Date: 24th September 2019
Our Reference: FRA16 1075

Rachael Evans
Gladman Developments Limited
Gladman House
Alexandra Way
Congleton
Cheshire
CW12 1LB

Dear Rachael,

RE: SOUTH NEWINGTON ROAD – BLOXHAM
SOAKAWAY TESTING TO BRE 365

Introduction

A series of soakaway tests were recently undertaken on the potential development site of South Newington Road Bloxham. The results of the testing are shown in the attached Factual Report.

Interpretation

The proposals were to excavate the test-pits to a depth of between 2.0m and 2.5m Below Ground Level for the testing. When the excavations were undertaken the competent bedrock (weathered Marl) was encountered at between 1.77m to 2.0m depth. Therefore, the testing was then undertaken at a shallower depth that initially planned.

Below the made ground and the topsoil superficial deposits comprised clayey sandy Gravel in the east or sandy gravelly Clay in the west to depth of between 1.40 and 1.70mbgl. In each of the test pits a thin band of more permeable clayey sandy Gravel of varying thickness was encountered above the marl bedrock.

The permeability of the soil at the test pit (TP101) location towards the lowest level within the plot was measured at 8.62×10^{-7} m/s which is below the normal practical limit of 1×10^{-6} m/s. For test location (TP102) the test water dissipated at a very slow rate through the clay based soils and the test was deemed to have failed.

Although the test results for location TP103 showed the permeability rate to be just better than the minimum practical infiltration flow rate; it is likely that the use of an infiltration basin or tank would be impractical due to the marl (bedrock) that was encountered in the base of the excavation. It would be impractical to provide a large infiltration facility just serving the east of the site. These larger facilities rely on the bigger base area rather than the flow dissipating out of the sides within a trial pit. The Marl would limit infiltration through the base and any water dissipated through the sides of the basin or tank would be likely to run along the marl base material and emerge further down the site.

The consequences of allowing concentrated larger amounts of water into the ground at one location would increase the risk of groundwater flooding further down the slope towards the sports pitches.

Yours sincerely

Mark Jones - Associate

For and on behalf of LK Consult Ltd

Eton Business Park, Eton Hill Rd, Radcliffe, Greater Manchester M26 2ZS
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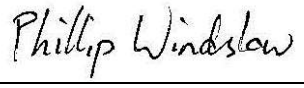
SOUTH NEWINGTON ROAD
BLOXHAM

SOAKAWAY TESTS
FACTUAL REPORT

Job Number: FRA 16 1075
Date: September 2019
Client: Gladman Developments Ltd

INCREASING LAND VALUE

LK GROUP

LK Consult Document Verification			
Site Address	South Newington Road, Bloxham, OX15 4NZ		
Report Title	Soakaway Tests Factual Report		
Job Number	FRA 16 1075	**Document Ref.**	1600-FRA 16 1075
Date Issued	September 2019	**Report Version**	R0
Prepared By	Phillip Windslow	**Signature**	
Reviewed By	Mark Jones	**Signature**	

Revision Record			
Revision No.	**Date**	**Nature of Revision**	**Approved By**

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CONTENTS

FIGURES

APPENDICES

1 Introduction

1.1 Background

LK Consult Ltd (LKC) has been commissioned by Gladman Developments Ltd to carry out Soakaway Tests for land to the west of South Newington Road, Bloxham. The investigation was undertaken to provide detailed information on the ground conditions at the site, in order to allow a drainage assessment to be undertaken.

1.2 Site Details

A summary of the site details is presented in Table 1-1. Figures 1 and 2 indicate the site location and boundary.

Location	West of South Newington Road, south of Colesbourne Road, Bloxham Centred at approximate National Grid Reference 442359E 235360N.
Topography	The site is relatively flat and approximately 112mAOD.
Land Use	The site currently comprises: -Agricultural land with residential properties adjacent to the north. -Two access tracks with associated farm buildings are present in the south of the field.
Proposed Development	Residential development.

Table 1-1: Summary of site details.

1.3 Previous Work

A PRA report (Ref: CL-602-LKC 16 1314-01, dated March 2019) has previously been undertaken by LKC. It is recommended that this work be read in conjunction with that report.

2 Ground Investigation

2.1 Site Investigation Design and Methodology

In order to assess the ground conditions at the site and to undertake a drainage assessment intrusive works were undertaken.

The investigation was carried out on the 5th September 2019 and comprised the following:

- 3no. trial pits (using JCB / 10t tracked machine) excavated to 1.77 to 2.00mbgl (ref. TP101 to TP103).
- 3no. Soakaway tests undertaken within the trial pits.

The soakaway tests were all originally intended to be undertaken at 2.00mbgl. However, this depth could not be reached in all locations due to the presence of shallow bedrock.

All profile logs are provided in Appendix A and are in line with BS14688-1[1] and BS5930[2].

2.2 Soakaway Tests

Soakaway tests were undertaken in accordance with BRE Digest 365[3].

Trial pits were excavated to approximate dimensions of 2.00m deep, 2.00m long and 0.50m wide. The arisings were logged in accordance with BS14688-1[4] and BS5930.

A slotted standpipe was placed vertically in the pit and clean gravel was then added to a depth of 1.00mbgl to prevent the sides falling in during water influx.

The pits were filled from a water bowser to approximately 1.00mbgl and the drop in level timed and recorded using a dipmeter inside the temporary standpipe.

[1] British Standards (2002) Geotechnical investigation and testing – Identification and Classification of Soil. Part 1: Identification and description. BS EN ISO 14688-1:2002.
[2] British Standard (2015). "Code of Practice for Ground Investigations". BS5930:2015.
[3] BRE (2003) 'Soakaway Design' British Research Establishment BRE Digest 365 2003
[4] British Standards (2002). Geotechnical investigation and testing – Identification and Classification of Soil. Part 1: Identification and description. BS EN ISO 14688-1:2002.

3 Ground Conditions

3.1 Geology – Generalised Sequence

The ground conditions beneath the site comprised made ground or reworked topsoil underlain by a thin layer of superficial deposits with weathered bedrock recovered as a clayey sandy gravel before refusal against competent rock at between 1.77 and 2.00mbgl. A summary section of the logs is provided in Plate 3-1, with additional comments below.

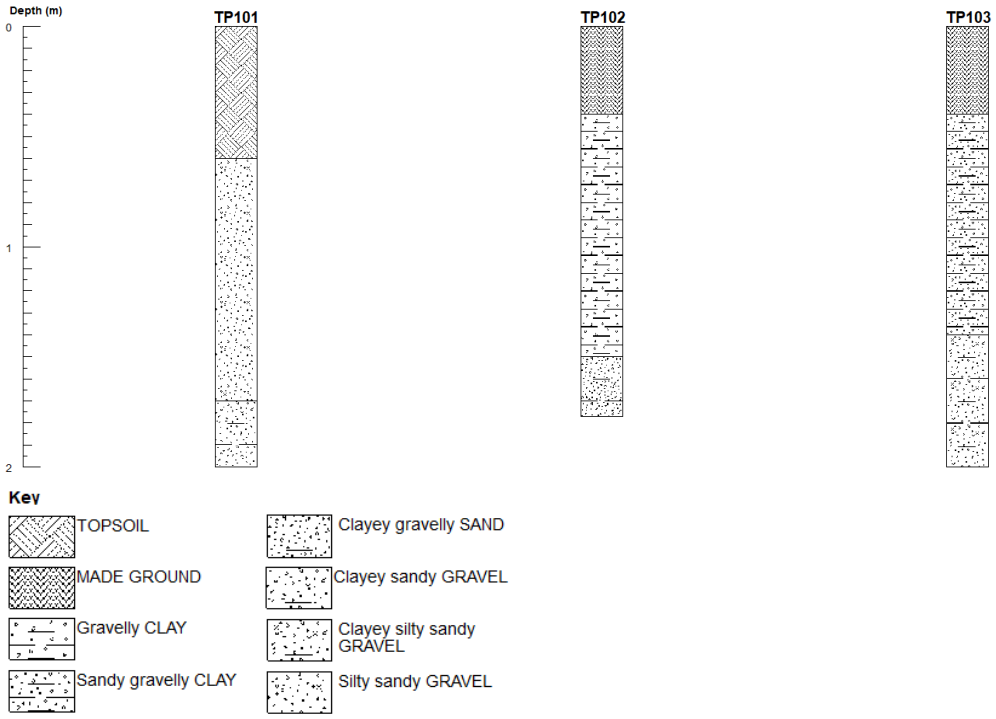


Plate 3-1: Summary of ground conditions.

Additional information on ground conditions:

Made ground consisted of sandy gravelly Silt with rare pottery fragments to 0.40mbgl. No anthropogenic inclusions were noted in TP101.

Superficial deposits comprised silty sandy Gravel in the north (TP101) and sandy gravelly Clay in the rest of the site to depths of between 1.40 and 1.70mbgl.

Bedrock (weathered marl) was encountered as a band of sands and gravel, which was thickest in TP103, with refusal in competent rock between 1.77 and 2.00mbgl. The bedrock consisted of a flaggy iron stained marl which was ooidal in places.

Soakaway Tests

Soakaway tests were carried out within the trial pits. The results of the soakaways are presented in Appendix B and summarised in Table 3-1.

BRE365[5] indicates that the calculation of the soil infiltration rate is made from the time taken for the water level to fall from 75% to 25% effective storage depth in each pit.

[5] BRE (2003) 'Soakaway Design' British Research Establishment BRE Digest 365 2003

Soil infiltration rate, $f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

Where:

V_{p75-25} = the effective storage volume of water in the trial pit between 75% and 25% effective depth.
a_{p50} = the internal surface area of the trial pit up to 50% effective depth including the base area.
t_{p75-25} = the time for the water level to fall from 75% to 25% effective depth.

Due to the slow rate at which water drained in TP101 and TP102, three tests were not carried out in these locations and tests were terminated before the required effective depth.

TP	Test No.	Strata at Test Level	Time for outflow between 75% and 25% (mins)	Soil infiltration rate (m/s)
TP101	1	Clayey silty sandy GRAVEL with MARL at base.	Not reached in over 3 hours. Extrapolated to 828.70.	8.62×10^{-7}
TP102	1	Sandy gravelly CLAY with MARL at base.	Not reached in over 4 hours. Could not be extrapolated.	Test Failed
TP103	1	Clayey silty sandy GRAVEL with MARL at base.	71.88	9.94×10^{-6}
	2		79.00	9.04×10^{-6}
	3		78.60	9.09×10^{-6}

Table 3-1: Summary of soakaway tests and permeability.

Based on the results of the soakaway tests, the permeability of the ground has been calculated within an order of magnitude of 9.00^{-6}m/sec with potential lower permeability where the tests were terminated (failed).

Figures

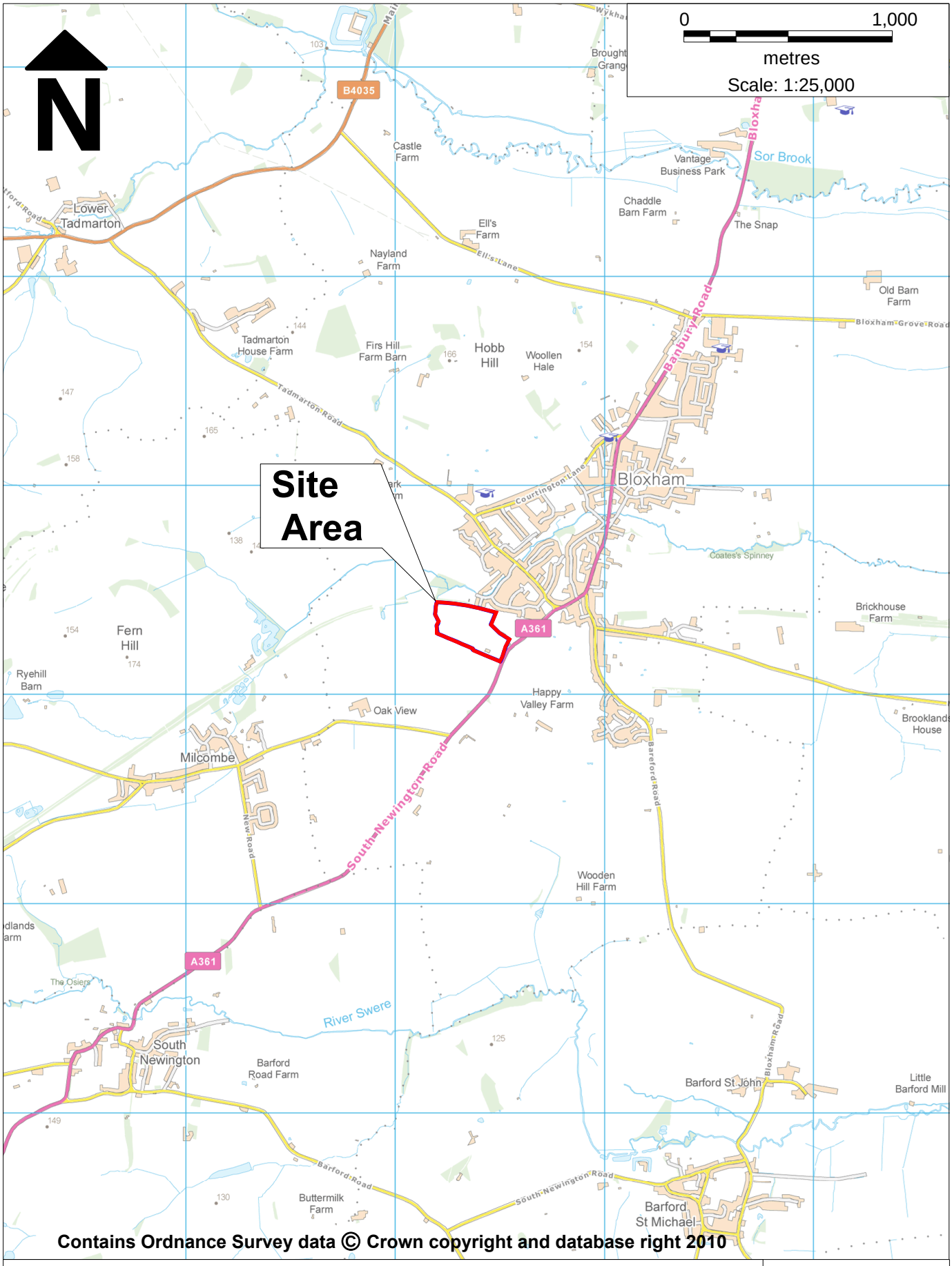
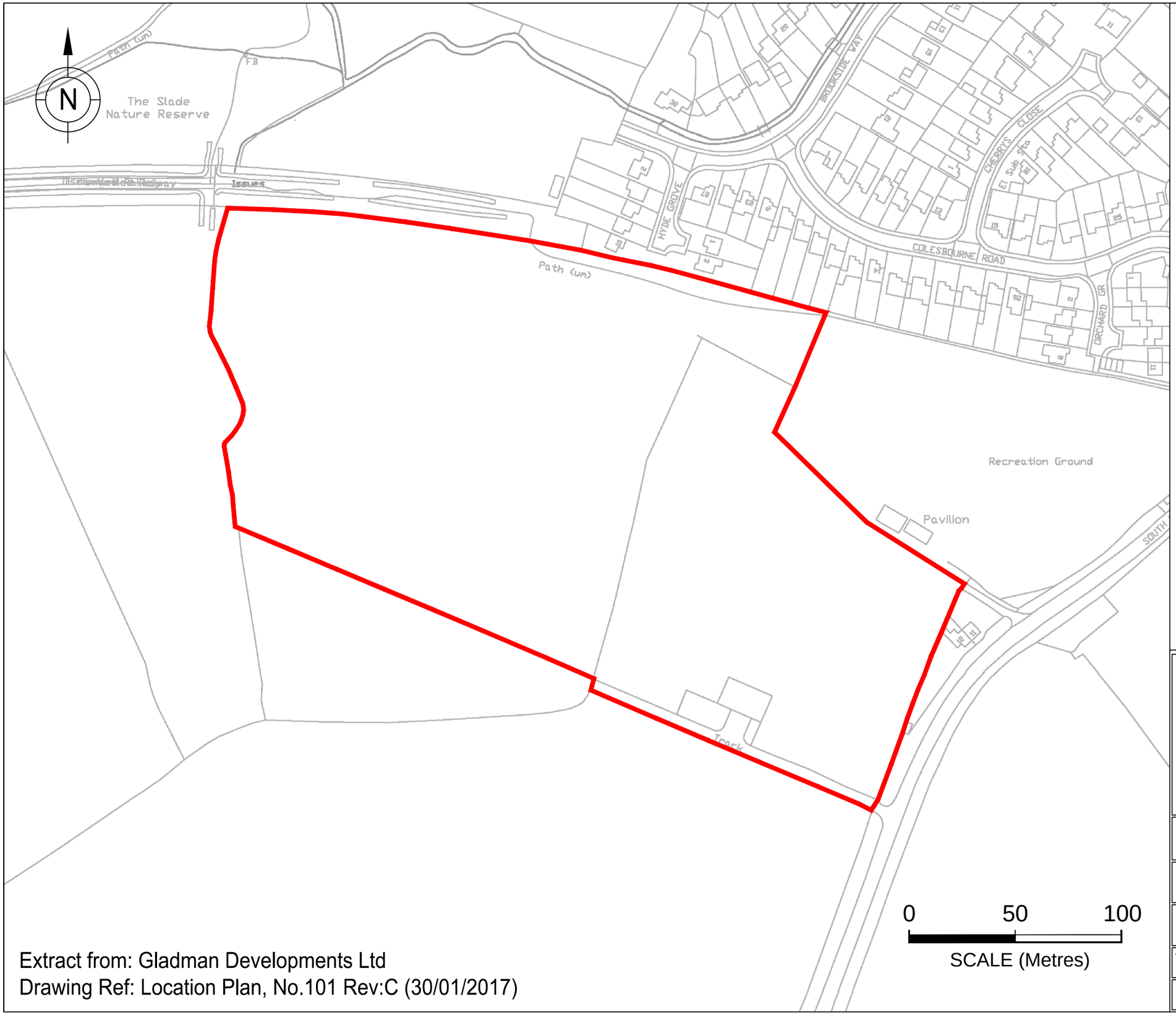


Figure 1: Site Area Location Plan, Land off South Newington Road, Bloxham

Drawn: September 2019 Scale: 1:25,000 @ A4 (see scale bar)

LK CONSULT LIMITED



KEY

Site Area Boundary

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.

LK CONSULT LIMITED

Client: Gladman Developments Ltd

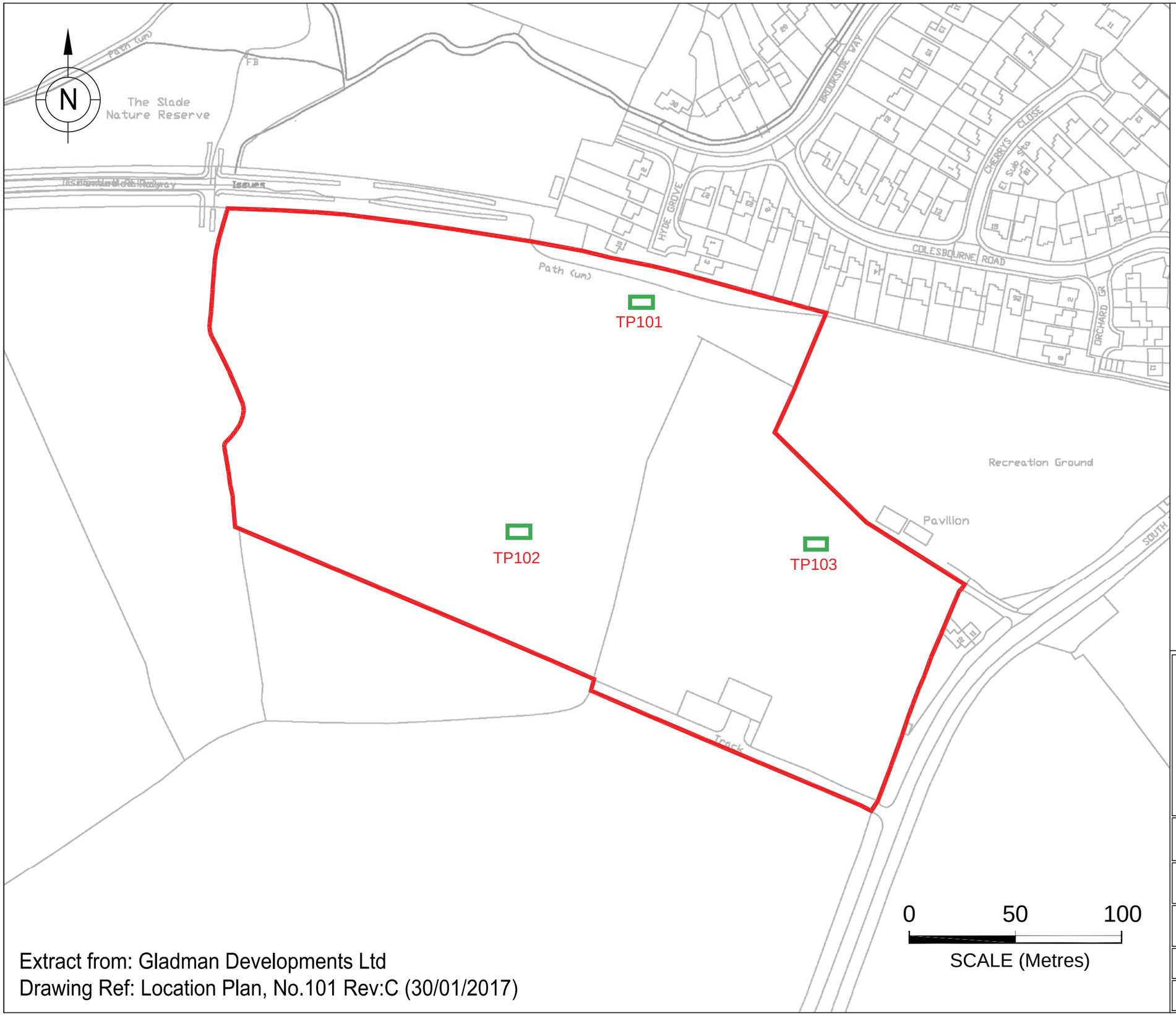
Site: Land off South Newington Road, Bloxham

Title: Site Area Boundary Plan

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 16 1075	1:2500 @ A4	2	

Drawn By:	Checked By:	Drawn:
AC	PP	Sept 2019

Extract from: Gladman Developments Ltd
Drawing Ref: Location Plan, No.101 Rev:C (30/01/2017)



Extract from: Gladman Developments Ltd
Drawing Ref: Location Plan, No.101 Rev:C (30/01/2017)

KEY

Site Area Boundary

Proposed Soakaway Trial Pit Locations

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.

LK CONSULT LIMITED

Client: Gladman Developments Ltd

Site: Land off South Newington Road, Bloxham

Title: Soakaway Test Pit Location Plan

Job No.:	A 1610Scale (See Scale Bar):	Figure:	Revision:
FRA 16 1075	1:2500 @ A4	3	

Drawn By:	Checked By:	Drawn:
AC	PP	Sept 2019

Appendix A

Profile Logs

LK CONSULT LTD Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200 web: www.thelkgroup.com		**Site** South Newington Road, Bloxham	**Trial Pit Number** **TP101**
Machine : JCB 3CX **Method :**	**Dimensions** 2.00mX2.00mX0.50m **Location** 442400 E 235400 N	**Ground Level (mOD)** **Dates** 05/09/2019	**Client** Gladman Developments Ltd **Engineer**	**Job Number** FRA 16 1075 **Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.60)	TOPSOIL: Reddish brown sandy gravelly clayey SILT with occasional rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular of marl.		
					0.60			
					(1.10)	Orangish brown silty sandy GRAVEL with occasional cobbles of marl. Sand is fine to coarse. Gravel is fine to coarse, subangular of iron stained marl.		
					1.70			
					(0.30)	Greyish brown clayey sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, angular of iron stained marl.		
					2.00	Complete at 2.00m		

Remarks

Scale (approx)	Logged By	Figure No.
1:40	EM	FRA 16 1075.TP101

LK CONSULT LTD Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200 web: www.thelkgroup.com		**Site** South Newington Road, Bloxham	**Trial Pit Number** **TP102**
Machine : JCB 3CX **Method :**	**Dimensions** 1.77mX2.00mX0.50m **Location** 442335 E 235285 N	**Ground Level (mOD)** **Dates** 05/09/2019	**Client** Gladman Developments Ltd **Engineer**	**Job Number** FRA 16 1075 **Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40) 0.40	MADE GROUND: Reddish brown slightly gravelly sandy SILT with occasional rootlets and rare pottery. Sand is fine to coarse. Gravel is fine to coarse, subangular of marl.		
					(1.10) 1.50	Firm to stiff consistency mottled grey and brown gravelly CLAY with occasional rootlets and rare cobbles of marl. Sand is fine to coarse. Gravel is fine to coarse, subangular of marl. Becoming increasingly sandy and gravelly with depth.		
					(0.27) 1.77	Reddish brown clayey gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular of iron stained marl. Refusal at 1.77mbgl against possibly weathered bedrock.		
						Complete at 2.00m		

Remarks

Scale (approx)	Logged By	Figure No.
1:40	EM	FRA 16 1075.TP102

LK CONSULT LTD Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200 web: www.thelkgroup.com	**Site** South Newington Road, Bloxham	**Trial Pit Number** **TP103**	
Machine : JCB 3CX **Method :**	**Dimensions** 2.00mX2.00mX0.50m	**Ground Level (mOD)**	**Client** Gladman Developments Ltd	**Job Number** FRA 16 1075
	Location 442485 E 235280 N	**Dates** 05/09/2019	**Engineer**	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40) 0.40	MADE GROUND: Reddish brown slightly gravelly sandy SILT with occasional rootlets and rare pottery fragments. Sand is fine to coarse. Gravel is fine to coarse, subangular of marl.		
					(1.00) 1.40	Firm to stiff consistency orangish brown sandy gravelly CLAY with rare black iron nudules. Sand is fine to coarse. Gravel is fine to coarse, subangular.		
					(0.60) 2.00	Greyish brown clayey silty sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, subangular of iron stained marl.		
						Complete at 2.00m		

Remarks

Scale (approx)	Logged By	Figure No.
1:40	PW	FRA 16 1075.TP103

Appendix B

Soakaway Test Data

LK GROUP

LK CONSULT LTD
Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Soakaway Test (BRE Digest 365)

Site : South Newington Road, Bloxham

Client : Gladman Developments Ltd

Engineer :

Job Number FRA 16 1075

Sheet 1 / 5

Location	Date	Level	Location
TP101	05/09/2019		

Pit Width (m)	0.50
Pit Depth (m)	1.96
Pit Length (m)	2.00

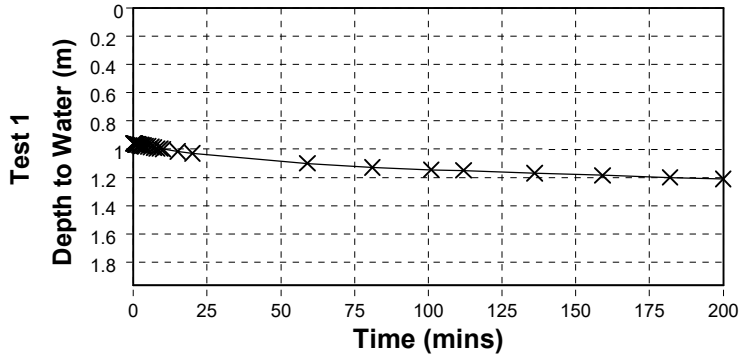
Soil type at test level	Clayey silty sandy GRAVEL
Groundwater	
Drain discharge depth	1.96
Sidewall stability	Stable
Stone filled or open pit	Stone Filled

	1
Effective depth (m)	1.00
Volume outflowing between 75% & 25% (m3)*	0.15
Mean surface area through which outflow occurs (m2)	3.50
Time for outflow between 75% & 25% (min)	828.70
SOIL INFILTRATION RATE (ms-1), f	8.62E-7

Remarks

* Volume outflowing reduced to account for granular backfill used during testing (30 % of free volume assumed).

Elapsed time (mins)	Depth to Water Test 1
0	0.96
0.083	0.96
0.167	0.96
0.333	0.96
0.5	0.96
0.667	0.965
0.833	0.965
1	0.965
1.5	0.965
2	0.97
2.5	0.97
3	0.975
3.5	0.975
4	0.98
5	0.98
6	0.985
7	0.99
8	0.995
9	0.995
10	1.00
15	1.015
20	1.03
59	1.10
81	1.13
101	1.145
112	1.15
136	1.17
159	1.185
182	1.20
200	1.21



LK CONSULT LTD
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Soakaway Test (BRE Digest 365)

Site : South Newington Road, Bloxham

Client : Gladman Developments Ltd

Engineer :

Job Number FRA 16 1075

Sheet 2 / 5

Location	Date	Level	Location
TP102	05/09/2019		

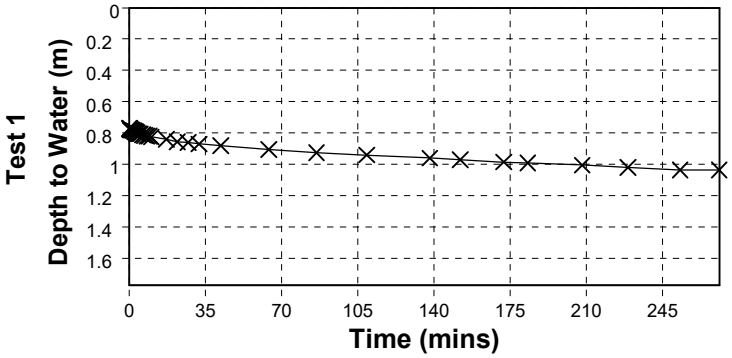
Pit Width (m)	0.50
Pit Depth (m)	1.77
Pit Length (m)	2.00

Soil type at test level	Sandy gravelly CLAY
Groundwater	
Drain discharge depth	1.77
Sidewall stability	Stable
Stone filled or open pit	Stone Filled

	1
Effective depth (m)	1.00
Volume outflowing between 75% & 25% (m3)*	
Mean surface area through which outflow occurs (m2)	
Time for outflow between 75% & 25% (min)	
SOIL INFILTRATION RATE (ms-1), f	Test Failed

Remarks

* Volume outflowing reduced to account for granular backfill used during testing (30 % of free volume assumed).



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Soakaway Test (BRE Digest 365)

Site : South Newington Road, Bloxham

Client : Gladman Developments Ltd

Engineer :

Job Number FRA 16 1075

Sheet 3 / 5

Elapsed time (mins)	Depth to Water Test 1
0	0.77
0.083	0.77
0.167	0.775
0.333	0.775
0.5	0.78
0.667	0.78
0.833	0.78
1	0.78
1.5	0.785
2	0.785
2.5	0.79
3	0.795
3.5	0.80
4	0.805
4.5	0.805
5	0.805
6	0.81
7	0.815
8	0.82
9	0.82
10	0.825
17	0.84
22	0.855
27	0.86
32	0.87
42	0.88
64	0.905
86	0.925
109	0.94
138	0.96
152	0.97
172	0.985
183	0.99
208	1.005
229	1.02
253	1.035
271	1.035

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Soakaway Test (BRE Digest 365)

Site : South Newington Road, Bloxham

Client : Gladman Developments Ltd

Engineer :

Job Number FRA 16 1075

Sheet 4 / 5

Location	Date	Level	Location
TP103	05/09/2019		

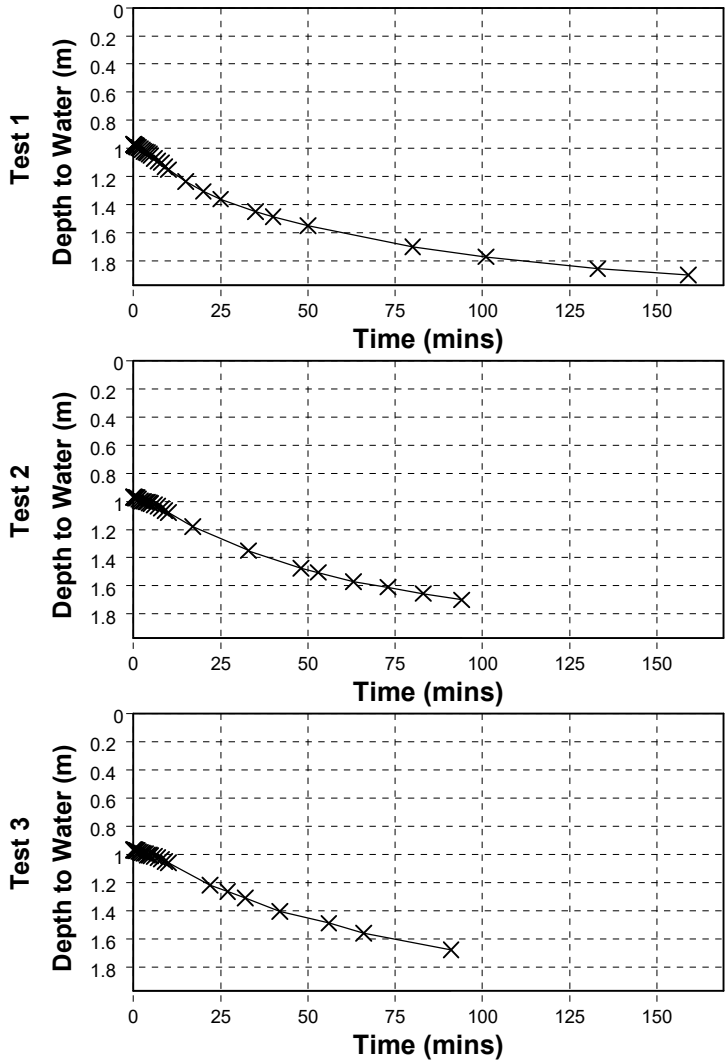
Pit Width (m)	0.50
Pit Depth (m)	1.97
Pit Length (m)	2.00

Soil type at test level	Clayey silty sandy GRAVEL
Groundwater	
Drain discharge depth	1.97
Sidewall stability	Stable
Stone filled or open pit	Stone Filled

	1	2	3
Effective depth (m)	1.00	1.00	1.00
Volume outflowing between 75% & 25% (m3)*	0.15	0.15	0.15
Mean surface area through which outflow occurs (m2)	3.50	3.50	3.50
Time for outflow between 75% & 25% (min)	71.88	79.00	78.60
SOIL INFILTRATION RATE (ms-1), f	9.94E-6	9.04E-6	9.09E-6

Remarks

* Volume outflowing reduced to account for granular backfill used during testing (30 % of free volume assumed).



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Soakaway Test (BRE Digest 365)

Site : South Newington Road, Bloxham

Client : Gladman Developments Ltd

Engineer :

Job Number FRA 16 1075

Sheet 5 / 5

Elapsed time (mins)	Depth to Water Test 1	Depth to Water Test 2	Depth to Water Test 3
0	0.97	0.97	0.97
0.083	0.97	0.97	0.97
0.167	0.97	0.97	0.97
0.333	0.98	0.97	0.97
0.5	0.98	0.975	0.97
0.667	0.98	0.975	0.975
0.833	0.985	0.975	0.975
1	0.99	0.975	0.975
1.5	0.995	0.985	0.98
2	1.00	0.995	0.985
2.5	1.01	1.00	0.99
3	1.02	1.00	0.995
3.5	1.025	1.005	0.995
4	1.03	1.005	1.005
4.5	1.04	1.01	1.005
5	1.05	1.015	1.01
6	1.07	1.025	1.015
7	1.09	1.035	1.025
8	1.10	1.05	1.035
9	1.13	1.065	1.05
10	1.15	1.08	1.06
15	1.235		
17		1.18	
20	1.305		
22			1.22
25	1.36		
27			1.265
32			1.31
33		1.35	
35	1.45		
40	1.485		
42			1.405
48		1.475	
50	1.55		
53		1.505	
56			1.49
63		1.57	
66			1.56
73		1.61	
80	1.70		
83		1.655	
91			1.68
94		1.70	
101	1.77		
133	1.855		
159	1.90		

Based across the UK with offices in Manchester, London, Liverpool and Glasgow.

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