

10th May 2013

Our ref: GE9323/GR01/130510

Jane Gibbs
Linden Homes Southern Limited
Linden House
14 Bartram Road
Totton
Southampton
SO40 9PP

Dear Jane,

RE: Bartons Road, Havant



Geo-Environmental



Further to your instruction, we write to present the findings of the preliminary ground investigation and assessment on this site.

Site Description

At the time of the investigation the site was the subject of a variety of uses including lawnmower repair/servicing, paddock, houses and kennels. The dog kennel business included a tarmac car park for around six to eight cars, temporary staff accommodation, a canine indoor pool, workshops and a paddock which was used as an exercise ground.

An unmade track ran the length of the eastern edge of the paddock which lead to some dilapidated sheds and workshops and a pigeon loft. At the north-west corner of the paddock was an inspection chamber, which was understood to be part of a foul main which passed beneath the railway line.

The south-western corner of the site was occupied by two Victorian semi-detached houses known as Eastleigh House Cottages. The cottages fronted onto a lawnmower repair business. Ground levels appeared to have been amended, possibly raised, to the west of the lawnmower repair buildings. More specific details of building uses on this portion of the site could not be established as access was restricted at the time of the investigation. Additionally, access was not available to the eastern portion of the site though it was evident that the area accommodated parking to the south, a bungalow structure as well as numerous outbuildings, sheds and workshops.

The site was bounded to the north by deciduous woodland; to the east by fields which were understood to be due for development as part of a new crematorium and by private houses fronting on to Bartons Road; to the south by Bartons Road with a garden centre beyond; and to the west by a railway cutting with public open space beyond.

The site was located at an elevation of 30m at the southern boundary and 25m at the northern boundary. The adjacent railway cutting was estimated to be approximately 5m deep at the northern boundary and 15m deep adjacent to the southern boundary.

Geology

The local British Geological Survey (BGS) geological map indicated that the site was likely to be underlain by a succession of Head Deposits, which typically comprise gravelly clay/clayey gravel, over London Clay Formation, which in the vicinity of the site typically comprises silty clay with occasional flint gravel bands and beds of sand.

Geo-Environmental Services Ltd
28 Crescent Road, Brighton, East Sussex, BN2 3RP
T: 01273 699 399 F: 01273 699 388 E: mail@gesl.net W: www.gesl.net

Environmental Consultants | Geotechnical Engineers | Site Investigations

A review of published records for boreholes within the vicinity of the site indicated that the London Clay Formation was likely to be at least 20m deep beneath the site and underlain by approximately 30-35m of interbedded sand and silty clay of the Lambeth Group, which in turn was underlain by Chalk.

Current Groundwater and Drainage Regime

Environment Agency records indicate that the Head Deposits would be classified as a Secondary Aquifer of intermediate vulnerability. The underlying London Clay Formation and Lambeth Group comprise non-aquifers, although groundwater is likely to be present at depth within these strata. The Chalk, which is present at considerable depth, comprises a Principal Aquifer and is the main source of water for potable supply abstractions, the closest abstraction points being approximately 3km to the south-west of the site. The Chalk beneath the site is likely to comprise a confined aquifer, i.e. possibly with no unsaturated zone above the groundwater.

It is understood that rainfall infiltration on this site is currently disposed of the combined/foul drainage.

Ground Conditions

Trial pits were excavated at locations across the site as shown in Figure 2, enclosed, and encountered a general profile of Topsoil overlying Head Deposits and London Clay Formation. In addition, Made Ground was encountered to a depth of 1.2m bgl, overlying Head Deposits, in TP4.

Whilst a summary of the ground conditions encountered are presented in Table 1, detailed descriptions of the ground conditions encountered at each location are presented on the enclosed trial pit logs.

Top (m bgl)	Base (m bgl)	Description
0	0.3	Dark brown silty clay with roots (TOPSOIL)
0	1.2	Dark brown silty sandy clay with brick concrete metal fabric and plastic (MADE GROUND)
0.3 – 1.2	1.6 – 3.0+	Soft to stiff orange-brown and light grey mottled sandy CLAY with gravel and cobble sized flint (HEAD DEPOSITS)
1.6 – 2.0	3.0+	Firm to very stiff grey/brown CLAY locally closely to very closely fissured with occasional silt partings (LONDON CLAY FORMATION)

Trial Pit TP1 was located close to the trees on the northern boundary and the London Clay Formation at this location was observed to be notably stiffer than in other trial pits and roots were present to at least 3.0m bgl. It was considered probable that the London Clay in TP1 was desiccated to some degree and this could impact on foundation performance.

Probing was undertaken across the site to estimate CBR values for pavement design. The CBR values recorded varied from 3% to >10% and this was due to the presence of clayey gravel at shallow depth. It is possible that the sub-grade would be frost susceptible, particularly where silty soils or Made Ground are present, and thus a minimum pavement thickness of 450mm is recommended.

Groundwater was not encountered within any of the trial pits and as stated above, groundwater is anticipated to be at considerable depth beneath the site.

Foundations

Based on the ground conditions encountered it is anticipated that conventional foundations could be used on this site, with foundations terminating either in the Head Deposits or the London Clay Formation. Both strata should be considered as being of high volume change potential unless/until testing is undertaken to verify their status. As such, a minimum founding depth of 1.0m bgl would be required.

However, Made Ground has been identified to a depth of 1.2m bgl in TP4 and the Head Deposits were soft to a depth of 1.2m bgl in TP3. As such, an allowance for deeper foundations should be made.

In addition, the London Clay Formation in TP1 was considered, based on site evidence, to be desiccated to a depth of at least 3.0m bgl. It is therefore recommended that a requirement for piled foundations is assumed where properties are proposed in the vicinity of trees. Further intrusive investigation and laboratory testing is recommended to clarify the lateral and vertical extent of desiccation and thus to inform foundation design.

Foundation design will also need to account for the presence of the railway cutting to the west of the site, such that any imposed structural load does not result in additional loading of the cutting slope as this would reduce the stability of the cutting slope. Given the variation in depth of the cutting (5-15m from north to south), it may also be necessary to consider piled foundations for any structures within the 'load shed envelope' adjacent to the cutting in order to transfer structural loads to below the cutting toe level.

Heave protection is recommended for all foundations on this site and suspended ground floor slabs are also recommended throughout.

A preliminary net allowable bearing capacity of 100kPa is recommended for the firm gravelly clay of the Head Deposits, this increasing to 125kPa for the stiff clay of the London Clay Formation.

Soakaways

Whilst soakage tests were undertaken in each of the trial pits, the water levels did not fall over the test period and thus it was not possible to derive a permeability value for soakaway design. It is considered, based on the test observations, that conventional soakaways would not function on this site. However, discharge to the ground from attenuation cells may be possible, albeit at very slow rates.

NHBC guidance states that soakaways should be located at least 5m from any structure. In addition, and specifically relevant to this site, is the presence of the railway cutting on the western boundary. Soakaways or attenuation cells should be located no closer than 10m from the western boundary in order to minimise the potential for reducing the stability of the railway cutting slope.

Initial consultation with the Environment Agency has revealed that it may be possible to use deep borehole soakaways into the Chalk at 50m+ beneath the site, albeit with the restriction that they accept water only from sealed roof systems and cannot be connected in to at a later stage. Additionally, any other drainage such as from roads, parking areas and the like would require an alternative means of storm water disposal.

It is understood that further investigation and assessment of the current drainage system is proposed in the next few days and from this, it may be possible to accommodate storm water disposal within the existing system, albeit with some storage and attenuation on site.

Contamination

Whilst the portion of the site investigated appeared to comprise greenfield land, Made Ground was encountered in TP4. Whilst no visual or olfactory evidence of contamination was observed, it is not possible to rule out the presence of soil contamination at this stage.

In addition, given that the southern portion of the site was being used for sales, servicing and repair of lawnmowers, it is likely that some spillage of oils and fuels could have occurred over the operational lifetime. Whilst the presence of predominantly clayey soils could inhibit migration of contamination, it is anticipated that some remedial action could be required to remove or otherwise manage soil contamination to provide protection for end users.

It is also possible that the presence of soil contamination would require the use of barrier pipe or ductile iron pipe for water supplies on this site.

Given the presence of Made Ground in some areas of the site, it is possible that ground gas protection measures could be required, subject to further investigation and assessment.

Recommendations

Given the current use of the site, it is anticipated that some form of planning condition would be applied by the Local Planning Authority. This is anticipated to require further investigation and assessment of the site through a staged approach of desk study, intrusive investigations, laboratory testing and assessment. It is likely that some soil contamination will be present and that remedial action will be required to protect end users.

In addition, further intrusive investigation will be required to support the design of foundations and drainage systems on this site.

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



GAVIN ROBERTS CGeol, BEng (Hons), MSc, FGS

Technical Director

Email: gavin.roberts@gesl.net

Enc Figure 1 Site Location Plan
 Figure 2 Trial Pit Location Plan
 Trial Pit Logs



Project:		Bartons Road, Havant		Title		Trial Pit Location Plan	
Client:		Linden Homes Southern Limited		Geo-Environmental Services Ltd			
Ref No:		GE9323		Revision:		0	
Drawn:		GR		Date:		10/05/2013	
Figure:		2		Scale:		Not To Scale	
							
				Geo-Environmental			

SAMPLING & TESTING		STRATA DESCRIPTION	STRATA				
			Legend	mOD	mBGL	Water	S/Pipe
0.20	D(1)	Dark brown silty clay with occasional roots (1-2mm) and rootlets (TOPSOIL).			0.30		
0.50	HPEN=1.2kg/cm2 D(2)	Firm orange/brown and light grey mottled silty sandy CLAY with rare fine sub-angular flint gravel (HEAD DEPOSITS).			0.90		
1.00	HPEN=1.4kg/cm2 D(3)				1.20		
1.50	HPEN=1.2kg/cm2 D(4)	Firm to stiff orange/brown and light grey mottled silty sandy CLAY with occasional medium to coarse sub-angular to sub-rounded flint gravel and flint cobbles (<100mm) (HEAD DEPOSITS).			2.00		
2.00	HPEN=2.6kg/cm2 D(5)				2.50		
2.50	D(6)				3.00		
3.00	D(7)	Very stiff grey/brown CLAY with silt partings and occasional roots (<50mm) (LONDON CLAY FORMATION).					
3.00		End of Trial Pit at 3.00 m					

SAMPLES: D=disturbed B=bulk U=undisturbed TESTS: MAC=macintosh IVAN=vane HPEN=penetrometer SPT=splrt-spoon CPT=cone WATER ∇=strike ▼=rest OTHERS: (2.00)=strata

Stability: No instability encountered	Type: Machine Excavated Trial Pit	Ref: GE9323	Position: TP1
Groundwater:	Method: JCB 3CX	Start: 02/05/2013	Scale: 1:25
Plant: JCB 3CX	Project: Bartons Road, Havant	Finish: 02/05/2013	Size: 3.0m x .70m
Remarks: Back filled on completion of soakage test.	Client:	Filled: 02/05/2013	Depth: 3.00m-BGL
		Eng: EN	Level: -
		Drawn: EN	Figure: FIG
		Ord: EN	Sheet: Sheet 1 of 1

SAMPLING & TESTING		STRATA DESCRIPTION	STRATA				
			Legend	mOD	mBGL	Water	S/Pipe
0.20	D(1)	Dark brown silty clay with occasional roots (1-2mm) and rootlets (TOPSOIL).			0.00		
0.50	D(2)	Firm to stiff orange/brown and light grey mottled silty sandy CLAY with frequent medium to coarse sub-angular flint gravel and occasional flint cobbles (<100mm) (HEAD DEPOSITS).			0.30		
1.00	HPEN=1.8kg/cm2 D(3)				1.30		
1.50	HPEN=1.2kg/cm2 D(4)				1.50		
2.00	HPEN=2.0kg/cm2 D(5)	Stiff grey and brown mottled closely fissured CLAY with occasional silt partings (LONDON CLAY FORMATION).			1.40		
2.50	HPEN=2.0kg/cm2 D(6)				3.00		
3.00	HPEN=2.0kg/cm2 D(7)	End of Trial Pit at 3.00 m					

SAMPLES: D=disturbed B=bulk U=undisturbed TESTS: MAC=macintosh VAN=vane HPEN=penetrometer SPT=spl-spoon CPT=cone WATER =strike =rest OTHERS: (2.00)=strata

Stability: No instability encountered.	Type Machine Excavated Trial Pit	Ref GE9323	Position TP2
Groundwater	Method JCB 3CX	Start 02/05/2013	Scale 1:25
Plant JCB 3CX	Project Bartons Road, Havant	Finish 02/05/2013	Size 2.8m x .70m
Remarks Back filled on completion of soakage test.	Client	Filled 02/05/2013	Depth 3.00mBGL
		Eng EN	Level -
		Drawn EN	Figure FIG
		Ckd EN	Sheet Sheet 1 of 1

SAMPLING & TESTING		STRATA DESCRIPTION	STRATA				
			Legend	mOD	mBGL	Water	St/Pipe
0.20	D(1)	Dark brown silty clay with occasional roots (1-2mm) and rootlets (TOPSOIL)			0.20		
0.50	D(2)	Brown slightly fine sandy silty CLAY (HEAD DEPOSITS)			0.30 0.35		
1.00	D(3)	Soft orange-brown and light grey mottled silty sandy gravelly CLAY. Gravel comprises medium to coarse sub-angular flint (HEAD DEPOSITS)			0.50 0.70		
1.50 1.50	HPEN=1.0kg/cm2 D(4)	Firm grey and orange/brown mottled CLAY with occasional medium sub-angular flint gravel (HEAD DEPOSITS)			1.20 0.80		
2.00 2.00	HPEN=2.0kg/cm2 D(5)	Stiff grey and brown mottled closely to very closely fissured CLAY with occasional silt partings (LONDON CLAY FORMATION)			1.60		
2.50 2.50	HPEN=2.5kg/cm2 D(6)				1.70		
3.00 3.00	HPEN=2.0kg/cm2 D(7)	End of Trial Pit at 3.00 m			3.00		

SAMPLES: D=disturbed B=bulk U=undisturbed TESTS: MAC=macintosh IVAN=vane HPEN=penetrometer SPT=split-spoon CPT=cone WATER ▽=strike ▼=rest OTHERS: (2.00)=strata

Stability: No instability encountered.	Type Machine Excavated Trial Pit	Ref GE9323	Position TP3
Groundwater:	Method JCB 3CX	Start 02/05/2013	Scale 1:25
Plant: JCB 3CX	Project Bartons Road, Havant	Finish 02/05/2013	Size: 3.0m x 7.0m
Remarks: Back filled on completion of soakage test	Client:	Filled 02/05/2013	Depth 3.00mBGL
		Eng EN	Level -
		Drawn EN	Figure FIG
		Ckd EN	Sheet Sheet 1 of 1

SAMPLING & TESTING		STRATA DESCRIPTION	STRATA				
			Legend	mOD	mBGL	Water	S/Pipe
0.20	D(1)	Dark brown silty sandy clay with frequent brick, concrete, metal, wire fabric and plastic (MADE GROUND).					
0.50	D(2)						
1.00	D(3)						
1.50	HPEN=0.8kg/cm2	Soft orange/brown and light grey mottled silty sandy CLAY with frequent medium to coarse sub-angular flint gravel (HEAD DEPOSITS).			1.20		
1.50	D(4)						
2.00	HPEN=1.0kg/cm2	Firm orange-brown and light grey mottled silty sandy CLAY with rare medium to coarse sub-angular flint gravel (HEAD DEPOSITS).			1.80		
2.00	D(5)						
2.50	HPEN=1.0kg/cm2						
2.50	D(6)						
3.00	D(7)	End of Trial Pit at 3.00 m			3.00		

SAMPLES: D=disturbed B=bulk U=undisturbed TESTS: MAC=macintosh IVAN=vane HPEN=penetrometer SPT=split-spoon CPT=cone WATER ▽=strike ▼=rest. OTHERS: (2.00)=strata

Stability: No instability encountered.	Type: Machine Excavated Trial Pit	Ref: GE9323	Position: TP4
Groundwater:	Method: JCB 3CX	Start: 02/05/2013	Scale: 1:25
Plant: JCB 3CX	Project: Bartons Road, Havant	Finish: 02/05/2013	Size: 3.9m x .70m
Remarks: Back filled on completion of soakage test.	Client:	Filled: 02/05/2013	Depth: 3.00mBGL
		Eng: EN	Level: -
		Drawn: EN	Figure: FIG
		Ckd: EN	Sheet: Sheet 1 of 1