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Land West of Kidmore End Road: Soakaway Testing

P25033_R2
March 2025



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Document Control

Title

Land West of Kidmore End Road: Soakaway Testing

Client

Fairfax Acquisitions Limited,
Buncton Barn,
Buncton Lane,
Bolney,
Haywards Heath,
RH17 5RE

Reference

P25033_R2

Status

Final

Document reference	Issue date	Comments	Written by	Approved by
P21335_R2	September 2022	Final	RLW	JEM
P25033_R2	March 2025	Updated to Aqua Terra	RLW	JEM

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1. Introduction

Aqua Terra Consultants Ltd (Aqua Terra) was instructed by Fairfax (Reading) Ltd (the Client) to undertake infiltration testing on a parcel of land west of Kidmore End Road which formerly comprised part of the former Reading Golf Course (the Site). Instruction to proceed in accordance with proposal Ref: P21335_P1, was confirmed by email from the Client dated 8th June 2022.

1.1. Site location

The Site address is as follows:

Land off Kidmore End Road,
Emmer Green,
Reading,
RG4 8SE

The Site area is approximately 5.9Ha and the National Grid Reference at the centre of the Site is: 471460, 177140. A Site location plan is presented in drawing P25033_R2_D01.

1.2. Brief

The Client is seeking to obtain planning permission for a proposed residential development at the Site. To support this application a suitable sustainable drainage strategy is required and, based on the published geology and known results from other parts of the Site, it was considered that infiltration drainage would likely be feasible. Therefore, the brief was to undertake sufficient testing to support the emerging design and drainage strategy.

1.3. Scope

The scope of work was to undertake infiltration testing across the Site in accordance with BRE365 (2016).

1.4. Limitations

This report is provided in accordance with the conditions defined in Appendix A.

2. Fieldwork

2.1. Fieldwork

Fieldwork was undertaken over two days between the 30th August and 1st September 2022, with the location of each exploratory hole agreed with the Client and designed to minimise Site damage whilst providing suitable coverage. Drawing P25033_R2_D02 details the locations of the exploratory holes, and the ground conditions encountered are discussed in Section 3. The works undertaken are summarised in the following table:

Table 2-1 Fieldwork undertaken

Work element	Comments/ rationale
Utilities and service clearance	Prior to the Site works a utilities report was obtained and each position was checked for services by trained and competent Aqua Terra staff using the plans (see Appendix B) and non-intrusive CAT and Genny techniques.
Trial pits	Six trial pit locations (TP01 to TP06) were machine excavated (using a JCB) to depths of between 2.9m and 3m below ground level (m bgl). TP01, TP02, TP03 and TP04 were all terminated within the superficial Black Park Gravel Member. In TP05 and TP06, the pits were terminated in the White Chalk. In all trial pits, the faces and base were cut to create as square a shape as possible, the dimensions of each pit were then measured and recorded. In pits that were planned to be installed, (TP02, TP04 and TP06) the pit was filled with 1m of gravel prior to soakaway testing to help prevent the sides of the pit collapsing.
Logging of strata	All strata were logged by competent Aqua Terra staff in accordance with BS5930. The engineering logs are presented in Appendix C.
Soakaway testing	Soakaway testing in general accordance with BRE 365 (2016) was carried out in each trial pit using a 1,000 litre IBC, which rapidly inundated the trial pits to the required depth. Water levels were measured at regular intervals across the test period. If tests were successful, repeat tests were run in the same saturated pit as detailed by BRE365. The results of this testing are presented in Appendix D.
Installations	3No. trial pits (TP02, TP04 and TP06) across the Site were fitted with an observation pipe prior to being backfilled with clean imported gravel, a bentonite seal and upstanding cover for future groundwater monitoring purposes. Above ground, the installations were clearly marked using a blue standpipe.
Backfill	Where there were no installations, on completion of excavation and testing, the pits were backfilled with arisings, which were compacted in discrete layers by the JCB in reverse order to excavation. Excess materials were carefully mounded on the backfilled pits to accommodate future settlement.

3. Ground conditions

3.1. Strata Encountered

The strata encountered during the fieldwork are summarised as follows:

- **Topsoil:** Typically 0.05m to 0.1m thick. Encountered as grass covered topsoil with abundant rootlets.
- **Black Park Gravel Member:** Recorded between 1.45m and >2.95m thick as a dark brown, gravelly SAND to sandy GRAVEL. Gravel was fine to coarse, sub angular to sub rounded of flint and chert with rare to occasional sandstone and fine chalk. Sand was fine to medium. Abundant rootlets noted within upper portion.
- **White Chalk:** Encountered in TP05 and TP06 only between 1.3 and >1.4m thick with the base not proven. Recorded as structureless CHALK composed of off-white, slightly clayey GRAVEL. Gravel is fine to coarse, with occasional cobbles, sub angular to sub rounded of high density chalk and flint. Grade Dc.

Exploratory logs of each position can be found in Appendix C and a photographic log is shown in Appendix E.

3.2. Progress and Obstructions

No obstructions were encountered in any of the exploratory holes.

3.3. Stability

Some side instability was noted in TP01 and TP03, which continued throughout the soakaway testing. TP01 had collapsed inwards to 2.23m bgl from 2.9m bgl, by the beginning of the third soakaway test. TP03 collapsed inwards to 2.2m bgl from 3.0m bgl, by the beginning of the third soakaway test. Based on this, the positions that were selected to be installed (TP02, TP04 and TP06), were infilled with gravel to maintain side stability during the soakaway testing. TP05 remained stable and open throughout all 3 rounds of testing without the addition of gravel.

3.4. Visual and olfactory evidence of contamination

There was no evidence of significant or gross impact to soils encountered within exploratory positions. In addition, no Made Ground was encountered in any of the locations.

3.5. Groundwater

No seepages or groundwater strikes were noted in any of the exploratory positions.

Installations were placed in TP02, TP04 and TP06 and groundwater levels were recorded at the cessation of Site work, all positions were found to be dry.

3.6. Summary of infiltration testing results

A summary of the infiltration testing is presented in Table 3-1 below with full results presented in Appendix D. The infiltration values for each pit have been calculated in accordance with the methodology set out in BRE 365.

Table 3-1 Summary of infiltration testing

Trial pit	Test	Depth of pit (m)	Geology of test section	Permeability (m/s)	Average (m/s)
TP01	1	2.9	Black Park Gravel Member	6.73E-05	5.42E-05
	2	2.6		4.51E-05	
	3	2.23		5.01E-05	
TP02	1	2.84	Black Park Gravel Member	1.73E-03	6.03E-04
	2			8.26E-05	
	3			7.07E-05	
TP03	1	3	Black Park Gravel Member	5.95E-05	3.75E-05
	2	2.5		3.12E-05	
	3	2.2		2.19E-05	
TP04	1	3	Black Park Gravel Member	1.20E-05	3.71E-05
	2			9.45E-06	
	3			2.15E-05	
TP05	1	2.94	White Chalk	8.27E-05	8.63E-05
	2			9.04E-05	
	3			8.98E-05	
TP06	1	2.9	White Chalk	5.33E-04	3.92E-04
	2			3.14E-04	
	3			3.28E-04	

The results above concur with Lewis 1989 typical hydraulic conductivity of common rock types, with an average conductivity of 10^{-5} m/s for both chalk and gravel deposits. Figure 3-1 below classifies the soil as clean sands and sand-gravel mixtures to very fine sands, silts and clay-silt laminate with good drainage.

Figure 3-1 Permeability and drainage characteristics of soils from BS 8004:1986

Permeability k (m/s)						
1 10^{-1} 10^{-2} 10^{-3} 10^{-4} 10^{-5} 10^{-6} 10^{-7} 10^{-8} 10^{-9} 10^{-10}						
Drainage	Good				Poor	Practically impervious
Type of soil	Clean gravels	Clean sands and sand-gravel mixtures	Very fine sands, silts and clay-silt laminate		Unfissured clays and well mixed clay silts containing more than 20 % clay	
		Desiccated and fissured clays				
Recommended method of determining k	Pumping tests in situ				Flow from piezometer tips	
	Constant head permeameter tests				Equilibrium	Non-equilibrium
	Estimation from grading curves					
		Falling head permeameter				Computed from oedometer or triaxial consolidation tests
	Very reliable		Reliable			

4. Conclusions

4.1. Ground conditions encountered

The trial pitting confirmed the published geology at the Site, consisting of the Black Park Gravel Member underlain by the weathered White Chalk to a maximum excavated depth of 3.0m bgl.

No groundwater seepages were noted within the excavations and all installed positions were noted to be dry at the completion of Site work. Side instability was noted in TP01 and TP03 and as a result TP02, TP04 and TP06 were filled with gravel for soakaway testing. TP05 remained open and stable for the duration of testing. No visual or olfactory evidence of gross contamination was noted within the excavations and no Made Ground was encountered.

Whilst not directly evidenced on Site, the underlying geology and area is known for suffering from the potential for subsidence as a result of solution features within the White Chalk. This should be factored into any proposed drainage strategy.

4.2. Infiltration drainage potential

Infiltration was observed in each of the exploratory positions. Several of the localities drained away within 10 minutes (TP02 and TP06) and these results may therefore not be typical of actual drainage characteristics for the majority of the Site. Localities at the uppermost, mid and lowest elevations (TP02, TP04 and TP06 respectively) have been installed to allow for a 12-month programme of groundwater monitoring.

Infiltration rates have been calculated for each trial pit. All positions drained away within sufficient timescales. As a result, it is possible to conclude that that soakaway drainage will likely be appropriate for the Site.

It should be noted that surface water flow off-Site was towards the north eastern corner, where the topography sharply declines to road level (on Kidmore End Road). Future surface water management plans should focus on retention and diversion of run-off in advance of this pathway.



	Figure Title Site location, Reading Golf Course	Client Fairfax (Reading) Limited and RGC (SODC) Limited	Date 08/09/22	Drawn RLW
		Drawing Number P25033_R2_D01	Scale NTS	Checked JEM
			Original A4	Revision 1
		Project Number P25033	Reading Golf Course, Emmer Green	



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	Figure Title Exploratory hole locations, Reading Golf Course	Client Fairfax (Reading) Limited and RGC (SODC) Limited	Date 08/09/22	Drawn RLW	 AQUA TERRA CONSULTING
		Drawing Number P25033_R2_D02	Scale 1:4,000	Checked JEM	
			Original A4	Revision 1	
		Project Number P25033	Reading Golf Course, Emmer Green		

Report Conditions

This report has been prepared by Aqua Terra Consultants Ltd. (Aqua Terra) in its professional capacity as soil and groundwater specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client and is provided by Aqua Terra solely for the internal use of its client.

The advice and opinions in this report should be read and relied on only in the context of the report, taking account of the terms of reference agreed with the client. The findings are based on the information made available to Aqua Terra at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology, and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

Where necessary and appropriate, the report represents and relies on published information from third party, publicly and commercially available sources which is used in good faith of its accuracy and efficacy. Aqua Terra cannot accept responsibility for the work of others.

Site investigation results necessarily rely on tests and observations within exploratory holes only. The inherent variation in ground conditions mean that the results may not be representative of ground conditions between exploratory holes. Aqua Terra take no responsibility for variation in ground conditions between exploratory positions.

This report is confidential to the client. The client may submit the report to regulatory bodies, where appropriate. Should the client wish to release this report to any other third party for that party's reliance, Aqua Terra may, by prior written agreement, agree to such release, if it is acknowledged that Aqua Terra accepts no responsibility of any nature to any third party to whom this report or any part thereof is made known. Aqua Terra accepts no responsibility for any loss or damage incurred as a result, and the third party does not acquire any rights whatsoever, contractual, or otherwise, against Aqua Terra except as expressly agreed with Aqua Terra in writing. Aqua Terra reserves the right to withhold and/ or negotiate the transference of reliance on this report, subject to legal and commercial review.