

# GROUND INVESTIGATION SERVICES (Southern) Ltd

Our Ref: S.5120

Your Ref:

05 April 2018

Didcot Town Council C/o Building Mechanics Ltd The Old Granary, Martley Court Barns, Martley, Worcestershire WR6 6QA

FAO Tim Studer

**Dear Sirs** 

# SITE INVESTIGATION: EDMUNDS PARK OUTDOOR SERVICES DEPOT, DIDCOT

We write to inform you of the ground conditions encountered in respect of the above and make recommendations with regard to the proposed development. Accordingly, please find enclosed site plan, borehole logs and laboratory test results.

It is understood that the new development will comprise a council depot building in place of the existing depot which will be demolished.

Therefore, prior to development it was required to undertake a geotechnical site investigation to establish ground and groundwater conditions underlying the site to enable foundation design.

Reference to the geological map for the area indicates the site is immediately underlain by bedrock represented by Upper Greensand Formation.

# **GEOTECHNICAL SURVEY**

The investigation comprised the drilling of two boreholes to 3.00m depths with in-situ Standard Penetration Tests (SPTs) performed at regular 1.00m depth intervals in order to provide an indication of the engineering behaviour of the soil. Undisturbed core samples of cohesive material were also retrieved and disturbed soil samples were taken at regular depth intervals.

Site work was conducted on the 12 March 2018. The weather was cold, dry and sunny.

Soil samples were submitted to the chemical laboratories of Evora Jones Laboratories on the 17 March 2018 for analysis of a range of chemical parameters including sulphur, sulphate and pH analysis. Other laboratory tests including sieve analysis, Atterburgs Limits and natural moisture content were undertaken in-house.

All information pertaining to the excavation works above is presented in the Borehole Logs, and with reference to the Notes and Abbreviations Sheet, presented to the rear of this report.

# **RESULTS OF SITE INVESTIGATION**

The results of the ground investigation indicate the site is underlain by a thin mantle of made ground extending down to 0.40m/0.40m depths overlying the Upper Greensand Formation.

Upper Greensand Formation comprises a mantle layer of soft and soft to firm dark brown/grey mottled brown very silty friable clay which transitions to a soft to firm and firm grey mottled brown clayey silt at 1.20m (BH1) and 0.70m (BH2). Roots of various size were recorded in both boreholes, more prominent and larger in BH2 to depths of 1.20m (BH1) and 1.60m (BH2).

These soft to firm layers superpose firm to stiff and stiff buff and olive brown clayey silt which contains significant proportion of very weak angular mudstone gravel which transitions to a very stiff to hard clayey silt, also interpreted as an extremely weak mudstone rock. This sequence continues to the base of the boreholes.

Groundwater was not encountered.

The results of geotechnical laboratory testing indicate the Upper Greensand Formation is classified predominantly as inorganic silt of high compressibility and low/medium shrinkage potential. A single sample from BH1 at 1.00m depth was classified as an inorganic clay of high plasticity and medium shrinkage potential. All samples were normally hydrated.

Chemical testing indicate alkaline pH soil conditions in all samples and very low sulphate/sulphur concentrations.

# **GEOTECHNICAL ASSESSMENT AND FOUNDATION OPTIONS**

New development will comprise single-storey dwelling taking the place of an existing single storey structure due for demolition. Anticipated bearing pressures for the new structures are estimated to be in the order of 30kN/metre run for perimeter walls.

Because the site was previously developed with substructures in place (foundations) and walls above, the soil beneath these load bearing structures will have been compressed to a greater magnitude than neighbouring unstressed soils. The footprint of the new development will overlie both of these soil units and settlement characteristics will not be uniform, i.e. settlement for new foundations will less over previously stressed soils when compared to unstressed soils leading to potential differential settlement.

Therefore the ground beneath the existing foundations will have been stressed to a depth 1½ times the breadth of the foundation (assuming 0.60m wide and 0.90m deep) equivalent to 1.80m deep. Therefore, to avoid the possibility of large differential movements occurring beneath different sections of load bearing walls, trench-fill foundations should be constructed at a minimum depth of 1.80m (based on the above assumptions). At this level, a net allowable bearing pressure of 150kpa has been calculated which means foundations will have to extend to a minimum of 1.80m which would provide an adequate factor of safety against shear failure and limit settlements to within 25mm, based on a coefficient of volume compressibility  $m_v$  of  $0.05m^2/MN$  and a bearing pressure of 30kN/m run for a single storey structure.

Notwithstanding the above, the final depths of all foundations will have to be determined with respect to their proximity to existing trees and hedging on and bordering the site (either those to be removed or retained and future planting), their water demand classification and the shrinkage potential of the soil (medium). In addition, where the foundations are likely to be affected by either shrinkage or where soil heave is recorded or predicted due to vegetation removal they should be designed to withstand these possible effects. Reference to NHBC Standards *'Building near trees'* Chapter 4.2 is recommended for design, specifically the relevant depth tables (Tables 12-21).

It is recommended suspended ground floor slabs are adopted for the development as a result of the potential for future clay soil shrinkage and swelling. Reference to NHBC Standards, Chapter 5.2 – *Suspended Floors* is advised.

Excavations, primarily for service and foundation trenches should remain stable in the medium to long term but will require temporary shoring if left open for a prolonged period of time. It is recommended all excavations in excess of 1.20m should be supported at all times in compliance with health and safety at work requirements.

Excavations should be regularly inspected by a competent person to ensure continued safety. Further advice on the safety of excavations is given in HSE - *The Construction (Health, Safety and Welfare) Regulations 1996* and *Health and Safety in Excavations HSG 185*.

# **BURIED CONCRETE SPECIFICATION**

The results of the laboratory testing indicate sulphate concentrations of less than 0.5 g/l (2:1 water : soil extract), with pH values in excess of 5.5pH. Such results, for a site which is neither brown-field nor pyritic with potentially mobile groundwater conditions, conform to Design Sulphate Class DS-1 and ACEC Class AC-1 conditions of BRE Special Digest 1. Therefore the designer should use the above classification in order to produce the concrete specification for sub-surface concrete.

Should you have any queries with regard to the report, please do not hesitate to contact the undersigned.

For and on behalf of Ground Investigation Services (Southern) Ltd Yours sincerely

Martyn P Boughton (Director)

Email: <u>martyn@gis-geotec.com</u>

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Borehole Location Plan Borehole Logs and Notes and Abbreviations Sheet Laboratory Test Data



# KEY 1

## NOTES ON EXPLORATORY HOLE RECORDS

## **GENERAL NOTES**

### 1 OPERATING PROCEDURES

The procedure used for cable percussion boring, rotary drilling, trial pitting, sampling, in situ and laboratory testing and sample descriptions are generally in accordance with BS5930: 2015 Code of practice for ground investigations, BS EN ISO 14688-1:2002 'Geotechnical investigation and testing – Identification and classification of soil – Part 1 Identification and description', BS EN ISO 14689-1:2003 'Geotechnical investigation and testing – Identification and classification of rock – Part 1 Identification and description' as appropriate, and BS1 377:1990 'Methods of test for soils for civil engineering purposes', unless stated otherwise.

### 2 GROUNDWATER

Exploratory hole water levels are recorded together with the depths at which seepages or inflows of water are detected. These observations are noted on the Records, but may be misleading for the following reasons:

- a) The exploratory hole is rarely left open at the relevant depth for a sufficient time for the water level to reach equilibrium.
- b) A permeable stratum may have been sealed off by the borehole casing.
- c) Water may have been added to the borehole to facilitate progress.
- d) The permeability may have been altered by the excavation/boring/drilling process.

Standpipes or piezometers should be installed when an accurate record of groundwater level is required, however, it should be noted that groundwater levels may vary significantly due to seasonal, climatic or man made effects. Water levels recorded during the investigation and any advice or comment made accordingly may, therefore, not be appropriate to particular foundation, geotechnical design, or temporary works solutions. Long term monitoring of standpipes or piezometers is always recommended when water levels are likely to have a significant effect on design.

#### 3 CHISELLING

The remarks in the Borehole Records contain information on the time spent advancing the borehole by 'Chiselling Techniques', and the depth of borehole over which it was required. Such information may be affected by a wide range of variable factors, unrelated to the geotechnical properties of the strata. Such factors include, but are not restricted to: plant, equipment and operator. The data should, therefore, only be used subjectively and with extreme caution.

#### 4 IDENTIFICATION AND DESCRIPTION OF SOILS - SEE SEPARATE SHEET

The identification system follows the Company's Engineering: Geotechnical Procedures Manual which is based on BS EN ISO 14688-1:2002 and appropriate clarifications in the National Foreword, BS 5930:2015 and BS EN ISO 14689- 1:2003

Relative density terms are given where supported by SPT N values, with the exception of Made Ground. The field assessment of compactness or relative density for coarse grained soils is only given on trial pit records where appropriate assessment of the soils has been undertaken.

Where the terms 'soft to firm', 'firm to stiff' etc. are used they indicate a strength which is close to the borderline between the two terms and cannot be precisely defined by inspection only, and/or which is indicated as borderline or ranging between the two terms after consideration also of in situ and laboratory test results. Consistencies may have been amended in the light of test results

Where 'to' links two terms, as in 'slightly sandy to sandy' this again represents a borderline case or a range, where the precise proportions cannot be determined as outlined previously.

The name of the geological formation is only given where this has been requested and can be determined with confidence (see Clause 41.5 of BS 5930:2015).

### 5 INTERPRETATION OF THE RESULTS OF THE INVESTIGATION

The description of ground conditions encountered and any engineering interpretation included in the report are based on the results of the boreholes and trial pits and the field and laboratory testing carried out. There may be ground conditions at the site which have not been revealed by the investigation and consequently have not been taken into account.

Any interpolation or extrapolation of strata between exploratory holes shown on any cross sections or site plans is an estimate only of the likely stratification based on general experience of the ground conditions and is subject to the interpretation of the reader.

The term "TOPSOIL" is used in this report to describe the surface, usually organic rich, layer including turf, subsoil and weathered material with roots. The use of this term may not imply that the soil satisfies the requirements of Clause 3 of BS 3882:2015, 'Specification for topsoil', or is suitable for general horticultural and agricultural purposes.

Laboratory test results in this report give the soil properties of individual specimens tested under specified conditions. Individual results or groups of results may not be appropriate for use as design parameters for some geotechnical analyses. The samples may be non-representative, disturbed internally, or prepared and tested under conditions suited for different geotechnical applications. Unless the selection of design parameters is discussed in this report, it is recommended that the advice of a Geotechnical Specialist is sought.

## NOTES ON EXPLORATORY HOLE RECORDS

## IN SITU TESTING AND SAMPLING

### STANDARD PENETRATION TESTS

- S() Standard Penetration Test (SPT). A 50mm diameter split barrel sampler is driven 450mm into the soil using a 63.6kg hammer with a 760mm drop. The penetration resistance (also known as the 'N' value) is expressed as the number of blows required to obtain 300mm penetration below an initial seating drive of 150mm which is taken through any ground which may be disturbed at the base of the borehole. The test is usually completed when the number of blows recorded during the test drive only reaches 50 in soils or 100 in weak rock. If a sample is not recovered in the sampler, a disturbed sample is taken on completion of the test and given the same depth as the top of the Standard Penetration Test drive.
- C() Standard Penetration Test carried out with a 60 degree cone. The test is usually conducted in coarse granular soils or weak rock using the same procedure as for the SPT, but with a 50mm diameter, 60 degree apex, solid cone fitted to the split barrel. A bulk disturbed sample is taken and given the same depth as the top of the test drive.

The depth on the borehole record at the left hand side of the 'depth' column is that at the start of the normal 450mm penetration. Where the full penetration of 300mm for the test drive is obtained, the penetration resistance ('N' value) is reported in the 'SPT Blows/N' column. If the full penetration of 300mm in the test drive is not obtained, then the length of drive (test length in mm) and the penetration resistance (number of blows) are both reported. Blows through the initial seating drive (normally 150mm) are not reported.

in the 'Test Length' column denotes that the blows and penetration were all in the initial Seating Drive section.

#### **OTHER IN SITU TESTS**

The following in situ tests are reported on the **Exploratory Hole Records**, in the 'Test' or 'Type' and 'Results' columns where appropriate.

- k In situ Permeability Test refer to detailed test results for permeability values
- PMT Pressuremeter Test refer to detailed test results for modulus values, etc.
- VN/R() Borehole Shear Vane Test (undrained shear strength cu in kPa) refer also to detailed test results, N 'Natural' or peak shear strength, R Remoulded shear strength
- VN/R() Hand Shear Vane Test (Direct reading of undrained shear strength in kPa). 'N' and 'R' as above. The values are indicative and should not be taken as being equivalent to laboratory test results. The Pilcon vane results have a factor varying from about a sixth for the 33mm vane to a third for the 19mm vane which reduces the BS1 377 shear vane value. The values presented are therefore approximate and should be treated with great caution if used for design purposes
- PP() Pocket Penetrometer. Unconfined Strength (UCS) reported in kg/cm<sup>2</sup> to the nearest 0.25 kg/cm<sup>2</sup> or kPa with the same accuracy. Equivalent c<sub>u</sub> in kPa is very approximately UCS x 50. Pocket Penetrometers are an aid to logging of cohesive soils, the results are indicative and should not be relied upon. The equipment used is not calibrated
- CBR() California Bearing Ratio Test (CBR%) refer also to detailed test results
- PID() Photo-Ionisation Detector Readings in headspace of small disturbed chemical samples. Result given in ppm by volume

#### SAMPLES

- U General purpose open tube sample. Sample normally taken with open tube sampler approximately 0.1m diameter and 0.45m long and driven with 80kg sinker bar and 56kg sliding hammer, unless noted otherwise. "XX" in U100 blows column denotes the number of hammer blows. The height of hammer drop can be variable depending on operator technique. Depths are given to the top of the sample if full penetration and recovery are achieved, otherwise actual lengths of penetration and recovery are given in the appropriate columns.
- U(X) General purpose open tube sample (X) mm diameter
- TW(X) Thin wall (push) sample (X) mm diameter
- P(X) Piston sample (X) mm diameter
- CBR Sample taken in CBR Mould
- D Small disturbed sample (plastic tub or jar with air tight lid)
- B Bulk disturbed sample (polythene bag, tied at neck size dependent on purpose)
- W Water sample
- # Sample not recovered
- C Core sample (CS short core, generally about 100mm; CL long core, generally 200mm to 300mm)

CD	Sample for chemical analysis in a plastic tub	К	Sample for chemical analysis in an amber
			glass jar
V	Sample for chemical analysis in a glass vial	CDKV	Set of samples for chemical analysis as above
WAC	Sample for Waste Acceptance Criteria		
ES	Environmental Sample	EW	Environmental Water Sample

## Recommended symbols for soils and rocks – BS 5930:2015



Made ground



Topsoil



**Boulders and Cobbles** 



Gravel



Sand



Silt



Clay



Peat

Composite soil types may signified By combined symbols, e.g.

• • • • • •

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Mudstone/Claystone



Sandy CLAY with a trace of fine medium gravel



Silty slightly clayey SAND





Limestone

Brecia

Coal

Shale

Siltstone

Sandstone



Conglomerate

# NOTES ON EXPLORATORY HOLE RECORDS

## **IDENTIFICATION AND DESCRIPTION OF SOILS**

	Basic Soil Ty	ре	Particle Size (mm)	e	Visual Identification	Composite Soil T (Mixtures of basic	<b>ypes</b> soil				Density / Cor	nsistency / Pea	at Condition																					
LS6					Large Boulders >630mm. These soils only seen complete in pits	Scale of secondary coarse soils. Term	constitu before	ents with . descript	coarse and on after	very	For very coar	se soils qualitat	tive description																					
Very Coai Soils	COBBL	.ES		200	or exposures. Often difficult to recover from boreholes.	Term before (term in ' [ ] ' may	ype	Descript	ion offer	Approx %2 <sup>nd</sup> ry	by inspecti- packaging.	on of voids	and particle																					
			coarse	63	Easily visible to naked eye; particle shape can be described, grading can	be used for 2 <sup>nd</sup> ry parts, matrix etc)	Princip Soil T	Descript	ion allei	soil type	Standard Per for Coarse S	etration Test i	n Boreholes																					
			medium	20	be described. Well graded: wide range of grain	Slightly (sandy*)	<b>Z</b> 0/	Used to	describe	-5	No of blows	Relative Dens	sity																					
(se	GRAVE	EL		6.3	sizes, well distributed. Poorly graded: not well graded. (May be uniform:	[occasional / little]	R	seconda	ry ts.	~5	4-10	Loose																						
(səz			fine		narrow limits; or gap graded; an intermediate size of particle is	[some]	BLES ( notes)	e.g. Grave fine and me subangula	el is edium r fine	5 – 20	10-30	Medium Dens	Medium Dense																					
ivel Si		coarse		2	markedly under represented). Visible to naked eye; no cohesion	Very (sandy*) [much / many]	(COB (See I	sandston	e and e.	20 to 40†	30-50	Dense																						
Gra			coarse	0.63	Well graded and poorly graded: as		VEL				>50	Very Dense																						
E SOILS ly over 65% Sand 8	SAND		medium	0.2	above		SAND. GRA BOULD	and (sand*) or and (cobbles+)		50†	Slightly cemented	Visual Examir removes soil ir can be abrade	nation: pick I lumps which ad.																					
COARSI		fine				<ul> <li>Fine or coarse</li> <li>Very coarse</li> <li>described as</li> </ul>	e soil ty soil type fine soi	pe as app e – see No I dependir	opriate tes g on beha	viour																								
<u> </u>			coarse	0.063	Only coarse silt visible with hand lens;	Scale of secondary	constitu	ients with f	ine soils. T	erms	Silty CLAY or	clayey SILT – u	se prefix only																					
	SILT	medium 0.02			exhibits little plasticity and marked dilatancy; slightly granular or silky to touch. Disintegrates in water; lumps day guidther personance polycian but	before, description	jatter p		nstituent.	Approx % 2 <sup>™</sup> ry	when seconda affect on ma 'slightly' or 've	ry constituent has significant erial characteristics. Terms ry' not applicable.																						
<u> </u>		0.0063 fine			fine		fine		fine		fine		fine		fine		fine		fine		fine		fine		0.0063	powders easily between fingers.	lerm before	Princi Soil T	Descript	ion after	soil type	Consistency		
ay Sizes	iy Sizes)		0.002		Term "SILT" or "CLAY" must be used, "SILT/CLAY" not allowed.	Slightly (sandy*)			escribe ents of ry	<35	Very soft	Finger easily p 25mm. Exus fingers	oushed in up to des between																					
& CI					Dry lumps can be broken but not	(sandy*)	OR	constitue	nts elly	35 to 65†	Soft	Finger push 10mm, Mould	ed in up to ed by fingers																					
5% Silt	CLAY				also disintegrate under water but more slowly than silt; smooth to the	Very (sandy*)	сгау	sandy Cl Gravel is rounded	_AÝ. coarse quartzite	>65†	Firm	Thumb mak easily. Rolls to	es impression o thread																					
ILS ly over 3					dilatancy; sticks to the fingers and dries slowly; shrinks appreciably on drving usually showing cracks.	* Coarse soil type † or described as co behaviour	as appi arse soi	opriate I depending	g on mass		Stiff	Can be indent thumb. Crumb	ted slightly by les if rolled																					
NE SO ypical									Intermediate and high plasticity clays show these properties to a moderate	EXAMPLES OF COM (indicating preferred of	IPOSITE	TYPES lescription)			Very Stiff	Indented to Cannot be mo	by thumbnail.																	
шE					and high degree, respectively.	Loose brown very san	gular coarse	GRAVEL wi	th many	Hard	nail	ied by thumb																						
ы	ORGAN	IIC			Contains varying amounts of organic vegetable matter - defined by colour:	Firm thinly interlaminat	SILT and CL	AY. Dense l	ght	Firm Peat	Fibres compre	essed together																						
gani ils	CLAY, SILT or		Varies		grey - slightly organic;	brown clayey fine and	l medium	SAND.			Spongy Peat	Very compres	sible, open																					
sõ	SAND				black – very organic.						Plastic Peat	Moulded in ha	and, smears																					
Structur	е												Particle Nature																					
Term	F	Field	Identification			Interval Scales							Particle Shape &																					
Homo- geneous	[	Depos	sit consists e	ssentially	of one type	Scale of Bedding	Spacinę	9	Mean Spa (mm)	acing	Scale of Spacin Discontinuities	ng of Other s / [Blocks]	Form																					
Interbed interlami	ded or A inated in	Alterna n equ	ating layers on al proportion dinate layers	of varying s. Otherw defined	types. Pre-qualified by thickness term if ise thickness of, and spacing between,	Very thickly bedde	ed		over 200	0	Very widely spa large]	iced / [Very	(Sub) angular (Sub) rounded Well rounded																					
Hetero- geneous	/	A mix	ture of types			Thickly bedded			2000-60	D	Widely space	d / [Large]	Low Sphericity																					
Weathered (granular)	d )	Partic	les may be w	veakened	and may show concentric layering	Medium bedded			600-200		Medium spac	ed / [Medium]	Flat or Elongate																					
Weathere (cohesive	ed ( e)	Usually has crumb or columnar struct			nar structure	Thinly bedded			200-60		Closely space	d / [Small]	High Sphericity																					
Fissured	Breaks into blocks along unpolished discontinuities				olished discontinuities	Very thinly beddee	d		60-20		Very closely /	[Very small]	Cubic																					
Sheared	E	Breaks into blocks along polished discontinuities No fissures				Thickly laminated			20-6		Extremely clo	sely spaced																						
Fibrous F	Peat F	No fissures Plant remains recognisable and retain some strength. When squeezed only water, no solids Plant remains recognisable, strength lost, Partial decomposition.				Spacing terms ma laminae, desiccati	ay also on crac	be used fo ks, rootlets	r distance etc. Term	between is such as	partings, isolate	ngs, isolated beds or ings or dustings may be																						
fibrous Pe	us Peat Turbid water when squeezed, <50% solids			, <50% solids	used for laminae	less tha	n 2mm an	a less tha	n 0.6mm r	espectively.		Toxture																						
Peat Gyttia	א פו פ 1	kecog iquee Decor	nisable plant zed only pas mposed plant	temains at te with >5 t & animal	sent, full decomposition. When 0% solids remains, maybe inorganic constituents	Discontinuity S (See Standard	hape for	Small s Mediun	cale (mm' n scale (cm	s) rough, s ì's) planar,	h, smooth nar, stepped, undulating		Rough Smooth Polished																					
Humus		Plant	remains, livir	ig organis	ms & inorganic constituents in topsoil	Persistence/Openi	ness)	Large s	scale (m's)	wavy, cur	vea, straight																							
NOTES	Identifi	ration	and descrip	tive metho	and descriptions, generally in accorda	ance with BS5030-20	115 Sec	tion 6 cla	1505 41 ar	d 43 and I		88 1.2002																						

NOTES Identification and descriptive method, and descriptions, generally in accordance with BS5930:2015 Section 6 clauses 41 and 43 and BS EN ISO 14688-1:2002 Additional notes relating to BS EN ISO 14688-2:2004 – modified terms for content of secondary fraction given in Annex B Table B1 are not comparable to 5930 and are not be used. Organic Content :- Low – 2 to 6%; Medium – 6 to 20%; High – >20%. Terms not used on borehole records Carbonate content :- Only noted if field test with dilute HCI undertaken – Carbonate free if no effervescence; Calcareous if slight effervescence; Highly calcareous if strong reaction Undrained shear strength :- terms from laboratory or in situ tests not given on borehole records. Very Coarse Solls – described by initially removing very coarse materials and describing residue before adding back the very coarse soils. If residue is cohesive then described as ' (COBBLES / BOULDERS) with low (cobble / boulder) content with (some / much etc) matrix of ' If residue is granular then described as ' with matrix of ' or as a coarse soil. **Cobbles** :-<10% - low cobble content; 10 to 20% - medium content; >20% - high content; **Boulders** <5% - low boulder content; 5 to 20% - medium content; >20% - high content

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1.00-1.45 1.00-2.00	2/D 3/U1	S 01	1	1	3	4	4	12			1.00-2.00 100%			(0.30)	× <u>0</u> × <u>0×</u>	with some	e fine medium	angular very	/ weak	mudstone			1-	
-														1.20	$\times$ $\times$ $\times$ $\times$ $\times$ $\times$ $\times$ $\times$ $\times$	gravel and Stiff buff a	d some fine 2n and olive browr	nm ø roots n clayey SIL	T with r	nuch fine		_		
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														1.70	<u>x</u> × ×	Hard clay	ey SILT (extre	mely weak N	NUDST	ONE)		_		
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														12.03.18 12.03.18	14.00	dry			nil nil	d	Iry			
Key														REMARK	s					Logaed by:	N	IPB		
U B	Undistur Bulk san	bed Sa nple	ample	е						SPT/S SPT/C		Split Spoo	1							Date:	1:	2.03.18		
DW	Disturbe	d Sam	ple							HSV Hand no	'n	Hand Shea	ar Vane							Checked by	/ JI	MH		
E	Environr	nental	Glass	s Jai	r/Plas	stic t	tub					Groundwa	er strike	Woathor	Cold and dry					Date: Approved h	0- y .11	4.05.18 M		
For explanation	of symbols	and at	n Del	iecto	s see	e prefa	ace t	to Bo	rehole rec	ords. All (	depths in r	oroundwa	er standing	weather: (	Joid and dry			Scale : 1	1:30	Date	0	5.04.18		
Gro	For explanation of symbols and abbreviations see preface to Borehole Ground Investigation																			Repo	ort No.	Fi	aure	

Services (Southern) Ltd 40 Home Close, Wootton OX13 6DD Tel 01865 326011

**BOREHOLE LOG** 

S.5120 2

G	S		(	3F S	R( O	0 )(	U JT	NC He	) IN ERM	IVE N) L	STI	GAT	ION S	ERVI	CES			<b>Date</b> April 20 <sup>2</sup>	18	Bor	ehole N <b>ГWO</b>	о.
								(		NT					Ground I	Level (m OD)	Co	o-ordina	ates	S	neet 1 of 1	
							Die		low						Boring	g Method:	Diamete	r of (cas	sings) and	Report No		
Edmo	nds Pa	ark	Οu	utd	00	or S	Sei	rvice	s Dei	oot. I	Park R	load. Die	dcot OX1	1 8QX	Windowless Sampling 101 & 116					, re	5120	
Lanto	SAMI		5.0	N	ייי	FS	TS	1100		- <u>-</u>	Water	Reduced	Denth								.0120	
Depth metres	Type & No.	SP	T reco rat	ords tio = i	er 80%	nergy	N' Value	PID ppm	HSV kN/m2	Windowless ample Recove	depth	Level m (AOD)	(thickness)	Legend		Str	ata Descr	iption			Backfill/ Installatio	Depth
GL - 1.00	1/U116	41	~	ĸ	ĸ	~				GL-1.00 90%			-		Gravel dr	essing over da	ırk brown gi	ravelly C	CLAY		ARISING	3
													0.20		Soft dark	greyish brown	sandy CLA	Y with n	nuch mediur	n	-	
													0.40	$\sim \sim \sim$	coarse gr	avel sized stor ROUND	ne and tarm	ac				
-													(0.30)	<u> </u>	Soft light	grey gravelly C	CLAY					
-													- 0.70	<u>× × ×</u>	Soft to fire	m dark brown f	riable claye	ey SILT v	with some		-	
1.00-1.45	2/DS	1	1	1	2	2	6			1.00-2.00			(0.40)	_ × ×× _ ×	10015 <20	dinin b						1-
1.00-2.00	3/U101									100%			1.10	× × ×	Soft to fire	m grey mottled	brown clay	vey SILT	with some		-	
-													(0.50)	_ <u>× ×</u> ×	roots <10	mm ø						
-														×× × × ×								-
													- 1.60	×	Firm to st	iff light grey mo	ottled olive I	brown fr	iable clayey		-	
-														× <sub>o</sub> × <sup>o</sup> ×	GRAVEL	medium coars	e angular v	ery wea	ik mudstone			
2.00-2.45	4/DS 5/U101	4	3	6	9	15	33			2.00-3.00 100%			(0.80)	× v × v v	2.00m - v	ery stiff to harc	1					2 -
_														×°×°×								
																		MUDOT			-	
-														<u>× ~ ×</u> <u>× ××</u>	Hard clay	ey SILT (extrei	mely weak	MUDST	ONE)			-
_													(0.60)	~ × ×								
0.00.0.45	0/20						40							^ <u>x * ×</u>		REENSAND	FORMATIO	N				
_ 3.00-3.45	6/05	9	9	9	11	14	43						3.00	)							-	3 -
-																						
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	Casing	Poo	ord							hicolli		ard	<u> </u>		Water love	Observation	c (donthe	in motr	as bolow Gl	<u>,</u>		5
Date	Dia	ım' (m	im)	<u> </u>	De	əpth		т	ime	Fro	om (m)	To (m)	Date	Time	strike	Water level (after 20min)	Flow	Casing I	evel Standi	ng	Remarks	
													12.03.18 12.03.18	14.00	dry	(		nil nil	dry			
Kev													DEMOS						Loggest			
U	Undisturbe	d Sam	ple						SPT/S		Split Spoo	n	REMARK	3					Logged by: Date:	MP 12.0	⊃ )3.18	
B	Bulk sampl	e Sample							SPT/C HSV		Solid Cone Hand Shea	ar Vane							Checked by	JM	4	
E	Water Sam Environme	ple ntal Gla	ass J	ar/Pl	lastic	c tub			Hand pe	n'	Hand pene Groundwa	etrometer ter strike		- · · · ·					Date:	04.0	)4.18	
PID For explanation	Photo-ionis of symbols a	ation D Id abbre	etec	tor ms se	ee pre	eface	to Bo	prehole rec	Cords. All o	lepths in n	Groundwa netres. Logg	ter standing ed in accordance v	Weather: with BS5930:2015	Cold and dry			Scale :	1:30	Date	JM 05.0	)4.18	
Gro	ound In	ves	tiga	atio	on														Report	No.	Figu	re

Ground Investigation Services (Southern) Ltd 40 Home Close, Wootton OX13 6DD Tel 01865 326011

**BOREHOLE LOG** 

S.5120 3

Sample		Sample	Moisture	Liquid	Plastic	Plasticity	Mass	ential	ines	on 1990	Sample			
Ref No.	No.	Depth	content	Limit	Limit	Index	Passing 425µm	ikage pot	3C Guidel	lassificati 377-Part 2:	Description			
		m	%	%	%	%	%	Shrir	HN	CI BS 1				
BH1	1	1.00	39	61	34	25	100	ſ	М	СН	Silty CLAY			
BH1	3	2.00	38	58	39	19	100		L	МН	Clayey SILT			
BH2	1	1.00	39	52	32	20	95	L	/M	МН	Clayey SILT			
BH2	5	3.00	27	56	31	25	100	ſ	M	МН	Clayey SILT			
REMARK	(S:				CL CI CH	Inorganic CLAN Inorganic CLAN Inorganic CLAN	/ low plasticity / medium plastic / high plasticity	city		ML MI MH	Inorganic SILT low compressibility Inorganic SILT medium compressibility Inorganic SILT high compressibility			
					CV CE N	Inorganic CLAN Inorganic CLAN Non shrinkabili	<pre>/ very high plast / extremely high ty</pre>	icity plastic	city	MV ME (O)	Inorganic SILT very high compressibility Inorganic SILT extremely high compressibility Organic matter	ły		
					L M H	Low shrinkabili Medium shrinka High shrinkabil	ty ability ity							
CLI	ENT:	Didcot T	own Coun	cil					3.	<b>Fest Met</b> 2 Nat	nods - BS 1377 : Part 2 : 199 ural moisture content	0		
	SITE:	Edmond Didcot O	s Park Out X11 8QX	door Ser	vices De	pot, Park	Road,		4.	3 Liqi me	id limit - cone penetrometer hod (definitive method)			
D	ATE:	29 March	2018						5.	3 Pla	tic limit and plasticity index			
Gr Ser	ound /ices	(Southerr	tion n) Ltd		INDEX PROPERTIES						Report No. Ta	ble		
40 Hor	ne Clos Tel 0	e, vvootton O 01865 326011	K13 6DD								S.5120 1			



Ground Investigation Services

40 Home Close

Wooton

Oxon OX13 6DD

# Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8P

Unit 3 Deeside Point Zone 3 Deeside Industrial Park Deeside CH5 2UA

## Tel: +44 (0) 1244 833780 Fax: +44 (0) 1244 833781



Attention :	Martyn Boughton
Date :	29th March, 2018
Your reference :	
Our reference :	Test Report 18/4208 Batch 1
Location :	Edmunds Park Didcot
Date samples received :	21st March, 2018
Status :	Final report
Issue :	1

Three samples were received for analysis on 21st March, 2018 of which three were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

**Compiled By:** 

illaumed.

Lucas Halliwell Project Co-ordinator

#### Exova Jones Environmental Client Name: Ground Investigation Services Report : Solid Reference: Location: Edmunds Park Didcot Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub Martyn Boughton Contact: JE Job No.: 18/4208 J E Sample No. 2 3 1 Sample ID BH1 BH2 BH2 1.00 1.00 3.00 Depth Please see attached notes for all abbreviations and acronyms COC No / misc Containers Т т т Sample Date 12/03/2018 12/03/2018 12/03/2018 Sample Type Soil Soil Soil Batch Number 1 1 1 Method LOD/LOR Units No. Date of Receipt 21/03/2018 21/03/2018 21/03/2018 TM30/PM15 Sulphur as S <0.01 <0.01 0.03 < 0.01 % TM50/PM29 Total Sulphate as SO4 BRE <0.01 0.05 0.02 <0.01 % TM38/PM20 <0.0015 <0.0015 0.0083 <0.0015 Sulphate as SO4 (2:1 Ext)# g/l TM73/PM12 8.00 8.74 8.36 <0.01 ъН pH units

# Exova Jones Environmental

**Notification of Deviating Samples** 

Client Name: Ground Investigation Services

Reference:

Location: Edmunds Park Didcot

Contact:

Martyn Boughton

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
					No deviating sample report results for job 18/4208	

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

## NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 18/4208

### SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCI (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

### WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

### **DEVIATING SAMPLES**

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

### SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

### DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

### BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

### **REPORTS FROM THE SOUTH AFRICA LABORATORY**

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

## ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa.
В	Indicates analyte found in associated method blank.
DR	Dilution required.
М	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
СО	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
Ν	Client Sample
ТВ	Trip Blank Sample
OC	Outside Calibration Range

# Exova Jones Environmental

### **JE Job No:** 18/4208

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	Dried and ground solid sample is boiled with dilute hydrochloric acid, the resulting liquor is then analysed.			AD	Yes
ТМ73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

Method Code Appendix