18th May 2022

Our ref: GE20814/WP02/220518

Geo-Environmental

Paul Thomas
Bargate Homes
The New Barn
Vicarage Farm Business Park
Winchester Road
Fair Oak
Hampshire
SO50 7HD

By email only

Dear Paul,

RE: Manor Farm, Bedhampton Phase 2 deep Borehole – Ground Investigation Letter

Geo-Environmental Services Limited (Geo-Environmental) was instructed by Bargate Homes (the Client) to construct an additional borehole adjacent to BH01 borehole which was drilled during the previous phase of intrusive ground investigation.

The purpose of this investigation was to ascertain the ground conditions, infiltration values of the strata encountered within the borehole and to ascertain the depth of groundwater to inform the emerging drainage strategy for the proposed development and address specific queries raised by the Lead Local Flood Authority.

Scope of Works

The following scope of works was agreed with the Client:

- Attendance of a Geo-Environmental Engineer to set out and supervise the intrusive investigation, undertake sampling, in-situ testing and logging of recovered soils from exploratory holes.
- Construction of 1No. cable percussion borehole (BH101) to a depth of 16m bgl together with in-situ testing and sampling at regular intervals.
- Undertake a falling head infiltration test in the borehole on completion of drilling.
- Installation of a groundwater monitoring well within the borehole, with a response zone in the basal 3m of the well to allow return monitoring.

The intrusive investigation works were undertaken on 25th April 2022. The additional borehole (BH101) was requested by the Client's Drainage Designer to assess conditions at greater depth than previously tested.

Site Description

At the time of the site works the site comprised part of a larger arable field. The field was relatively flat with a very gentle southwards slope. Bounding the site to the south was a hedgerow with a railway line beyond. The western site boundary was formed of a hedgerow and trees with the A3 and A27 at higher level beyond. An industrial unit was located to the north of the site with residential properties located along Lower Road. The remainder of the arable field lay to the east of the site and was fenced off for the Phase 1 development area.

Ground Conditions

The borehole was located adjacent to borehole (BH01) which was constructed during a previous phase of intrusive investigation.

The ground conditions encountered in BH101 were broadly consistent with the anticipated published sequence of strata, i.e. River Terrace Deposits overlying Chalk of the White Chalk Subgroup at depth.

Whilst a summary of the ground conditions encountered is presented in Table 1, reference should also be made to the exploratory hole log for further information which are presented within Appendix A. The exploratory hole location is shown on Figure 2.

Top (m bgl)	Base (m bgl)	Description
0.00	3.00	**RIVER TERRACE DEPOSITS:** Stiff brown slightly silty CLAY with occasional 1mm rootlets observed in the top 0.5m.
3.00	16.00	**CHALK:** 3.00-6.00m bgl: Beige to white CHALK matrix composed of subrounded to subangular gravel. Gravel was fine to medium grained, low-medium density chalk. 6.00-16.00m bgl: Recovered as wet white CHALK. Occasional ferruginous staining.

Table 1 Summary of ground conditions

Made Ground was not encountered within any of the exploratory holes.

The methods used to construct the borehole cause loss of any in-situ structure and recovery of disturbed Chalk. As such, it is possible that the quality and weathering condition of the Chalk at depth could differ from that described based on the chalk recovered. The classification as CIRIA Grade Dm has been applied as a conservative estimate.

Groundwater

Groundwater was encountered within BH101 at 6.40m bgl during drilling and rose to 4.50m bgl after drilling had been suspended for 20 minutes.

A groundwater monitoring well was installed within BH101 with one groundwater monitoring visit undertaken on the 4th May 2022, with the encountered groundwater depths (m bgl) detailed in Table 2.

Location	Depth of Groundwater (m bgl)
	04/05/2022
BH101	2.71

Table 2 Groundwater monitoring results

It should also be noted that changes in groundwater levels do occur for a number of reasons including seasonal effects and variations in drainage. Such fluctuations may only be recorded by the measurement of the groundwater level within a series of standpipes or piezometers installed within appropriate response zones.

Obstructions

No obstructions were encountered during the investigation. Obstructions elsewhere cannot be discounted.

Falling Head Testing

Falling head testing was undertaken within the cable percussive borehole, BH101. The test was undertaken prior to the installation of the groundwater monitoring well.

Groundwater was present within the borehole during testing and was recorded at a depth of 4.50m bgl prior to commencing testing. The estimated preliminary infiltration rate for the test undertaken within BH101 is summarised within Table 3 below.

Exploratory Hole	Stratum tested	Estimated infiltration rate (m/s)
BH101	Chalk	$1.48x10^{-5}$

Table 3 Estimated infiltration values derived from borehole falling head testing

Geotechnical Testing

In situ hand penetrometer testing was undertaken in clay soils within the cable percussive borehole. These results ranged between 2.5 and 3.0kg/cm^2 (very stiff).

In situ Standard Penetration Tests (SPT) were undertaken at intervals within the cable percussion borehole. SPT 'N' values ranged between N=11 and N=12 within the soils of the River Terrace Deposits and N=9 and N=18 within the Chalk.

Geotechnical laboratory tests were undertaken on selected samples of the Chalk recovered from depths below 10m bgl. The results are summarised Table 4.

Location	Sample depth (m bgl)	Description	SMC (%)	NMC (%)	Bulk density (Mg/m3)	Dry density (Mg/m3)
BH01	10.2	Off white slightly putty CHALK with fine to coarse intact chalk fragments	20	20	2.09	1.74
	13.0	Off white slightly putty CHALK with fine to coarse intact chalk fragments	26	26	1.99	1.58
	15.0	Off white slightly putty CHALK with fine to coarse intact chalk fragments	24	24	2.05	1.64

Table 4 Saturation moisture content results

Closure

We trust we have interpreted your request correctly and provided sufficient information for your current requirements.

Should you have any queries please do not hesitate to contact us.

Yours sincerely
For and on Behalf of Geo-Environmental

WILL PURSLOW BSc (Hons), MSc, FGS
Graduate Consultant Engineer
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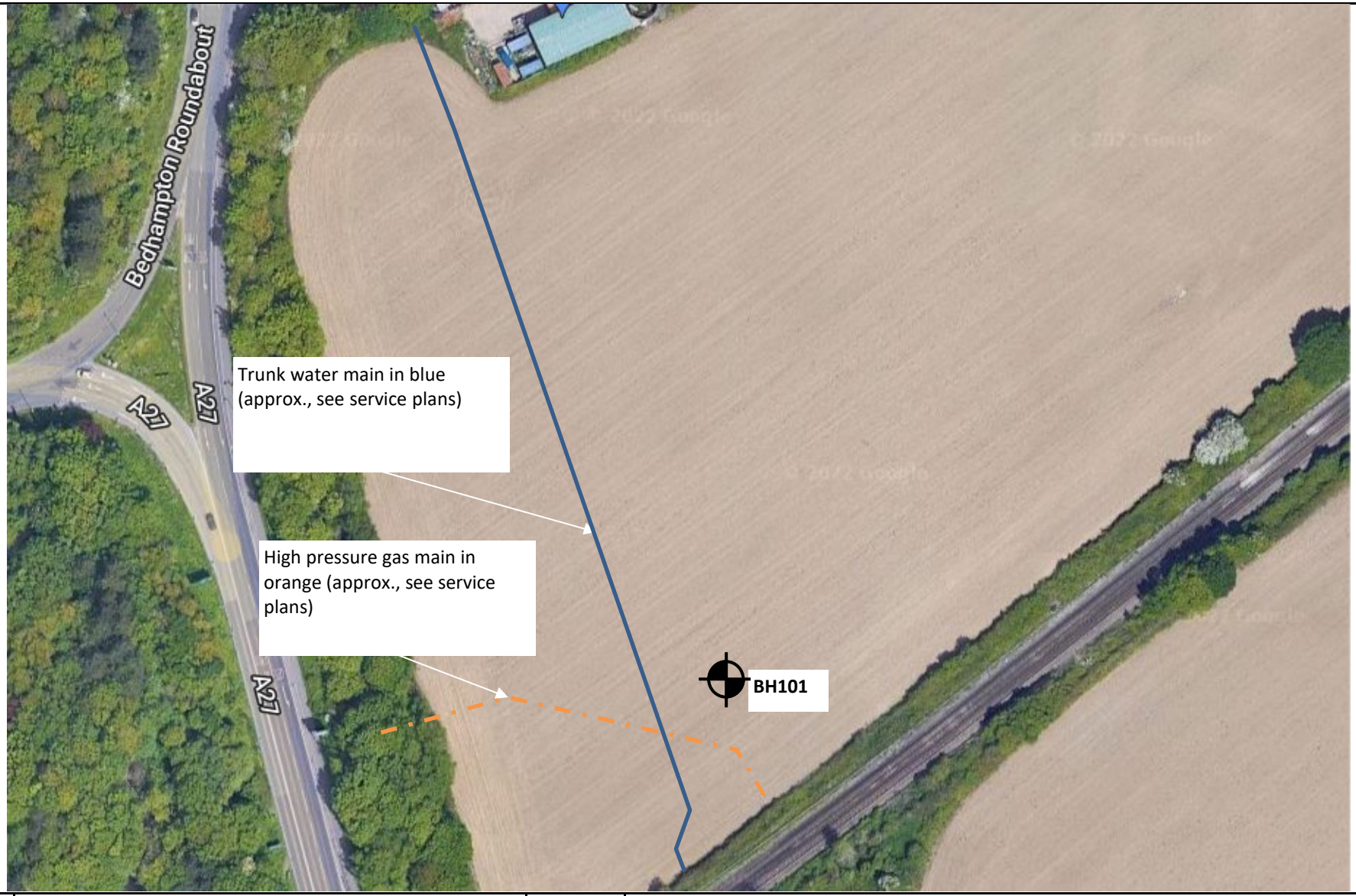
Enc Figure 1 - Site Location Plan
Figure 2 – Exploratory Hole Location Plan (Aerial)
Figure 3 – Exploratory Hole Location Plan (Proposed development)
Appendix A - Exploratory Hole Logs

FIGURES

Project:	Manor Farm, Bedhampton Ph2 deep BH			**Title**	Site Location Plan
Client:	Bargate Homes			**Geo-Environmental Services Ltd** **Unit 7 Danworth Farm, Cuckfield Road** **Hurstpierpoint, West Sussex BN6 9GL** **+44(0)1273 832972 www.gesl.net**	Geo-Environmental
Ref No:	GE20814	**Revision:**	0		
Drawn:	SA	**Date:**	08/04/2022		
Figure:	1	**Scale:**	Not to scale		



Project:	Manor Farm, Bedhampton Ph2 deep BH			**Title**	Exploratory Hole Location Plan (Aerial)
Client:	Bargate Homes			**Geo-Environmental Services Ltd** **Unit 7 Danworth Farm, Cuckfield Road** **Hurstpierpoint, West Sussex BN6 9GL** **+44(0)1273 832972 www.gesl.net**	Geo-Environmental
Ref No:	GE20814	**Revision:**	1		
Drawn:	WP	**Date:**	29/04/2022		
Figure:	2	**Scale:**	Not to scale		

Project:	Manor Farm, Bedhampton Ph2 deep BH			**Title**	Exploratory Hole Location Plan (Proposed development)
Client:	Bargate Homes			**Geo-Environmental Services Ltd** **Unit 7 Danworth Farm, Cuckfield Road** **Hurstpierpoint, West Sussex BN6 9GL** **+44(0)1273 832972 www.gesl.net**	Geo-Environmental
Ref No:	GE20814	**Revision:**	0		
Drawn:	WP	**Date:**	08/04/2022		
Figure:	3	**Scale:**	Not to scale		

APPENDIX A

Geo-Environmental	Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net	**Borehole Log**	Borehole No. **BH101** Sheet 1 of 2
Project Name:	Manor Farm, Bedhampton Ph2 deep BH	Project No. GE20814	Co-ords: 51E - 51N Hole Type CP
Location:			Level: Scale 1:50
Client:	Bargate Homes		Dates: 25/04/2022 Logged By WP

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50	PP	3.0kg/cm2	0.50			Crop stubble over stiff dark brown slightly silty CLAY. Occasional 1mm rootlets. RIVER TERRACE DEPOSITS
		0.70	D					Firm to stiff brown slightly silty CLAY. RIVER TERRACE DEPOSITS
		1.00		N=12 (3 for 75mm/2,3,3,4)				
		1.45	D					
		2.00	PP	2.5kg/cm2				*Wet matrix.*
		2.00		N=11 (4 for 75mm/3,2,3,3)				
		2.45	D					
		3.00		N=10 (4 for 75mm/2,3,2,3)	3.00			Recovered as soft light brown to beige clayey CHALK matrix composed of subrounded to subangular gravels. Gravels are fine to medium grained, low to medium density chalk. WHITE CHALK SUBGROUP
		3.45	D					*Dry matrix.*
		4.00		N=10 (3 for 75mm/2,2,3,3)				Recovered as white structureless CHALK comprised of subrounded gravel. Gravels are fine to coarse grained, medium to high density chalk. Occasional ferruginous staining. WHITE CHALK SUBGROUP
	▼	4.45	D		4.50			
		5.00		N=14 (4 for 75mm/3,3,4,4)				
		5.45	D					
		6.00	D		6.00			Recovered as wet white structureless CHALK. Occasional ferruginous staining throughout. WHITE CHALK SUBGROUP
	▽	6.45	D					*Very wet matrix.*
		6.50		N=13 (6 for 75mm/4,3,3,3)				
		7.50	D					
		8.00		N=15 (3 for 75mm/4,3,4,4)				
		8.45	D					
		9.00 - 9.50	B					
		9.45	D					
		9.50		N=9 (4 for 75mm/2,2,2,3)				
								Continued on Next Sheet

Casing		Water Strikes (mbgl)		Chiselling (mbgl)		Remarks
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to	
	15.50	6.40	4.50			Wet below 2m. Groundwater recorded at 5.52m bgl following drilling.

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Geo-Environmental	Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net	**Borehole Log**	Borehole No. **BH101** Sheet 2 of 2

Project Name:	Manor Farm, Bedhampton Ph2 deep BH	Project No. GE20814	Co-ords: 51E - 51N	Hole Type CP
Location:			Level:	Scale 1:50
Client:	Bargate Homes		Dates: 25/04/2022	Logged By WP

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.20 - 10.70	B					Recovered as wet white structureless CHALK. Occasional ferruginous staining throughout. WHITE CHALK SUBGROUP	
		11.00		N=12 (2 for 75mm/1,3,4,4)					11
		11.45	D						
		11.90 - 12.40	B						12
		12.50		N=12 (4 for 75mm/2,2,4,4)					
		12.95	D						13
		13.00 - 13.50	B						
		14.00		N=18 (6 for 75mm/3,4,5,6)					14
		14.45	D						
		15.00 - 15.50	B						15
		15.50		N=14 (5 for 75mm/4,3,2,5)					
		15.95	D		16.00			End of Borehole at 16.00m	16
									17
									18
									19
									20

Casing		Water Strikes (mbgl)		Chiselling (mbgl)	
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to
	15.50	6.40	4.50		

Remarks

Wet below 2m. Groundwater recorded at 5.52m bgl following drilling.

AGS