From:	Gemma Keenan
To:	Tracey Williams
Cc:	[redacted]
Subject:	Norfolk Vanguard - Email 10 of 18 Deadline 1 Submissions
Date:	16 January 2019 15:27:19
Attachments:	ExA;WQApp16.4;10.D1.3 Norfolk Vanguard WQ Appendix 16.4 Crossing 3 GI.pdf

Dear Tracey

This is email 10 of 18 of the Applicant's submission for Norfolk Vanguard Examination Deadline 1.

We enclose the following documents:

Appendix to Written Questions:

- Appendix 16.4 TerraConsult Crossing 3

Please could you kindly confirm receipt.

Best Regards

Gemma Keenan BSc, MIEMA, CEnv
Senior Environmental Consultant

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VATTENFALL

Norfolk Vanguard Offshore Wind Farm

The Applicant Responses to First Written Questions

Appendix 16.4 – TerraConsult 2017 Ground Investigations Report: Crossing 3 (Q16.8)

Applicant: Norfolk Vanguard Limited
Document Reference: ExA;WQApp16.4;10.D1.3
Deadline 1

Date: January 2019

Photo: Kentish Flats Offshore Wind Farm

TerraConsult

November 2017
Report No 3318-R003-3

East Anglia (North) Offshore Wind Farm

Crossing 3 Site Investigation

Carried out for:

Gutteridge, Haskins and Davey Ltd (GHD)

East Anglia (North) Offshore Wind Farm

Crossing 3 Site Investigation

Date: November 2017

Report No 3318-R003-3

Prepared for:

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DOCUMENT INFORMATION AND CONTROL SHEET

Document Status and Approval Schedule

Report No.	Title
3318-R003-3	East Anglia (North) Offshore Wind Farm Crossing 3 Site Investigation

Prepared by:	**Victoria Smith**	[redacted]	**Engineering Geologist**
Approved by:	**Derek Daniels**	[redacted]	**Operations Manager**
Date:	**03/11/17**		

Issue:	Date:	Description:	Prepared by:
1	11/10/17	Draft for Approval	VS
2	01/11/17	Final	DD
3	03/11/17	Final (minor amendments)	DD

East Anglia (North) Offshore Wind Farm

Crossing 3 Site Investigation
CONTENTS

DRAWINGS

APPENDICES

East Anglia (North) Offshore Wind Farm

Crossing 3 Site Investigation

1 INTRODUCTION

TerraConsult Limited (TCL) was commissioned by Gutteridge, Haskins and Davey Ltd (GHD) to carry out a ground investigation for the proposed cable route crossing the River Wensum, near Swanton Morley, Norfolk.

This report presents the factual records of the fieldwork and laboratory testing. The data is also presented separately in digital format following AGS4 (2011).

The scope of the investigation, which was specified by GHD, comprised:

- Boreholes formed by cable percussive techniques;
- In situ testing comprising of;
  - Standard penetration tests in boreholes;
  - Variable head permeability testing;
- Post fieldwork monitoring and sampling;
- Geotechnical laboratory testing;
- Geoenvironmental laboratory testing;
- Factual report (GIR) and AGS data.

The investigation was carried out in accordance with the contract specification and relevant standards (see References). The fieldwork was carried out between 04/08/17 and 14/08/17.

Whilst every attempt is made to record full details of the strata encountered in the exploratory holes, techniques of exploratory hole formation and sampling will inevitably lead to disturbance, mixing or loss of material in some soils and rocks.

All information given in this report is based on the ground conditions encountered during the site work and on the results of laboratory and field tests performed during the investigation. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations and water conditions between or below exploratory holes. It should be noted that groundwater levels, gas concentrations and gas flows usually vary due to seasonal, atmospheric and/or other effects and may at times differ to those measured during the investigation.

2 SITE DESCRIPTION

2.1 Location and Topography

The site is located approximately 6.9 km north-east of the centre of Dereham, Norfolk. The approximate location of Crossing 3 is located between Ordnance Survey National Grid Reference TG 042 176 and TG 040 176. A site location plan is presented as drawing reference 3318(C3)D001-1.

2.2 Published Geology

The online British Geological Survey (BGS) 1:50,000 scale map shows the site to be underlain by clay, silt, sand and gravel Alluvium overlying river terrace deposits. Beneath this lies the White Chalk Subgroup.

3 FIELDWORK

3.1 General

Fieldwork was undertaken between 04/08/17 and 14/08/17. The scope of the works, as provided by GHD comprised:

Table 1: Scope of Intrusive Works and In Situ Testing

Exploratory Hole/In Situ Test Type	Proposed number
Cable percussion, SPTs, variable head permeability test, install	BH17-C3-01
Cable percussion, SPTs, variable head permeability test	BH17-C3-02
Cable percussion, SPTs, variable head permeability test, install	BH17-C3-03
Cable percussion, SPTs, variable head permeability test	BH17-C3-04

The exploratory hole locations were selected by GHD. The locations were set out by the GHD site representative prior to commencement.

3.2 Exploratory Holes

The exploratory holes were logged by an engineer in accordance with the recommendations of BS5930:2015, which incorporates the requirements of BS EN ISO 14688-1, 14688-2 and 14689-1. Methods of formation and geological descriptions, together with sample records, in situ test results and observations made during formation of the exploratory hole are given in the logs presented in Appendix A and should be read in conjunction with the Key included therein. Sample photographs are presented in Appendix B.

A summary of the exploratory holes formed is listed in the following table.

Table 2: Summary of Exploratory Positions

Exploratory position:	Type:	Final depth (m):	Easting (mE):	Northing (mN):	Level (mAOD):	Start date:	End date:
BH17-C3-01	CP	16.50	604035.95	317597.72	17.53	08/08/2017	09/08/2017
BH17-C3-02	CP	17.00	604062.91	317610.41	16.84	04/08/2017	07/08/2017
BH17-C3-03	CP	20.00	604265.31	317755.75	23.57	09/08/2017	11/08/2017
BH17-C3-04	CP	17.10	604294.24	317784.53	22.33	11/08/2017	14/08/2017

Type: CP – cable percussion;

Prior to commencement, all exploratory positions were checked for services by reference to available plans, visual inspection and CAT survey. Inspection pits were excavated by hand and rechecked with a CAT at all borehole locations.

An exploratory hole location plan is presented as drawing 3318(C3)D002-1.

3.3 Sampling

Samples for geotechnical and geoenvironmental testing and strata description were taken during the formation of the exploratory holes in general accordance with the specification, BS5930:2015, BS10175:2011 and BS EN ISO 22475-1:2006. Soil and water samples for geochemical analysis were taken in accordance with the specification and stored in cool boxes for despatch directly to Concept Life Sciences (Formerly Scientific Analysis Laboratories, SAL) in Braintree, Essex.

A summary of water samples taken from monitoring installations is presented in Appendix C.

3.4 In Situ Testing

In situ testing was carried in accordance with BS 5930:2015, BS 1377-9 (1990), BS EN ISO 22282-1:2012 and BS EN ISO 22282-2:2012 unless otherwise stated. SPT results are presented on individual exploratory hole logs. Information relating to the identification and calibration of SPT hammers can also be found on the individual borehole logs. Hammer calibration certificates are presented in Appendix F. Due to the nature of the strata within which water strikes were encountered, no variable head permeability tests were undertaken at this site.

3.5 Instrumentation and Monitoring

Details of instrumentation installed is presented on the exploratory hole logs. A summary of the installed instrumentation is listed in the following table.

Table 3: Summary of Instrumentation

Exploratory position:	Instrument type:	Instrument reference:	Internal diameter (mm):	Installed depth (m bgl):	Depth (m AOD):	Top of response zone (m bgl):	Base of response zone (m bgl):
BH17-C3-01	Standpipe	BH17-C3-01	50	16.50	1.03	1.00	15.00
BH17-C3-03	Standpipe	BH17-C3-03	50	20.00	2.33	6.00	9.00

Records of monitoring and gas/groundwater sampling carried out by TerraConsult during and after the fieldwork period to the date of issue of this report are presented in Appendix C. Calibration certificates are presented in Appendix F.

3.6 Surveying

On completion of the fieldworks, all exploratory positions were surveyed by use of GPS. Coordinates and reduced levels to Ordnance Survey are provided on the exploratory hole logs.

4 LABORATORY TESTING

4.1 Geotechnical Testing

The testing was scheduled by GHD and was carried out by GEO Site Testing Services Ltd (GSTL), Llanelli, Camarthenshire, in accordance with BS 1377 (1990) and BRE SD1 unless otherwise stated. The testing is summarised below and the results are presented in Appendix D.

Table 4: Summary of Geotechnical Laboratory Testing

Lab test:	Number undertaken:	Method:	Remarks:
Atterburg Limit 4 Point Method	1	BS1377: Part 2: 4.3 & 5.3	
Particle size Distribution	4	BS1377: Part 2: 9.2	
BRE SD1 Suite	1	BRE SD1	
One dimensional consolidation	1	BS1377: Part 5: 3	
Triaxial 100mm single stage	1	BS1377: Part 7: 8	

4.2 Geoenvironmental Testing

The testing was scheduled by GHD and carried out by Concept Life Sciences. The results are presented in Appendix E.

5 REFERENCES

AGS: 2010: Electronic transfer of geotechnical and geoenvironmental data (Edition 4 including addendum 3, 2011). Association of Geotechnical and Geoenvironmental Specialists.

BRE Special Digest 1: 2005 Concrete in aggressive ground.

BS 1377 : 1990 : Methods of test for soils for civil engineering purposes. Published in nine parts. British Standards Institution.

BS 5930 : 2015 : Code of practice for site investigation. British Standards Institution.

BS 10175 : 2011: Investigation of potentially contaminated sites – Code of Practice. British Standards Institution

BS EN 1997-1: 2004 : Eurocode 7 – Geotechnical Design – Part 1: General rules. Including UK National Appendix of November 2007. British Standards Institution.

BS EN ISO 14688-1 : 2002 : Geotechnical investigation and testing – Identification and classification of soil – Part 1: Identification and description. British Standards Institution.

BS EN ISO 14688-2 : 2004 : Geotechnical investigation and testing – Identification and classification of soil – Part 2: Principles for a classification. British Standards Institution.

BS EN ISO 14689-1 : 2003 : Geotechnical investigation and testing – Identification and classification of rock – Part 1: Identification and description. British Standards Institution.

BS EN ISO 22282-1 : 2012 Geotechnical investigation and testing. Geohydraulic testing Part1: General Rules

BS EN ISO 22282-2 : 2012 Geotechnical investigation and testing. Geohydraulic testing Part 2: Water Permeability Tests in a borehole using open systems

BS EN ISO 22475-1 : 2006 : Geotechnical investigation and testing – Sampling methods and groundwater measurements – Part 1: Technical principals for execution (July 2011 reprint). British Standards Institution.

BS EN ISO 22476-3 : 2005 : Geotechnical investigation and testing – Field Testing – Part 3: Standard penetration test

6 LICENCES

British Geological Survey Reproduction Licence Number: IPR/187-68CF CO8/053-CSL

Ordnance Survey Reproduction Licence Number. 100035365

DRAWINGS

3318(C3)D001-1 Site Location Plan
3318(C3)D002-1 Exploratory Hole Location Plan

Site Location Plan

TerraConsult

Address:
East Anglia

Notes:

AGS		Project:	East Anglia (North) Offshore Wind Farm	Drawing No:
Issue:	FINAL	Project No:	3318	**3318(C3)D001-1**
Scale:	1:25000	Client:	GHD Ltd	

Exploratory Hole Location Plan

TerraConsult

Legend Key

Locations By Type - CP

AGS		Project:	East Anglia (North) Offshore Wind Farm	Drawing No:
Issue:	FINAL	Project No:	3318	3318(C3)D002-1
Scale:	1:3000	Client:	GHD Ltd	

APPENDICES

APPENDIX A
Exploratory Hole Records

Key sheet

Boreholes

Exploratory Hole Key Sheet

TerraConsult

SAMPLES:

Undisturbed:	
U	Driven tube sample
UT	Thin wall driven tube sample
TW	Pushed thin wall tube sample
P	Pushed piston sample
L	Liner sample (from windowless or similar sampler), full recovery unless otherwise stated
CBR	CBR mould sample
BLK	Block sample
C	Core sample (from rotary core) taken for laboratory testing
Disturbed:	
D	Small sample
B	Bulk sample
AMAL	Amalgamated sample
Environmental:	
ES	Environmental soil sample
EW	Environmental water sample
Comments:	Sample reference numbers are assigned to every sample taken. A sample reference of 'NR' indicates that an attempt was made to take a tube sample; however, there was no recovery. Sample recovery is given as a percentage.

TESTS:

SPT S or SPT C	Standard Penetration Test, open shoe (S) or solid cone (C)
	The Standard Penetration Test is defined in BS EN ISO 22476-3 (2005). The incremental blow counts are given in the Field Records column; each increment is 75mm unless stated otherwise and any penetration under self weight in mm (SW) is noted. Where the full 300mm test drive is achieved the total number of blows for the test drive is presented as N = ** in the Test column. Where the test drive blows reach 50 (either in total or for a single increment) the total blow count beyond the seating drive is given (without the N = prefix).
ICBR	In situ CBR
IV	In situ vane shear strength, peak (p) and remoulded (r), kPa
HV	Hand vane shear strength, peak (p) and remoulded (r), kPa
PP	Pocket penetrometer test, converted to shear strength, kPa
KFH, KRH, KPI	Variable head permeability tests (KFH = falling head test, KRH = rising head test, KPI = packer test), permeability value
PID/FID	Photo-ionisation detector/Flame-ionisation detector
	Test results provided in Field Records column

DRILLING RECORDS:

The mechanical indices (TCR/SCR/RQD & If) are defined in BS 5930: 2015 and BS EN ISO 22575-1 (2006)

TCR	Total Core Recovery, %
SCR	Solid Core Recovery, %
RQD	Rock Quality Designation, %
If	Fracture spacing, mm. Minimum, typical and maximum spacings are presented.
NI	Non intact is used where the core is fragmented.
CRF	Core recovered (length in m) in the following run
AZCL	Assessed zone of core loss
NR	Not recovered

GROUNDWATER:

▼ Groundwater strike

▽ Groundwater level after standing period

DEPTH REMARKS:

EoS	End of Shift
SoS	Start of Shift
EoBH	End of Borehole

INSTRUMENTATION:

Details of installations are given on the Record. Legend column shows installed instrument depths including slotted pipe section or tip depth, response zone filter material type and layers of backfill. The type of instrument installed is indicated by a code adjacent to the Legend column at the base of the instrument.

SP	Standpipe
SPIE	Standpipe piezometer
PPIE	Pneumatic piezometer
EPIE	Electronic piezometer
HPIE	Hydraulic piezometer
GMP	Gas monitoring standpipe
(xx)	Internal diameter
ICE	Biaxial inclinometer
ICM	Inclinometer tubing for use with probe
SLIP	Slip indicator
ESET	Electronic settlement cell/gauge
ETM	Magnetic extensometer settlement point
ETR	Rod extensometer

EXPLORATORY HOLE TYPE:

CP	Cable percussion
DP	Dynamic probe
DCP	Dynamic cone penetrometer
HA	Hand auger
IP	Inspection pit
OP	Observation pit/trench
PC	Pavement core
RC	Rotary core
RO	Rotary open hole
SH	Shaft
SNC	Sonic (resonance)
TP	Trial pit/trench
TRAV	Traverse
WLS	Windowless (dynamic) sample
WS	Window (dynamic) sample

AGS

Project: **East Anglia (North) Offshore Wind Farm**

Project No: **3318**

Client: **GHD Ltd**

Reference

KEY SHEET

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.00	08-08-17	08-08-17	TM	Hand tools	n/a	n/a	08-08-17	VS	
CP	0.00	16.50	08-08-17	09-08-17	TM	Dando 2000	n/a	n/a	09-08-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE:	604035.95
mN:	317597.72
mAOD:	17.53
Grid:	OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
			17.33	0.20	Firm dark brown slightly sandy CLAY. Frequent rootlets. (TOPSOIL)					
					Medium dense light yellowish brown very sandy slightly silty subangular to rounded fine to coarse GRAVEL of chalk and flint. (ALLUVIUM)			0.50	D1	
								0.50	ES1	
								0.50 - 1.00	B1	
								1.00	D2	
								1.00	ES2	
						Dry		1.50	C	N=13 (2,3/3,3,3,4)
								1.50	ES3	
								1.50 - 1.95	B2	
								2.00	D3	
								2.00	ES4	
								3.00	D4	
								3.00 - 3.45	B3	
						Dry	3.00	3.50	C	N=15 (3,3/3,4,4,4)
						Dry	4.50	4.50	C	N=9 (1,2/2,3,2,2)
								4.50 - 4.95	B4	
				(9.90)						
						Dry	6.00	6.00	C	N=11 (2,3/2,3,3,3)
								6.00 - 6.45	D5	
						Dry	7.30	7.50	C	N=19 (2,2/3,4,5,7)
								7.50 - 7.95	D6	
						Dry	9.00	9.00	C	N=14 (1,2/2,3,4,5)
								9.00 - 9.45	B5	
	Inst					Water	Casing	10.00 - 10.45 Depth	D7 Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
1.00	0.80		

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	7.50	7.50
150	16.50	16.50

Depth related remarks:

From:	To:	Remarks:

Chiselling details:

From:	to:	Duration:	Tool:

AGS

Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths and reduced levels are in metres.

Log issue: FINAL

Scale: 1:50

Project: East Anglia (North) Offshore Wind Farm

Project No: 3318

Client: GHD Ltd

Exploratory position reference:

BH17-C3-01

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.00	08-08-17	08-08-17	TM	Hand tools	n/a	n/a	08-08-17	VS	
CP	0.00	16.50	08-08-17	09-08-17	TM	Dando 2000	n/a	n/a	09-08-17	VS	SPT hammer ID: SI 4 E(r)% 74

Location details:

mE:	604035.95
mN:	317597.72
mAOD:	17.53
Grid:	OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing				
						Water	Casing	Depth	Type & No	Results/Remarks
			7.43	10.10	Medium dense light yellowish brown very sandy slightly silty subangular to rounded fine to coarse GRAVEL of chalk and flint. (ALLUVIUM)					
					Medium dense light brownish grey very silty gravelly fine to coarse SAND. Gravel is angular to subrounded fine to medium of flint and chalk. (ALLUVIUM)	Dry	10.50	10.50	S	N=23 (3,4/4,5,6,8)
				(3.90)		Dry	12.00	12.00 12.00 - 12.45	S D8	N=14 (2,3/3,3,4,4)
						Dry	13.50	13.50 13.50 - 13.95	S D9	N=21 (1,2/2,4,6,9)
			3.53	14.00	Medium dense light yellowish brown very silty very sandy subangular to rounded fine to coarse GRAVEL of chalk and flint. (ALLUVIUM)					
	SP					Dry	15.00	15.00 15.00 - 15.45	C D10	N=17 (1,0/1,3,5,8)
				(2.50)						
			1.03	16.50	Borehole ends at 16.50m (Blowing sands)					
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:

Diameter & casing:

Dia (mm):	Depth:	Casing:

Depth related remarks:

From:	To:	Remarks:

Chiselling details:

From:	to:	Duration:	Tool:

AGS

Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.

Log issue: FINAL

Scale: 1:50

Project: East Anglia (North) Offshore Wind Farm

Project No: 3318

Client: GHD Ltd

Exploratory position reference:

BH17-C3-01

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	04-08-17	04-08-17	GB	Hand tools	n/a	n/a	04-08-17	VS	
CP	0.00	17.00	04-08-17	07-08-17	GB	Dando 2000	n/a	n/a	07-08-17	VS	SPT hammer ID: SI 8 E(r)% 73

Location details:

mE: 604062.91
mN: 317610.41
mAOD: 16.84
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
			16.69	0.15	Firm dark brown slightly sandy CLAY. Occasional rootlets. (TOPSOIL)					
					Very soft dark brown pseduofibrous PEAT. (ALLUVIUM)			0.50	D1	
								0.50	ES1	
								0.60 - 0.80	B1	
				(1.55)				1.00	D2	
								1.00	ES2	
						Dry		1.50	C	N=4 (1,0/0,1,1,2)
								1.50	ES3	
			15.14	1.70	Loose light brownish grey very silty fine to coarse SAND. (ALLUVIUM)			1.50 - 1.95	B2	
				(0.50)				2.00	ES4	
			14.64	2.20	Dark greyish brown slightly silty fine to coarse SAND and angular to subrounded fine to coarse GRAVEL of flint. (ALLUVIUM)			2.30	D3	
				(0.60)						
			14.04	2.80	Medium dense light yellowish brown silty very sandy subangular to rounded fine to coarse GRAVEL of chalk and flint. (ALLUVIUM)			3.00 - 3.45	B3	
						Dry	3.00	3.50	C	N=13 (1,2/3,3,3,4)
						Dry	4.50	4.50	C	N=17 (1,1/2,3,5,7)
								4.50 - 4.95	B4	
				(5.00)						
						Dry	6.00	6.00	C	N=28 (2,3/5,7,8,8)
								6.00 - 6.45	B5	
						Dry	7.50	7.50	C	N=25 (1,3/4,6,7,8)
								7.50 - 7.95	B6	
			9.04	7.80	Medium dense light brownish grey very silty gravelly fine to coarse SAND. Gravel is angular to subrounded fine to medium of flint and chalk. (ALLUVIUM)					
						Dry	9.00	9.00	C	N=16 (1,2/4,3,4,5)
								9.00 - 9.45	D4	
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
2.20	0.67	2.00	

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	7.50	7.50
150	17.00	17.00

Depth related remarks:

From:	To:	Remarks:

Chiselling details:

From:	to:	Duration:	Tool:

AGS

Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths and reduced levels are in metres.

Log issue: FINAL
Scale: 1:50

Project: East Anglia (North) Offshore Wind Farm
Project No: 3318
Client: GHD Ltd

Exploratory position reference:

BH17-C3-02

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	04-08-17	04-08-17	GB	Hand tools	n/a	n/a	04-08-17	VS	
CP	0.00	17.00	04-08-17	07-08-17	GB	Dando 2000	n/a	n/a	07-08-17	VS	SPT hammer ID: SI 8 E(r)% 73

Location details:

mE: 604062.91
mN: 317610.41
mAOD: 16.84
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing				
						Water	Casing	Depth	Type & No	Results/Remarks
					Medium dense light brownish grey very silty gravelly fine to coarse SAND. Gravel is angular to subrounded fine to medium of flint and chalk. (ALLUVIUM)	Dry	10.50	10.50 10.50 - 10.95	C D5	N=14 (2,2/2,3,4,5)
				(6.80)		Dry	12.00	12.00 12.00 - 12.45 12.00 - 13.00	S D6 B7	N=13 (1,2/2,3,3,5)
						Dry	13.50	13.50 13.50 - 13.95	S D7	N=18 (2,3/3,4,5,6)
			2.24	14.60	Medium dense light yellowish brown silty very sandy subangular to rounded fine to coarse GRAVEL of chalk and flint. (ALLUVIUM)	Dry	15.00	15.00 15.00	C B8	N=26 (2,2/4,5,7,10)
				(2.40)						
			-0.16	17.00	Borehole ends at 17.00m (Blowing sands)					
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck: Rose to: Casing: Sealed:

Diameter & casing:

Dia (mm): Depth: Casing:

Depth related remarks:

From: To: Remarks:

Chiselling details:

From: to: Duration: Tool:

AGS

Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths and reduced levels are in metres.

Log issue: FINAL
Scale: 1:50

Project: East Anglia (North) Offshore Wind Farm
Project No: 3318
Client: GHD Ltd

Exploratory position reference:

BH17-C3-02

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	09-08-17	09-08-17	GB	Hand tools	n/a	n/a	09-08-17	VS	
CP	0.00	20.00	09-08-17	11-08-17	GB	Dando 2000	n/a	n/a	11-08-17	VS	SPT hammer ID: SI 8 E(r)% 73

Location details:

mE: 604265.31
mN: 317755.75
mAOD: 23.57
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Water	Casing	Depth	Type & No	Results/Remarks
					Samples & In Situ Testing					
			23.27	(0.30) 0.30	Dark orangish brown slightly silty gravelly clayey fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Frequent rootlets and plant matter. (ALLUVIUM)			0.50 0.50 0.50 - 1.00	D1 ES1 B1	
			22.57	(0.70) 1.00	Dark orangish brown gravelly slightly clayey fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. (ALLUVIUM)			1.00 1.00	D2 ES2	
				(1.80)	Medium dense dark orangish brown slightly silty gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. (ALLUVIUM)	Dry		1.50 1.50 1.50 - 1.95	C ES3 B2	N=24 (1,2/4,5,6,9)
			20.77	2.80				2.00 2.00	D3 ES4	
				(1.40)	Very dense dark orangish brown sandy slightly silty GRAVEL. Gravel of subangular to subrounded fine to coarse flint. (ALLUVIUM)			3.00 - 3.45	B3	
			19.37	4.20		Dry	3.00	3.50	C	50 (2,4/50 for 245mm)
				(4.90)	Dense dark orangish brown slightly silty gravelly fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. (ALLUVIUM)	Dry	4.50	4.50 4.50 - 4.95	C B4	N=41 (1,3/6,8,12,15)
						Dry	6.00	6.00 6.00 - 6.45	C B5	N=40 (2,5/8,9,11,12)
					7.20 - 9.10 m: Becomes slightly gravelly	Dry	7.50	7.50 7.50 - 7.95	S D4	N=11 (1,2/2,2,3,4)
		SP	14.47	9.10		Dry	9.00	9.00 9.00 - 9.45	C B6	N=23 (1,3/4,5,7,7)
					Firm to stiff dark brownish grey slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. Rare dark orangish brown staining. (ALLUVIUM)					
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
7.20	6.76	7.20	

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	6.20	6.20
150	9.50	9.50

Depth related remarks:

From:	To:	Remarks:

Chiselling details:

From:	to:	Duration:	Tool:

AGS

Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.

Log issue: FINAL
Scale: 1:50

Project: East Anglia (North) Offshore Wind Farm
Project No: 3318
Client: GHD Ltd

Exploratory position reference:

BH17-C3-03

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	09-08-17	09-08-17	GB	Hand tools	n/a	n/a	09-08-17	VS	
CP	0.00	20.00	09-08-17	11-08-17	GB	Dando 2000	n/a	n/a	11-08-17	VS	SPT hammer ID: SI 8 E(r)% 73

Location details:

mE: 604265.31
mN: 317755.75
mAOD: 23.57
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Water	Casing	Depth	Type & No	Results/Remarks
					Firm to stiff dark brownish grey slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. Rare dark orangish brown staining. (ALLUVIUM)			10.50 - 10.95	U1	80 (80%)
				(3.40)				11.00	D5	
						Dry	9.50	12.00	S	N=27 (2,5/5,7,7,8)
								12.00 - 12.45	D6	
			11.07	12.50	Firm to stiff dark grey slightly sandy gravelly CLAY. Gravel of subangular to subrounded fine to coarse chalk and occasional flint. Rare dark orangish brown staining. (ALLUVIUM)					
					12.50 m: Occasionally mottle dark brownish grey			13.50 - 13.95	U2	90 (60%)
								14.00	D7	
					15.00 - 20.00 m: Becomes stiff to very stiff	Dry	9.50	15.00	S	50 (2,7/50 for 275mm)
								15.00 - 15.45	D8	
				(7.50)				16.50 - 16.95	U3	100 (60%)
								17.00	D9	
						Dry	9.50	18.00	S	50 (9,6/50 for 290mm)
								18.00 - 18.45	D10	
								19.50 - 19.95	U4	100 (100%)
Inst			3.57	20.00	Borehole ends at 20.00m (Target depth)	Water	Casing	20.00	D7	
								Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:

Diameter & casing:

Dia (mm):	Depth:	Casing:

Depth related remarks:

From:	To:	Remarks:

Chiselling details:

From:	to:	Duration:	Tool:

AGS

Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths and reduced levels are in metres.

Log issue: FINAL
Scale: 1:50

Project: East Anglia (North) Offshore Wind Farm
Project No: 3318
Client: GHD Ltd

Exploratory position reference:

BH17-C3-03

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	11-08-17	11-08-17	GB	Hand tools	n/a	n/a	11-08-17	VS	
CP	0.00	17.10	14-08-17	14-08-17	GB	Dando 2000	n/a	n/a	14-08-17	VS	SPT hammer ID: SI 8 E(r)% 73

Location details:

mE:	604294.24
mN:	317784.53
mAOD:	22.33
Grid:	OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Water	Casing	Depth	Type & No	Results/Remarks
				(0.30)	Dark orangish brown gravelly slightly silty clayey fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Frequent rootlets.					
			22.03	0.30	(ALLUVIUM)					
				(0.40)	Dark orangish brown gravelly slightly clayey fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.			0.50	D1	
								0.50	ES1	
			21.63	0.70	(ALLUVIUM)			0.60 - 0.80	B1	
					Dense dark orangish brown very sandy slightly silty GRAVEL. Gravel of subangular to subrounded fine to coarse flint.			1.00	D2	
					(ALLUVIUM)			1.00	ES2	
						Dry	1.50	1.50	C	N=37 (2,5/6,8,11,12)
								1.50	ES3	
								1.50 - 1.95	B2	
								2.00	ES4	
						Dry	3.00	3.00	C	N=20 (1,3/3,4,6,7)
								3.00 - 3.45	B3	
					3.20 - 4.10 m: Becomes slightly gravelly					
				(6.80)						
						Dry	4.50	4.50	C	N=46 (3,6/9,11,12,14)
								4.50 - 4.95	B4	
						Dry	6.00	6.00	C	N=30 (2,4/5,7,8,10)
								6.00 - 6.45	B5	
	▼									
			14.83	7.50	Medium dense orange brown slightly gravelly slightly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint.	Dry	7.40	7.50	C	N=11 (3,2/3,2,3,3)
					(ALLUVIUM)			7.50 - 7.95	B6	
	▽									
						Dry	9.00	9.00	C	N=12 (2,3/3,2,3,4)
								9.00 - 9.45	B7	
	Inst					Water	Casing	Depth	Type & No	Results

Samples & In Situ Testing

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
9.10	7.19	9.10	

Diameter & casing:

Dia (mm):	Depth:	Casing:
200	6.00	6.00

Depth related remarks:

From:	To:	Remarks:

Chiselling details:

From:	to:	Duration:	Tool:

AGS

Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths and reduced levels are in metres.

Log issue: FINAL

Scale: 1:50

Project: East Anglia (North) Offshore Wind Farm

Project No: 3318

Client: GHD Ltd

Exploratory position reference:

BH17-C3-04

Borehole Log

TerraConsult

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Barrel type:	Drill Bit:	Logged:	Logger:	Remarks:
IP	0.00	1.20	11-08-17	11-08-17	GB	Hand tools	n/a	n/a	11-08-17	VS	
CP	0.00	17.10	14-08-17	14-08-17	GB	Dando 2000	n/a	n/a	14-08-17	VS	SPT hammer ID: SI 8 E(r)% 73

Location details:

mE: 604294.24
mN: 317784.53
mAOD: 22.33
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results/Remarks
				(7.30)	Medium dense orange brown slightly gravelly slightly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. (ALLUVIUM)	Dry	10.50	10.50 10.50 - 10.95	C B8	N=14 (2,2/3,4,4,3)
						Dry	12.00	12.00 12.00 - 12.45	C B9	N=12 (1,2/2,3,3,4)
						Dry	13.50	13.50 13.50 - 13.95	C B10	N=14 (2,2/3,3,4,4)
			7.53	14.80						
				(2.30)	Medium dense dark orangish brown gravelly slightly silty fine to coarse SAND. Gravel of subangular to subrounded fine to coarse flint. Occasional cobbles of subangular to subrounded flint. (ALLUVIUM)	Dry	15.00	15.00 15.00	C B11	N=20 (2,3/4,4,6,6)
						Dry	16.50	16.50 16.50 - 16.95	C B12	N=35 (4,6/7,9,9,10)
			5.23	17.10	Borehole ends at 17.10m (Blowing sands)					
	Inst					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:

Diameter & casing:

Dia (mm):	Depth:	Casing:

Depth related remarks:

From:	To:	Remarks:

Chiselling details:

From:	to:	Duration:	Tool:

AGS

Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths and reduced levels are in metres.

Log issue: FINAL
Scale: 1:50

Project: East Anglia (North) Offshore Wind Farm
Project No: 3318
Client: GHD Ltd

Exploratory position reference:

BH17-C3-04

Sheet 2 of 2

APPENDIX B
Photographs

BH17-C3-01

None taken

BH17-C3-02

None taken

BH17-C3-03

1.00 m

9.10 m

BH17-C3-04

0.50 m

2.00 m

16.50 m

APPENDIX C
Instrumentation Sampling and Monitoring Records

No: 3318 **GROUNDWATER AND GROUND GAS MONITORING** TerraConsult

Site: East Anglia OWF **GROUND GAS AND GROUNDWATER MONITORING DATA**

Location	Date	Monitored by	Well Details		Groundwater					Gas											Weather	
			Standpipe diameter (mm)	Depth to Base (m bgl)	Water Depth (m bgl)	Water Sample Taken?	Water Temp oC	Odour	Colour	Atmospheric Pressure (mbar)	Atmospheric Pressure Comment	Relative Pressure (Pa)	Flow (l/h)	CH_4 (% v/v)	GSV CH_4 (l/hr)	CO_2 (% v/v)	GSV CO_2 (l/hr)	O_2 (% v/v)	CO (ppm)	H2S (ppm)	VOC (ppm)	Conditions	Ambient Temp ^oC
BH17-C3-01	22/08/17	VS	51	14.80	1.16	Y				1017	NM	0.0	0.0	0.0	0.0000	0.4	0.0000	18.5	0	0	NM	Sunny, dry	21
	31/08/17	VS	51	14.05	1.13	N				1015	NM	0.0	0.0	0.0	0.0000	1.2	0.0000	18.0	0	0	NM	Sunny, dry	19
	14/09/17	VS	51	13.30	1.08	N				1002	NM	0.0	0.0	0.0	0.0000	0.3	0.0000	20.3	0	0	NM	Showers	15
BH17-C3-03	22/08/17	VS	51	9.05	5.73	Y				1018	NM	0.0	0.0	0.0	0.0000	0.2	0.0000	18.6	0	0	NM	Sunny, dry	21
	31/08/17	VS	51	8.87	5.76	N				1013	NM	0.0	0.0	0.0	0.0000	0.3	0.0000	18.7	0	0	NM	Sunny, dry	19
	14/09/17	VS	51	8.75	5.76	N				997	NM	0.0	0.0	0.0	0.0000	0.1	0.0000	19.5	0	0	NM	Showers	15

NOTES:
NM = Not Measured.
(x) = Peak value recorded.
[grey] = Below detection limit.

GSV (l/HR) = [gas concentration (%v/v)] x [gas well flow rate (l/hr)
100

APPENDIX D
Geotechnical Laboratory Test Results

Report References: GSTL 35625

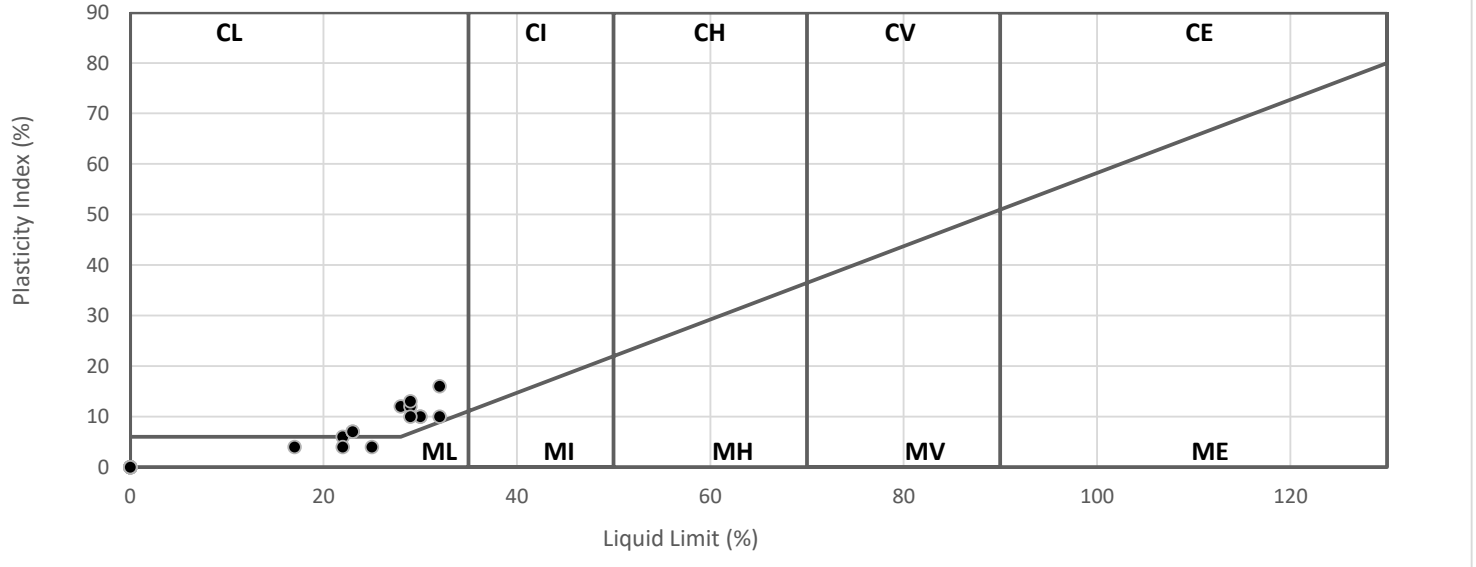
CLS 684646

GSTL	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX (BS 1377 : Part 2 : 1990 Method 5)	
Contract Number	**36525**	
Site Name	**E Anglia Wind Farm - Cable Route**	

Hole Reference	Sample Number	Sample Type	Depth (m)			Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity index %	Passing .425mm %	Remarks
BH17-C3-03	6	B	9.00	-	9.45	20	22	16	6	80	M/CL Low Plasticity
BH17-C4-03	2	D	1.00	-		24	29	17	12	100	CL Low Plasticity
				-							
				-							
				-							
				-							
				-							
				-							
				-							

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

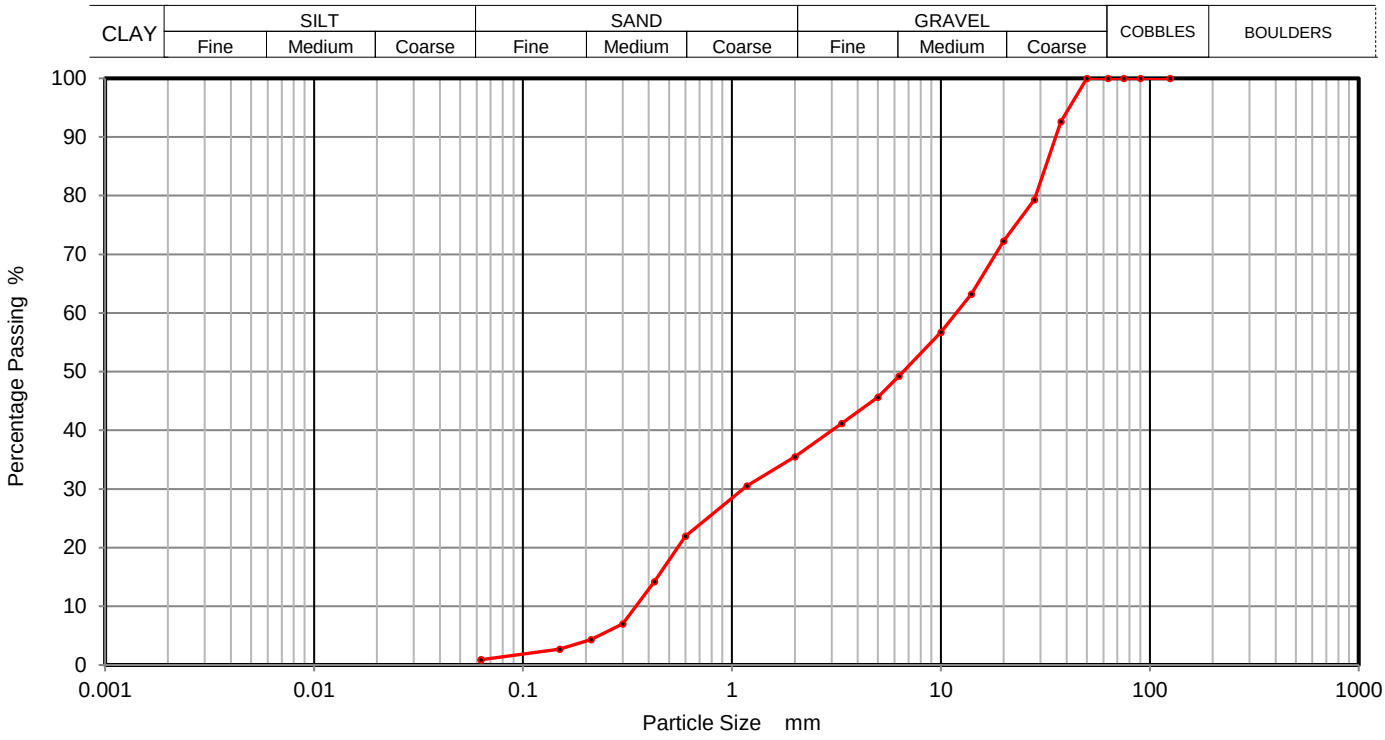
PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION
BS 5930:1999+A2:2010



Operators	Checked	20/09/2017	Sean Penn	[redacted]
DB	Approved	21/09/2017	Ben Sharp	

UKAS TESTING
2788

GSTL	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	36525
		Borehole/Pit No.	BH17-C3-01
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	3
Soil Description	Brown slightly silty fine to coarse sandy fine to coarse GRAVEL	Depth Top	3.00
		Depth Base	3.45
		Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	
90	100	0.0060	
75	100	0.0019	
63	100		
50	100		
37.5	93		
28	79		
20	72		
14	63		
10	57		
6.3	49		
5	46		
3.35	41		
2	35		
1.18	31		
0.6	22		
0.425	14		
0.3	7		
0.212	4		
0.15	3		
0.063	1		

Sample Proportions	% dry mass
Cobbles	0
Gravel	65
Sand	34
Silt and Clay	1

Grading Analysis	
Uniformity Coefficient	

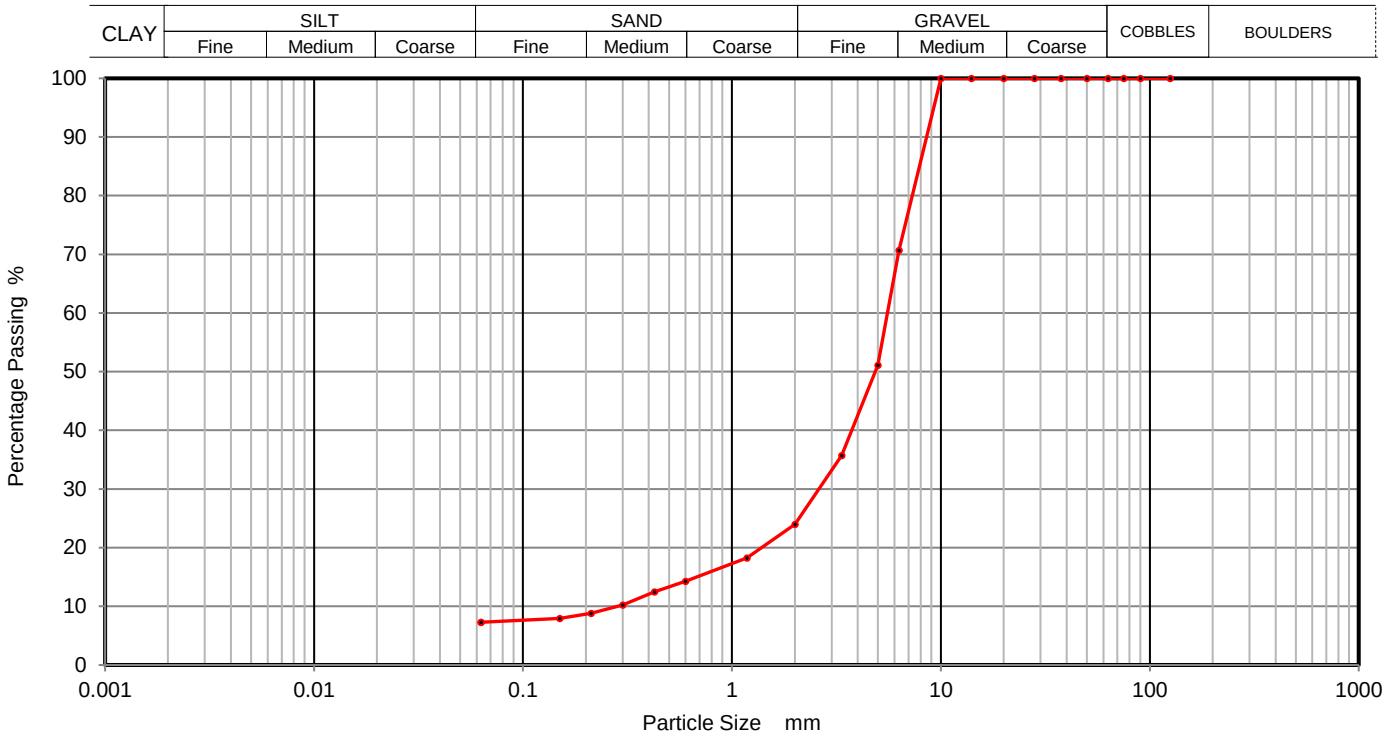
Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	20/09/2017	Sean Penn	[redacted]
RO/MH	Approved	21/09/2017	Ben Sharp	

UKAS TESTING 2788

GSTL	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	36525
		Borehole/Pit No.	BH17-C3-02
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	2
Soil Description	Black slightly silty fine to coarse sandy fine to medium GRAVEL	Depth Top	1.00
		Depth Base	
		Sample Type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	
90	100	0.0060	
75	100	0.0019	
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	71		
5	51		
3.35	36		
2	24		
1.18	18		
0.6	14		
0.425	12		
0.3	10		
0.212	9		
0.15	8		
0.063	7		

Sample Proportions	% dry mass
Cobbles	0
Gravel	76
Sand	17
Silt and Clay	7

Grading Analysis	
Uniformity Coefficient	

Remarks

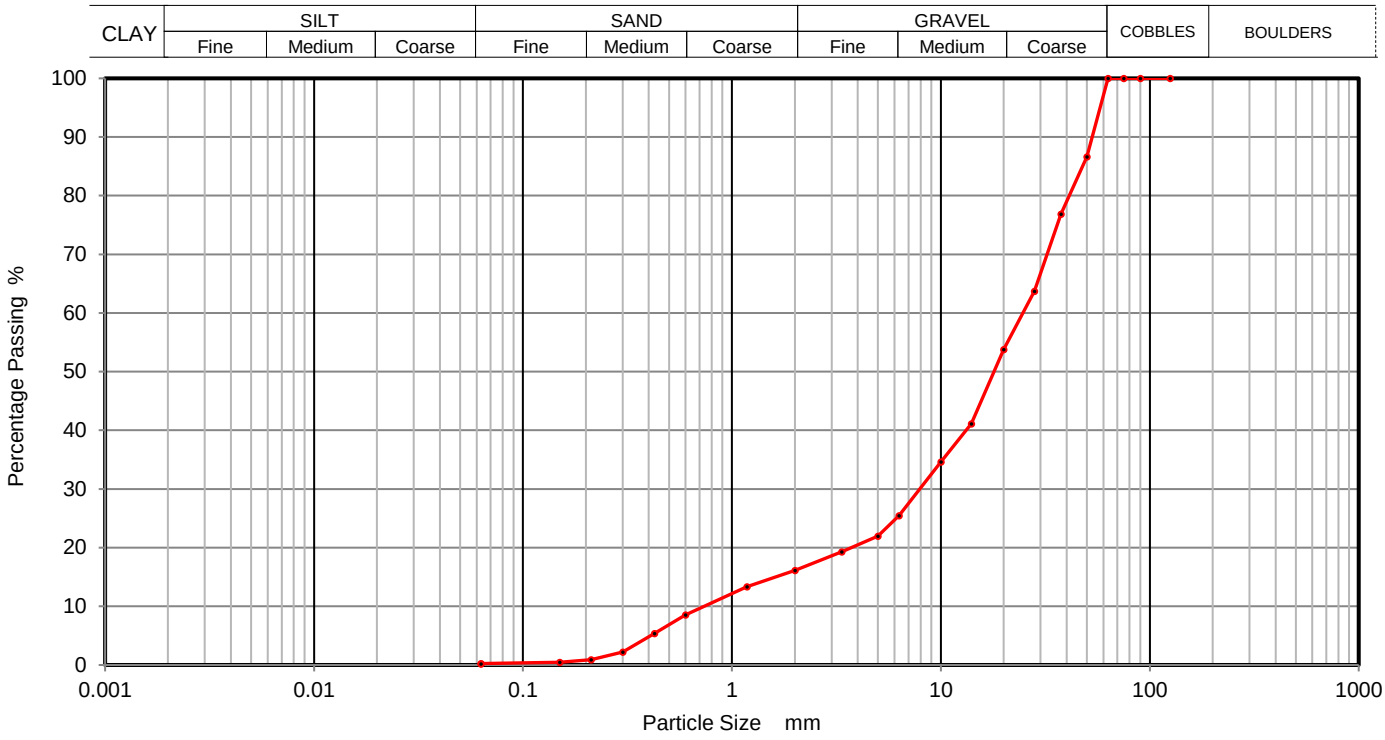
Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	20/09/2017	Sean Penn
RO/MH	Approved	21/09/2017	Ben Sharp

[redacted]

UKAS TESTING 2788

GSTL	PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2	Contract Number	36525
		Borehole/Pit No.	BH17-C3-03
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	3
Soil Description	Brown fine to coarse sandy fine to coarse GRAVEL	Depth Top	3.00
		Depth Base	3.45
		Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	
90	100	0.0060	
75	100	0.0019	
63	100		
50	87		
37.5	77		
28	64		
20	54		
14	41		
10	35		
6.3	25		
5	22		
3.35	19		
2	16		
1.18	13		
0.6	9		
0.425	5		
0.3	2		
0.212	1		
0.15	0		
0.063	0		

Sample Proportions	% dry mass
Cobbles	0
Gravel	84
Sand	16
Silt and Clay	0

Grading Analysis	
Uniformity Coefficient	

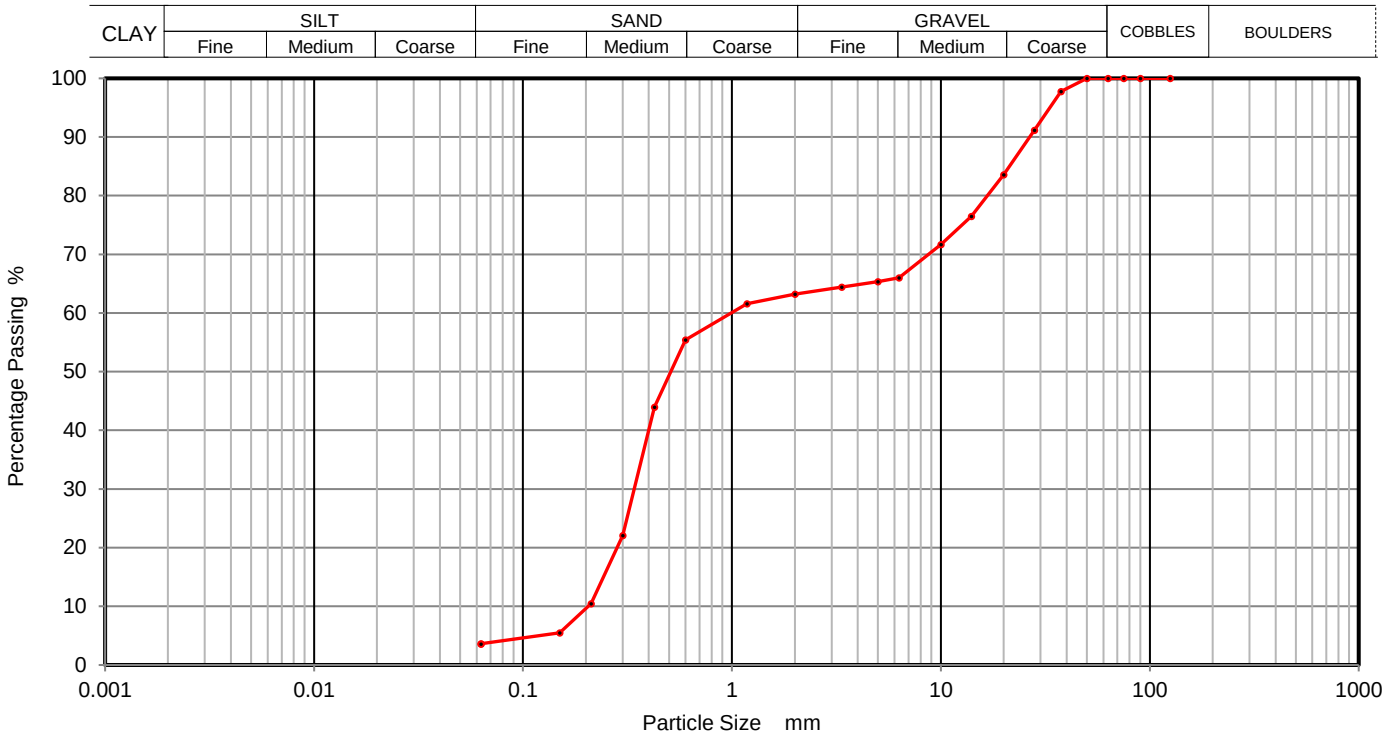
Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	20/09/2017	Sean Penn	
RO/MH	Approved	21/09/2017	Ben Sharp	

UKAS TESTING 2788

GSTL	**PARTICLE SIZE DISTRIBUTION** **BS 1377 Part 2:1990** **Wet Sieve, Clause 9.2**	Contract Number	**36525**
		Borehole/Pit No.	**BH17-C3-04**
Site Name	**E Anglia Wind Farm - Cable Route**	Sample No.	**2**
Soil Description	Brown slightly silty fine to coarse gravelly fine to coarse SAND	Depth Top	**1.50**
		Depth Base	**1.95**
		Sample Type	**B**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	
90	100	0.0060	
75	100	0.0019	
63	100		
50	100		
37.5	98		
28	91		
20	84		
14	76		
10	72		
6.3	66		
5	65		
3.35	64		
2	63		
1.18	62		
0.6	55		
0.425	44		
0.3	22		
0.212	10		
0.15	5		
0.063	4		

Sample Proportions	% dry mass
Cobbles	0
Gravel	37
Sand	59
Silt and Clay	4

Grading Analysis	
Uniformity Coefficient	

Remarks

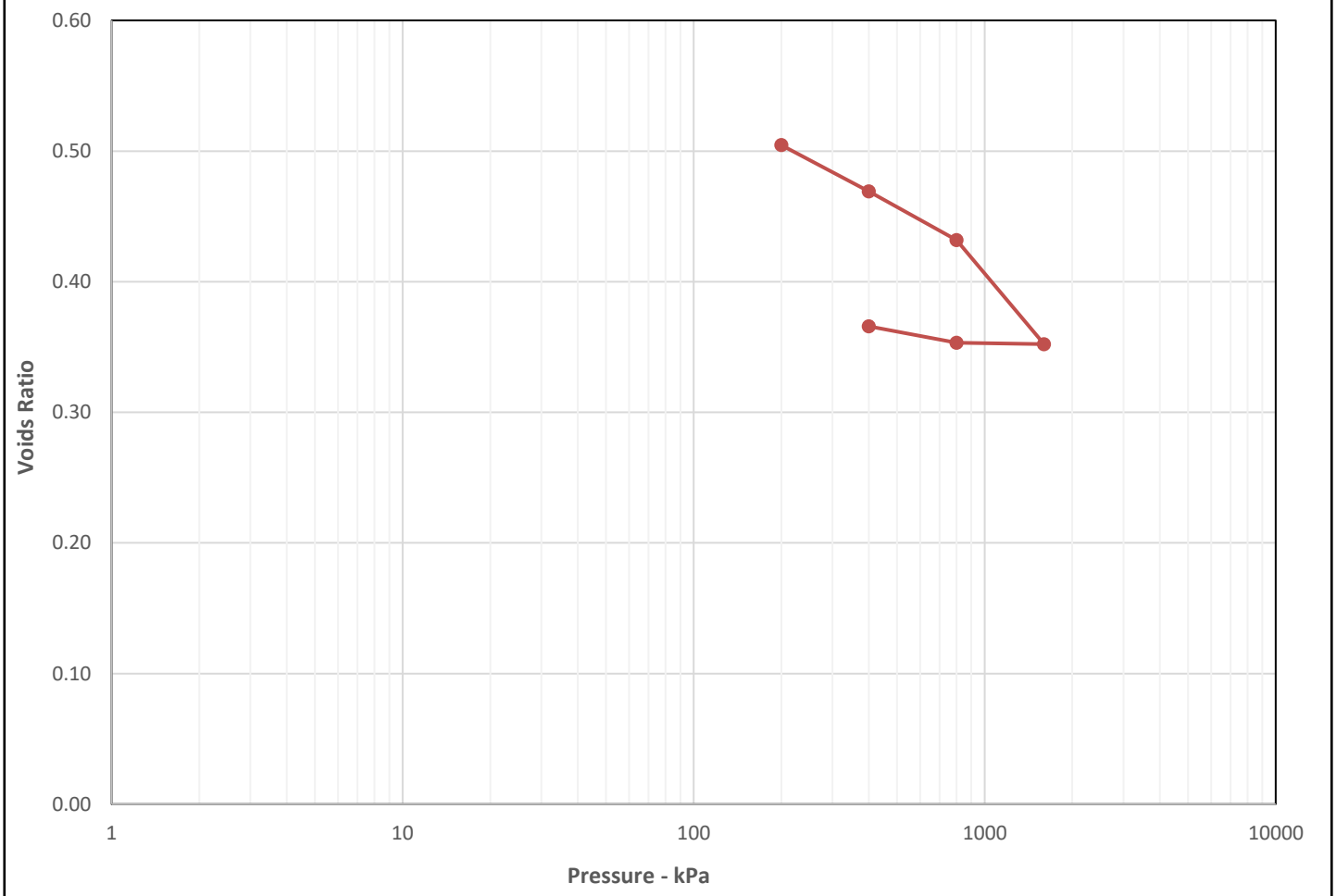
Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	20/09/2017	Sean Penn
RO/MH	Approved	21/09/2017	Ben Sharp

[redacted]

UKAS TESTING 2788

GSTL	ONE DIMENSIONAL CONSOLIDATION TEST BS1377:Part 5:1990, clause 3	Contract Number	36525
		Borehole/Trialpit No.	BH17-C3-03
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	1
Soil Description	Grey slightly sandy fine gravelly silty CLAY	Depth Top (m)	10.50
		Depth Base (m)	10.95
Lab Temperature	20°c	Sample Location	Middle
Remarks	Cv Calculated Using T90	Sample Type	U

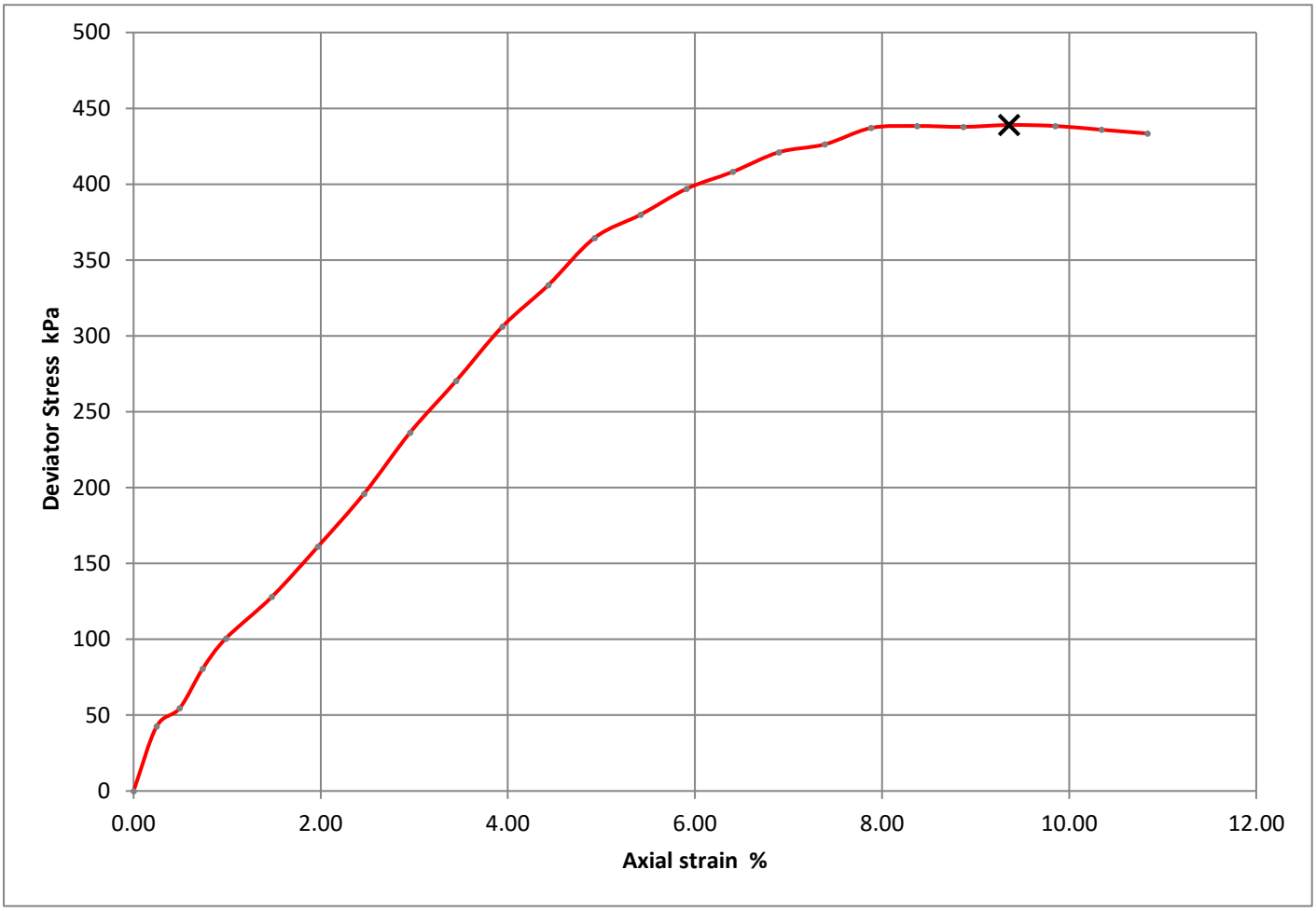


Initial Sample Conditions		Pressure Range			Mv m2/MN	Cv m2/yr	Pressure Range			Mv m2/MN	Cv m2/yr
Moisture Content (%)	18	0	-	200	0.18	13		-			
Bulk Density (Mg/m3)	2.00	200	-	400	0.12	7.7		-			
Dry Density (Mg/m3)	1.70	400	-	800	0.064	5.8		-			
Voids Ratio	0.5609	800	-	1600	0.1	6.1		-			
Degree of saturation	83.9	1600	-	800	0.001	7.6		-			
Height (mm)	19.82	800	-	400	0.023	8.2		-			
Diameter (mm)	75.01		-					-			
Particle Density (Mg/m3)	2.65		-					-			

Operators	Checked	20/09/2017	Sean Penn	[redacted]
LG	Approved	21/09/2017	Ben Sharp	

UKAS TESTING
2788

GSTL	Single Stage Unconsolidated-Undrained Triaxial Test BS 1377 : 1990 Part 7 : 8	Contract Number	36525
		Borehole/Pit No.	BH17-C3-03
Site Name	E Anglia Wind Farm - Cable Route	Sample No.	3
Soil Description	Green/brown silty CLAY	Depth Top (m)	16.50
		Depth Base (m)	16.95
		Sample Type	U



Moisture Content (%)	19
Bulk Density (Mg/m^3)	2.23
Dry Density (Mg/m^3)	1.88
Specimen Length (mm)	203
Specimen Diameter (mm)	102
Cell Pressure (kPa)	300
Deviator Stress (kPa)	439
Undrained Shear Strength (kPa)	220
Failure Strain (%)	9.4
Mode Of Failure	Plastic
Membrane Used/Thickness	Rubber/0.3mm
Rate of Strain (%/min)	3.00

Specimen Post Test	Sample Split
PICTURE NOT AVAILABLE	PICTURE NOT AVAILABLE

Checked	20/09/2017	Sean Penn	[redacted]
Approved	21/09/2017	Paul Evans	

UKAS TESTING 2788

CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

Concept Life Sciences is a trading name of Concept Life Sciences Analytical & Development Services Limited registered in England and Wales (No 2514788)

Concept Life Sciences

Certificate of Analysis

3 Crittall Drive
Springwood Industrial Estate
Braintree
Essex
CM7 2RT
Tel : 01376 560120
Fax : 01376 552923

Report Number: Supplement 1C to Report Number 684646-1

Date of Report: 23-Oct-2017

Customer: TerraConsult (South) Limited
Suite F17 Dugard House
Peartree Road
Colchester
Essex
CO3 0UL

Customer Contact: Victoria Smith

Customer Job Reference:
Customer Site Reference: Happisburgh/East Anglia
Date Job Received at Concept: 05-Sep-2017
Date Analysis Started: 26-Sep-2017
Date Analysis Completed: 29-Sep-2017

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

This report should not be reproduced except in full without the written approval of the laboratory

Tests covered by this certificate were conducted in accordance with Concept Life Sciences SOPs

All results have been reviewed in accordance with Section 25 of the Concept Life Sciences, Analytical Services Quality Manual

Report checked and authorised by :
Chelsea Entwistle
Senior Customer Service Advisor

Issued by :
Aislinn Arthey
Customer Service Advis

Concept Reference: 684646
Project Site: Happisburgh/East Anglia
Customer Reference:

Soil Analysed as Soil
BRE SD1 (SE)

Concept Reference	**684646 005**
Customer Sample Reference	**BH17-C3-02 D2 @ 1.00m**
Date Sampled	**Deviating**
Matrix Class	**Other**

Determinand	Method	Test Sample	LOD	Units	
(Water soluble) Ammonia expressed as NH4	T710	AR	0.01	g/l	<0.01
(Water soluble) Cl-	T710	A40	0.01	g/l	**0.01**
Magnesium	T112	A40	1	mg/l	**15**
(Water soluble) NO3	T710	A40	0.01	g/l	<0.01
pH	T7	A40			**5.7**
(Water Soluble) SO4 expressed as SO4	T242	A40	0.01	g/l	**1.1**
SO4(Total)	T102	A40	0.02	%	**1.6**
Sulphur (total)	T6	A40	0.01	%	**0.99**
Moisture @105C	T162	AR	0.1	%	**76**
Retained on 2mm	T2	A40	0.1	%	**0.3**

Index to symbols used in Supplement 1C to Report Number 684646-1

Value	Description
A40	Assisted dried < 40C
AR	As Received
M	Analysis is MCERTS accredited
N	Analysis is not UKAS accredited

Notes

Supplement 1C Report reissued to include only sample 005
Retained on 2mm is removed before analysis
The date of sampling has not been provided and therefore the time from sampling to analysis is unknown. It is possible therefore that the results provided may be compromised

Method Index

Value	Description
T162	Grav (1 Dec) (105 C)
T2	Grav
T6	ICP/OES
T112	ICP/OES (SIM)(Water Extract)
T7	Probe
T102	ICP/OES (HCl extract)
T242	2:1 Extraction/ICP/OES (TRL 447 T1)
T710	2:1 Extraction / Discrete Analyser

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
(Water soluble) Ammonia expressed as NH4	T710	AR	0.01	g/l	N	005
(Water soluble) Cl-	T710	A40	0.01	g/l	N	005
Magnesium	T112	A40	1	mg/l	N	005
(Water soluble) NO3	T710	A40	0.01	g/l	N	005
pH	T7	A40			N	005
(Water Soluble) SO4 expressed as SO4	T242	A40	0.01	g/l	N	005
SO4(Total)	T102	A40	0.02	%	N	005
Sulphur (total)	T6	A40	0.01	%	N	005
Moisture @105C	T162	AR	0.1	%	N	005
Retained on 2mm	T2	A40	0.1	%	N	005

APPENDIX E
Geoenvironmental Laboratory Test Results

Report References: 677813

677853

CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

Concept Life Sciences is a trading name of Concept Life Sciences Analytical & Development Services Limited registered in England and Wales (No 2514788)

Concept Life Sciences

Certificate of Analysis

3 Crittall Drive
Springwood Industrial Estate
Braintree
Essex
CM7 2RT
Tel : 01376 560120
Fax : 01376 552923

Report Number: Supplement 1C to Report Number 677813-1

Date of Report: 23-Oct-2017

Customer: TerraConsult Limited
Unit 34
Bold Business Centre
Bold Lane
Sutton
St Helens
WA9 4TX

Customer Contact: Mr Jimmy Thorburn

Customer Job Reference: 3318
Customer Purchase Order: PO-001839
Customer Site Reference: Norfolk Vanguard Cable Route
Date Job Received at Concept: 31-Jul-2017
Date Analysis Started: 29-Aug-2017
Date Analysis Completed: 12-Sep-2017

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

This report should not be reproduced except in full without the written approval of the laboratory

Tests covered by this certificate were conducted in accordance with Concept Life Sciences SOPs

All results have been reviewed in accordance with Section 25 of the Concept Life Sciences, Analytical Services Quality Manual

UKAS TESTING
1549

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Report checked and authorised by :
Chelsea Entwistle
Senior Customer Service Advisor

Issued by :
Aislinn Arthey
Customer Service Advis

Concept Reference: 677813
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Miscellaneous

				Concept Reference	**677813 002**	**677813 006**	**677813 018**	**677813 026**
				Customer Sample Reference	**BH17-C3-01 ES2 @ 1.00m**	**BH17-C3-02 ES2 @ 1.00m**	**BH17-C3-03 ES2 @ 1.00m**	**BH17-C3-04 ES2 @ 1.00m**
				Date Sampled	**08-AUG-2017**	**07-AUG-2017**	**10-AUG-2017**	**14-AUG-2017**
				Matrix Class	**Other**	**Other**	**Sandy Soil**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**				
Arsenic	T257	A40	2.0	mg/kg	**17**	**10**	**9**	**31**
Barium	T257	A40	2	mg/kg	**29**	**92**	**13**	**27**
Beryllium	T245	A40	0.5	mg/kg	<0.5	**0.8**	<0.5	**0.7**
Boron (water-soluble)	T82	A40	1	mg/kg	<1	<1	<1	<1
Cadmium	T257	A40	0.1	mg/kg	**0.1**	**0.8**	<0.1	**0.3**
Chromium	T257	A40	0.5	mg/kg	**19**	**14**	**9.5**	**17**
Copper	T257	A40	2	mg/kg	**8**	**17**	**4**	**14**
Lead	T257	A40	2	mg/kg	**10**	**8**	**6**	**12**
Mercury	T245	A40	1.0	mg/kg	<1.0	<1.0	<1.0	<1.0
Nickel	T257	A40	0.5	mg/kg	**15**	**18**	**7.3**	**23**
Selenium	T257	A40	3	mg/kg	<3	<3	<3	<3
Vanadium	T257	A40	0.1	mg/kg	**44**	**42**	**22**	**37**
Zinc	T257	A40	2	mg/kg	**33**	**14**	**19**	**52**
Moisture @105C	T162	AR	0.1	%	**7.6**	**74**	**7.3**	**12**
Retained on 2mm	T2	A40	0.1	%	**58.3**	<0.1	**31.3**	**27.4**

Concept Reference: 677813
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Asbestos

				Concept Reference	**677813 005**	**677813 017**
				Customer Sample Reference	**BH17-C3-02 ES1 @ 0.50m**	**BH17-C3-03 ES1 @ 0.50m**
				Date Sampled	**07-AUG-2017**	**10-AUG-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Asbestos ID	T27	A40			Asbestos not detected	Asbestos not detected

Concept Reference: 677813
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Soil Organic Matter

				Concept Reference	**677813 006**	**677813 018**
				Customer Sample Reference	**BH17-C3-02 ES2 @ 1.00m**	**BH17-C3-03 ES2 @ 1.00m**
				Date Sampled	**07-AUG-2017**	**10-AUG-2017**
				Matrix Class	**Other**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Soil Organic Matter	T287	A40	0.1	%	**43**	**0.3**

Concept Reference: 677813
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
TPH CWG

				Concept Reference	**677813 006**	**677813 018**
				Customer Sample Reference	**BH17-C3-02 ES2 @ 1.00m**	**BH17-C3-03 ES2 @ 1.00m**
				Date Sampled	**07-AUG-2017**	**10-AUG-2017**
				Matrix Class	**Other**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Benzene	T209	AR	10	µg/kg	<10	<10
Toluene	T209	AR	10	µg/kg	<10	<10
EthylBenzene	T209	AR	10	µg/kg	<10	<10
M/P Xylene	T209	AR	10	µg/kg	<10	<10
O Xylene	T209	AR	10	µg/kg	<10	<10
Methyl tert-Butyl Ether	T54	AR	1	µg/kg	**2**	<1
TPH (C5-C6 aliphatic)	T54	AR	0.010	mg/kg	<0.010	<0.010
TPH (C6-C7 aromatic)	T54	AR	0.010	mg/kg	<0.010	<0.010
TPH (C6-C8 aliphatic)	T54	AR	0.010	mg/kg	<0.010	<0.010
TPH (C7-C8 aromatic)	T54	AR	0.010	mg/kg	<0.010	<0.010
TPH (C8-C10 aliphatic)	T54	AR	0.010	mg/kg	<0.010	<0.010
TPH (C8-C10 aromatic)	T54	AR	0.010	mg/kg	<0.010	<0.010
TPH (C10-C12 aliphatic)	T219	AR	2	mg/kg	<2	<2
TPH (C10-C12 aromatic)	T219	AR	2	mg/kg	<2	<2
TPH (C12-C16 aliphatic)	T219	AR	2	mg/kg	<2	<2
TPH (C12-C16 aromatic)	T219	AR	2	mg/kg	<2	<2
TPH (C16-C21 aliphatic)	T219	AR	2	mg/kg	<2	<2
TPH (C16-C21 aromatic)	T219	AR	2	mg/kg	<2	<2
TPH (C21-C35 aliphatic)	T219	AR	2	mg/kg	**6**	<2
TPH (C21-C35 aromatic)	T219	AR	2	mg/kg	**18**	<2
TPH (C35-C40 aliphatic)	T219	AR	2	mg/kg	<2	<2
TPH (C35-C40 aromatic)	T219	AR	2	mg/kg	<2	<2

Concept Reference: 677813
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Organochlorine insecticides

				Concept Reference	**677813 006**	**677813 018**
				Customer Sample Reference	**BH17-C3-02 ES2 @ 1.00m**	**BH17-C3-03 ES2 @ 1.00m**
				Date Sampled	**07-AUG-2017**	**10-AUG-2017**
				Matrix Class	**Other**	**Sandy Soil**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Hexachlorocyclohexane	T16	AR	0.01	mg/kg	<0.01	<0.01
Hexachlorobenzene	T1	AR	0.01	mg/kg	<0.01	<0.01
Heptachlor	T16	AR	0.01	mg/kg	<0.01	<0.01
Aldrin	T16	AR	0.01	mg/kg	<0.01	<0.01
Heptachlor epoxide	T16	AR	0.01	mg/kg	<0.01	<0.01
Chlordane	T16	AR	0.01	mg/kg	<0.01	<0.01
Endosulphan	T16	AR	0.01	mg/kg	<0.01	<0.01
DDE	T16	AR	0.01	mg/kg	<0.01	<0.01
Dieldrin	T16	AR	0.01	mg/kg	<0.01	<0.01
Endrin	T16	AR	0.01	mg/kg	<0.01	<0.01
DDD	T16	AR	0.01	mg/kg	<0.01	<0.01
DDT	T16	AR	0.01	mg/kg	(131) <0.01	(131) <0.01

Concept Reference: 677813
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Organophosphorous insecticides

					Concept Reference	677813 006	677813 018
					Customer Sample Reference	BH17-C3-02 ES2 @ 1.00m	BH17-C3-03 ES2 @ 1.00m
					Date Sampled	07-AUG-2017	10-AUG-2017
					Matrix Class	Other	Sandy Soil
Determinand	**Method**	**Test Sample**	**LOD**	**Units**			
Dichlorvos	T16	AR	0.01	mg/kg		<0.01	<0.01
Mevinphos	T16	AR	0.01	mg/kg		<0.01	<0.01
Dimethoate	T16	AR	0.01	mg/kg		<0.01	<0.01
Diazinon	T16	AR	0.01	mg/kg		<0.01	<0.01
Pirimiphos methyl	T16	AR	0.01	mg/kg		(162) <0.02	(162) <0.02
Malathion	T16	AR	0.01	mg/kg		<0.01	<0.01
Fenitrothion	T16	AR	0.01	mg/kg		<0.01	<0.01
Parathion	T16	AR	0.01	mg/kg		<0.01	<0.01
Azinphos methyl	T16	AR	0.01	mg/kg		<0.01	<0.01

Concept Reference: 677813
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Triazines Suite

					Concept Reference	677813 006	677813 018
					Customer Sample Reference	BH17-C3-02 ES2 @ 1.00m	BH17-C3-03 ES2 @ 1.00m
					Date Sampled	07-AUG-2017	10-AUG-2017
					Matrix Class	Other	Sandy Soil
Determinand	**Method**	**Test Sample**	**LOD**	**Units**			
Simazine	T16	AR	0.01	mg/kg		(64) <0.01	(64) <0.01
Atrazine	T16	AR	0.01	mg/kg		(64) <0.01	(64) <0.01
Propazine	T16	AR	0.01	mg/kg		(64) <0.01	(64) <0.01
Trietazine	T16	AR	0.01	mg/kg		(64) <0.01	(64) <0.01
Prometryn	T16	AR	0.01	mg/kg		(64) <0.01	(64) <0.01
Terbutryn	T16	AR	0.01	mg/kg		(64) <0.01	(64) <0.01

Concept Reference: 677813
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Urons

					Concept Reference	677813 006	677813 018
					Customer Sample Reference	BH17-C3-02 ES2 @ 1.00m	BH17-C3-03 ES2 @ 1.00m
					Date Sampled	07-AUG-2017	10-AUG-2017
					Matrix Class	Other	Sandy Soil
Determinand	**Method**	**Test Sample**	**LOD**	**Units**			
Chlorotoluron	T310	AR	0.01	mg/kg		<0.01	<0.01
Diuron	T310	AR	0.01	mg/kg		<0.01	<0.01
Isoproturon	T310	AR	0.01	mg/kg		<0.01	<0.01
Linuron	T310	AR	0.01	mg/kg		<0.01	<0.01
Monuron	T310	AR	0.01	mg/kg		<0.01	<0.01

Concept Reference: 677813
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Phenoxy Acetic acid herbicides

	Concept Reference	677813 006	677813 018
	Customer Sample Reference	BH17-C3-02 ES2 @ 1.00m	BH17-C3-03 ES2 @ 1.00m
	Date Sampled	07-AUG-2017	10-AUG-2017
	Matrix Class	Other	Sandy Soil

Determinand	Method	Test Sample	LOD	Units		
Mecoprop	T16	AR	0.01	mg/kg	(36) <0.02	(36) <0.02
Phenoxy Acetic acid herbicide: MCPA	T16	AR	0.01	mg/kg	(36) <0.02	(36) <0.02
Dichlorprop	T16	AR	0.01	mg/kg	(36) <0.02	(36) <0.02
Phenoxy Acetic acid herbicide: 2,4-D	T16	AR	0.01	mg/kg	(36) <0.02	(36) <0.02
Fenoprop	T16	AR	0.01	mg/kg	(36) <0.02	(36) <0.02
Phenoxy Acetic acid herbicide: 2,4,5-T	T16	AR	0.01	mg/kg	(36) <0.02	(36) <0.02

Concept Reference: 677813
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
Phenols (Speciated)

	Concept Reference	677813 006	677813 018
	Customer Sample Reference	BH17-C3-02 ES2 @ 1.00m	BH17-C3-03 ES2 @ 1.00m
	Date Sampled	07-AUG-2017	10-AUG-2017
	Matrix Class	Other	Sandy Soil

Determinand	Method	Test Sample	LOD	Units		
Resorcinol	T17	AR	0.05	mg/kg	<0.05	<0.05
Catechol	T17	AR	0.05	mg/kg	<0.05	<0.05
Phenol	T17	AR	0.1	mg/kg	<0.1	<0.1
Cresols	T17	AR	0.05	mg/kg	<0.05	<0.05
Xylenols	T17	AR	0.05	mg/kg	<0.05	<0.05
Naphthols	T17	AR	0.05	mg/kg	<0.05	<0.05
Trimethyl phenol	T17	AR	0.05	mg/kg	<0.05	<0.05
Total Phenols	T17	AR	0.1	mg/kg	<0.1	<0.1

Index to symbols used in Supplement 1C to Report Number 677813-1

Value	Description
A40	Assisted dried < 40C
AR	As Received
64	Analysis was performed by an alternative technique
131	Result is outside of the scope of accreditation due to a QC Failure
162	LOD determined by matrix spike recovery
36	LOD Raised due to low Matrix spike recovery
S	Analysis was subcontracted
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Urons and Triazines analysis transferred to Concept Life Sciences Cambridge
PAAH, OCP and OPP analysis transferred to Concept Life Sciences Manchester
BTEX: Samples submitted for GC/MS (Headspace) analysis were submitted in inappropriate containers. It is possible therefore that the results provided may be compromised.
Retained on 2mm is removed before analysis
Asbestos subcontracted to REC Limited
Reported results on as received samples are corrected to a 105 degree centigrade dry weight basis except OCP, OPP, Triazines, Urons and PAAH
Supplement 1C report reissued to include 002, 005, 006, 017, 018 and 026
Phenols, OCP, OPP, BTEX/MTBE: These samples have been analysed exceeding recommended holding times. It is possible therefore that the results provided may be compromised.

Method Index

Value	Description
T245	ICP/OES (Aqua Regia Extraction)
T2	Grav
T54	GC/MS (Headspace)
T82	ICP/OES (Sim)
T162	Grav (1 Dec) (105 C)
T27	PLM
T219	GC/FID (SE)
T257	ICP/OES (SIM) (Aqua Regia Extraction)
T287	Calc TOC/0.58
T17	HPLC
T1	GC/MS (HR)
T310	LC/MS/MS
T16	GC/MS
T209	GC/MS (Head Space)(MCERTS)

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Arsenic	T257	A40	2.0	mg/kg	N	002,006
Arsenic	T257	A40	2	mg/kg	M	018,026
Barium	T257	A40	2	mg/kg	N	002,006
Barium	T257	A40	2	mg/kg	U	018,026
Beryllium	T245	A40	0.5	mg/kg	N	002,006
Beryllium	T245	A40	0.5	mg/kg	U	018,026
Boron (water-soluble)	T82	A40	1	mg/kg	N	002,006,018,026
Cadmium	T257	A40	0.1	mg/kg	N	002,006
Cadmium	T257	A40	0.1	mg/kg	M	018,026
Chromium	T257	A40	0.5	mg/kg	N	002,006
Chromium	T257	A40	0.5	mg/kg	M	018,026
Copper	T257	A40	2	mg/kg	N	002,006
Copper	T257	A40	2	mg/kg	M	018,026
Lead	T257	A40	2	mg/kg	N	002,006
Lead	T257	A40	2	mg/kg	M	018,026
Mercury	T245	A40	1.0	mg/kg	N	002,006
Mercury	T245	A40	1.0	mg/kg	U	018,026
Nickel	T257	A40	0.5	mg/kg	N	002,006
Nickel	T257	A40	0.5	mg/kg	M	018,026
Selenium	T257	A40	3	mg/kg	N	002,006
Selenium	T257	A40	3	mg/kg	U	018,026
Vanadium	T257	A40	0.1	mg/kg	N	002,006
Vanadium	T257	A40	0.1	mg/kg	U	018,026
Zinc	T257	A40	2	mg/kg	N	002,006
Zinc	T257	A40	2	mg/kg	M	018,026
Moisture @105C	T162	AR	0.1	%	N	002,006,018,026
Retained on 2mm	T2	A40	0.1	%	N	002,006,018,026
Asbestos ID	T27	A40			SU	005,017
Soil Organic Matter	T287	A40	0.1	%	N	006,018
Benzene	T209	AR	10	µg/kg	N	006
Benzene	T209	AR	10	µg/kg	M	018
Toluene	T209	AR	10	µg/kg	N	006
Toluene	T209	AR	10	µg/kg	M	018
EthylBenzene	T209	AR	10	µg/kg	N	006
EthylBenzene	T209	AR	10	µg/kg	M	018
M/P Xylene	T209	AR	10	µg/kg	N	006
M/P Xylene	T209	AR	10	µg/kg	M	018
O Xylene	T209	AR	10	µg/kg	N	006
O Xylene	T209	AR	10	µg/kg	M	018
Methyl tert-Butyl Ether	T54	AR	1	µg/kg	N	006
Methyl tert-Butyl Ether	T54	AR	1	µg/kg	U	018
TPH (C5-C6 aliphatic)	T54	AR	0.010	mg/kg	N	006,018
TPH (C6-C7 aromatic)	T54	AR	0.010	mg/kg	N	006,018
TPH (C6-C8 aliphatic)	T54	AR	0.010	mg/kg	N	006,018
TPH (C7-C8 aromatic)	T54	AR	0.010	mg/kg	N	006,018
TPH (C8-C10 aliphatic)	T54	AR	0.010	mg/kg	N	006,018
TPH (C8-C10 aromatic)	T54	AR	0.010	mg/kg	N	006,018
TPH (C10-C12 aliphatic)	T219	AR	2	mg/kg	N	006,018

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
TPH (C10-C12 aromatic)	T219	AR	2	mg/kg	N	006,018
TPH (C12-C16 aliphatic)	T219	AR	2	mg/kg	N	006,018
TPH (C12-C16 aromatic)	T219	AR	2	mg/kg	N	006,018
TPH (C16-C21 aliphatic)	T219	AR	2	mg/kg	N	006,018
TPH (C16-C21 aromatic)	T219	AR	2	mg/kg	N	006,018
TPH (C21-C35 aliphatic)	T219	AR	2	mg/kg	N	006,018
TPH (C21-C35 aromatic)	T219	AR	2	mg/kg	N	006,018
TPH (C35-C40 aliphatic)	T219	AR	2	mg/kg	N	006,018
TPH (C35-C40 aromatic)	T219	AR	2	mg/kg	N	006,018
Hexachlorocyclohexane	T16	AR	0.01	mg/kg	N	006
Hexachlorocyclohexane	T16	AR	0.01	mg/kg	U	018
Hexachlorobenzene	T1	AR	0.01	mg/kg	N	006
Hexachlorobenzene	T1	AR	0.01	mg/kg	U	018
Heptachlor	T16	AR	0.01	mg/kg	N	006
Heptachlor	T16	AR	0.01	mg/kg	U	018
Aldrin	T16	AR	0.01	mg/kg	N	006
Aldrin	T16	AR	0.01	mg/kg	U	018
Heptachlor epoxide	T16	AR	0.01	mg/kg	N	006
Heptachlor epoxide	T16	AR	0.01	mg/kg	U	018
Chlordane	T16	AR	0.01	mg/kg	N	006
Chlordane	T16	AR	0.01	mg/kg	U	018
Endosulphan	T16	AR	0.01	mg/kg	N	006
Endosulphan	T16	AR	0.01	mg/kg	U	018
DDE	T16	AR	0.01	mg/kg	N	006
DDE	T16	AR	0.01	mg/kg	U	018
Dieldrin	T16	AR	0.01	mg/kg	N	006
Dieldrin	T16	AR	0.01	mg/kg	U	018
Endrin	T16	AR	0.01	mg/kg	N	006
Endrin	T16	AR	0.01	mg/kg	U	018
DDD	T16	AR	0.01	mg/kg	N	006
DDD	T16	AR	0.01	mg/kg	U	018
DDT	T16	AR	0.01	mg/kg	N	006
DDT	T16	AR	0.01	mg/kg	U	018
Dichlorvos	T16	AR	0.01	mg/kg	N	006
Dichlorvos	T16	AR	0.01	mg/kg	U	018
Mevinphos	T16	AR	0.01	mg/kg	N	006
Mevinphos	T16	AR	0.01	mg/kg	U	018
Dimethoate	T16	AR	0.01	mg/kg	N	006
Dimethoate	T16	AR	0.01	mg/kg	U	018
Diazinon	T16	AR	0.01	mg/kg	N	006
Diazinon	T16	AR	0.01	mg/kg	U	018
Pirimiphos methyl	T16	AR	0.01	mg/kg	N	006
Pirimiphos methyl	T16	AR	0.01	mg/kg	U	018
Malathion	T16	AR	0.01	mg/kg	N	006
Malathion	T16	AR	0.01	mg/kg	U	018
Fenitrothion	T16	AR	0.01	mg/kg	N	006
Fenitrothion	T16	AR	0.01	mg/kg	U	018
Parathion	T16	AR	0.01	mg/kg	N	006
Parathion	T16	AR	0.01	mg/kg	U	018
Azinphos methyl	T16	AR	0.01	mg/kg	N	006
Azinphos methyl	T16	AR	0.01	mg/kg	U	018
Simazine	T16	AR	0.01	mg/kg	N	006,018
Atrazine	T16	AR	0.01	mg/kg	N	006,018
Propazine	T16	AR	0.01	mg/kg	N	006,018
Trietazine	T16	AR	0.01	mg/kg	N	006,018
Prometryn	T16	AR	0.01	mg/kg	N	006,018
Terbutryn	T16	AR	0.01	mg/kg	N	006,018
Chlorotoluron	T310	AR	0.01	mg/kg	N	006,018
Diuron	T310	AR	0.01	mg/kg	N	006,018
Isoproturon	T310	AR	0.01	mg/kg	N	006,018
Linuron	T310	AR	0.01	mg/kg	N	006,018
Monuron	T310	AR	0.01	mg/kg	N	006,018
Mecoprop	T16	AR	0.01	mg/kg	N	006,018
Phenoxy Acetic acid herbicide: MCPA	T16	AR	0.01	mg/kg	N	006,018
Dichlorprop	T16	AR	0.01	mg/kg	N	006,018
Phenoxy Acetic acid herbicide: 2,4-D	T16	AR	0.01	mg/kg	N	006,018
Fenoprop	T16	AR	0.01	mg/kg	N	006,018
Phenoxy Acetic acid herbicide: 2,4,5-T	T16	AR	0.01	mg/kg	N	006,018
Resorcinol	T17	AR	0.05	mg/kg	N	006
Resorcinol	T17	AR	0.05	mg/kg	M	018

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Catechol	T17	AR	0.05	mg/kg	N	006,018
Phenol	T17	AR	0.1	mg/kg	N	006
Phenol	T17	AR	0.1	mg/kg	M	018
Cresols	T17	AR	0.05	mg/kg	N	006
Cresols	T17	AR	0.05	mg/kg	M	018
Xylenols	T17	AR	0.05	mg/kg	N	006
Xylenols	T17	AR	0.05	mg/kg	M	018
Naphthols	T17	AR	0.05	mg/kg	N	006,018
Trimethyl phenol	T17	AR	0.05	mg/kg	N	006
Trimethyl phenol	T17	AR	0.05	mg/kg	M	018
Total Phenols	T17	AR	0.1	mg/kg	N	006,018

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DELIVERING SCIENCE

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Concept Life Sciences

Certificate of Analysis

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Report Number: Supplement 1A to Report Number 677813-1

Date of Report: 18-Oct-2017

Customer: TerraConsult Limited
Unit 34
Bold Business Centre
Bold Lane
Sutton
St Helens
WA9 4TX

Customer Contact: Mr Jimmy Thorburn

Customer Job Reference: 3318
Customer Purchase Order: PO-001839
Customer Site Reference: Norfolk Vanguard Cable Route
Date Job Received at Concept: 31-Jul-2017
Date Analysis Started: 29-Aug-2017
Date Analysis Completed: 12-Sep-2017

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

This report should not be reproduced except in full without the written approval of the laboratory

Tests covered by this certificate were conducted in accordance with Concept Life Sciences SOPs

All results have been reviewed in accordance with Section 25 of the Concept Life Sciences, Analytical Services Quality Manual

UKAS TESTING
1549

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Report checked and authorised by :
Chelsea Entwistle
Senior Customer Service Advisor

Issued by :
Aislinn Arthey
Customer Service A

Waste Acceptance Criteria

Customer Sample Reference : BH17-C3-02 ES2 @ 1.00m
SAL Sample Reference : 677813 006
Project Site : Norfolk Vanguard Cable Route
Customer Reference : 3318
Test Portion Mass (g) : 87.5
Date Sampled : 07-AUG-2017
Matrix Class : Other

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
pH	Probe			N	6.4		>6.0	
Loss on Ignition @450C	Ign @450C/Grav	0.1	%	N	39			**10.0**
Total Organic Carbon	OX/IR	0.1	%	N	25	3.0	5.0	**6.0**
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	<2.0			
BTEX (Sum)	Calc	0.040	mg/kg	N	<0.040	6.0		
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
TPH (C10-C40)	GC/FID (SE)	10	mg/kg	N	(13) 100	500.0		
Coronene	GC/MS (MCERTS)	0.1	mg/kg	N	<0.1			
PCB EC7 (Sum)	Calc	0.00035	mg/kg	N	<0.14	1.0		
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	74			
Retained on 2mm	Grav	0.1	%	N	<0.1			

10:1 Leachate					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony (Dissolved)	Calc / ICP/MS (Filtered)	0.011	mg/kg	N	<0.011	0.06	0.7	5.0
Arsenic (Dissolved)	Calc / ICP/MS (Filtered)	0.0022	mg/kg	N	<0.0022	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.011	mg/kg	N	<0.011	20.0	100.0	300.0
Cadmium (Dissolved)	Calc / ICP/MS (Filtered)	0.00022	mg/kg	N	<0.00022	0.04	1.0	5.0
Chloride	Calc / Discrete Analyser	11	mg/kg	N	56	800.0	15000.0	25000.0
Chromium (Dissolved)	Calc / ICP/MS (Filtered)	0.011	mg/kg	N	<0.011	0.5	10.0	70.0
Copper (Dissolved)	Calc / ICP/MS (Filtered)	0.0054	mg/kg	N	<0.0054	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	11	mg/kg	N	560	**500.0**	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.54	mg/kg	N	4.0	10.0	150.0	500.0
Lead (Dissolved)	Calc / ICP/MS (Filtered)	0.0032	mg/kg	N	<0.0032	0.5	10.0	50.0
Mercury (Dissolved)	Calc / ICP/MS (Filtered)	0.00054	mg/kg	N	<0.00054	0.01	0.2	2.0
Molybdenum (Dissolved)	Calc / ICP/MS (Filtered)	0.011	mg/kg	N	<0.011	0.5	10.0	30.0
Nickel (Dissolved)	Calc / ICP/MS (Filtered)	0.011	mg/kg	N	<0.011	0.4	10.0	40.0
Phenols(Mono)	Calc / Colorimetry (CF)	0.22	mg/kg	N	<0.22	1.0		
Selenium (Dissolved)	Calc / ICP/MS (Filtered)	0.0054	mg/kg	N	<0.0054	0.1	0.5	7.0
SO4--	Calc / Discrete Analyser	5.4	mg/kg	N	1200	**1000.0**	20000.0	50000.0
Total Dissolved Solids	Calc	110	mg/kg	N	2400	4000.0	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.022	mg/kg	N	<0.022	4.0	50.0	200.0

From: EC Directive 99/31/EC and Landfill Regulations 2002 (as ammended)
The 2:1 moisture extract was not produced because the moisture content of the sample was greater than 200%. Therefore, the exact application of the two-step leaching test is precluded on technical grounds (ref: Section 5.2.4 BS EN 12457-3:2002). Results are derived from a single step leaching at L/S 10/1 as prescribed by the EA guidance. (Ref Section C4.1.1 Guidance on Sampling and Testing of Wastes to meet Landfill Waste Acceptance Procedures Version 1 April 2005, Environment Agency)
Notes:- Cumulative release at L/S=10 (mg/kg of dry matter) in accordance with BS EN 12457. Soil leaching procedure is not covered by our UKAS accreditation

As detailed in- Waste Classification. Guidance on the classification and assessment of waste. Technical Guidance WM3:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/427077/LIT_10121.pdf

Landfill WAC analysis (specifically leaching test results) should not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Waste Acceptance Criteria

Customer Sample Reference : BH17-C3-03 ES2 @ 1.00m
SAL Sample Reference : 677813 018
Project Site : Norfolk Vanguard Cable Route
Customer Reference : 3318
Test Portion Mass (g) : 175
Date Sampled : 10-AUG-2017
Matrix Class : Sandy Soil

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
pH	Probe			M	8.3		>6.0	
Loss on Ignition @450C	Ign @450C/Grav	0.1	%	M	0.9			10.0
Total Organic Carbon	OX/IR	0.1	%	N	0.2	3.0	5.0	6.0
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	<2.0			
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
TPH (C10-C40)	GC/FID (SE)	10	mg/kg	M	(13) <10	500.0		
Coronene	GC/MS (MCERTS)	0.1	mg/kg	N	<0.1			
PCB EC7 (Sum)	Calc	0.00035	mg/kg	N	<0.14	1.0		
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	7.3			
Retained on 2mm	Grav	0.1	%	N	31.3			

10:1 Leachate					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic (Dissolved)	Calc / ICP/MS (Filtered)	0.0020	mg/kg	N	0.0058	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.021	20.0	100.0	300.0
Cadmium (Dissolved)	Calc / ICP/MS (Filtered)	0.00020	mg/kg	N	<0.00020	0.04	1.0	5.0
Chloride	Calc / Discrete Analyser	10	mg/kg	N	28	800.0	15000.0	25000.0
Chromium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.017	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	10	mg/kg	N	72	500.0	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.50	mg/kg	N	4.5	10.0	150.0	500.0
Lead (Dissolved)	Calc / ICP/MS (Filtered)	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury (Dissolved)	Calc / ICP/MS (Filtered)	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	30.0
Nickel (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.4	10.0	40.0
Phenols(Mono)	Calc / Colorimetry (CF)	0.20	mg/kg	N	<0.20	1.0		
Selenium (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
SO4--	Calc / Discrete Analyser	5.0	mg/kg	N	7.3	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	100	mg/kg	N	440	4000.0	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.020	mg/kg	N	<0.020	4.0	50.0	200.0

From: EC Directive 99/31/EC and Landfill Regulations 2002 (as ammended)

Notes:- Cumulative release at L/S=10 (mg/kg of dry matter) in accordance with BS EN 12457. Soil leaching procedure is not covered by our UKAS accreditation

As detailed in- Waste Classification. Guidance on the classification and assessment of waste. Technical Guidance WM3:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/427077/LIT_10121.pdf

Landfill WAC analysis (specifically leaching test results) should not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Concept Reference: 677813
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil

Total and Speciated USEPA16 PAH (SE) (MCERTS)

				Concept Reference	**677813 006**	**677813 018**
				Customer Sample Reference	**BH17-C3-02 ES2 @ 1.00m**	**BH17-C3-03 ES2 @ 1.00m**
				Test Sample	**AR**	**AR**
				Date Sampled	**07-AUG-2017**	**10-AUG-2017**
				Matrix Class	**Other**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**		
Naphthalene	GC/MS	0.1	mg/kg	N	<0.1	-
Naphthalene	GC/MS	0.1	mg/kg	U	-	<0.1
Acenaphthylene	GC/MS	0.1	mg/kg	N	<0.1	-
Acenaphthylene	GC/MS	0.1	mg/kg	U	-	<0.1
Acenaphthene	GC/MS	0.1	mg/kg	N	<0.1	-
Acenaphthene	GC/MS	0.1	mg/kg	M	-	<0.1
Fluorene	GC/MS	0.1	mg/kg	N	<0.1	-
Fluorene	GC/MS	0.1	mg/kg	M	-	<0.1
Phenanthrene	GC/MS	0.1	mg/kg	N	<0.1	-
Phenanthrene	GC/MS	0.1	mg/kg	U	-	<0.1
Anthracene	GC/MS	0.1	mg/kg	N	<0.1	-
Anthracene	GC/MS	0.1	mg/kg	M	-	<0.1
Fluoranthene	GC/MS	0.1	mg/kg	N	<0.1	<0.1
Pyrene	GC/MS	0.1	mg/kg	N	<0.1	<0.1
Benzo(a)Anthracene	GC/MS	0.1	mg/kg	N	<0.1	-
Benzo(a)Anthracene	GC/MS	0.1	mg/kg	M	-	<0.1
Chrysene	GC/MS	0.1	mg/kg	N	<0.1	-
Chrysene	GC/MS	0.1	mg/kg	M	-	<0.1
Benzo(b)fluoranthene	GC/MS	0.1	mg/kg	N	**0.1**	-
Benzo(b)fluoranthene	GC/MS	0.1	mg/kg	U	-	<0.1
Benzo(k)fluoranthene	GC/MS	0.1	mg/kg	N	<0.1	<0.1
Benzo(a)Pyrene	GC/MS	0.1	mg/kg	N	<0.1	-
Benzo(a)Pyrene	GC/MS	0.1	mg/kg	M	-	<0.1
Indeno(123-cd)Pyrene	GC/MS	0.1	mg/kg	N	<0.1	-
Indeno(123-cd)Pyrene	GC/MS	0.1	mg/kg	M	-	<0.1
Dibenzo(ah)Anthracene	GC/MS	0.1	mg/kg	N	<0.1	-
Dibenzo(ah)Anthracene	GC/MS	0.1	mg/kg	M	-	<0.1
Benzo(ghi)Perylene	GC/MS	0.1	mg/kg	N	<0.1	-
Benzo(ghi)Perylene	GC/MS	0.1	mg/kg	M	-	<0.1
Polyaromatic Hydrocarbons (Total)	GC/MS	0.1	mg/kg	N	**0.1**	-
Polyaromatic Hydrocarbons (Total)	GC/MS	0.1	mg/kg	U	-	<0.1

Concept Reference: 677813
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil

BTEX

				Concept Reference	**677813 006**	**677813 018**
				Customer Sample Reference	**BH17-C3-02 ES2 @ 1.00m**	**BH17-C3-03 ES2 @ 1.00m**
				Test Sample	**AR**	**AR**
				Date Sampled	**07-AUG-2017**	**10-AUG-2017**
				Matrix Class	**Other**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**		
Benzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	N	<10	-
Benzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	-	<10
Toluene	GC/MS (Head Space)(MCERTS)	10	µg/kg	N	<10	-
Toluene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	-	<10
EthylBenzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	N	<10	-
EthylBenzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	-	<10
Meta/Para-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	N	<10	-
Meta/Para-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	-	<10
Ortho-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	N	<10	-
Ortho-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	-	<10

Concept Reference: 677813
Project Site: Norfolk Vanguard Cable Route
Customer Reference: 3318

Soil Analysed as Soil
PCBs EC7 (SE)

				Concept Reference	**677813 006**	**677813 018**
				Customer Sample Reference	**BH17-C3-02 ES2 @ 1.00m**	**BH17-C3-03 ES2 @ 1.00m**
				Test Sample	**AR**	**AR**
				Date Sampled	**07-AUG-2017**	**10-AUG-2017**
				Matrix Class	**Other**	**Sandy Soil**
Determinand	**Method**	**LOD**	**Units**	**Symbol**		
Polychlorinated biphenyl BZ#28	GC/MS	20	µg/kg	N	<20	-
Polychlorinated biphenyl BZ#28	GC/MS	20	µg/kg	M	-	<20
Polychlorinated biphenyl BZ#52	GC/MS	20	µg/kg	N	<20	-
Polychlorinated biphenyl BZ#52	GC/MS	20	µg/kg	M	-	<20
Polychlorinated biphenyl BZ#101	GC/MS	20	µg/kg	N	<20	-
Polychlorinated biphenyl BZ#101	GC/MS	20	µg/kg	M	-	<20
Polychlorinated biphenyl BZ#118	GC/MS	20	µg/kg	N	<20	-
Polychlorinated biphenyl BZ#118	GC/MS	20	µg/kg	M	-	<20
Polychlorinated biphenyl BZ#153	GC/MS	20	µg/kg	N	<20	-
Polychlorinated biphenyl BZ#153	GC/MS	20	µg/kg	M	-	<20
Polychlorinated biphenyl BZ#138	GC/MS	20	µg/kg	N	<20	-
Polychlorinated biphenyl BZ#138	GC/MS	20	µg/kg	M	-	<20
Polychlorinated biphenyl BZ#180	GC/MS	20	µg/kg	N	<20	-
Polychlorinated biphenyl BZ#180	GC/MS	20	µg/kg	M	-	<20

Index to symbols used in Supplement 1A to Report Number 677813-1

Value	Description
8:1	Leachate to BS EN 12457-3 (8:1)
2:1	Leachate to BS EN 12457-3 (2:1)
A40	Assisted dried < 40C
AR	As Received
13	Results have been blank corrected.
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

BTEX: Samples submitted for GC/MS (Headspace) analysis were submitted in inappropriate containers. It is possible therefore that the results provided may be compromised.
Retained on 2mm is removed before analysis
Reported results on as received samples are corrected to a 105 degree centigrade dry weight basis except ANC
pH, LOI & TOC were performed on assisted dried samples (<40 degree centigrade). All other results relate to samples as received.
PAH, BTEX/MTBE, TPH & PCB: These samples have been analysed exceeding recommended holding times. It is possible therefore that the results provided may be compromised.
Supplement 1A report reissued to include only samples 006 and 018

CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

Concept Life Sciences is a trading name of Concept Life Sciences Analytical & Development Services Limited registered in England and Wales (No 2514788)

Concept Life Sciences

Certificate of Analysis

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Report Number: Supplement 1B to Report Number 677853-1

Date of Report: 18-Oct-2017

Customer: TerraConsult (South) Limited
Suite F17 Dugard House
Peartree Road
Colchester
Essex
CO3 0UL

Customer Contact: Victoria Smith

Customer Job Reference: 3318
Customer Site Reference: East Anglia OWF
Date Job Received at Concept: 24-Aug-2017
Date Analysis Started: 25-Aug-2017
Date Analysis Completed: 04-Sep-2017

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

This report should not be reproduced except in full without the written approval of the laboratory

Tests covered by this certificate were conducted in accordance with Concept Life Sciences SOPs

All results have been reviewed in accordance with Section 25 of the Concept Life Sciences, Analytical Services Quality Manual

UKAS TESTING
1549

Report checked and authorised by :
Aislinn Arthey
Customer Service Advisor

Issued by :
Aislinn Arthey
Customer Service Advis

Concept Reference: 677853
Project Site: East Anglia OWF
Customer Reference: 3318

Water Analysed as Water
Heavy Metals (9)

Concept Reference	**677853 002**	**677853 003**
Customer Sample Reference	**C3-01**	**C3-03**
Date Sampled	**22-AUG-2017**	**22-AUG-2017**

Determinand	Method	Test Sample	LOD	Units		
As (Dissolved)	T281	F	0.0002	mg/l	**0.0013**	**0.029**
Cd (Dissolved)	T281	F	0.00002	mg/l	<0.00002	**0.00065**
Cr (Dissolved)	T281	F	0.001	mg/l	<0.001	(149) <0.005
Cu (Dissolved)	T281	F	0.0005	mg/l	**0.0010**	**0.026**
Pb (Dissolved)	T281	F	0.0003	mg/l	<0.0003	**0.0078**
Hg (Dissolved)	T281	F	0.00005	mg/l	<0.00005	(149) <0.00025
Ni (Dissolved)	T281	F	0.001	mg/l	**0.002**	**0.018**
Se (Dissolved)	T281	F	0.0005	mg/l	**0.0044**	**0.14**
Zn (Dissolved)	T281	F	0.002	mg/l	**0.005**	**0.049**

Concept Reference: 677853
Project Site: East Anglia OWF
Customer Reference: 3318

Water Analysed as Water
Total and Speciated USEPA16 PAH (SE)

Concept Reference	**677853 002**	**677853 003**
Customer Sample Reference	**C3-01**	**C3-03**
Date Sampled	**22-AUG-2017**	**22-AUG-2017**

Determinand	Method	Test Sample	LOD	Units		
Naphthalene	T149	AR	0.01	µg/l	<0.01	<0.01
Acenaphthylene	T149	AR	0.01	µg/l	<0.01	<0.01
Acenaphthene	T149	AR	0.01	µg/l	<0.01	<0.01
Fluorene	T149	AR	0.01	µg/l	<0.01	<0.01
Phenanthrene	T149	AR	0.01	µg/l	<0.01	<0.01
Anthracene	T149	AR	0.01	µg/l	<0.01	<0.01
Fluoranthene	T149	AR	0.01	µg/l	<0.01	<0.01
Pyrene	T149	AR	0.01	µg/l	<0.01	<0.01
Benzo(a)Anthracene	T149	AR	0.01	µg/l	<0.01	<0.01
Chrysene	T149	AR	0.01	µg/l	<0.01	<0.01
Benzo(b)fluoranthene	T149	AR	0.01	µg/l	<0.01	<0.01
Benzo(k)fluoranthene	T149	AR	0.01	µg/l	<0.01	<0.01
Benzo(a)Pyrene	T149	AR	0.01	µg/l	<0.01	<0.01
Indeno(123-cd)Pyrene	T149	AR	0.01	µg/l	<0.01	<0.01
Dibenzo(ah)Anthracene	T149	AR	0.01	µg/l	<0.01	<0.01
Benzo(ghi)Perylene	T149	AR	0.01	µg/l	<0.01	<0.01
PAH(total)	T149	AR	0.01	µg/l	<0.01	<0.01

Concept Reference: 677853
Project Site: East Anglia OWF
Customer Reference: 3318

Water Analysed as Water
TPH (CWG) with MTBE & BTEX SE

				Concept Reference	**677853 002**	**677853 003**
				Customer Sample Reference	**C3-01**	**C3-03**
				Date Sampled	**22-AUG-2017**	**22-AUG-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Benzene	T54	AR	1	µg/l	<1	<1
Toluene	T54	AR	1	µg/l	<1	<1
EthylBenzene	T54	AR	1	µg/l	<1	<1
M/P Xylene	T54	AR	1	µg/l	<1	<1
O Xylene	T54	AR	1	µg/l	<1	<1
Methyl tert-Butyl Ether	T54	AR	1	µg/l	<1	<1
TPH (C5-C6 aliphatic)	T54	AR	0.020	mg/l	<0.020	<0.020
TPH (C6-C7 aromatic)	T54	AR	0.020	mg/l	<0.020	<0.020
TPH (C6-C8 aliphatic)	T54	AR	0.020	mg/l	<0.020	<0.020
TPH (C7-C8 aromatic)	T54	AR	0.020	mg/l	<0.020	<0.020
TPH (C8-C10 aliphatic)	T54	AR	0.020	mg/l	<0.020	<0.020
TPH (C8-C10 aromatic)	T54	AR	0.020	mg/l	<0.020	<0.020
TPH (C10-C12 aliphatic)	T219	AR	0.01	mg/l	<0.01	<0.01
TPH (C10-C12 aromatic)	T219	AR	0.01	mg/l	<0.01	<0.01
TPH (C12-C16 aliphatic)	T219	AR	0.01	mg/l	<0.01	<0.01
TPH (C12-C16 aromatic)	T219	AR	0.01	mg/l	<0.01	**0.01**
TPH (C16-C21 aliphatic)	T219	AR	0.01	mg/l	**0.01**	**0.02**
TPH (C16-C21 aromatic)	T219	AR	0.01	mg/l	**0.02**	**0.03**
TPH (C21-C35 aliphatic)	T219	AR	0.01	mg/l	**0.05**	**0.04**
TPH (C21-C35 aromatic)	T219	AR	0.01	mg/l	**0.04**	**0.04**

Concept Reference: 677853
Project Site: East Anglia OWF
Customer Reference: 3318

Water Analysed as Water
Organochlorine insecticides

				Concept Reference	**677853 002**	**677853 003**
				Customer Sample Reference	**C3-01**	**C3-03**
				Date Sampled	**22-AUG-2017**	**22-AUG-2017**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
Hexachlorocyclohexane	T16	AR	0.01	µg/l	<0.01	(100) <0.10
Hexachlorobenzene	T16	AR	0.01	µg/l	<0.01	(100) <0.10
Heptachlor	T16	AR	0.01	µg/l	<0.01	(100) <0.10
Aldrin	T16	AR	0.01	µg/l	<0.01	(100) <0.10
Heptachlor epoxide	T16	AR	0.01	µg/l	<0.01	(100) <0.10
Chlordane	T16	AR	0.01	µg/l	<0.01	(100) <0.10
Endosulphan	T16	AR	0.01	µg/l	<0.01	(100) <0.10
DDE	T16	AR	0.01	µg/l	<0.01	(100) <0.10
Dieldrin	T16	AR	0.01	µg/l	<0.01	(100) <0.10
Endrin	T16	AR	0.01	µg/l	<0.01	(100) <0.10
DDD	T16	AR	0.01	µg/l	<0.01	(100) <0.10
DDT	T16	AR	0.01	µg/l	(36) <0.02	(100,36) <0.20

Concept Reference: 677853
Project Site: East Anglia OWF
Customer Reference: 3318

Water Analysed as Water
Organophosphorous insecticides

	Concept Reference	677853 002	677853 003
	Customer Sample Reference	C3-01	C3-03
	Date Sampled	22-AUG-2017	22-AUG-2017

Determinand	Method	Test Sample	LOD	Units		
Dichlorvos	T16	AR	0.01	µg/l	<0.01	(100) <0.10
Mevinphos	T16	AR	0.01	µg/l	<0.01	(100) <0.10
Dimethoate	T16	AR	0.01	µg/l	<0.01	(100) <0.10
Diazinon	T16	AR	0.01	µg/l	<0.01	(100) <0.10
Pirimiphos methyl	T16	AR	0.01	µg/l	<0.01	(100) <0.10
Malathion	T16	AR	0.01	µg/l	<0.01	(100) <0.10
Fenitrothion	T16	AR	0.01	µg/l	<0.01	(100) <0.10
Parathion	T16	AR	0.01	µg/l	<0.01	(100) <0.10
Azinphos methyl	T16	AR	0.01	µg/l	<0.01	(100) <0.10

Index to symbols used in Supplement 1B to Report Number 677853-1

Value	Description
AR	As Received
F	Filtered
149	LOD raised due to high dissolved solids
100	LOD determined by sample aliquot used for analysis
36	LOD Raised due to low Matrix spike recovery
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Supplement 1B Report Reissued to include only samples 002 and 003
OCP and OPP analysis transferred to Concept Life Sciences Manchester

Method Index

Value	Description
T16	GC/MS
T149	GC/MS (SIR)
T281	ICP/MS (Filtered)
T219	GC/FID (SE)
T54	GC/MS (Headspace)

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
As (Dissolved)	T281	F	0.0002	mg/l	U	002-003
Cd (Dissolved)	T281	F	0.00002	mg/l	U	002-003
Cr (Dissolved)	T281	F	0.001	mg/l	U	002-003
Cu (Dissolved)	T281	F	0.0005	mg/l	U	002-003
Pb (Dissolved)	T281	F	0.0003	mg/l	U	002-003
Hg (Dissolved)	T281	F	0.00005	mg/l	U	002-003
Ni (Dissolved)	T281	F	0.001	mg/l	U	002-003
Se (Dissolved)	T281	F	0.0005	mg/l	U	002-003
Zn (Dissolved)	T281	F	0.002	mg/l	U	002-003
Naphthalene	T149	AR	0.01	µg/l	U	002-003
Acenaphthylene	T149	AR	0.01	µg/l	U	002-003
Acenaphthene	T149	AR	0.01	µg/l	U	002-003
Fluorene	T149	AR	0.01	µg/l	U	002-003
Phenanthrene	T149	AR	0.01	µg/l	U	002-003
Anthracene	T149	AR	0.01	µg/l	U	002-003
Fluoranthene	T149	AR	0.01	µg/l	U	002-003
Pyrene	T149	AR	0.01	µg/l	U	002-003

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Benzo(a)Anthracene	T149	AR	0.01	µg/l	U	002-003
Chrysene	T149	AR	0.01	µg/l	U	002-003
Benzo(b)fluoranthene	T149	AR	0.01	µg/l	N	002-003
Benzo(k)fluoranthene	T149	AR	0.01	µg/l	U	002-003
Benzo(a)Pyrene	T149	AR	0.01	µg/l	U	002-003
Indeno(123-cd)Pyrene	T149	AR	0.01	µg/l	U	002-003
Dibenzo(ah)Anthracene	T149	AR	0.01	µg/l	U	002-003
Benzo(ghi)Perylene	T149	AR	0.01	µg/l	U	002-003
PAH(total)	T149	AR	0.01	µg/l	N	002-003
Benzene	T54	AR	1	µg/l	U	002-003
Toluene	T54	AR	1	µg/l	U	002-003
EthylBenzene	T54	AR	1	µg/l	U	002-003
M/P Xylene	T54	AR	1	µg/l	U	002-003
O Xylene	T54	AR	1	µg/l	U	002-003
Methyl tert-Butyl Ether	T54	AR	1	µg/l	U	002-003
TPH (C5-C6 aliphatic)	T54	AR	0.020	mg/l	N	002-003
TPH (C6-C7 aromatic)	T54	AR	0.020	mg/l	N	002-003
TPH (C6-C8 aliphatic)	T54	AR	0.020	mg/l	N	002-003
TPH (C7-C8 aromatic)	T54	AR	0.020	mg/l	N	002-003
TPH (C8-C10 aliphatic)	T54	AR	0.020	mg/l	N	002-003
TPH (C8-C10 aromatic)	T54	AR	0.020	mg/l	N	002-003
TPH (C10-C12 aliphatic)	T219	AR	0.01	mg/l	N	002-003
TPH (C10-C12 aromatic)	T219	AR	0.01	mg/l	N	002-003
TPH (C12-C16 aliphatic)	T219	AR	0.01	mg/l	N	002-003
TPH (C12-C16 aromatic)	T219	AR	0.01	mg/l	N	002-003
TPH (C16-C21 aliphatic)	T219	AR	0.01	mg/l	N	002-003
TPH (C16-C21 aromatic)	T219	AR	0.01	mg/l	N	002-003
TPH (C21-C35 aliphatic)	T219	AR	0.01	mg/l	N	002-003
TPH (C21-C35 aromatic)	T219	AR	0.01	mg/l	N	002-003
Hexachlorocyclohexane	T16	AR	0.01	µg/l	N	002-003
Hexachlorobenzene	T16	AR	0.01	µg/l	N	002-003
Heptachlor	T16	AR	0.01	µg/l	N	002-003
Aldrin	T16	AR	0.01	µg/l	N	002-003
Heptachlor epoxide	T16	AR	0.01	µg/l	N	002-003
Chlordane	T16	AR	0.01	µg/l	N	002-003
Endosulphan	T16	AR	0.01	µg/l	N	002-003
DDE	T16	AR	0.01	µg/l	N	002-003
Dieldrin	T16	AR	0.01	µg/l	N	002-003
Endrin	T16	AR	0.01	µg/l	N	002-003
DDD	T16	AR	0.01	µg/l	N	002-003
DDT	T16	AR	0.01	µg/l	N	002-003
Dichlorvos	T16	AR	0.01	µg/l	N	002-003
Mevinphos	T16	AR	0.01	µg/l	N	002-003
Dimethoate	T16	AR	0.01	µg/l	N	002-003
Diazinon	T16	AR	0.01	µg/l	N	002-003
Pirimiphos methyl	T16	AR	0.01	µg/l	N	002-003
Malathion	T16	AR	0.01	µg/l	N	002-003
Fenitrothion	T16	AR	0.01	µg/l	N	002-003
Parathion	T16	AR	0.01	µg/l	N	002-003
Azinphos methyl	T16	AR	0.01	µg/l	N	002-003

APPENDIX F
Calibration Certificates

SPT, DS and DP hammer(s)	SI 3, SI 4, SI 5
Gas monitor(s)	GFM 435 s/n 11378

SPT Calibration Report

EQUIPE GROUP
www.equipegroup.com

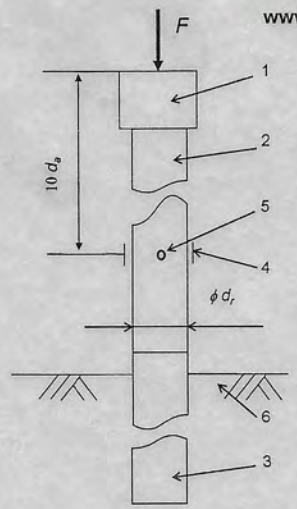
Hammer Energy Measurement Report

Type of Hammer	SPT HAMMER
Client	SI DRILLING
Test No	EQU1695
Test Depth (m)	8.70
Date of Test	29 December 2016
Valid until	29 December 2017
Hammer ID	SI 3

Mass of the hammer	m = 63.5kg
Falling height	h = 0.76m
E_{theor} =	$m \times g \times h$ = 473J

Characteristics of the instrumented rod

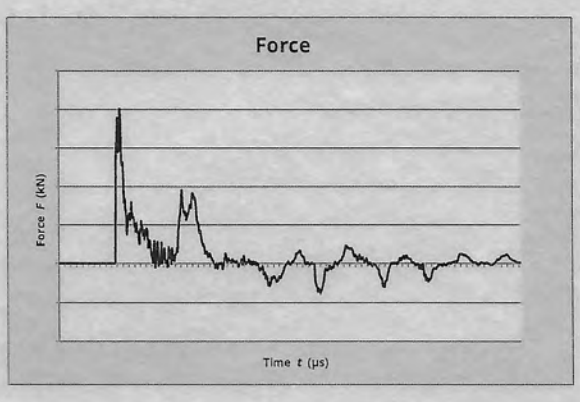
Diameter	d_r = 0.052 m
Length of the instrumented rod	0.558 m
Area	A = 11.61 cm^2
Modulus	E_a = 206843 MPa

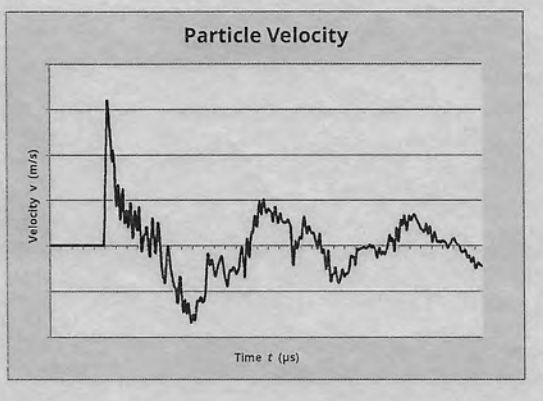


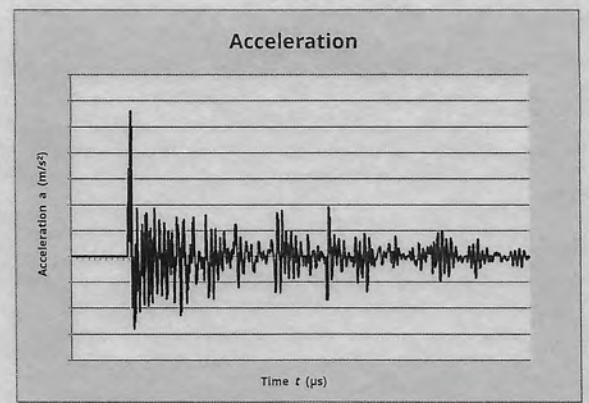
Key
1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

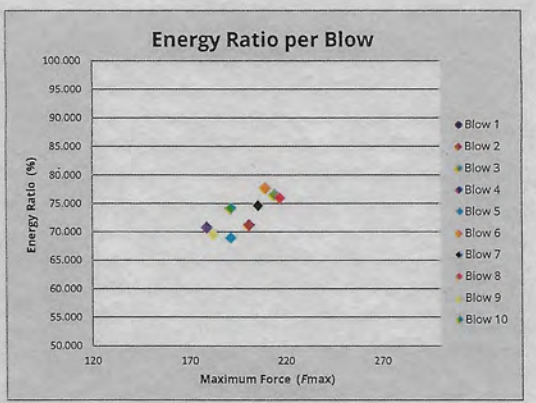
F Force
d_r Diameter of rod

Fig. B.1 and B.2 BS EN ISO 22476-3 : 2005 + A1 : 2011









Observations:
1.

E_{meas} = **0.355** kN-m

E_{theor} = **0.473** kN-m

Energy Ratio (E_r) = $\frac{E_{meas}}{E_{theor}}$: **75.14%**

Equipe SPT Analyzer Operators: KS

Prepared by:	[redacted]	Checked by:	[redacted]	Date	10/01/2017

Equipe Group, The Paddocks, Home Farm Offices, The Upton Estate, Banbury, Oxfordshire, OX15 6HU
Tel: +44 (0)1295 670990 Fax: +44 (0)1295 678232 Email: info@equipegroup.com

SPT Calibration Report

www.equipegroup.com

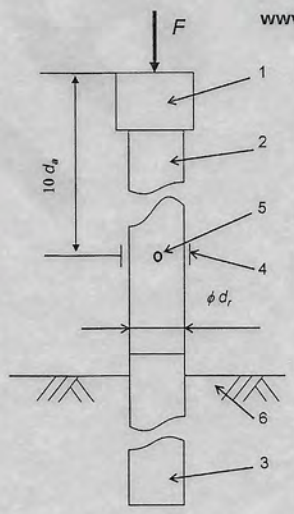
Hammer Energy Measurement Report

Type of Hammer	SPT HAMMER
Client	SI DRILLING
Test No	EQU1694
Test Depth (m)	8.70
Date of Test	29 December 2016
Valid until	29 December 2017
Hammer ID	4 CUT DOWN

Mass of the hammer	m = 63.5kg
Falling height	h = 0.76m
E_{theor} =	$m \times g \times h$ = 473J

Characteristics of the instrumented rod

Diameter	d_r = 0.052 m
Length of the instrumented rod	0.558 m
Area	A = 11.61 cm^2
Modulus	E_a = 206843 MPa

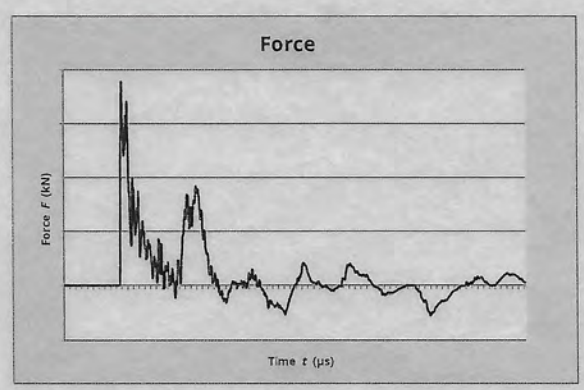


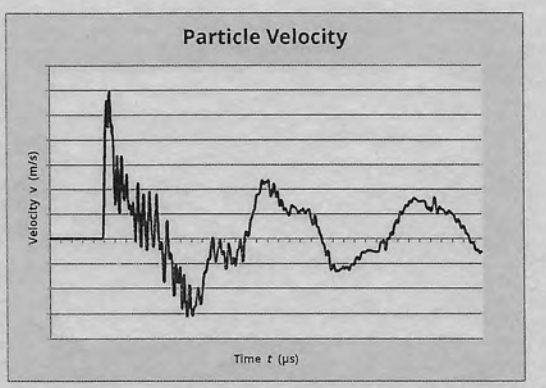
Key

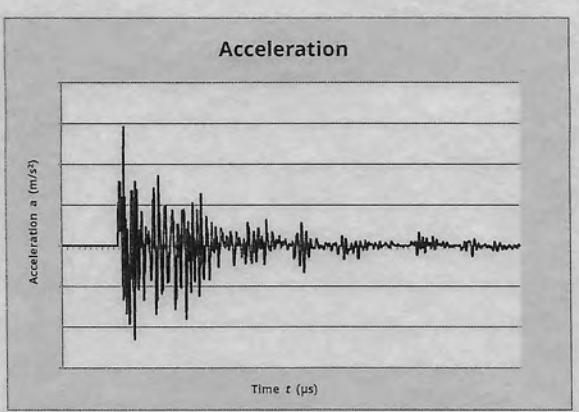
1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

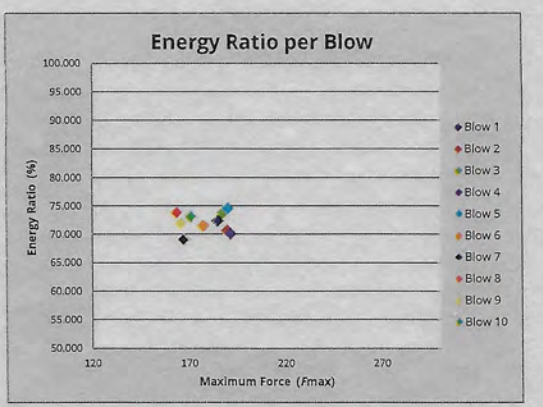
F Force
d_r Diameter of rod

Fig. B.1 and B.2 BS EN ISO 22476-3 : 2005 + A1 : 2011









Observations:
1.

E_{meas} = **0.351** kN-m

E_{theor} = **0.473** kN-m

Energy Ratio (E_r) = $\frac{E_{meas}}{E_{theor}}$: **74.14%**

Equipe SPT Analyzer Operators: KS

Prepared by: [redacted]	Checked by [redacted]	Date 10/01/2017

 Equipe Group, The Paddocks, Home Farm Offices, The Upton Estate, Banbury, Oxfordshire, OX15 6HU
Tel: +44 (0)1295 670990 Fax: +44 (0)1295 678232 Email: info@equipegroup.com

SPT Calibration Report

www.equipegroup.com

Hammer Energy Measurement Report

Type of Hammer	SPT HAMMER
Client	SI DRILLING
Test No	EQU1690
Test Depth (m)	8.70
Date of Test	29 December 2016
Valid until	29 December 2017
Hammer ID	SI 05

Mass of the hammer	m = 63.5kg
Falling height	h = 0.76m
E_{theor} =	$m \times g \times h$ = 473J

Characteristics of the instrumented rod

Diameter	d_r = 0.052 m
Length of the instrumented rod	0.558 m
Area	A = 11.61 cm^2
Modulus	E_a = 206843 MPa

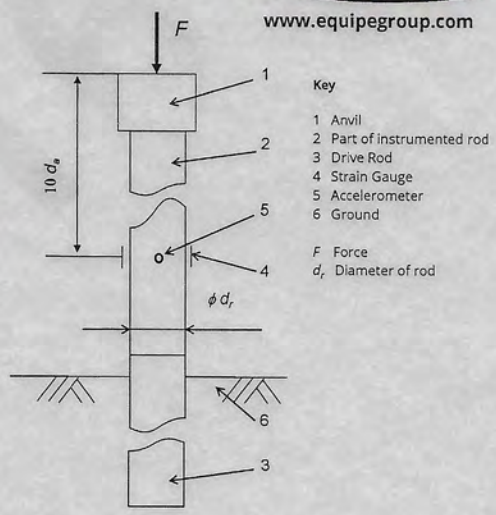
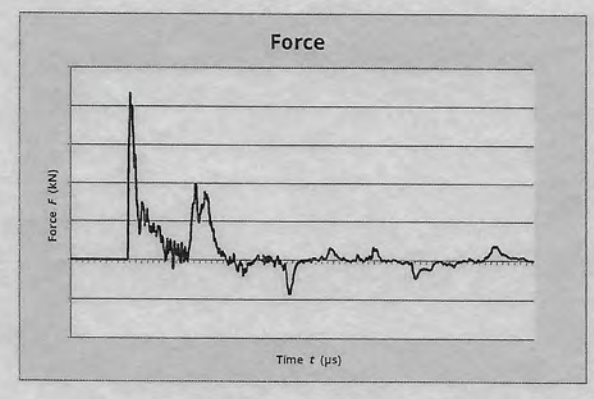
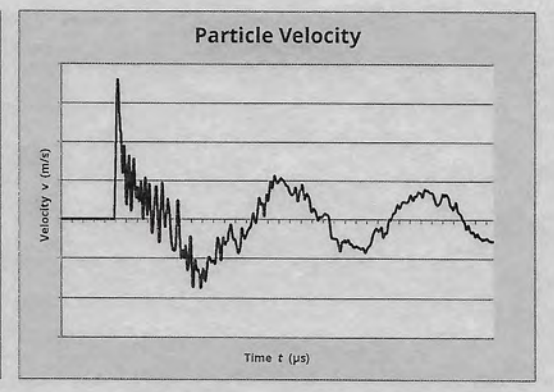
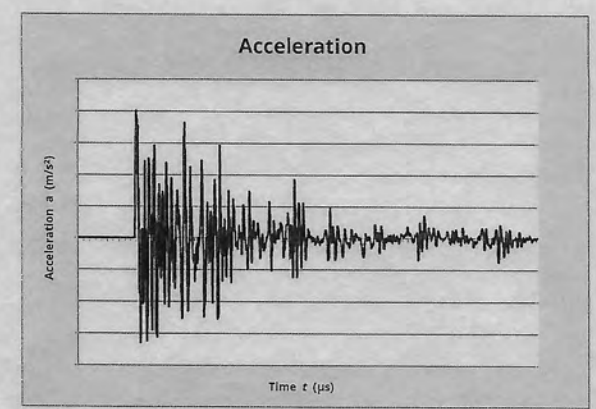
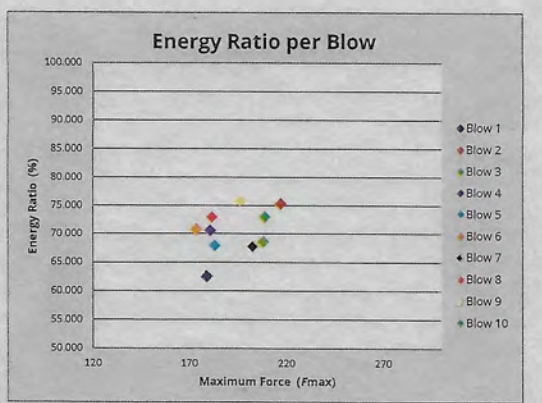


Fig. B.1 and B.2 BS EN ISO 22476-3 : 2005 + A1 : 2011









Observations:
1.

E_{meas} = **0.343** kN-m

E_{theor} = **0.473** kN-m

Energy Ratio (E_r) = $\frac{E_{meas}}{E_{theor}}$: **72.53%**

Equipe SPT Analyzer Operator: KS

Prepared by: [redacted] **Checked by:** [redacted] **Date** 10/01/2017

 Equipe Group, The Paddocks, Home Farm Offices, The Upton Estate, Banbury, Oxfordshire, OX15 6HU
Tel: +44 (0)1295 670990 Fax: +44 (0)1295 678232 Email: info@equipegroup.com

TEST DATE AND CONDITIONS		
Date	21/06/2017	
Atmospheric Pressure	997	mB
Ambient Temperature	23.0	°C
Environics Serial No.	5089	

GAS DATA LTD
Pegasus House
Seven Stars Estate
Wheler Rd
Coventry
CV3 4LB
Tel 02476303311 Fax 02476307711

GFM435 Final Inspection & Calibration Check Certificate

Customer	Terraconsult (South) Ltd
Certificate Number	119385
Order Number	317112

Serial Number	11378	Recalibration DUE Date	
Software Version	G435-00.0024/0004	*21/06/2018*	

Instrument Checks					
Keyboard	✓		Display Contrast	✓	
Pump Flow In	400	*Accept > 200 cc/min*	Pump Flow @ -200mB	200	*Accept > 200 cc/min*
Clock Set / Running	✓		Labels Fitted	✓	

Gas Checks						
Sensor	CH_4		CO_2		O_2	
	Instrument Gas Readings %	True Gas Value %	Instrument Gas Readings %	True Gas Value %	Instrument Gas Readings %	True Gas Value %
	59.7 *Accept +/- 3.0*	*60*	39.7 *Accept +/- 3.0*	*40*	20.8 *Accept +/- 0.5*	*20.9*
	5.0 *Accept +/- 0.3*	*5*	4.8 *Accept +/- 0.3*	*5*	6.0 *Accept +/- 0.3*	*6*
Zero Reading 100% N_2	0.0 *Accept +/- 0.0*	*0.0*	0.0 *Accept +/- 0.0*	*0.0*	0.0 *Accept + 0.1*	*0.0*

Optional Gas Checks						
Applied Gas & Range of GFM		Concentration Tested @ *(ppm)*	Instrument Readings *(ppm)*			
Gas Type	Range *(ppm)*		Zero Reading		Instrument Gas Reading	
H2S	5000	*1500*	0	*Accept +/-0.0*	1500	*Accept +/-5.0*
CO	2000	*1000*	0	*Accept +/-0.0*	1000	*Accept +/-5.0*
				Accept +/-0.0		*Accept +/-5.0*
				Accept +/-0.0		*Accept +/-5.0*
Hexane	2.0%	*2.0%*	0	*Accept +/-0.0*	1.99	*Accept +/-10.0*

Cross Gas Effects							
Applied Gas *(ppm)*		Instrument Readings *(ppm)*					
Gas Type	Concentration	Toxic 1: *H2S*		Toxic 2: *CO*		Toxic 3: *Hex*	Toxic 4:
H2S	*1500*	1500		0		0	
CO	*1000*	60		1000		0	
Hexane	*2.0%*	0		0		1.99	

Pressure Checks			
Atmospheric Pressure [AP] *(mB)*			
Current Atmospheric Pressure *(mB)*	Instrument Atmospheric Pressure Reading *(mB)*		
All Ports Open to Atmosphere	*Open Ports*	997	*Accept +/- 2.0*
AP Port *(Internal)*	*+800 mB*	801	*Accept +/- 5.0*
AP Port *(Internal)*	*+1200mb*	1199	*Accept +/- 5.0*

Flow Checks					
Borehole Flow	Instrument Flow Reading *(l/h)*		Differential Pressure		
Applied Flow Reading *(l/h)*			Instrument DP Reading *(Pa)*		Applied DP Pressure *(Pa)*
-30.0	-29.8	*Accept +/-3.0*	-272	*Accept +/-50*	*-276*
-3.0	-3.1	*Accept +/-1.0*	-15	*Accept +/-6.0*	*-14*
0.0	0.0	*Accept +/-0.0*	0.0	*Accept +/-0.5*	*0.0*
+3.0	3.0	*Accept +/-0.5*	13	*Accept +/-3.0*	*14*
+30.0	30.0	*Accept +/-3.0*	294	*Accept +/-50*	*295*
+60.0	58.5	*Accept +/-6.0*	843	*Accept +/-130*	*876*
+90.0	85.9	*Accept +/-9.0*	1616	*Accept +/-250*	*1717*

All test performed with equipment that is traceable to National Standards unless otherwise stated







TerraConsult

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