudstone Formation

Firm friable gravelly CLAY representing the Raglan Mudstone Formation is present at TP02 between 2.60 m and the extent of the trial pit at 3.00 m.

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Groundwater

Groundwater was encountered at TP01 at 2.55 m.

Soakaway Test Results

Soakaway percolation tests were undertaken at SA01 and SA02 and are summarised below. The complete data table and soakaway graphs are included in Appendix D. Only a single test was possible at each location.

Test Run	Test Location (Results in m/s)	
	SA01	SA02
1	**2.76×10^{-6}**	**2.03×10^{-5}**
2	N/A	N/A
3	N/A	N/A

Red font indicates extrapolated data.
SA01 did not reach TP75 min value during the course of the test (5 hours 6 minutes).

Conclusions/Recommendations

The soft sandy very gravelly CLAY (alluvium) at SA02 has a reasonably high infiltration rate at 1.30 m depth of 2.03×10^{-5} m/s. The strata tested at SA01 at 1.55 m gives a far lower extrapolated infiltration rate of approximately 2.76×10^{-6} m/s. This strata although similar to that at SA02 is identified as Made Ground due to some ceramic fragments being found within the matrix. This 'remoulded' CLAY seems to have different permeability properties compared to the natural CLAY. This is also illustrated by the water table being found at 2.55 m (rising to 2.48 m after 5 hours 33 minutes) at TP01 although it was not encountered at TP02 to the extent of the trial pit at 3.0 m. BRE365 guidance recommends that soakaways should not be built within 1.0 m of the water table.

The low permeability and close vicinity to the water table at SA01 means that we do not recommend a soakaway solution in that area. SA01 in comparison is deemed suitable for soakaway solutions.

Soakaway solutions at the northern boundary of the site are recommended. Consultation with a suitably qualified and experienced drainage engineer is recommended.

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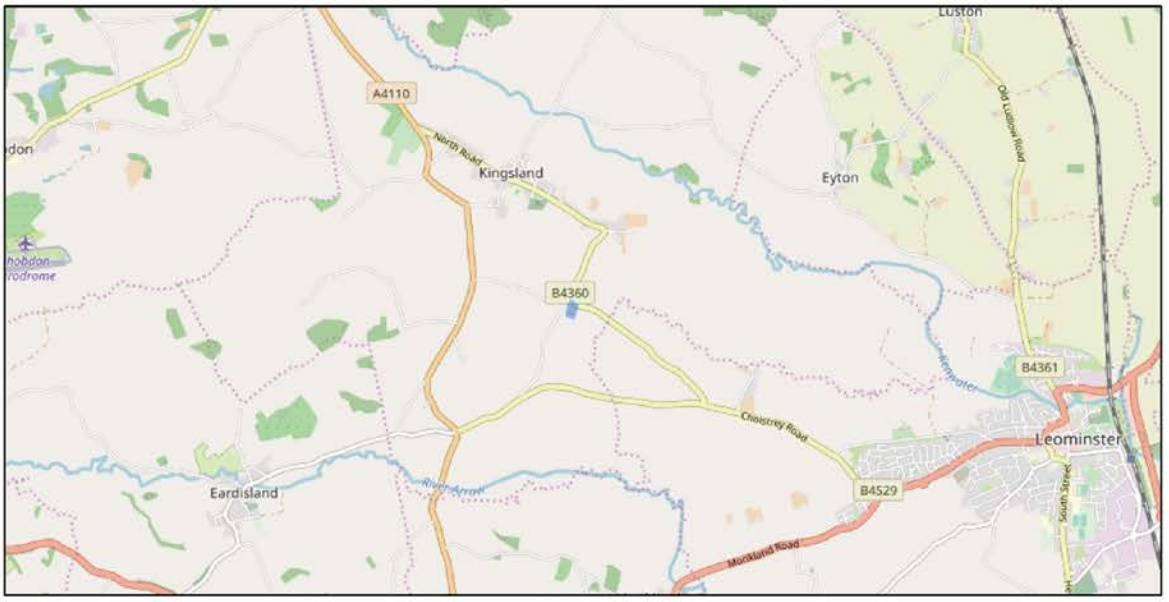
Written by Dave Boswell MSc [redacted]

Enclosed:
Appendix A – Site Plans
Appendix B – Trial Pit Logs
Appendix C – Photographic Record
Appendix D – Soakaway Test Results

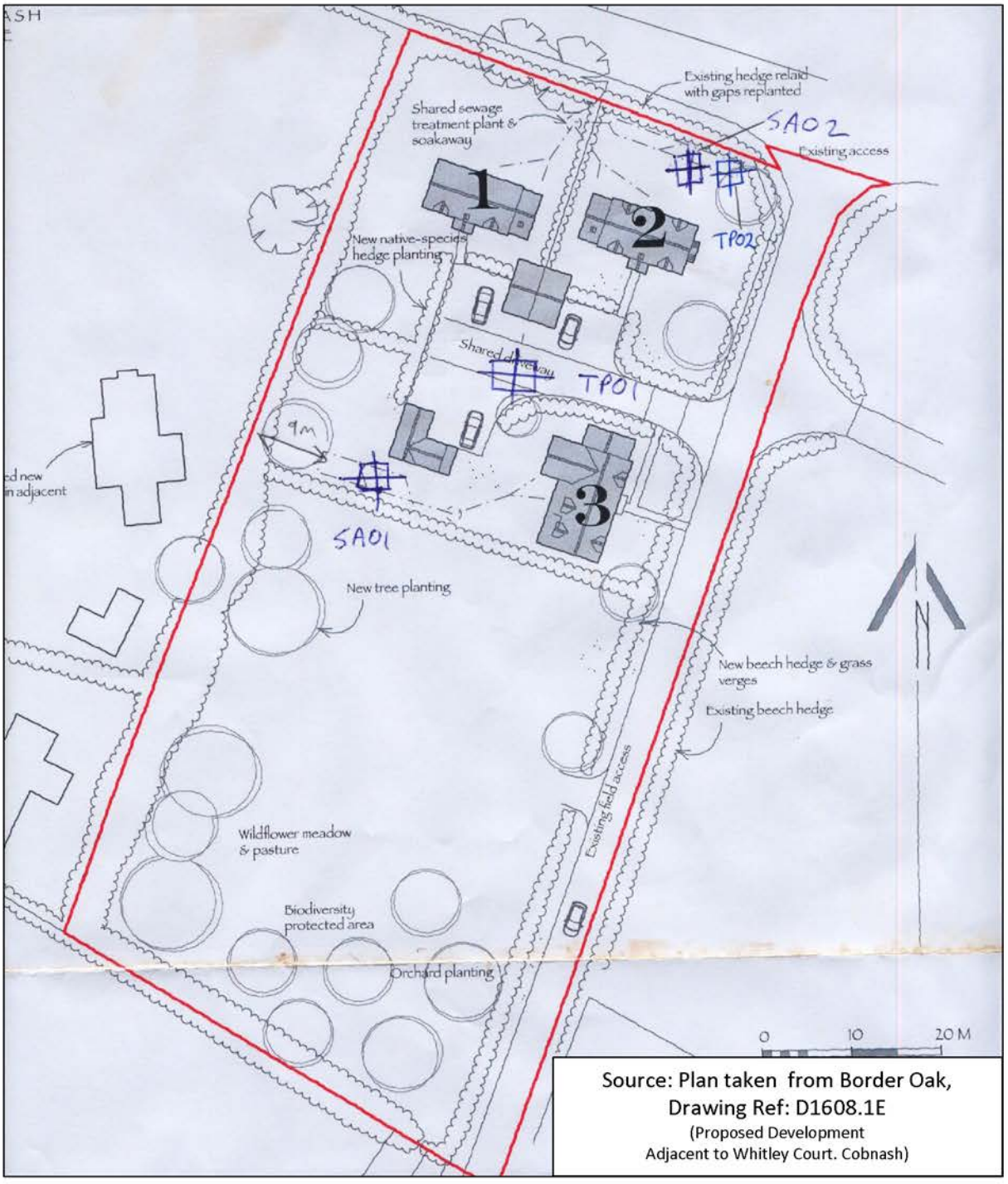
Appendix A – Site Plans



Map Courtesy of Leaflet | Powered by Esri | DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Map courtesy of Google Maps

EMS geotech ENVIRONMENTAL MANAGEMENT SOLUTIONS	Project Number:	E15194
	Site:	Land adjacent to B4360, Cobnash, Leominster HR6 9RA
	Drawing Title:	Site Location Plan



ENVIRONMENTAL MANAGEMENT SOLUTIONS	Project Number:	E15194
	Site:	Land adjacent to B4360, Cobnash, Leominster HR6 9RA
	Drawing Title:	Exploratory Hole Location Plan

Appendix B – Trial Pit Logs

ENVIRONMENTAL MANAGEMENT SOLUTIONS

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EXPLORATORY HOLE LOG

Project				HOLE No
Land adjacent B4360, Cobnash, Leominster, HR6 9RA				SA01
Job No	Date	Ground Level (m)	Co-Ordinates ()	
E15194	18-10-19	89.00	E 345,031.0 N 260,313.0	
Contractor				Sheet
Environmental Management Solutions Limited				1 of 1

SAMPLES & TESTS		Water	STRATA				Geology	Instrument/ Backfill
Depth	Sample No.		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
			88.70		(0.30) 0.30	MADE GROUND. Grassed remoulded topsoil of brown slightly gravelly very silty clay. Gravel is subangular coarse mudstone with some plastic waste. Frequent rootlets.		
			87.45		(1.25) 1.55	MADE GROUND. Remoulded soft to firm reddish brown very gravelly clay. Gravel is subangular to subrounded, fine to coarse sandstone. Frequent cobbles.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	Backfilled with arisings on completion. No groundwater encountered. Side walls stable.

All dimensions in metres Scale 1:18.75	Client Mr N Caine	Method/ Plant Used Hydraulic excavator	Logged By DB

EXPLORATORY HOLE LOG E15194 COBNASH SOAKAWAYS, LEOMINSTER.GPJ GINT STD AGS 3_1.GDT 30/10/19

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EXPLORATORY HOLE LOG

Project				HOLE No
Land adjacent B4360, Cobnash, Leominster, HR6 9RA				SA02
Job No	Date	Ground Level (m)	Co-Ordinates ()	
E15194	18-10-19	89.00	E 345,061.0 N 260,349.0	
Contractor				Sheet
Environmental Management Solutions Limited				1 of 1

SAMPLES & TESTS		Water	STRATA				Geology	Instrument/ Backfill
Depth	Sample No.		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
			88.70		(0.30) 0.30	MADE GROUND. Grassed remoulded topsoil of brown slightly gravelly very silty clay. Gravel is subangular coarse mudstone with some plastic waste. Frequent rootlets.		
			87.70		(1.00) 1.30	Soft reddish brown slightly sandy gravelly CLAY. Gravel is subangular to rounded, fine to coarse sandstone and mudstone. Frequent cobbles from 1.2 m. (ALLUVIUM)		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Backfilled with arisings on completion. No groundwater encountered. Side walls stable.

All dimensions in metres Scale 1:18.75	Client Mr N Caine	Method/ Plant Used Hydraulic excavator	Logged By DB

EXPLORATORY HOLE LOG E15194 COBNASH SOAKAWAYS, LEOMINSTER.GPJ GINT STD AGS 3_1.GDT 30/10/19

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EXPLORATORY HOLE LOG

Project				HOLE No
Land adjacent B4360, Cobnash, Leominster, HR6 9RA				TP01
Job No	Date	Ground Level (m)	Co-Ordinates ()	
E15194	18-10-19	89.00	E 345,044.0 N 260,326.0	
Contractor				Sheet
Environmental Management Solutions Limited				1 of 1

SAMPLES & TESTS		Water	STRATA				Geology	Instrument/ Backfill
Depth	Sample No.		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
			88.70		(0.30) 0.30	MADE GROUND. Grassed remoulded topsoil of brown slightly gravelly very silty clay. Gravel is subangular coarse mudstone with some plastic waste. Frequent rootlets.		
					(1.90)	MADE GROUND. Remoulded soft reddish brown very gravelly clay. Gravel is subangular to subrounded, fine to coarse sandstone and ceramic fragment. Frequent cobbles.		
			86.80		2.20			
		1	86.45		(0.35) 2.55	Soft light brown gravelly very sandy CLAY. Gravel is subangular to subrounded fine to coarse sandstone and miceous mudstone. (ALLUVIUM)		
			86.20		(0.25) 2.80	Light brown clayey GRAVEL of angular to subrounded, fine to coarse sandstone and mudstone. (ALLUVIUM)		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Backfilled with arisings on completion. Groundwater encountered at 2.55 m. Side walls stable.

All dimensions in metres Scale 1:18.75	Client Mr N Caine	Method/ Plant Used Hydraulic excavator	Logged By DB

EXPLORATORY HOLE LOG E15194 COBNASH SOAKAWAYS, LEOMINSTER.GPJ GINT STD AGS 3_1.GDT 30/10/19

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EXPLORATORY HOLE LOG

Project				HOLE No
Land adjacent B4360, Cobnash, Leominster, HR6 9RA				TP02
Job No	Date	Ground Level (m)	Co-Ordinates ()	
E15194	18-10-19	87.00	E 345,065.0 N 260,346.0	
Contractor				Sheet
Environmental Management Solutions Limited				1 of 1

SAMPLES & TESTS		Water	STRATA				Geology	Instrument/ Backfill
Depth	Sample No.		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
			86.70		(0.30) 0.30	MADE GROUND. Grassed remoulded topsoil of brown slightly gravelly very silty clay. Gravel is subangular coarse mudstone. Frequent rootlets.		
			85.20		(1.50) 1.80	Soft reddish brown sandy CLAY. (ALLUVIUM)		
			84.40		(0.80) 2.60	Reddish brown sandy clayey GRAVEL of subangular to rounded, fine to coarse mudstone and quartz rich sandstone. Red bands of clay and frequent cobbles from 2.3 m. (ALLUVIUM)		
			84.00		(0.40) 3.00	Firm red very sandy gravelly friable CLAY. Gravel is angular to subrounded, fine to coarse mudstone with occasional cobbles. Grey / green discolouration. (RAGLAN MUDSTONE FORMATION)		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Backfilled with arisings on completion. No groundwater encountered. Side walls stable.

All dimensions in metres Scale 1:18.75	Client Mr N Caine	Method/ Plant Used Hydraulic excavator	Logged By DB

EXPLORATORY HOLE LOG E15194 COBNASH SOAKAWAYS, LEOMINSTER.GPJ GINT STD AGS 3_1.GDT 30/10/19

Appendix C – Photograhic Record
Trial Pit Photos

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Photographic Record

TP01

TP01 Arisings

E15194 - Land adjacent to B4360, Cobnash, Leominster HR6 9RA.

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Photographic Record

TP01 Extended

TP01 Extended Photo 2

E15194 - Land adjacent to B4360, Cobnash, Leominster HR6 9RA.

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Photographic Record

TP02

TP02 Arisings

E15194 - Land adjacent to B4360, Cobnash, Leominster HR6 9RA.

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Photographic Record

SA01

SA01 Arisings

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Photographic Record

SA02

SA02 Arisings

E15194 - Land adjacent to B4360, Cobnash, Leominster HR6 9RA.

Appendix C – Photograhic Record
Site Walkover Photos

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Photographic Record

Northern Boundary

Eastern Boundary

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Photographic Record

Southern Boundary

Western Boundary

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Appendix D – Soakaway Test Results

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Percolation Test Result Sheet

Project Name: Land adjacent B4360, Cobnash Soakaways
Project Number: E15194
Date of Test: 18/10/2019
Test Location: SA01 Test 1

Time elapsed (seconds)	Water level (mm below ground level)
0	827
90	828
210	833
1020	840
1320	841
2640	847
4020	853
5370	859
7440	869
10050	875
12030	878
13650	884
16050	886
18330	894

Depth of pit (m): 1.55
Width of pit (m): 0.35
Length of pit (m): 1.50

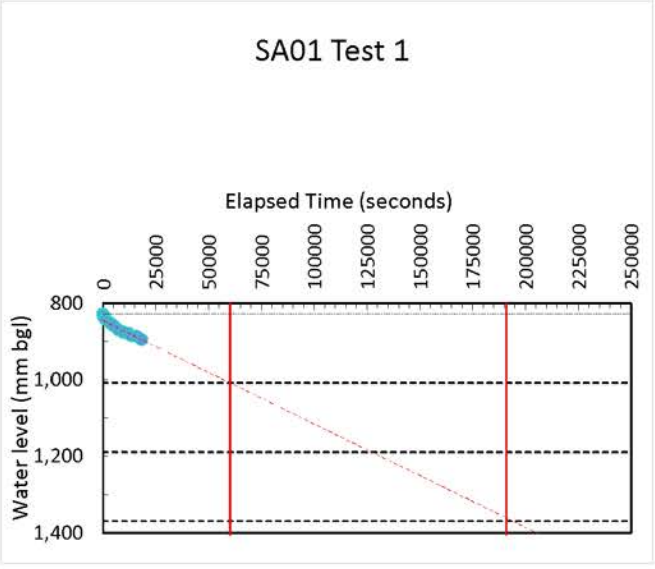
Depth 75% full to 25% full: 362 mm

Time 75% full to 25% full: 131000 seconds

V_p: **362 seconds/mm**

V_p = Time 75% full to 25% full / Depth 75% full to 25% full

m/s **2.75954E-06**



Based on extrapolated data. The test did not reach the TP75 point during the duration of the test (5 hours 6 minutes).

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Percolation Test Result Sheet

Project Name: Land adjacent B4360, Cobnash Soakaways
Project Number: E15194
Date of Test: 18/10/2019
Test Location: SA02 Test 1

Time elapsed (seconds)	Water level (mm below ground level)
0	798
60	802
240	815
360	824
480	827
690	842
1680	887
3060	933
4440	963
6480	1,003
8970	1,048
11040	1,090
12540	1,128
15120	1,177
17550	1,228
18900	1,258

Depth of pit (m):	1.30
Width of pit (m):	0.35
Length of pit (m):	1.30

Depth 75% full to 25% full	251 mm
Time 75% full to 25% full	12350 seconds
V_p	**49 seconds/mm**

V_p = Time 75% full to 25% full / Depth 75% full to 25% full

m/s **2.03E-05**