ETIHAD GROUND INVESTIGATION

FACTUAL GROUND INVESTIGATION REPORT

Prepared for CITY FOOTBALL GROUP LIMITED

Report Ref: 37349

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Prepared for CITY FOOTBALL GROUP LIMITED

Report Ref: 37349

PROJECT: Ongoing ground investigation

CONSULTANT: Buro Happold

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ORIGINATOR	APPROVER
T HASTINGS Senior Engineer	C THOMAS Geotechnical Consultant

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1. INTRODUCTION

Geotechnical Engineering Limited (GEL) was instructed by Buro Happold (the Consultant) acting on behalf of City Football Group Limited (the Client) to carry out an investigation to determine the ground conditions at the Etihad Stadium in Manchester.

The scope of works and terms and conditions of appointment were specified by the Consultant and GEL correspondence reference T33726, dated 17th October 2022. The investigation was carried out under direction and supervision of the Consultant.

This report describes the investigation and presents the findings.

2. SITE LOCATION AND GEOLOGY

The site is situated at Manchester City Football Club Stadium, Ashton New Road, Bradford, Manchester, M11 3HY and may be located by its National Grid co-ordinates SJ 867 986.

British Geological Survey (BGS) England and Wales (Sheet No. 085 - Manchester, 1:50 000, 2011) and the BGS online geology (1:50,000) indicate the site is underlain by Made Ground over till deposits and the Pennine Upper Coal Measures Formation (mudstone, siltstone and sandstone).

3. GROUND INVESTIGATION

3.1 Fieldwork

The fieldwork was carried out in general accordance with BS5930:2015+A1:2020 during the period 15th November to 20th December 2022 and comprised eight boreholes, three window samples, four machine excavated trial pits, five vacuum excavated observation trenches, eight

Cone Penetrometer Test (CPT) locations, two Dynamic Cone Penetrometer (DCP) testing locations, and two inspection pits. Additionally, two of the boreholes were assessed by downhole geophysics, permeability tests were attempted in four of the boreholes, and one machine excavated trial pit included a soakaway permeability test.

The exploratory hole locations were selected by the Consultant and set out by this Company and are shown on Figure 1. The ground level and co-ordinates at each exploratory hole were established by this Company using GPS techniques.

Initially, the surface hardstanding at all locations (excluding BH22/08, (WS)TP22/05, (WS)TP22/08, TP22/06, TP22/07 and CPT22/08) was rotary cored (300mm) or broken out with a hydraulic breaker, then an inspection pit was hand excavated at each borehole, window sample and cone penetrometer testing location to a maximum depth of 1.20m to check for buried services.

The boreholes, referenced BH22/01 to BH22/04, BH22/06A, BH22/07 and BH22/08 (Appendix A), were advanced using a light cable tool (shell and auger) rig utilising 200mm tools and casing. The boreholes were advanced using a clay cutter and bailer with the occasional use of a heavy chisel to assist boring.

Disturbed samples of the arisings were taken and retained in plastic tubs, bags, and glass jars. Undisturbed samples of 100mm nominal diameter were taken in suitable cohesive soils using a thin walled, open drive sampler (UT100). The UT samples were wax sealed on site to prevent moisture loss.

Borehole reference BH22/05 was formed and BH22/01 to BH22/05, BH22/06A, BH22/07 and BH22/08 (Appendix A) were extended using a track-mounted Geotechnical Pioneer Rig. Heavy duty dynamic sampling techniques were employed to produce a continuous

disturbed sample of 112mm nominal diameter. The samples were recovered in semi-rigid plastic liner.

On refusal to dynamic sampling the boreholes were continued by Geobor S wireline, rotary drilling techniques utilising either a water or polymer flush. An inner barrel assembly, incorporating a semi-rigid plastic liner, is deployed down the borehole and is latched onto the outer barrel to recover continuous cores of 102mm diameter. The outer barrel acts as the casing ensuring the hole is fully cased at all times.

The dynamic samples and rotary core were extracted horizontally from the sampler and core barrel respectively, the semi-rigid liner was cut to length and caps placed at each end to retain moisture content. All samples and core were retained in sequence in labelled, wooden core boxes.

Standard penetration tests (SPT) were carried out in general accordance with BS EN ISO 22476-3:2005+A1:2011. A split barrel or a solid cone was used depending upon the materials encountered and the split barrel samples retained in airtight plastic tubs. The SPT N value was taken as the number of blows to penetrate the 300mm test drive following a 150mm seating drive. Where low penetration was recorded the seating drive was terminated at 25 blows and the test drive completed after a further 50 blows. Detailed SPT results, together with the energy ratio (E_r), are presented in Appendix A and summarised as uncorrected N values on the borehole logs.

Boreholes were monitored for groundwater ingress as cable percussion and dynamic sampling proceeded. Upon encountering water, boring/drilling was temporarily stopped to allow the level to stabilise. Water levels were also recorded at the start and finish of each day's work and on completion of the borehole and are presented on the relevant log.

Downhole geophysical assessments were carried out in BH22/04 and BH22/06A. The results and images are presented in Appendix A.

Variable head permeability tests were carried out in BH22/04, BH22/05, BH22/06A and BH22/07 in general accordance with the procedures given in BS EN ISO 22282-2:2012. Rising head tests were carried out by lowering the water level in the standpipe. Falling head tests were carried out by topping up the standpipe with clean water. Coefficients of permeability were calculated using the BS EN ISO 22282-2:2012 Hvorslev method and the Velocity Graph method. Intake factors have been derived from Hvorslev and are presented along with the results in Appendix A.

The window samples, referenced (WS)TP22/01, (WS)TP22/05 and (WS)TP22/08 (Appendix A), were formed using a Terrier 2000 rig. Disturbed samples were taken and retained in a combination of plastic tubs, bags and glass jars. Dynamic sampling techniques were then employed in (WS)TP22/01 and (WS)TP22/08 to produce a continuous disturbed sample of 84mm diameter reducing to 73mm as the borehole was advanced. The samples were recovered in semi-rigid plastic liner.

The samples were extracted horizontally from the sampler, labelled and caps placed each end to retain moisture.

On completion, slotted standpipes were installed in all boreholes. Each standpipe consisted of a 35mm ID PVC slotted tube set in a granular filter medium and sealed above and below with a bentonite plug. Gas monitoring standpipes were installed in all boreholes and (WS)TP22/01. Each installation consisted of a 50mm ID HDPE slotted tube set in a filter response zone of non-calcareous pea gravel. The installation was sealed above with a bentonite plug and accessed via a valve assembly.

The installations were protected at the surface by a lockable stopcock cover set in concrete. Installation details are given on the relevant borehole logs and in Figure 2.

Location ID	Duel Installation Reference	Well Depth (m)	Well Diameter (mm)	Geosock Used	Depth Response Zone Top (m)	Depth Response Zone Base (m)	Depth Slotted Zone Top (m)	Depth Slotted Zone Base (m)
(WS)TP22/01	-	2.6	50	Yes	1	2.6	1	2.6
BH22/01	Deep	52	35	Yes	42	52	42	52
	Shallow	4	50	Yes	0.5	4	1	4
BH22/02	Deep	40	35	Yes	29.9	40	30	40
	Shallow	3	50	No	0.9	3.1	1	3
BH22/03	Deep	62	35	Yes	49.8	62	50	62
	Shallow	3	50	Yes	0.8	3.1	1	3
BH22/04	Deep	40	35	Yes	30	40	30	40
	Shallow	5	50	No	1	5	1	5
BH22/05	Deep	40	35	Yes	30	40	30	40
	Shallow	3	50	Yes	1	3	1	3
BH22/06A	Deep	50	35	Yes	40	50	40	50
	Shallow	4	50	No	1	4	1	4
BH22/07	Deep	40	35	Yes	29.9	40	30	40
	Shallow	4	50	No	0.9	4.2	1	4
BH22/08	Deep	50	35	Yes	40	50	40	50
	Shallow	8	50	No	1	8	1	8

Figure 2 – Installation Summary Table

The trial pits, referenced TP22/02, TP22/03, TP22/06 and TP22/07 (Appendix A), were formed by a tracked excavator with a 0.60m bucket.

The observation trenches, referenced OT22/01 to OT22/05 (Appendix A), were formed by a 26-tonne vacuum excavator to locate buried services and uncover buried structures.

The ground surface at trial pits referenced TP22/02 and TP22/03, and all observation trenches consisted of hardstanding which required breaking out prior to excavation.

Representative disturbed samples were taken and retained in sealed plastic tubs, bags and glass jars.

Photographs of the trial pit and observation trench profile and spoil heap were taken and are presented separately.

A soakaway test was carried out in trial pit TP22/02 in general accordance with BRE DG 365 (2016). The excavation sides were squared using the excavator bucket and the dimensions recorded within the test section. The trial pit was partially filled with clean water using a dedicated bowser with a 75mm diameter outlet and the fall in level recorded against time. The test was repeated 3 times. The results are presented in Appendix A.

On completion, all trial pits were backfilled with arisings compacted in suitable layers by the excavator bucket. At TP22/02 and TP22/03, the ground surface was reinstated with tarmacadam. At TP22/06 and TP22/07, the ground surface was left slightly proud to accommodate the future inevitable settlement of the backfill.

On completion, all observation trenches were backfilled with gravel. The ground surface was reinstated.

Thirteen inspection pits, referenced BH22/06, (WS)TP22/05, CPT22/01 to CPT22/08, CPT22/05A, CBR22/01 and CBR22/02 (Appendix A), were hand excavated to a maximum depth of 1.20m to check for buried services.

Two Dynamic Cone Penetrometer tests (DCP), referenced CBR22/01 DCP and CBR22/02 DCP (Appendix A), were carried out using a CNS Farnell A2465 dynamic cone penetrometer. Probe depths were measured with respect to ground level and the number of blows for the penetration of the probe was recorded. Equivalent CBR values have been calculated and presented with the results in Appendix A.

On completion, BH22/06, (WS)TP22/05, (WS)TP22/08, CPT22/01 to CPT22/05, CPT22/05A, CPT22/07, CPT22/08, CBR22/01 and CBR22/02 were backfilled with arisings and the surface

reinstated. With regard to location CPT22/06, this was completed as borehole BH22/06A (Appendix A).

Eight static Cone Penetrometer Tests (CPTs), referenced CPT22/01 to CPT22/04, CPT22/05A, and CPT22/06 to CPT22/08 (Appendix A), were carried out by LANKELMA Limited using a 17.9-tonne track-truck mounted CPT unit in general accordance with BS EN ISO 22476-1:2012.

Details of the findings and results are presented in LANKELMA report ref: 01 P-108203_01, presented in Appendix A.

Samples for chemical analyses were dispatched daily from site directly to i2 Analytical, Watford under a Chain of Custody. The remaining samples were brought to this Company's laboratory for testing and storage.

3.2 Logging

The logging of soils and rocks was carried out by an Engineering Geologist in general accordance with BS5930:2015+A1:2020. A key to the exploratory hole logs is presented in Appendix A.

Detailed descriptions of the core and samples are given in the borehole logs, Appendix A, along with details of sampling, in situ testing, groundwater ingress, installations and relevant comments on drilling techniques.

Suitable core subsamples were selected by the Engineer, under the direction of the Consultant. The core was carefully logged and prepared prior to preserving the subsample by wrapping in clingfilm, tinfoil and coating with at least three layers of wax. The sample

was further protected by a covering of waxed cheesecloth, labelled, and transported horizontally in padded, wooden core boxes.

Hand vane tests were carried out on suitable samples. The results are presented on the borehole log and tabulated in Appendix A.

Prior to logging, photographs of the core were taken and are presented separately.

The trial pits were logged in situ to a depth of approximately 1.20m and thereafter from the surface. Detailed descriptions are given in the trial pit logs, Appendix A, along with details of sampling and in situ testing, groundwater ingress and relevant comments on stability and excavatability. Detailed sketches of the exposed services in observation trenches OT22/01 to OT22/05 are presented in Appendix A.

3.3 Monitoring

The post-fieldwork monitoring programme was carried out during the period of 3rd January to 7th February 2023 and comprised five rounds of gas monitoring, six rounds of groundwater measurements, two rounds of groundwater sampling and one round of variable head permeability tests.

Water levels recorded within the installations are presented in Appendix B.

Selected installations were monitored for gas flow and then tested for methane, carbon dioxide, oxygen, hydrogen sulphide, and carbon monoxide using a Gas Data GFM 436 gas analyser; an excerpt from the user manual and the calibration certificate, showing the detection limits of the equipment, along with subsequent readings and water level records, are presented in Appendix B.

The installations were monitored for Volatile Organic Compounds (VOC's) using a MiniRAE Lite Photo-Ionisation Detector (PID) with a 10.6eV gas discharge lamp. The detector uses an ultraviolet light source to break down the chemicals into positive and negative ions (ionisation). The detector measures the charge of the ionised gas and converts the signal into current. The current is then amplified and displayed as "ppm"; after measurement the ions reform the original gas or vapour allowing it to be sampled. The calibration certificate for the equipment used and the subsequent readings are presented in Appendix B.

Prior to water sampling, the water monitoring standpipes were developed by pumping and then purged until at least three well volumes of water had been removed.

3.4 Laboratory Testing

A schedule of laboratory tests was prepared by the Consultant, the results are presented in Appendix C.

The natural water content was determined on one-hundred and twenty-one selected samples in accordance with BS EN ISO 17892-1:2014.

Liquid limit and plastic limit tests were carried out on forty-eight selected samples in accordance with BS EN ISO 17892-12:2018:5.3 & 5.5. Atterberg line plots have also been presented.

Particle size distributions were determined in accordance with BS EN ISO 17892-4:2016 for forty-nine samples by wet sieving [5.2]. The fine fractions of sixteen of these samples were further analysed by sedimentation using the pipette method [5.4]. The results are presented as grading curves.

The compaction characteristics of two selected soil samples were investigated using a 4.5kg rammer in accordance with BS 1377-4:1990:3.5 and 3.6. The results are presented as a plot of dry density against moisture content.

Unconsolidated undrained triaxial compression tests were carried out under a single cell pressure in accordance with BS EN ISO 17892-8:2018 on thirteen specimens prepared from full diameter UT100 samples. A cell pressure equal to the approximate overburden pressure at sample depth/specified by the Consultant was used. Fully saturated, Φu = 0, conditions were assumed and the undrained cohesion, cu was taken as half the deviator stress at failure.

Ten samples were selected for determination of shear strength by hand vane. These tests were carried out under in-house methods.

Fourteen rock cores were tested for their unconfined compressive strength in accordance with ISRM (2007). Where specified (on five samples), axial and radial strain measurements were made using linear displacement transducers to enable Young's modulus and Poisson's ratio to be calculated in accordance with ISRM (2006).

Point load index tests were carried out on one-hundred and three selected lengths of core in accordance with ISRM (2007).

The BRE SD1 (2005) Suite D; water soluble sulphate, total sulphate and total sulphur, together with pH (plus chloride and nitrate as dependant options), was determined for sixty-two samples by Chemtest using in-house methods.

Selected samples were despatched to i2 Analytical, Watford, where chemical analyses were carried out to in-house methods for a suite of contaminants. The results are presented in Appendix D.

GEOTECHNICAL ENGINEERING LIMITED

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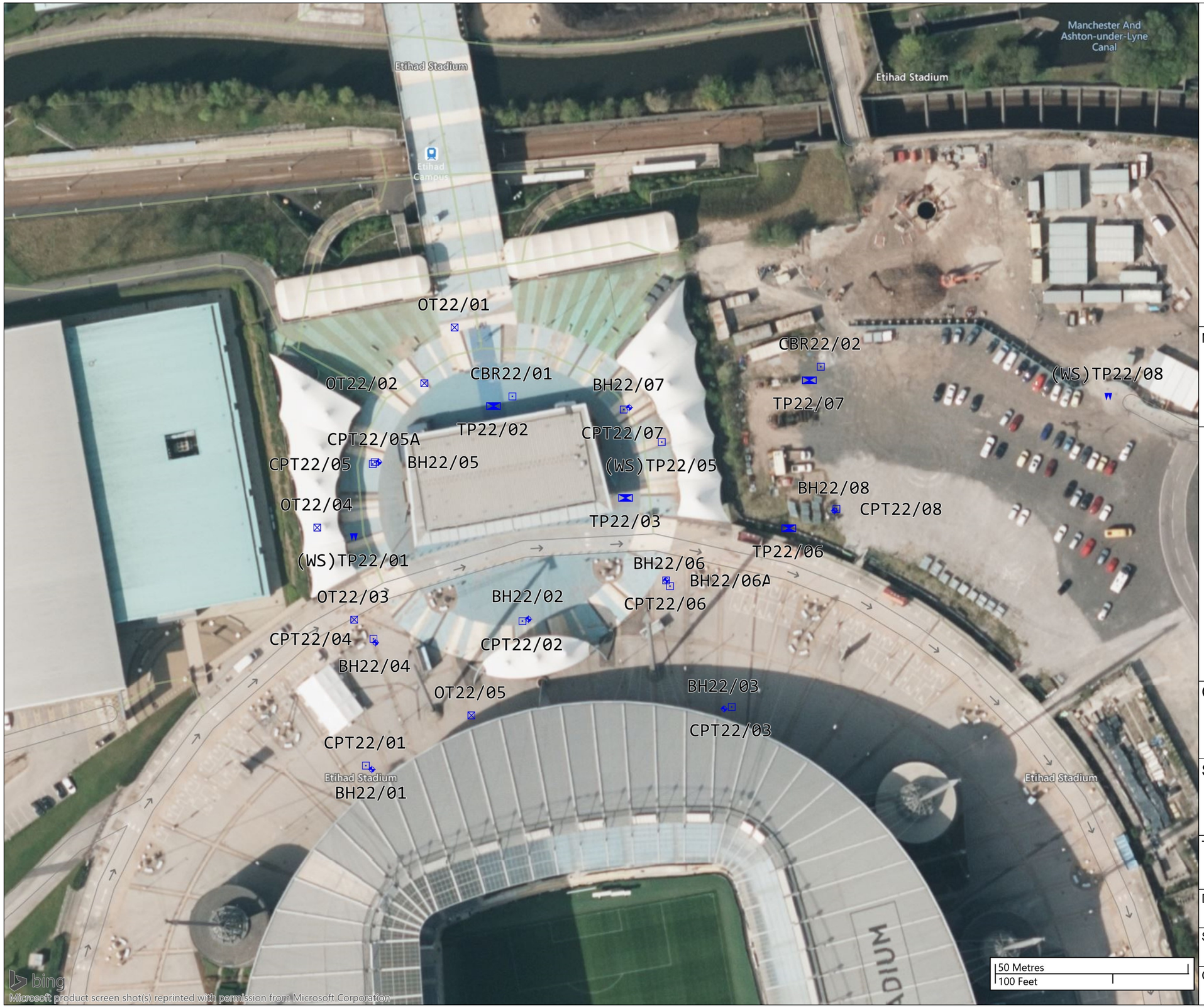
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Key.

- Borehole
- Inspection Pit
- Observation Pit
- Trial Pit
- Window Sample

North

Notes:

Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

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Client: CITY FOOTBALL GROUP LIMITED

Site: ETIHAD GROUND INVESTIGATION

Title: EXPLORATORY HOLE LOCATION PLAN

Drawn By:	AC	Checked By:	TH	Paper Size:	A3
Scale:	1:1000			Date:	February 2023
Contract:	37349			Figure:	1

APPENDIX A

FIELDWORK DATA

Geotechnical Engineering Limited

KEY TO EXPLORATORY HOLE LOGS

Sample type

D	Small disturbed	U	Undisturbed	L	Dynamic	ES	Environmental - soil	CS	Core subsample (prepared)
B	Bulk disturbed	UT	Undisturbed thin wall	C	Core	EW	Environmental - water	LS	Dynamic subsample (prepared)
LB	Large bulk disturbed	P	Piston	W	Water				

Test type

S SPT - Split spoon sampler followed by uncorrected SPT 'N' Value

C SPT - Solid cone followed by uncorrected SPT 'N' Value

(*250 - Where full test drive not completed, linearly extrapolated 'N' value reported, ** - Denotes no effective penetration). Arrow length reflects test depth range.

H Hand vane - direct reading in kPa - not corrected for BS1377 (1990). Re* denotes refusal. Where the limit of the equipment is reached during a test, the reported value is the minimum recorded shear strength of the material.

M Mackintosh probe - number of blows to achieve 100mm penetration

Mx Mexe cone - average reading of equivalent CBR value in %

PP Pocket penetrometer - calculated reading in kPa

Vo Headspace vapour reading, uncorrected peak values in ppm, using a PID (calibrated with isobutylene, using a 10.6eV bulb)

TR In situ thermal resistivity by needle probe in mK/W

Sample/core range/I_f

Dynamic sample

Undisturbed sample - open drive including thin wall. Symbol length reflects recovery

x = Total Core Recovery (TCR) as percentage of core run

y = Solid Core Recovery (SCR) as percentage of core run. Assessment of core is based on full diameter

z = Rock Quality Designation (RQD). The amount of solid core greater then 100mm expressed as percentage of core run

Where SPT has been carried out at the beginning of core run, disturbed section of core excluded from SCR and RQD assessment

I_f - fracture spacing - the modal fracture spacing (mm) over the indicated length of core. Where spacing varies significantly, the minimum, mode and maximum values are also given. NI = non-intact core NA = not applicable NR = no recovery

Instrumentation

Porous tip

Perforated standpipe

Inclinometer

Extensometer

Backfill

Granular response zone

Bentonite seal

Cement/ bentonite grout

Soil backfill

Concrete

Cover

Raised cover

Stopcock cover

Stratum boundaries

Estimated boundary

Grading boundary

Logging

The logging of soils and rocks has been carried out in general accordance with BS 5930:2015+A1:2020

Chalk is logged in general accordance with Lord et al (2002) CIRIA C574. Where possible, dynamic samples in chalk have been logged in accordance with CIRIA C574; descriptions and gradings (if presented) should be treated with caution given the potential for sample disturbance.

For rocks the term fracture has been used to identify a mechanical break within the core. Where possible incipient and drilling induced fractures have been excluded from the assessment of fracture state. Where doubt exists, a note has been made in the descriptions. All fractures are considered to be continuous unless otherwise reported.

Made Ground is readily identified when, within the natural make up, man made constituents are evident. Where Made Ground appears to be reworked natural material the differentiation between in situ natural deposits and Made Ground is much more difficult to ascertain. The interpretation of Made Ground within the logs should therefore be treated with caution.

The descriptors "topsoil" and "tarmacadam" are used as generic terms and do not imply conformation to any particular standard or composition.

Rootlets are defined as being less than 2mm in diameter, roots are defined as in excess of 2mm diameter.

General comments

The process of drilling and sampling will inevitably lead to sample disturbance, mixing or loss of material in some soil and rocks.

Indicated water levels are those recorded during the process of drilling or excavating exploratory holes and may not represent standing water levels.

All depths are measured along the axis of the borehole and are related to ground level at the point of entry. All inclinations are measured normal to the axis of the core.

Where provided, the stratigraphical names/geological rock units are for guidance only and may not be wholly accurate.

Geotechnical Engineering Limited

BOREHOLE LOG

BH22/01

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 7

Start Date 15 November 2022 Easting 386736 Scale 1:50

End Date 24 November 2022 Northing 398602 Ground Level 60.55mOD Depth 55.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
C	0.00 - 0.10							Black TARMACADAM.	0.10	60.45	
1B	0.00 - 0.10										
2B	0.10 - 0.35						Vo 0.1	Light grey slightly clayey sandy angular fine to coarse limestone GRAVEL. (MADE GROUND)	0.35	60.20	
3D	0.20										
1ES	0.30						Vo 0.5	Dark grey and dark brown very sandy angular fine to coarse limestone, clinker, sandstone and rare brick GRAVEL. (MADE GROUND)			
4B	0.35 - 0.55										
2ES	0.50										
5D	0.50										
6B	0.90 - 1.20						Vo 0.6	0.50m: Geotextile membrane.	0.90	59.65	
3ES	1.00		Nil				C *51	Firm dark grey slightly sandy slightly gravelly locally gravelly CLAY. Gravel is angular fine to coarse clinker, limestone, sandstone, slate and rare brick. Strong hydrocarbon odour. (MADE GROUND)	1.20	59.35	
7D	1.00										
8B	1.20 - 1.65										
4ES	1.50						Vo 0.1				
9D	2.00	2.00					C 40	Stiff to very stiff dark grey slightly gravelly sandy CLAY with a low angular and subangular sandstone cobble content. Gravel is angular fine to coarse clinker, limestone, sandstone and rare brick and metal fragments. Faint hydrocarbon odour. (MADE GROUND)			
10B	2.00 - 2.45										
11B	2.45 - 2.95	2.00					C *81				
12B	2.50 - 2.84						Vo 0.2				
5ES	2.50							2.50 - 2.85m: Tending to clayey very sandy gravel with a low angular and subangular sandstone cobble content.			
13D	3.00	3.00					C 45				
14B	3.00 - 3.45										
6ES	3.50	3.00			3.50		C 25				
15B	3.50 - 3.95						Vo 0.1				
15D	4.00	4.00					C 10				
16D	4.00								4.10	56.45	
17B	4.00 - 4.45							Firm becoming stiff greyish brown slightly sandy slightly gravelly locally gravelly CLAY with rare pockets (up to 50x50x50mm) of reddish brown fine and medium sand. Gravel is subangular and subrounded fine to coarse sandstone.			
18B	4.10 - 4.50										
19D	4.50	4.00					C 13				
7ES	4.50						Vo 0.2				
20B	4.50 - 4.95										
21D	5.00	5.00					C 16				
22B	5.00 - 5.45										
8ES	5.50						Vo 0.1		5.50	55.05	
23D	6.00	6.00						Firm to stiff brown slightly gravelly slightly sandy locally silty CLAY. Gravel is subangular and subrounded fine to coarse sandstone.			
24UT	6.00 - 6.45										
25B	6.50 - 7.00						Vo 0.0				
9ES	6.50										
26B	7.00 - 7.45	7.00					S 17				
27D	7.00										
28D	8.00										

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	0.10	Rotary Core	Geotechnical Pioneer Rig
0.10	1.20	Inspection Pit	Hand Tools
1.20	13.45	Cable Percussion	Dando 2000

WATER STRIKE

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
3.50	Nil	3.40	20	

CASING DEPTH

DIAM (mm)	BASE (m)
200	13.00
168	21.50
140	55.00

BARREL DIAMETER

DIAM (mm)	BASE (m)
300	0.10
200	13.00
128	14.00
146	55.00

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.50	Concrete
0.50	4.00	Gravel
4.00	42.00	Bentonite
42.00	52.00	Gravel

INSTRUMENTATION

DEPTH (m)	TYPE
4.00	Standpipe (50mm) with geosock
52.00	Standpipe (35mm) with geosock

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
15-11-2022 08:00	0.00	Nil	
15-11-2022 13:00	1.20	Nil	Dry
16-11-2022 10:00	1.20	Nil	Dry
16-11-2022 15:00	4.50	4.00	NR
17-11-2022 07:00	4.50	4.00	NR
17-11-2022 15:00	13.45	12.00	NR

REMARKS

Polymer flush used 13.00-55.00m. Drilling completed on 24/11/2022, installation completed on 29/11/2022; lead length of Geobor casing detatched while installing borehole, all pipework removed before casing was retrieved, installation restarted.

AGS

CONTRACT	CHECKED
37349	CT

Geotechnical Engineering Limited

BOREHOLE LOG

BH22/01

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 2 of 7

Start Date 15 November 2022 Easting 386736 Scale 1:50

End Date 24 November 2022 Northing 398602 Ground Level 60.55mOD Depth 55.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
29UT	8.00 - 8.45	8.00									
30B	8.50 - 9.00										
31D	9.00	9.00					S 14				
32B	9.00 - 9.45										
33D	10.00	10.00						10.00m: Triaxial test indicates very stiff.			
34UT	10.00 - 10.45										
35B	10.50 - 11.00										
36D	11.00	11.00					S 11				
37B	11.00 - 11.45										
38D	12.00	12.00									
39UT	12.00 - 12.45										
40B	12.50 - 13.00										
41D	13.00	12.00					S 20	Stiff becoming very stiff brown slightly gravelly slightly sandy locally sandy silty CLAY. Gravel is angular to rounded fine to coarse sandstone, siltstone and rare quartzite, mudstone, limestone, ironstone and coal.	13.00	47.55	
42B	13.00 - 13.45										
43L	13.00 - 14.00										
44B	13.50 - 13.90										
45D	13.90 - 14.00										
46D	14.00 - 14.36	12.00	96	NA			S *71	14.00 - 14.30m: Gravelly with a low subrounded quartzite cobble content.			
47C	14.00 - 15.20	14.00									
48B	14.50 - 14.90										
49D	14.90 - 15.00										
50D	15.20 - 15.65	15.20	97				S 34	Very stiff light grey locally dark grey slightly sandy slightly gravelly locally gravelly silty CLAY locally tending to extremely weak fossiliferous siltstone. Gravel is angular to subrounded fine to coarse siltstone and rare mudstone lithorelicts.	15.65	44.90	
51C	15.20 - 16.70										
52D	15.90 - 16.00										

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
13.00	14.00	Windowless Sample	Geotechnical Pioneer Rig
14.00	55.00	Rotary Core	Geotechnical Pioneer Rig

WATER STRIKE

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)

BACKFILL

TOP (m)	BASE (m)	MATERIAL
52.00	55.00	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
18-11-2022 11:00	13.00	12.00	10.82
18-11-2022 13:30	14.00	14.00	11.98
21-11-2022 11:00	14.00	14.00	0.82
21-11-2022 17:00	21.20	21.20	1.18
22-11-2022 08:00	21.20	21.20	2.18
22-11-2022 17:40	30.20	30.20	1.96

REMARKS

AGS

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Geotechnical Engineering Limited

BOREHOLE LOG

BH22/01

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 3 of 7

Start Date 15 November 2022 Easting 386736 Scale 1:50

End Date 24 November 2022 Northing 398602 Ground Level 60.55mOD Depth 55.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
53D	16.60	16.70										
54D	16.70	16.93	16.70	100				S *167				
55C	16.70	18.20		10								
56D	16.90	17.00		0								
					NI					17.20	43.35	
									Extremely weak locally very weak locally thinly and thickly laminated dark grey and grey locally carbonaceous MUDSTONE frequently disintegrated to very stiff clay. Laminae are subhorizontal planar smooth. Fractures are subhorizontal to 30° extremely closely to closely spaced planar smooth.			
57D	17.90	18.00										
58CS	18.00	18.20			70							
59C	18.20	19.70	18.20	97	80					18.20	42.35	
				93	NI				Very weak to weak locally extremely weak thinly and thickly laminated light grey SILTSTONE. Laminae are subhorizontal to 10° undulating smooth. Fractures are subhorizontal to 30° medium locally widely spaced planar and undulating smooth rarely stained black.			
				93	320							
60CS	18.60	18.90			660							
61D	19.60	19.70										
62D	19.70	19.87	19.70	100				S *250				
63C	19.70	21.20		88								
				83								
64CS	20.70	21.00										
65D	21.10	21.20										
66C	21.20	22.70	21.20	100	NI					21.20	39.35	
67CS	21.20	21.40		89	150				Extremely weak to weak thinly and thickly laminated dark grey and grey locally purplish brown MUDSTONE. Laminae are subhorizontal to 10° planar smooth. Fractures are 10-30° very closely to medium spaced planar rarely stepped smooth.			
				63	410							
					NI					22.50	38.05	
68D	22.60	22.70			100				Very weak becoming weak thickly bedded light grey locally grey and dark grey MUDSTONE with rare siltstone laminae. Fractures are 10-40° closely and medium spaced planar smooth.			
69D	22.70	22.86	22.70	100	310			S *214				
70C	22.70	24.20		63								
				61					23.00 - 23.20m: Recovered as angular medium and coarse gravel.			
									Continued Next Page			

HOLE CONSTRUCTION

TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE

DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH

DIAM (mm) BASE (m)

BARREL DIAMETER

DIAM (mm) BASE (m)

BACKFILL

TOP (m) BASE (m) MATERIAL

INSTRUMENTATION

DEPTH (m) TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
23-11-2022 08:15	30.20	30.20	2.11
23-11-2022 18:30	45.20	45.20	2.34
24-11-2022 07:50	45.20	45.20	2.34
24-11-2022 18:00	55.00	55.00	1.95

REMARKS

AGS

CONTRACT	CHECKED
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Geotechnical Engineering Limited

BOREHOLE LOG

BH22/01

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 4 of 7

Start Date 15 November 2022 Easting 386736 Scale 1:50

End Date 24 November 2022 Northing 398602 Ground Level 60.55mOD Depth 55.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
71D	24.10	24.20										
72C	24.20	25.70	24.20	100 90 86								
73D	25.35	25.45										
74CS	25.45	25.70										
75C	25.70	27.20	25.70	100 97 93								
76CS	26.25	26.53										
77D	27.10	27.20										
78C	27.20	28.70	27.20	100 78 57					27.20 - 27.50m: Dark grey. 27.70 - 27.90m: Rare nodular fossils (up to 5mm). 27.75 - 27.80m: 45° planar smooth fracture.			
79CS	27.20	27.41										
80D	28.60	28.70										
81C	28.70	30.20	28.70	100 87 69								
82CS	29.22	29.42										
83D	30.10	30.20										
84C	30.20	31.70	30.20	100 87 83					30.77 - 30.79m: Abundant randomly oriented fragments (up to 5x5x2mm) of carbonaceous organic material.			
85CS	31.03	31.27										
86D	31.55	31.70							31.70 - 31.75m: Subhorizontal to 20° black carbonaceous organic fragments (up to 5x5x3mm). 31.70 - 39.40m: Weak to moderately weak. Closely and medium spaced thin beds of grey siltstone.			
87C	31.70	33.20	31.70	100	NI							
88CS	31.83	32.16		77	270							

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

CONTRACT	CHECKED
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Geotechnical Engineering Limited

BOREHOLE LOG



BH22/01

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 5 of 7

Start Date 15 November 2022 Easting 386736 Scale 1:50

End Date 24 November 2022 Northing 398602 Ground Level 60.55mOD Depth 55.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
				73	530							
					NI				32.75 - 33.05m: Fractures are 10-30° and 60-80° extremely closely to closely spaced planar rarely stepped smooth.			
89D	33.10 - 33.20				NI							
90C	33.20 - 34.70		33.20	91	300							
				73	540							
				70					33.50 - 33.55m: 80° planar smooth fracture. 33.60 - 33.80m: 70° planar smooth fracture.			
91D	34.00 - 34.10								33.90 - 34.05m: 70° undulating smooth fracture.			
92CS	34.14 - 34.58											
93C	34.70 - 36.20		34.70	100								
				90								
94CS	35.00 - 35.38			77								
									35.40 - 35.50m: 60° planar smooth fracture.			
									35.70 - 36.05m: 60° becoming 80° undulating smooth fracture.			
95D	36.10 - 36.20											
96C	36.20 - 37.70		36.20	100								
				100								
				83								
97CS	36.96 - 37.37											
98D	37.40 - 37.50											
99C	37.70 - 39.20		37.70	100								
				85								
				80								
100CS	38.21 - 38.74											
									38.80 - 39.20m: 70° planar locally stepped smooth fracture.			
101D	39.10 - 39.20								39.10 - 39.20m: Fractures are 10-40° and 60-70° very closely spaced planar smooth.			
102C	39.20 - 40.70		39.20	100								
				90								
				77	80							
					290							
					445							
103CS	39.83 - 40.21								Weak locally moderately weak thinly and thickly interlaminated grey locally dark grey MUDSTONE and SILTSTONE. Bedding fractures are 20-30° closely and medium spaced planar smooth.	39.40	21.15	
									Continued Next Page			

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

CONTRACT	CHECKED
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Geotechnical Engineering Limited

BOREHOLE LOG

BH22/01

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 6 of 7

Start Date 15 November 2022 Easting 386736 Scale 1:50

End Date 24 November 2022 Northing 398602 Ground Level 60.55mOD Depth 55.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
				NI				40.40m: Subhorizontal becoming 40° stepped smooth fracture.			
104D	40.60 - 40.70			20				40.40 - 40.60m: Fractures are 10-30° very closely and closely spaced planar smooth.	40.60	19.95	
105C	40.70 - 42.20	40.70	100	40				Weak locally moderately weak grey MUDSTONE with rare thick laminae of siltstone. Fractures are 20-30° medium spaced planar smooth.			
			93	70							
			90	300				41.10 - 41.25m: 50° planar smooth fracture.			
				540							
106CS	41.56 - 41.89										
107D	41.85 - 41.95										
								42.00 - 43.65m: Fractures are 10-30° very closely and closely spaced planar smooth.			
108C	42.20 - 43.70	42.20	100	NI				42.20 - 42.35m: 80° planar smooth fracture.			
			77	50				42.40 - 42.55m: 80° planar smooth fracture.			
			8	120							
								43.05 - 43.15m: Subvertical undulating smooth fracture.			
								43.20 - 43.30m: Subvertical undulating smooth fracture.			
109D	43.55 - 43.65										
110C	43.70 - 45.20	43.70	67	NI				Extremely weak black and dark grey MUDSTONE thinly interbedded with dark grey and black pyritic COAL recovered as sandy angular and subangular fine and medium gravel. (CHARLOTTE UPPER LEAF COAL SEAM).	43.65	16.90	
			0								
			0								
								44.80 - 46.00m: Grey.			
111D	45.10 - 45.20							45.00 - 45.20m: Black coal recovered as sandy fine and medium gravel.			
112C	45.20 - 46.70	45.20	100	NI				Very weak to moderately weak locally thinly laminated to very thinly bedded grey and dark grey MUDSTONE locally disintegrated to angular and subangular fine to coarse gravel. Laminae are 20° planar smooth. Fractures are subhorizontal to 20° closely and medium spaced planar smooth.	45.20	15.35	
			90	230							
			79	480							
113D	46.10 - 46.20										
114CS	46.31 - 46.50							46.10 - 46.20m: 50° undulating rough fracture.			
115C	46.70 - 48.20	46.70	100					46.70 - 47.35m: Dark grey.			
			81								
			80					47.25 - 47.35m: Extremely weak black coal disintegrated to sandy angular fine to coarse gravel.			
116D	47.80 - 47.90										
117CS	47.90 - 48.20										
								Continued Next Page			

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

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37349	CT

Geotechnical Engineering Limited

BOREHOLE LOG

BH22/01

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 7 of 7

Start Date 15 November 2022 Easting 386736 Scale 1:50

End Date 24 November 2022 Northing 398602 Ground Level 60.55mOD Depth 55.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
118C	48.20 - 49.70	48.20	93 77 52	NI 70 220				Very weak to weak grey MUDSTONE. Laminae are subhorizontal to 30° planar rarely undulating smooth. Bedding fractures are subhorizontal to 20° very closely to medium spaced planar smooth.	48.30	12.25	
119CS	49.44 - 49.61			NI				Weak becoming moderately weak dark grey locally carbonaceous MUDSTONE. Fracture are subhorizontal to 30° very closely to medium spaced planar rarely undulating smooth.	49.35	11.20	
120D	49.60 - 49.70			110							
121C	49.70 - 51.20	49.70	100 83 45	220							
								50.55 - 50.70m: Subvertical becoming 70° undulating smooth fracture.			
122D	51.10 - 51.20										
123C	51.20 - 52.70	51.20	90 60 28								
124CS	51.45 - 51.60							51.75 - 51.80m: Disintegrated to angular and subangular fine to coarse gravel.			
								52.10 - 52.70m: Closely spaced thin beds of extremely weak black coal disintegrated to angular fine to coarse gravel.			
125D	52.35 - 52.45										
126C	52.70 - 54.20	52.70	100 84 81	NI 270 460				Very weak to weak locally extremely weak grey MUDSTONE with frequent fragments of black organic material. Fractures are subhorizontal to 30° closely and medium spaced planar and undulating smooth.	52.70	7.85	
127CS	53.06 - 53.30							53.60 - 53.80m: Subvertical undulating rough fracture.			
128D	54.10 - 54.20										
129C	54.20 - 55.00	54.20	100 96 89								
130CS	54.20 - 54.40							54.60 - 55.00m: Moderately weak.			
131D	54.75 - 54.85							54.90 - 55.00m: 40° planar smooth fracture.	55.00	5.55	
								Borehole Completed at 55.00m			

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

CONTRACT	CHECKED
37349	CT

Geotechnical Engineering Limited

BOREHOLE LOG

BH22/02

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 8

Start Date 15 November 2022 Easting 386777 Scale 1:50

End Date 08 December 2022 Northing 398641 Ground Level 60.55mOD Depth 60.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
C	0.00 - 0.10						Vo 10.8	Black TARMACADAM.	0.10	60.45	
1B	0.10 - 0.30							Light grey subangular and subrounded limestone COBBLES with some sandy fine to coarse gravel. Gravel is angular to subrounded fine to coarse limestone. (MADE GROUND)	0.30	60.25	
1ES	0.50 - 0.70						Vo 11.3				
2B	0.50 - 0.70										
3D	0.50 - 0.70										
2ES	0.90 - 1.10						Vo 10.7	Greyish brown slightly clayey sandy locally very sandy angular to subrounded fine to coarse limestone and brick GRAVEL with a low subangular brick cobble content. (MADE GROUND)	1.20	59.35	
4B	0.90 - 1.10										
5D	0.90 - 1.10										
6B	1.20 - 1.70										
3ES	1.50						Vo 1.5	Firm greyish brown slightly sandy slightly gravelly CLAY with a low angular brick and concrete cobble content. Gravel is angular to subrounded fine to coarse brick and concrete. (MADE GROUND)			
7D	2.00										
8B	2.00 - 2.50										
4ES	2.50	2.00					S 17				
9D	2.50 - 2.95						Vo 1.1	2.50m: Stiff.			
10B	2.50 - 2.95										
11D	3.00	3.00					S 13		3.00	57.55	
12D	3.00 - 3.45							Firm greyish brown locally mottled grey slightly sandy slightly gravelly CLAY. Gravel is angular and subangular fine and medium sandstone and coal.			
13B	3.00 - 3.45										
14UT	3.50 - 3.95	3.00					Vo 0.6				
5ES	3.50										
16D	4.00 - 4.45	4.00					S 14				
17B	4.00 - 4.45										
18UT	4.50 - 4.95	4.00									
19D	5.00	5.00					S 13				
20D	5.00 - 5.45										
21B	5.00 - 5.45										
22D	6.00	6.00									
23UT	6.00 - 6.45										
24B	6.50 - 7.00										
25D	7.00	7.00					S 18	7.00m: Becoming stiff.			
26D	7.00 - 7.45										
27B	7.00 - 7.45										
28D	8.00										

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HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	0.10	Rotary Core	Geotechnical Pioneer Rig
0.10	1.20	Inspection Pit	Hand Tools
1.20	14.00	Cable Percussion	Cable Percussion Rig

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)
200	13.50
168	24.00
140	60.00

BARREL DIAMETER

DIAM (mm)	BASE (m)
300	0.10
200	14.00
128	14.20
146	60.00

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.50	Concrete
0.50	0.60	Gravel
0.60	0.90	Bentonite
0.90	3.10	Gravel

INSTRUMENTATION

DEPTH (m)	TYPE
3.00	Standpipe (50mm)
40.00	Standpipe (35mm) with geosock

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
15-11-2022 07:00	0.00	Nil	
15-11-2022 17:00	0.10	Nil	Dry
17-11-2022 07:00	0.10	Nil	Dry
17-11-2022 17:00	1.20	Nil	1.15
22-11-2022 12:00	1.20	Nil	NR
22-11-2022 16:00	4.00	4.00	NR

REMARKS

Water flush used 14.20-15.00m. Polymer flush used 15.00-60.00m. Driller notes reduced flush returns (20%) 21.00-22.50m and 45.00-46.50m and (10%) 46.50-48.00m. Driller notes loss of flush returns 22.50-24.00m and 48.00-60.00m.

CONTRACT	CHECKED
37349	CT

Geotechnical Engineering Limited

BOREHOLE LOG

BH22/02

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 2 of 8

Start Date 15 November 2022 Easting 386777 Scale 1:50

End Date 08 December 2022 Northing 398641 Ground Level 60.55mOD Depth 60.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
29UT	8.00 - 8.45	8.00									
30B	8.50 - 9.00										
31D	9.00	9.00					S 23				
32D	9.00 - 9.45										
33B	9.00 - 9.45										
34D	10.00	10.00						Stiff grey slightly gravelly slightly sandy locally sandy silty CLAY. Gravel is subangular and subrounded fine to coarse siltstone, mudstone and sandstone.	10.00	50.55	
UT	10.00 - 10.45										
35D	10.30										
36B	10.50 - 11.00										
37D	11.00										
38D	11.00 - 11.50										
39B	11.50 - 12.00										
40D	12.00	12.00					S 17				
41D	12.00 - 12.45										
42B	12.00 - 12.45										
43D	13.00	13.00						13.00 - 14.00m: Becoming very stiff. Rare thin and thick laminae of orangish brown fine and medium sand.			
44UT	13.00 - 13.45										
45B	13.50 - 14.00										
46D	14.00	13.50					S 42		14.00	46.55	
48L	14.00 - 14.20							Very stiff locally stiff brown slightly sandy locally sandy slightly gravelly CLAY. Gravel is angular to rounded fine and medium siltstone, mudstone, sandstone and rare limestone and quartzite.			
49C	14.20 - 15.00	14.20	100	NA							
50D	14.90 - 15.00							15.00 - 15.50m: Gravel is fine to coarse.			
51D	15.00 - 15.40	14.20	100				S *60				
52C	15.00 - 16.50	15.00	0					Extremely weak grey MUDSTONE with frequent thin laminae of grey siltstone. Frequently tending to very stiff fissured grey silty clay. Relict bedding fractures are subhorizontal to 10° extremely closely and very closely spaced planar rarely stepped smooth and 80° to subvertical planar smooth.			
53D	15.40 - 15.50		0	NI					15.50	45.05	

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HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
14.00	14.20	Windowless Sample	Geotechnical Pioneer Rig
14.20	60.00	Rotary Core	Geotechnical Pioneer Rig

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)

BACKFILL

TOP (m)	BASE (m)	MATERIAL
3.10	29.90	Bentonite
29.90	40.00	Gravel
40.00	60.00	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
23-11-2022 07:00	4.00	4.00	NR
23-11-2022 12:00	9.00	9.00	NR
24-11-2022 07:00	9.00	9.00	NR
24-11-2022 14:30	14.00	13.50	NR
02-12-2022 10:30	14.00	13.50	Dry
02-12-2022 13:45	15.00	14.20	3.40

REMARKS

AGS

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BOREHOLE LOG



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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 3 of 8

Start Date 15 November 2022 Easting 386777 Scale 1:50

End Date 08 December 2022 Northing 398641 Ground Level 60.55mOD Depth 60.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
54D	16.40	16.50										
55C	16.50	18.00	16.50	100 0 0								
									17.40 - 17.45m: Moderately weak thin bed of grey siltstone.			
					NI 80				Extremely weak to weak grey MUDSTONE with frequent extremely closely and very closely spaced thin laminae of siltstone. Bedding fractures are 10-20° extremely closely to medium spaced planar smooth and 80° to subvertical undulating and stepped smooth.	17.70	42.85	
56D	18.00	18.13	18.00		220			S *273				
57C	18.00	19.50		100 63 37								
58D	18.60	18.70										
59D	18.80	18.90										
60C	19.50	21.00	19.50	100 53 26								
61CS	19.50	19.72										
62D	20.90	21.00										
63D	21.00	21.45	21.00	85 23 0				S 11	21.00 - 21.70m: Disintegrated to clayey sandy angular fine to coarse gravel.			
64C	21.00	22.50										
65D	21.85	21.95			NI				Extremely weak black pyritic COAL recovered as angular fine to coarse gravel.	21.75	38.80	
					NI				Extremely weak to very weak grey, dark grey and black MUDSTONE disintegrated to very stiff sandy gravelly clay with rare coal gravel. Relict fractures are subhorizontal very closely spaced planar smooth.	22.05	38.50	
66C	22.50	24.00	22.50	100 0 0								
67D	22.90	23.00										
									Very weak to moderately weak thinly laminated to thinly bedded grey MUDSTONE locally thinly interlaminated with siltstone. Bedding fractures are subhorizontal very closely to medium spaced planar and undulating smooth.			
68D	23.90	24.00								23.90	36.65	
69D	24.00	24.12	24.00					S *300				

Continued Next Page

HOLE CONSTRUCTION

TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH

DIAM (mm) BASE (m)

BARREL DIAMETER

DIAM (mm) BASE (m)

BACKFILL

TOP (m) BASE (m) MATERIAL

INSTRUMENTATION

DEPTH (m) TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
05-12-2022 10:40	15.00	14.20	3.60
05-12-2022 17:40	22.50	22.50	Dry
06-12-2022 08:00	22.50	22.50	Dry
06-12-2022 17:10	34.50	34.50	0.90
07-12-2022 08:00	34.50	34.50	0.90
07-12-2022 17:15	52.50	52.50	22.00

REMARKS

AGS

CONTRACT	CHECKED
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Geotechnical Engineering Limited

BOREHOLE LOG

BH22/02

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 4 of 8

Start Date 15 November 2022 Easting 386777 Scale 1:50

End Date 08 December 2022 Northing 398641 Ground Level 60.55mOD Depth 60.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
70C	24.00 - 25.50		100 82 75	NI 100 300							
71D	24.90 - 25.00							24.75 - 24.85m: Disintegrated to angular medium and coarse gravel. 25.05 - 25.35m: Dark grey carbonaceous mudstone locally tending to extremely weak black coal.			
72C	25.50 - 27.00	25.50	100 100 100	80 90 140 760				25.70 - 26.45m: Fractures are widely spaced.			
73CS	26.55 - 26.80			140 170 300							
74C 75CS	27.00 - 28.50 27.00 - 27.50	27.00	93 93 74	570							
				50 100 240							
76C	28.50 - 30.00	28.50	100 52 27	NI 40 150				Weak dark grey and black carbonaceous MUDSTONE with medium spaced moderately weak thinly interbedded grey mudstone and siltstone and closely to widely spaced very thinly and thinly bedded extremely weak black coal frequently disintegrated to angular fine to coarse gravel. Fractures are 10-30° very closely to medium spaced planar rarely undulating and stepped smooth and 80° to subvertical planar smooth. (CHARLOTTE LOWER LEAF COAL SEAM).	28.50	32.05	
77CS	29.20 - 29.40			250 300							
78D 79C	29.90 - 30.00 30.00 - 31.50	30.00	100 73 49	NI 40 100				28.90 - 29.20m: Non intact. Subvertical undulating smooth fracture.			
80CS	31.00 - 31.30			NI 250 530				Weak locally extremely weak fossiliferous grey MUDSTONE. Bedding fractures are subhorizontal to 20° closely and medium spaced planar smooth.	30.85	29.70	
81D 82C	31.40 - 31.50 31.50 - 33.00	31.50	100 97 66								

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
08-12-2022 08:15	52.50	52.50	19.70
08-12-2022 14:30	60.00	60.00	19.00

REMARKS

AGS

CONTRACT	CHECKED
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Geotechnical Engineering Limited

BOREHOLE LOG



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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 5 of 8

Start Date 15 November 2022 Easting 386777 Scale 1:50

End Date 08 December 2022 Northing 398641 Ground Level 60.55mOD Depth 60.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
83CS	32.10 - 32.42										
84D	32.90 - 33.00			NI					32.90	27.65	
85C	33.00 - 34.50	33.00	100 97 78	150 300				Weak to moderately weak thinly laminated to thinly bedded grey SILTSTONE with very closely to medium spaced thinly and thickly laminated dark grey mudstone rarely thinly bedded light grey fine sandstone. Fractures are 10-45° very closely to medium spaced planar smooth.			
86CS	33.40 - 33.74										
87D	34.40 - 34.50										
88C	34.50 - 36.00	34.50	100 73 60					34.50 - 34.60m: Recovered non-intact as subangular coarse gravel. 34.65 - 34.80m: 70° planar rough fracture.			
89CS	35.57 - 35.72										
90D	35.90 - 36.00										
91C	36.00 - 37.50	36.00	100 79 57					36.50 - 36.55m: Conjugate intersecting fractures. Non intact.			
92CS	36.92 - 37.23										
93D	37.40 - 37.50										
94C	37.50 - 39.00	37.50	100 75 29					37.50 - 38.05m: Mudstone is thinly and thickly interlaminated with siltstone. 37.60m: Very weak.			
95CS	37.60 - 37.80										
				NI 30 115				Weak locally moderately weak grey MUDSTONE with medium spaced thinly laminated to thinly bedded medium strong light grey siltstone rarely tending to fine sandstone. Bedding fractures are subhorizontal to 30° extremely closely to closely spaced planar smooth.	38.05	22.50	
96D	38.90 - 39.00										
97C	39.00 - 40.50	39.00	100 84 9					38.40 - 38.50m: Two subhorizontal becoming 50° very closely spaced undulating rough fractures.			

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

CONTRACT	CHECKED
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BOREHOLE LOG

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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 6 of 8

Start Date 15 November 2022 Easting 386777 Scale 1:50

End Date 08 December 2022 Northing 398641 Ground Level 60.55mOD Depth 60.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
								40.15 - 40.35m: 80° planar smooth fracture.			
98D	40.40 - 40.50										
99C	40.50 - 42.00	40.50	90 76 63					40.80 - 40.90m: Locally gravel sized brown limestone. 40.95 - 41.50m: Subvertical to 80° undulating rough fracture.	41.00	19.55	
				NI 250 360				Moderately weak thinly laminated to very thinly bedded grey SILTSTONE with extremely closely to closely spaced thinly and thickly interlaminated dark grey mudstone. Fractures are subhorizontal to 30° very closely to medium spaced planar rarely undulating smooth.			
100CS	41.45 - 41.65										
101D	41.90 - 42.00										
102C	42.00 - 43.50	42.00	93 83 73					42.00 - 42.40m: 50° undulating smooth fracture.			
103D	42.90 - 43.00										
104CS	43.23 - 43.50										
105C	43.50 - 45.00	43.50	100 91 84					43.50 - 44.15m: Mudstone is thinly laminated to medium bedded.			
106CS	43.60 - 43.95							43.95 - 44.05m: 60° planar smooth fracture.			
107CS	44.25 - 44.50			130 270 290				Moderately weak thickly laminated to thinly bedded grey fine SANDSTONE with extremely closely and very closely spaced thinly and thickly laminated grey siltstone and rare thinly laminated mudstone. Laminae are subhorizontal to 10° planar rarely undulating smooth. Fractures are subhorizontal to 20° medium and widely spaced rarely very closely spaced planar smooth.	44.15	16.40	
108C	45.00 - 46.50	45.00	100 100 99	560							
				20 920							
109CS	46.10 - 46.50										
110C	46.50 - 48.00	46.50	93 66 46	470				Medium strong grey frequently stained reddish brown fine and medium SANDSTONE with rare thinly laminated black coal and mudstone. Fractures are 10-30° very closely and medium spaced planar smooth.	47.00	13.55	
111CS	46.50 - 47.00			NI 110 350				47.00 - 47.10m: Extremely closely and very closely spaced thinly interlaminated coal. 47.00 - 47.25m: 70° planar smooth locally rough fracture. 47.20 - 47.40m: Subvertical undulating smooth incipient fracture. 47.55 - 48.30m: Fractures are very closely and closely spaced with 70° to subvertical intersecting planar smooth fractures.			
112C	48.00 - 49.50	48.00						Continued Next Page			

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

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Geotechnical Engineering Limited

BOREHOLE LOG

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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 7 of 8

Start Date 15 November 2022 Easting 386777 Scale 1:50

End Date 08 December 2022 Northing 398641 Ground Level 60.55mOD Depth 60.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
			100 85 70	70 270 390							
113CS	49.10 - 49.50										
114C	49.50 - 51.00	49.50	100 85 71	30 35 190 790				Moderately weak reddish brown fine and medium SANDSTONE with rare thinly laminated coal. Fractures are subhorizontal to 20° very closely to widely spaced planar smooth and 60-80° medium spaced planar smooth.	49.75	10.80	
115CS	50.20 - 50.55							50.80 - 51.10m: 80° to subvertical intersecting planar smooth fractures.			
116C	51.00 - 52.50	51.00	100 85 83	NI 120 160 770							
117CS	51.86 - 52.17							52.05 - 52.50m: Subvertical planar smooth incipient fracture.			
118C	52.50 - 54.00	52.50	100 99 89	NI 70 200 20 350 560				53.20 - 53.70m: Locally light grey.			
119CS	53.60 - 54.00							53.70 - 54.25m: Light grey.			
120C	54.00 - 55.50	54.00	100 79 25	NI 20 120				Very weak to weak thickly laminated to medium bedded dark grey MUDSTONE with thinly interlaminated to very thinly interbedded greyish brown siltstone. Fractures are 5-20° very closely and closely spaced planar smooth. Bedding fractures are 5-20° extremely closely and very closely spaced planar smooth.	54.25	6.30	
121CS	55.30 - 55.43										
122C 123D	55.50 - 57.00 55.50 - 55.60	55.50	90 46 32	NI 40 90				Very weak dark grey carbonaceous MUDSTONE. Fractures are randomly orientated very closely and closely spaced planar polished.	55.50	5.05	
								Continued Next Page			

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

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Geotechnical Engineering Limited

BOREHOLE LOG

BH22/02

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 8 of 8

Start Date 15 November 2022 Easting 386777 Scale 1:50

End Date 08 December 2022 Northing 398641 Ground Level 60.55mOD Depth 60.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
					90 100 390				Weak locally moderately weak grey locally dark grey MUDSTONE. Bedding fractures are subhorizontal to 20° closely and medium spaced undulating and planar smooth.	56.45	4.10	
124D 125C	56.90 - 57.00 57.00 - 58.50		57.00	100 91 59								
					NI 50 130				Very weak to weak dark grey carbonaceous MUDSTONE with thinly bedded coal locally disintegrated to angular fine to coarse gravel. Fractures are subhorizontal very closely spaced planar smooth.	58.05	2.50	
126D 127C	58.40 - 58.50 58.50 - 60.00		58.50	96 86 55	NI 80 190				Very weak to moderately weak thinly interlaminated to thinly interbedded grey MUDSTONE and light grey SILTSTONE. Bedding fractures are subhorizontal to 10° closely and medium spaced planar rarely undulating smooth.	58.65	1.90	
128CS	59.30 - 59.72				650				58.70 - 58.80m: Subhorizontal undulating smooth fracture infilled (up to 100mm) with firm grey sandy clay. 59.35 - 60.00m: Fractures are widely spaced.			
									Borehole Completed at 60.00m	60.00	0.55	

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

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Geotechnical Engineering Limited

BOREHOLE LOG

BH22/03

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 9

Start Date 15 November 2022 Easting 386828 Scale 1:50

End Date 30 November 2022 Northing 398618 Ground Level 60.85mOD Depth 64.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
C	0.00 - 0.10						Vo 11.0	Black TARMACADAM.	0.10	60.75	
1B	0.10 - 0.25						Vo 12.6	Light grey sandy angular to subrounded fine to coarse limestone, brick and rare concrete GRAVEL. (MADE GROUND)	0.25	60.60	
1ES	0.10 - 0.25								0.50	60.35	
2D	0.10 - 0.25										
2ES	0.25 - 0.50										
3B	0.25 - 0.50							Brown and greyish brown clayey very sandy angular to subrounded fine to coarse brick, concrete, clinker and rare limestone and quartzite GRAVEL with rare wood fragments (up to 150x30x20mm). (MADE GROUND)			
4D	0.25 - 0.50										
3ES	0.90 - 1.10						Vo 11.8				
5B	0.90 - 1.10										
6D	0.90 - 1.10	Nil					C 9		1.20	59.65	
7B	1.20 - 1.65							0.50m: Geotextile membrane.			
								Firm to stiff greyish brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded clinker, brick, siltstone and rare sandstone. (MADE GROUND)			
8D	2.00	2.00					C <1				
9B	2.00 - 2.45							Firm brownish grey slightly sandy slightly gravelly locally gravelly locally silty CLAY. Gravel is angular to subrounded fine to coarse sandstone and rare brick. (MADE GROUND)			
10B	2.50 - 3.00						Vo 1.9	2.00m: SPT terminated after seating drive due to deviation from vertical.			
4ES	2.50										
11D	3.00	3.00					C 19				
12B	3.00 - 3.45								3.10	57.75	
								Stiff to very stiff greyish brown thinly laminated slightly sandy slightly gravelly CLAY. Gravel is angular and subangular fine and medium sandstone.			
13UT	3.50 - 3.95	3.00					Vo 1.4				
5ES	3.50										
14B	3.50 - 3.95										
15B	4.00 - 4.45	4.00					S 16				
16D	4.00 - 4.45										
17UT	4.50 - 4.95	4.00									
18D	5.00 - 5.45	5.00					S 10	5.00m: Locally firm.			
19D	5.00										
20B	5.00 - 5.45										
21UT	6.00 - 6.45	6.00									
22D	6.00										
23B	6.50 - 7.00										
24D	7.00 - 7.45	7.00					S 14				
25D	7.00										
26B	7.00 - 7.45										
27D	8.00	8.00									

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	0.10	Rotary Core	Geotechnical Pioneer Rig
0.10	1.20	Inspection Pit	Hand Tools
1.20	10.50	Cable Percussion	Dando 2000

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)
200	9.00
168	16.00
140	64.50

BARREL DIAMETER

DIAM (mm)	BASE (m)
300	0.10
200	10.50
128	11.50
146	64.50

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.50	Concrete
0.50	0.60	Gravel
0.60	0.80	Bentonite
0.80	3.10	Gravel

INSTRUMENTATION

DEPTH (m)	TYPE
3.00	Standpipe (50mm) with geosock
62.00	Standpipe (35mm) with geosock

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
15-11-2022 08:00	0.00	Nil	
15-11-2022 11:30	1.20	Nil	Dry
21-11-2022 07:00	1.20	Nil	NR
21-11-2022 16:30	7.00	7.00	NR
22-11-2022 07:00	7.00	7.00	NR
22-11-2022 12:00	10.50	10.00	NR

REMARKS

Polymer flush used 11.50-64.50m. Driller notes reduced flush returns (70%) 42.00-43.50m. Driller notes loss of flush returns 43.50-64.50m.

CONTRACT	CHECKED
37349	CT

Geotechnical Engineering Limited

BOREHOLE LOG

BH22/03

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 2 of 9

Start Date 15 November 2022 Easting 386828 Scale 1:50

End Date 30 November 2022 Northing 398618 Ground Level 60.85mOD Depth 64.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
28UT	8.00 - 8.45										
29B	8.50 - 9.00										
30D	9.00 - 9.45	9.00					S 19				
31D	9.00										
32B	9.00 - 9.45										
33D	10.00	9.00									
34UT	10.00 - 10.45										
								10.25m: Locally firm.			
35L	10.50 - 11.00	9.00						Stiff becoming very stiff brown slightly gravelly slightly sandy locally sandy CLAY. Gravel is angular to subrounded fine and medium rarely coarse siltstone, mudstone, limestone, sandstone and rare coal.	10.45	50.40	
36D	10.90 - 11.00						H 140				
37D	11.00 - 11.45	9.00					S 30				
38L	11.00 - 11.50	11.00									
39C	11.50 - 12.00	11.50	100	NA							
40D	11.90 - 12.00						H 140				
41D	12.00 - 12.45	12.00	93				S 31				
42C	12.00 - 13.50										
43D	12.90 - 13.00										
44D	13.50 - 13.95	13.50	100				S 38				
45C	13.50 - 15.00										
46D	13.90 - 14.00							14.00 - 15.15m: Sandy gravelly.			
47D	14.90 - 15.00										
48D	15.00 - 15.45	15.00	100				S 34				
49C	15.00 - 16.50		85	NI							
			63	100							
				200							
								Extremely weak locally thinly laminated grey locally dark grey MUDSTONE frequently tending to very stiff gravelly clay. Bedding fractures are subhorizontal to 20° very closely to medium spaced planar rough frequently infilled (up to 10mm) with grey silty clay.	15.15	45.70	
								Continued Next Page			

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
10.50	11.50	Windowless Sample	Geotechnical Pioneer Rig
11.50	64.50	Rotary Core	Geotechnical Pioneer Rig

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)

BACKFILL

TOP (m)	BASE (m)	MATERIAL
3.10	49.80	Bentonite
49.80	62.00	Gravel
62.00	62.10	Bentonite
62.10	64.50	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
22-11-2022 15:20	10.50	10.00	10.00
22-11-2022 16:30	11.50	11.00	5.45
23-11-2022 08:00	11.50	11.00	5.25
23-11-2022 17:00	21.00	21.00	0.90
24-11-2022 08:00	21.00	21.00	0.90
24-11-2022 18:05	34.50	34.50	0.90

REMARKS

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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 3 of 9

Start Date 15 November 2022 Easting 386828 Scale 1:50

End Date 30 November 2022 Northing 398618 Ground Level 60.85mOD Depth 64.50 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
50D	16.40	16.50										
51D	16.50	16.80	16.50	100				S *100				
52C	16.50	18.00		63								
				57								
					NI							
					5							
					180				Extremely weak thickly laminated to very thinly bedded dark grey MUDSTONE with very closely and closely spaced extremely weak very thinly bedded black coal. Bedding fractures are 20-30° extremely closely to closely spaced planar smooth.	17.30	43.55	
53D	17.90	18.00										
54C	18.00	19.50	18.00	100								
				96								
				96	100							
					200							
					470				Extremely weak to very weak grey locally dark grey MUDSTONE with rare thinly laminated siltstone and coal. Fractures are subhorizontal closely to medium spaced planar rarely undulating rough.	18.20	42.65	
55D	19.00	19.10										
56D	19.50	19.76	19.50	100	NI			S *100				
57C	19.50	21.00		80					19.50 - 19.80m: Drilling disturbed.			
				80								
					130							
					250							
					270							
58D	20.60	20.70										
59CS	20.70	20.90										
					NI							
60C	21.00	22.50	21.00	97	80				Very weak to weak dark grey locally carbonaceous MUDSTONE. Fractures are 10-30° very closely to medium spaced planar smooth.	20.90	39.95	
				63	230				21.40 - 21.50m: Two 70° very closely spaced planar smooth fractures.			
				35								
61CS	22.12	22.34							Extremely weak to weak dark grey MUDSTONE with very closely to medium spaced thickly laminated to thinly bedded black frequently pyritic coal. Locally disintegrated to sandy angular fine to coarse gravel. Fractures are 10-20° extremely closely to medium spaced planar rarely stepped smooth. (CHARLOTTE UPPER LEAF COAL SEAM).			
62D	22.40	22.50										
63D	22.50	22.63	22.50	100				S *273				
64C	22.50	24.00		62	NI					22.60	38.25	
				45	50							
					250				22.90 - 23.00m: Subvertical becoming 50° undulating smooth incipient fracture.			
65CS	23.05	23.21							23.30 - 23.40m: 70° planar smooth fracture.			
					20				Very weak to weak locally extremely weak light grey MUDSTONE with rare siltstone laminae. Fractures are subhorizontal to 30° closely and medium spaced rarely extremely closely spaced undulating rarely planar smooth.	23.60	37.25	
					230							
66D	23.90	24.00			320							
67C	24.00	25.50	24.00									

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
25-11-2022 08:00	34.50	34.50	1.80
25-11-2022 13:45	45.00	45.00	21.10
28-11-2022 10:45	45.00	45.00	20.65
28-11-2022 17:30	50.20	50.20	20.10
29-11-2022 08:00	50.20	50.20	20.70
29-11-2022 16:35	57.00	57.00	18.70

REMARKS

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BOREHOLE LOG

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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 4 of 9

Start Date 15 November 2022 Easting 386828 Scale 1:50

End Date 30 November 2022 Northing 398618 Ground Level 60.85mOD Depth 64.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
			100 100 80								
68CS	24.47 - 24.81										
69D	25.40 - 25.50										
70C	25.50 - 27.00	25.50	100								
71CS	25.74 - 26.27		100 89	NI 210 500				Very weak to moderately weak thinly interlaminated to very thinly interbedded light grey and grey SILTSTONE, MUDSTONE and rarely fine SANDSTONE. Bedding fractures are 10-20° closely and medium spaced planar rarely undulating smooth. 26.25 - 26.40m: 70° planar smooth fracture.	25.65	35.20	
72D	26.90 - 27.00										
73C	27.00 - 28.50	27.00	100 95 95								
74D	27.70 - 27.85										
75CS	27.84 - 27.99							28.00 - 28.50m: Rare nodular fossils (up to 10x7x5mm).			
76C	28.50 - 30.00	28.50	100 90 73								
77CS	28.95 - 29.28										
78D	29.35 - 29.45							29.30 - 29.35m: Calcareous mudstone nodule (100x50x50mm) recovered as angular to subrounded fine to coarse gravel.			
79C	30.00 - 31.50	30.00	100					29.90 - 30.00m: 70° planar smooth fracture.			
80CS	30.15 - 30.27		80 51					30.30 - 30.70m: Subvertical undulating smooth fracture.			
81D	30.45 - 30.55			NI 100 160				Weak to moderately weak thinly and thickly laminated grey and dark grey MUDSTONE with rare siltstone laminae. Bedding fractures are 10-30° very closely and closely spaced planar smooth. 30.75 - 31.10m: 70° planar smooth fracture.	30.50	30.35	
82C	31.50 - 33.00	31.50	100								
83CS	31.50 - 31.67		63 20	NI 80				Extremely weak locally very weak grey MUDSTONE. Bedding fractures are 10-30° very closely and closely spaced planar smooth.	31.70	29.15	
								Continued Next Page			

HOLE CONSTRUCTION

TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH

DIAM (mm) BASE (m)

BARREL DIAMETER

DIAM (mm) BASE (m)

BACKFILL

TOP (m) BASE (m) MATERIAL

INSTRUMENTATION

DEPTH (m) TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
30-11-2022 08:00	57.00	57.00	20.50
30-11-2022 15:35	64.50	64.50	20.00

REMARKS

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BOREHOLE LOG

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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 5 of 9

Start Date 15 November 2022 Easting 386828 Scale 1:50

End Date 30 November 2022 Northing 398618 Ground Level 60.85mOD Depth 64.50 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
					190							
					NI				Very weak to weak thinly laminated dark grey MUDSTONE. Fractures are 20-30° very closely and closely spaced planar smooth.	32.45	28.40	
					50							
					100							
84D	32.90	33.00										
85C	33.00	34.50	33.00	100					32.50 - 32.65m: 60° undulating smooth fracture.			
				87					32.70 - 32.90m: Subvertical planar smooth fracture.			
				65					33.20 - 33.50m: 60° planar smooth fracture.			
					30				Very weak to weak light grey fossiliferous SILTSTONE frequently tending to light grey mudstone. Fractures are subhorizontal to 20° very closely to medium spaced planar rarely undulating smooth.	33.35	27.50	
					150							
					210							
86CS	34.15	34.40							33.40 - 33.45m: Extremely weak black coal disintegrated to angular fine to coarse gravel.			
87D	34.40	34.50			95				33.50 - 33.55m: 45° undulating smooth fracture.	34.30	26.55	
88C	34.50	36.00	34.50	100	230				34.05 - 34.15m: Subvertical becoming 70° stepped smooth fracture.			
				100	400							
89CS	34.81	35.22		93					Moderately weak to medium strong locally weak thinly and thickly interlaminated grey SILTSTONE and MUDSTONE. Bedding fractures are subhorizontal to 10° closely and medium locally widely spaced planar smooth.			
90D	35.30	35.40							35.30 - 35.40m: 60° planar smooth fracture.			
									35.80 - 35.90m: 50° undulating smooth fracture.			
									35.90 - 36.00m: 60° planar smooth fracture.			
91C	36.00	37.50	36.00	100					36.00 - 36.05m: Thinly interlaminated to very thinly interbedded siltstone and mudstone.			
				100								
92CS	36.30	36.80		100								
					650							
									36.95 - 37.05m: Subhorizontal to 50° stepped smooth fracture.			
					150							
					170				37.20 - 37.30m: 60° planar smooth fracture.	37.30	23.55	
					200				Weak to strong thinly interlaminated to very thinly interbedded light grey, grey and dark grey rarely stained light brown SILTSTONE, fine SANDSTONE and MUDSTONE. Bedding fractures are subhorizontal to 20° medium spaced planar smooth.			
93C	37.50	39.00	37.50	100	270							
				97								
				97	NI							
					430							
									37.75 - 37.85m: Fractures are 20-40° very closely spaced and intersecting planar smooth.	38.30	22.55	
					180							
					400				Moderately weak to medium strong thinly laminated to medium bedded light grey fine and medium SANDSTONE. Laminae are 10-30° planar rarely undulating smooth locally weak grey mudstone and siltstone. Fractures are subhorizontal to 20° closely to widely spaced planar smooth and 70-80° closely and medium spaced planar rarely undulating smooth locally rough.			
94D	38.60	38.70			770							
95CS	38.70	39.00										
96C	39.00	40.50	39.00	100								
				100								
97CS	39.38	39.85		93					38.30m: Rare grey mudstone laminae.			
									39.85 - 40.10m: Dark grey.			
									39.85 - 40.15m: Medium strong dark grey siltstone.			

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

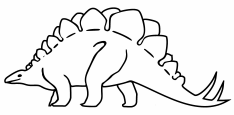
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SITE ETIHAD GROUND INVESTIGATION

Sheet 6 of 9

Start Date 15 November 2022 Easting 386828 Scale 1:50

End Date 30 November 2022 Northing 398618 Ground Level 60.85mOD Depth 64.50 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
98C	40.50	42.00	40.50	100 100 100								
99CS	41.58	42.00										
100C	42.00	43.50	42.00	97 75 63	50 220 230				42.10m: Locally very thinly to thickly bedded medium sandstone. Laminae becoming rare. 42.25 - 42.60m: 75° planar smooth locally rough fracture. 42.40 - 42.55m: Laminae frequently stained reddish brown. 42.55 - 44.85m: Stained reddish brown locally dark reddish brown.			
101CS	42.72	43.13			550							
102D	43.40	43.50			NI				43.15 - 43.30m: Subvertical planar rough fracture.			
103C	43.50	45.00	43.50	100 84 66	NI 160 340							
104CS	44.18	44.54										
105D	44.55	44.65										
106CS	44.75	45.00										
107C	45.00	46.50	45.00	100 87					44.85 - 46.50m: Frequently stained reddish brown.			
108CS	45.30	45.60		87					45.50 - 45.70m: Medium bed of medium strong grey stained reddish brown siltstone.			
109C	46.50	48.00	46.50	93 63 29	NI 50 280				Very weak to weak thinly laminated to very thinly bedded grey MUDSTONE with rare thinly laminated siltstone. Bedding fractures are 10-20° very closely to medium spaced planar smooth and polished rarely disintegrated (up to 20mm) to grey silty clay.	46.50	14.35	
110D	47.05	47.15										
111CS	47.55	47.83							47.10 - 47.40m: Locally disintegrated to angular medium and coarse gravel. Subvertical becoming 70° planar locally undulating smooth fracture. 47.50m: Laminae are grey and dark grey.			
112C	48.00	49.50	48.00									

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

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SITE ETIHAD GROUND INVESTIGATION

Sheet 7 of 9

Start Date 15 November 2022 Easting 386828 Scale 1:50

End Date 30 November 2022 Northing 398618 Ground Level 60.85mOD Depth 64.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
			100 36 16					48.20 - 48.45m: Recovered as clayey angular fine to coarse gravel.			
				NI 50 160				Extremely weak to very weak dark grey MUDSTONE. Fractures are 20-30° very closely and closely spaced planar smooth and 60-80° closely spaced planar smooth.	48.45	12.40	
113D	49.35 - 49.50							48.55 - 49.05m: Subvertical undulating locally planar smooth fracture. 49.20 - 49.35m: Carbonaceous.			
114C	49.50 - 50.20	49.50	90 71 43	NI 130 220				Weak to moderately weak light grey MUDSTONE. Fractures are subhorizontal to 20° very closely to medium spaced planar rough.	49.40	11.45	
115CS	49.85 - 50.05										
116C	50.20 - 51.00	50.20	100 75 75					50.10 - 50.20m: Disintegrated to very stiff grey clay. 50.20 - 50.40m: Frequently disintegrated to angular to subrounded sandy fine to coarse gravel.			
117CS	50.70 - 51.00										
118C	51.00 - 52.50	51.00	100 87 43	NI 60 195				Weak to moderately weak dark grey MUDSTONE. Fractures are subhorizontal to 10° very closely and closely spaced planar smooth.	51.05	9.80	
119D	51.50 - 51.60										
120CS	51.95 - 52.23										
				55 120 160				Weak to moderately weak grey becoming light grey fossiliferous MUDSTONE. Fractures are 20-30° very closely and closely becoming closely and medium spaced planar rarely undulating smooth.	52.10	8.75	
121C	52.50 - 54.00	52.50	100 90 73					52.15 - 52.25m: Thin bed of moderately weak greyish brown limestone. 52.60 - 52.70m: 40° undulating locally stepped smooth fracture. 52.75 - 52.90m: Two 40° very closely spaced planar smooth fractures.			
122CS	53.00 - 53.23			410							
				150 170 240							
123C	54.00 - 55.50	54.00	100 92 57	NI 120 270				Weak to moderately weak becoming medium strong locally strong thinly interlaminated to thinly interbedded grey MUDSTONE, grey SILTSTONE and light grey fine and medium SANDSTONE. Laminae are subhorizontal to 20° planar rarely undulating smooth. Fractures are 20-30° closely and medium spaced planar smooth.	54.05	6.80	
124D	55.40 - 55.50							54.50 - 54.60m: 50° planar smooth fracture. Subvertical planar smooth fracture. 54.95 - 55.05m: 80° becoming subvertical undulating and planar smooth incipient fracture.			
125C	55.50 - 57.00	55.50	100 87 84					55.30 - 55.50m: Two 50° closely spaced planar smooth fractures.			
126CS	55.70 - 55.97										

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

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BOREHOLE LOG

BH22/03

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 8 of 9

Start Date 15 November 2022 Easting 386828 Scale 1:50

End Date 30 November 2022 Northing 398618 Ground Level 60.85mOD Depth 64.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
								56.15 - 56.20m: Disintegrated to slightly clayey subangular coarse gravel.			
127CS	56.49 - 56.66										
128C	57.00 - 58.50	57.00	100 62 55	NI 100 370				Very weak to weak grey fossiliferous MUDSTONE with rare thinly laminated to very thinly bedded light grey siltstone and greyish brown limestone. Fractures are 10-30° very closely to medium spaced planar rarely undulating smooth. 57.00 - 57.25m: Drilling disturbed. Recovered as very clayey angular to subrounded fine to coarse gravel. 57.35 - 57.50m: Subvertical becoming 50° undulating smooth fracture. 57.90 - 58.10m: 70° planar smooth fracture.	57.00	3.85	
129CS	58.00 - 58.35										
130D	58.40 - 58.50										
131C	58.50 - 60.00	58.50	100 62 38					58.50 - 58.80m: Recovered non-intact. Subvertical becoming 80° planar locally stepped smooth fracture.			
132CS	58.85 - 59.00										
								59.60 - 59.70m: Disintegrated to angular fine to coarse gravel.			
133D	59.90 - 60.00										
134C	60.00 - 61.50	60.00	100 85 64					59.90 - 60.00m: Subvertical planar smooth fracture. 60.00 - 60.15m: Disintegrated to angular fine to coarse gravel. 60.00 - 60.45m: Dark grey locally carbonaceous.			
135CS	60.25 - 60.43			NI 200 510				Weak to medium strong locally very weak thinly laminated to thinly bedded light grey SILTSTONE with frequent thinly laminated to thinly bedded dark grey mudstone and thickly laminated to very thinly bedded light grey fine sandstone. Laminae are 10-20° planar frequently undulating smooth. Fractures are subhorizontal to 20° closely and medium spaced planar smooth.	60.45	0.40	
136CS	60.98 - 61.21										
137C	61.50 - 63.00	61.50	100 52 41					60.50 - 60.65m: 70° planar smooth fracture. 61.05 - 61.15m: Medium strong thin bed of greyish brown limestone.			
138CS	61.68 - 61.90			NI 70 150				61.20 - 61.30m: Two intersecting 10° and 40° planar smooth fractures.	61.90	-1.05	
								Weak to medium strong thickly laminated to thinly bedded light grey becoming light bluish grey frequently becomiing rarely stained light brown fine and medium SANDSTONE with frequent thinly laminated to very thinly bedded light grey siltstone and rare thinly and thickly laminated dark grey mudstone. Fractures are 10-30° closely and medium spaced planar smooth.			
139C	63.00 - 64.50	63.00	100 93 85	390 390 510				61.90 - 63.00m: 85° becoming subvertical undulating smooth fracture. Recovered non-intact as angular fine to coarse gravel. 63.00 - 63.15m: Drilling disturbed. Recovered as grey slightly gravelly sandy silty clay.			
140CS	63.54 - 64.07										

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

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Geotechnical Engineering Limited

BOREHOLE LOG

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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 9 of 9

Start Date 15 November 2022 Easting 386828 Scale 1:50

End Date 30 November 2022 Northing 398618 Ground Level 60.85mOD Depth 64.50 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
								64.00 - 64.50m: Abundant extremely closely and very closely spaced mudstone laminae.			
				60					64.50	-3.65	
								Borehole Completed at 64.50m			

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

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BOREHOLE LOG

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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 7

Start Date 15 November 2022 Easting 386737 Scale 1:50

End Date 15 December 2022 Northing 398635 Ground Level 60.60mOD Depth 49.70 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
C	0.00 - 0.10						Vo 12.8	Black TARMACADAM.	0.10	60.50	
1B	0.10 - 0.30							Greyish brown locally light grey sandy angular to subrounded fine to coarse brick and concrete GRAVEL. (MADE GROUND)	0.30	60.30	
1ES	0.10 - 0.30							0.30m: Geotextile membrane.			
2D	0.10 - 0.30						Vo 12.1				
2ES	0.50 - 0.70										
3B	0.50 - 0.70										
4D	0.50 - 0.70						Vo 11.8	Brown sandy angular to subrounded fine to coarse brick, concrete and rare quartzite GRAVEL. (MADE GROUND)			
3ES	0.90 - 1.10							0.40m: Steel reinforcement bar fragment (300x10mm diam).			
5B	0.90 - 1.10										
6D	0.90 - 1.10	Nil					C *65		1.20	59.40	
7B	1.20 - 1.65							Very dense dark grey slightly silty sandy angular and subangular fine to coarse sandstone, limestone, concrete and brick GRAVEL. (MADE GROUND)			
4ES	1.50						Vo 1.0				
								1.80 - 2.00m: Subangular to subrounded sandstone boulder.			
8D	2.00	2.00					C <1		2.00	58.60	
9B	2.00 - 2.45							Soft brownish grey slightly sandy slightly gravelly CLAY. Gravel is angular and subangular fine to coarse sandstone. (MADE GROUND)			
5ES	2.40						Vo 1.2				
10B	2.50 - 2.67	2.50					C *214	2.00m: SPT terminated after seating drive due to deviation from vertical.	2.50	58.10	
11L	2.50 - 3.00										
12D	2.90 - 3.00							Very dense multicoloured slightly sandy angular and subangular fine to coarse brick, concrete and quartzite GRAVEL with a moderate subangular concrete cobble content. (MADE GROUND)	2.90	57.70	
13L	3.00 - 3.50	2.50					C 14				
6ES	3.20 - 3.40						Vo 0.0				
14D	3.40 - 3.50										
15L	3.50 - 4.00	3.00					C 35	Firm becoming stiff to very stiff dark greyish brown slightly sandy gravelly silty CLAY. Gravel is angular to subrounded fine to coarse brick, concrete, quartzite and sandstone. (MADE GROUND)	3.70	56.90	
16D	3.90 - 4.00										
17L	4.00 - 4.50	3.00					C 46				
7ES	4.20 - 4.30						Vo 0.0	Dense brownish grey and dark reddish brown gravelly clayey fine to coarse SAND. Gravel is angular and subangular fine to coarse brick, concrete and rare glass, clinker, sandstone and quartzite. (MADE GROUND)			
18D	4.40 - 4.50										
19L	4.50 - 5.20	3.00					C *60		4.50	56.10	
8ES	4.50 - 4.70	4.50					Vo 0.0				
20D	4.90 - 5.00							Very dense dark greyish brown clayey very sandy angular to subrounded fine to coarse clinker, brick, quartzite and concrete GRAVEL with a low subangular brick and concrete cobble content. (MADE GROUND)			
21L	5.20 - 6.20	5.20					C 20	4.95 - 5.05m: Light grey.	5.20	55.40	
								5.10 - 5.20m: Reddish brown angular and subangular brick cobble.			
22D	6.10 - 6.20							Medium dense light grey sandy angular and subangular fine to coarse limestone and rare brick GRAVEL. (MADE GROUND)			
23L	6.20 - 7.20	6.20					C 9	6.20m: Loose.			
								6.20 - 7.55m: Slightly sandy.			
24D	7.10 - 7.20										
25L	7.20 - 8.20	7.20					C 14				
								Stiff becoming very stiff brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine and medium sandstone, siltstone and quartzite.	7.55	53.05	

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	0.10	Rotary Core	Geotechnical Pioneer Rig
0.10	1.20	Inspection Pit	Hand Tools
1.20	2.50	Cable Percussion	Cable Percussion Rig

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)
200	3.00
168	12.20
140	49.70

BARREL DIAMETER

DIAM (mm)	BASE (m)
300	0.10
200	2.50
128	12.20
146	49.70

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.20	Concrete
0.20	0.30	Gravel
0.30	1.00	Bentonite
1.00	5.00	Gravel

INSTRUMENTATION

DEPTH (m)	TYPE
5.00	Standpipe (50mm)
40.00	Standpipe (35mm) with geosock

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
15-11-2022 08:15	0.00	Nil	
15-11-2022 11:30	0.10	Nil	Dry
17-11-2022 11:30	0.10	Nil	Dry
17-11-2022 13:45	1.20	Nil	Dry
28-11-2022 13:00	1.20	Nil	NR
28-11-2022 15:00	2.50	2.50	NR

REMARKS

Water flush used 12.20-49.70m. Driller notes loss of flush returns 34.70-49.70m. Geophysical testing undertaken at this location, results presented separately.

CONTRACT	CHECKED
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BOREHOLE LOG

BH22/04

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 2 of 7

Start Date 15 November 2022 Easting 386737 Scale 1:50

End Date 15 December 2022 Northing 398635 Ground Level 60.60mOD Depth 49.70 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
26D	8.10 - 8.20										
27L	8.20 - 9.20	8.20					C 23				
28D	9.10 - 9.20										
29L	9.20 - 10.20	9.20					C 30				
30D	10.10 - 10.20										
31D	10.20 - 10.65	10.20					S 12	10.20m: Firm.			
32L	10.20 - 11.20										
33D	11.10 - 11.20										
UT	11.20 - 11.80	11.20									
34L	11.20 - 12.20										
35D	12.10 - 12.20										
36C	12.20 - 13.70	12.20	100	NA							
37D	13.10 - 13.20							13.45 - 13.50m: Subangular sandstone cobble.			
38D	13.70 - 14.15	13.70	100				S 29				
39C	13.70 - 15.20										
40D	14.00 - 14.45										
41D	14.10 - 14.20										
42D	15.10 - 15.20										
43D	15.20 - 15.65	15.20	100				S 39				
44C	15.20 - 16.70										

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
2.50	12.20	Windowless Sample	Geotechnical Pioneer Rig
12.20	49.70	Rotary Core	Geotechnical Pioneer Rig

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)

BACKFILL

TOP (m)	BASE (m)	MATERIAL
5.00	30.00	Bentonite
30.00	40.00	Gravel
40.00	49.70	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
06-12-2022 10:00	2.50	2.50	0.80
06-12-2022 17:30	9.20	9.20	1.50
07-12-2022 08:15	9.20	9.20	1.50
07-12-2022 17:30	21.20	21.20	1.00
08-12-2022 08:30	21.20	21.20	1.85
08-12-2022 18:20	30.20	30.20	1.00

REMARKS

AGS

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BOREHOLE LOG

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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 3 of 7

Start Date 15 November 2022 Easting 386737 Scale 1:50

End Date 15 December 2022 Northing 398635 Ground Level 60.60mOD Depth 49.70 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
45D	16.10	16.20			NA				Very stiff frequently fissured grey slightly sandy slightly gravelly locally gravelly silty CLAY locally tending to extremely weak mudstone and siltstone. Gravel is angular and subangular fine to coarse mudstone and siltstone lithorelicts.	16.05	44.55	
46D	16.70	17.00	16.70	100				S *100				
47C	16.70	18.20		17								
48D	17.10	17.20		11								
49CS	17.60	17.77			NI							
					90							
					170							
50C	18.20	19.70	18.20	100	NA				Weak grey SILTSTONE thinly interlaminated to thinly interbedded with extremely weak dark grey mudstone. Bedding fractures are subhorizontal to 10° very closely and closely spaced planar smooth.	17.60	43.00	
				18					Stiff dark grey and brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to subrounded fine to coarse mudstone and siltstone lithorelicts.	18.20	42.40	
				12								
51D	19.10	19.20										
					90				Extremely weak locally very weak brownish grey locally brown MUDSTONE. Bedding fractures are subhorizontal to 20° extremely closely and very closely spaced planar smooth.	19.25	41.35	
					180							
52D	19.60	19.70			NI							
53D	19.70	19.92	19.70	100				S *120				
54C	19.70	21.20		0					19.50 - 22.90m: Disintegrated to very stiff fissured clay. Fissures are subhorizontal to 20° extremely closely and very closely spaced planar smooth.			
				0								
55D	20.10	20.20										
56C	21.20	22.70	21.20	100								
57D	21.20			0								
				0					22.00 - 22.20m: Relict fractures are subhorizontal and 60° planar smooth.			
									22.70m: SPT indicates moderately weak.			
58D	22.10	22.20							Very weak to weak locally moderately weak grey SILTSTONE locally with thinly interlaminated dark grey mudstone. Fractures are subhorizontal to 30° very closely to medium spaced planar smooth.			
59D	22.70	22.75	22.70	83				S *500	22.90 - 23.05m: 70° planar rough fracture.			
60C	22.70	24.20		52					22.90 - 23.10m: Subvertical planar smooth fracture stained orangish brown and reddish brown.	22.90	37.70	
				40	NI							
61CS	23.20	23.54			340				Very weak to weak locally moderately weak dark grey MUDSTONE with extremely closely and very closely spaced thinly interlaminated grey siltstone. Fractures are subhorizontal to 20° very closely to medium spaced planar smooth.			
					NI							
					45							
					115					23.80	36.80	

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HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)

BACKFILL

TOP (m)	BASE (m)	MATERIAL

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
12-12-2022 14:30	30.20	30.20	12.00
12-12-2022 17:45	33.20	33.20	2.00
13-12-2022 08:00	33.20	33.20	2.00
13-12-2022 15:00	37.70	37.70	20.00
14-12-2022 09:30	37.70	37.70	20.00
14-12-2022 16:30	43.20	43.20	20.00

REMARKS

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BOREHOLE LOG

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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 4 of 7

Start Date 15 November 2022 Easting 386737 Scale 1:50

End Date 15 December 2022 Northing 398635 Ground Level 60.60mOD Depth 49.70 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
62D	24.10 - 24.20			NI							
63C	24.20 - 25.70	24.20	100	70							
			97	115							
			57	250							
				NI							
				70							
				100							
64CS	25.15 - 25.37			NI							
				210							
				380							
65C	25.70 - 27.20	25.70	100								
			88								
66CS	26.06 - 26.48		81								
				NI				26.65 - 26.85m: 60° becoming subvertical undulating smooth fracture.			
				120							
				220							
67C	27.20 - 28.70	27.20	100								
			96								
			93	NI				27.40 - 27.45m: 50° planar smooth fracture.			
68CS	27.67 - 28.05			230							
				380							
69C	28.70 - 30.20	28.70	100								
			97								
			97					28.95 - 29.00m: 70° planar smooth fracture.			
70CS	29.38 - 29.70										
71C	30.20 - 31.70	30.20	83	NI				30.20 - 30.70m: Recovered as angular to subrounded fine to coarse gravel.			
			44								
			28								
72D	30.70 - 30.80							30.70 - 31.30m: Fractures are 10-30° very closely and closely spaced locally intersecting planar smooth rarely disintegrated (up to 20mm) to grey gravelly clay.			
				NI							
				40							
				90							
73CS	31.43 - 31.70			150							
				250							
				420							
74C	31.70 - 33.20	31.70	100								
			69								

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HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
15-12-2022 08:00	43.20	43.20	20.00
15-12-2022 15:15	49.70	49.70	20.00
15-12-2022 16:30	49.70	13.00	20.00
19-12-2022 10:00	44.00	13.00	NR

REMARKS

AGS

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BOREHOLE LOG

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SITE ETIHAD GROUND INVESTIGATION

Sheet 5 of 7

Start Date 15 November 2022 Easting 386737 Scale 1:50

End Date 15 December 2022 Northing 398635 Ground Level 60.60mOD Depth 49.70 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
				50								
					NI 80 330				32.20 - 33.20m: Frequently milled. Fractures are frequently infilled (up to 50mm) with grey clay.			
75CS	32.64	32.83							32.55 - 32.60m: 60° planar smooth fracture.			
									32.80 - 32.95m: 60° planar smooth fracture.			
76D	33.10	33.20										
77C	33.20	34.70	33.20	100								
				41	NI				33.30 - 33.40m: Subvertical stepped smooth fracture. Locally disintegrated to tabular coarse gravel.			
78CS	33.45	33.58		27	30 100				33.75 - 34.40m: Fractures are subhorizontal to 30° very closely and closely spaced planar smooth and 60° to subvertical intersecting planar smooth. Frequently disintegrated to clayey angular and subangular fine to coarse gravel.			
79D	34.60	34.70										
80C	34.70	36.20	34.70	100								
				35								
				13								
					NI							
81D	35.40	35.50							Extremely weak black pyritic COAL. Fractures are 60-80° extremely closely and very closely spaced planar smooth. (CHARLOTTE UPPER LEAF COAL SEAM)	35.30	25.30	
					NI 130 250				Very weak to weak thinly laminated grey locally fossiliferous SILTSTONE locally tending to mudstone. Fractures are subhorizontal to 10° closely and medium spaced undulating rarely planar smooth.	36.00	24.60	
82C	36.20	37.70	36.20	100								
				73								
				73								
83D	37.60	37.70										
84C	37.70	39.20	37.70	93	NI 50 100				Extremely weak to very weak dark grey carbonaceous MUDSTONE partially disintegrated to silty sandy angular and subangular fine to coarse gravel. Bedding fractures are subhorizontal to 10° extremely closely to closely spaced planar smooth.	37.70	22.90	
85D	37.90	38.00		51								
				21								
					NI 70 310				Extremely weak to very weak grey MUDSTONE locally disintegrated to clayey angular and subangular fine to coarse gravel. Bedding fractures are subhorizontal to 10° closely and medium spaced planar smooth.	38.65	21.95	
86D	39.10	39.20										
87C	39.20	40.70	39.20	100	400				39.40 - 39.45m: Thin bed of weak greyish brown siltstone.			
				92								
				79								
					NI 160 290							
88D	40.00	40.10							Continued Next Page			

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

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BOREHOLE LOG

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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 6 of 7

Start Date 15 November 2022 Easting 386737 Scale 1:50

End Date 15 December 2022 Northing 398635 Ground Level 60.60mOD Depth 49.70 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
89C	40.70	42.20	40.70	100 100 93	NI 70 130				Extremely weak to weak dark grey thinly and thickly laminated carbonaceous MUDSTONE with medium and widely spaced thin and medium beds of very weak black coal and frequently becoming rarely disintegrated to angular fine and medium gravel. Fractures are subhorizontal to 10° very closely and closely spaced planar smooth frequently disintegrated (up to 10mm) to dark grey slightly gravelly clay.	41.25	19.35	
90D	42.10	42.20										
91C	42.20	43.20	42.20	100 48 15								
92CS	42.60	42.72										
93C	43.20	43.70	43.20									
94D	43.60	43.70										
95C	43.70	45.20	43.70	100 31 15								
					NI				Extremely weak to very weak light grey and grey fossiliferous MUDSTONE locally disintegrated to clayey subangular medium and coarse gravel. Bedding fractures are subhorizontal to 10° extremely closely to closely spaced planar and undulating smooth.	44.20	16.40	
96D	45.10	45.20			NI 90 110							
97C	45.20	46.70	45.20	84 59 40								
98CS	45.80	45.90			NI 170 230				45.70 - 47.10m: Weak. Fractures are closely and medium spaced.			
99C	46.70	48.20	46.70	100 73 59	370				47.05 - 47.30m: 70° planar smooth fracture.			
					NI 70				Weak to medium strong light grey fine and medium SANDSTONE with extremely closely to closely spaced thinly and thickly interlaminated dark grey mudstone and siltstone. Bedding fractures are subhorizontal to 30° closely and medium spaced planar smooth.	47.10	13.50	
100CS	47.48	47.92			580				47.90 - 48.20m: Rare thin beds of light brownish grey siltstone. Subvertical planar smooth fracture.			
									Continued Next Page			

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

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BOREHOLE LOG

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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 7 of 7

Start Date 15 November 2022 Easting 386737 Scale 1:50

End Date 15 December 2022 Northing 398635 Ground Level 60.60mOD Depth 49.70 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
101CS 102C	48.20 - 48.57 48.20 - 49.70	48.20	70 42 25	NI 60 80 330 NI 90 130 NI NR				Very weak thinly interlaminated grey MUDSTONE and SILTSTONE. Fractures are subhorizontal to 20° very closely and closely spaced planar smooth. 49.10 - 49.25m: Frequently disintegrated to angular coarse gravel. Assessed zone of core loss. Borehole Completed at 49.70m	48.55 49.25 49.70	12.05 11.35 10.90	

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

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BOREHOLE LOG

BH22/05

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 9

Start Date 15 November 2022 Easting 386738 Scale 1:50

End Date 01 December 2022 Northing 398682 Ground Level 60.95mOD Depth 64.60 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
C	0.00 - 0.10						Vo 3.7	Black TARMACADAM.	0.10	60.85	
1B	0.10 - 0.30							Light grey sandy angular to subrounded fine to coarse concrete and limestone GRAVEL. (MADE GROUND)	0.30	60.65	
1ES	0.10 - 0.30										
2D	0.10 - 0.30						Vo 3.4				
2ES	0.50 - 0.70							Brown slightly clayey locally very clayey sandy locally very sandy angular to subrounded fine to coarse concrete, brick, limestone, plastic fragments and rare clinker and tarmacadam GRAVEL with a low angular brick cobble content. (MADE GROUND)	1.20	59.75	
3B	0.50 - 0.70										
4D	0.50 - 0.70										
3ES	0.90 - 1.10										
5B	0.90 - 1.10										
6D	0.90 - 1.10	Nil					C 34				
7L	1.20 - 1.70	1.20						Stiff and very stiff brown slightly sandy gravelly silty CLAY with closely to widely spaced thin beds of greyish brown and dark grey silty sandy gravel. Gravel is angular to subrounded fine to coarse brick, sandstone, siltstone and mudstone. (MADE GROUND)			
8L	1.70 - 2.20	1.20					C 17				
4ES	1.90 - 2.10						Vo 0.0				
9D	2.10 - 2.20										
10UT	2.20 - 2.80	1.20									
11L	2.80 - 3.20	1.20					C 41				
5ES	2.90 - 3.10						Vo 0.0				
12D	3.10 - 3.20										
13L	3.20 - 3.70	3.20					C 21				
14L	3.70 - 4.20	3.20					C 17				
6ES	3.90 - 4.10						Vo 0.0				
15D	4.10 - 4.20										
16L	4.20 - 4.70	3.20					C 8				
								Soft to firm light grey locally mottled light brown slightly sandy silty CLAY.	4.40	56.55	
17UT	4.70 - 5.30	3.20					H 35				
18L	5.30 - 6.30	5.30						Stiff brown slightly gravelly slightly sandy silty CLAY with rare rootlets. Gravel is angular to subrounded fine to coarse sandstone, siltstone and mudstone.	5.20	55.75	
19D	5.40 - 5.50										
20D	5.90 - 6.00						H 139				
21D	6.30 - 6.75	6.30					S 27				
22L	6.30 - 7.30										
23D	6.90 - 7.00						H 140				
24D	7.30 - 7.75	7.30					S 32				
25L	7.30 - 8.30							7.30m: Locally very stiff.			
26D	7.90 - 8.00						H 140				
								Continued Next Page			

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	0.10	Rotary Core	Geotechnical Pioneer Rig
0.10	1.20	Inspection Pit	Hand Tools
1.20	8.30	Windowless Sample	Geotechnical Pioneer Rig

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)
200	3.20
168	22.00
140	64.60

BARREL DIAMETER

DIAM (mm)	BASE (m)
300	0.10
128	8.30
146	64.60

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.50	Concrete
0.50	1.00	Bentonite
1.00	3.00	Gravel
3.00	30.00	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE
3.00	Standpipe (50mm) with geosock
40.00	Standpipe (35mm) with geosock

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
15-11-2022 08:30	0.00	Nil	
15-11-2022 13:30	1.20	1.20	0.50
21-11-2022 11:00	1.20	1.20	0.50
21-11-2022 16:00	5.30	5.30	0.50
22-11-2022 08:00	5.30	5.30	0.00
22-11-2022 17:00	15.10	15.10	1.00

REMARKS

Polymer flush used 8.30-64.60m. Driller notes reduced flush returns (50%) 18.10-24.10m. Driller notes loss of flush returns 24.10-64.60m.

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SITE ETIHAD GROUND INVESTIGATION

Sheet 2 of 9

Start Date 15 November 2022 Easting 386738 Scale 1:50

End Date 01 December 2022 Northing 398682 Ground Level 60.95mOD Depth 64.60 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
27D	8.30	8.75	8.30	100	NA			S 23				
28C	8.30	9.10										
29D	9.00	9.10						H 140				
30D	9.10	9.55	9.10	33				S 23				
31C	9.10	10.60										
32D	9.50	9.60										
									10.25 - 10.40m: Subangular sandstone cobble.			
33D	10.60	11.05	10.60	100				S 22				
34C	10.60	12.10										
35D	11.20	11.30										
36D	11.90	12.00										
37D	12.10	12.55	12.10	60				S 20				
38C	12.10	13.60										
39D	12.90	13.00										
40D	13.60	14.05	13.60	93				S 40				
41C	13.60	15.10							13.60m: Becoming very stiff.			
42D	13.90	14.00										
43D	14.90	15.00										
44D	15.10	15.55	15.10	100				S 50				
45C	15.10	16.60		0								
				0	NI				Extremely weak thinly laminated light greyish brown MUDSTONE locally tending to very stiff gravelly clay. Laminae are subhorizontal planar smooth. Fractures are randomly orientated extremely closely to very closely spaced frequently intersecting planar smooth.	15.40	45.55	
46D	15.90	16.00										

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
8.30	64.60	Rotary Core	Geotechnical Pioneer Rig

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)

BACKFILL

TOP (m)	BASE (m)	MATERIAL
30.00	40.00	Gravel
40.00	64.60	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
23-11-2022 07:50	15.10	15.10	1.00
23-11-2022 17:30	22.60	22.60	0.00
24-11-2022 07:50	22.60	22.60	6.50
24-11-2022 17:30	33.10	33.10	14.00
25-11-2022 07:50	33.10	33.10	14.00
25-11-2022 12:00	40.60	40.60	9.00

REMARKS

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SITE ETIHAD GROUND INVESTIGATION

Sheet 3 of 9

Start Date 15 November 2022 Easting 386738 Scale 1:50

End Date 01 December 2022 Northing 398682 Ground Level 60.95mOD Depth 64.60 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
47D	16.50	16.60										
48C	16.60	18.10	16.60	100 92 70	NI 100 230				Extremely weak to very weak becoming weak thinly and thickly laminated grey MUDSTONE with frequent siltstone laminae locally disintegrated to very stiff gravelly clay locally clayey angular and subangular fine to coarse gravel. Laminae are subhorizontal planar smooth. Fractures are 10-40° very closely to medium spaced planar rarely stepped smooth frequently infilled (up to 20mm) with soft grey clay.	16.60	44.35	
49D	17.60	17.70										
50CS	17.70	18.10										
51C	18.10	19.60	18.10	100 63 59				C *200				
52CS	18.55	18.75							19.00 - 19.60m: Brown locally grey.			
53D	19.50	19.60										
54C	19.60	21.10	19.60	100 70 55					20.00 - 20.10m: Thinly and thickly interlaminated mudstone, siltstone and rarely fine sandstone.			
55CS	20.69	20.89										
56D	20.90	21.00										
57C	21.10	22.60	21.10	100 31 8				C *176				
58D	21.50	21.60							21.40 - 21.50m: Subvertical undulating locally stepped smooth fracture.			
59D	22.50	22.60										
60C	22.60	24.10	22.60	100 63 44					23.15 - 23.25m: 60° planar smooth fracture.			
61D	24.00	24.10										

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
28-11-2022 11:45	40.60	40.60	19.00
28-11-2022 16:15	43.60	43.60	19.00
29-11-2022 08:40	43.60	43.60	19.00
29-11-2022 16:30	52.60	52.60	19.00
30-11-2022 08:00	52.60	52.60	19.00
30-11-2022 17:00	60.10	60.10	19.00

REMARKS

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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 4 of 9

Start Date 15 November 2022 Easting 386738 Scale 1:50

End Date 01 December 2022 Northing 398682 Ground Level 60.95mOD Depth 64.60 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
62C	24.10 - 25.60	24.10	100 81 60					24.45 - 24.55m: Thin bed of extremely weak black coal disintegrated to sandy angular and subangular fine to coarse gravel.			
63D	25.50 - 25.60										
64C	25.60 - 27.10	25.60	100 34 20								
65D	26.90 - 27.00										
66C	27.10 - 28.60	27.10		NI				27.00 - 27.40m: Extremely closely and very closely spaced thickly laminated to thinly bedded extremely weak black coal locally disintegrated to angular and subangular fine to coarse sandy gravel.			
67D	27.30 - 27.40		100 85 65	NI 120 175							
68D	28.50 - 28.60										
69C	28.60 - 30.10	28.60	100 77 65								
70D	30.00 - 30.10										
71C	30.10 - 31.60	30.10	100 57 29					Very weak to weak dark grey and black MUDSTONE. Fractures are subhorizontal to 30° very closely and closely spaced planar smooth.	30.75	30.20	
72CS	31.31 - 31.43			NI 100 150				Extremely weak to very weak dark grey and black carbonaceous MUDSTONE with very closely spaced thinly and medium bedded extremely weak to very weak black pyritic coal frequently disintegrated to angular fine to coarse gravel. Fractures are subhorizontal very closely spaced planar smooth. (CHARLOTTE LOWER LEAF COAL SEAM).			
73D	31.50 - 31.60										
74C	31.60 - 33.10	31.60	80 7 0						31.90	29.05	

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
01-12-2022 07:50	60.10	60.10	19.00
01-12-2022 11:40	64.60	64.60	15.00
02-12-2022 09:30	64.60	64.60	19.00

REMARKS

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BOREHOLE LOG

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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 5 of 9

Start Date 15 November 2022 Easting 386738 Scale 1:50

End Date 01 December 2022 Northing 398682 Ground Level 60.95mOD Depth 64.60 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
					NI 30 40							
75D	33.00	33.10										
76C	33.10	34.60	33.10	100 20 0	NI				Extremely weak grey MUDSTONE frequently disintegrated to very stiff gravelly clay with rare thin and thick laminae of black coal. Bedding fractures are subhorizontal to 10° extremely closely spaced rarely very closely to closely spaced planar and undulating smooth.	33.10	27.85	
77D	34.50	34.60			NI 110 180				Extremely weak light grey MUDSTONE locally disintegrated to very stiff gravelly clay. Bedding fractures are subhorizontal to 10° closely spaced planar locally undulating rough and smooth. 34.40 - 34.55m: 70° planar locally stepped smooth fracture. 34.45 - 34.60m: Locally stained reddish brown.	34.40	26.55	
78C	34.60	36.10	34.60	100 90 90								
79CS	35.84	35.98			NI 110 150				Moderately weak to medium strong thinly interlaminated to very thinly interbedded light grey fine and medium SANDSTONE and SILTSTONE with rare mudstone laminae. Laminae are 10-30° planar smooth. Fractures are subhorizontal to 15° very closely and closely spaced planar rough rarely smooth.	35.40	25.55	
80D	36.00	36.10										
81C	36.10	37.60	36.10	100 82 59								
					NI 80 260				Extremely weak to weak thinly and thickly interlaminated grey MUDSTONE and SILTSTONE with widely spaced thin beds of very weak brown limestone. Laminae are subhorizontal planar. Fractures are subhorizontal to 10° very closely to medium spaced planar smooth and 50-60° closely and medium spaced planar smooth.	36.50	24.45	
82CS	37.20	37.39										
83D	37.36	37.49										
84D	37.50	37.60										
85C	37.60	39.10	37.60	100 55 26					37.60 - 38.10m: Subvertical planar smooth fracture.			
86D	38.40	38.50										
87C	39.10	40.60	39.10	100 65 21								
					305							
88CS	39.60	39.77			NI 80							

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

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SITE ETIHAD GROUND INVESTIGATION

Sheet 6 of 9

Start Date 15 November 2022 Easting 386738 Scale 1:50

End Date 01 December 2022 Northing 398682 Ground Level 60.95mOD Depth 64.60 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
				110							
89D	40.20 - 40.30										
90C	40.60 - 42.10	40.60	100								
			67								
			41	NI				40.80 - 40.90m: Disintegrated to subangular fine to coarse gravel.	40.85	20.10	
				80				Very weak locally extremely weak grey MUDSTONE. Fractures are subhorizontal to 30° very closely and closely spaced planar smooth rarely disintegrated (up to 10mm) to gravelly silt and 40-50° closely and medium spaced planar smooth.			
91D	41.50 - 41.60			190					41.75	19.20	
				NI				Very weak to weak thickly laminated to very thinly bedded dark grey MUDSTONE. Bedding fractures are subhorizontal to 20° very closely and closely spaced planar smooth locally polished.			
				70							
92C	42.10 - 43.60	42.10	93	120				42.10 - 42.20m: Thin bed of moderately weak grey siltstone.			
			63					42.20 - 42.45m: Disintegrated to clayey subangular fine to coarse gravel.	42.75	18.20	
93D	42.40 - 42.55		57					42.40 - 42.75m: Dark grey locally grey.			
				NI				42.55 - 42.70m: Disintegrated to angular and subangular coarse gravel.			
94CS	42.85 - 43.05			150							
				400				Weak to moderately weak grey fossiliferous MUDSTONE with rare siltstone laminae. Fractures are subhorizontal to 30° closely and medium spaced planar locally undulating smooth.			
95C	43.60 - 45.10	43.60	97					43.30 - 43.40m: 50° planar smooth fracture.			
			81								
			66								
96D	44.00 - 44.10										
97CS	44.40 - 44.70							44.75 - 44.95m: 70° undulating smooth fracture.			
98C	45.10 - 46.60	45.10	93								
			83								
			73								
99CS	45.54 - 45.84										
								Weak to moderately weak dark grey mottled grey fossiliferous MUDSTONE frequently thinly and thickly interlaminated with light grey siltstone and rare very thinly bedded greyish brown limestone. Bedding fractures are subhorizontal to 10° very closely to medium spaced planar rarely undulating smooth.			
100D	46.25 - 46.35								46.40	14.55	
				NI				46.90 - 47.00m: Disintegrated to silty angular fine to coarse gravel.			
101C	46.60 - 48.10	46.60		50							
102CS	46.60 - 46.85		100	220							
			78								
			71								
				NI				Moderately weak to medium strong light grey frequently stained reddish brown locally dark reddish brown fine SANDSTONE with frequent thinly interlaminated dark grey siltstone and mudstone. Bedding fractures are subhorizontal to 20° very closely to medium spaced planar rarely undulating smooth.	47.10	13.85	
				190							
103CS	47.40 - 47.66			230							

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

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SITE ETIHAD GROUND INVESTIGATION

Sheet 7 of 9

Start Date 15 November 2022 Easting 386738 Scale 1:50

End Date 01 December 2022 Northing 398682 Ground Level 60.95mOD Depth 64.60 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
104C	48.10 - 49.60	48.10	97 53 34					48.10 - 48.20m: Subvertical undulating rough fracture. 48.20 - 48.30m: 60° planar smooth fracture. 48.40 - 48.70m: 70° planar smooth fracture.			
105CS	48.73 - 48.96							48.65 - 48.73m: Disintegrated to angular coarse gravel.			
				NI				49.10 - 49.30m: 70° planar smooth fracture.			
								49.30 - 49.60m: 80° to subvertical extremely closely spaced and intersecting planar smooth fractures.			
106C	49.60 - 51.10	49.60	93 87 81	NI 240 410				49.60 - 49.85m: Subvertical becoming 80° planar locally undulating smooth fracture.			
107CS	50.03 - 50.26							49.95 - 54.75m: Frequently stained reddish brown and orangish brown. Sandstone is fine to coarse.			
108D	50.85 - 50.95							50.65 - 50.85m: 40° planar smooth fracture.			
109C	51.10 - 52.60	51.10	89 89								
110CS	51.40 - 51.70		89								
111D	52.10 - 52.20			30 120 200				52.20 - 52.30m: 60° planar smooth fracture.			
112D	52.60 - 52.70	52.60	100								
113C	52.60 - 54.10		98 65								
114CS	53.60 - 53.90			300							
115C	54.10 - 55.60	54.10	100 82 44	25 110 200							
116CS	54.50 - 54.70							Very weak to weak grey and dark grey locally stained dark reddish brown MUDSTONE. Bedding fractures are locally subhorizontal to 20° extremely closely to closely spaced planar smooth rarely disintegrated (up to 5mm) to reddish brown clay.	54.75	6.20	
				NI 80 150				55.30 - 55.60m: Fractures are randomly oriented undulating locally stepped smooth.			
117D	55.50 - 55.60							55.60 - 55.75m: Dark grey and grey.			
118C	55.60 - 57.10	55.60	100 37 21					55.95 - 56.75m: Frequently disintegrated to angular fine to coarse gravel.			

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

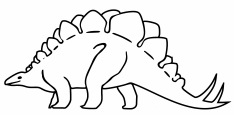
REMARKS

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BOREHOLE LOG



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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 8 of 9

Start Date 15 November 2022 Easting 386738 Scale 1:50

End Date 01 December 2022 Northing 398682 Ground Level 60.95mOD Depth 64.60 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
				NI 30 120							
119CS	56.75 - 56.88			NI 60 190				Weak locally moderately weak dark grey locally carbonaceous and fossiliferous MUDSTONE. Fractures are subhorizontal to 20° very closely and closely spaced planar smooth frequently disintegrated (up to 5mm) to grey silty clay and 70-80° closely and medium spaced planar smooth.	56.75	4.20	
120D	57.00 - 57.10										
121C	57.10 - 58.60	57.10	93 74 31					57.40 - 57.55m: Disintegrated to angular fine to coarse gravel. 57.70 - 57.80m: Disintegrated to subangular medium and coarse gravel.			
122CS	58.10 - 58.30										
123D	58.40 - 58.50										
124C	58.60 - 60.10	58.60	91 57 31	NI 40 170				Very weak to weak locally extremely weak grey fossiliferous MUDSTONE. Fractures are subhorizontal to 20° very closely and closely spaced planar smooth.	58.70	2.25	
125CS	59.35 - 59.50							59.20 - 59.30m: Locally disintegrated to very stiff grey clay. 59.30 - 59.50m: Thinly and thickly interlaminated with light grey siltstone.			
				NI 40 50				Weak thickly laminated grey locally dark grey MUDSTONE. Fractures are subhorizontal to 20° very closely spaced undulating locally planar smooth locally disintegrated (up to 5mm) to slightly gravelly silty clay.	59.55	1.40	
126D	59.80 - 59.90										
127C	60.10 - 61.60	60.10	100 79 51	NI 210 330				Very weak to weak grey locally dark grey fossiliferous MUDSTONE. Fractures are subhorizontal to 20° closely and medium spaced planar smooth.	60.10	0.85	
128CS	61.15 - 61.35							60.70 - 60.80m: 60° undulating smooth fracture. 60.90 - 61.00m: Disintegrated to subangular medium and coarse gravel.			
129C	61.60 - 63.10	61.60	93 81 76	NI 170 320				Moderately weak to medium strong thinly interlaminated to thinly interbedded dark grey, grey and light grey MUDSTONE, SILTSTONE and fine SANDSTONE with rare thin laminae of black coal. Bedding fractures are subhorizontal to 20° very closely to medium spaced planar locally undulating smooth.	61.75	-0.80	
130CS	62.20 - 62.60							62.17 - 62.21m: Disintegrated to subangular medium and coarse gravel. 62.80 - 62.90m: 80° planar smooth fracture.			
131C	63.10 - 64.60	63.10	93 88 77								
132CS	63.65 - 63.95										

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HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

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BOREHOLE LOG



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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 9 of 9

Start Date 15 November 2022 Easting 386738 Scale 1:50

End Date 01 December 2022 Northing 398682 Ground Level 60.95mOD Depth 64.60 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
									Borehole Completed at 64.60m	64.60	-3.65	

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

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INSPECTION PIT LOG

BH22/06

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 15 November 2022 Easting 386814 Scale 1:25

End Date 15 November 2022 Northing 398650 Ground Level 60.60mOD Depth 1.10 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
C	0.00	0.10			Black TARMACADAM.			
1B	0.10	0.30			Light grey and greyish brown sandy angular to subrounded fine to coarse limestone and rare concrete and brick GRAVEL with a medium subrounded limestone cobble content. (MADE GROUND)	0.10	60.50	
1ES	0.10	0.30			0.30m: Geotextile membrane.	0.30	60.30	
2D	0.10	0.30						
2ES	0.50	0.70	Vo 10.9		Brown slightly clayey slightly sandy angular to subrounded fine to coarse limestone and rare brick GRAVEL with a medium limestone cobble content. (MADE GROUND)			
3B	0.50	0.70						
4D	0.50	0.70						
3ES	0.90	1.10	Vo 9.9		Greyish brown angular to subrounded fine to coarse limestone GRAVEL. (MADE GROUND)	0.80	59.80	
5B	0.90	1.10			0.90 - 1.05m: Orange ceramic drain (approx. 150mm diam) in pit wall.			
6D	0.90	1.10				1.10	59.50	
					Trial pit Completed at 1.10m			

Equipment: Pit excavated by Geotechnical Pioneer Rig+Hand Tools

Pit width x length: 0.30m x 0.30m

Sidewall stability: Stable and vertical

Groundwater:
Not encountered

Backfill: Tarmacadam 0.00 - 0.20m.
Arisings 0.20 - 1.10m.

Remarks: Hole terminated at 1.10m due to encountering service. Location relocated to BH22/06A.

CONTRACT	CHECKED
37349	**CT**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

BOREHOLE LOG

BH22/06A

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 8

Start Date 24 November 2022 Easting 386813 Scale 1:50

End Date 08 December 2022 Northing 398651 Ground Level 60.60mOD Depth 59.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
								(Please refer to log CPT22/06)			
1B	1.20 - 1.50								1.20	59.40	
1ES	1.50	1.50					C *86	Dark grey slightly clayey sandy angular and subangular fine to coarse sandstone, concrete and brick GRAVEL. (MADE GROUND)	1.50	59.10	
2L	1.50 - 2.00						Vo 1.0				
3D	2.00 - 2.21	Nil					S *214	Very dense brown clayey very sandy angular to subrounded fine to coarse brick, quartzite and concrete GRAVEL. (MADE GROUND)			
4L	2.00 - 2.50						Vo 0.0				
2ES	2.20 - 2.40										
5D	2.40 - 2.50										
6D	2.50 - 2.71	Nil	100	NA			S *250		2.50	58.10	
7C	2.50 - 3.00	2.50						Brown CONCRETE locally disintegrated to sandy very clayey angular and subangular fine to coarse concrete and rare brick and quartzite gravel. (MADE GROUND)			
8D	3.00 - 3.37	2.50	100	NA			S *50		3.00	57.60	
9C	3.00 - 3.50	3.00						Very dense multicoloured slightly sandy angular and subangular fine to coarse brick, sandstone, quartzite and concrete GRAVEL. (MADE GROUND)			
10D	3.50 - 3.81	3.00	100				S *94				
11C	3.50 - 4.00						Vo 0.0				
3ES	3.70 - 3.90							3.70 - 3.90m: Thin bed of very stiff sandy gravelly silt.			
12D	3.90 - 4.00										
13D	4.00 - 4.45	3.00					S 21	Stiff brown slightly gravelly slightly sandy locally silty CLAY. Gravel is angular to subrounded fine to coarse mudstone and siltstone.	4.00	56.60	
14L	4.00 - 4.50						Vo 0.0				
4ES	4.20 - 4.40										
15D	4.40 - 4.50										
16D	4.50 - 4.95	3.00					S 25				
17L	4.50 - 5.00						H 108				
5ES	4.70 - 4.90						Vo 0.0				
18D	4.90 - 5.00										
19UT	5.00 - 5.60	3.00									
20L	5.00 - 6.00							5.25m: Locally firm.			
21D	5.90 - 6.00										
22D	6.00 - 6.45	6.00					S 17				
23L	6.00 - 7.00										
24D	6.90 - 7.00										
25UT	7.00 - 7.40	6.00									
26L	7.00 - 8.00							7.25m: Hand vane suggests soft.			
27D	7.90 - 8.00							7.90 - 8.00m: Tending to sandy clay.			
28D	8.00 - 8.45	6.00					S 20				

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
1.20	1.50	Cable Percussion	Dando 2000
1.50	2.50	Windowless Sample	Geotechnical Pioneer Rig
2.50	4.00	Rotary Core	Geotechnical Pioneer Rig

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)
200	3.00
168	9.00
140	59.00

BARREL DIAMETER

DIAM (mm)	BASE (m)
200	1.50
128	2.50
146	4.00
128	9.00

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.20	Concrete
0.20	0.30	Gravel
0.30	1.00	Bentonite
1.00	4.00	Gravel

INSTRUMENTATION

DEPTH (m)	TYPE
4.00	Standpipe (50mm)
50.00	Standpipe (35mm) with geosock

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
24-11-2022 14:30	1.20	Nil	Dry
24-11-2022 15:00	1.25	Nil	Dry
25-11-2022 07:00	1.25	Nil	Dry
25-11-2022 11:30	1.50	Nil	1.50
30-11-2022 08:30	1.50	Nil	Dry
30-11-2022 17:30	9.00	9.00	0.00

REMARKS

Polymer flush used 2.50-4.00m and 9.00-57.20m. Water flush used 57.20-59.00m. Driller notes reduced flush returns (40%) 34.70-36.20m. Driller notes loss of flush returns 36.20-59.00m. Geophysical testing undertaken at this location, results presented separately.

AGS

CONTRACT	CHECKED
37349	CT

Geotechnical Engineering Limited

BOREHOLE LOG

BH22/06A

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 2 of 8

Start Date 24 November 2022 Easting 386813 Scale 1:50

End Date 08 December 2022 Northing 398651 Ground Level 60.60mOD Depth 59.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
29L	8.00 - 9.00						H 92				
30D	8.90 - 9.00										
31D	9.00 - 9.45	6.00					S 25				
32C	9.00 - 9.20	9.00	100	NA							
33D	9.20 - 9.65	9.00					S 20				
34C	9.20 - 10.70		97	NA				Stiff brown slightly gravelly slightly sandy locally sandy CLAY. Gravel is angular to rounded fine to coarse siltstone, mudstone sandstone and rare limestone, coal and quartzite.	9.20	51.40	
35D	9.50 - 9.60										
36D	10.60 - 10.70										
37D	10.70 - 11.15	10.70					S 29				
38C	10.70 - 12.20		100								
39D	12.10 - 12.20										
40D	12.20 - 12.65	12.20					S 29				
41C	12.20 - 13.70		100								
42D	13.60 - 13.70										
43D	13.70 - 14.15	13.70					S 46				
44C	13.70 - 15.20		100					13.70m: Becoming very stiff.			
45D	15.10 - 15.20										
46D	15.20 - 15.65	15.20					S 46				
47C	15.20 - 16.70		100								
48D	15.45 - 15.55		0								
			0	NA				Very stiff dark grey locally greyish brown sandy gravelly CLAY. Gravel is angular and subangular fine and medium mudstone and siltstone lithorelicts.	15.45	45.15	

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
4.00	9.00	Windowless Sample	Geotechnical Pioneer Rig
9.00	59.00	Rotary Core	Geotechnical Pioneer Rig

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)
146	59.00

BACKFILL

TOP (m)	BASE (m)	MATERIAL
4.00	40.00	Bentonite
40.00	50.00	Gravel
50.00	59.00	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
01-12-2022 08:50	9.00	9.00	0.00
01-12-2022 17:00	21.20	21.20	0.84
02-12-2022 08:15	21.20	21.20	2.51
02-12-2022 13:40	30.20	30.20	3.22
05-12-2022 10:50	30.20	30.20	3.50
05-12-2022 17:00	37.70	37.70	21.30

REMARKS

AGS

CONTRACT	CHECKED
37349	CT

Geotechnical Engineering Limited

BOREHOLE LOG



BH22/06A

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 3 of 8

Start Date 24 November 2022 Easting 386813 Scale 1:50

End Date 08 December 2022 Northing 398651 Ground Level 60.60mOD Depth 59.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
49D	16.60	16.70	16.70	93	NI			S *375	Very weak dark grey MUDSTONE with extremely closely and very closely spaced thin siltstone laminae. Fractures are subhorizontal to 35° extremely closely to closely spaced planar smooth rarely infilled (up to 30mm) with grey sandy gravelly clay and 80° to subvertical planar rarely undulating and stepped smooth.	16.60	44.00	
50D	16.70	16.89		39	40							
51C	16.70	18.20		0	80							
52D	18.00	18.10										
53C	18.20	19.70	18.20	94	NI				Extremely weak black COAL locally thinly interlaminated with dark brownish grey mudstone disintegrated to sandy gravelly clay.	18.10	42.50	
54D	18.20	18.30		0								
				0						18.60	42.00	
					NA				Very stiff frequently fissured grey locally mottled brownish grey slightly sandy slightly gravelly silty CLAY frequently tending to clayey silt locally extremely weak siltstone and rare mudstone. Gravel is angular to subrounded fine to coarse mudstone and siltstone lithorelicts and rare coal. Fissures are subhorizontal to 40° undulating smooth.			
55D	18.90	19.00										
56D	19.70	19.91	19.70	100				S *214				
57C	19.70	21.20		17								
				17								
58D	20.80	20.90										
59CS	20.90	21.20			NI				Very weak to moderately weak light grey locally stained brown micaceous SILTSTONE. Fractures are subhorizontal to 10° closely and medium spaced planar smooth stained orangish brown.	20.90	39.70	
					150							
60C	21.20	22.70	21.20	97	300							
				93								
				89								
61CS	21.68	21.89										
62D	22.70	22.80	22.70	97				S *500				
63C	22.70	24.20		65								
64CS	23.00	23.20		45	NI				Extremely weak to weak grey MUDSTONE rarely becoming frequently thinly interlaminated with grey siltstone. Fractures are subhorizontal to 30° extremely closely to medium spaced planar smooth.	22.90	37.70	
					130							
					250							
									22.90 - 23.00m: Disintegrated to clayey subangular and subrounded fine to coarse gravel.			
									23.25 - 23.40m: 80° planar smooth fracture.			
									Continued Next Page			

HOLE CONSTRUCTION

TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH

DIAM (mm) BASE (m)

BARREL DIAMETER

DIAM (mm) BASE (m)

BACKFILL

TOP (m) BASE (m) MATERIAL

INSTRUMENTATION

DEPTH (m) TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
06-12-2022 08:45	37.70	37.70	21.80
06-12-2022 17:00	49.70	49.70	21.32
07-12-2022 07:50	49.70	49.70	19.18
07-12-2022 17:15	57.20	57.20	20.82
08-12-2022 07:50	57.20	57.20	19.21
08-12-2022 11:15	59.00	59.00	18.49

REMARKS

AGS

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BOREHOLE LOG

BH22/06A

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 4 of 8

Start Date 24 November 2022 Easting 386813 Scale 1:50

End Date 08 December 2022 Northing 398651 Ground Level 60.60mOD Depth 59.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
65D	24.10 - 24.20										
66C	24.20 - 25.70	24.20	100								
67D	24.35 - 24.45		80 69					24.90 - 25.10m: Two 50° intersecting planar smooth fractures.			
68CS	25.45 - 25.65										
69C	25.70 - 27.20	25.70	80 47 11								
				NI 40 160				Extremely weak locally very weak grey and dark grey MUDSTONE rarely thinly interlaminated with grey siltstone. Bedding fractures are subhorizontal to 20° very closely and closely spaced planar smooth and 80° to subvertical planar smooth.	26.35	34.25	
70D	27.10 - 27.20										
71CS	27.18 - 27.33	27.20	83								
72C	27.20 - 28.70		32 0								
73D	28.60 - 28.70										
74C	28.70 - 30.20	28.70	85 85 85	90 200 220				Extremely weak to weak grey MUDSTONE rarely thinly interlaminated with grey siltstone. Fractures are subhorizontal to 10° closely and medium spaced planar smooth rarely disintegrated (up to 20mm) to grey gravelly clay. 28.90 - 28.95m: 80° planar rough fracture.	28.70	31.90	
75D	30.10 - 30.20										
76C	30.20 - 31.70	30.20	100 79								
77CS	30.46 - 30.70		67	NI 140 200				30.50 - 30.55m: 50° planar smooth fracture. 30.70 - 30.75m: Disintegrated to subangular fine to coarse gravel. 30.90 - 31.15m: 70° planar smooth fracture.			
78D	31.15 - 31.25										
79CS	31.45 - 31.65							Very weak to weak thinly laminated to thinly bedded grey SILTSTONE frequently thinly interlaminated with grey mudstone. Fractures are subhorizontal to 10° very closely to medium spaced planar smooth.			
80C	31.70 - 33.20	31.70	100 73					31.92 - 32.00m: 50° planar smooth fracture.	31.90	28.70	
								Continued Next Page			

HOLE CONSTRUCTION

TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH

DIAM (mm) BASE (m)

BARREL DIAMETER

DIAM (mm) BASE (m)

BACKFILL

TOP (m) BASE (m) MATERIAL

INSTRUMENTATION

DEPTH (m) TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
08-12-2022 16:00	59.00	8.00	21.12
09-12-2022 07:30	59.00	8.00	21.00
19-12-2022 14:15	59.00	8.00	NR

REMARKS

AGS

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Geotechnical Engineering Limited

BOREHOLE LOG

BH22/06A

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 5 of 8

Start Date 24 November 2022 Easting 386813 Scale 1:50

End Date 08 December 2022 Northing 398651 Ground Level 60.60mOD Depth 59.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
				60	50							
					250							
					330							
81CS	32.53	32.87										
					NI				32.90 - 33.10m: Very weak. Subvertical planar and stepped smooth fracture.			
					120							
82C	33.20	34.70	33.20	100	180							
				97	200							
				97								
83CS	33.60	33.92			220							
					330				Moderately weak grey SILTSTONE frequently thinly interlaminated to thinly interbedded with very weak to weak grey mudstone. Bedding fractures are subhorizontal to 10° medium spaced planar smooth.	33.60	27.00	
					350				33.60 - 34.50m: Mudstone laminae are dark grey.			
									34.15 - 34.50m: Rare thinly interlaminated dark grey mudstone.			
84CS	34.52	34.70			190					34.50	26.10	
85C	34.70	36.20	34.70		460				Weak to moderately weak grey frequently stained reddish brown fine and medium SANDSTONE locally thinly interlaminated with dark grey siltstone rarely mudstone. Bedding fractures are subhorizontal to 20° closely and medium spaced planar smooth.			
86CS	34.70	35.10		100								
				73								
				73								
					NI							
					70				35.10 - 35.50m: Partially recovered non-intact. 70° very closely spaced planar smooth fractures and incipient fractures.			
					360				35.20 - 35.80m: Light grey locally stained light reddish grey.			
					NI							
					140							
					160							
87C	36.20	37.70	36.20	50					36.20 - 36.95m: Subvertical undulating smooth fracture.			
				33								
				29					36.50 - 36.80m: Light grey frequently stained reddish brown.			
88D	36.90	37.00										
					NR				36.95 - 37.70m: Assessed zone of core loss.			
89C	37.70	39.20	37.70	90	NI							
				49	60							
				25	90							
90CS	38.25	38.50			330				38.40 - 39.00m: 80° to subvertical planar smooth fracture.			
					NI							
					60							
					120							
91C	39.20	40.70	39.20	90								
				49								
				24					39.45 - 39.95m: Recovered non-intact as subangular coarse gravel and cobbles. Probable subvertical planar smooth fracture.			

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

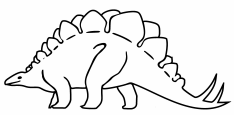
REMARKS

AGS

CONTRACT	CHECKED
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Geotechnical Engineering Limited

BOREHOLE LOG



BH22/06A

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 6 of 8

Start Date 24 November 2022 Easting 386813 Scale 1:50

End Date 08 December 2022 Northing 398651 Ground Level 60.60mOD Depth 59.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
92CS	40.30	40.43							40.35 - 41.50m: 60° planar rough fracture.			
93C	40.70	42.20	40.70	100	NI				40.70 - 41.75m: Stained light reddish brown becoming reddish brown.			
94CS	40.70	40.87		37	90							
				21	150				41.05 - 41.45m: Frequently disintegrated to subangular coarse gravel. 80° to subvertical undulating smooth fracture.			
					NI					41.75	18.85	
					35				Very weak to weak grey MUDSTONE frequently disintegrated to angular to subrounded fine to coarse gravel. Fractures are subhorizontal to 15° extremely closely to closely spaced planar smooth.			
95D	42.10	42.20			65							
96C	42.20	43.70	42.20	100								
				49								
				7								
					NI							
97D	43.60	43.70			60							
98C	43.70	45.20	43.70	100	110							
				63								
				7	NI							
					30							
					40							
99D	44.40	44.50			NI							
					60							
					90				Extremely weak to very weak locally fossiliferous light grey and grey MUDSTONE locally tending to very stiff clay with medium spaced thin beds of grey siltstone. Bedding fractures are subhorizontal to 30° very closely and closely spaced planar and undulating smooth locally disintegrated (up to 50mm) to sandy gravelly clay.	44.40	16.20	
100C	45.20	46.70	45.20	90								
				24								
				0								
									Extremely weak to weak dark grey and grey carbonaceous MUDSTONE with very closely to medium spaced thickly laminated to thinly bedded dark grey and black coal frequently disintegrated to angular and subangular fine to coarse gravel. Fractures are subhorizontal very closely spaced planar smooth. (THIN COAL 'A' SEAM).	45.95	14.65	
101D	46.00	46.10			NI							
					50							
					60							
102C	46.70	48.20	46.70	86	NI					46.70	13.90	
103CS	46.90	47.20		83	150				Weak to moderately weak locally very weak thinly interlaminated to thinly interbedded grey and light grey SILTSTONE and dark grey mudstone. Bedding fractures are subhorizontal to 30° very closely to medium spaced planar and undulating smooth.			
				57	270				46.70 - 46.90m: 70° planar smooth fracture.			
									47.45 - 48.05m: Rare subvertical undulating smooth incipient fractures.			
									Continued Next Page			

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

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Geotechnical Engineering Limited

BOREHOLE LOG

BH22/06A

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 7 of 8

Start Date 24 November 2022 Easting 386813 Scale 1:50

End Date 08 December 2022 Northing 398651 Ground Level 60.60mOD Depth 59.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
104C	48.20	49.70	48.20	97	430							
105CS	48.40	48.62		67								
				48	NI							
					190							
					220							
					NI				49.15 - 49.25m: Disintegrated to sandy angular to subrounded fine to coarse gravel.			
					80							
					280							
106D	49.60	49.70										
107C	49.70	51.20	49.70	100								
108CS	49.70	50.00		54								
				49					50.10 - 50.35m: Recovered non-intact. 70° planar smooth fracture.			
									50.40 - 50.55m: Thin bed of medium strong light grey fine sandstone. 70° planar smooth fracture.			
									50.85 - 51.20m: Medium bed of medium strong light grey fine sandstone. 70° planar smooth fracture.			
109D	51.10	51.20										
110C	51.20	52.70	51.20	93					51.20 - 51.30m: Recovered non-intact as subangular coarse gravel.			
				61								
				39					51.55 - 51.65m: 70° planar smooth fracture.			
111CS	51.75	52.00										
									52.30 - 52.50m: Subvertical locally extremely closely spaced planar and undulating smooth fractures.			
112D	52.60	52.70										
113C	52.70	54.20	52.70	83								
				29								
				11					53.00 - 53.90m: Limited recovery. Frequently disintegrated to clayey angular fine to coarse gravel.			
114CS	53.32	53.49										
					NI							
					NR							
115C	54.20	55.70	54.20	91	NI					54.20	6.40	
116CS	54.37	54.48		44	30				Weak to moderately weak dark grey carbonaceous MUDSTONE locally tending to black coal and frequently disintegrated to angular fine to coarse gravel. Bedding fractures are subhorizontal to 10° very closely and closely spaced planar smooth.			
				19	170							
117C	55.70	57.20	55.70	100								
				49					55.80 - 55.90m: Subvertical planar smooth fracture.			

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

CONTRACT	CHECKED
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Geotechnical Engineering Limited

BOREHOLE LOG

BH22/06A

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 8 of 8

Start Date 24 November 2022 Easting 386813 Scale 1:50

End Date 08 December 2022 Northing 398651 Ground Level 60.60mOD Depth 59.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
				14					56.15 - 56.55m: Subvertical very closely spaced planar smooth fractures. 56.40 - 56.50m: Thin bed of light grey siltstone.			
					NI					56.65	3.95	
118CS	56.90	57.00			70 100				Weak to moderately weak thinly laminated to thinly bedded grey and light grey SILTSTONE locally thinly interlaminated to thinly interbedded dark grey mudstone and light grey fine sandstone. Bedding fractures are subhorizontal to 10° closely and medium spaced planar smooth.			
119C	57.20	58.70	57.20	100								
120CS	57.30	57.70		83 69	380							
					NI 20				57.80 - 57.85m: 80° planar smooth fracture stained orangish brown.			
					NI 180 200				58.05 - 58.20m: Subvertical planar smooth incipient fracture. 58.30 - 58.80m: Subvertical planar smooth fracture.			
121C	58.70	59.00	58.70	60								
122D	58.70	58.85		47 47								
									Borehole Completed at 59.00m	59.00	1.60	

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

CONTRACT	CHECKED
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Geotechnical Engineering Limited

BOREHOLE LOG

BH22/07

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 6

Start Date 15 November 2022 Easting 386804 Scale 1:50

End Date 19 December 2022 Northing 398696 Ground Level 61.00mOD Depth 45.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
C	0.00 - 0.10							Black TARMACADAM.	0.10	60.90	
1B	0.10 - 0.30							Light grey sandy angular to subrounded fine to coarse limestone and rare concrete GRAVEL. (MADE GROUND)	0.30	60.70	
2D	0.10 - 0.30						Vo 6.9				
1ES	0.30 - 0.50						Vo 7.2				
3B	0.30 - 0.50							Greyish brown slightly clayey locally clayey very sandy angular and subangular fine to coarse brick, siltstone, limestone, concrete and rare tarmacadam GRAVEL with a low angular and subangular brick and concrete cobble content. (MADE GROUND)	1.15	59.85	
4D	0.30 - 0.50										
2ES	0.90 - 1.10										
5B	0.90 - 1.10										
6D	0.90 - 1.10	Nil					C 17				
7B	1.20 - 1.65										
3ES	1.50						Vo 3.0	Firm to stiff dark grey and grey slightly sandy gravelly CLAY. Gravel is angular fine to coarse sandstone, brick and concrete. Strong hydrocarbon odour. (MADE GROUND)			
8D	2.00	2.00					C *200		2.00	59.00	
9B	2.00 - 2.50	Nil					Vo 1.0	Brown clayey sandy angular to subrounded fine to coarse brick, concrete, sandstone, quartzite, mudstone and limestone GRAVEL. Faint hydrocarbon odour. (MADE GROUND)			
10L	2.00 - 2.30										
4ES	2.10 - 2.20	2.30	100	NA			Vo 3.0		2.30	58.70	
11D	2.20 - 2.30	2.30		NA			S *67		2.40	58.60	
12C	2.30 - 2.50		100								
13D	2.40 - 2.50										
5ES	2.40			NA			Vo 0.0	Dark brownish grey locally dark grey and reddish brown slightly sandy angular to subrounded fine to coarse brick, limestone, quartzite and rare concrete GRAVEL. Faint hydrocarbon odour. (MADE GROUND)	2.80	58.20	
14D	2.50 - 2.88	3.00					S 34				
15C	2.50 - 3.00										
6ES	2.80 - 3.00										
16D	3.00 - 3.45										
17L	3.00 - 3.50	3.50					S 10	Very stiff dark brownish grey slightly sandy gravelly clayey SILT. Gravel is angular to subrounded fine to coarse brick, quartzite and clinker. (MADE GROUND)			
18D	3.50 - 3.95										
19L	3.50 - 4.00						Vo 0.0				
7ES	3.70 - 3.90										
20D	3.90 - 4.00	4.00					S 2	Stiff becoming firm brown slightly sandy gravelly silty CLAY locally tending to clayey very sandy gravel. Gravel is angular to subrounded fine to coarse brick and quartzite. (MADE GROUND)			
21D	4.00 - 4.45										
22L	4.00 - 4.50										
23UT	4.50 - 4.95	4.50						4.00 - 4.50m: Very soft slightly gravelly slightly sandy.	4.50	56.50	
24D	4.95 - 5.05							Stiff becoming very stiff brown locally tending to dark brown slightly gravelly slightly sandy locally sandy silty CLAY. Gravel is angular to subrounded fine and medium sandstone, siltstone, mudstone and rare coal.			
25D	5.05 - 5.10	4.50					S 27				
26D	5.10 - 5.55										
27L	5.10 - 6.00										
28D	5.20 - 5.30										
29D	5.90 - 6.00										
30D	6.00 - 6.45	4.50					S 32				
31L	6.00 - 6.60	6.00									
32D	6.60 - 7.05	6.00					S 24				
33C	6.60 - 7.50	6.60	100	NA							
34D	6.90 - 7.00										
35D	7.50 - 7.95	7.50					S 24				
36C	7.50 - 9.00		100								
37D	7.90 - 8.00										

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	0.10	Rotary Core	Geotechnical Pioneer Rig
0.10	1.20	Inspection Pit	Hand Tools
1.20	2.50	Cable Percussion	Cable Percussion Rig

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)
200	3.00
168	14.00
140	45.00

BARREL DIAMETER

DIAM (mm)	BASE (m)
300	0.10
200	2.50
128	2.50
146	3.00

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.50	Concrete
0.50	0.60	Gravel
0.60	0.90	Bentonite
0.90	4.20	Gravel

INSTRUMENTATION

DEPTH (m)	TYPE
4.00	Standpipe (50mm)
40.00	Standpipe (35mm) with geosock

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
15-11-2022 09:00	0.00	Nil	
15-11-2022 09:10	0.10	Nil	Dry
17-11-2022 15:50	0.10	Nil	Dry
17-11-2022 17:55	1.20	Nil	Dry
29-11-2022 12:00	1.20	Nil	NR
29-11-2022 14:00	2.50	2.50	NR

REMARKS

Partial collapse of borehole 2.50-2.00m prior to commencing dynamic sampling. Water flush used 2.30-3.00m. Polymer flush used 6.60-45.00m. Driller notes reduced flush returns (40%) 31.50-33.00m. Driller notes loss of flush returns 33.00-45.00m.

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BOREHOLE LOG

BH22/07

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 2 of 6

Start Date 15 November 2022 Easting 386804 Scale 1:50

End Date 19 December 2022 Northing 398696 Ground Level 61.00mOD Depth 45.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
38D	8.90 - 9.00										
39D	9.00 - 9.45	9.00	100				S 26				
40C	9.00 - 10.50										
41D	9.90 - 10.00										
42D	10.50 - 10.95	10.50	100				S 34				
43C	10.50 - 12.00										
44D	10.90 - 11.00										
45D	11.90 - 12.00										
46D	12.00 - 12.45	12.00	100				S 33				
47C	12.00 - 13.50										
48D	12.90 - 13.00										
49D	13.50 - 13.95	13.50	100				S 44				
50C	13.50 - 15.00										
51D	14.50 - 14.60										
52D	15.00 - 15.45	15.00	100				S 48				
53C	15.00 - 16.50										
54D	16.00 - 16.10							15.80 - 15.90m: Dark grey.			
								Continued Next Page			

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
2.00	2.30	Windowless Sample	Geotechnical Pioneer Rig
2.30	3.00	Rotary Core	Geotechnical Pioneer Rig
3.00	6.60	Windowless Sample	Geotechnical Pioneer Rig

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)
128	6.60
146	45.00

BACKFILL

TOP (m)	BASE (m)	MATERIAL
4.20	29.90	Bentonite
29.90	40.00	Gravel
40.00	45.00	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
12-12-2022 13:50	2.00	Nil	0.90
12-12-2022 17:20	3.00	3.00	0.20
13-12-2022 08:15	3.00	3.00	0.40
13-12-2022 17:15	13.50	13.50	1.10
14-12-2022 14:20	13.50	13.50	0.40
14-12-2022 17:45	19.50	19.50	0.70

REMARKS

AGS

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BOREHOLE LOG

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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 3 of 6

Start Date 15 November 2022 Easting 386804 Scale 1:50

End Date 19 December 2022 Northing 398696 Ground Level 61.00mOD Depth 45.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
									Stiff becoming very stiff brown locally tending to dark brown slightly gravelly slightly sandy locally sandy silty CLAY. Gravel is angular to subrounded fine and medium sandstone, siltstone, mudstone and rare coal.			
55D	16.50	16.83	16.50	100	NI			S *136	5.90 - 16.40m: Light bluish grey mottled light brown.	16.40	44.60	
56C	16.50	18.00		86	840				Extremely weak thinly laminated light brownish grey MUDSTONE locally tending to very stiff slightly gravelly locally gravelly silty clay. Laminae are subhorizontal extremely closely spaced planar smooth. Bedding fractures are subhorizontal to 20° very closely and closely spaced planar smooth rarely stained brown.			
				86					16.70 - 17.55m: Fractures are widely spaced.	17.55	43.45	
					NI				17.15 - 17.25m: 30° planar smooth lamination.			
					250				17.40 - 17.55m: Two very closely spaced thin beds of very weak brown and light reddish brown siltstone.			
57D	17.90	18.00			320							
58C	18.00	19.50	18.00	100					Extremely weak to very weak thinly and thickly laminated grey locally dark grey MUDSTONE locally disintegrated to very stiff gravelly clay with medium spaced thin beds of light brown siltstone. Bedding fractures are subhorizontal to 20° closely and medium spaced planar smooth.			
				90								
				87								
59CS	19.02	19.27										
60C	19.50	21.00	19.50	100	NI				19.85 - 19.95m: Thin bed of weak grey mudstone.			
				60	80							
				50	100				20.40 - 21.00m: Fractures are widely spaced.			
					600							
61CS	20.80	21.00										
62D	20.90	21.00										
63D	21.00	21.11	21.00	100	NI			S *429	Extremely weak to weak thinly interlaminated to thinly interbedded grey and light grey MUDSTONE and SILTSTONE. Bedding fractures are subhorizontal to 20° very closely and closely spaced planar and undulating smooth.	21.05	39.95	
64C	21.00	22.50		98	60							
				90	150							
65CS	22.13	22.38										
66D	22.40	22.50										
67D	22.50	22.63	22.50	100				S *333				
68C	22.50	24.00		83	60				Very weak to weak locally moderately weak grey SILTSTONE with medium and widely spaced thin beds of thinly interlaminated mudstone. Fractures are subhorizontal to 20° very closely to medium spaced planar smooth.	22.60	38.40	
69CS	22.80	22.91		60	240				23.00 - 23.10m: Subvertical planar smooth fracture.			
					370				23.40 - 23.80m: Fractures are 30-40° locally intersecting planar smooth.			
70D	23.90	24.00										
71C	24.00	25.50	24.00									
									Continued Next Page			

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
6.60	45.00	Rotary Core	Geotechnical Pioneer Rig

WATER STRIKE Groundwater not encountered prior to use of flush

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)

BACKFILL

TOP (m)	BASE (m)	MATERIAL

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
15-12-2022 08:00	19.50	19.50	0.60
15-12-2022 17:30	30.00	30.00	1.50
16-12-2022 08:15	30.00	30.00	18.90
16-12-2022 13:15	37.50	37.50	13.60
19-12-2022 10:00	37.50	37.50	20.65
19-12-2022 15:15	45.00	45.00	20.65

REMARKS

AGS

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Geotechnical Engineering Limited

BOREHOLE LOG

BH22/07

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 4 of 6

Start Date 15 November 2022 Easting 386804 Scale 1:50

End Date 19 December 2022 Northing 398696 Ground Level 61.00mOD Depth 45.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
			100 86 81					24.70 - 24.85m: Extremely weak. 60° undulating rough fracture.			
72CS	25.15 - 25.43			20 150 380				Weak to moderately weak thinly interlaminated to thinly interbedded light grey and grey fine SANDSTONE and SILTSTONE. Fractures are subhorizontal to 30° extremely closely to medium spaced planar smooth.	25.05	35.95	
73C 74CS	25.50 - 27.00 25.50 - 25.89	25.50	100 60 47								
				NI				26.10 - 26.30m: 70° planar smooth fracture. 26.20 - 26.70m: Disintegrated to fine sand.			
				NI 200 380				26.55 - 26.80m: 70° planar smooth fracture.			
75C	27.00 - 28.50	27.00	100 93 82								
				NI 150 200				27.40 - 28.15m: Stained brown and greyish brown. 27.45 - 28.05m: Fractures are 60-70° closely spaced planar smooth.			
76CS	28.26 - 28.50			55 250 410							
77C 78CS	28.50 - 30.00 28.60 - 29.08	28.50	100 90 67								
				NI 90 130				29.55 - 32.40m: Rare becoming frequent 60° planar smooth rarely incipient fractures frequently stained orangish brown.			
79C	30.00 - 31.50	30.00	100 61 59	NI 60 140							
80CS	30.81 - 31.03										
				NI 40 160				31.10 - 32.40m: Fractures are very closely spaced and intersecting.			
81C	31.50 - 33.00	31.50	100 40 29								
								Continued Next Page			

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

CONTRACT	CHECKED
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Geotechnical Engineering Limited

BOREHOLE LOG

BH22/07

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 5 of 6

Start Date 15 November 2022 Easting 386804 Scale 1:50

End Date 19 December 2022 Northing 398696 Ground Level 61.00mOD Depth 45.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
82CS	32.40	32.80			440				32.40 - 33.80m: Sandstone is fine to coarse.			
					NI				32.80 - 33.00m: 60° planar smooth fracture stained orangish brown.			
83C	33.00	34.50	33.00	100	30				33.00 - 33.80m: Fractures are widely spaced.			
84CS	33.00	33.40		54	80							
				54	800				33.25m: Medium strong.			
					NI					33.80	27.20	
85C	34.50	36.00	34.50	100					Extremely weak to very weak thickly laminated grey and dark grey MUDSTONE. Bedding fractures are subhorizontal to 20° locally 50-70° extremely closely and very closely spaced planar smooth.			
				52								
				0								
					NI							
					60							
					NI					35.35	25.65	
					60				Extremely weak to weak dark grey MUDSTONE frequently disintegrated to angular and subangular fine to coarse gravel with very closely to widely spaced thinly interlaminated to very thinly interbedded brownish grey siltstone. Fractures are subhorizontal to 30° very closely and closely spaced planar smooth rarely 80° to subvertical planar smooth.			
					140							
86D	35.90	36.00										
87C	36.00	37.50	36.00	100								
				67								
				27					36.50 - 36.65m: Carbonaceous.			
					NI					36.70	24.30	
					60				Extremely weak to very weak grey becoming light grey MUDSTONE frequently disintegrated to angular fine to coarse gravel. Bedding fractures are subhorizontal to 30° extremely closely to closely spaced planar and undulating smooth.			
					100							
88D	37.40	37.50										
89C	37.50	39.00	37.50	100								
				41								
				21								
90D	38.00	38.10										
					NI					38.25	22.75	
					50				Very weak dark grey carbonaceous MUDSTONE. Fractures are subhorizontal to 20° very closely and closely spaced planar smooth.			
					110							
91CS	38.70	38.81										
					NI				Very weak to weak grey locally fossiliferous MUDSTONE with extremely closely and very closely spaced thinly interlaminated grey siltstone. Fractures are 10-40° closely and medium spaced planar rough.	38.85	22.15	
92C	39.00	40.50	39.00	100	180							
				70	250							
				59								
									39.00 - 39.20m: Disintegrated to subangular fine to coarse gravel.			
									39.30 - 39.80m: 50° becoming subvertical undulating rough fracture intersecting with subvertical planar smooth fracture.			
									Continued Next Page			

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

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Geotechnical Engineering Limited

BOREHOLE LOG

BH22/07

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 6 of 6

Start Date 15 November 2022 Easting 386804 Scale 1:50

End Date 19 December 2022 Northing 398696 Ground Level 61.00mOD Depth 45.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
93CS	40.18 - 40.30										
94C	40.50 - 42.00	40.50	100 85 80					40.50 - 40.70m: 70° to subvertical undulating smooth fracture. 40.75 - 40.90m: 70° to subvertical planar rough fracture. Partially disintegrated to subangular fine to coarse gravel.			
				NI 260					41.00	20.00	
95CS	41.30 - 41.69			370				Weak thinly interlaminated to thinly interbedded dark grey and light grey MUDSTONE and SILTSTONE with widely spaced thin beds of light grey fine sandstone. Bedding fractures are subhorizontal to 20° very closely to medium spaced planar and undulating smooth. 41.20 - 42.00m: Locally fossiliferous.			
96C	42.00 - 43.50	42.00	100								
97CS	42.00 - 42.15		53 29	NI 80 140				42.30 - 42.50m: 80° to subvertical planar smooth fracture.			
98C	43.50 - 45.00	43.50	100	NI				43.30 - 43.35m: Disintegrated to subangular grey slightly sandy clayey fine to coarse gravel.			
99CS	43.50 - 43.75		75 53	120 230				43.70 - 43.80m: 40° planar smooth fracture. 43.90 - 44.00m: 40° planar smooth fracture locally disintegrated to angular and subangular fine and medium gravel. 44.10 - 45.00m: Very weak fossiliferous grey mudstone with closely spaced very thin beds of brownish grey siltstone. 44.40 - 44.75m: Disintegrated to angular medium and coarse gravel. 60° probably very closely spaced planar smooth fractures.			
								Borehole Completed at 45.00m	45.00	16.00	

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE Groundwater not encountered prior to use of flush
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

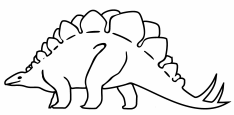
REMARKS

AGS

CONTRACT	CHECKED
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Geotechnical Engineering Limited

BOREHOLE LOG



BH22/08

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 8

Start Date 17 November 2022 Easting 386857 Scale 1:50

End Date 20 December 2022 Northing 398669 Ground Level 61.15mOD Depth 60.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B	0.10 - 0.40							Brown clayey locally very clayey very sandy angular fine to coarse sandstone, limestone, clinker and rare brick and concrete GRAVEL. (MADE GROUND)			
1ES	0.20						Vo 0.3				
2D	0.30						Vo 0.2				
2ES	0.35						Vo 0.1				
3ES	0.50							0.40m: Geotextile membrane.			
3B	0.80 - 1.20										
4D	0.80						Vo 0.2				
4ES	1.00										
5B	1.20 - 1.63	Nil					C *55		1.20	59.95	
5ES	1.50						Vo 2.2	Very stiff dark grey slightly gravelly sandy CLAY. Gravel is angular and subangular fine to coarse limestone, sandstone, brick, concrete and rare ceramic and metal. (MADE GROUND)			
6D	2.00	2.00					C *77				
7B	2.00 - 2.35										
6ES	2.50	2.00					C *64		2.50	58.65	
8B	2.50 - 2.89						Vo 1.8	Very stiff brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is angular and subangular fine to coarse sandstone, limestone and rare brick and wood. (MADE GROUND)			
9D	3.00	3.00					C *53				
10B	3.00 - 3.44										
11B	3.50 - 3.95	3.00			3.50		C 39				
7ES	3.50						Vo 1.6				
12D	4.00	4.00					C 12		4.00	57.15	
13B	4.00 - 4.45							Firm becoming stiff brown locally mottled grey slightly sandy slightly gravelly silty CLAY. Gravel is angular fine to coarse sandstone and coal. (MADE GROUND)			
14B	4.50 - 4.95	4.00					C 20				
8ES	4.50						Vo 0.9				
15D	5.00	5.00					S 21				
16B	5.00 - 5.45										
9ES	5.50						Vo 1.0				
17D	6.00	6.00									
18UT	6.00 - 6.45										
19B	6.50 - 7.00										
20D	7.00	7.00					S 27				
21D	7.00 - 7.45										
22B	7.00 - 7.45										
23D	8.00	8.00	-						8.00	53.15	

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	1.20	Inspection Pit	Hand Tools
1.20	15.00	Cable Percussion	Cable Percussion Rig
15.00	60.00	Rotary Core	Geotechnical Pioneer Rig

WATER STRIKE

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS
3.50	3.00	3.10	20	

CASING DEPTH

DIAM (mm)	BASE (m)
200	13.50
168	21.00
140	60.00

BARREL DIAMETER

DIAM (mm)	BASE (m)
200	15.00
146	60.00

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.50	Concrete
0.50	1.00	Bentonite
1.00	8.00	Gravel
8.00	40.00	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE
8.00	Standpipe (50mm)
50.00	Standpipe (35mm) with geosock

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
17-11-2022 15:30	0.00	Nil	
17-11-2022 16:30	0.60	Nil	Dry
18-11-2022 07:30	0.60	Nil	0.10
18-11-2022 09:30	1.20	Nil	Dry
30-11-2022 07:00	1.20	Nil	NR
30-11-2022 15:30	8.00	8.00	NR

REMARKS

Polymer flush used 15.00-60.00m.

AGS

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Geotechnical Engineering Limited

BOREHOLE LOG

BH22/08

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 2 of 8

Start Date 17 November 2022 Easting 386857 Scale 1:50

End Date 20 December 2022 Northing 398669 Ground Level 61.15mOD Depth 60.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
24UT	8.00 - 8.45							Stiff becoming very stiff brown slightly sandy slightly gravelly CLAY with rare thin and thick laminae of grey silty fine sand. Gravel is angular and subangular fine and medium sandstone.			
25B	8.50 - 9.00										
26D	9.00	9.00					S 20				
27D	9.00 - 9.45										
28B	9.00 - 9.45										
29D	10.00	10.00									
30UT	10.00 - 10.45										
31B	10.50 - 11.00										
32D	11.00	11.00					S 35				
33B	11.00 - 11.45										
34D	12.00	12.00							12.00	49.15	
35B	12.00 - 12.50							Light brown very silty fine to coarse SAND with frequent thin laminae of orangish brown fine and medium sand.			
36D	13.00	13.00					S 35		13.00	48.15	
37D	13.00 - 13.45							Very stiff brown slightly gravelly slightly sandy CLAY. Gravel is angular to subrounded fine to coarse mudstone and siltstone.			
38B	13.00 - 13.45										
39D	14.00	13.50					S 39				
40D	14.00 - 14.45										
41B	14.00 - 14.45										
42D	15.00	13.50	100	NA			S 43	Very stiff brown slightly gravelly slightly sandy silty CLAY. Gravel is angular to subrounded fine to coarse mudstone and siltstone.	15.00	46.15	
43D	15.00 - 15.45	15.00									
44C	15.00 - 15.30	15.30					S 41	Very stiff brown mottled grey and light orangish brown slightly sandy slightly gravelly locally gravelly CLAY locally tending to extremely weak siltstone. Gravel is angular to subrounded fine to coarse mudstone and siltstone lithorelicts.			
45D	15.30 - 15.75		100								
46C	15.30 - 16.80										
47D	15.60 - 15.70								15.90	45.25	

Continued Next Page

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED

WATER STRIKE

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)

BACKFILL

TOP (m)	BASE (m)	MATERIAL
40.00	50.00	Gravel
50.00	60.00	Bentonite

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
01-12-2022 07:20	8.00	8.00	NR
01-12-2022 15:30	15.00	13.50	NR
13-12-2022 08:35	15.00	15.00	3.20
13-12-2022 17:30	27.30	27.30	0.00
14-12-2022 08:50	27.30	27.30	4.87
14-12-2022 17:00	33.30	33.30	2.17

REMARKS

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BOREHOLE LOG

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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 3 of 8

Start Date 17 November 2022 Easting 386857 Scale 1:50

End Date 20 December 2022 Northing 398669 Ground Level 61.15mOD Depth 60.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
					NA							
48D	16.60	16.70										
49D	16.80	17.22	16.80	100	NA			S *56	Very stiff grey slightly gravelly slightly sandy silty CLAY locally tending to extremely weak siltstone. Gravel is angular to subrounded fine to coarse mudstone and siltstone.	16.75	44.40	
50C	16.80	18.30		45								
				45								
					NI					17.65	43.50	
					100				Very weak to weak light grey SILTSTONE with very closely spaced thin laminae of dark grey mudstone. Bedding fractures are subhorizontal to 10° closely and medium spaced planar smooth frequently stained orangish brown.			
					320							
51D	18.20	18.30										
52C	18.30	19.80	18.30	100					18.30 - 18.50m: Two subvertical very closely spaced planar smooth fractures.			
				83								
				72								
53CS	19.56	19.72							19.40 - 19.45m: 70° planar smooth fracture.			
54D	19.70	19.80										
55D	19.80	20.02	19.80	100				S *214				
56C	19.80	21.30		67								
				66								
57CS	20.17	20.43							20.45 - 20.55m: Disintegrated to sandy angular fine to coarse gravel.			
									21.00 - 21.95m: Very closely to closely spaced thin beds of grey fine sandstone.			
58C	21.30	22.80	21.30	100					21.20 - 21.30m: 60° planar smooth fracture stained orangish brown.			
				89								
				65					21.65 - 21.80m: 60° planar smooth fracture stained orangish brown.			
									21.95 - 22.90m: Frequently stained light orangish brown.			
59CS	22.48	22.80							22.35 - 22.40m: Two 45° very closely spaced undulating and planar smooth fractures.			
60D	22.80	22.90	22.80	100				S *750	22.80 - 23.30m: 80° planar smooth fracture stained orangish brown.	22.90	38.25	
61C	22.80	24.30		80	NI							
				62	360				Weak light grey fine and medium SANDSTONE. Fractures are subhorizontal to 20° medium spaced planar smooth stained orangish brown.			
					530							
62CS	23.47	23.83							23.95 - 24.00m: 30° planar smooth fracture stained orangish brown.			

Continued Next Page

HOLE CONSTRUCTION

TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE

DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH

DIAM (mm) BASE (m)

BARREL DIAMETER

DIAM (mm) BASE (m)

BACKFILL

TOP (m) BASE (m) MATERIAL

INSTRUMENTATION

DEPTH (m) TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
15-12-2022 08:40	33.30	33.30	4.31
15-12-2022 17:30	45.30	45.30	2.15
16-12-2022 09:40	45.30	45.30	7.52
16-12-2022 14:00	49.80	49.80	3.14
19-12-2022 10:00	49.80	49.80	8.84
19-12-2022 17:30	55.80	55.80	4.12

REMARKS

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Geotechnical Engineering Limited

BOREHOLE LOG

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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 4 of 8

Start Date 17 November 2022 Easting 386857 Scale 1:50

End Date 20 December 2022 Northing 398669 Ground Level 61.15mOD Depth 60.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
63C	24.30 - 25.80	24.30	100 100 93								
64CS	25.49 - 25.80							25.50m: Medium strong.			
65C	25.80 - 27.30	25.80	100 56 51								
66CS	26.29 - 26.55			NI 30 50				26.55 - 27.65m: Medium spaced thin and thick beds of extremely weak grey siltstone. Bedding fractures are extremely closely and very closely spaced locally disintegrated to firm slightly sandy gravelly clay.			
67D	27.20 - 27.30										
68C	27.30 - 28.80	27.30	100 41 0	NI 40 120					27.65	33.50	
								Extremely weak to weak locally medium strong thinly laminated to thinly bedded grey and dark grey MUDSTONE locally tending to very stiff grey clay and locally disintegrated to clayey angular and subangular fine to coarse gravel. Fractures are subhorizontal to 20° extremely closely to closely spaced planar smooth.			
69D	28.70 - 28.80							28.60 - 28.80m: Subvertical planar smooth fracture. Disintegrated to angular tabular coarse gravel.			
70C	28.80 - 30.30	28.80	100 23 13	NI				28.90 - 30.10m: Dark grey.			
71D	30.20 - 30.30			NI 30 130							
72C	30.30 - 31.80	30.30	83 30 13					30.60 - 31.00m: Locally disintegrated to angular and subangular fine to coarse mudstone gravel.			
73CS	31.40 - 31.60			NI 60 190							
74C	31.80 - 33.30	31.80	93								
								Continued Next Page			

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED

WATER STRIKE

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)

BACKFILL

TOP (m)	BASE (m)	MATERIAL

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
20-12-2022 08:00	55.80	55.80	7.74
20-12-2022 12:00	60.00	60.00	3.19

REMARKS

AGS

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BOREHOLE LOG

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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 5 of 8

Start Date 17 November 2022 Easting 386857 Scale 1:50

End Date 20 December 2022 Northing 398669 Ground Level 61.15mOD Depth 60.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
75CS	32.10 - 32.40		47 36	300				32.10 - 32.40m: Fractures are medium spaced.			
				NI 90 160				32.80 - 32.90m: Subvertical planar rough fracture.			
76C	33.30 - 34.80	33.30	100 80 70								
77D	33.80 - 33.90										
				NI				34.40 - 34.65m: Disintegrated to very stiff clay and very clayey angular fine and medium gravel.	34.65	26.50	
78C	34.80 - 36.30	34.80	100 93 77	NI 120 270				Very weak locally medium strong thinly and thickly interlaminated grey MUDSTONE and light grey SILTSTONE. Bedding fractures are subhorizontal to 20° very closely to medium spaced planar smooth.			
79CS	35.38 - 35.65							35.90m: 50° planar smooth fracture.			
80C	36.30 - 37.80	36.30	100 70 43	NI 120 260					36.60	24.55	
81D	37.40 - 37.50							Extremely weak to very weak thinly and thickly laminated dark grey MUDSTONE locally tending to very stiff dark grey clay and locally disintegrated to clayey angular fine to coarse gravel. Bedding fractures are subhorizontal to 20° very closely and closely spaced planar smooth.			
				NI				37.50 - 37.60m: Subvertical planar rough fracture.			
82C	37.80 - 39.30	37.80	100 67 33	50 150							
83CS	38.45 - 38.62										
				NI				Extremely weak thinly laminated black COAL frequently disintegrated to angular fine to coarse gravel. Rare thin beds of weak dark grey and black mudstone. Bedding fractures are subhorizontal to 20° extremely and very closely spaced planar smooth rarely polished. (THIN COAL 'B' SEAM)	39.15	22.00	
84C	39.30 - 40.80	39.30	93 67 43	40 130							

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

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BOREHOLE LOG

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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 6 of 8

Start Date 17 November 2022 Easting 386857 Scale 1:50

End Date 20 December 2022 Northing 398669 Ground Level 61.15mOD Depth 60.00 m

sample no & type	sample depth (m) from to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
85D	40.20 - 40.30							40.40 - 40.50m: Thin bed of moderately weak light grey calcareous mudstone.			
86C	40.80 - 42.30	40.80	100 93 81	NI 95 130				Weak to moderately weak thinly and thickly interlaminated light grey and grey MUDSTONE and fine to coarse SANDSTONE locally disintegrated to clayey angular fine to coarse gravel. Bedding fractures are subhorizontal to 20° closely and medium spaced planar smooth.	40.70	20.45	
87CS	41.34 - 41.68			NI 200 540							
88C	42.30 - 43.80	42.30	95 80 76								
89CS	43.20 - 43.60										
90C 91CS	43.80 - 45.30 43.80 - 44.00	43.80	100 60 35	NI 70 210				43.70 - 43.80m: 50° planar rough fracture infilled (up to 40mm) with clayey sandy angular and subangular fine to coarse gravel. 44.00 - 44.10m: Disintegrated to slightly clayey angular tabular medium and coarse gravel.	44.10	17.05	
92CS	44.20 - 44.49			350				Very weak to weak grey MUDSTONE with very closely and closely spaced thin beds of very thinly and thickly interlaminated light grey siltstone. Bedding fractures are subhorizontal to 10° very closely and closely spaced planar rarely undulating smooth.			
				NI 60 90				44.10 - 44.20m: 60° planar smooth fracture infilled (up to 15mm) with grey slightly gravelly clay. 44.10 - 44.45m: Bedding fractures are medium spaced. 44.50 - 44.60m: 80° planar smooth fracture. 44.60 - 44.85m: Disintegrated to angular tabular coarse gravel.			
93C	45.30 - 46.80	45.30	70 13 0	NI				45.30 - 46.50m: Limited recovery. Recovered as very soft and soft grey gravelly clay.			
94D 95C	46.70 - 46.80 46.80 - 48.30	46.80	63 17 0	NI 40 85				Extremely weak to weak dark grey locally carbonaceous MUDSTONE with rare thinly laminated grey siltstone rarely tending to grey mudstone frequently disintegrated to slightly clayey sandy angular fine to coarse gravel. Fractures are subhorizontal to 30° extremely closely to closely spaced planar smooth rarely 80° to subvertical planar smooth.	46.50	14.65	

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

CONTRACT	CHECKED
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Geotechnical Engineering Limited

BOREHOLE LOG

BH22/08

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 7 of 8

Start Date 17 November 2022 Easting 386857 Scale 1:50

End Date 20 December 2022 Northing 398669 Ground Level 61.15mOD Depth 60.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
96D	48.20	48.30										
97C	48.30	49.80	48.30	80 35 0								
98D	49.20	49.30										
99C	49.80	51.30	49.80	89 58 16								
100CS	50.75	50.90			NI 50 140							
101C	51.30	52.80	51.30	97 64 33								
102CS	51.85	52.00										
103C	52.80	54.30	52.80	93 54 42								
104CS	53.15	53.58			420							
					NI 60 200							
					NI							
105C	54.30	55.80	54.30	27 0 0					54.30 - 55.80m: Limited recovery.			
106C 107CS	55.80	57.30 56.15	55.80	100	NI				Very weak to weak thinly interlaminated to thinly interbedded grey and dark grey locally fossiliferous MUDSTONE and SILTSTONE with widely spaced thin beds of light grey fine sandstone. Bedding fractures are subhorizontal to 30° extremely closely to closely spaced planar smooth locally infilled (up to 10mm) with soft grey clay.	55.80	5.35	

Continued Next Page

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

CONTRACT	CHECKED
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Geotechnical Engineering Limited

BOREHOLE LOG

BH22/08

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 8 of 8

Start Date 17 November 2022 Easting 386857 Scale 1:50

End Date 20 December 2022 Northing 398669 Ground Level 61.15mOD Depth 60.00 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
				70 34	80 160							
108C	57.30	58.80	57.30	97 63 33					57.65 - 58.00m: 70° to subvertical planar smooth fracture.			
109C 110CS	58.80 - 60.00 58.80 - 59.00		58.80	58 50 41	50 195 205							
					NR				Assessed zone of core loss.	59.50	1.65	
									Borehole Completed at 60.00m	60.00	1.15	

HOLE CONSTRUCTION
TOP (m) BASE (m) TYPE PLANT USED

WATER STRIKE
DEPTH (m) CASING (m) ROSE TO (m) AFTER (min) REMARKS

CASING DEPTH
DIAM (mm) BASE (m)

BARREL DIAMETER
DIAM (mm) BASE (m)

BACKFILL
TOP (m) BASE (m) MATERIAL

INSTRUMENTATION
DEPTH (m) TYPE

HOLE PROGRESS
DATE TIME DEPTH (m) CASING (m) WATER (m)

REMARKS

AGS

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Geotechnical Engineering Limited

STANDARD PENETRATION TEST

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	base depth (m)	casing depth (m)	water level (m)	seating drive				test drive								test type	N	energy ratio %
						blows		pen (mm)		blows				pen (mm)						
BH22/01	1.20		1.65	Nil	Dry	7	7	75	75	13	11	11	15	75	75	75	70	C	51	72
BH22/01	2.00		2.45	2.00	Dry	10	10	75	75	7	8	10	15	75	75	75	75	C	40	72
BH22/01	2.50		2.84	2.00	Dry	8	13	75	75	20	20	10		75	75	35		C	81	72
BH22/01	3.00		3.45	3.00	Dry	5	8	75	75	11	13	12	9	75	75	75	75	C	45	72
BH22/01	3.50		3.95	3.00	NR	5	5	75	75	8	6	6	5	75	75	75	75	C	25	72
BH22/01	4.00		4.45	4.00	NR	1	1	75	75	1	3	3	3	75	75	75	75	C	10	72
BH22/01	4.50		4.95	4.00	NR	1	2	75	75	3	4	3	3	75	75	75	75	C	13	72
BH22/01	5.00		5.45	5.00	NR	2	3	75	75	4	4	4	4	75	75	75	75	C	16	72
BH22/01	7.00		7.45	7.00	NR	2	3	75	75	3	4	4	6	75	75	75	75	S	17	72
BH22/01	9.00		9.45	9.00	NR	2	3	75	75	3	3	3	5	75	75	75	75	S	14	72
BH22/01	11.00		11.45	11.00	NR	2	2	75	75	2	3	3	3	75	75	75	75	S	11	72
BH22/01	13.00		13.45	12.00	NR	2	3	75	75	4	4	5	7	75	75	75	75	S	20	72
BH22/01	14.00		14.36	12.00	11.40	10	14	75	75	14	25	11		75	75	60		S	71	71
BH22/01	15.20		15.65	15.20	0.91	2	3	75	75	6	9	8	11	75	75	75	75	S	34	71
BH22/01	16.70		16.93	16.70	0.85	5	20	75	65	43	7			75	15			S	167	71
BH22/01	19.70		19.87	19.70	1.09	6	19	75	35	50				60				S	250	71
BH22/01	22.70		22.86	22.70	0.91	16	9	75	15	50				70				S	214	71
BH22/02	2.50		2.95	2.00	NR	2	3	75	75	4	4	4	5	75	75	75	75	S	17	72
BH22/02	3.00		3.45	3.00	NR	2	2	75	75	3	3	3	4	75	75	75	75	S	13	72
BH22/02	4.00		4.45	4.00	NR	2	3	75	75	3	3	3	5	75	75	75	75	S	14	72

notes:
1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

STANDARD PENETRATION TEST

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	base depth (m)	casing depth (m)	water level (m)	seating drive				test drive								test type	N	energy ratio %
						blows		pen (mm)		blows				pen (mm)						
BH22/02	5.00		5.45	5.00	NR	2	3	75	75	3	3	3	4	75	75	75	75	S	13	72
BH22/02	7.00		7.45	7.00	NR	2	2	75	75	3	4	5	6	75	75	75	75	S	18	72
BH22/02	9.00		9.45	9.00	NR	2	3	75	75	5	5	6	7	75	75	75	75	S	23	72
BH22/02	12.00		12.45	12.00	NR	2	3	75	75	3	4	5	5	75	75	75	75	S	17	72
BH22/02	14.00		14.45	13.50	NR	5	7	75	75	9	10	11	12	75	75	75	75	S	42	72
BH22/02	15.00		15.40	14.20	3.40	7	11	75	75	12	15	16	7	75	75	75	25	S	60	70
BH22/02	18.00		18.13	18.00	0.80	25		75		50				55				S	273	70
BH22/02	21.00		21.45	21.00	0.80	10	6	75	75	4	2	3	2	75	75	75	75	S	11	70
BH22/02	24.00		24.12	24.00	1.00	25		65		50				50				S	300	70
BH22/03	1.20		1.65	Nil	NR	1	2	75	75	3	2	2	2	75	75	75	75	C	9	72
BH22/03	2.00		2.13	2.00	NR	15	10	75	50									C	<1	72
BH22/03	3.00		3.45	3.00	NR	3	3	75	75	4	5	5	5	75	75	75	75	C	19	72
BH22/03	4.00		4.45	4.00	NR	2	3	75	75	4	4	4	4	75	75	75	75	S	16	72
BH22/03	5.00		5.45	5.00	NR	2	2	75	75	2	2	3	3	75	75	75	75	S	10	72
BH22/03	7.00		7.45	7.00	NR	2	3	75	75	2	4	3	5	75	75	75	75	S	14	72
BH22/03	9.00		9.45	9.00	NR	3	3	75	75	4	4	5	6	75	75	75	75	S	19	72
BH22/03	11.00		11.45	9.00	10.30	3	4	75	75	5	7	9	9	75	75	75	75	S	30	70
BH22/03	12.00		12.45	12.00	0.60	3	4	75	75	5	7	8	11	75	75	75	75	S	31	70
BH22/03	13.50		13.95	13.50	0.90	5	6	75	75	8	7	11	12	75	75	75	75	S	38	70
BH22/03	15.00		15.45	15.00	0.90	3	8	75	75	8	8	8	10	75	75	75	75	S	34	70

notes:
1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

STANDARD PENETRATION TEST

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	base depth (m)	casing depth (m)	water level (m)	seating drive		test drive				test type	N	energy ratio %
						blows	pen (mm)	blows				pen (mm)						
BH22/03	16.50		16.80	16.50	0.90	10 13	75 75	19 31				75 75			S	100	70
BH22/03	19.50		19.76	19.50	2.10	13 12	75 35	24 26				75 75			S	100	70
BH22/03	22.50		22.63	22.50	0.90	25	75	50				55			S	273	70
BH22/04	1.20		1.58	Nil	NR	4 5	75 75	12 16	17	5		75 75	75	5	C	65	72
BH22/04	2.00		2.15	2.00	NR	2 2	75 75								C	<1	72
BH22/04	2.50		2.60	2.50	NR	10 15	10 20	50				70			C	214	72
BH22/04	3.00		3.45	2.50	0.00	1 1	75 75	2 2	3	7		75 75	75	75	C	14	70
BH22/04	3.50		3.95	3.00	0.80	2 2	75 75	7 7	10	11		75 75	75	75	C	35	70
BH22/04	4.00		4.45	3.00	0.80	4 8	75 75	9 10	12	15		75 75	75	75	C	46	70
BH22/04	4.50		4.90	3.00	1.50	3 20	75 75	16 17	13	4		75 75	75	25	C	60	70
BH22/04	5.20		5.65	5.20	0.00	5 5	75 75	6 4	4	6		75 75	75	75	C	20	70
BH22/04	6.20		6.65	6.20	3.50	3 3	75 75	3 2	1	3		75 75	75	75	C	9	70
BH22/04	7.20		7.65	7.20	3.50	6 5	75 75	3 3	4	4		75 75	75	75	C	14	70
BH22/04	8.20		8.65	8.20	0.50	2 3	75 75	4 5	7	7		75 75	75	75	C	23	70
BH22/04	9.20		9.65	9.20	1.50	2 3	75 75	5 5	9	11		75 75	75	75	C	30	70
BH22/04	10.20		10.65	10.20	0.00	1 2	75 75	2 2	3	5		75 75	75	75	S	12	70
BH22/04	13.70		14.15	13.70	2.55	3 4	75 75	5 6	9	9		75 75	75	75	S	29	70
BH22/04	15.20		15.65	15.20	4.55	3 6	75 75	7 9	9	14		75 75	75	75	S	39	70
BH22/04	16.70		17.00	16.70	5.65	8 16	75 75	23 27				75 75			S	100	70
BH22/04	19.70		19.92	19.70	3.85	6 19	75 45	33 7				75 25			S	120	70

notes:
1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

STANDARD PENETRATION TEST

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	base depth (m)	casing depth (m)	water level (m)	seating drive		test drive								test type	N	energy ratio %
						blows	pen (mm)	blows				pen (mm)						
BH22/04	22.70		22.75	22.70	6.55	25	20	50				30				S	500	70
BH22/05	1.20		1.65	Nil	0.50	4 8	75 75	7	6	11	10	75	75	75	75	C	34	70
BH22/05	1.70		2.15	1.20	0.50	1 1	75 75	2	4	6	5	75	75	75	75	C	17	70
BH22/05	2.80		3.25	1.20	1.00	3 6	75 75	14	11	8	8	75	75	75	75	C	41	70
BH22/05	3.20		3.65	3.20	0.00	11 8	75 75	5	5	5	6	75	75	75	75	C	21	70
BH22/05	3.70		4.15	3.20	1.00	2 3	75 75	7	5	3	2	75	75	75	75	C	17	70
BH22/05	4.20		4.65	3.20	1.00	1 2	75 75	2	2	2	2	75	75	75	75	C	8	70
BH22/05	6.30		6.75	6.30	1.00	3 4	75 75	4	6	7	10	75	75	75	75	S	27	70
BH22/05	7.30		7.75	7.30	1.00	3 4	75 75	6	7	9	10	75	75	75	75	S	32	70
BH22/05	8.30		8.75	8.30	1.00	2 3	75 75	4	5	6	8	75	75	75	75	S	23	70
BH22/05	9.10		9.55	9.10	1.00	3 5	75 75	4	5	6	8	75	75	75	75	S	23	70
BH22/05	10.60		11.05	10.60	1.00	2 3	75 75	3	5	6	8	75	75	75	75	S	22	70
BH22/05	12.10		12.55	12.10	1.00	2 3	75 75	3	5	5	7	75	75	75	75	S	20	70
BH22/05	13.60		14.05	13.60	1.00	2 3	75 75	5	7	14	14	75	75	75	75	S	40	70
BH22/05	15.10		15.55	15.10	1.00	3 5	75 75	7	8	15	20	75	75	75	75	S	50	70
BH22/05	18.10		18.29	18.10	15.00	10 15	75 35	50				75				C	200	70
BH22/05	21.10		21.26	21.10	3.00	25	75	37	13			75	10			C	176	70
BH22/06A	1.50		1.83	1.50	Dry	5 11	75 75	13	25	12		75	75	25		C	86	72
BH22/06A	2.00		2.21	Nil	Dry	6 19	75 65	50				70				S	214	71
BH22/06A	2.50		2.71	Nil	Dry	4 21	75 75	50				60				S	250	71

notes:
1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

STANDARD PENETRATION TEST

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	base depth (m)	casing depth (m)	water level (m)	seating drive				test drive								test type	N	energy ratio %
						blows		pen (mm)		blows				pen (mm)						
BH22/06A	3.00		3.37	2.50	0.00	3	5	75	75	9	4	24		75	75	70		S	50	71
BH22/06A	3.50		3.81	3.00	0.82	5	11	75	75	21	23	6		75	75	10		S	94	71
BH22/06A	4.00		4.45	3.00	0.91	3	3	75	75	4	5	5	7	75	75	75	75	S	21	71
BH22/06A	4.50		4.95	3.00	2.31	3	3	75	75	4	4	6	11	75	75	75	75	S	25	71
BH22/06A	6.00		6.45	6.00	0.00	1	4	75	75	3	3	5	6	75	75	75	75	S	17	71
BH22/06A	8.00		8.45	6.00	3.38	2	3	75	75	4	6	4	6	75	75	75	75	S	20	71
BH22/06A	9.00		9.45	6.00	4.31	3	3	75	75	3	6	7	9	75	75	75	75	S	25	71
BH22/06A	9.20		9.65	9.00	2.11	3	3	75	75	4	4	6	6	75	75	75	75	S	20	71
BH22/06A	10.70		11.15	10.70	2.84	3	4	75	75	6	7	8	8	75	75	75	75	S	29	71
BH22/06A	12.20		12.65	12.20	2.97	2	4	75	75	5	6	9	9	75	75	75	75	S	29	71
BH22/06A	13.70		14.15	13.70	0.96	4	8	75	75	9	11	10	16	75	75	75	75	S	46	71
BH22/06A	15.20		15.65	15.20	1.74	4	6	75	75	7	8	13	18	75	75	75	75	S	46	71
BH22/06A	16.70		16.89	16.70	2.81	6	18	75	75	50				40				S	375	71
BH22/06A	19.70		19.91	19.70	2.11	2	20	75	65	50				70				S	214	71
BH22/06A	22.70		22.80	22.70	0.94	25		70		50				30				S	500	71
BH22/07	1.20		1.65	Nil	NR	5	6	75	75	5	4	4	4	75	75	75	75	C	17	72
BH22/07	2.00		2.19	2.00	NR	13	12	75	35	50				75				C	200	72
BH22/07	2.50		2.88	2.30	1.00	2	7	75	75	13	18	19		75	75	75		S	67	70
BH22/07	3.00		3.45	3.00	0.00	6	8	75	75	8	10	6	10	75	75	75	75	S	34	70
BH22/07	3.50		3.95	3.50	0.20	5	6	75	75	3	2	3	2	75	75	75	75	S	10	70

notes:
1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

STANDARD PENETRATION TEST

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	base depth (m)	casing depth (m)	water level (m)	seating drive				test drive								test type	N	energy ratio %
						blows		pen (mm)		blows				pen (mm)						
BH22/07	4.00		4.45	4.00	0.30	2	1	75	75	1	0	1	0	75	75	75	75	S	2	70
BH22/07	5.10		5.55	4.50	0.70	4	4	75	75	6	6	8	7	75	75	75	75	S	27	70
BH22/07	6.00		6.45	4.50	2.10	4	5	75	75	6	7	9	10	75	75	75	75	S	32	70
BH22/07	6.60		7.05	6.00	1.80	2	4	75	75	5	5	7	7	75	75	75	75	S	24	70
BH22/07	7.50		7.95	7.50	0.80	4	4	75	75	4	5	6	9	75	75	75	75	S	24	70
BH22/07	9.00		9.45	9.00	0.80	2	3	75	75	3	7	7	9	75	75	75	75	S	26	70
BH22/07	10.50		10.95	10.50	0.80	4	4	75	75	6	7	10	11	75	75	75	75	S	34	70
BH22/07	12.00		12.45	12.00	0.80	4	5	75	75	7	7	9	10	75	75	75	75	S	33	70
BH22/07	13.50		13.95	13.50	0.80	4	6	75	75	7	9	11	17	75	75	75	75	S	44	70
BH22/07	15.00		15.45	15.00	0.60	4	6	75	75	10	10	12	16	75	75	75	75	S	48	70
BH22/07	16.50		16.73	16.50	0.70	13	12	75	45	38	12			75	35			S	136	70
BH22/07	21.00		21.11	21.00	0.90	25		70		50				35				S	429	70
BH22/07	22.50		22.63	22.50	0.70	12	13	75	5	50				45				S	333	70
BH22/08	1.20		1.63	Nil	NR	5	5	75	75	10	13	13	14	75	75	75	50	C	55	72
BH22/08	2.00		2.35	2.00	NR	5	13	75	75	17	18	15		75	75	45		C	77	72
BH22/08	2.50		2.89	2.00	NR	3	12	75	75	12	17	17	4	75	75	75	10	C	64	72
BH22/08	3.00		3.44	3.00	NR	3	5	75	75	10	15	15	10	75	75	75	60	C	53	72
BH22/08	3.50		3.95	3.00	NR	5	11	75	75	12	12	8	7	75	75	75	75	C	39	72
BH22/08	4.00		4.45	4.00	NR	2	3	75	75	2	2	4	4	75	75	75	75	C	12	72
BH22/08	4.50		4.95	4.00	NR	2	3	75	75	3	5	5	7	75	75	75	75	C	20	72

notes:
1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

STANDARD PENETRATION TEST

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	base depth (m)	casing depth (m)	water level (m)	seating drive				test drive								test type	N	energy ratio %
						blows		pen (mm)		blows				pen (mm)						
BH22/08	5.00		5.45	5.00	NR	3	3	75	75	5	5	5	6	75	75	75	75	S	21	72
BH22/08	7.00		7.45	7.00	NR	3	3	75	75	5	7	8	7	75	75	75	75	S	27	72
BH22/08	9.00		9.45	9.00	NR	3	3	75	75	4	5	5	6	75	75	75	75	S	20	72
BH22/08	11.00		11.45	11.00	NR	3	6	75	75	6	7	8	14	75	75	75	75	S	35	72
BH22/08	13.00		13.45	13.00	NR	4	5	75	75	7	7	9	12	75	75	75	75	S	35	72
BH22/08	14.00		14.45	13.50	NR	3	3	75	75	4	8	12	15	75	75	75	75	S	39	72
BH22/08	15.00		15.45	13.50	NR	7	8	75	75	10	10	10	13	75	75	75	75	S	43	72
BH22/08	15.30		15.75	15.30	0.00	3	5	75	75	6	8	12	15	75	75	75	75	S	41	71
BH22/08	16.80		17.22	16.80	0.83	10	13	75	75	15	15	12	8	75	75	75	45	S	56	71
BH22/08	19.80		20.02	19.80	2.11	3	4	75	75	50				70				S	214	71
BH22/08	22.80		22.90	22.80	2.01	7	18	75	5	50				20				S	750	71

notes:
1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
37349	CT

Geotechnical Engineering Limited

IN-SITU HAND VANE/POCKET PENETROMETER

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Borehole /trial pit no.	Depth (m)	Hand vane peak (kPa)	Average hand vane peak (kPa)	Hand vane remoulded (kPa)	Average hand vane remoulded (kPa)	Pocket penetrometer (kPa)	Average pocket penetrometer (kPa)	Remarks
BH22/03	10.90	>140 / >140 / >140						
BH22/03	11.90	>140 / >140 / >140						
BH22/05	4.60	36 / 32 / 38	35					
BH22/05	6.00	136 / 140 / >140						
BH22/05	7.00	>140 / >140 / >140						
BH22/05	8.00	>140 / >140 / >140						
BH22/05	9.00	>140 / >140 / >140						
BH22/06A	4.50	110 / 124 / 90	108					
BH22/06A	8.00	85 / 102 / 88	92					

Hand vane and pocket penetrometer test results reported as undrained shear strength

CONTRACT **37349**

CHECKED **CT**

EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Borehole: **BH22/04**

Log Type: ***Comp_FIELD***

Location: **Etihad** Area: **Manchester** Grid Ref: Elevation:

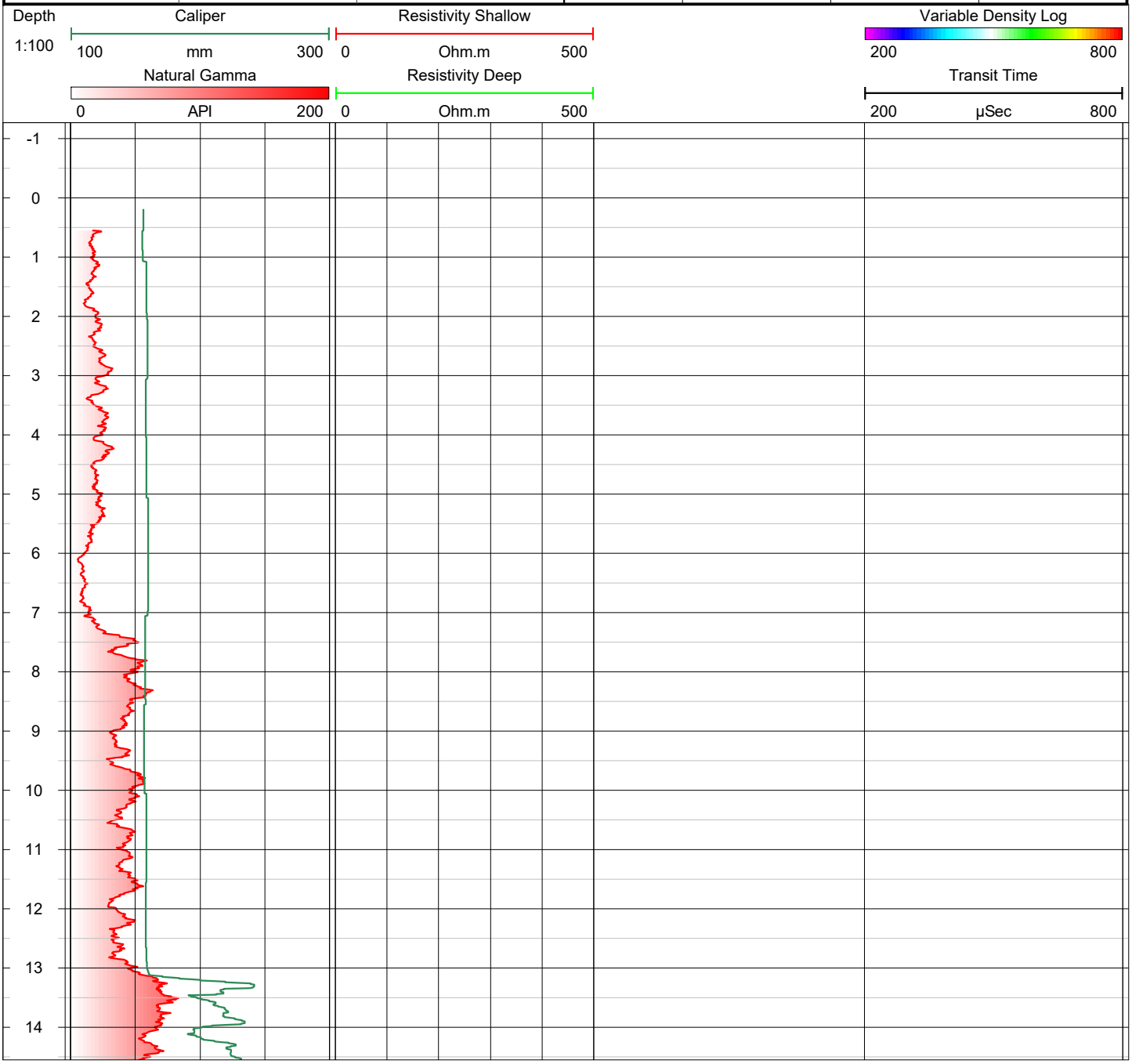
Drilled Depth: (m)	**49.0**	Date:	**16.12.22**
Logged Depth: (m)	**43.2**	Recorded By:	**C. Clinton**
Logging Datum:	**Ground Level**	Remarks:	
Logged Interval: (m)	**2.0 - 43.2**		
Fluid Level: (m)	**19.1**		

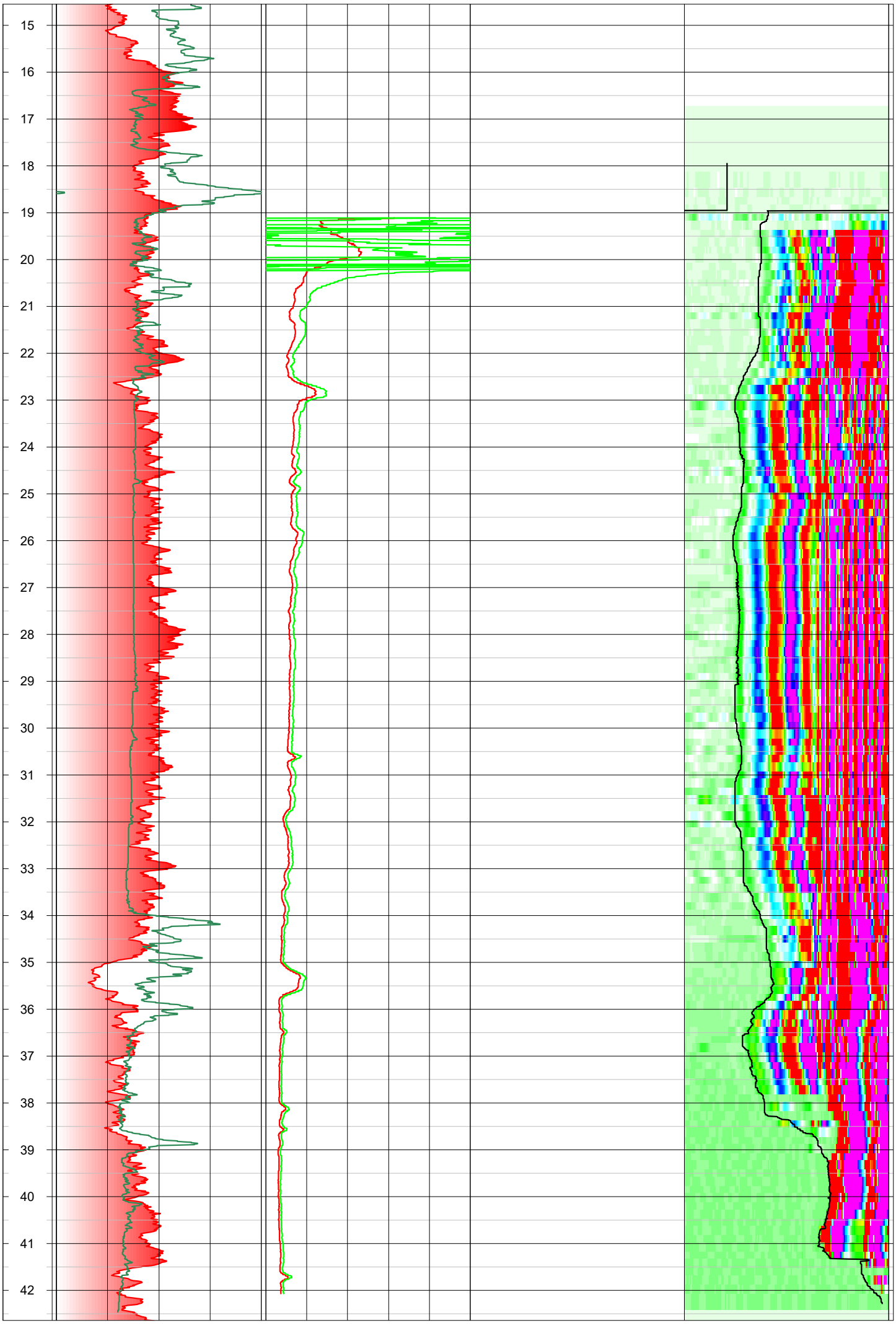
BOREHOLE RECORD

Bit: (mm)	From: (m)	To: (m)
150	**13.2**	**43.2**

CASING RECORD

Type	Size: (mm)	From: (m)	To: (m)
150	**Steel**	**-0.7**	**13.2**




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EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Log Type: ***Comp_FIELD***

Borehole: **BH22/04**

Location: **Etihad** Area: **Manchester** Grid Ref: Elevation:

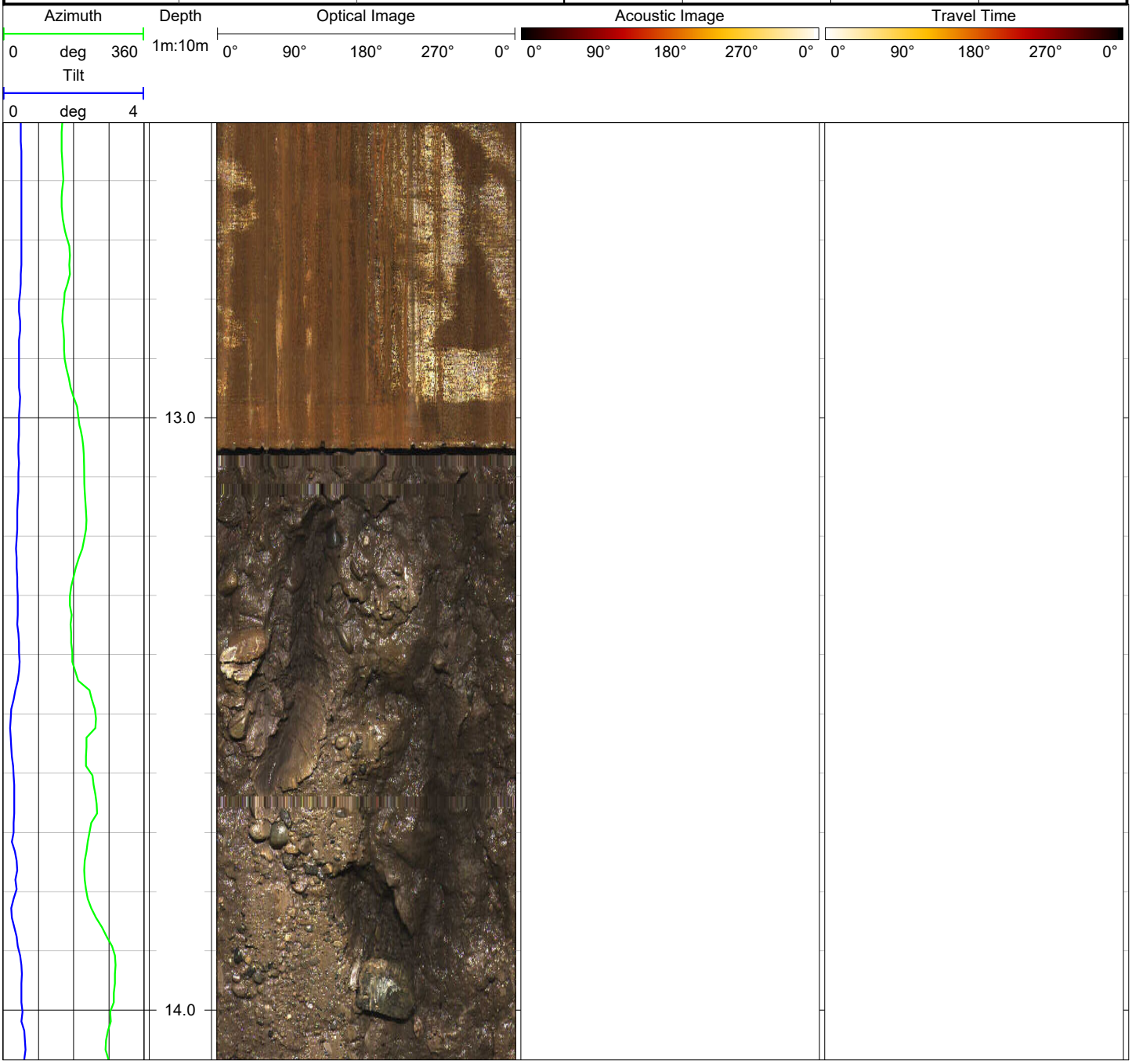
Drilled Depth: (m)	**49.0**	Date:	**16.12.22**
Logged Depth: (m)	**43.2**	Recorded By:	**C. Clinton**
Logging Datum:	**Ground Level**	Remarks:	
Logged Interval: (m)	**2.0 - 43.2**		
Fluid Level: (m)	**19.1**		

BOREHOLE RECORD

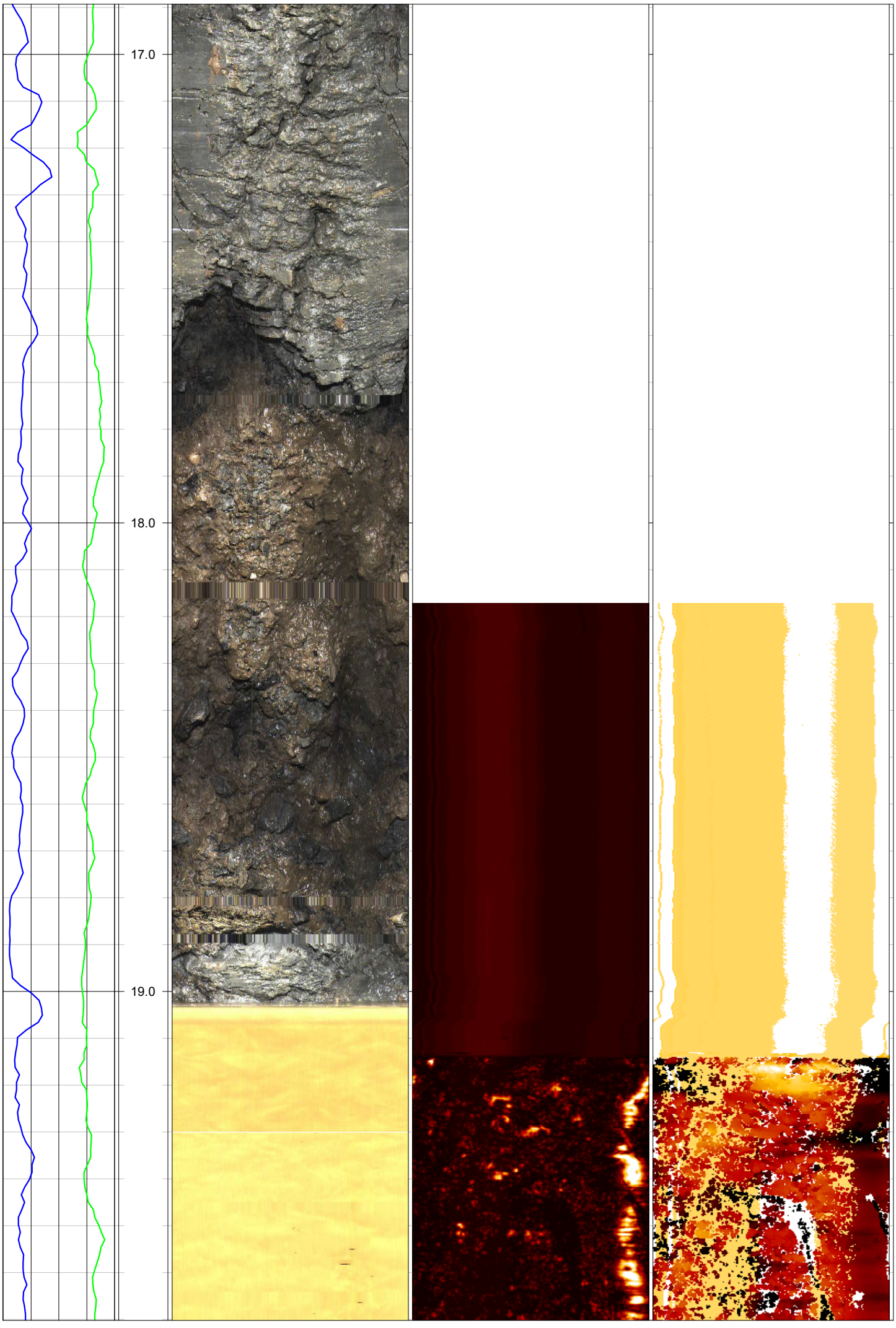
Bit: (mm)	From: (m)	To: (m)
150	**13.2**	**43.2**

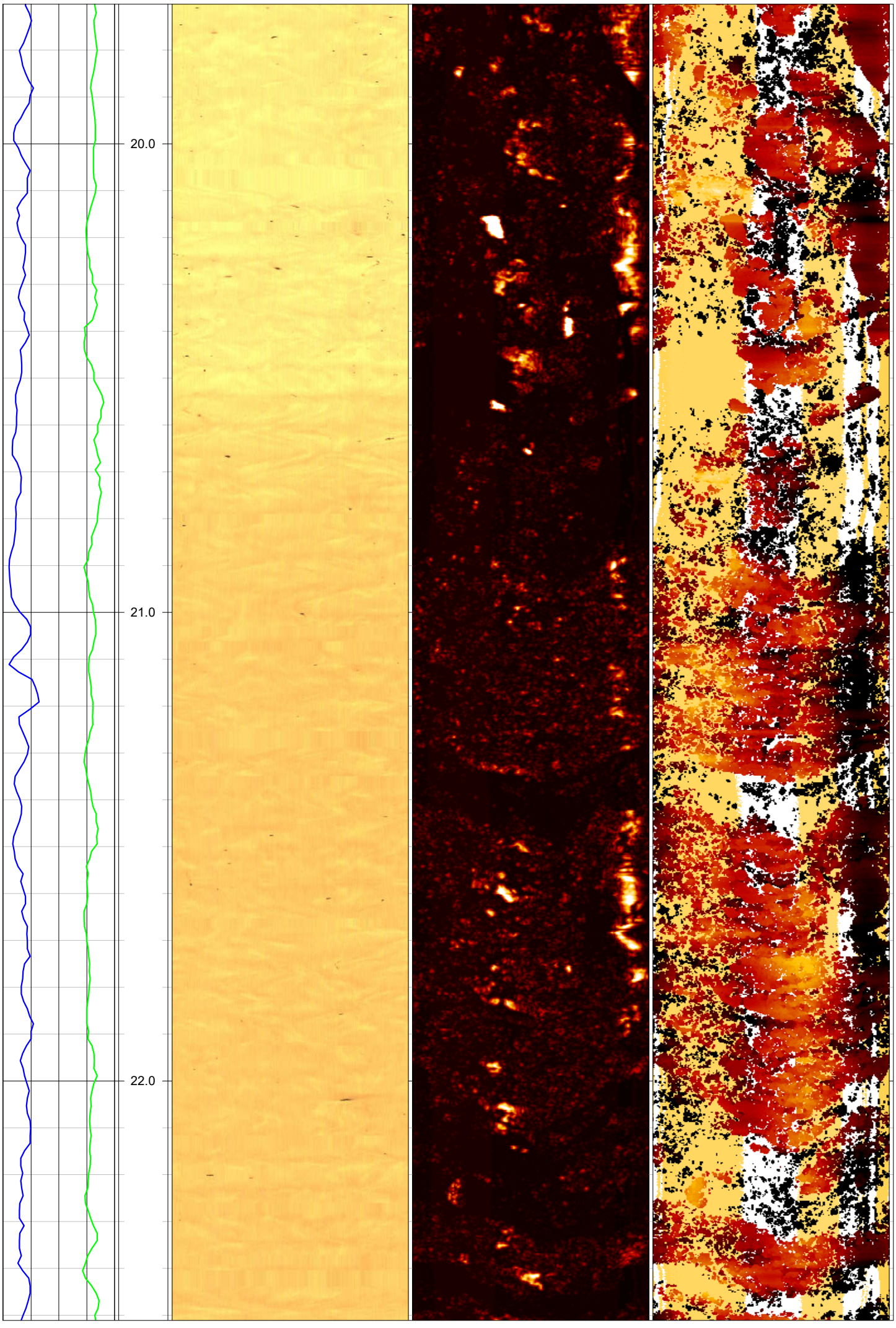
CASING RECORD

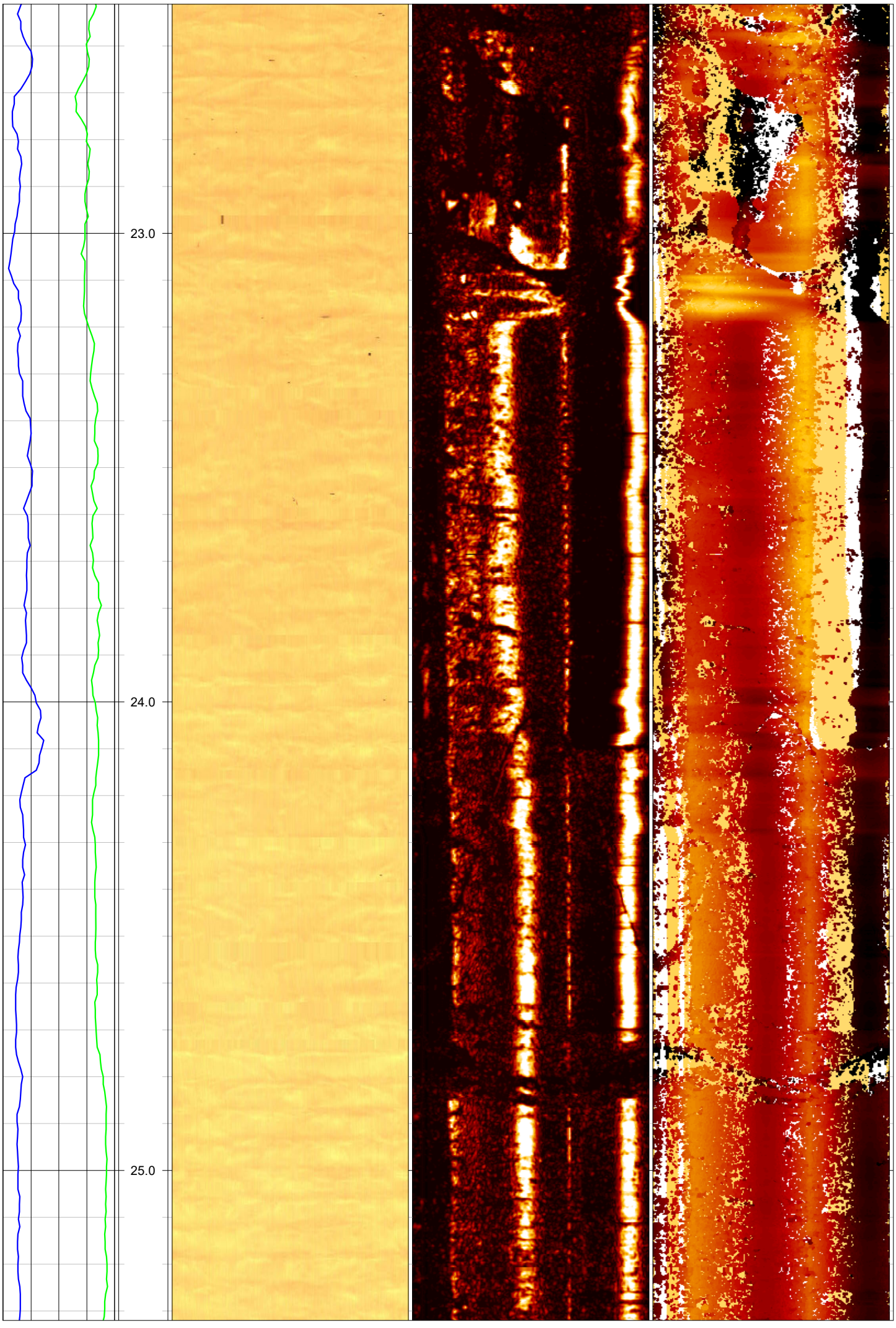
Type	Size: (mm)	From: (m)	To: (m)
150	**Steel**	**-0.7**	**13.2**

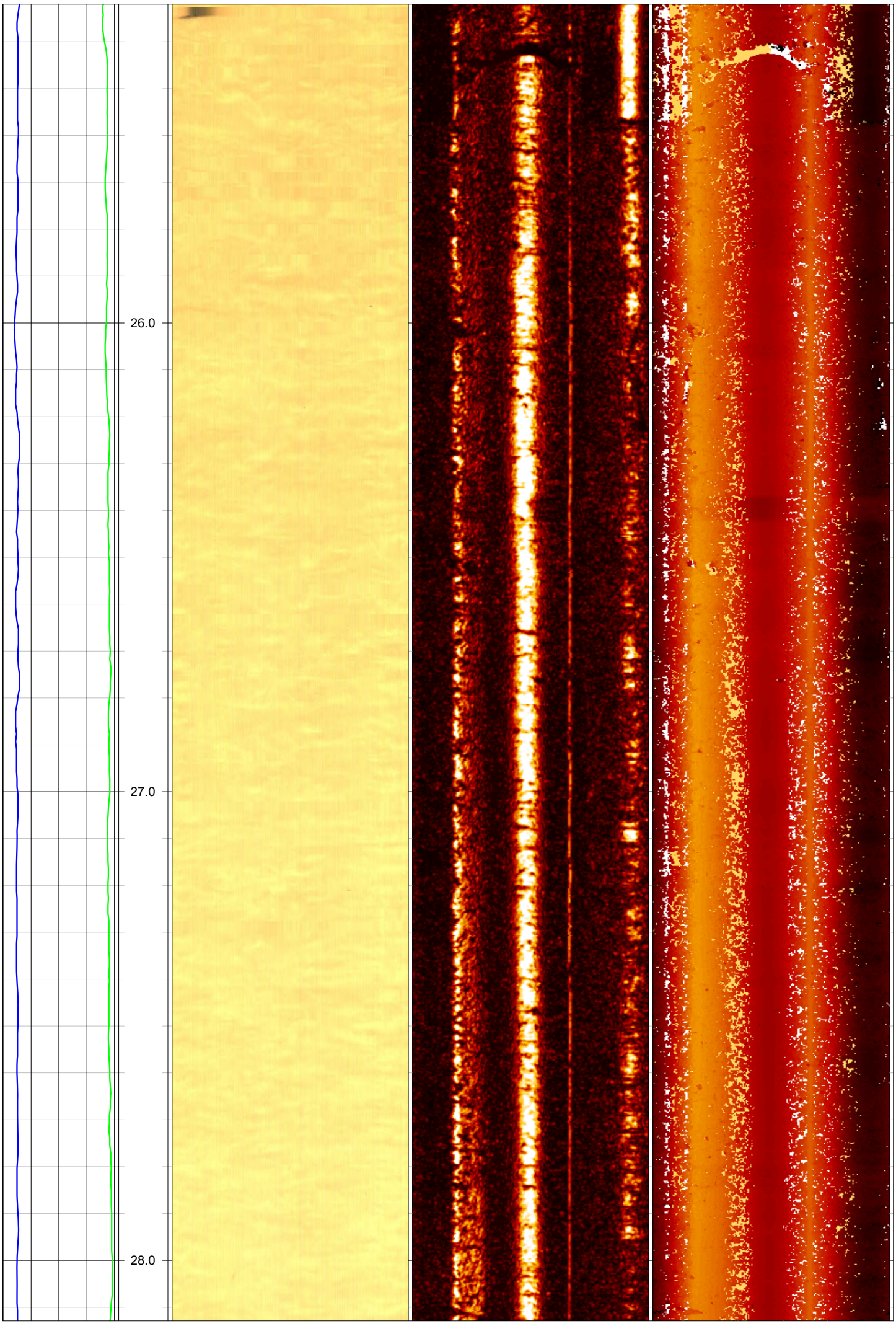


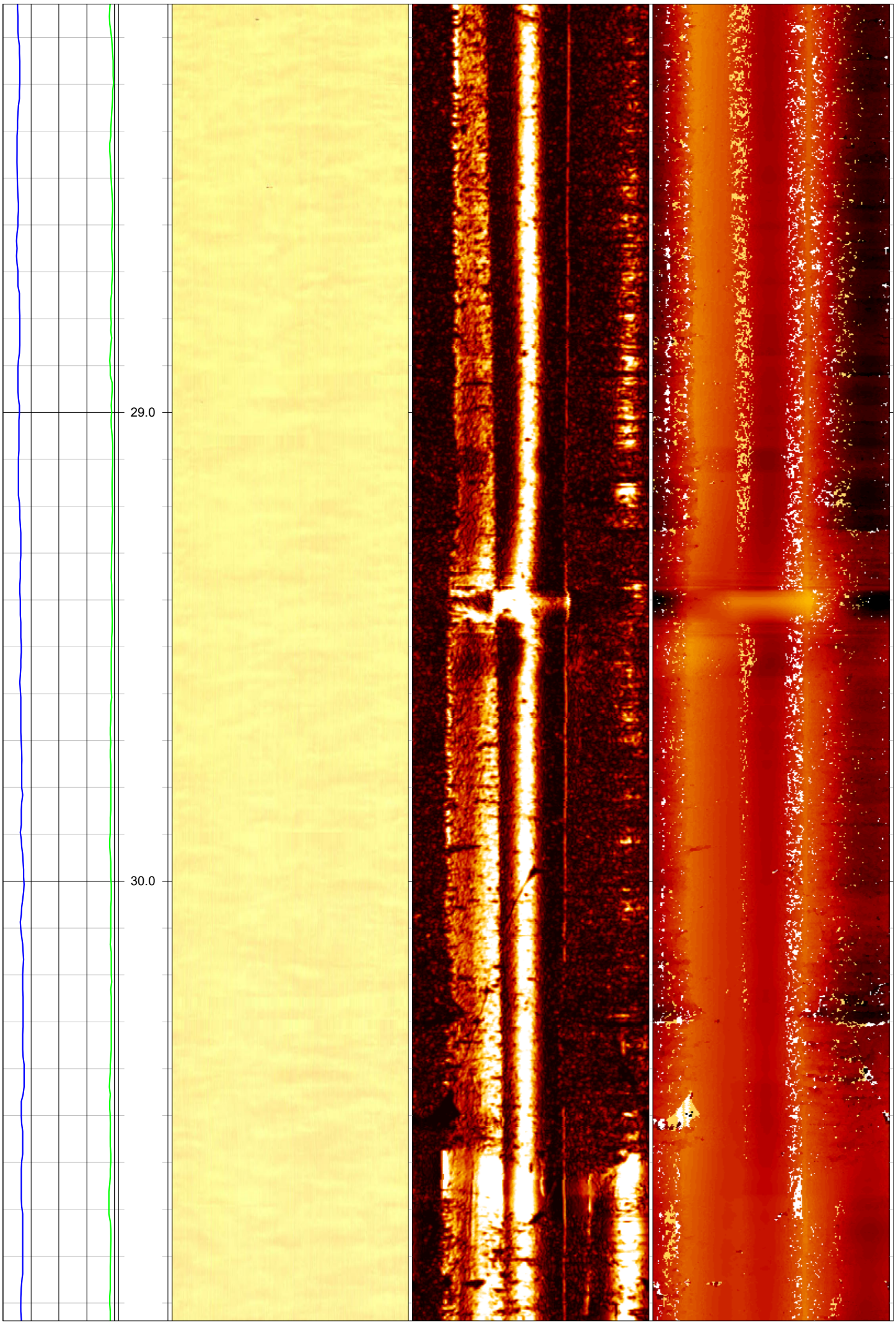

15.0
16.0

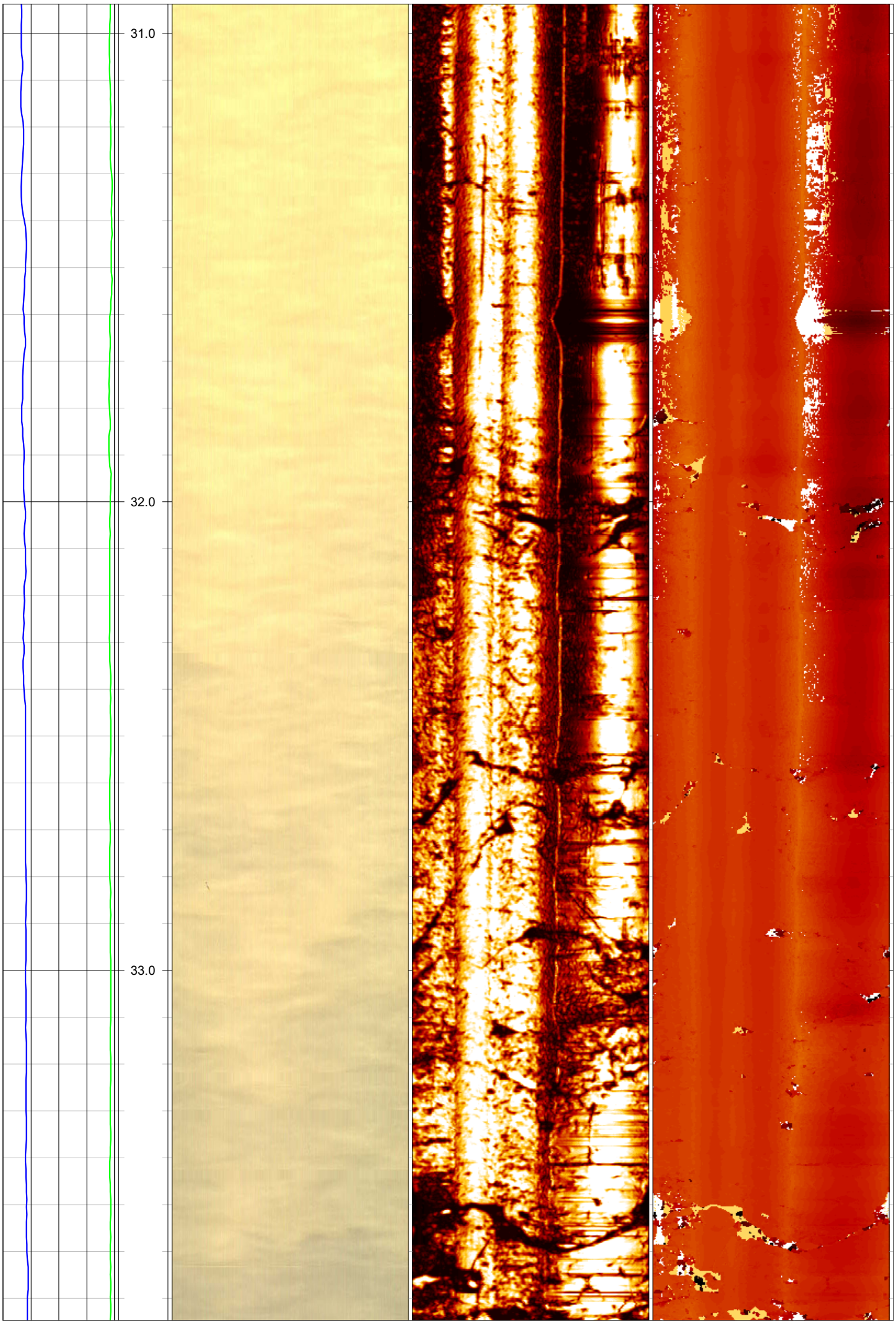

17.0
18.0
19.0

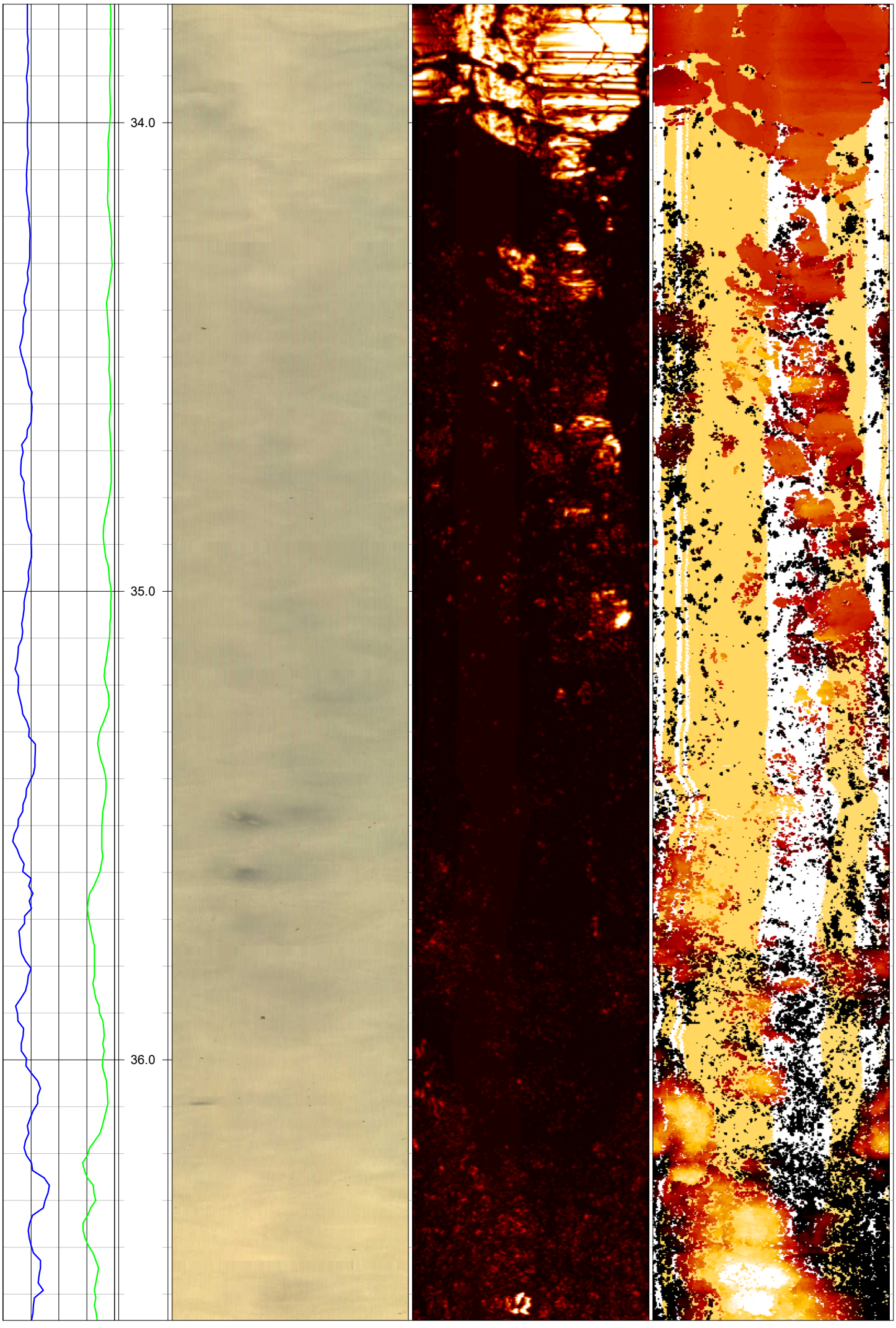

20.0
21.0
22.0

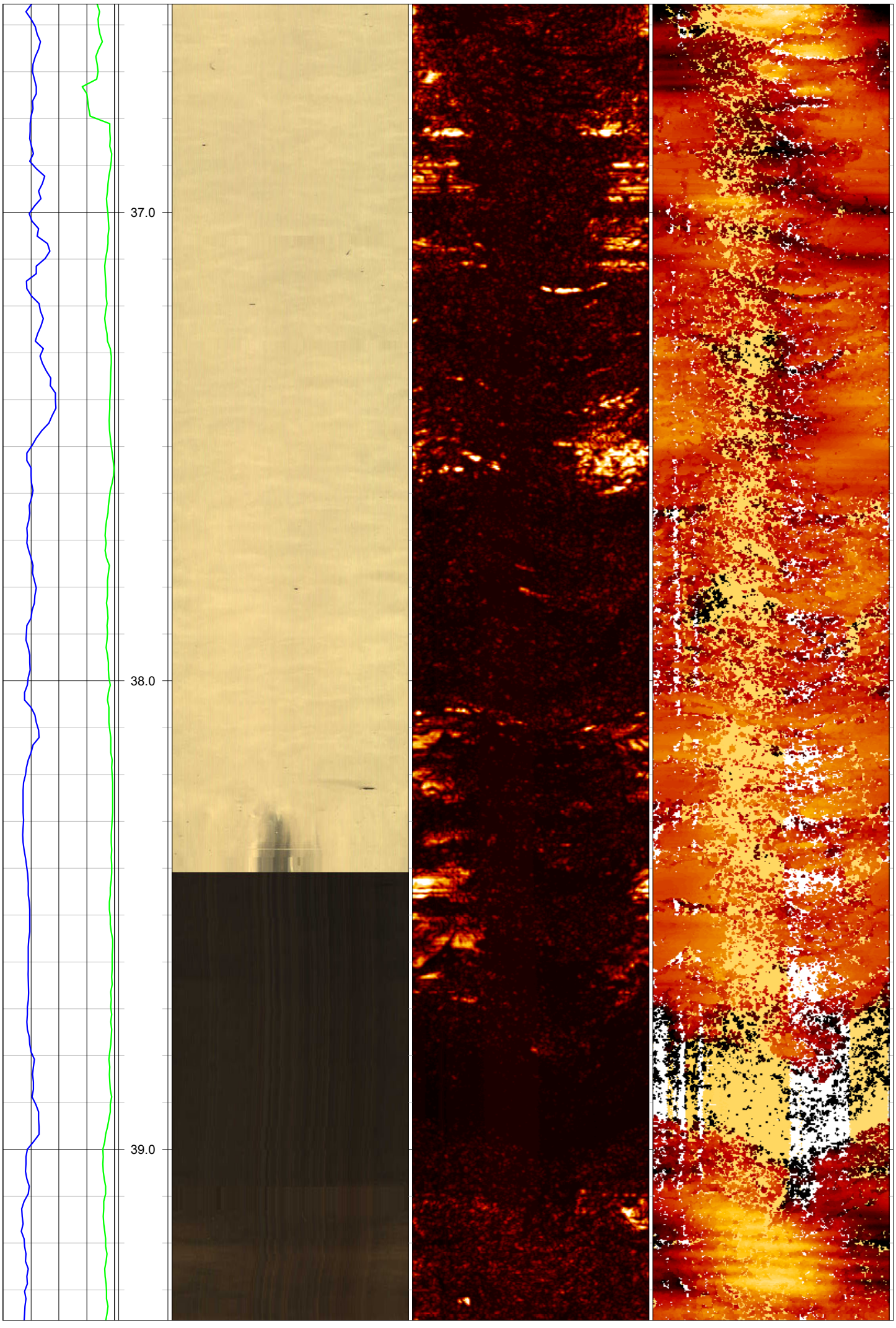

23.0
24.0
25.0

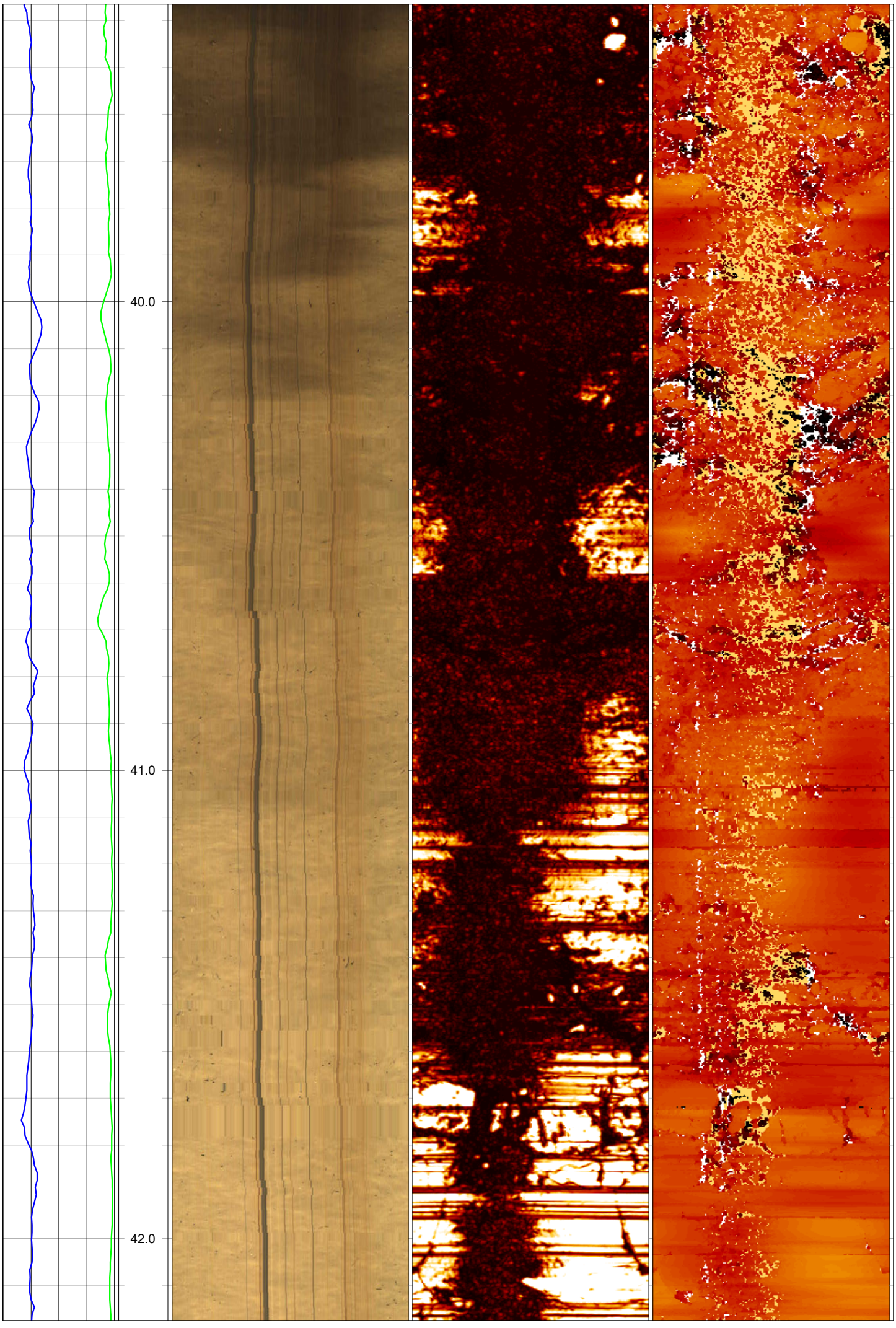

26.0
27.0
28.0

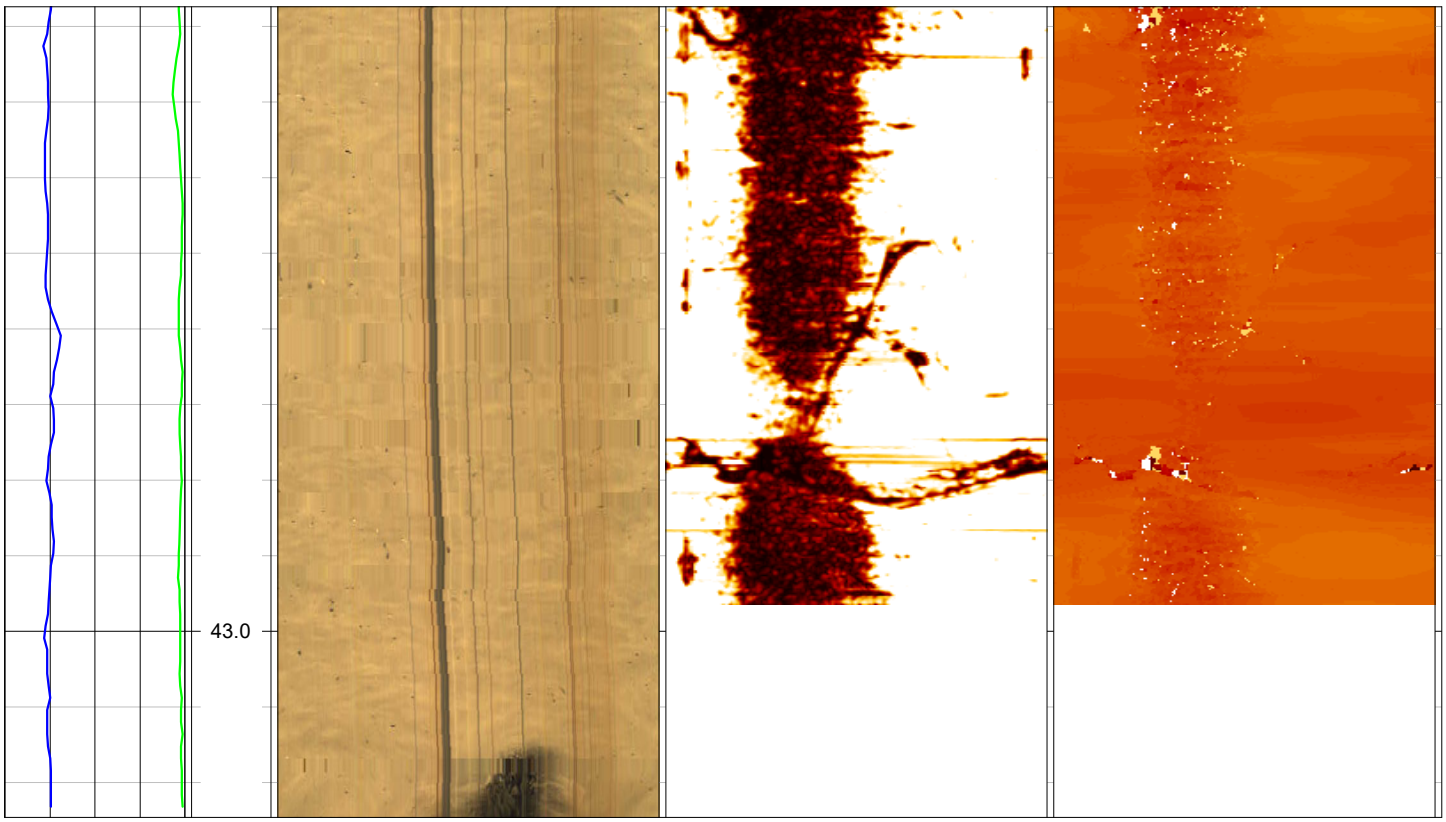

29.0
30.0


31.0
32.0
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37.0
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42.0


43.0

EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Borehole: **BH22/6A**

Log Type: ***Comp_FIELD***

Location: **Etihad** Area: **Manchester** Grid Ref: Elevation:

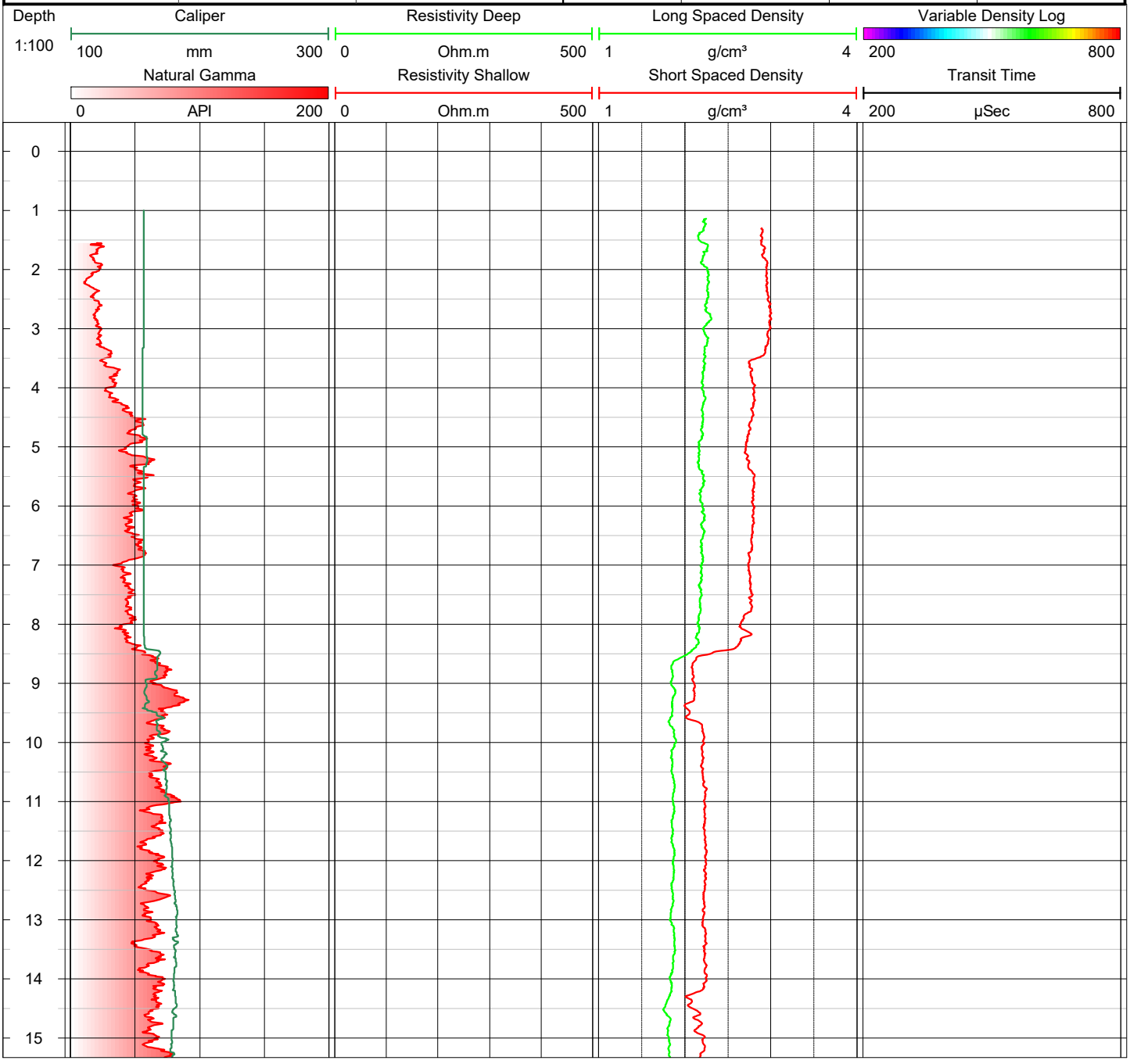
Drilled Depth: (m)	**59.0**	Date:	**13.12.22**
Logged Depth: (m)	**58.0**	Recorded By:	**C. Clinton**
Logging Datum:	**Ground Level**	Remarks:	
Logged Interval: (m)	**2.0 - 58.0**		
Fluid Level: (m)	**20.2**		

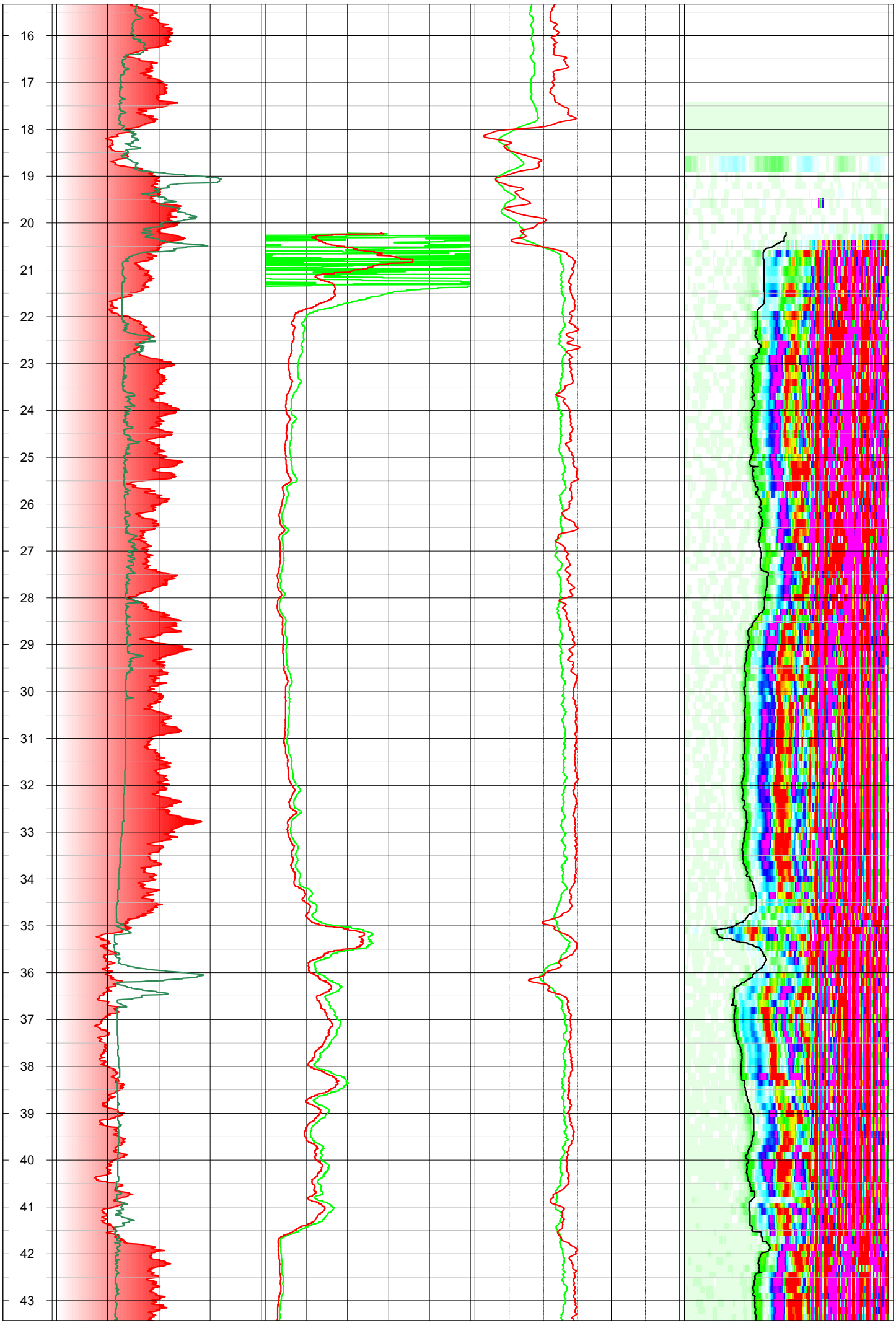
BOREHOLE RECORD

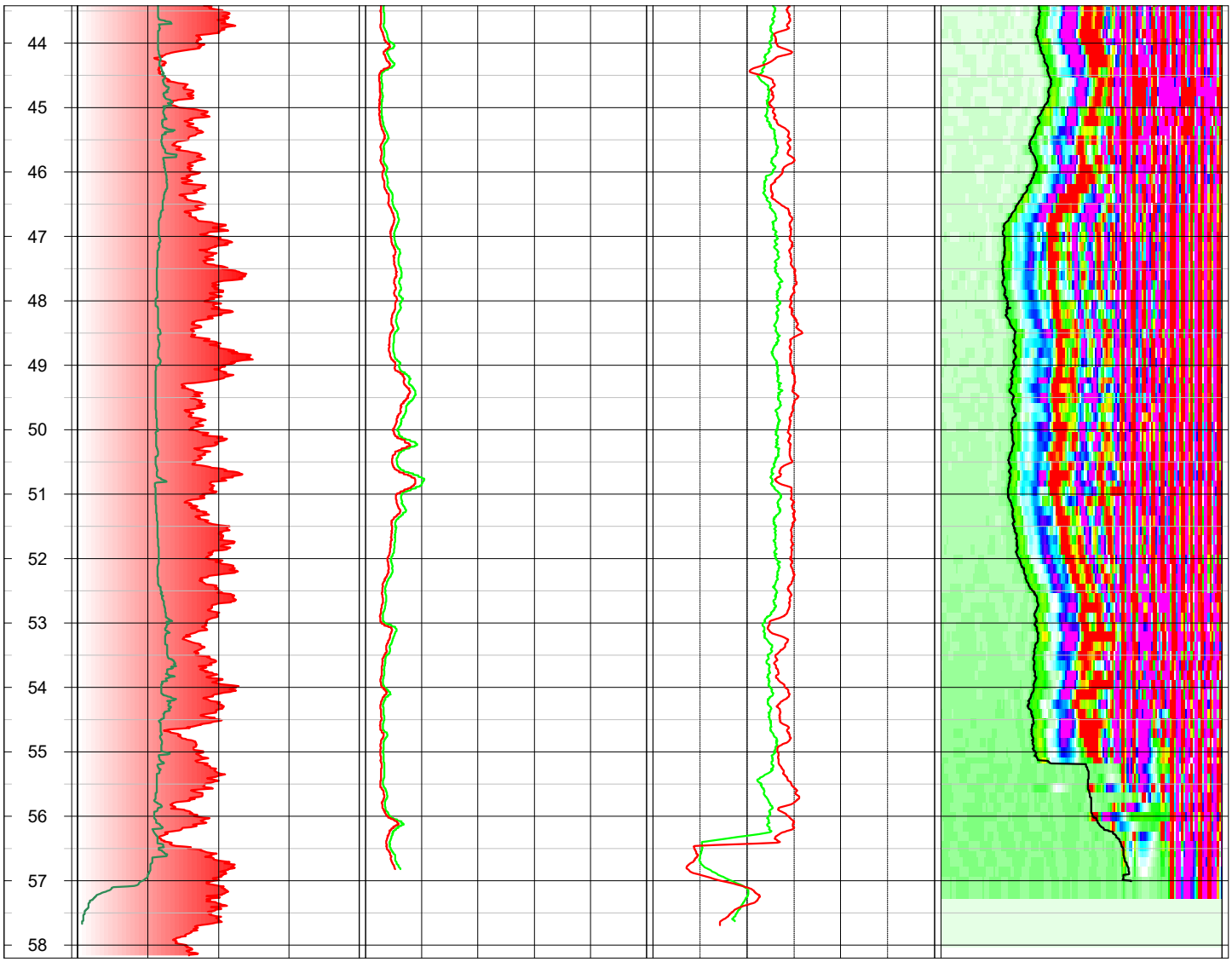
Bit: (mm)	From: (m)	To: (m)
150	**8.4**	**57.4**

CASING RECORD

Type	Size: (mm)	From: (m)	To: (m)
150	**Steel**	**0.0**	**8.4**




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58

EUROPEAN GEOPHYSICAL SERVICES LTD

Client: **Geotechnical Engineering**

Borehole: **BH22/6A**

Log Type: ***Image_FIELD***

Location: **Etihad** Area: **Manchester** Grid Ref: Elevation:

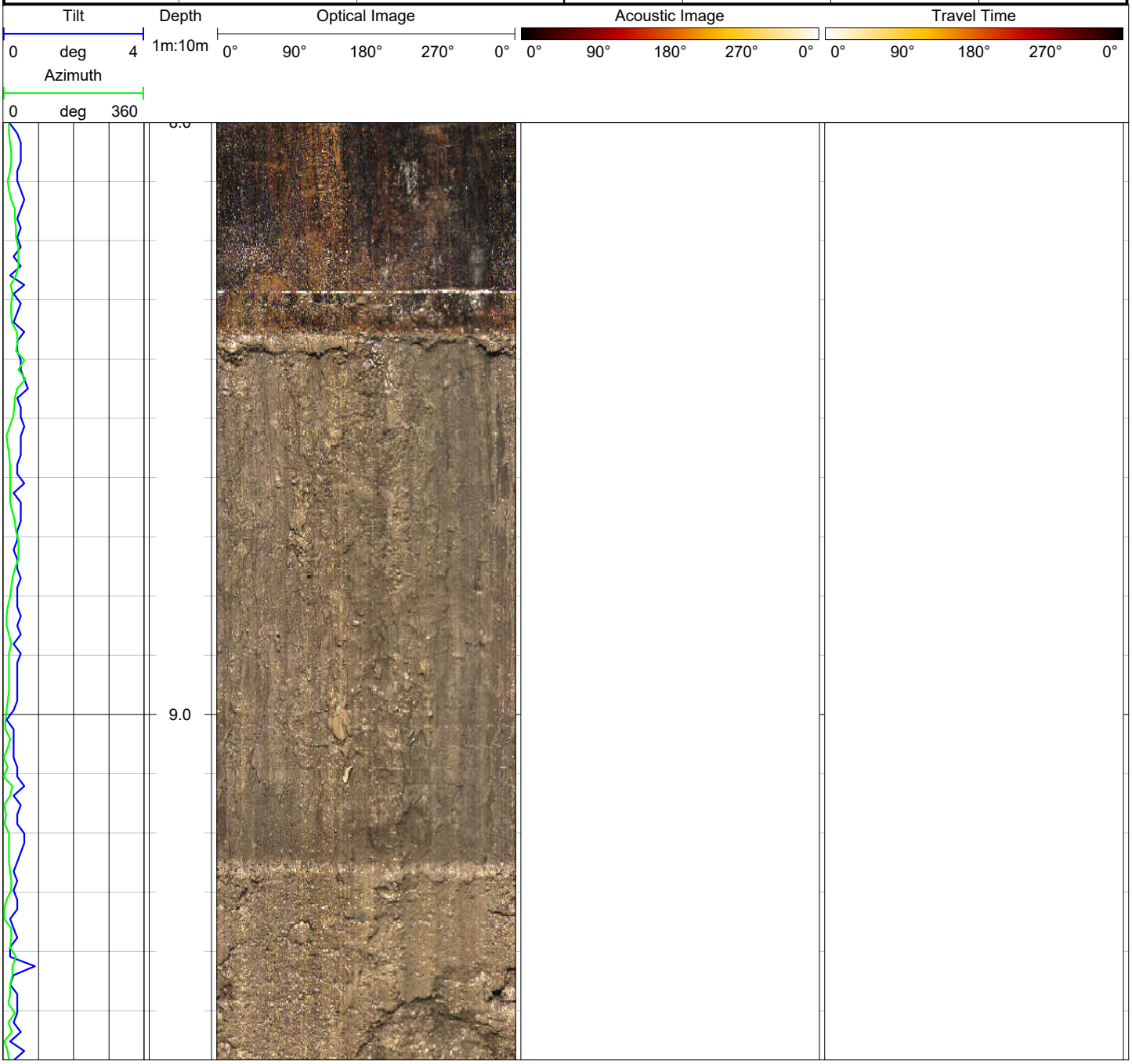
Drilled Depth: (m)	**59.0**	Date:	**13.12.22**
Logged Depth: (m)	**58.0**	Recorded By:	**C. Clinton**
Logging Datum:	**Ground Level**	Remarks:	
Logged Interval: (m)	**8.4 - 57.4**		
Fluid Level: (m)	**20.2**		

BOREHOLE RECORD

Bit: (mm)	From: (m)	To: (m)
150	**8.4**	**57.4**

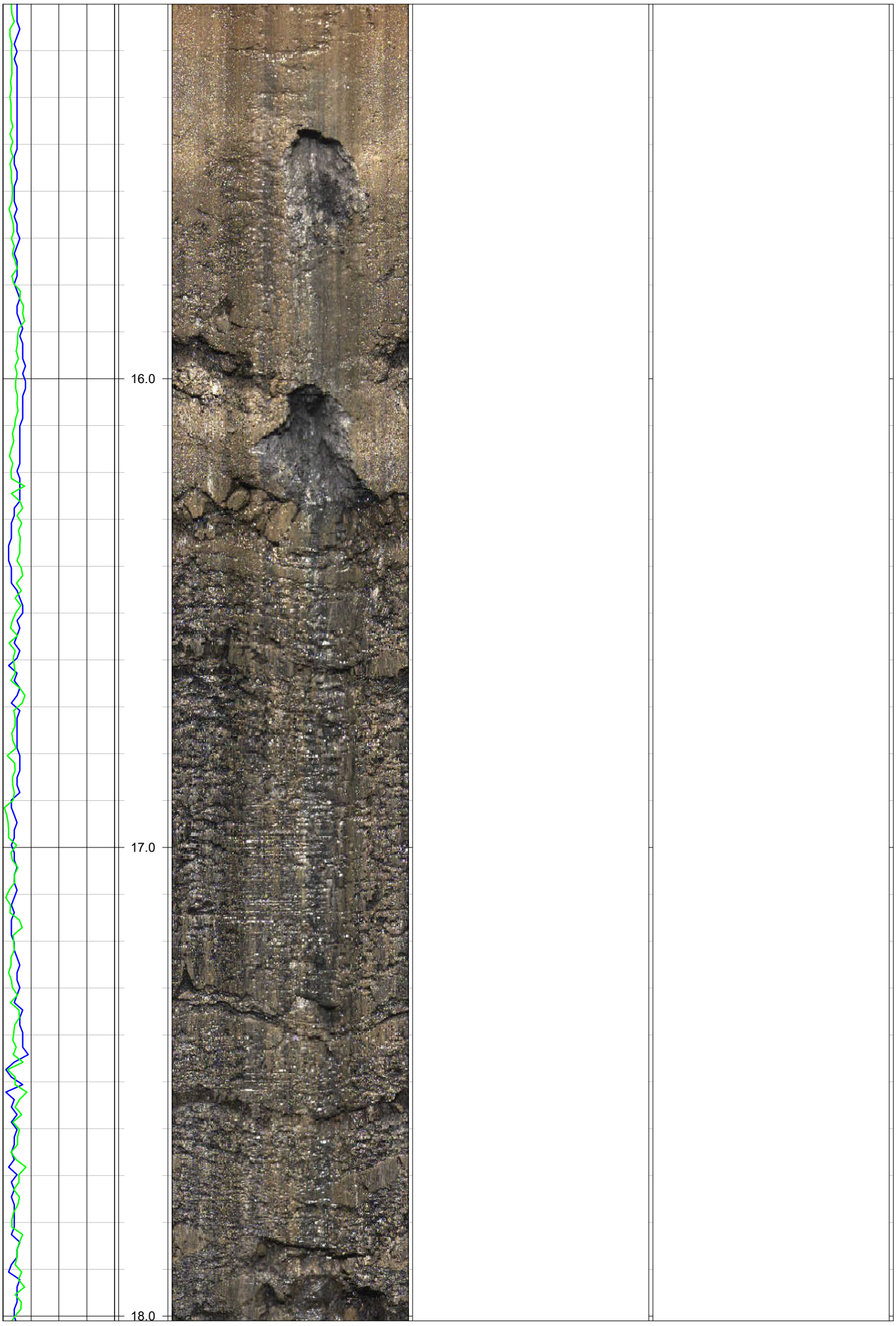
CASING RECORD

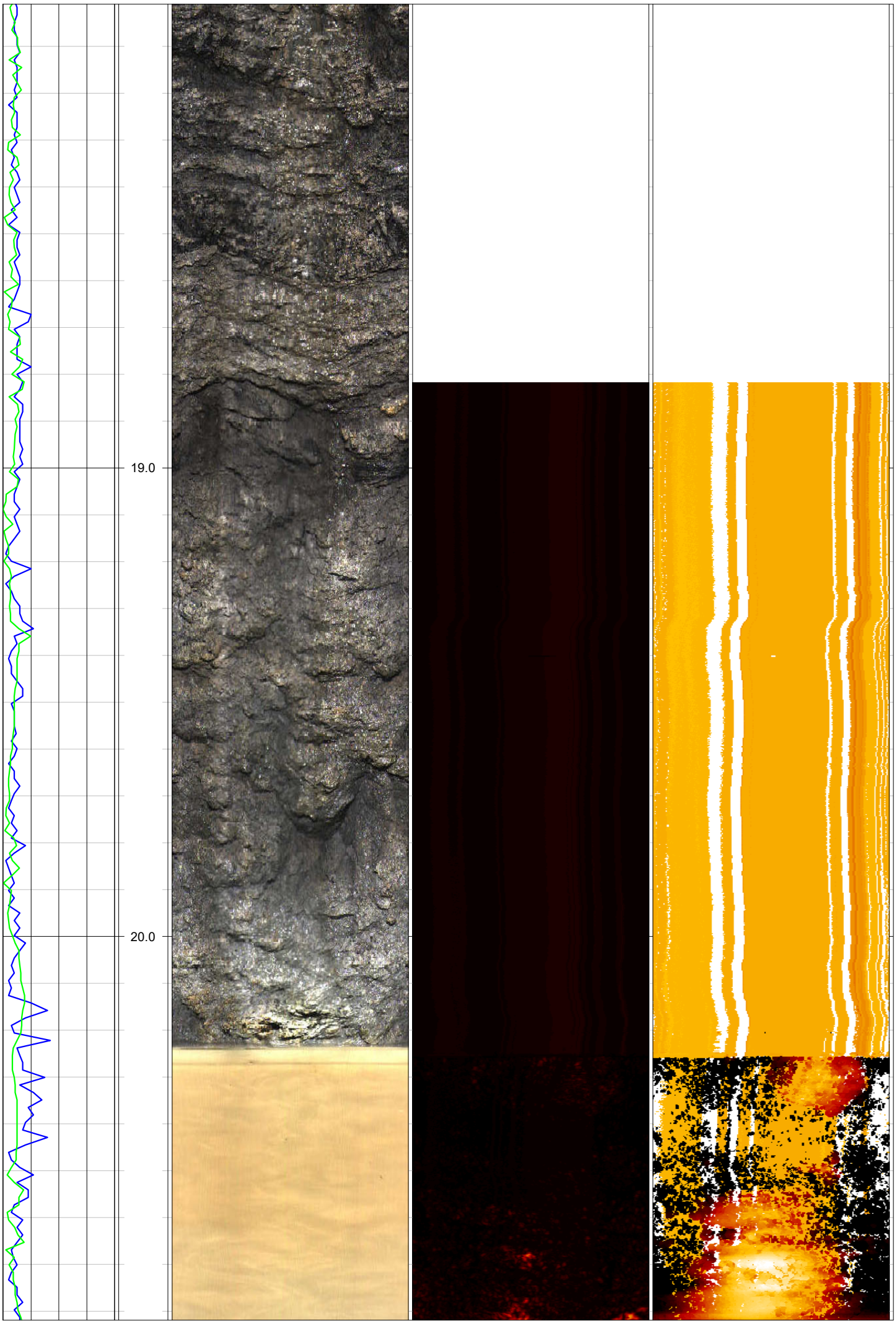
Type	Size: (mm)	From: (m)	To: (m)
150	**Steel**	**0.0**	**8.4**

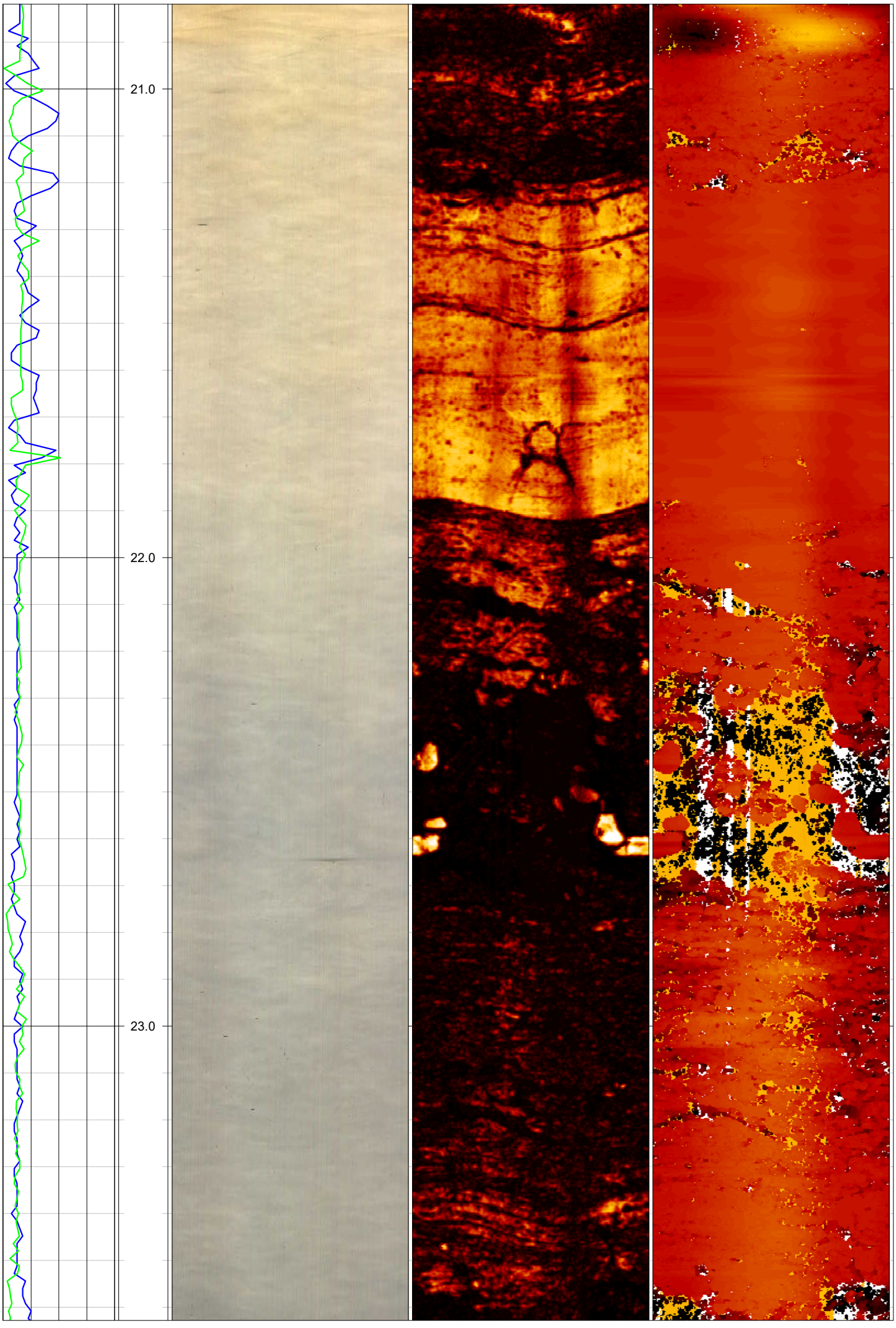


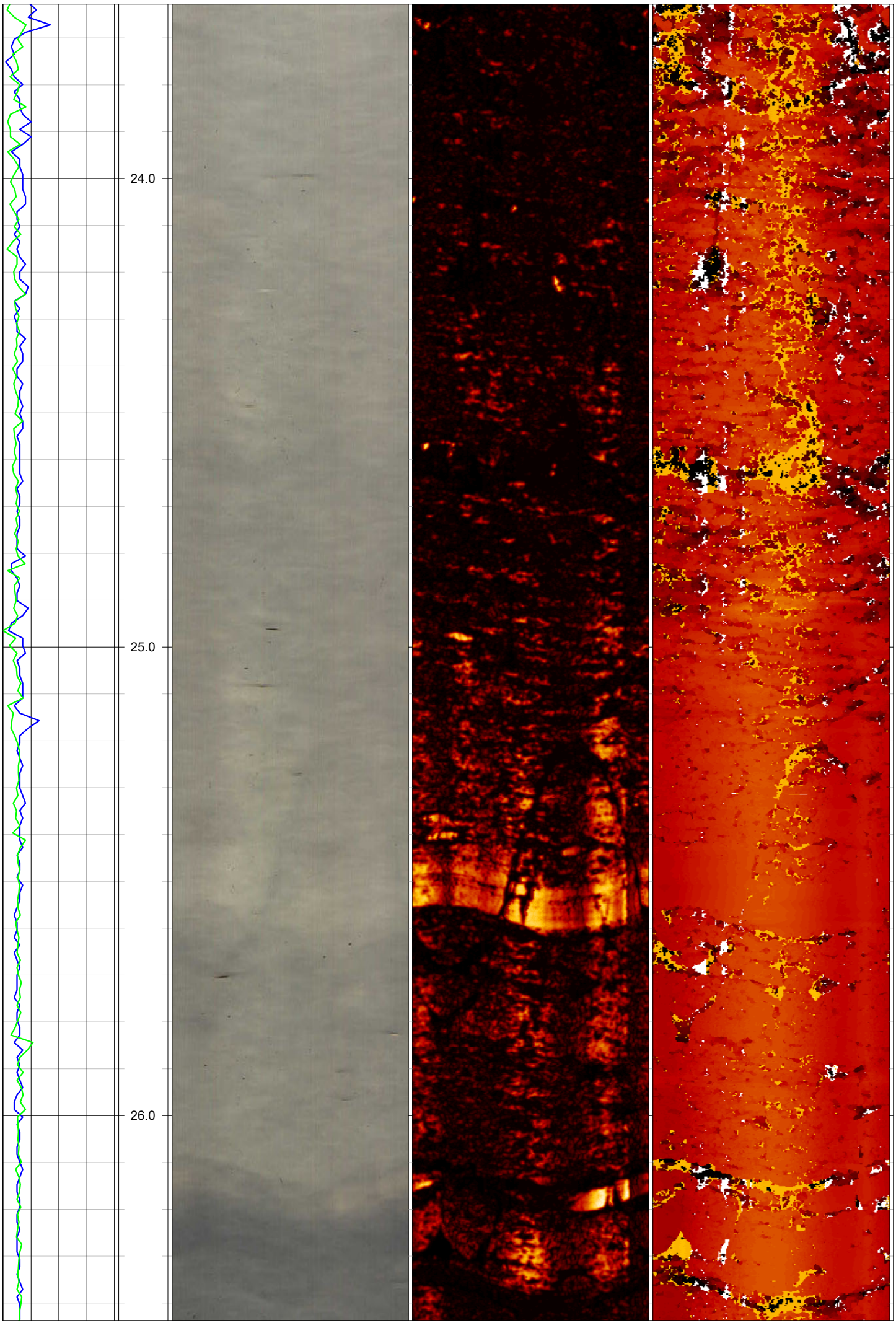

10.0
11.0
12.0

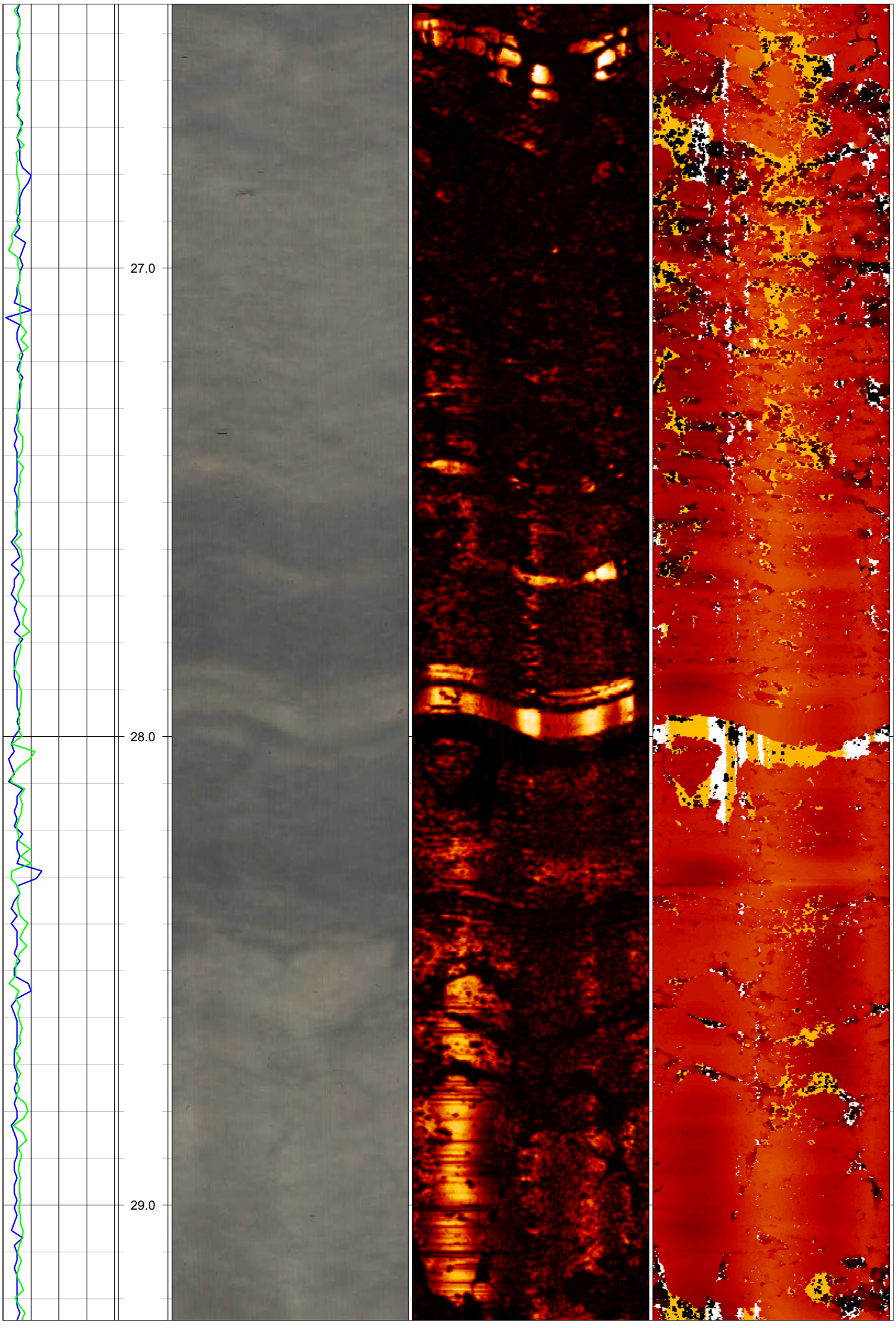

13.0
14.0
15.0

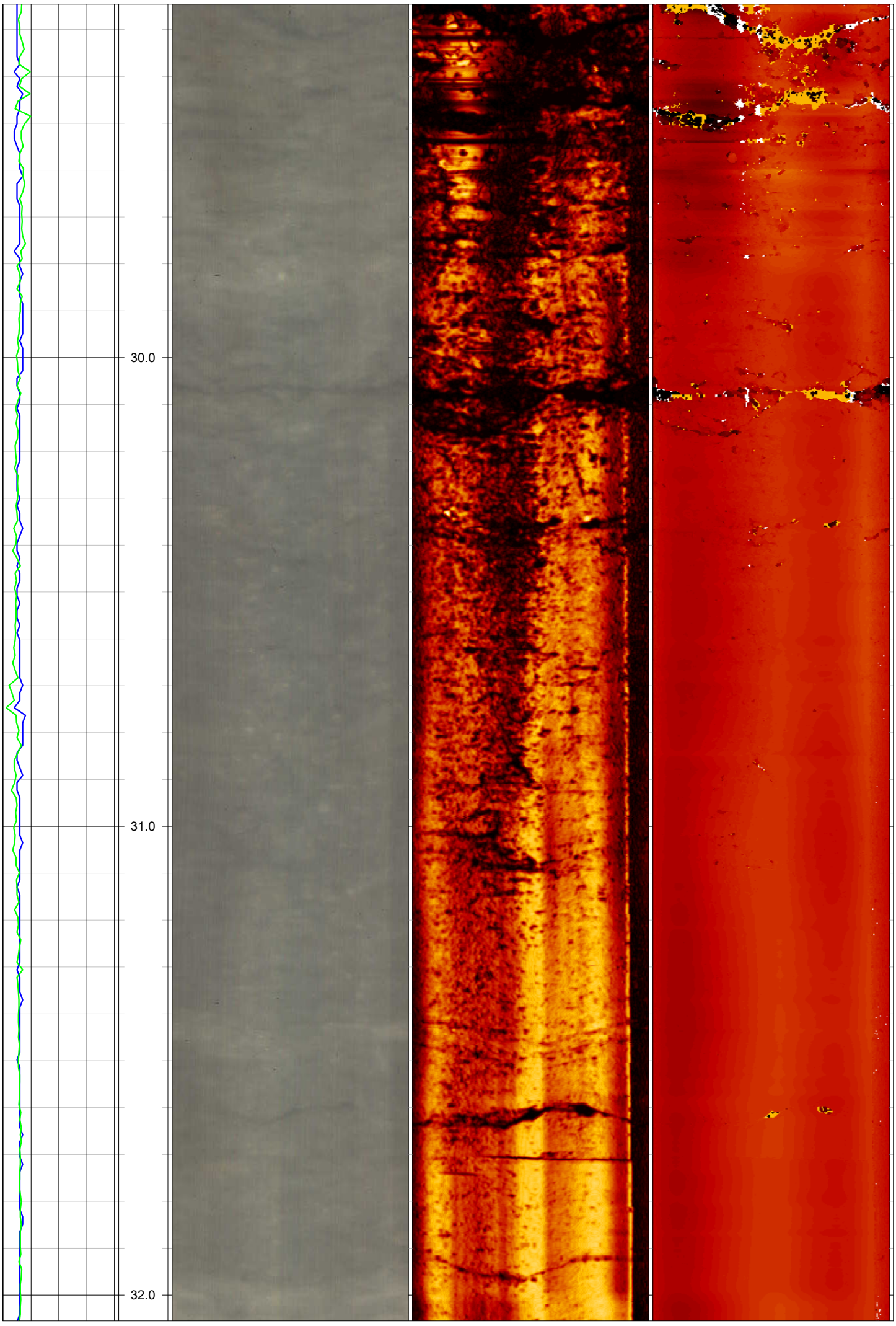

16.0
17.0
18.0

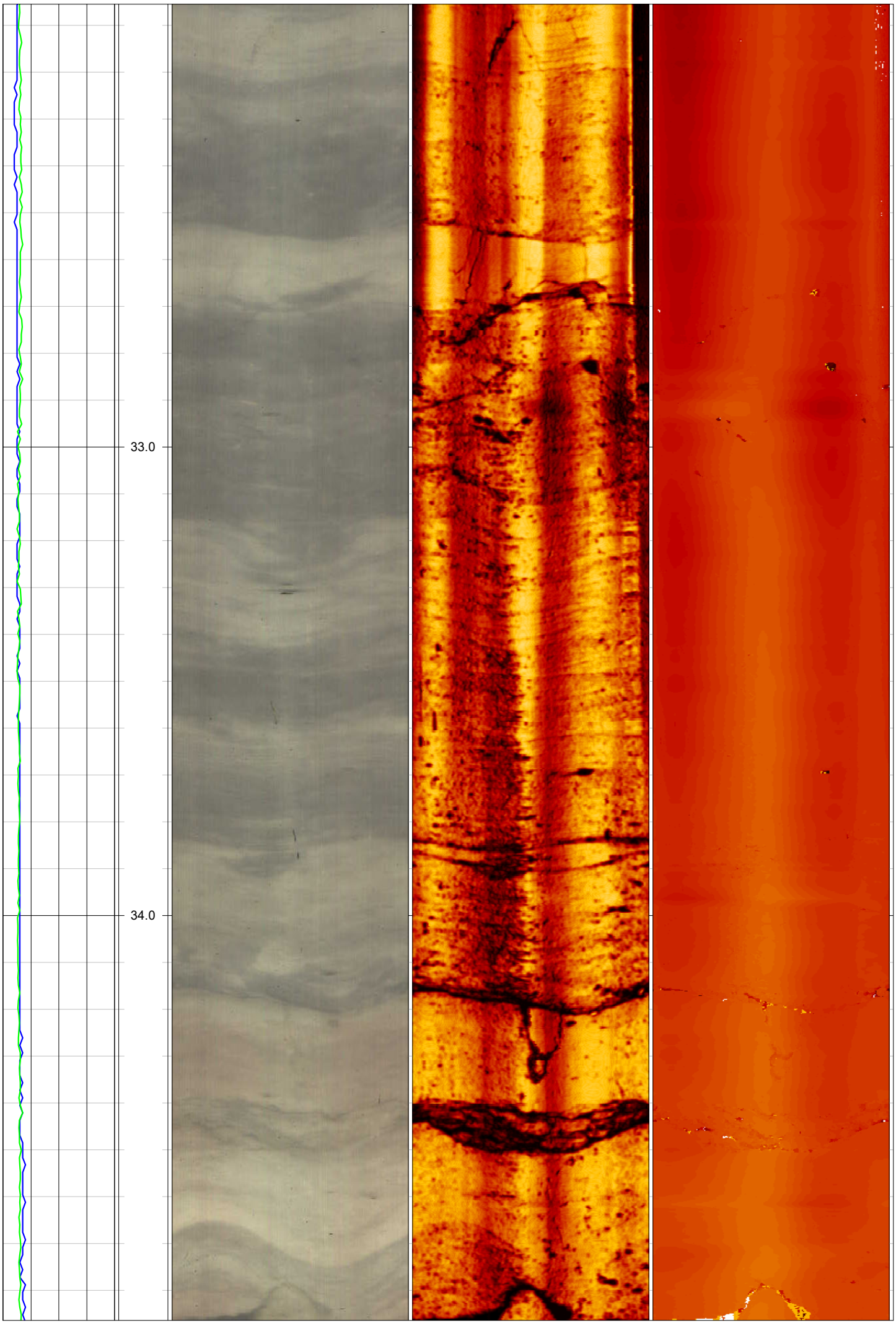

19.0
20.0

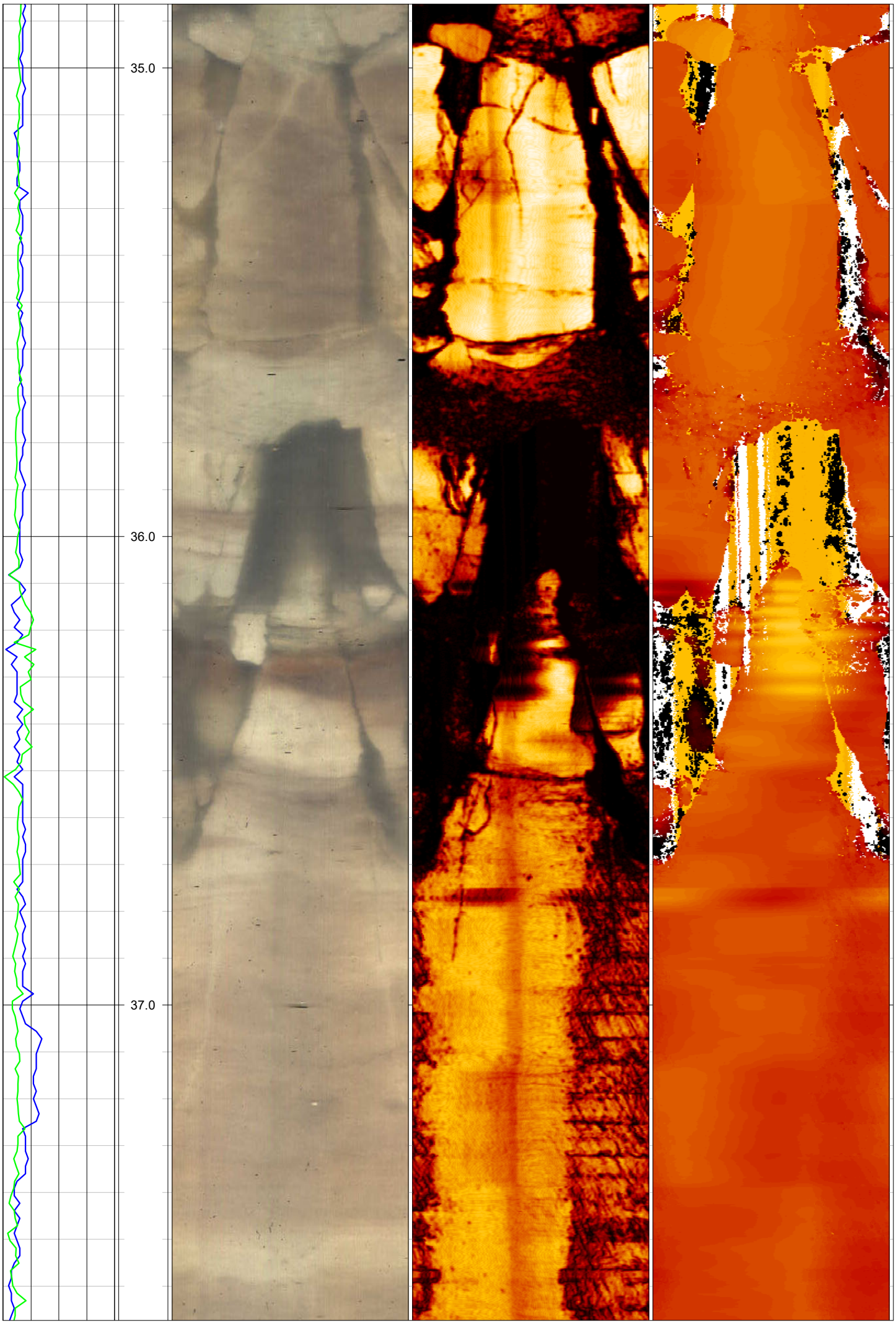

21.0
22.0
23.0

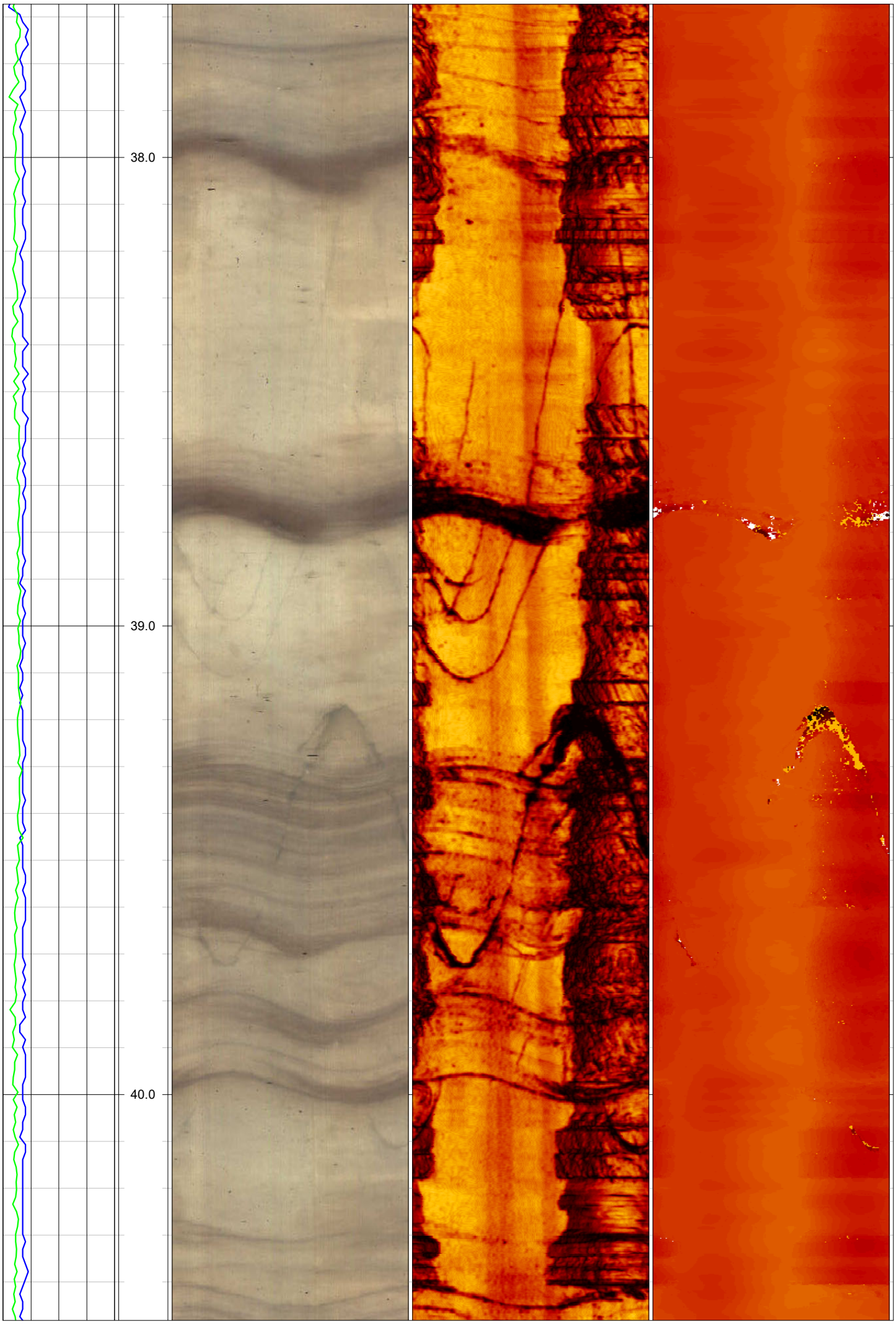

24.0
25.0
26.0

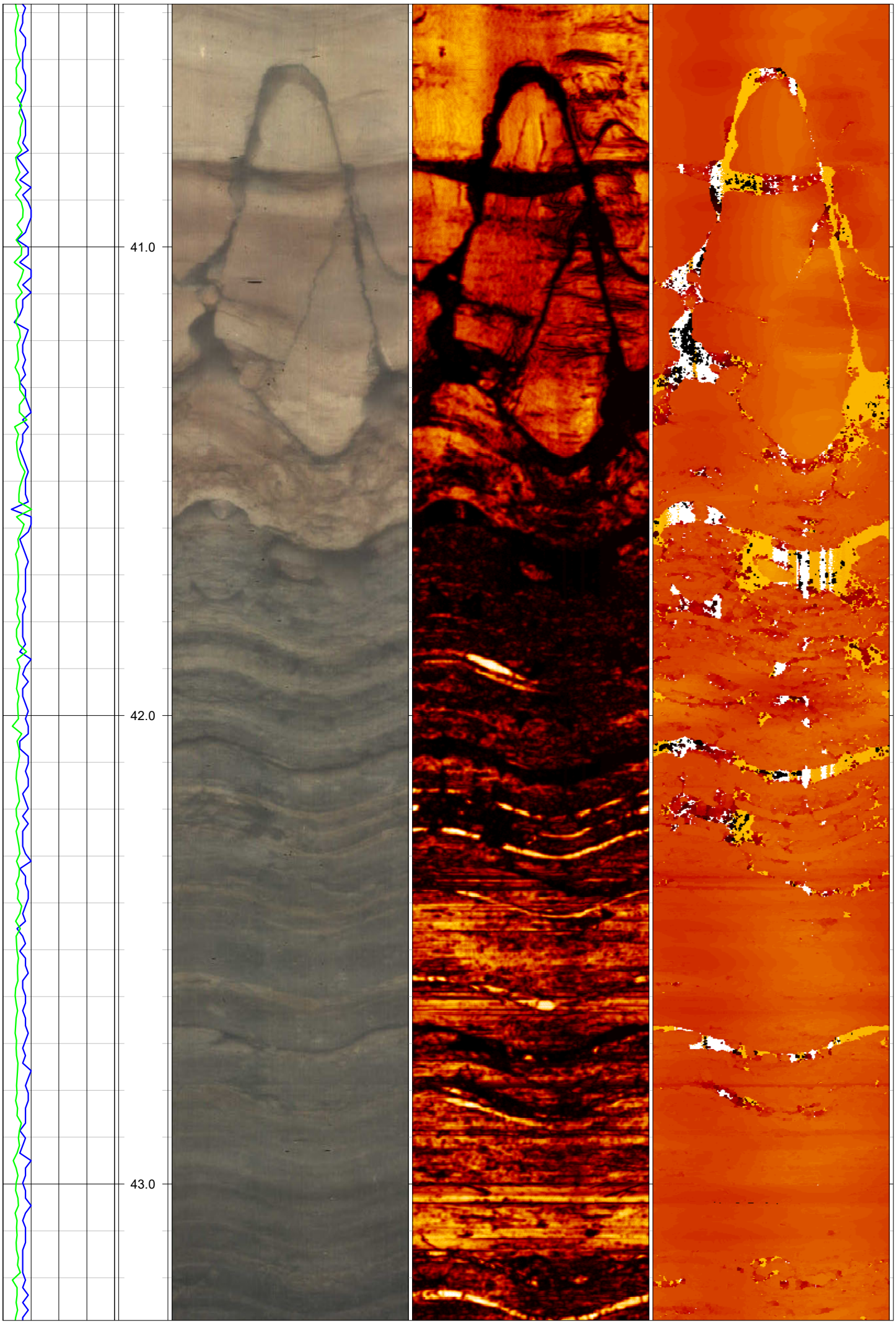

27.0
28.0
29.0

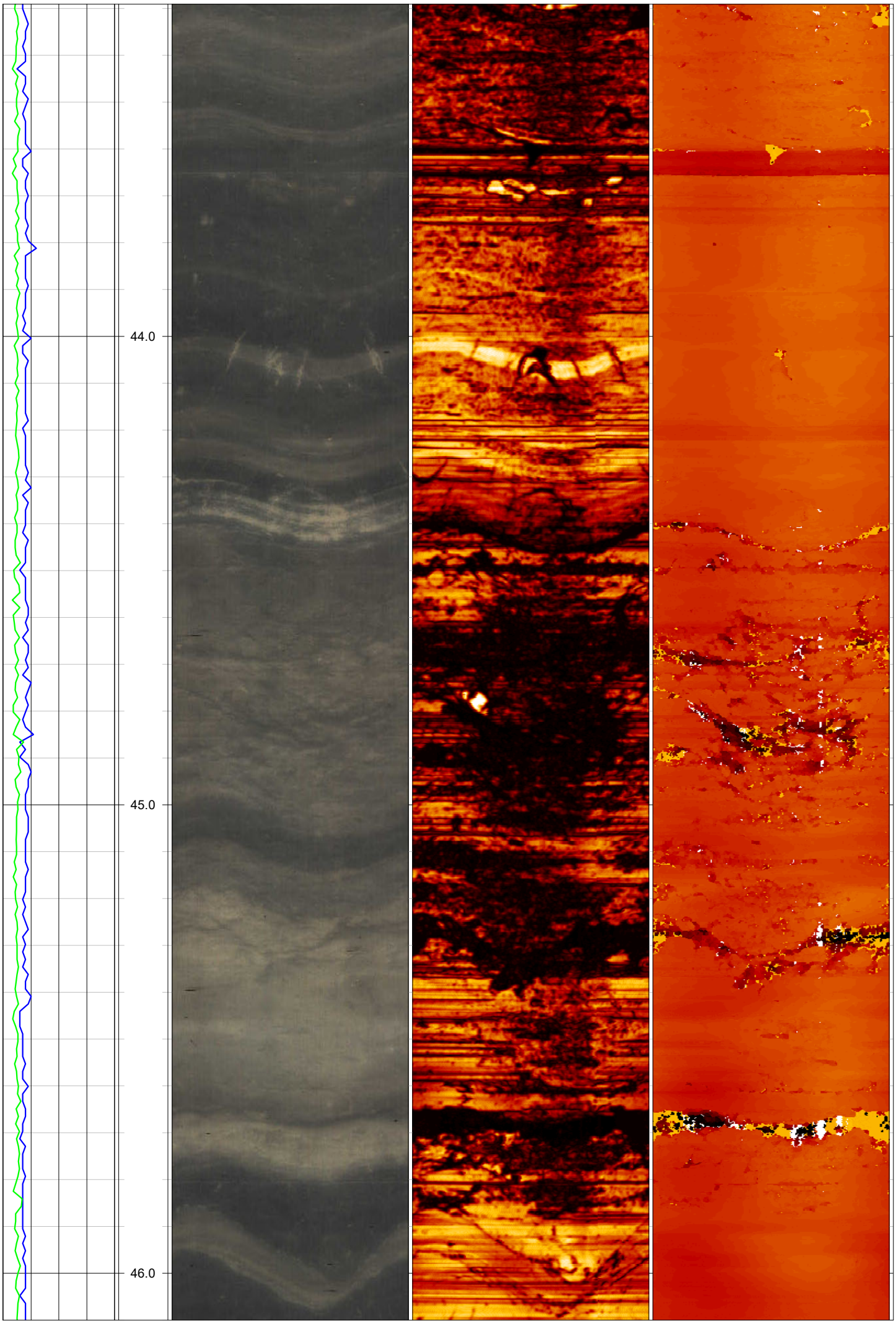

30.0
31.0
32.0

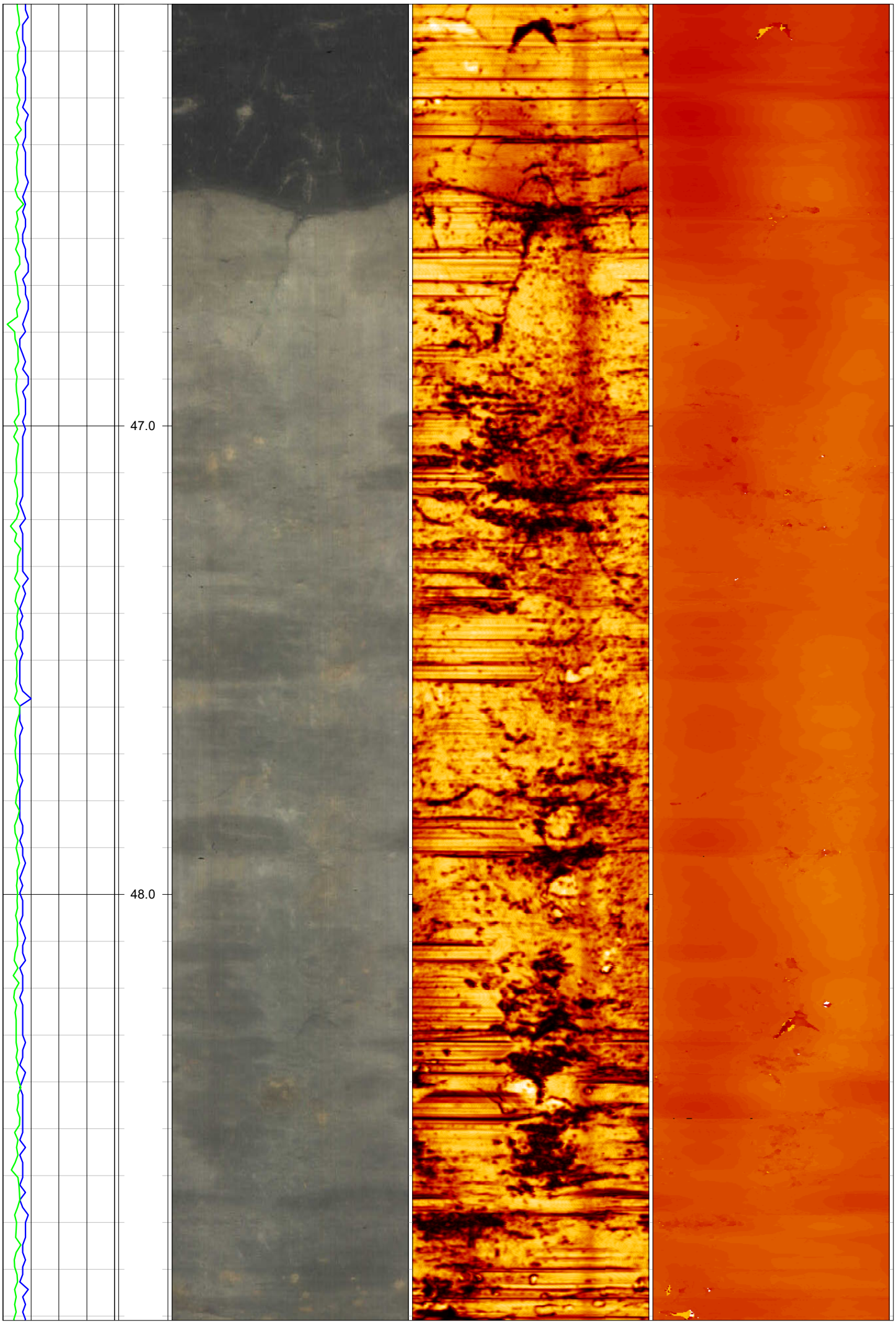

33.0
34.0

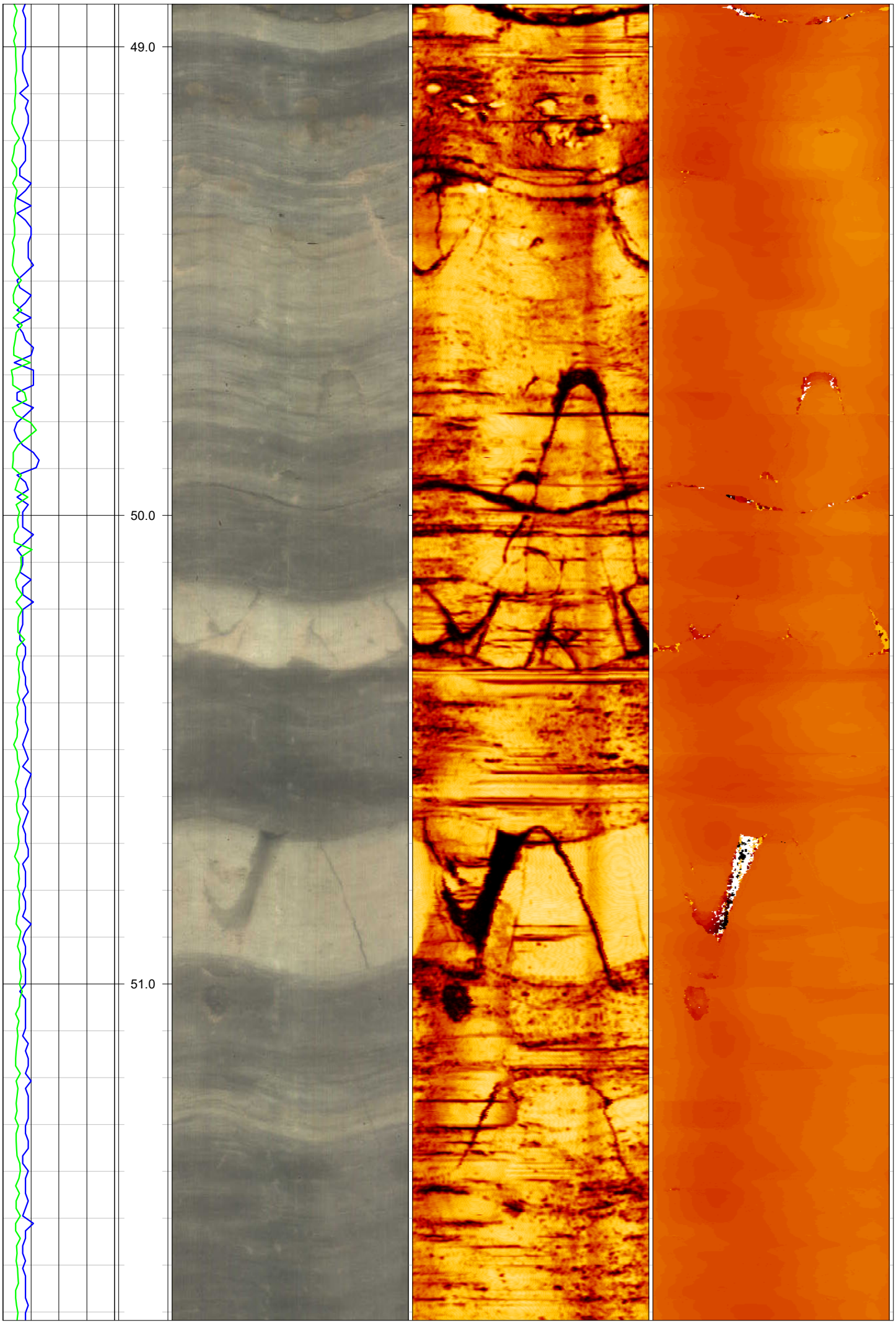

35.0
36.0
37.0

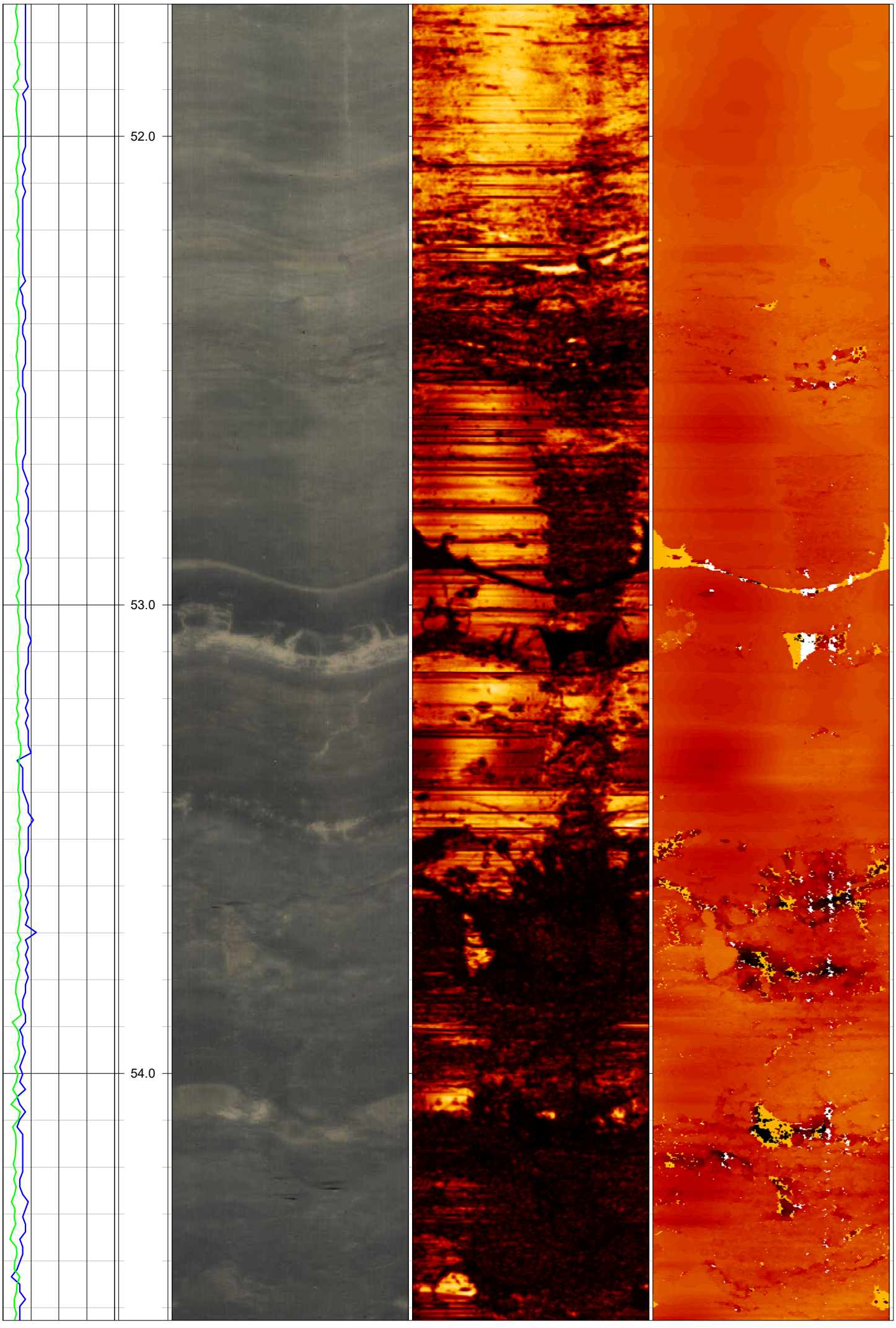

38.0
39.0
40.0

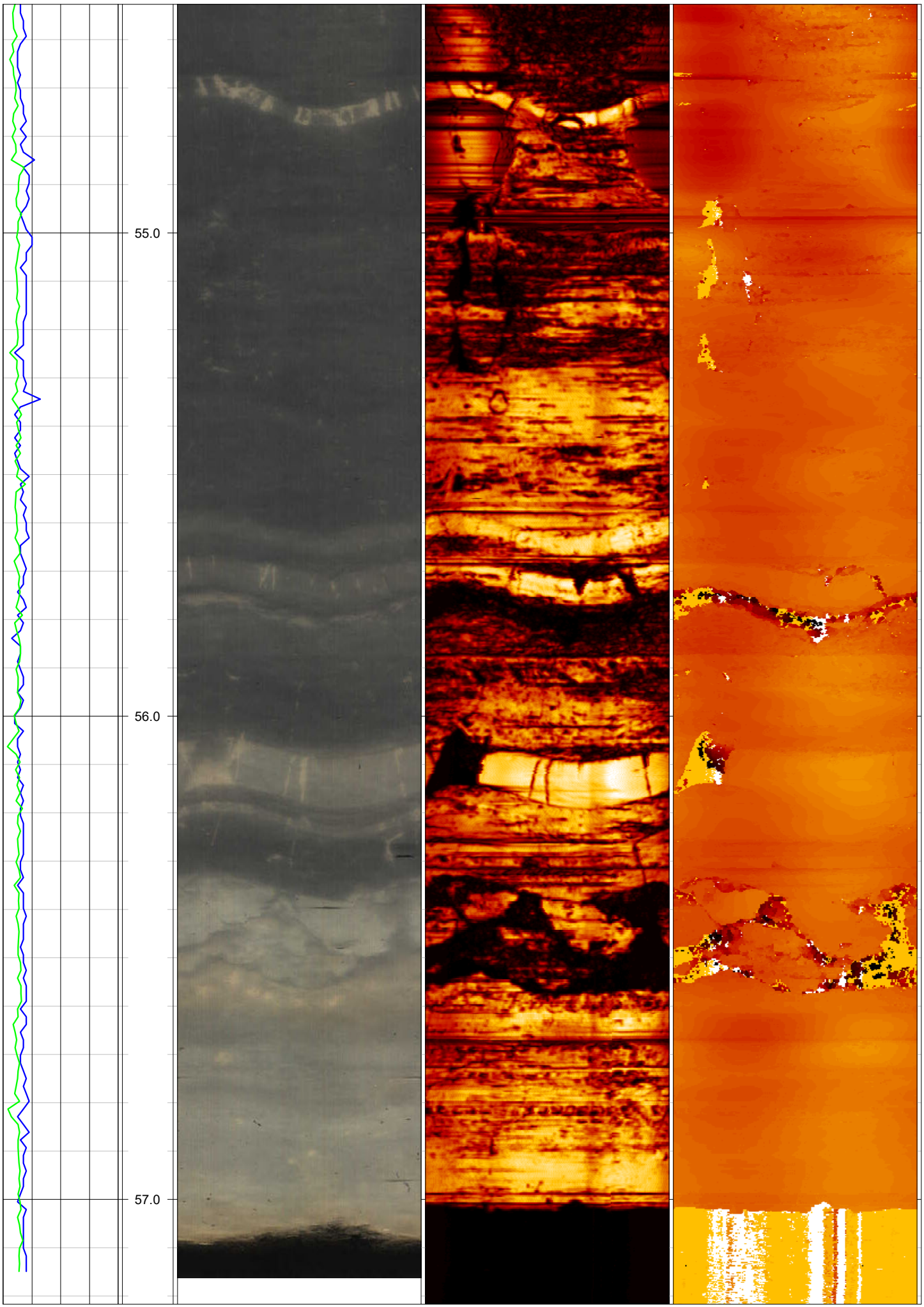

41.0
42.0
43.0


44.0
45.0
46.0


47.0
48.0


49.0
50.0
51.0

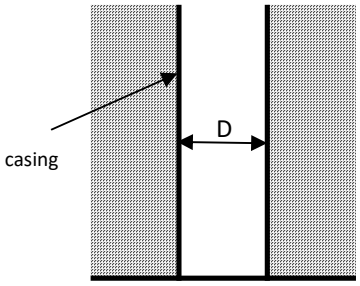

52.0
53.0
54.0


55.0
56.0
57.0

Geotechnical Engineering Limited

PERMEABILITY TEST - INTAKE FACTORS

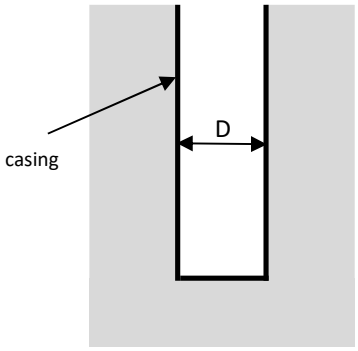
A



$F=2D$

Soil flush with bottom at impervious boundary

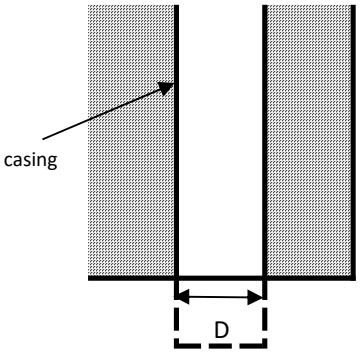
B



$F=2.75D$

Soil flush with bottom in uniform soil

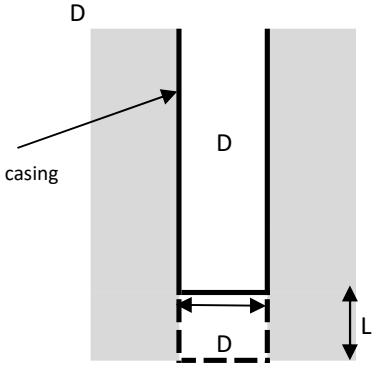
C



$$F=\frac{2\pi L}{\ln\left[\frac{2L}{D}+\sqrt{1+\left(\frac{(2L)^2}{D}\right)}\right]}$$

Well point or hole extended at impervious boundary

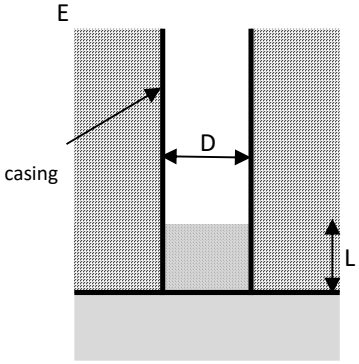
D



$$F=\frac{2\pi L}{\ln\left[\frac{L}{D}+\sqrt{\left(1+(L/D)^2\right)}\right]}$$

Well point or hole extended in uniform soil

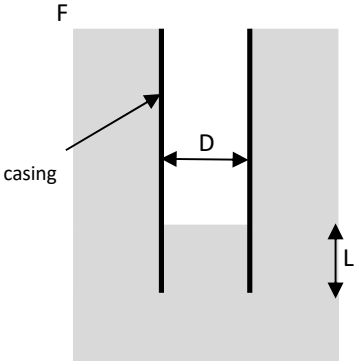
E



$$F=\frac{2D}{1+\left(\left(\frac{8}{\pi}\right)\left(\frac{L}{D}\right)\right)}$$

Soil in casing with bottom at impervious boundary

F



$$F=\frac{2.75D}{1+\left(\left(\frac{11}{\pi}\right)\left(\frac{L}{D}\right)\right)}$$

Soil in casing with bottom in uniform soil

REMARKS

Expressions come from Hvorlsev.

BS EN ISO 22282-2:2012 recommends the use of intake factors given above for the Hvorlsev method variable head test.

BS EN ISO 22282-2:2012 reports equation D as suitable for the Velocity method variable head test where $1.2 < L/D < 10$.

BS EN ISO 22282-2:2012 refers to a simpler version of Equation D for $L/D > 10$, however Equation D will still apply for $L/D > 10$.

Equation D may be used for tests using piezometer tips.

Cases A and B tend to measure the mean permeability of the soil; C and D the horizontal permeability; E and F the vertical permeability.

Where the horizontal permeability is much greater than the vertical, all tests tend to measure the former.

Geotechnical Engineering Limited

PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT CITY FOOTBALL GROUP LIMITED BOREHOLE **BH22/04**

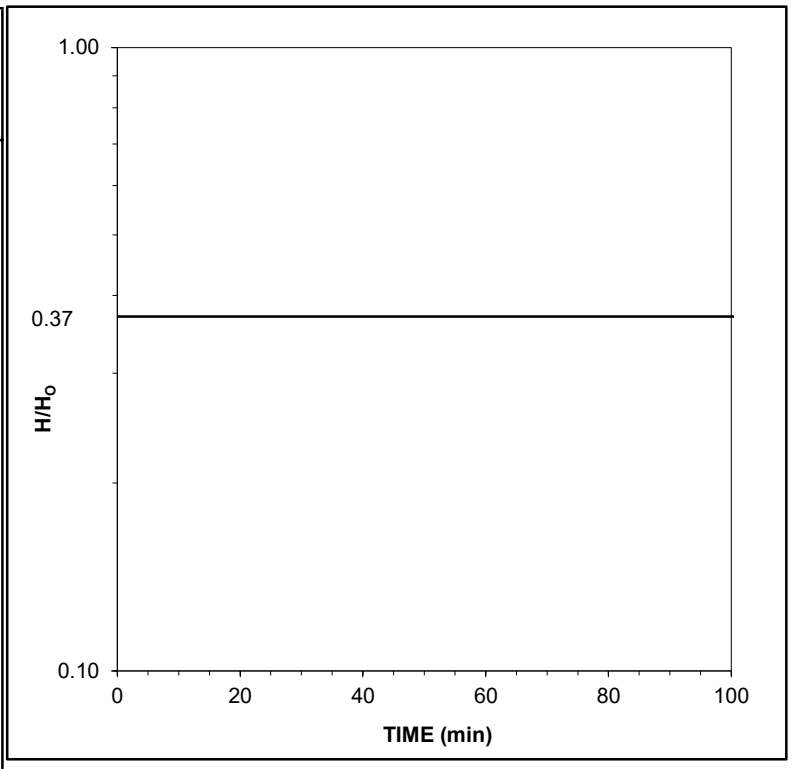
SITE ETIHAD GROUND INVESTIGATION

DEPTH RECORD

BASE OF FILTER	40.00 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	30.00 m	DIAMETER OF ACCESS TUBE	0.04 m
TEST INTERVAL	10.00 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	RISING
DEPTH TO STANDING WATER BELOW DATUM	19.34 m	DATE	08/02/2023

TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H / H_O
0.50	19.34	0.00	



Hvorslev method $$k = \frac{A}{FT}$$

Velocity graph method $$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case* **D**

RESULTS

Hvorslev method		**Velocity graph method**		
Cross sectional area of access tube, A	**0.0010** m^2	Cross sectional area of access tube, A		**0.0010** m^2
Intake factor*, F	**12.771** m	Intake factor*, F		**12.771** m
Time lag, T	**0** s	Variable head, H_1	**0.00** m at time, t_1	**0** s
		Variable head, H_2	**0.00** m at time, t_2	**0** s
Permeability, k	**-- ms^{-1}**	**Permeability, k**		**-- ms^{-1}**

REMARKS

Test Operator: MN

70L water removed by surging over 25 minutes, no head developed.

Permeability could not be calculated.

* See intake factors key sheet

CONTRACT	CHECKED
37349	**JH**

MNTH

Geotechnical Engineering Limited

PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT CITY FOOTBALL GROUP LIMITED BOREHOLE **BH22/04**

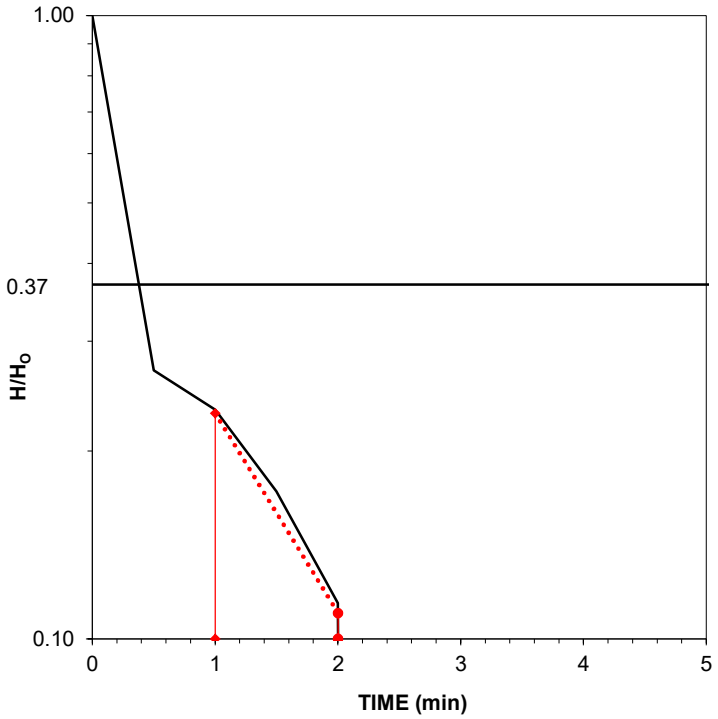
SITE ETIHAD GROUND INVESTIGATION

DEPTH RECORD

BASE OF FILTER	40.00 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	30.00 m	DIAMETER OF ACCESS TUBE	0.04 m
TEST INTERVAL	10.00 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	19.34 m	DATE	08/02/2023

TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H / H_O
0.00	11.10	8.24	1.00
0.50	17.12	2.22	0.27
1.00	17.42	1.92	0.23
1.50	17.92	1.42	0.17
2.00	18.40	0.94	0.11
2.50	19.34	0.00	0.00



Hvorslev method $k = \frac{A}{FT}$

Velocity graph method $k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$

Intake factor based on case* **D**

RESULTS

Hvorslev method		**Velocity graph method**		
Cross sectional area of access tube, A	**0.0010** m^2	Cross sectional area of access tube, A		**0.0010** m^2
Intake factor*, F	**12.771** m	Intake factor*, F		**12.771** m
Time lag, T	**0** s	Variable head, H_1	**1.90** m at time, t_1	**60** s
		Variable head, H_2	**0.91** m at time, t_2	**120** s
Permeability, k	**-- ms^{-1}**	**Permeability, k**		**9.3E-07 ms^{-1}**

REMARKS

Test Operator: MN

100L water added.

CONTRACT	CHECKED
37349	**JH**

* See intake factors key sheet

MNTH

Geotechnical Engineering Limited

PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT CITY FOOTBALL GROUP LIMITED BOREHOLE **BH22/05**

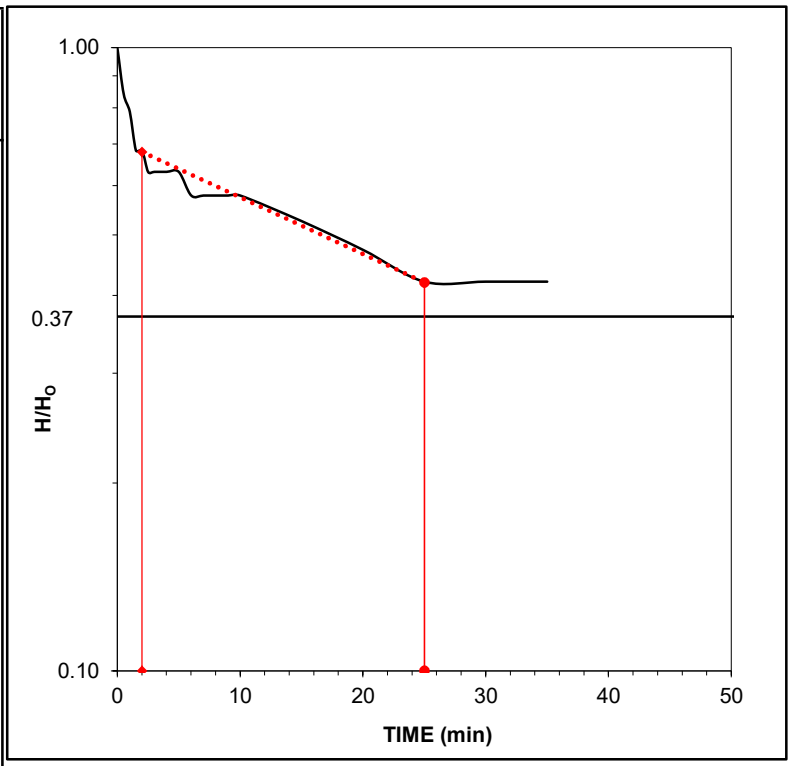
SITE ETIHAD GROUND INVESTIGATION

DEPTH RECORD

BASE OF FILTER	40.00 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	30.00 m	DIAMETER OF ACCESS TUBE	0.04 m
TEST INTERVAL	10.00 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	RISING
DEPTH TO STANDING WATER BELOW DATUM	19.75 m	DATE	08/02/2023

TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H / H_O
0.00	19.94	0.19	1.00
0.50	19.91	0.16	0.84
1.00	19.90	0.15	0.79
1.50	19.88	0.13	0.68
2.00	19.88	0.13	0.68
2.50	19.87	0.12	0.63
3.00	19.87	0.12	0.63
4.00	19.87	0.12	0.63
5.00	19.87	0.12	0.63
6.00	19.86	0.11	0.58
7.00	19.86	0.11	0.58
8.00	19.86	0.11	0.58
9.00	19.86	0.11	0.58
10.00	19.86	0.11	0.58
15.00	19.85	0.10	0.53
20.00	19.84	0.09	0.47
25.00	19.83	0.08	0.42
30.00	19.83	0.08	0.42
35.00	19.83	0.08	0.42



Hvorslev method $k = \frac{A}{FT}$

Velocity graph method $k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$

Intake factor based on case* **D**

RESULTS

Hvorslev method			**Velocity graph method**			
Cross sectional area of access tube, A	**0.0010**	m^2	Cross sectional area of access tube, A		**0.0010**	m^2
Intake factor*, F	**12.771**	m	Intake factor*, F		**12.771**	m
Time lag, T		s	Variable head, H_1	**0.13** m at time, t_1	**120**	s
			Variable head, H_2	**0.08** m at time, t_2	**1500**	s
Permeability, k	**--**	ms^{-1}	**Permeability, k**		**2.6E-08**	ms^{-1}

REMARKS

Test Operator: MN

75L water removed by surging over 30 minutes.

CONTRACT	CHECKED
37349	**JH**

* See intake factors key sheet

MNTH

Geotechnical Engineering Limited

PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT CITY FOOTBALL GROUP LIMITED BOREHOLE **BH22/05**

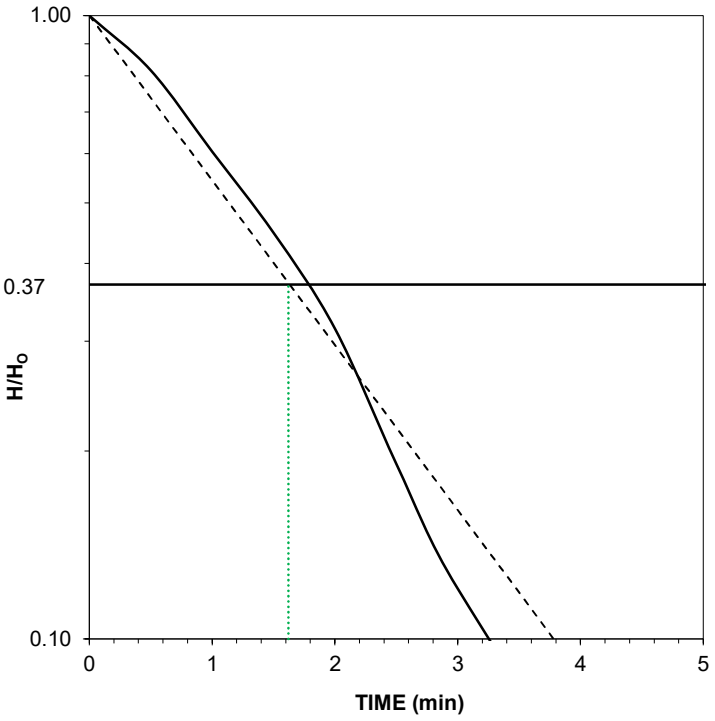
SITE ETIHAD GROUND INVESTIGATION

DEPTH RECORD

BASE OF FILTER	40.00 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	30.00 m	DIAMETER OF ACCESS TUBE	0.04 m
TEST INTERVAL	10.00 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	19.75 m	DATE	08/02/2023

TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H / H_O
0.00	12.94	6.81	1.00
0.50	14.19	5.56	0.82
1.00	15.63	4.12	0.60
1.50	16.70	3.05	0.45
2.00	17.61	2.14	0.31
2.50	18.45	1.30	0.19
3.00	18.93	0.82	0.12
4.00	19.32	0.43	0.06
5.00	19.41	0.34	0.05
6.00	19.55	0.20	0.03
7.00	19.61	0.14	0.02
8.00	19.65	0.10	0.01
9.00	19.67	0.08	0.01
10.00	19.73	0.02	0.00
15.00	19.74	0.01	0.00
20.00	19.75	0.00	0.00



Hvorslev method $k = \frac{A}{FT}$

Velocity graph method $k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$

Intake factor based on case* **D**

RESULTS

Hvorslev method		**Velocity graph method**		
Cross sectional area of access tube, A	**0.0010** m^2	Cross sectional area of access tube, A		**0.0010** m^2
Intake factor*, F	**12.771** m	Intake factor*, F		**12.771** m
Time lag, T	**97.2** s	Variable head, H_1	**0.00** m at time, t_1	**0** s
		Variable head, H_2	**0.00** m at time, t_2	**0** s
Permeability, k	**7.8E-07** ms^{-1}	**Permeability, k**		**--** ms^{-1}

REMARKS

Test Operator: MN

150L water added.

CONTRACT	CHECKED
37349	**JH**

* See intake factors key sheet

MNTH

Geotechnical Engineering Limited

PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT CITY FOOTBALL GROUP LIMITED BOREHOLE **BH22/06A**

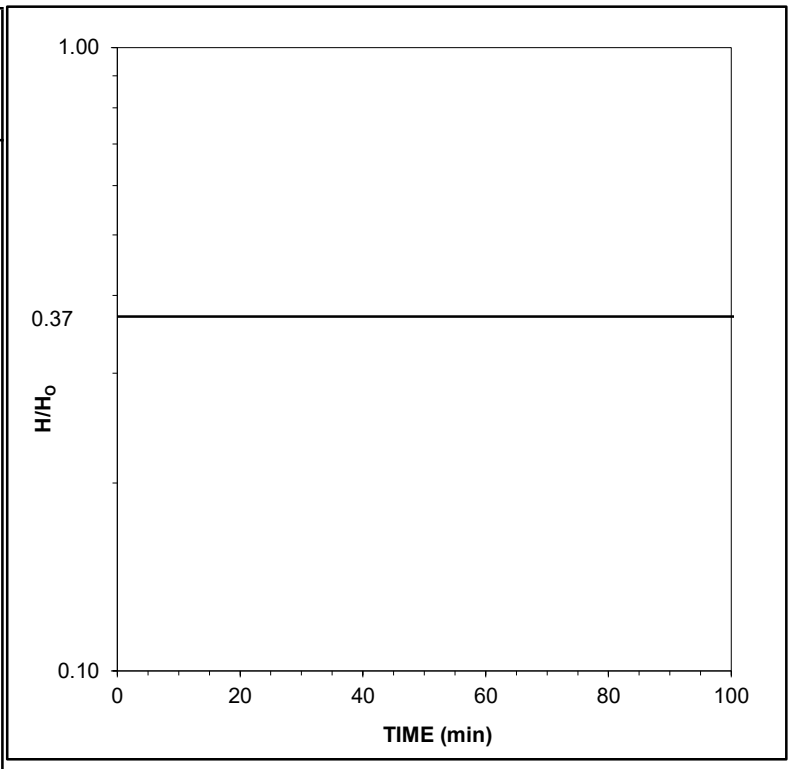
SITE ETIHAD GROUND INVESTIGATION

DEPTH RECORD

BASE OF FILTER	50.00 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	40.00 m	DIAMETER OF ACCESS TUBE	0.04 m
TEST INTERVAL	10.00 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	RISING
DEPTH TO STANDING WATER BELOW DATUM	20.95 m	DATE	07/02/2023

TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H / H_O
0.50	20.95	0.00	



Hvorslev method $k = \frac{A}{FT}$

Velocity graph method $k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$

Intake factor based on case* **D**

RESULTS

Hvorslev method		**Velocity graph method**		
Cross sectional area of access tube, A	**0.0010** m^2	Cross sectional area of access tube, A		**0.0010** m^2
Intake factor*, F	**12.771** m	Intake factor*, F		**12.771** m
Time lag, T	**0** s	Variable head, H_1	**0.00** m at time, t_1	**0** s
		Variable head, H_2	**0.00** m at time, t_2	**0** s
Permeability, k	**-- ms^{-1}**	**Permeability, k**		**-- ms^{-1}**

REMARKS

Test Operator: MN

70L water removed by surging over 1 hour, no head developed.
Permeability could not be calculated.

* See intake factors key sheet

CONTRACT	CHECKED
37349	**JH**

MNTH

Geotechnical Engineering Limited

PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT CITY FOOTBALL GROUP LIMITED BOREHOLE **BH22/06A**

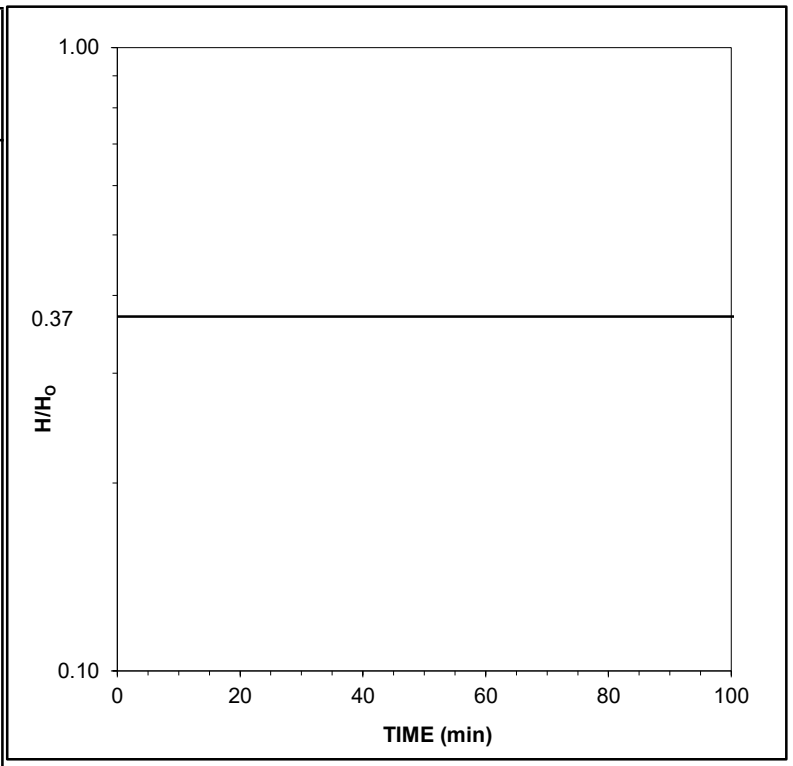
SITE ETIHAD GROUND INVESTIGATION

DEPTH RECORD

BASE OF FILTER	50.00 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	40.00 m	DIAMETER OF ACCESS TUBE	0.04 m
TEST INTERVAL	10.00 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	20.95 m	DATE	07/02/2023

TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H / H_O
0.50	20.95	0.00	



Hvorslev method $$k = \frac{A}{FT}$$

Velocity graph method $$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case* **D**

RESULTS

Hvorslev method		**Velocity graph method**		
Cross sectional area of access tube, A	**0.0010** m^2	Cross sectional area of access tube, A		**0.0010** m^2
Intake factor*, F	**12.771** m	Intake factor*, F		**12.771** m
Time lag, T	**0** s	Variable head, H_1	**0.00** m at time, t_1	**0** s
		Variable head, H_2	**0.00** m at time, t_2	**0** s
Permeability, k	**-- ms^{-1}**	**Permeability, k**		**-- ms^{-1}**

REMARKS

Test Operator: MN

70L water added, no head developed.

Permeability could not be calculated.

* See intake factors key sheet

CONTRACT	CHECKED
37349	**JH**

MNTH

Geotechnical Engineering Limited

PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT CITY FOOTBALL GROUP LIMITED BOREHOLE **BH22/07**

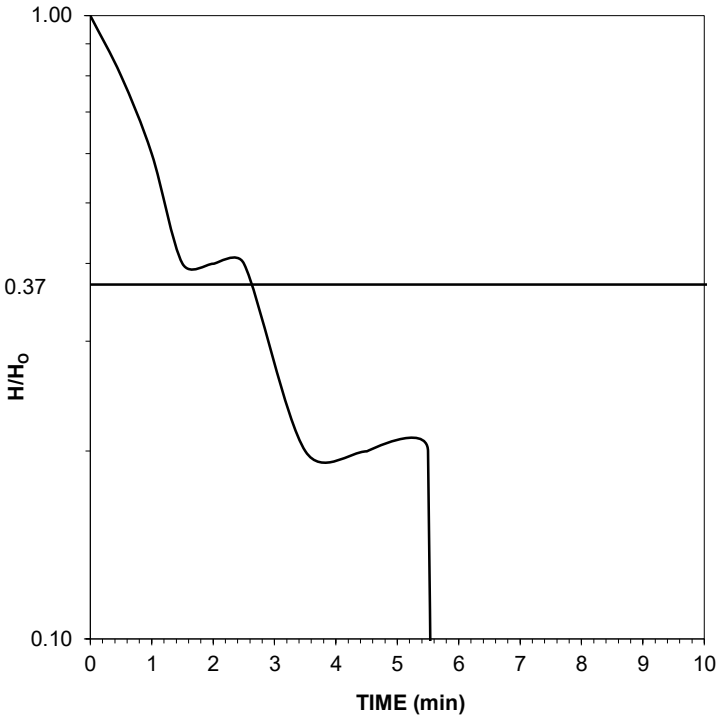
SITE ETIHAD GROUND INVESTIGATION

DEPTH RECORD

BASE OF FILTER	40.00 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	29.90 m	DIAMETER OF ACCESS TUBE	0.04 m
TEST INTERVAL	10.10 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	RISING
DEPTH TO STANDING WATER BELOW DATUM	21.35 m	DATE	07/02/2023

TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H / H_O
0.00	21.40	0.05	1.00
0.50	21.39	0.04	0.80
1.00	21.38	0.03	0.60
1.50	21.37	0.02	0.40
2.00	21.37	0.02	0.40
2.50	21.37	0.02	0.40
3.50	21.36	0.01	0.20
4.50	21.36	0.01	0.20
5.50	21.36	0.01	0.20
6.50	21.35	0.00	0.00



Hvorslev method $$k = \frac{A}{FT}$$

Velocity graph method $$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case* **D**

RESULTS

Hvorslev method		**Velocity graph method**		
Cross sectional area of access tube, A	**0.0010** m^2	Cross sectional area of access tube, A		**0.0010** m^2
Intake factor*, F	**12.873** m	Intake factor*, F		**12.873** m
Time lag, T	**0** s	Variable head, H_1	**0.00** m at time, t_1	**0** s
		Variable head, H_2	**0.00** m at time, t_2	**0** s
Permeability, k	**-- ms^{-1}**	**Permeability, k**		**-- ms^{-1}**

REMARKS Test Operator: MN

75L water removed over 55 minutes. Insufficient head developed for determining permeability.

CONTRACT	CHECKED
37349	**JH**

* See intake factors key sheet

MNTH

Geotechnical Engineering Limited

PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT CITY FOOTBALL GROUP LIMITED BOREHOLE **BH22/07**

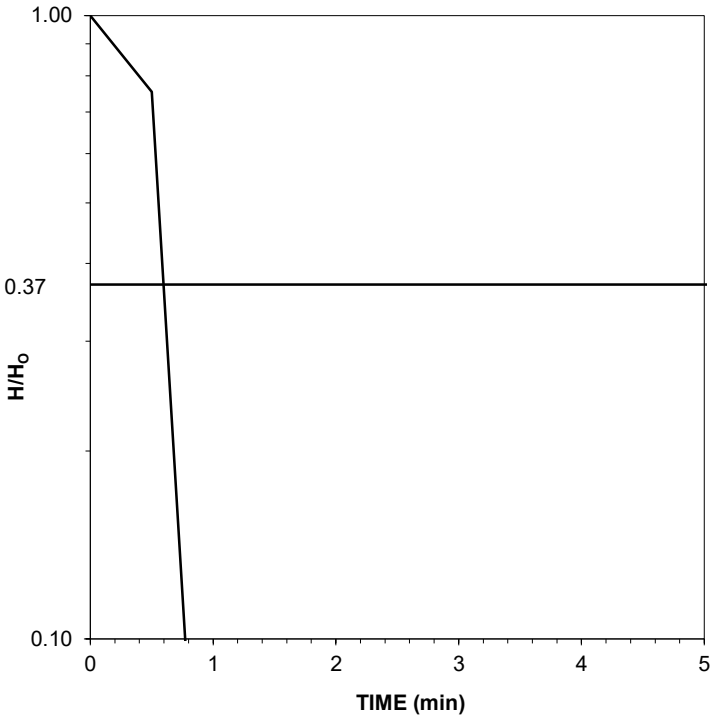
SITE ETIHAD GROUND INVESTIGATION

DEPTH RECORD

BASE OF FILTER	40.00 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	29.90 m	DIAMETER OF ACCESS TUBE	0.04 m
TEST INTERVAL	10.10 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	21.35 m	DATE	07/02/2023

TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H / H_O
0.00	0.00	21.35	1.00
0.50	5.25	16.10	0.75
1.00	20.96	0.39	0.02
1.50	21.12	0.23	0.01
2.00	21.20	0.15	0.01
2.50	21.24	0.11	0.01
3.50	21.29	0.06	0.00
4.50	21.30	0.05	0.00
5.50	21.31	0.04	0.00
6.50	21.33	0.02	0.00
7.50	21.34	0.01	0.00
8.50	21.35	0.00	0.00



Hvorslev method $$k = \frac{A}{FT}$$

Velocity graph method $$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case* **D**

RESULTS

Hvorslev method		**Velocity graph method**		
Cross sectional area of access tube, A	**0.0010** m^2	Cross sectional area of access tube, A		**0.0010** m^2
Intake factor*, F	**12.873** m	Intake factor*, F		**12.873** m
Time lag, T	**0** s	Variable head, H_1	**0.00** m at time, t_1	**0** s
		Variable head, H_2	**0.00** m at time, t_2	**0** s
Permeability, k	**-- ms^{-1}**	**Permeability, k**		**-- ms^{-1}**

REMARKS

Test Operator: MN

75L water added. Drop in head too fast to determine permability, only two readings determined prior to levelling of head.

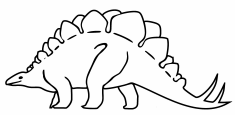
CONTRACT	CHECKED
37349	**JH**

* See intake factors key sheet

MNTH

Geotechnical Engineering Limited

BOREHOLE LOG



(WS)TP22/01

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 02 December 2022 Easting 386732 Scale 1:50

End Date 07 December 2022 Northing 398662 Ground Level 60.80mOD Depth 2.60 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
C	0.00	0.12						Vo 0.0	Black TARMACADAM.	0.12	60.68	
1B	0.12	0.25							Light grey sandy angular and subangular fine to coarse limestone GRAVEL. (MADE GROUND)	0.30	60.50	
1ES	0.12							Vo 0.0				
2D	0.20							Vo 0.0	Brown gravelly fine to coarse SAND. Gravel is angular and subangular fine to coarse sandstone, brick and concrete. (MADE GROUND)			
2ES	0.35											
3B	0.50	1.10										
3ES	0.50											
4D	0.50							Vo 0.0				
4ES	1.00											
5D	1.10	1.50	Nil					C 30	Stiff brownish grey slightly sandy slightly gravelly CLAY. Gravel is angular and subangular fine to coarse sandstone, brick and concrete. (MADE GROUND)	1.15	59.65	
5ES	1.20							Vo 0.0				
L	1.20	2.00										
6ES	1.80							Vo 0.0				
L	2.00	2.60	Nil					C 13	Dark grey and black gravelly fine to coarse SAND. Gravel is angular fine and medium clinker and ash. (MADE GROUND)	1.90	58.90	
6B	2.20	2.50								2.10	58.70	
7B	2.40								Firm dark grey slightly sandy slightly gravelly CLAY. Gravel is angular and subangular fine to coarse sandstone and rare brick and concrete. (MADE GROUND)			
			Nil					C <1		2.60	58.20	
									Borehole Completed at 2.60m			

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	0.12	Rotary Core	Concrete Corer
0.12	1.20	Inspection Pit	Hand Tools
1.20	2.60	Windowless Sample	Dart 428

WATER STRIKE Groundwater not encountered

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)
300	0.12
101	2.00
92	2.60

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	0.20	Concrete
0.20	1.00	Bentonite
1.00	2.60	Gravel

INSTRUMENTATION

DEPTH (m)	TYPE
2.60	Standpipe (50mm) with geosock

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
02-12-2022 07:45	0.00	Nil	
02-12-2022 14:30	0.12	Nil	Dry
07-12-2022 07:00	0.12	Nil	Dry
07-12-2022 14:00	2.60	Nil	Dry

REMARKS

AGS

CONTRACT	CHECKED
37349	CT

Geotechnical Engineering Limited

INSPECTION PIT LOG

(WS)TP22/05

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 08 December 2022 Easting 386812 Scale 1:25

End Date 08 December 2022 Northing 398687 Ground Level 61.05mOD Depth 0.90 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B	0.10	0.40			Black TARMACADAM.			
1ES	0.15		Vo 0.0		Light grey sandy angular fine to coarse limestone GRAVEL with a high angular and subangular limestone cobble content. (MADE GROUND)	0.12	60.93	
2D	0.30		Vo 0.0					
2ES	0.30				Brown sandy angular and subangular fine to coarse sandstone, chert and rare brick and concrete GRAVEL. (MADE GROUND)	0.40	60.65	
3ES	0.50		Vo 0.0					
3B	0.60	0.90						
4D	0.80							
					0.90m: Concrete obstruction.	0.90	60.15	
					Trial pit Completed at 0.90m			

Equipment: Pit excavated by Hand Tools

Pit width x length: 0.30m x 0.30m

Sidewall stability: Stable and vertical.

Groundwater:
Not encountered

Backfill: Tarmacadam 0.00 - 0.12m.
Arisings 0.12 - 0.90m.

Remarks: Hole terminated at 0.90m due to concrete obstruction.

AGS

CONTRACT	CHECKED
37349	CT

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

BOREHOLE LOG

(WS)TP22/08

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 02 December 2022 Easting 386928 Scale 1:50

End Date 02 December 2022 Northing 398698 Ground Level 62.40mOD Depth 3.44 m

sample no & type	sample depth (m) from	to	casing depth (m)	samp. /core range	If	water record depth (m)	instru-ment	test type & value	description	depth (m)	reduced level (m)	legend
1B	0.10	0.30						Vo 0.0	Reddish brown and grey becoming dark brown and grey sandy angular and subangular fine to coarse limestone GRAVEL. (MADE GROUND)			
1ES	0.10											
2D	0.10							Vo 0.0		0.30	62.10	
2ES	0.30								Stiff to very stiff dark brown slightly sandy slightly gravelly CLAY with a low angular to subrounded chert and sandstone cobble content and rare metal fragments (up to 70x50x5mm). Gravel is angular and subangular fine to coarse sandstone, brick and concrete. (MADE GROUND)			
3B	0.30	0.50						Vo 0.0				
3ES	0.50								0.30 - 0.50m: Steel reinforcement bar (5mm diam).			
4D	0.50											
4ES	1.00							Vo 0.0				
5D	1.20	1.65	Nil					S 41				
6B	1.20	2.00										
L	1.20	2.00										
7D	1.50											
5ES	2.00		Nil					S 14				
8D	2.00	2.45						Vo 0.0	2.00m: Firm.			
9B	2.00	3.00										
L	2.00	3.00										
10D	2.50											
6ES	2.90							Vo 0.0				
11D	3.00	3.44	Nil					S *52				
									Borehole Completed at 3.44m	3.44	58.96	

HOLE CONSTRUCTION

TOP (m)	BASE (m)	TYPE	PLANT USED
0.00	1.20	Inspection Pit	Hand Tools
1.20	3.44	Windowless Sample	Dart 428

WATER STRIKE Groundwater not encountered

DEPTH (m)	CASING (m)	ROSE TO (m)	AFTER (min)	REMARKS

CASING DEPTH

DIAM (mm)	BASE (m)

BARREL DIAMETER

DIAM (mm)	BASE (m)
101	2.00
92	3.00

BACKFILL

TOP (m)	BASE (m)	MATERIAL
0.00	3.44	Arisings

INSTRUMENTATION

DEPTH (m)	TYPE

HOLE PROGRESS

DATE TIME	DEPTH (m)	CASING (m)	WATER (m)
02-12-2022 07:45	0.00	Nil	
02-12-2022 14:30	3.44	Nil	Dry

REMARKS

AGS

CONTRACT	CHECKED
37349	CT

Geotechnical Engineering Limited

STANDARD PENETRATION TEST

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole no.	borehole depth (m)	s.w.p (mm)	base depth (m)	casing depth (m)	water level (m)	seating drive		test drive				test type	N	energy ratio %
						blows	pen (mm)	blows				pen (mm)						
(WS)TP22/01	1.20		1.65	Nil	Dry	1 2	75 75	6 6 9 9				75 75 75 75		C	30	67
(WS)TP22/01	2.00		2.45	Nil	Dry	7 5	75 75	3 4 3 3				75 75 75 75		C	13	67
(WS)TP22/01	2.60		2.63	Nil	Dry	50	30							C	<1	67
(WS)TP22/08	1.20		1.65	Nil	Dry	6 6	75 75	7 11 12 11				75 75 75 75		S	41	67
(WS)TP22/08	2.00		2.45	Nil	Dry	6 4	75 75	4 3 3 4				75 75 75 75		S	14	67
(WS)TP22/08	3.00		3.44	Nil	Dry	4 6	75 75	9 11 13 17				75 75 75 65		S	52	67

notes:
1. Test carried out in general accordance with BS EN ISO 22476-3:2005 + A1:2011
2. s.w.p = self weight penetration.
3. N values have not been subjected to any correction.
4. Test carried out using split spoon S, solid cone C.
5. Where full test drive not completed, linearly extrapolated N value reported.
6. ** Denotes no effective penetration.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

TRIAL PIT LOG

TP22/02

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 29 November 2022 Easting 386768 Scale 1:25

End Date 29 November 2022 Northing 398696 Ground Level 60.95mOD Depth 3.40 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
					Black TARMACADAM.			
1B 1ES 2D	0.12 - 0.50 0.12 - 0.50 0.12 - 0.50		Vo 0.0		Grey subangular fine to coarse limestone GRAVEL. (MADE GROUND)	0.12	60.83	
2ES 3LB 4D	0.50 - 0.85 0.50 - 0.85 0.50 - 0.80		Vo 0.0		Grey and reddish brown very sandy subangular fine to coarse brick, limestone and concrete GRAVEL with a low angular and subangular brick, limestone and concrete cobble content. (MADE GROUND)	0.50	60.45	
3ES 5B 6B	1.00 - 1.10 1.00 - 1.10 1.10 - 2.60		Vo 0.0		Dark brown and black sandy subangular fine to coarse brick, limestone and concrete GRAVEL with a low angular and subangular brick, limestone and concrete cobble content. (MADE GROUND)	0.85	60.10	
					Reddish brown and brown clayey locally very clayey very sandy subangular fine to coarse concrete, brick and slag GRAVEL with a high angular and subangular concrete, brick and slag cobble content and a low subangular concrete and rare slag boulder content. Rare pockets (up to 100x100x80mm) of grey and reddish brown clay. (MADE GROUND) 1.10m: Rare steel reinforcement bar (20mm diam).	1.10	59.85	
4ES 7D	2.00 - 2.40 2.00		Vo 0.0					
5ES 8B 9D 10B	2.50 - 2.60 2.50 2.50 2.60 - 3.40		Vo 0.0		Stiff brown locally mottled reddish brown slightly sandy gravelly silty CLAY with a low subangular brick cobble content. Gravel is subangular coarse brick. (MADE GROUND)	2.50	58.45	
11D 6ES	3.00 3.00		Vo 0.0					
					Trial pit Completed at 3.40m	3.40	57.55	

Equipment: Pit excavated by Takeuchi TB290

Pit width x length: 0.80m x 5.80m

Sidewall stability: Stable and vertical.

Groundwater:
Not encountered

Backfill: Tarmacadam 0.00 - 0.12m.
Arisings 0.12 - 3.40m.

Remarks: Surface hardstanding cut by road saw and broken out with hydraulic breaker. Trial Pit terminated at 3.40m due to frequent obstructions. Boulder encountered at 3.40m spans roughly 15% of the base of the trial pit. A soakaway test was undertaken at this location, the results are reported separately.

CONTRACT	CHECKED
37349	**CT**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

TRIAL PIT LOG

TP22/03

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 30 November 2022 Easting 386802 Scale 1:25

End Date 30 November 2022 Northing 398672 Ground Level 60.85mOD Depth 2.25 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
					Black TARMACADAM.			
1B 1ES 2D	0.13 - 0.40 0.13 - 0.40 0.13 - 0.40		Vo 0.0		Light grey very sandy subangular fine to coarse limestone GRAVEL. (MADE GROUND) 0.15 - 0.40m: Three disused north-south orientated surface water drain pipes (approx 200mm diam) terminating 0.50-1.00m from north face of pit.	0.13	60.72	
2ES 3B 4D	0.40 - 1.26 0.40 - 1.26 0.40 - 1.26		Vo 0.0		0.40m: Geotextile membrane.	0.40	60.45	
					Grey slightly clayey sandy locally very sandy subangular and subrounded fine to coarse concrete, limestone and rare sandstone GRAVEL with a low locally high concrete and limestone cobble content. (MADE GROUND)			
3ES 5B 6D	1.00 1.00 1.00		Vo 0.0					
4ES 7LB 8D	1.25 - 1.80 1.26 - 1.80 1.26 - 1.80		Vo 0.0			1.26	59.59	
5ES 9D	1.50 1.50 - 1.80		Vo 0.0		Firm to stiff brown slightly sandy gravelly CLAY frequently stained black. Gravel is subangular and subrounded fine to coarse limestone, brick and rare concrete. Strong musty odour. (MADE GROUND)			
					1.80m: Concrete boulder running approx. 1.20m from south face of pit.	1.80	59.05	
10B 11B 12D 6ES	2.00 2.00 - 2.25 2.00 - 2.25 2.00 - 2.25		Vo 0.0		Brown clayey subangular and subrounded medium and coarse limestone and brick GRAVEL. (MADE GROUND)			
					2.25m: Copper lightning tape running along the north and west faces of pit. Trial pit Completed at 2.25m	2.25	58.60	

Equipment: Pit excavated by Takeuchi TB290

Pit width x length: 0.80m x 4.20m

Sidewall stability: Stable and vertical

Groundwater:
Not encountered

Backfill: Tarmacadam 0.00 - 0.13m.
Arisings 0.13 - 2.25m.

Remarks: Surface hardstanding cut by road saw and broken out with hydraulic breaker.
Trial pit terminated at 2.25m upon encountering bare copper lightning conductor tape.

AGS

CONTRACT	CHECKED
37349	**CT**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

TRIAL PIT LOG

TP22/06

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 01 December 2022 Easting 386845 Scale 1:25

End Date 01 December 2022 Northing 398664 Ground Level 60.90mOD Depth 2.20 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B 1ES 2D	0.00 0.00 0.00	- 0.20 - 0.20 - 0.20	Vo 0.0		Very stiff brown locally mottled grey gravelly CLAY. Gravel is angular and subangular fine to coarse brick, concrete and rare wood. (MADE GROUND)			
					0.30m: Orange geotextile membrane.	0.30	60.60	
2ES 3B 4D	0.50 0.50 0.50	- 0.80 - 0.80 - 0.80	Vo 0.0	▼	Brown clayey locally very clayey sandy locally very sandy angular and subangular fine to coarse brick and concrete GRAVEL with a low angular and subangular brick and concrete cobble content. Faint musty odour. (MADE GROUND)			
					0.80m: Dark greyish brown. 0.90m: Subangular concrete boulder. 1.10 - 1.20m: Thin bed of dark grey clay.			
3ES 5B 6D	1.30 1.30 1.30	- 1.50 - 1.50 - 1.50	Vo 0.0					
4ES 7B 8D	2.00 2.00 2.00	- 2.20 - 2.20 - 2.20	Vo 0.0					
					Trial pit Completed at 2.20m	2.20	58.70	

Equipment: Pit excavated by Takeuchi TB290

Pit width x length: 1.60m x 4.20m with long side orientated 135°

Sidewall stability: Stable and vertical.

Groundwater: Groundwater seepage encountered at 0.70m

Backfill: Arisings 0.00 - 2.20m. Material tampered down by excavator.

Remarks: Pit terminated at 2.20m due to hard strata.

AGS

CONTRACT	CHECKED
37349	**CT**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

TRIAL PIT LOG

TP22/07

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 01 December 2022 Easting 386850 Scale 1:25

End Date 01 December 2022 Northing 398703 Ground Level 61.75mOD Depth 3.90 m

sample no & type	sample depth (m) from to	test type & value	water record	description	depth (m)	reduced level (m)	legend
				Black and dark brown sandy angular and subangular fine to coarse tarmacadam and rare brick and concrete GRAVEL. (MADE GROUND)			
1B	0.20 - 0.40	Vo 0.0			0.15	61.60	
1ES	0.20 - 0.40			Brown clayey very sandy angular and subangular fine to coarse brick, concrete and rare wood GRAVEL. (MADE GROUND)			
2D	0.20 - 0.40		▼	0.30m: Orange geotextile membrane.			
					0.60	61.15	
				Brown very clayey very sandy angular to subangular fine to coarse brick, concrete and rare wood GRAVEL with a high angular and subangular brick and concrete cobble content. Faint musty odour. (MADE GROUND)			
2ES	1.00 - 1.20	Vo 0.0					
3B	1.00 - 1.20						
4D	1.00 - 1.20						
				1.70m: Becoming dark greyish brown.			
5B	2.00 - 2.40				2.00	59.75	
6D	2.00 - 2.40			Brown very clayey very sandy angular and subangular fine to coarse brick and concrete GRAVEL with a low angular and subangular brick and concrete cobble content. Faint musty odour. (MADE GROUND)			
3ES	2.20 - 2.40	Vo 0.0					
				2.40 - 2.50m: Rare steel reinforcement bar fragments (up to 400x10mm diam).			
4ES	2.90 - 3.10	Vo 0.0					
7B	2.90 - 3.10						
8D	2.90 - 3.10						
5ES	3.70 - 3.90	Vo 0.0					
9B	3.70 - 3.90						
10D	3.70 - 3.90						
				Trial pit Completed at 3.90m	3.90	57.85	

Equipment: Pit excavated by Takeuchi TB290

Pit width x length: 1.10m x 3.80m with long side orientated 090°

Sidewall stability: Stable and vertical.

Groundwater: Groundwater seepage encountered at 0.40m

Backfill: Arisings 0.00 - 3.90m. Material tampered down by excavator.

Remarks: Pit terminated at 3.90m due to hard strata.

AGS

CONTRACT	CHECKED
37349	**CT**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

SOAKAWAY TEST

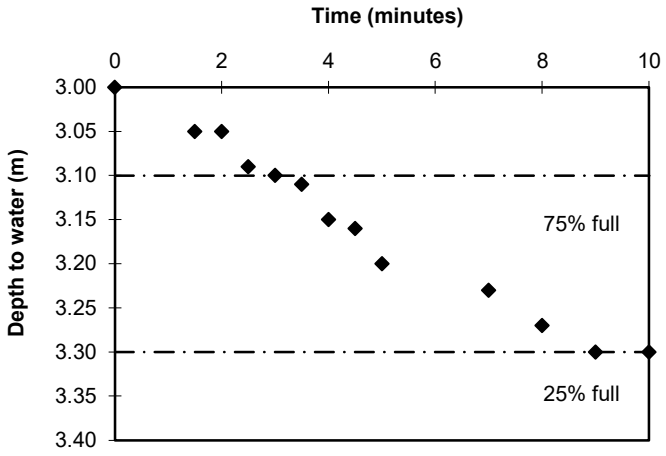
CLIENT CITY FOOTBALL GROUP LIMITED
SITE ETIHAD GROUND INVESTIGATION
DATE 02/12/2022

TRIAL PIT **TP22/02**

TEST 1

LENGTH	5.80	m
BREADTH	0.80	m
DEPTH	3.40	m
WATER LEVEL	Dry	
FILL LEVEL	3.00	m
v_{p75-25}	0.928	m^3
a_{p50}	7.280	m^2
t_{p75-25}	6	min

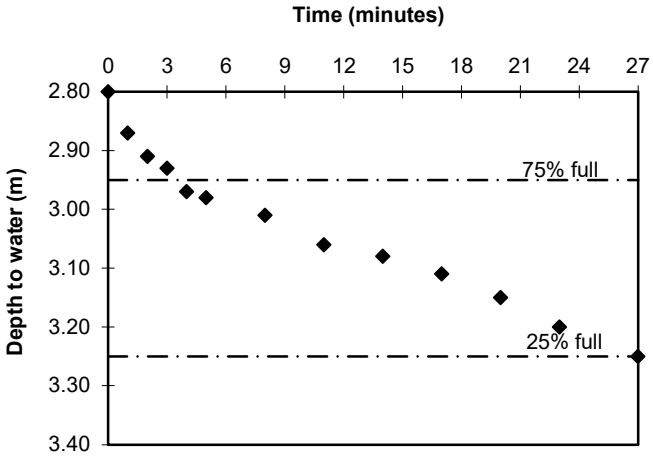
soil infiltration rate, *f* **3.5×10^{-4} ms^{-1}**



TEST 2

LENGTH	5.80	m
BREADTH	0.80	m
DEPTH	3.40	m
WATER LEVEL	Dry	
FILL LEVEL	2.80	m
v_{p75-25}	1.392	m^3
a_{p50}	8.600	m^2
t_{p75-25}	24	min

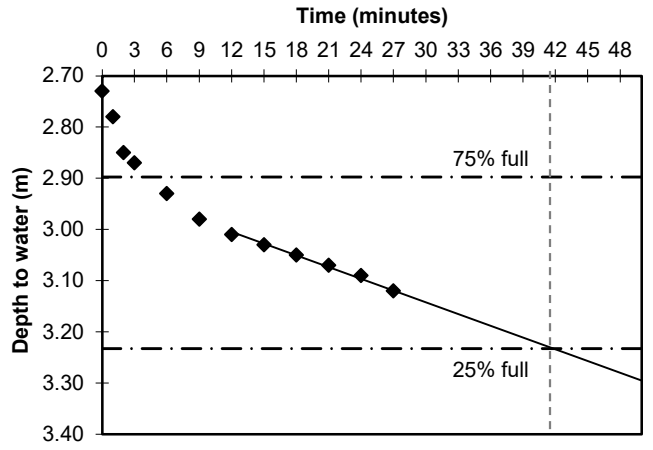
soil infiltration rate, *f* **1.1×10^{-4} ms^{-1}**



TEST 3

LENGTH	5.80	m
BREADTH	0.80	m
DEPTH	3.40	m
WATER LEVEL	Dry	
FILL LEVEL	2.73	m
v_{p75-25}	1.554	m^3
a_{p50}	9.062	m^2
t_{p75-25}	38	min

soil infiltration rate, *f* **7.6×10^{-5} ms^{-1}**
Calculated by extrapolating timeline.



Remarks Test carried out in accordance with BRE DG 365 (2016).

CONTRACT	CHECKED
37349	**JH**

NR / TH

Geotechnical Engineering Limited

TRIAL PIT LOG

OT22/01

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 29 November 2022 Easting 386758 Scale 1:25

End Date 30 November 2022 Northing 398717 Ground Level 61.00mOD Depth 2.00 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
					Black TARMACADAM.	0.10	60.90	
1B	0.20	0.30			Light grey sandy angular to subrounded fine to coarse crystalline GRAVEL. (MADE GROUND)			
1ES	0.20	0.30	Vo 0.0			0.30	60.70	
2B	0.50	0.60			Soft brownish grey slightly sandy gravelly CLAY with a low angular and subangular concrete and brick cobble content. Gravel is angular and subangular fine to coarse concrete and brick. (MADE GROUND)			
2ES	0.50	0.60	Vo 0.0		0.30 - 0.70m: Concrete obstruction around suspected electrical cables at 4.40-5.40m from southeast face of the pit.			
						1.20	59.80	
3B	1.30	1.50			Firm brown slightly sandy slightly gravelly CLAY. Gravel is angular and subangular fine to coarse concrete and brick. (MADE GROUND)			
3ES	1.30	1.50	Vo 0.0					
					Trial pit Completed at 2.00m	2.00	59.00	

Equipment: Pit excavated by Vacuum Excavation

Pit width x length: 0.65m x 8.20m with long side orientated 325°

Sidewall stability: Stable and vertical.

Groundwater:
Not encountered

Backfill: Tarmacadam 0.00 - 0.10m.
Gravel 0.10 - 2.00m.

Remarks: Surface hardstanding cut by road saw and broken out with hydraulic breaker. All observed services are shown on separate sketches.

CONTRACT	CHECKED
37349	**CT**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

TRIAL PIT LOG

OT22/02

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 01 December 2022 Easting 386750 Scale 1:25

End Date 01 December 2022 Northing 398702 Ground Level 61.05mOD Depth 1.50 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
					Black TARMACADAM.			
1B 1ES	0.12 - 0.35 0.15		Vo 0.0		Light grey sandy angular fine to coarse limestone GRAVEL. (MADE GROUND)	0.12	60.93	
2B 2ES 3B	0.35 - 0.50 0.40 0.50 - 1.00		Vo 0.0		Dark brown, brown and dark grey very sandy angular to subrounded fine to coarse limestone and chert GRAVEL with a medium angular to subrounded limestone and chert cobble content. (MADE GROUND)	0.35	60.70	
3ES	0.90		Vo 0.0					
					Trial pit Completed at 1.50m	1.50	59.55	

Equipment: Pit excavated by Vacuum Excavation

Pit width x length: 0.70m x 4.00m with long side orientated 090°

Sidewall stability: Stable and vertical.

Groundwater:
Not encountered

Backfill: Tarmacadam 0.00 - 0.10m.
Gravel 0.10 - 1.50m.

Remarks: Surface hardstanding cut by road saw and broken out with hydraulic breaker. All observed services are shown on separate sketches.

AGS

CONTRACT	CHECKED
37349	**CT**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

TRIAL PIT LOG

OT22/03

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 02 December 2022 Easting 386732 Scale 1:25

End Date 02 December 2022 Northing 398641 Ground Level 60.60mOD Depth 1.45 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
					Black TARMACADAM.			
1B 1ES	0.20 - 0.40 0.20 - 0.40		Vo 0.0		Grey sandy angular and subangular fine to coarse limestone GRAVEL. (MADE GROUND) 0.15 - 0.85m: Concrete slabs and wooden panels at 0.00-1.00m from north face of pit above green ducts (100mm diam) in western face of pit.	0.15	60.45	
					Soft brownish grey slightly gravelly sandy CLAY with a low angular and subangular concrete and brick cobble content. Gravel is angular and subangular fine to coarse concrete and brick. (MADE GROUND)	0.45	60.15	
2B 2ES	0.80 - 1.00 0.80 - 1.00		Vo 0.0					
					Trial pit Completed at 1.45m	1.45	59.15	

Equipment: Pit excavated by Vacuum Excavation

Pit width x length: 0.60m x 2.30m with long side orientated 345°

Sidewall stability: Stable and vertical.

Groundwater: Groundwater seepage encountered at 1.45m and rose to 1.25m after 20 minutes.

Backfill: Tarmacadam 0.00 - 0.10m.
Gravel 0.10 - 1.45m.

Remarks: Surface hardstanding cut by road saw and broken out with hydraulic breaker. All observed services are shown on separate sketches.

AGS

CONTRACT	CHECKED
37349	**CT**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

TRIAL PIT LOG

OT22/04

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 05 December 2022 Easting 386722 Scale 1:25

End Date 06 December 2022 Northing 398665 Ground Level 60.85mOD Depth 2.00 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
					Black TARMACADAM.			
1B 1ES	0.12 - 0.40 0.12		Vo 0.0		Light grey sandy angular fine to coarse limestone GRAVEL. (MADE GROUND)	0.12	60.73	
2ES 2B	0.40 0.50 - 2.00		Vo 0.0		Brown sandy angular and subangular fine to coarse sandstone, chert, brick and concrete GRAVEL with a high angular to subrounded chert and sandstone cobble content. (MADE GROUND)	0.40	60.45	
					Trial pit Completed at 2.00m	2.00	58.85	

Equipment: Pit excavated by Vacuum Excavation

Pit width x length: 1.20m x 1.20m

Sidewall stability: Stable and vertical.

Groundwater:
Not encountered

Backfill: Tarmacadam 0.00 - 0.10m.
Arisings 0.10 - 2.00m.

Remarks: Surface hardstanding cut by road saw and broken out with hydraulic breaker. All observed services are shown on separate sketches.

AGS

CONTRACT	CHECKED
37349	**CT**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

TRIAL PIT LOG

OT22/05

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 01 December 2022 Easting 386762 Scale 1:25

End Date 01 December 2022 Northing 398616 Ground Level 60.55mOD Depth 1.20 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B	0.12	0.40			Black TARMACADAM.			
1ES	0.15				Light grey sandy angular medium and coarse rarely fine limestone GRAVEL. (MADE GROUND)	0.12	60.43	
2B	0.40	1.00			0.40 - 1.20m: Gravel is fine and medium rarely coarse.			
2ES	0.90							
					Trial pit Completed at 1.20m	1.20	59.35	

Equipment: Pit excavated by Vacuum Excavation

Pit width x length: 1.20m x 1.20m

Sidewall stability: Stable and vertical.

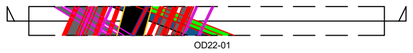
Groundwater:
Not encountered

Backfill: Tarmacadam 0.00 - 0.10m.
Gravel 0.10 - 1.20m.

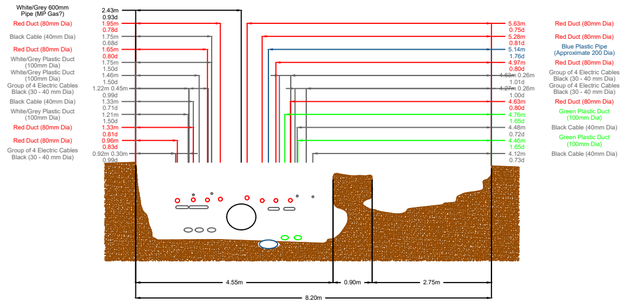
Remarks: Surface hardstanding cut by road saw and broken out with hydraulic breaker. All observed services are shown on separate sketches.

CONTRACT	CHECKED
37349	**CT**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS



OD22-01

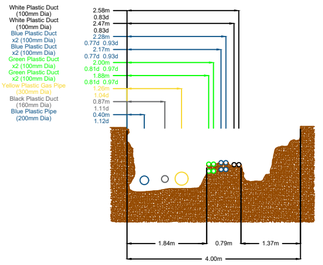


OT22-01
Facing North-East

Level Datum = 56.00m



OD22-02



OT22-02
Facing East

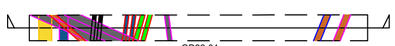
Level Datum = 56.00m



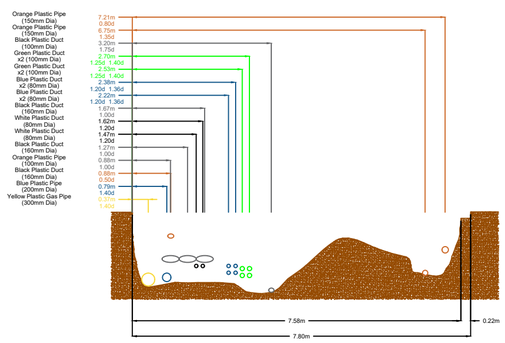
OT22-03

OT22-03
Facing East

Level Datum = 56.00m



OD22-04

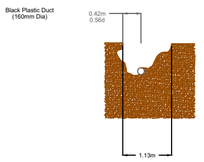


OT22-04
Facing North

Level Datum = 56.00m



OT22-05



OT22-05
Facing South-West

Level Datum = 56.00m

NOTES

1. DRAINAGE INFORMATION HAS BEEN DETERMINED WITHOUT MAN ENTRY INTO CHAMBERS AND WHILST EVERY EFFORT HAS BEEN MADE TO CORRECTLY IDENTITY THIS INFORMATION, IT SHOULD ALWAYS BE CHECKED IN AREAS THAT ARE CRITICAL TO THE FUTURE PROPOSAL.
2. ALL SEWERS ARE PRESUMED TO BE STRAIGHT BETWEEN CHAMBERS.

LEGEND



PAS 128 : 2014

SURVEY CATEGORY	QUALITY LEVEL	CRITERIA USED IN THE DETERMINATION OF QUALITY LEVEL
TYPE B - DETECTION	QL-B4	A UTILITY SEGMENT WHICH IS SUSPECTED TO EXIST BUT HAS NOT BEEN DETECTED AND THEREFORE HAS NOT BEEN RECORDED **(NO DETECTION POSSIBLE)**
	QL-B3	POSITION OF THE UTILITY DETECTED BY ONE OF THE GEOPHYSICAL TECHNIQUES **(EML OR GPR DETECTION WITH LIMITED CONFIDENCE IN DEPTH)**
	QL-B2	POSITION AND DEPTH OF THE UTILITY DETERMINED BY ONE OF THE GEOPHYSICAL TECHNIQUES **(EML OR GPR DETECTION WITH CONFIDENCE IN DEPTH)**
	QL-B1	POSITION AND DEPTH OF THE UTILITY DETERMINED BY MULTIPLE GEOPHYSICAL TECHNIQUES **(EML + GPR DETECTION)**

Rev	Date	Description	Drawn
1	XXX	XXX	XXX
2	XXX	XXX	XXX
3	XXX	XXX	XXX

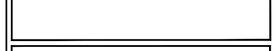
Electromagnetic and/or Ground Penetrating Radar techniques have been used to locate/map underground utilities and associated features shown on this drawing. Geotechnical Engineering Ltd (GEL) has taken reasonable care to ensure that the information contained within this drawing is accurate and of the highest quality. GEL has used any record drawings provided by the client or by the Statutory Utility Providers, at the client's request, at the time of the survey. Any information taken from these drawings (e.g. pipe sizes and position) is not guaranteed. Historic record information is often incomplete and inaccurate and cannot be relied upon.

GEL is not liable for any topographical survey that has not been undertaken by us. Any inaccuracies relating to topographical plans/development plans/Ordnance Survey data that we have no control over is the liability of the customer. Where quoted, depth information of underground services/features is stated. Depths are generally within +/- 10% accurate, but cannot be guaranteed. Any depths shown are drains are usually to invert (base of drainage channel) unless otherwise stated.

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ABBREVIATIONS (Land & Utilities)

AV	AIR VALVE	FL	FLOOR LEVEL	RS	ROAD SIGN
BH	BOREHOLE	GT	GREASE TRAP	SA	SOIL & ANCHORS
BN	LITTER / GRIT SALT BIN	GY	GULLY	SF	SAND FILLED
BL	BASE LEVEL	HV	HIGH VOLTAGE	SI	SPUN IRON
BS	BUS STOP	IC	INSPECTION CHAMBER	SL	SOIL LEVEL (TOP)
BP	BOUNDARY POST	IL	INVERT LEVEL	SP	SIGN POST
BS	BUS STOP	INT	INTERCEPTOR	ST	STOP TAP
BTC	BRITISH TELECOM CHAMBER	KO	KERB OUTLET	SV	STOP VALVE
CATV	CABLE TV COVER	LH	LAMP HOLE	SVP	SOIL VENT PIPE
CH	CHIMNEY	LP	LAMP POST	TBM	TEMPORARY BENCH MARK
CI	CAST IRON	LV	LOW VOLTAGE	TCB	TELEPHONE CALL BOX
CL	COVER LEVEL	MH	MANHOLE	TE	TRAPPED EXIT
CO	CLEAN OUT	MP	MARKER POST	TC	TRAFFIC FLOW CHAMBER COVER
CP	CABLE PIT	MW	MONITORING WELL	TK	TANK
CR	CABLE RISER	OP	OUTLET PIPE	TL	TRAFFIC LIGHT
CT	CONTROL / CONTROL BOX	OSBM	OS BENCH MARK	TP	TELEGRAPH POLE
DP	DOWN PIPE	P	PIPE	UP	UNKNOWN PIPE
E/C	ELECTRIC INSPECTION COVER	PB	POST BOX	VC	VITREOUS CLAY
EOC	EDGE OF CANOPY	PE	POLYETHYLENE	VP	VENT PIPE
EP	ELECTRICITY POLE	PR	PIPE RISER	VR	VAPOUR RECOVERY
FB	FLOWER BED	PS	PUMPING STATION	WC	WATER COURSE
FB	FOOTBRIDGE	PVC	POLYVINYL CHLORIDE	WM	WATER METER
FH	FIRE HYDRANT	RE	RODDING EYE	WO	WASH OUT VALVE
		RF	RUBBLE FILLED	WS	WEAK SIGNAL



geospatial
Geotechnical Engineering Ltd
Telephone: (01452) 527743 Facsimile: (01452) 729314 E-mail: surveying@geoeng.co.uk Web: www.geoeng.co.uk

Client

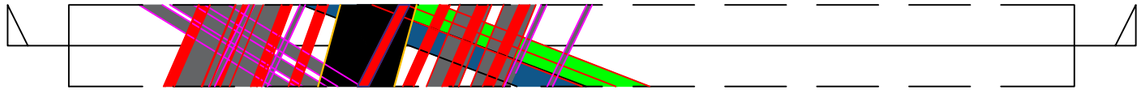
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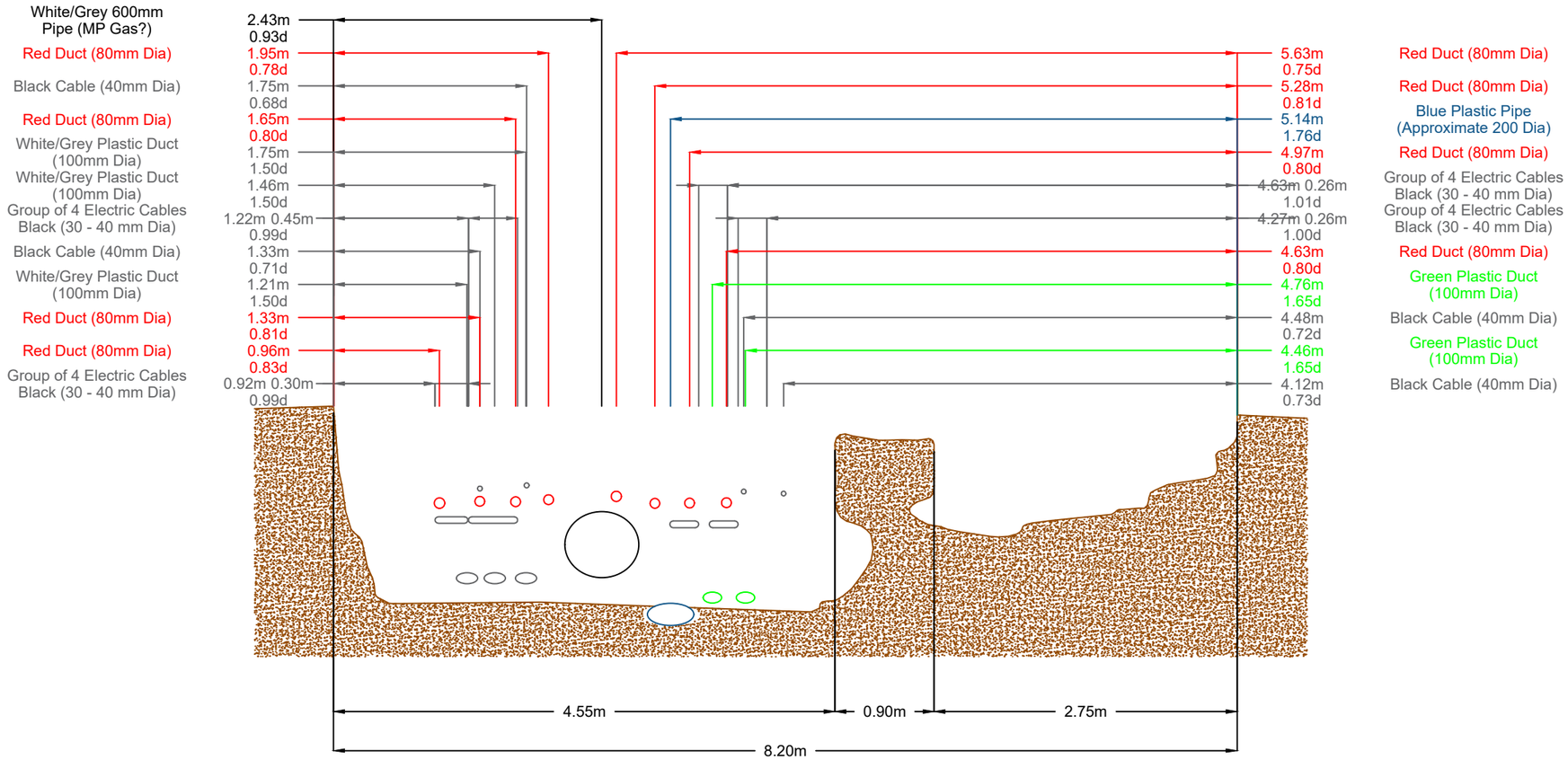
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Project Number:	**Rev:**	**Surveyed By:**	**Approved By:**
37349	-	RW/MA	ZM



OD22-01



OT22-01
Facing North-East

Level Datum = 56.00m

NOTES

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LEGEND

Ground Level
Ground Material
Section Note
Section Utility

PAS 128 : 2014

SURVEY CATEGORY	QUALITY LEVEL	CRITERIA USED IN THE DETERMINATION OF QUALITY LEVEL
TYPE B - DETECTION	QL-D4	A UTILITY SEGMENT WHICH IS SUSPECTED TO EXIST BUT HAS NOT BEEN DETECTED OR RECORDED. SHOWN AS AN ASSUMED ROUTE. (NO DETECTION POSSIBLE)
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Rev.	Date	Description	Drawn
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B	XXX	XXX	XXX
C	XXX	XXX	XXX

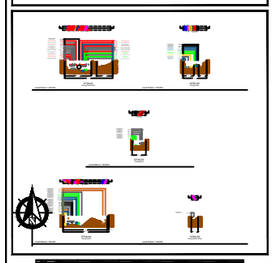
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ABBREVIATIONS (Land & Utilities)

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BH	BOREHOLE	GV	GAS VALVE	SB	SIGN BOARD
Bin	LITTER / DRY SALT BIN	GY	GULLY	SF	SAND FILLED
BO	BOLLARD	HT	HIGH VOLTAGE	SL	STREET LIGHT
BOL	BOLLARD	IC	INSPECTION CHAMBER	SL	SILT LEVEL (TOP)
BP	BOUNDARY POST	IL	INVERT LEVEL	SP	SIGN POST
BT	BT MANHOLE	KO	KERB OUTLET	SP	SOIL PIPE
BTC	BRITISH TELECOM CHAMBER	KO	KERB OUTLET	SV	STOP VALVE
CATV	CABLE TV COVER	LH	LAMP HOLE	SVP	SOIL VENT PIPE
CB	CATCH PIT / GULLY	LP	LAMP POST	TB	TELEPHONE BOX/KIOSK/MARK
CI	CAST IRON	LV	LOW VOLTAGE	TCB	TELEPHONE CALL BOX
CL	COVER LEVEL	MH	MANHOLE	TE	TRAPPED EXIT
CO	CLEANOUT	MP	MARKER POST	TM	TELECOM CHAMBER COVER
CP	CABLE PIT	MW	MONITORING WELL	TK	TANK
CR	CABLE RISER	OP	OUTLET PIPE	TL	TRAFFIC LIGHT
CT	CABLE TV CONTROL BOX	OS	ORDNANCE MARK	TP	TELEGRAPH POLE
DP	DOWN PIPE	P	POLE	UI	UNIDENTIFIED
EIC	ELECTRIC INSPECTION COVER	PB	POST BOX	UO	VITREOUS CLAY
EJ	EXPANSION JOINT	PC	PETROL LINE	VC	VALVE COVER
EP	ELECTRICITY POLE	PR	PIPE RISER	VR	VAPOUR RECOVERY
ER	EARTH ROD	PV	PIPE (VERTICAL)	WL	WATER LEVEL
FB	FOOTBRIDGE	RC	RODDING CHAMBER/ORDE	WO	WASH OUT VALVE
FH	FIRE HYDRANT	RE	RODDING EYE	WO	WASH OUT VALVE
		RF	RUBBLE FILLED	WS	WEAK SIGNAL



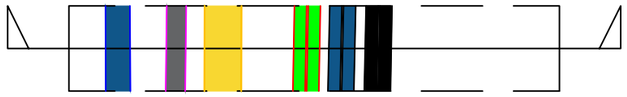
geospatial
Geotechnical Engineering Ltd
Telephone: (01452) 527743 Facsimile: (01452) 729314 E-mail: surveying@geoeng.co.uk Web: www.geoeng.co.uk

Client
City Football Group Limited

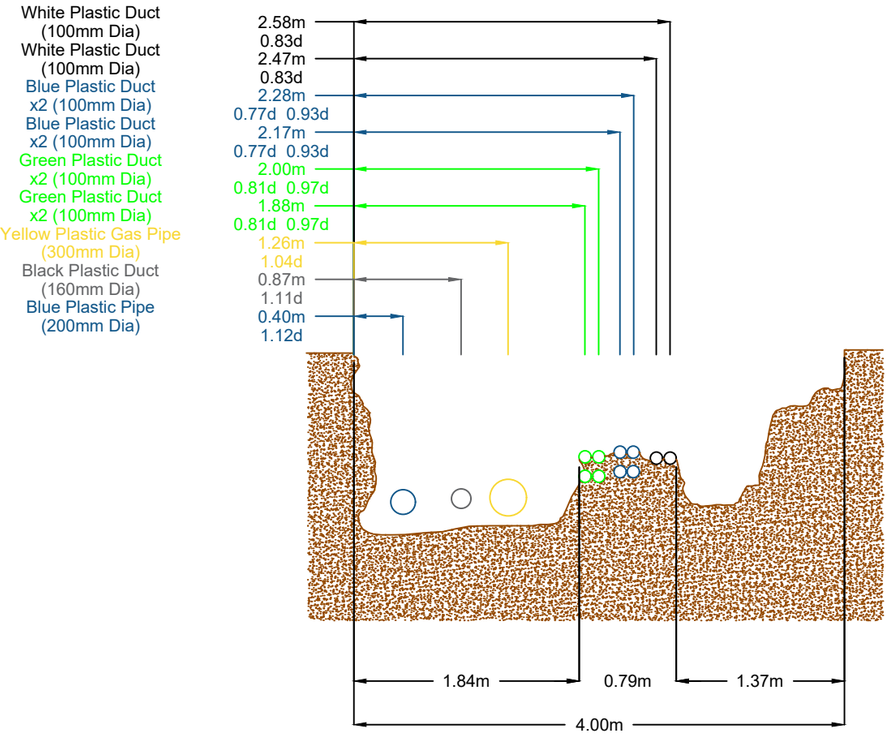
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Sections

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Project Number:	Rev:	Surveyed By:	Approved By:
37349 OT22-01	-	RW/MA	ZM



OD22-02



OT22-02
Facing East

Level Datum = 56.00m

NOTES

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LEGEND

Ground Level
Ground Material
Section Note
Section Utility

PAS 128 : 2014

SURVEY CATEGORY	QUALITY LEVEL	CRITERIA USED IN THE DETERMINATION OF QUALITY LEVEL
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Rev.	Date	Description	Drawn
A	XXX	XXX	XXX
B	XXX	XXX	XXX
C	XXX	XXX	XXX

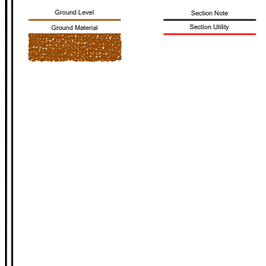
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BH	BOREHOLE	GV	GAS VALVE	SB	SIGN BOARD
BIN	BOROUGH SALT BIN	GT	GULLY TOP	SC	SCREW CAP
BL	BASE LEVEL	HV	HIGH VOLTAGE	SF	SPUN PILE
BOL	BOLLARD	IC	INSPECTION CHAMBER	SL	SALT LEVEL (TOP)
BP	BOUNDARY POST	IL	INVERT LEVEL	SP	SIGN POST
BS	BUS STOP	INT	INTERCEPTOR	ST	STOP VALVE
BTIC	BRITISH TELECOM CHAMBER	KO	KERB OUTLET	SV	SCOUR VALVE
CATV	CABLE TV COVER	LH	LAMP HOLE	SVP	SOIL VENT PIPE
CB	CONTROL BOX	LP	LAMP POST	TBM	TEMPORARY BENCHMARK
CH	CHAMBER	LV	LOW VOLTAGE	TC	TELEPHONE CABLE BOX
CL	COVER LEVEL	MH	MANHOLE	TE	TRAMPED EAT
CO	CONCRETE	Mkr	MARKER POST	TEL	TELECOM CHAMBER COVER
CP	CAR PARK	OS	OUTLET SHELL	TK	TANK
CR	CABLE RISER	OP	OUTLET PIPE	TL	TRAFFIC LIGHT
DCB	DRIVERS CONTROL BOX	OSBM	O.S BENCH MARK	TP	TELEGRAPH POLE
DP	DRAIN POINT	P	PIPE	TR	TRANSFORMER
EC	ELECTRIC INSPECTION COVER	PB	POST BOX	VC	VITREOUS CLAY
EOC	EDGE OF CANOPY	PE	POLYETHYLENE	VP	VENT PIPE
EP	ELECTRICITY POLE	PH	PHONE BOX	WC	WATER COURSE/VERY
ER	EARTH ROD	PV	PIPE (VERTICAL)	WL	WATER LEVEL
FB	FOOTBRIDGE	PVC	POLYVINYL CHLORIDE	WM	WATER METER
FH	FIRE HYDRANT	RE	RODDED EYE	WV	WATER VALVE
		RF	RUBBLE FILLED	WS	WILMI SIGNAL



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Client

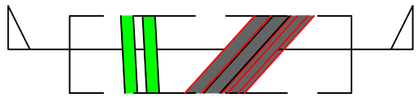
City Football Group Limited

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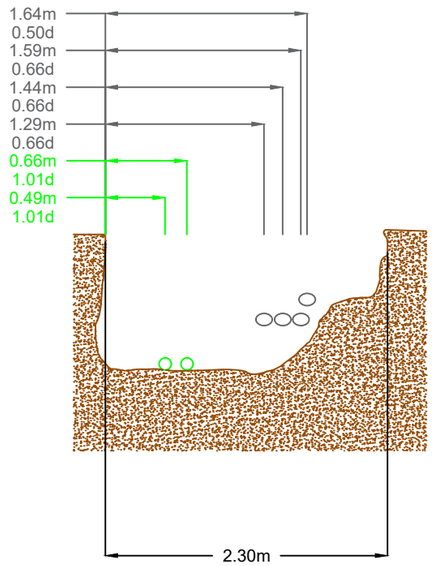
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37349 OT22-02	-	RW/MA	ZM



OT22-03

Black Plastic Duct (110mm Dia)
Black Plastic Duct (110mm Dia)
Black Plastic Duct (110mm Dia)
Green Plastic Duct (100mm Dia)
Green Plastic Duct (100mm Dia)



OT22-03
Facing East

Level Datum = 56.00m

NOTES

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LEGEND

Ground Level
Ground Material
Section Note
Section Utility

PAS 128 : 2014

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Rev.	Date	Description	Drawn
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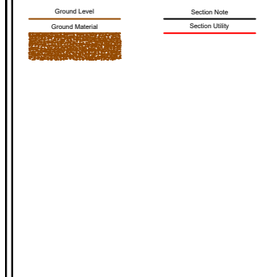
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BS	BRITISH STD SALT BIN		HP	HAND PUMP	SC	SPOT LEVEL (KERB)
BL	BASE LEVEL		HV	HIGH VOLTAGE	SI	SPUN IRON
BOL	BOLLARD		IC	INSPECTION CHAMBER	SL	SILT LEVEL (TOP)
BP	BOUNDARY POST		IL	INVERT LEVEL	SP	SIGN POST
BS	BOX SCOP		IN	INTERCEPTOR	ST	STOP TAP
BTIC	BRITISH TELECOM CHAMBER		KO	KERB OUTLET	SV	STOP VALVE
CA	CATTLE TROUGH		LP	LAMP POLE	TBM	TEMPORARY BENCH MARK
CB	CONTROL BOX		LP	LAMP POLE	TBM	TEMPORARY BENCH MARK
CI	CAST IRON		LV	LOW VOLTAGE	TCB	TELEPHONE CALL BOX
CL	CONCRETE LID		MH	MANHOLE	TL	TOPPED ELEV
CO	CONCRETE		MK	MARKER POST	TL	TELECOM CHAMBER COVER
CP	CABLE PIT		MW	MONITORING WELL	TK	TANK
CR	CABLE RISER		OP	OUTLET PIPE	TL	TRAFFIC LIGHT
DCB	DRIVERS CONTROL BOX		OSBM	O.S BENCH MARK	TP	TELEGRAPH POLE
DP	DRAIN POINT		P	PIPE	TR	TRANSFORMER
EC	ELECTRIC INSPECTION COVER		PB	POST BOX	VC	VITREOUS CLAY
EOC	EDGE OF CANOPY		PE	POLYETHYLENE	VP	VENT PIPE
EP	ELECTRICITY POLE		PI	PIPE (INVERT)	WD	WATER DISCOVERY
ER	EARTH ROD		PV	PIPE (VERTICAL)	WL	WATER LEVEL
FB	FOOTBRIDGE		PVC	POLYVINYL CHLORIDE	WM	WATER METER
FH	FIRE HYDRANT		R	RODDING EYE	WO	WASTE WATER OIL
			RF	RUBBLE FILLED	WS	WEAK SIGNAL



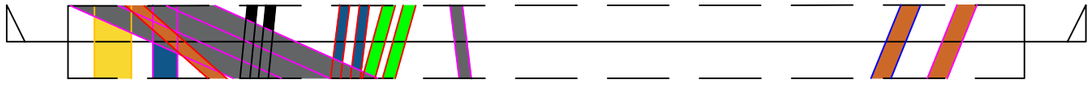
geospatial
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Client
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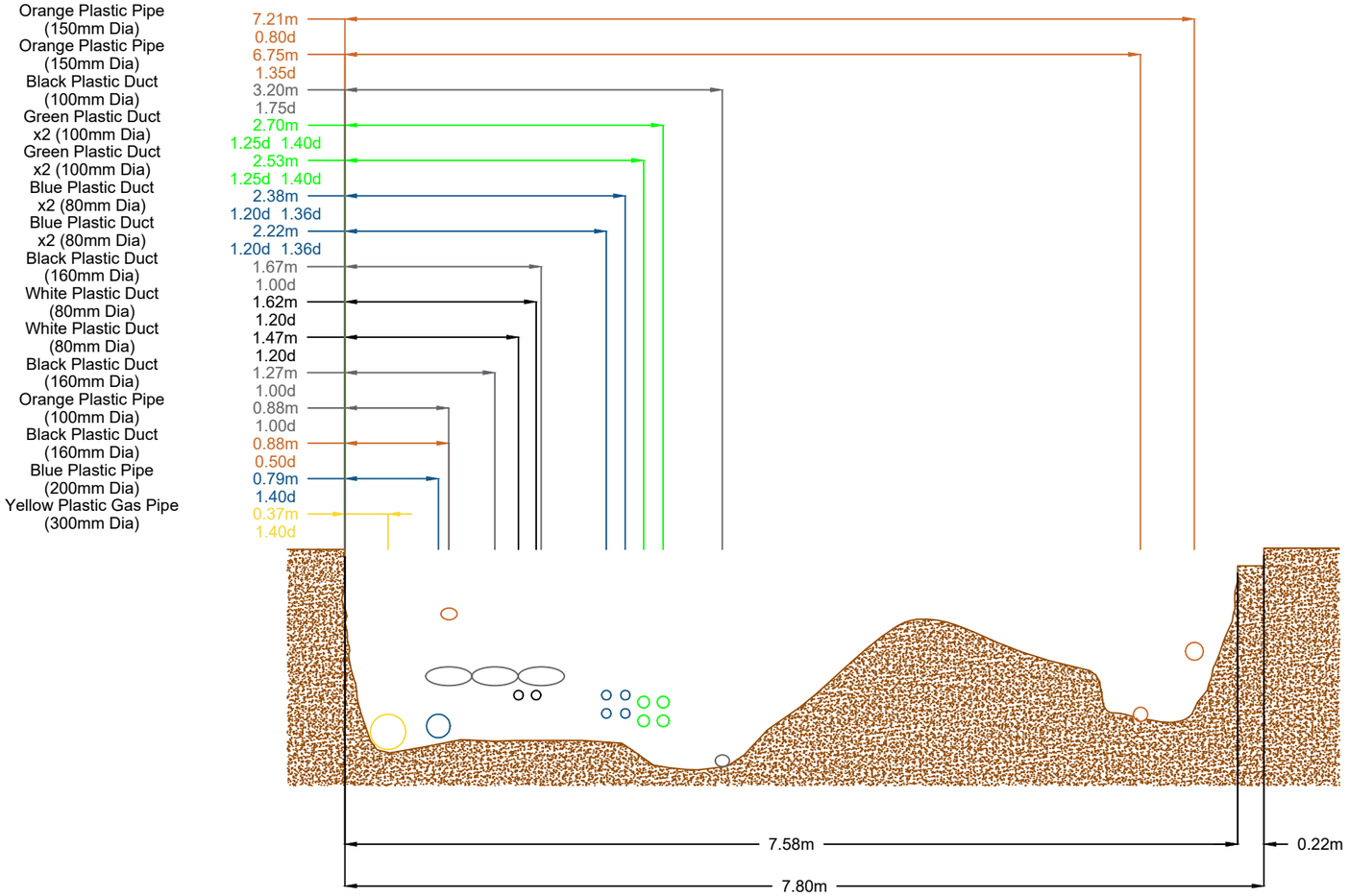
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Project Number:	Rev:	Surveyed By:	Approved By:
37349 OT22-03	-	RW/MA	ZM



OD22-04



OT22-04
Facing North

Level Datum = 56.00m

NOTES

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LEGEND

Ground Level
Ground Material
Section Note
Section Utility

PAS 128 : 2014

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C	XXX	XXX	

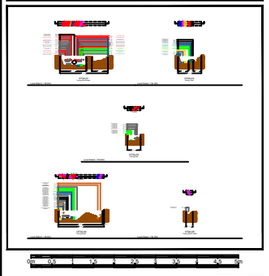
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ABBREVIATIONS (Land & Utilities)

AV	AIR VALVE	FL	FLOOR LEVEL	RS	ROAD SIGN
BH	BOREHOLE	GV	GAS VALVE	SB	SIGN BOARD
BIN	LITTER / GRIT SALT BIN	HV	HIGH VOLTAGE	SC	SOIL CONNECTION
BL	BASE LEVEL	IC	INSPECTION CHAMBER	SI	SIPON IRON
BOL	BOLLARD	IG	INTERCEPTOR	SL	SILT LEVEL (TOP)
BP	BOUNDARY POST	IND	INDICATOR	SP	SIGN POST
BS	BUS STOP	INT	INTERCEPTOR	ST	STOP TAP
BTIC	BRITISH TELECOM CHAMBER	KO	KERB OUTLET	SV	STOP VALVE
C	CONTROL BOX	KS	KERB STONE	TBE	TELEPHONE PIPE
CB	CONTROL BOX	LP	LAMP POST	TBM	TEMPORARY BENCH MARK
CI	CAST IRON	LV	LOW VOLTAGE	TCB	TELEPHONE CALL BOX
CL	CHANNEL LEVEL	MH	MANHOLE	TL	TRAFFIC LIGHT
CO	CONCRETE	Mo	MANAGER POST	TSL	TELECOM CHAMBER COVER
CP	CABLE PIT	MW	MONITORING WELL	TK	TANK
CT	CABLE TUNNEL	OHL	OVER HEAD LINE	TL	TRAFFIC LIGHT
DCB	DRAINAGE CONTROL BOX	OSBM	O.S BENCH MARK	TP	TELEGRAPH POLE
DP	DOWN PIPE	P	POST	UI	UNIDENTIFIED
EC	ELECTRIC INSPECTION COVER	PB	POST BOX	VC	VITREOUS CLAY
EHC	ELECTRIC MANHOLE	PC	PEDESTRIAN CONTROL	VP	VENT PIPE
EP	ELECTRICITY POLE	PR	PIPE RISER	VR	VAPOUR RECOVERY
ER	EARTH ROD	PV	PIPE (VERTICAL)	WL	WATER LEVEL
FB	FOOTBRIDGE	PVC	POLYVINYL CHLORIDE	WM	WATER METER
FH	FIRE HYDRANT	R	RODDING EYE	WP	WATER POLO VE
		RF	RUBBLE FILLED	WS	WEAK SIGNAL



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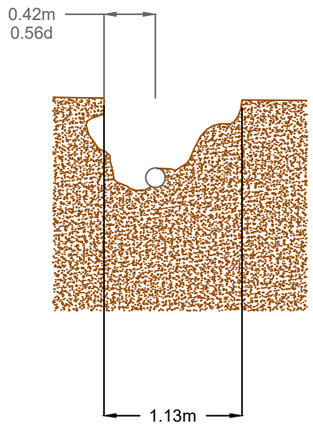
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1:50	A3	1	01/02/2023
Project Number:	Rev:	Surveyed By:	Approved By:
37349 OT22-04	-	RW/MA	ZM



OT22-05

Black Plastic Duct
(160mm Dia)



OT22-05
Facing South-West

Level Datum = 56.00m

NOTES

1. DRAINAGE INFORMATION HAS BEEN DETERMINED WITHOUT MAN ENTRY INTO CHAMBERS AND WHILST EVERY EFFORT HAS BEEN MADE TO CORRECTLY IDENTIFY THIS INFORMATION, IT SHOULD ALWAYS BE CHECKED IN AREAS THAT ARE CRITICAL TO THE INTENDED PROPOSAL.
2. ALL SEWERS ARE PRESUMED TO BE STRAIGHT BETWEEN CHAMBERS

LEGEND

Ground Level
Ground Material
Section Note
Section Utility

PAS 128 : 2014

SURVEY CATEGORY	QUALITY LEVEL	CRITERIA USED IN THE DETERMINATION OF QUALITY LEVEL
TYPE B - DETECTION	QL-B4	A UTILITY SEGMENT WHICH IS SUSPECTED TO EXIST BUT HAS NOT BEEN DETECTED OR RECORDED. SHOWN AS AN ASSUMED ROUTE. **(NO DETECTION POSSIBLE)**
	QL-B3	POSITION OF THE UTILITY DETECTED BY ONE OF THE GEOPHYSICAL TECHNIQUES. **(EML OR GPR DETECTION WITH LIMITED CONFIDENCE IN DEPTH)**
	QL-B2	POSITION AND DEPTH OF THE UTILITY DETECTED BY ONE OF THE GEOPHYSICAL TECHNIQUES. **(EML OR GPR DETECTION WITH CONFIDENCE IN DEPTH)**
	QL-B1	POSITION AND DEPTH OF THE UTILITY DETERMINED BY MULTIPLE GEOPHYSICAL TECHNIQUES. **(EML + GPR DETECTION)**

Rev.	Date	Description	Drawn
E	XXX	XXX	XXX
F	XXX	XXX	XXX
T	XXX	XXX	XXX

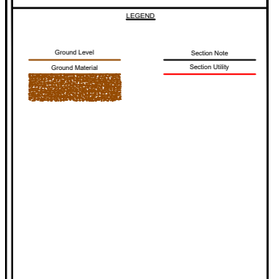
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ABBREVIATIONS (Land & Utilities)

AV	AIR VALVE	FL	FLOOR LEVEL	RS	ROAD SIGN
BH	BOREHOLE	GV	GAS VALVE	SB	SIGN BOARD
BIN	BRINE INJECT SALT BIN	HY	HYDRANT	SC	SPEED CAMERA
BL	BASE LEVEL	HV	HIGH VOLTAGE	SF	SIPON FEED
BOL	BOLLARD	IC	INSPECTION CHAMBER	SL	SILT LEVEL (TOP)
BP	BUSINESS POST	IL	INVERT LEVEL	SP	SIGN POST
BS	BUS STOP	IND	INTERCEPTOR	ST	STOP VALVE
BTIC	BRITISH TELECOM CHAMBER	KC	KERB CUT	SV	SCOUR VALVE
CATV	CABLE TV COVER	LH	LAMP HOLE	SVP	SOIL VENT PIPE
CB	CONTROL BOX	LP	LAMP POST	TBM	TEMPORARY BENCHMARK
CH	CHAMBER	MB	MAIL BOX/BOX	TCB	TRAFFIC CONTROL BOX
CL	COVER LEVEL	MH	MANHOLE	TE	TRAPPED EXIT
CO	CONCRETE	Mkr	MARKER POST	TEL	TELECOM CHAMBER COVER
CP	CAR PARK	OIL	OIL INTERCEPTOR SHELL	TL	TELEGRAPH
CR	CABLE RISER	OP	OUTLET PIPE	TL	TRAFFIC LIGHT
DCB	DRIVERS CONTROL BOX	OSBM	O.S BENCH MARK	TP	TELEGRAPH POLE
DP	DOWN PIPE	P	PIPE	TR	TRAFFIC RADAR
EIC	ELECTRIC INSPECTION COVER	PB	POST BOX	VC	VITREOUS CLAY
EOC	EDGE OF CANOPY	PE	POLYETHYLENE	VP	VENT PIPE
EP	ELECTRICITY POLE	PI	PIPE (INVERT)	WD	WATER DISCOVERY
ER	EARTH ROD	PV	PIPE (VERTICAL)	WL	WATER LEVEL
FB	FOOTBRIDGE	PVC	POLYVINYL CHLORIDE	WM	WATER METER
FH	FIRE HYDRANT	RE	RODDING EYE	WV	WATER VALVE
		RF	RUBBLE FILLED	WS	WILMI SIGNAL



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Sections

Scale:	Sheet Size:	Sheet Number:	Date:
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Project Number:	**Rev:**	**Surveyed By:**	**Approved By:**
37349 OT22-05	-	RW/MA	ZM

Geotechnical Engineering Limited

INSPECTION PIT LOG

CBR22/01

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 07 December 2022 Easting 386773 Scale 1:25

End Date 07 December 2022 Northing 398699 Ground Level 61.00mOD Depth 0.80 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
C	0.00	0.12			Black TARMACADAM.			
					Dark brown clayey sandy angular and subangular fine to coarse limestone GRAVEL. (MADE GROUND)	0.12	60.88	
1B	0.30	0.40						
2B	0.60	0.80						
					Trial pit Completed at 0.80m	0.80	60.20	

Equipment: Pit excavated by Hand Tools+Concrete Corer

Pit width x length: 0.30m x 0.30m

Sidewall stability: Stable and vertical.

Groundwater:
Not encountered

Backfill: Tarmacadam 0.00 - 0.12m.
Arisings 0.12 - 0.80m.

Remarks: Dynamic Cone Penetration test undertaken at this location, results presented separately. Test resfused at 0.25m; instructed to advance hole with hand tools and reattempt after clearing obstructions at 0.38m. Test refused at 0.43m; instructed to terminate test and take samples for geotechnical testing.

AGS

CONTRACT	CHECKED
37349	**CT**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

INSPECTION PIT LOG

CBR22/02

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 08 December 2022 Easting 386854 Scale 1:25

End Date 08 December 2022 Northing 398706 Ground Level 61.65mOD Depth 0.30 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
C	0.00	0.12			Black TARMACADAM.			
					Brown clayey very sandy angular and subangular fine to coarse brick, concrete and rare limestone GRAVEL. (MADE GROUND)	0.12	61.53	
					Trial pit Completed at 0.30m	0.30	61.35	

Equipment: Pit excavated by Hand Tools+Concrete Corer

Pit width x length: 0.30m x 0.30m

Sidewall stability: Stable and vertical.

Groundwater:
Not encountered

Backfill: Tarmacadam 0.00 - 0.12m.
Arisings 0.12 - 0.30m.

Remarks: Dynamic Cone Penetration test undertaken at this location, results presented separately. Test refused at 0.14m; instructed to advance hole with hand tools and reattempt after clearing obstructions at 0.30m.

CONTRACT	CHECKED
37349	**CT**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

DYNAMIC CONE PENETROMETER TESTING

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

CBR22/01 DCP

DATE 07/12/2022 Test No. Part 1

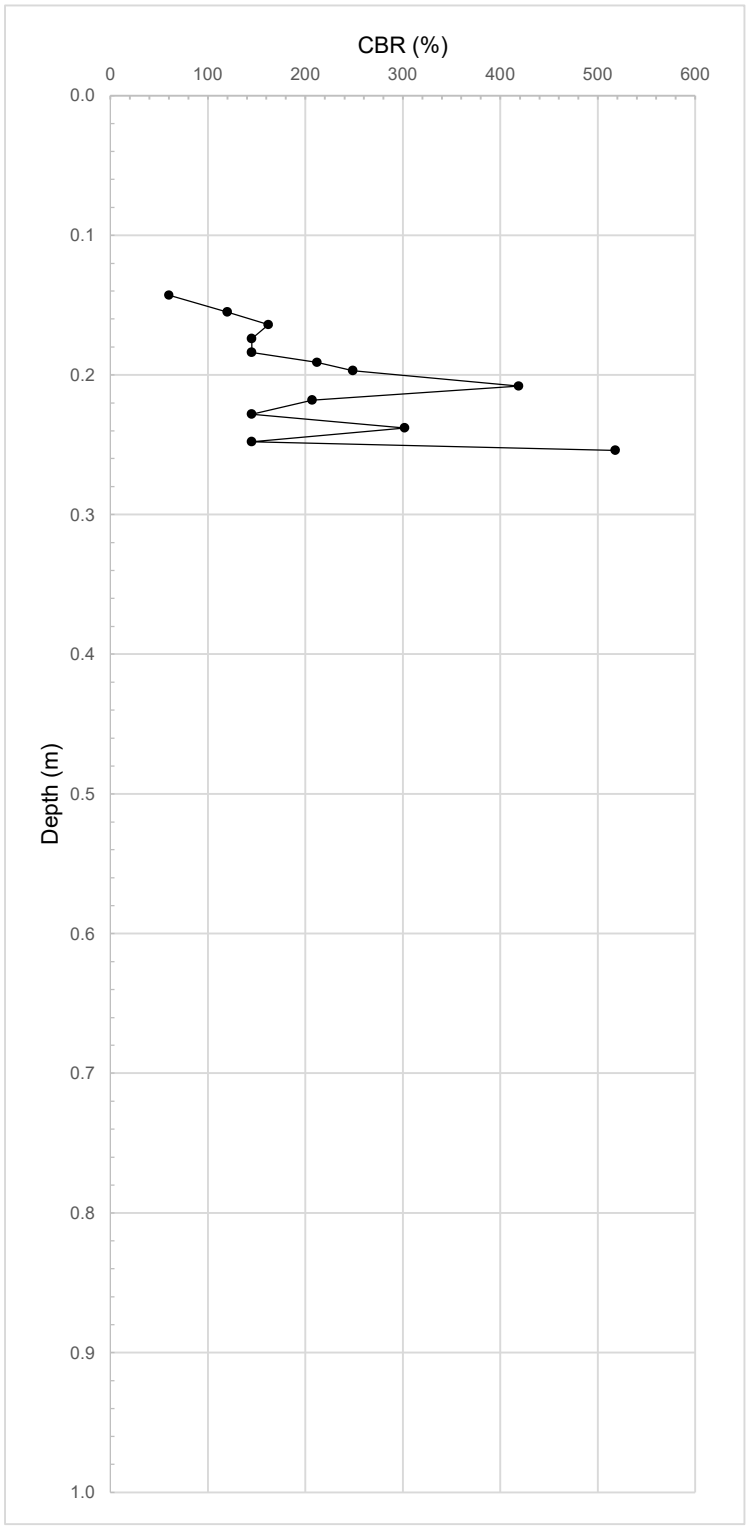
Initial Scale Reading (mm) 212 Datum bgl (mm) 120

Easting 386773

Northing 398699

Ground Level 61.00 mOD

no. of blows	Scale reading (mm)	Penetration Increment (mm)	Depth bgl (m)	DCP (mm/blow)	CBR (%)
5	235	23	0.14	5	60
5	247	12	0.16	2	120
5	256	9	0.16	2	162
5	266	10	0.17	2	145
5	276	10	0.18	2	145
5	283	7	0.19	1	212
5	289	6	0.20	1	249
15	300	11	0.21	1	419
7	310	10	0.22	1	207
5	320	10	0.23	2	145
10	330	10	0.24	1	302
5	340	10	0.25	2	145
10	346	6	0.25	1	518



Remarks:

CBR correlation based on the relationship Log10 (CBR) = 2.48 - 1.057 * Log10 (mm/blow) developed by TRL taken from Highways England CS229: Data for Pavement Assessment (2020).

Strata too hard to penetrate with DCP testing equipment 0.25-0.39m and 0.43-0.80m, hole advanced using hand tools 0.25-0.39m and 0.43-0.80m.

CONTRACT	CHECKED
37349	CT

Geotechnical Engineering Limited

DYNAMIC CONE PENETROMETER TESTING

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

CBR22/01 DCP

DATE 07/12/2022 Test No. Part 2

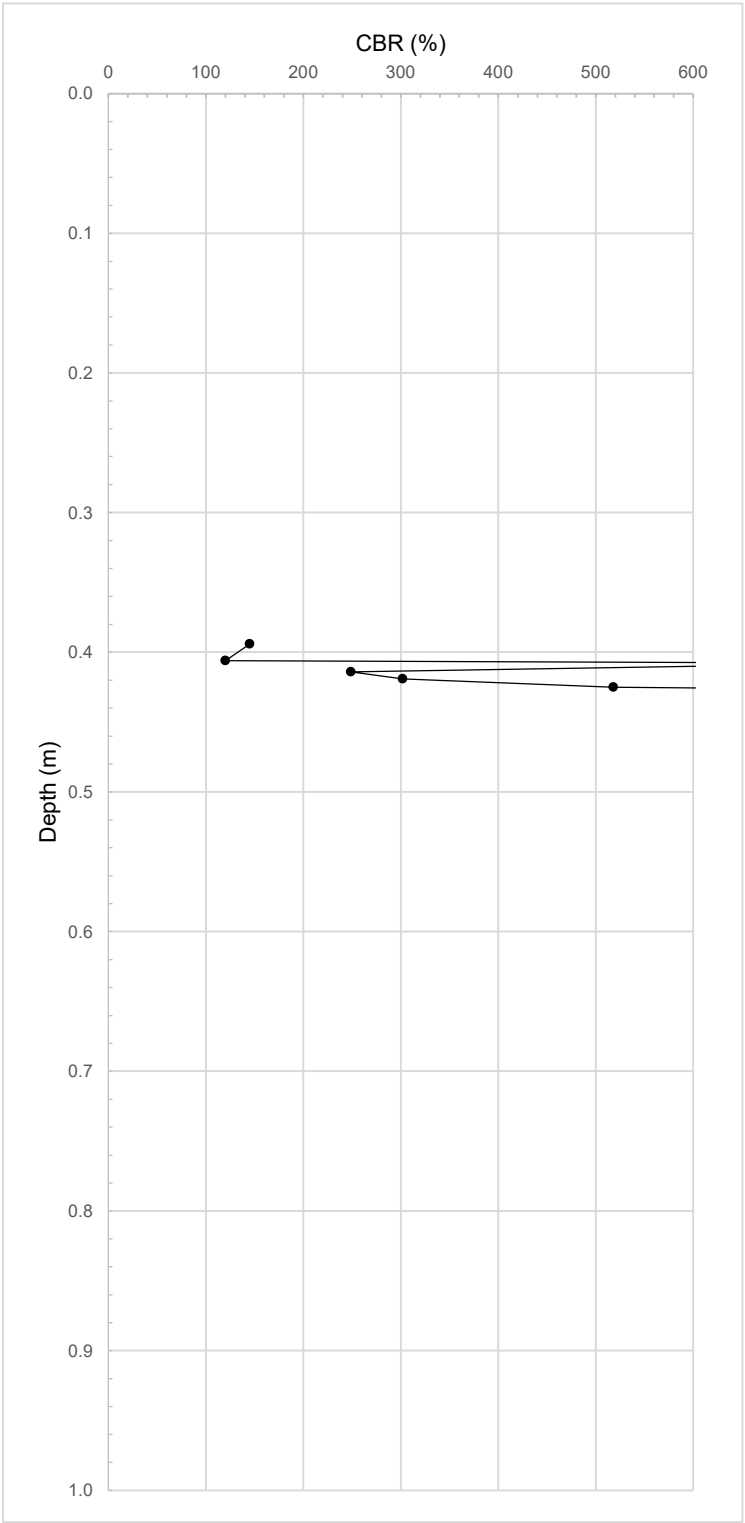
Easting 386773

Northing 398699

Initial Scale Reading (mm) 380 Datum bgl (mm) 384

Ground Level 61.00 mOD

no. of blows	Scale reading (mm)	Penetration Increment (mm)	Depth bgl (m)	DCP (mm/blow)	CBR (%)
5	390	10	0.39	2	145
5	402	12	0.41	2	120
5	404	2	0.41	0	795
5	410	6	0.41	1	249
5	415	5	0.42	1	302
10	421	6	0.43	1	518
15	425	4	0.43	0	1221
15	426	1	0.43	0	5286



Remarks:

CBR correlation based on the relationship Log10 (CBR) = 2.48 - 1.057 * Log10 (mm/blow) developed by TRL taken from Highways England CS229: Data for Pavement Assessment (2020).

Strata too hard to penetrate with DCP testing equipment 0.25-0.39m and 0.43-0.80m, hole advanced using hand tools 0.25-0.39m and 0.43-0.80m.

CONTRACT	CHECKED
37349	CT

Geotechnical Engineering Limited

DYNAMIC CONE PENETROMETER TESTING

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

CBR22/02 DCP

DATE 08/12/2022 Test No. 1

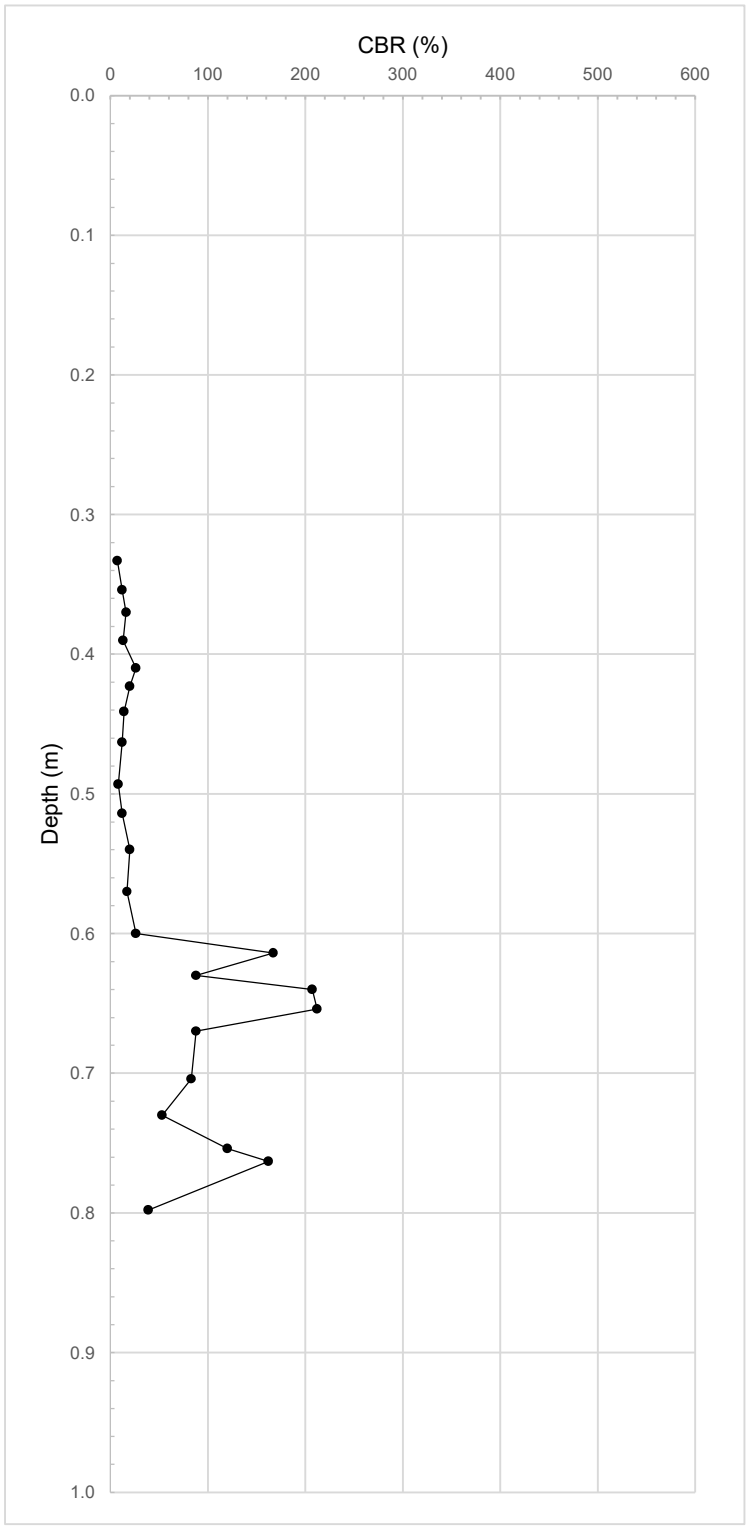
Easting 386854

Northing 398707

Initial Scale Reading (mm) 500 Datum bgl (mm) 300

Ground Level 61.65 mOD

no. of blows	Scale reading (mm)	Penetration Increment (mm)	Depth bgl (m)	DCP (mm/blow)	CBR (%)
1	533	33	0.33	33	7
1	554	21	0.35	21	12
1	570	16	0.37	16	16
1	590	20	0.39	20	13
2	610	20	0.41	10	26
1	623	13	0.42	13	20
1	641	18	0.44	18	14
1	663	22	0.46	22	12
1	693	30	0.49	30	8
1	714	21	0.51	21	12
2	740	26	0.54	13	20
2	770	30	0.57	15	17
3	800	30	0.60	10	26
8	814	14	0.61	2	167
5	830	16	0.63	3	88
7	840	10	0.64	1	207
10	854	14	0.65	1	212
5	870	16	0.67	3	88
10	904	34	0.70	3	83
5	930	26	0.73	5	53
10	954	24	0.75	2	120
5	963	9	0.76	2	162
5	998	35	0.80	7	39



Remarks:

CBR correlation based on the relationship Log10 (CBR) = 2.48 - 1.057 * Log10 (mm/blow) developed by TRL taken from Highways England CS229: Data for Pavement Assessment (2020).

Strata too hard to penetrate with DCP testing equipment 0.12-0.33m, hole advanced using hand tools 0.12-0.33m.

CONTRACT	CHECKED
37349	CT

Geotechnical Engineering Limited

INSPECTION PIT LOG

CPT22/01

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 15 November 2022 Easting 386734 Scale 1:25

End Date 15 November 2022 Northing 398603 Ground Level 60.55mOD Depth 1.20 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
C	0.00	0.10			Black TARMACADAM.			
1B	0.10	0.35			Light grey sandy angular fine to coarse limestone GRAVEL. (MADE GROUND)	0.10	60.45	
2D	0.20		Vo 0.3					
1ES	0.25							
3B	0.35	0.55			Dark grey and dark brown very sandy angular fine to coarse limestone, clinker, sandstone and rare brick and concrete GRAVEL with a low angular limestone cobble content. (MADE GROUND) 0.50m: Geotextile membrane. 0.70m: Strong hydrocarbon odour.	0.35	60.20	
2ES	0.50		Vo 0.5					
4D	0.50							
5B	0.90	1.20			Dark grey slightly gravelly clayey fine to coarse SAND. Gravel is angular fine to coarse clinker, limestone, sandstone and slate and rare brick. Strong hydrocarbon odour. (MADE GROUND)	0.90	59.65	
3ES	1.00		Vo 1.2					
6D	1.00							
					Trial pit Completed at 1.20m	1.20	59.35	

Equipment: Pit excavated by Geotechnical Pioneer Rig+Hand Tools

Pit width x length: 0.30m x 0.30m

Sidewall stability: Stable and vertical

Groundwater:
Not encountered

Backfill: Tarmacadam 0.00 - 0.10m.
Arisings 0.10 - 1.20m.

Remarks: Cone Penetration Testing (CPT) undertaken at this location, results presented separately.

CONTRACT	CHECKED
37349	**CT**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

INSPECTION PIT LOG

CPT22/02

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 15 November 2022 Easting 386776 Scale 1:25

End Date 16 November 2022 Northing 398640 Ground Level 60.55mOD Depth 1.20 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
C	0.00	0.15	Vo 3.2		Black TARMACADAM.			
1B	0.15	0.35			Dark grey sandy angular to subrounded fine to coarse concrete and limestone GRAVEL with a medium grey subangular limestone cobble content. (MADE GROUND)	0.15	60.40	
1ES	0.15	0.35						
2D	0.15	0.35						
2ES	0.45	0.60	Vo 5.4		Dark greyish brown locally black sandy angular to subrounded fine to coarse concrete, brick and limestone GRAVEL with a low subangular concrete and limestone cobble content and rare wood fragments (up to 100x70x70mm). (MADE GROUND)	0.45	60.10	
3B	0.45	0.60						
4D	0.45	0.60						
3ES	0.90	1.10	Vo 5.4		Firm greyish brown sandy gravelly CLAY with a low subangular siltstone cobble content. Gravel is angular to subrounded fine to coarse brick, concrete and siltstone. (MADE GROUND)	0.75	59.80	
5B	0.90	1.10						
6D	0.90	1.10						
					Trial pit Completed at 1.20m	1.20	59.35	

Equipment: Pit excavated by Hand Tools+Geotechnical Pioneer Rig

Pit width x length: 0.30m x 0.30m

Sidewall stability: Stable and vertical

Groundwater:
Not encountered

Backfill: Tarmacadam 0.00 - 0.15m.
Arisings 0.15 - 1.20m.

Remarks: Cone Penetration Testing (CPT) undertaken at this location, results presented separately.

CONTRACT	CHECKED
37349	**CT**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

INSPECTION PIT LOG

CPT22/03

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 15 November 2022 Easting 386830 Scale 1:25

End Date 15 November 2022 Northing 398618 Ground Level 60.55mOD Depth 1.20 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
C	0.00	0.10			Black TARMACADAM.			
1B	0.10	0.30			Light grey sandy angular fine to coarse limestone and rare brick GRAVEL. (MADE GROUND)	0.10	60.45	
2D	0.20		Vo 0.2					
1ES	0.25				Soft dark grey slightly gravelly sandy CLAY. Gravel is angular fine to coarse sandstone, limestone, clinker and rare brick and concrete. (MADE GROUND)	0.30	60.25	
3B	0.30	0.45	Vo 0.4			0.45	60.10	
2ES	0.35				Firm greyish brown slightly sandy slightly gravelly CLAY. Gravel is subangular and subrounded fine to coarse sandstone.			
4B	0.45	1.20	Vo 0.7					
3ES	0.50							
5D	0.50							
4ES	1.00		Vo 0.3					
6D	1.00							
					Trial pit Completed at 1.20m	1.20	59.35	

Equipment: Pit excavated by Hand Tools+Geotechnical Pioneer Rig

Pit width x length: 0.30m x 0.30m

Sidewall stability: Stable and vertical.

Groundwater:
Not encountered

Backfill: Tarmacadam 0.00 - 0.10m.
Arisings 0.10 - 1.20m.

Remarks: Cone Penetration Testing (CPT) undertaken at this location, results presented separately.

CONTRACT	CHECKED
37349	**CT**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

INSPECTION PIT LOG

CPT22/04

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 15 November 2022 Easting 386736 Scale 1:25

End Date 15 November 2022 Northing 398636 Ground Level 60.60mOD Depth 1.20 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
C	0.00	0.10			Black TARMACADAM.			
1B	0.10	0.30			Light grey sandy angular fine to coarse limestone and rare brick GRAVEL. (MADE GROUND)	0.10	60.50	
2D	0.20		Vo 0.3					
1ES	0.25							
3B	0.35	0.55			Dark grey and dark brown very sandy angular fine to coarse limestone, clinker, sandstone and rare brick and concrete GRAVEL with a low angular limestone cobble content. (MADE GROUND)	0.30	60.30	
2ES	0.50		Vo 0.3		0.50m: Geotextile membrane.			
4D	0.50				0.70m: Strong hydrocarbon odour.			
5B	0.90	1.20			Dark grey slightly sandy angular fine to coarse clinker, limestone, sandstone, slate and rare brick GRAVEL. Strong hydrocarbon odour. (MADE GROUND)	0.90	59.70	
3ES	1.00		Vo 0.3					
6D	1.00							
					Trial pit Completed at 1.20m	1.20	59.40	

Equipment: Pit excavated by Geotechnical Pioneer Rig+Hand Tools

Pit width x length: 0.30m x 0.30m

Sidewall stability: Stable and vertical

Groundwater:
Not encountered

Backfill: Tarmacadam 0.00 - 0.10m.
Arisings 0.10 - 1.20m.

Remarks: Cone Penetration Testing (CPT) undertaken at this location, results presented separately.

CONTRACT	CHECKED
37349	**CT**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

INSPECTION PIT LOG

CPT22/05

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 16 November 2022 Easting 386736 Scale 1:25

End Date 16 November 2022 Northing 398682 Ground Level 60.95mOD Depth 0.82 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
C	0.00	0.15			Black TARMACADAM.			
1B	0.15	0.35	Vo 4.6		Light grey sandy angular to subrounded fine to coarse brick, concrete, limestone and rare tarmacadam GRAVEL with a low angular concrete cobble content. (MADE GROUND)	0.15	60.80	
1ES	0.15	0.35						
2D	0.15	0.35						
2ES	0.35	0.60	Vo 8.2		Greyish brown sandy angular to subrounded fine to coarse concrete, brick, quartzite and limestone GRAVEL with rare wood fragments (up to 30x10x10mm). (MADE GROUND)	0.35	60.60	
3B	0.35	0.60						
4D	0.35	0.60						
3ES	0.60	0.80	Vo 2.2		Light brown slightly gravelly fine to coarse SAND. Gravel is angular to subrounded fine to coarse limestone, clinker and concrete. (MADE GROUND)	0.60	60.35	
5B	0.60	0.80						
6D	0.60	0.80						
					0.68 - 0.82m: Black plastic duct (approx. 160mm diam) in pit wall.	0.82	60.13	
					Trial pit Completed at 0.82m			

Equipment: Pit excavated by Hand Tools+Geotechnical Pioneer Rig

Pit width x length: 0.30m x 0.30m

Sidewall stability: Stable and vertical

Groundwater:
Not encountered

Backfill: Tarmacadam 0.00 - 0.15m.
Arisings 0.15 - 0.82m.

Remarks: Hole terminated at 0.82m due to encountering service. Location relocated to CPT22/05A.

CONTRACT	CHECKED
37349	**CT**

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Geotechnical Engineering Limited

INSPECTION PIT LOG

CPT22/05A

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 16 November 2022 Easting 386737 Scale 1:25

End Date 17 November 2022 Northing 398682 Ground Level 60.95mOD Depth 1.20 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
C	0.00	0.10			Black TARMACADAM.			
1B	0.10	0.30			Light grey sandy angular to subrounded fine to coarse concrete, limestone and rare brick GRAVEL. (MADE GROUND)	0.10	60.85	
					Brown slightly clayey sandy angular to subrounded fine to coarse brick and concrete GRAVEL with a medium angular brick cobble content. (MADE GROUND)	0.30	60.65	
2B	0.50	0.70						
1ES	0.90	1.10	Vo 4.3					
3B	1.00	1.20						
					Trial pit Completed at 1.20m	1.20	59.75	

Equipment: Pit excavated by Hand Tools+Geotechnical Pioneer Rig

Pit width x length: 0.30m x 0.30m

Sidewall stability: Stable and vertical

Groundwater:
Not encountered

Backfill: Tarmacadam 0.00 - 0.10m.
Arisings 0.10 - 1.20m.

Remarks: Cone Penetration Testing (CPT) undertaken at this location, results presented separately.

CONTRACT	CHECKED
37349	**CT**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

INSPECTION PIT LOG

CPT22/06

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 15 November 2022 Easting 386813 Scale 1:25

End Date 16 November 2022 Northing 398651 Ground Level 60.60mOD Depth 1.20 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
C	0.00	0.10			Black TARMACADAM.	0.10	60.50	
1B	0.20	0.35	Vo 3.3		Dark greyish brown sandy angular to subrounded fine to coarse brick, concrete, siltstone and limestone GRAVEL with a medium angular brick cobble content and frequent wood fragments (up to 70x70x50mm). (MADE GROUND)			
1ES	0.20	0.40						
2D	0.20	0.40						
2ES	0.50	0.70	Vo 12.1		0.50m: Geotextile membrane.			
3B	0.50	0.70						
4D	0.50	0.70			0.70 - 0.80m: Steel reinforcement bar fragment (100x5mm diam).			
3ES	0.90	1.10	Vo 4.1					
5B	0.90	1.10						
6D	0.90	1.10						
					Trial pit Completed at 1.20m	1.20	59.40	

Equipment: Pit excavated by Hand Tools+Geotechnical Pioneer Rig

Pit width x length: 0.30m x 0.30m

Sidewall stability: Stable and vertical

Groundwater:
Not encountered

Backfill:

Remarks: Cone Penetration Testing (CPT) undertaken at this location, results presented separately. Please refer to log BH22/06A for backfill information.

CONTRACT	CHECKED
37349	**CT**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

Geotechnical Engineering Limited

INSPECTION PIT LOG

CPT22/07

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 15 November 2022 Easting 386802 Scale 1:25

End Date 17 November 2022 Northing 398696 Ground Level 60.95mOD Depth 1.20 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
C	0.00	0.10			Black TARMACADAM.			
1B	0.10	0.30	Vo 0.5		Light grey subangular limestone COBBLES with some light grey sandy gravel. Gravel is angular to subrounded fine to coarse limestone and rare concrete. (MADE GROUND)	0.10	60.85	
1ES	0.10	0.30						
2B	0.35	0.50	Vo 5.8		Greyish brown slightly silty gravelly fine to coarse SAND. Gravel is angular and subangular brick, siltstone, limestone, concrete and rare tarmacadam. (MADE GROUND)	0.35	60.60	
2ES	0.35	0.50						
3D	0.35	0.50						
3ES	0.90	1.10	Vo 15.6					
4B	0.90	1.10						
5D	0.90	1.10						
					Trial pit Completed at 1.20m	1.20	59.75	

Equipment: Pit excavated by Hand Tools+Geotechnical Pioneer Rig

Pit width x length: 0.30m x 0.30m

Sidewall stability: Stable and vertical

Groundwater:
Not encountered

Backfill: Tarmacadam 0.00 - 0.10m.
Arisings 0.10 - 1.20m.

Remarks: Cone Penetration Testing (CPT) undertaken at this location, results presented separately.

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INSPECTION PIT LOG

CPT22/08

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Sheet 1 of 1

Start Date 16 November 2022 Easting 386858 Scale 1:25

End Date 16 November 2022 Northing 398670 Ground Level 61.20mOD Depth 1.20 m

sample no & type	sample depth (m) from	to	test type & value	water record	description	depth (m)	reduced level (m)	legend
1B	0.10	0.40			Brown slightly clayey very sandy angular fine to coarse sandstone, limestone, clinker and rare brick and concrete GRAVEL. (MADE GROUND)			
1ES	0.20		Vo 0.2					
2D	0.30							
2ES	0.35		Vo 0.6					
					0.40m: Geotextile membrane.			
3ES	0.50		Vo 0.4					
3B	0.80							
4D	0.80	1.20						
4ES	1.00		Vo 0.4					
					Trial pit Completed at 1.20m	1.20	60.00	

Equipment: Pit excavated by Hand Tools

Pit width x length: 0.30m x 0.30m

Sidewall stability: Stable and Vertical

Groundwater:
Not encountered

Backfill: Arisings 0.00 - 1.20m.

Remarks: Cone Penetration Testing (CPT) undertaken at this location, results presented separately.

CONTRACT	CHECKED
37349	**CT**

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

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MANCHESTER

SOIL INVESTIGATION

CPT REPORT

Cone penetration testing
Parameter interpretation

Project Reference.: P-108203-1

Report Issue No.: 01 P-108203_01

PROJECT:	Manchester

CLIENT:	Geotechnical Engineering

FIELDWORK

CPT rig(s)	17.9-tonne track-truck mounted CPT unit (UK20)
Date fieldwork started	17th November 2022
Date fieldwork completed	17th November 2022
Lankelma's representative	Emma Stickland
Client's representative	Richard Heath

DOCUMENT CHECKING

Action	Date	Name
Completed	24/11/2022	Christopher Player
Checked	25/11/2022	Joseph Hobbs
Approved	25/11/2022	Joseph Hobbs

Issue	Date	Status
01_01	25/11/2022	Final

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Appendix F PARAMETER RESULTS 2 – SPT N60, Phi, D_r, E, I_c

Appendix G PENETROMETER TEMPERATURE RESULTS

1 INTRODUCTION

At the request of Geotechnical Engineering, a soils investigation was carried out on project *Manchester*.

Site location:

(In the general region of)

GEL Compound – Gate 3
Etihad Stadium
Ashton New Road
Manchester
M11 4DB

2 DISCLAIMER

The investigation information, raw data and interpretations provided in this report are for the sole benefit of the Client identified at the front of the report.

Lankelma has exercised reasonable skill and care in the fieldwork and preparation of this report. This report has been completed based on information available to Lankelma at the time of preparation. The measurement and interpreted data in this report do not constitute recommendations for design purposes. An appropriately qualified person must review and interpret the data given in this report, together with any assumptions we have made that affect the data, before using the data for design or recommendation. Lankelma accepts no responsibility for the accuracy or suitability of any assumptions, derived soil parameters, soil classification descriptions or soil layer boundaries contained in this report.

3 COMPLETED WORKS

- 8 nr. cone penetration tests with pore pressure measurement (CPTu)
- Factual report including point data interpretation of selected parameters

Appendix A contains tabulated details of the works completed together with analysis results where applicable.

4 FIELDWORK GENERAL

Fieldwork was performed with a 17.9-tonne track-truck mounted CPT unit (UK20) equipped with a 17.5-tonne capacity hydraulic ram set.

The Client was responsible for the positioning and re-survey of all investigative locations.

The target depth for the investigation was between 15 m and 20 m below ground level or until cone refusal was reached. Table 3 details the final test depths and reasons for test termination

(*refusal factor)*. Where required, each penetration refusal decision was verbally confirmed with the Client's on-site representative.

5 CONE PENETRATION TESTS

Cone penetration testing was carried out in general accordance with BS ISO 22476-1:2012.

Penetrometer measurements included cone tip resistance, friction sleeve resistance and dynamic pore water pressure sampled at a 10 mm resolution.

Penetrometers were calibrated in accordance with ISO 376:2011. The management of calibration records is in accordance with ISO 10012. Copies of all calibration certificates for the cones used are provided in Appendix B.

The penetrometer used was a digital model (down-hole digitisation) with internal measurement of load cell temperature. The temperature data was used for QA during the test and QC during processing. The test operative aimed to keep the rate of temperature change to less than 0.5°/min in low strength soils to maintain acceptable measurement error. The temperature data can be used to assess ground temperature at depths where the cone has paused for more than 10 minutes with an accuracy of ~+- 0.5°.

The piezometer filter element was in the u_2 position and was vacuum saturated in a > 99.9% vacuum under 1000 cSt silicone oil for > 7 days prior to mobilisation. The pore pressure system was vacuum saturated in the disassembled state under 500 cSt glycerine oil (dipropylene glycol or propylene glycol) and assembled under oil prior to each test.

5.1 GLOSSARY OF CPT TERMS AND SYMBOLS

SYMBOLS & ABBREVIATIONS

B_q	**Pore pressure ratio.** The net pore pressure normalized with respect to the net cone resistance: $B_q = (u_2 - u_0)/(q_t - \sigma_v)$
F_r	**Normalised friction sleeve resistance:** $F_r = f_s / (q_c - \sigma_v)$
f_s	**Friction sleeve resistance:** The total frictional force acting on the friction sleeve, F_s, divided by its surface area A_s: $f_s = F_s/A_s$.
G	**Shear modulus**
g	**Gravitational constant:** g = 9.81 m/s^2
G_0	**Small strain shear modulus**
Gs	**Specific gravity of solids**
HOC	**Heavily overconsolidated**
I_c	**Soil Behaviour Type Index:** Continuous numerical representation of Robertson (1990) soil behaviour type classification chart.
LOC	**Lightly overconsolidated**
NC	**Normally consolidated**
OC	**Overconsolidated**

q_c	**Cone resistance:** The total force acting on the cone Q_c, divided by the projected area of the cone, A_c: $q_c = Q_c/A_c$.
Q_t	**Normalised cone resistance** (Method 1): $Q_t = (q_c - \sigma_v)/\sigma'v$
q_t	**Corrected tip resistance:** The cone tip resistance q_c corrected for pore water pressure effects on the cone shoulder.
$q_{t\text{-}net}$	**Net cone resistance:** $q_{t\text{-}net} = q_t - \sigma_v$. Where q_t is unavailable q_c is applied.
q_{t1}	**Normalised cone resistance** (Method 2): $q_{t1} = (q_t)/(\sigma'_v)^{0.5}(\frac{q_t}{\sigma_{atm}})/(\frac{\sigma_{v0}'}{\sigma_{atm}})^{0.5}$
R_f	**Friction ratio:** The ratio, expressed as a percentage, of the sleeve friction, f_s, to the cone resistance, q_c, at a given depth: $R_f = (f_s/q_c) \cdot 100$
SBT or SBTn	**Soil behaviour type classification**
SPT	**Standard Penetration Test**
u_0	**Equilibrium pore pressure**
u_2	**Pore pressure:** Dynamic pore pressure measured at the shoulder position (u_2) during penetration and during dissipation tests. $u_2 = \Delta u_2 + u_0$
Δu_2	**Excess pore pressure:** $\Delta u_2 = u_2 - u_0$
V_s, V_p	**Shear wave velocity, V_s, and pressure wave velocity, V_p.** Measured with use of a seismic receiver.
z	**Depth below ground level:** Depth as penetration length without correction for inclination, or true depth after correction for inclination.
Greek	
γ	**Unit weight of soil**
γ_w	**Unit weight of water**
ρ	**Volumetric mass density (or specific mass) of soil:** $\rho = \gamma/g$
σ_v	**Total overburden stress**
σ'_v	**Effective overburden stress**
σ_{atm}, **or,** P_a	**Reference atmospheric stress:** σ_{atm} = 101.3 kPa

TERMS

Cone or 'tip': The conical tip of the cone penetrometer.

Friction sleeve: The section of the cone penetrometer upon which the sleeve friction is measured, located behind the cone tip.

Piezocone: A cone penetrometer with a pore pressure sensor (u_2 or u_1)

Seismic cone: A cone penetrometer with a seismic receiver incorporated inside or behind.

Dynamic pore pressure: The pore pressure measured during penetration (u_2 or u_1) .

Soil behaviour type, or 'SBT': Soil classification scheme or classified soil type according to Robertson (1990, 2016) often abbreviated to SBT or according to normalised cone parameters SBTn.

Rod string: The series of hollow tube push rods that transmit force to the penetrometer.

5.2 CPT DATA REDUCTION AND PRESENTATION

The CPT results are presented in Appendix C. The corrected cone resistance (q_t), local side friction (f_s), dynamic pore water pressure (u_2), friction ratio (R_f) and inclination are all presented against depth and elevation in accordance BS ISO 22476-1:2012. CPT data and the associated derived geotechnical parameters are included in the 4.0 data file provided.

The cone tip and sleeve force measurements were converted to pressure using the nominal dimensions of the penetrometer.

Zero load output values were recorded before and after each test. The set of zero values applied to the measurements (subtracted from the raw output measurement) were those deemed to be obtained at a temperature closest to ground temperature, or the average of the two sets where appropriate.

For tests performed with digital cones, the tip sleeve and pore pressure measurements were corrected for static and transient temperature effects using parameters obtained from the *TEMPERATURE EFFECTS* section of the calibration certificate. For each CPT, the dataset was first grouped into penetration strokes (max 1.2 m) and then locally sub-grouped by tip resistance above and below 2 MPa. For each sub-group of qc < 2 MPa, the slope of the temperature (T) profile with time (t) was determined by regression to obtain the rate of temperature change $\Delta T/\Delta t$. For each recorded value, the static and transient temperature error component (apparent sensor output due to change in temperature) was subtracted from the reading.

For subtraction type cones incorporating traditional temperature compensation wiring in the strain gauge circuit, the residual apparent cone tip resistance ($q_{c:a}$) and sleeve resistance ($f_{s:a}$) due to static and transient temperature effects can be approximated by

$q_{c:a} = a(\Delta T/\Delta t) + b(\Delta T)$,

$f_{s:a} = a(\Delta T/\Delta t) + b(\Delta T) - q_{c:a}$

and

$u_a = b(\Delta T)$

Where $q_{c:a}$ is the apparent tip resistance, $f_{s:a}$ is the apparent sleeve resistance, a is the apparent resistance due to unit transient temperature change $\Delta T/\Delta t$, and b is the change in apparent resistance per unit static temperature change relative to the temperature of the penetrometer at the time of zero load output measurement. Note that for the piezometer sensor only the static temperature component is considered and is only applied to piezometer sensors without temperature compensation circuitry.

Parameter a is established by subjecting the cone to a positive and negative nominal temperature change (ΔT ~ +- 9°) in water and measuring the apparent output corresponding to the maximum rate of temperature change at the load cells. Parameter b is established by measuring the apparent output after the cone has temperature stabilised.

The temperature corrected tip ($q_{c:c}$), sleeve resistance ($f_{s:c}$) and pore pressure ($u_{:c}$) are then found from

$q_{c:c} = q_{c:m} - q_{c:a}$,

$f_{s:c} = f_{s:m} - f_{s:a}$

$u_{:c} = u_{:m} - u_{:a}$

Where subscript '$_{:m}$', denotes the field measured resistance/pressure as recorded in the raw data files.

Notes:

1. Depending on the temperature performance of the individual cone, temperature correction of the sleeve is often not warranted as it does not substantially improve accuracy. This is because for subtraction type cones the errors in the sleeve force largely cancel with errors in the tip force when they have the same sign.

2. There is currently no recognised nomenclature for CPT parameters with temperature correction applied during post processing. To avoid confusion the nomenclature is kept unchanged in the logs and AGS data (q_c/q_t, f_s, and u_2) and unless stated otherwise, temperature correction has been applied using the parameters reported in the calibration certificate.

For piezocone tests the total cone resistance (or 'corrected cone resistance') was calculated according to the formula

$$q_t = q_c + u_2 \times (1 - a)$$

Where a is the 'area ratio' and (1- a) is the proportion of cross-sectional area between the cone tip and penetrometer body where pore pressures (positive or negative) can act to add or subtract from the total external axial force on the tip. The difference between measured and corrected values is largest in low strength collapsible soils with large excess pore pressures. The percentage adjustment is described by the curves on the chart below for a = 0.8:

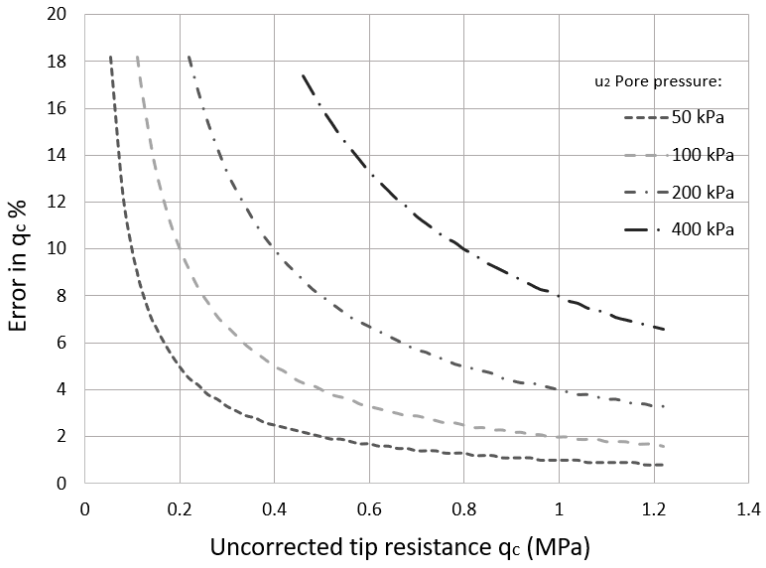


Figure 5-1 Uncorrected tip with measured tip resistance

Penetration length readings were corrected for inclination and sleeve readings were depth corrected for the dimensional offset between cone tip and sleeve during post processing. Rod spikes (artefacts of the pause for push rod addition) were filtered from the cone tip and sleeve data and replaced with an interpolated value. The data was re-sampled from 10 mm resolution to 20 mm to reduce the size of the data set to a more manageable size for end users. A 20 mm resolution is well within the intrinsic influence zone of the cone tip measurement and the loss of meaningful resolution is negligible.

The raw data is presented in Appendix C. For piezocone tests q_t is reported on all logs, and q_c only appears in the digital AGS data.

Geotechnical parameters appropriate for drained and undrained cone penetration conditions were derived for corresponding drained and undrained derived soil behaviour types (SBTs) respectively, however, to account for uncertainty in the SBT correlation with drainage behaviour, all parameters were derived over a range of transitional soils within the range 2.4 < *Ic* < 2.7 (see section 6.3).

In general, the engineering parameters derived for fine grain soils (undrained) are suitable for soils of both silicate and carbonate composition, whereas parameters derived for coarse soils are intended for non-cemented silicate composition.

5.3 IN-SITU STRESS CONDITIONS

An estimate of the equilibrium pore pressure and total and effective vertical stress states is required for derivation of most soil parameters obtained from the CPT and dissipation test.

The total vertical stress with depth was calculated as the sum of the derived soil unit weight above a given depth. See section 5.4 for information on the empirical estimate of soil unit weight.

An arbitrary phreatic surface of 3.00 mBGL was applied in the calculation of effective stress.

Note: The term phreatic surface is used here, however when it is based on piezometer measurements (piezocone) it is assumed that the piezometric level (under hydrostatic conditions) and phreatic surface coincide. The phreatic or piezometric level reported is intended to provide information about pore pressure distribution assumed for calculation purposes and may not represent the true position of the groundwater table or perched water bodies. Complex groundwater pressure distributions will be applied if they are observed from the measurements and are sufficiently well defined.

5.4 SOIL UNIT WEIGHT

The soil unit weight was estimated using the following method proposed by Robertson (2010b).

$$\frac{y}{y_w} = 0.27\,Log(R_f) + 0.36\,(Log(q_t/R_f)) + 1.236$$

Throughout pre-drilled zones (inspection pits or drill-out) the soil was assigned a nominal unit weight of 17 kN/m^3.

For depths where the friction sleeve resistance measurement was less than zero due to measurement limitations, the friction sleeve resistance input parameter was substituted with a nominal 1.0 kPa resistance for the purpose of obtaining an approximate soil unit weight necessary for estimation of total vertical stress over the entire profile.

5.5 SOIL BEHAVIOUR TYPE

The data have been interpreted using 4 soil behaviour type schemes: Robertson (1990, 2010, 2016) and Schneider et al, 2008. The Robertson (1990) scheme is widely used and forms the bases of the layer analysis whereby the profile is split into zones of common classification. The Robertson (2010 & 2016) and Schneider at al methods are less widely used but can provide better or more relevant classification in many instances. Differences in classification between the Robetson 1990, 2016 and Schneider et al schemes can also help to identify significant structure/cementation (Robertson 2016).

A dedicated soil behaviour type comparison log is provided in Appendix D.

Robertson (1990, 2010)

The soil behaviour type (SBT) was interpreted using the Robertson (1990) classification system based on the normalised cone resistance (Qt) and normalised friction sleeve resistance (Fr) for silicate and organic soils.

While the classification based on normalised parameters is more accurate, particularly for NC soils exceeding 15 m depth, the classification is often significantly in error (artificially granular/drained) at shallow depth (< 1-3 m). The error at shallow depth is associated with the potentially large difference between the estimated vertical effective stress (applied in normalisation) and the unknown horizontal stress influencing penetration resistance.

Robertson (2010) proposed a non-normalised version of the 1990 chart which uses dimensionless cone resistance (q_c/Pa) and friction ratio (Rf). The classification according to this chart can be more reliable at shallow depth.

It should be noted that:

- The SBT classification provides a general soil type and tends to show biased towards the soil fraction that dominates the mechanical behaviour.
- If fine cohesive soils are dry and overconsolidated, the classification tends to shift towards a coarser soil type (or lower I_c index)

While the repeatability and behavioural bias of the SBT is usually beneficial, the classification is not always an appropriate substitute for classification based on particle size and plasticity index tests.

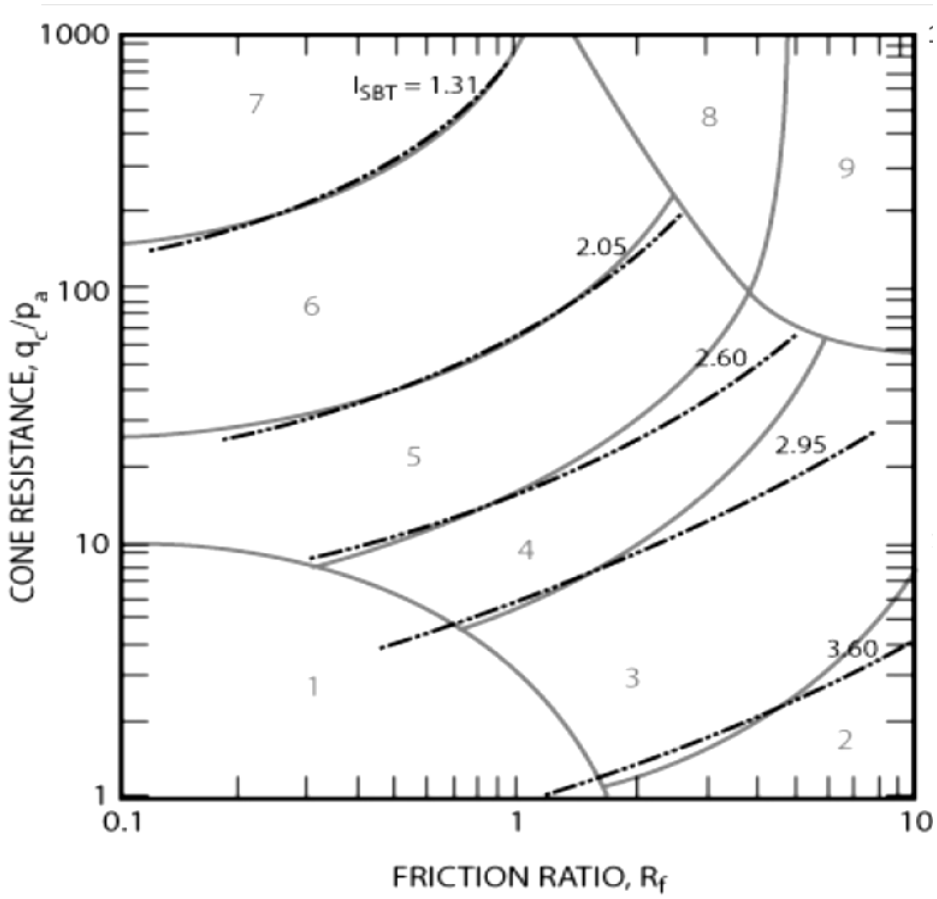


Figure 5-2 Non-normalised SBT chart by Robertson et al. (2010) based on dimensionless cone resistance (qc/Pa) and friction ration, Rf, showing contours of SBT index ISBT (denoted Ic on the test plots). The chart is also applicable to normalised tip (Q_t) and sleeve (F_r) values.

Table 1 Robertson (1990, 2010) soil behaviour type zone descriptions

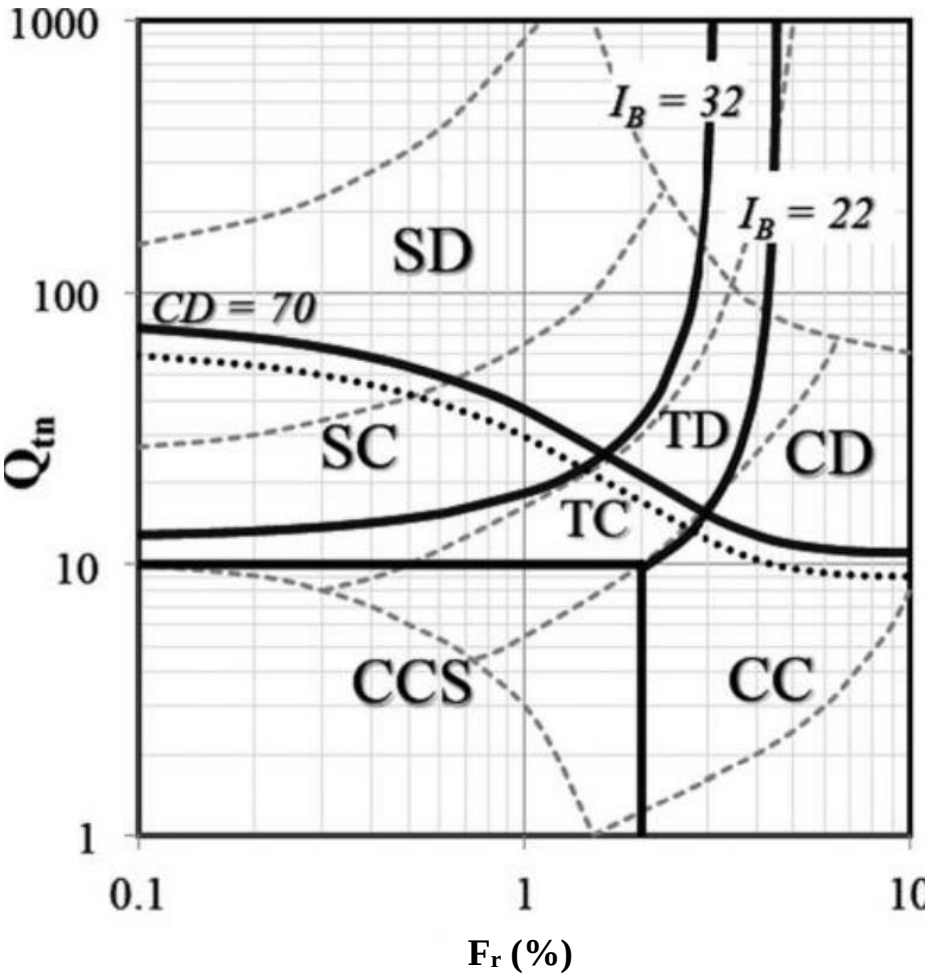
Zone	Soil Behaviour Type (SBT)		
1	Sensitive fine-grained	6	Sands - clean sand to silty sand
2	Organic soils	7	Gravelly sand to sand
3	Clays – clay to silty clay	8*	Very stiff/dense sand to clayey sand[1]
4	Silt mixtures - clayey silt to silty clay	9*	Very stiff fine grained[1]
5	Sand mixtures – silty sand to sandy silt	*Heavily overconsolidated or cemented*	

[1]Note zones 8 and 9 appear as *'Very stiff/dense sand to clayey sand - HOC or cemented'* and *'Very stiff fine grained - HOC or cemented'* within the soil unit descriptions of plots in Appendix D.

Results are presented in Appendix D.

Robertson 2016

Using the same Q_t - F_r space as above, Robertson (2016) proposed an alternative purely behavioural classification system that places less emphasis on classification according to composition/textural properties and more emphasis on mechanical behaviour – namely the tendency of the soil to dilate or collapse during large strain shear, and sensitivity.



Zone	Soil Behaviour Type (SBT)
CCS	Clay-like – contractive - sensitive
CC	Clay-like – Contractive
CD	Clay-like – Dilative
TC	Transitional - Contractive
TD	Transitional - Dilative
SC	Sand-like - Contractive
SD	Sand-like - Dilative

Figure 5-3 Robertson 2016 soil behaviour type classification chart and zone descriptions

Schneider *et al.* (2008)

Schneider *et al.* (2008) proposed a classification system based on the normalised pore pressure B_q and tip resistance Q_t. This system is particularly useful for soils of very low strength or that exhibit drainage behaviour or u_2 response inconsistent with the SBT derived from tip and sleeve measurements. However, when using this method for onshore CPT data, the u_2 piezometer response should be assessed for possible desaturation. Generally, it is safest to only use this method when the piezometer response is 'spikey' and responding dynamically to changes in tip resistance.

A set of logs showing both the Robertson and Schneider et al. classification results are provided for comparison in Appendix D.

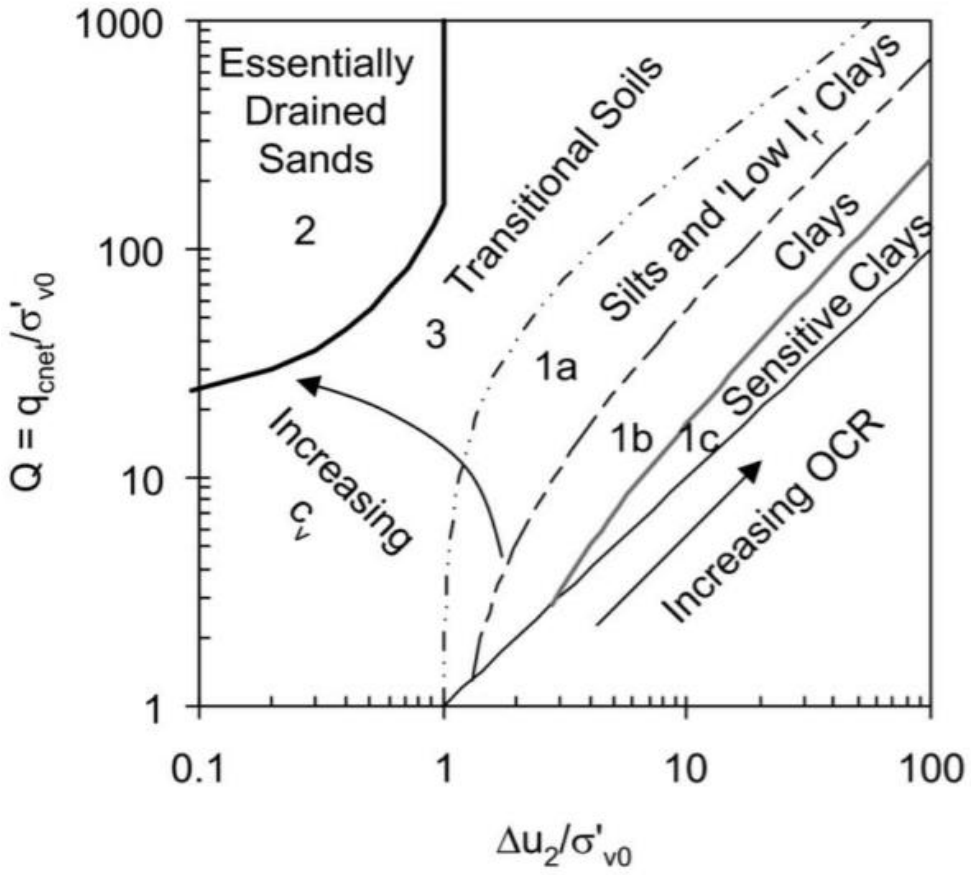


Figure 5-4 Schneider 2008 soil behaviour type classification chart and zone descriptions

Layer Analysis

The layer boundaries are manually interpreted based on broad changes in Robertson 1990 SBT classification or variance with depth. Once layer boundaries are defined, the SBT zones classified within each layer are listed together with the corresponding percentage of data points within the layer (excluding null/filtered data). The modal classification is reported in full, with abbreviated short descriptions for all secondary zones, for example - '*Clays - clay to silty clay [74%]; *Silt mixtures [20%]*', where the asterisk represents an abbreviation of the full description '*Silt mixtures - clayey silt to silty clay*'. It is important to consider that the classification zone boundaries do not exist in nature and small shifts in the cone response can lead to multiple classifications within layers of relatively uniform behaviour; especially were the layer data plot close to a zone junction and/or has spurious spikes or very thin layers. Therefore, some system is required to limit the number of classified zones that appear within each layer description. The following logic has been used to only retain high % constituent classification values:

For LT >= 1, C = 85
For 0.5 <= LT < 1, C = 75
For 0 < LT < 0.5, C = 65

Where
C = Minimum % SBT zone classification coverage within the layer description text
LT = Layer thickness (m)

For layers having a thickness of less than 1 m, 10% of data at the top and bottom of the layer are excluded to limit the effect of transition zone data (measured resistance influenced by overlying or underlying strata) being included in the classification.

The continuous SBT index I_c should be used to assess the classification distribution and variation not accounted for by the layer description.

5.6 SOIL BEHAVIOUR TYPE INDEX - I_C

The principal trend in soil behaviour type (SBT) variation can be expressed by a continuous index, I_C, proposed by Robertson and Wride (1998) based on a similar index proposed by Jefferies and Davies (1993). The index provides a continuous profile of SBT variation with depth for end-user analysis of soil units and variation within units. The equivalent non-normalised version proposed by Robertson (2010) is provided for comparison.

The basis of I_c and its approximation of the original chart classification zones may be seen from Figure 5-2. The method does not identify zones 1 (*sensitive fine grained)* or zones 8 & 9 (*heavily overconsolidated or cemented*).

Normalised SBT index I_C (Robertson and Wride, 1998)*:*

$$I_c = [(3.47 - \log Q_t)^2 + (logF_r + 1.22)^2]^{0.5}$$

Non-normalised SBT index I_C (Robertson, 2010)*:*

$$I_c = \left[\left(3.47 - \log\left(\frac{q_c}{\sigma_{atm}}\right)\right)^2 + (logR_f + 1.22)^2\right]^{0.5}$$

The normalised version of I_c is generally more accurate, while the non-normalised version is intended for compatibility with the non-normalised Robertson's (2010) SBT chart and may be more accurate at shallow depths in overconsolidated soils.

The results are presented in Appendix D.

5.7 RELATIVE DENSITY

The relative density of sands was calculated based on an empirical relationship proposed by Jamiolkowski *et al.* (2001) based on a large database of undisturbed frozen samples and calibration chamber tests. The expected accuracy may be evaluated from the figures presented below.

$$D_r = 100\left[0.268 \cdot \ln\left(\frac{q_t/\sigma_{atm}}{\sqrt{\sigma_{vo}'/\sigma_{atm}}}\right) - k\right]$$

k = Compressibility dependant constant can be taken as -0.675 for medium compressibility (applied value in our interpretation), <= 1 for high compressibility and >= 2 for compressible sands.

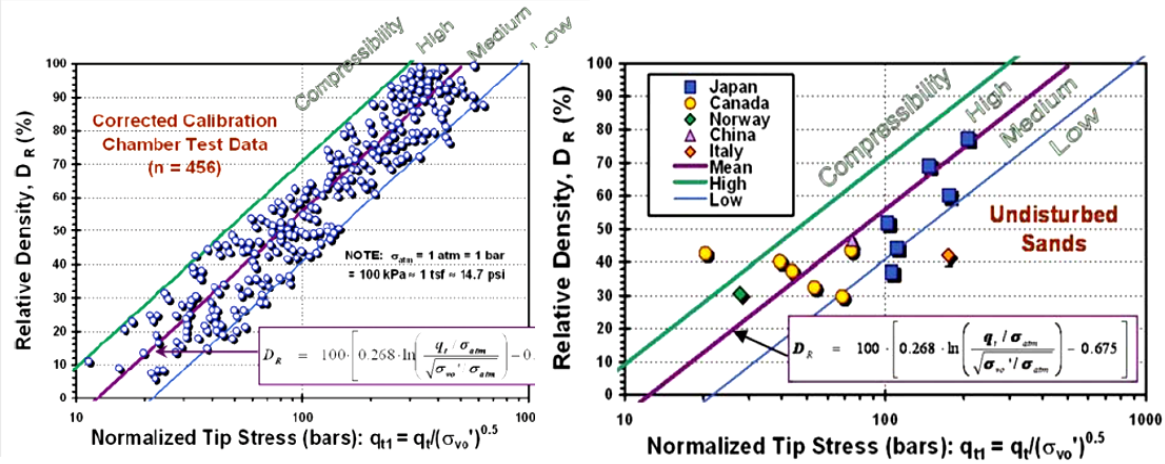


Figure 5-5 Relative density with normalised tip stress and sand compressibility from calibration chamber tests (left) and undisturbed frozen samples (right). Jamiolkowski *et al.* (2001). Reproduced from Mayne (2007).

The results are presented in Appendix F.

5.8 UNDRAINED SHEAR STRENGTH

The undrained shear strength s_u is usually estimated by the bearing capacity method, whereby the net tip resistance is divided by a factor N_k (Lunne *et al*, 1981):

$$s_u = \frac{q_c - \sigma_{v0}}{N_k}$$

Where N_k is an empirical factor which varies with soil type, stress history, structure/fabric, plasticity, and the mode of shear.

Mayne and Peuchen (2018) performed an evaluation of 407 high-quality undrained anisotropically consolidated triaxial compression tests (CAUC) with net tip resistance data pairs, resulting in N_{kt} factors with regression analysis details for five categories of clays shown in Table 2.

Table 2 Summary of CAUC s_u versus q_{net} for clays. Reproduced from Mayne and Peuchen (2018).

Clay Group	Number of sites	Nr Data	Correlation Coefficient r^2	Factor N_{kt}	Mean Pore Pressure Parameter B_q
Offshore NC-LOC	17	115	0.98	12.32	0.51
Onshore NC-LOC	30	191	0.867	12	0.53
Sensitive NC-LOC	5	43	0.507	10.33	0.84
OC Intact	5	36	0.862	13.57	0.49
OC Fissured	5	22	0.393	22.47	-0.01
All clays	62	407	0.923	13.33	0.55

Alternatively, a variable N_{kt} factor can be estimated for the profile as a function of the pore pressure parameter B_q, applicable for B_q values of > -0.01. The following equation proposed by Mayne and Peuchen is based on the same database evaluation:

$$N_{kt} = 10.5 - 4.6 \cdot \ln(B_q + 0.1)$$

Where the pore pressure parameter B_q is the ratio of excess pore pressure to net tip resistance:

$$B_q = \frac{u_2 - u_0}{q_t - \sigma_{v0}}$$

The N_{kt} estimate has a standard error of 2.4 N_k and correlation coefficient of 0.645.

The estimate based on B_q is presented as 's_u5' on the parameter plots and is only suitable for tests that have a high-quality pore pressure data, often indicated by a positive, repeatable, and dynamic response.

Note: N_{kt} (with subscript 't') indicates a N_k factor that has been established using the corrected tip resistance q_t. N_{kt} can be applied to the uncorrected tip resistance q_c (non-piezocone tests) but results in a slightly lower estimate of s_u depending on the correction magnitude (q_c - q_t) in lower strength soils.

Undrained shear strengths corresponding to selected values of N_k are presented on the plots of Appendix D. *'s_u3'* on the logs (N_k = 15) has been included as a reference for comparison to traditionally applied N_k values of 15 and 20.

The results are presented in Appendix E.

5.9 OVERCONSOLIDATION RATIO

The preconsolidation stress σ_p' was calculated based on the method proposed by Mayne et al (2009):

$$\sigma_p' = k \cdot (q_t - \sigma_{vo})^{m\prime}$$

$$OCR = \sigma_p{}'/\sigma'_{v0}{}'$$

Mayne *et al* found that the trend with mean grain size followed a power law through the addition of exponent m' and that its value can be estimated by relation to soil behaviour type index I_c:

$$m' = 1 - \frac{0.28}{1 + \left(\frac{I_c}{2.65}\right)^{25}}$$

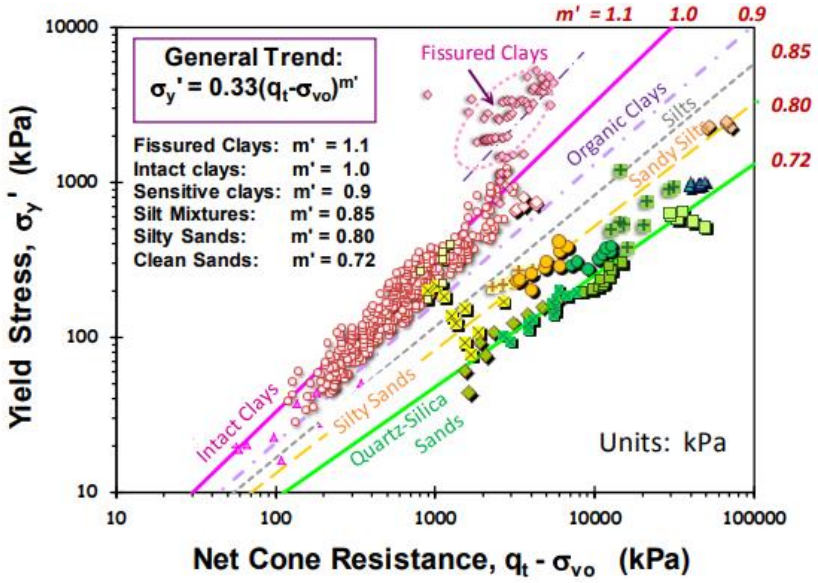


Figure 5-6 Preconsolidation stress with net cone resistance power law, reproduced from Mayne (2014).

An additional set of σ_p' and OCR values were calculated for m' = 1.1 to reflect the upper trend for over consolidated fissured clays not captured by the correlation with I_c.

The results are presented in Appendix E.

5.10 SPT N60 VALUES

Equivalent SPT N60 values, defined as the non-normalised SPT blow count over a 30 cm interval, were derived for two correlations.

Method 1 - Jefferies and Davies (1993) cited in Lunne *et al.* (1997):

$$N_{60} = \frac{q_t}{8.5 \cdot \sigma_{atm} \cdot \left(1 - \frac{I_c}{4.6}\right)}$$

Method 2 - Robertson (2012):

$$\frac{\left(\frac{q_t}{p_a}\right)}{N_{60}} = 10^{(1.268 - 0.2817 I_c)}$$

The correlations are intended for clays, silts and sands and not for carbonates or cemented geo-materials.

The results are presented in Appendix F.

5.11 FRICTION ANGLE

Sands

The peak friction angle of granular materials was calculated using the Kulhawy and Mayne (1990) method. The relationship is based on a calibration chamber database from 24 sands of varying mineralogy and is found from:

$$\phi' = 17.6 + 11.0 \cdot \log (q_{t1})$$

Where:

ϕ' = Peak friction angle (degrees)

q_{t1} = stress normalised cone resistance:

$$q_{t1} = \left(\frac{q_t}{\sigma_{atm}}\right) / \left(\frac{\sigma_{v0'}}{\sigma_{atm}}\right)^{0.5}$$

The presence of compressible minerals tends to reduce tip resistance resulting in lower estimate of friction angle, while very coarse (sand) or larger grain size tends to increase tip resistance resulting in higher estimate. Increased penetration resistance due to high k_0 conditions also results in an overestimate of friction angle.

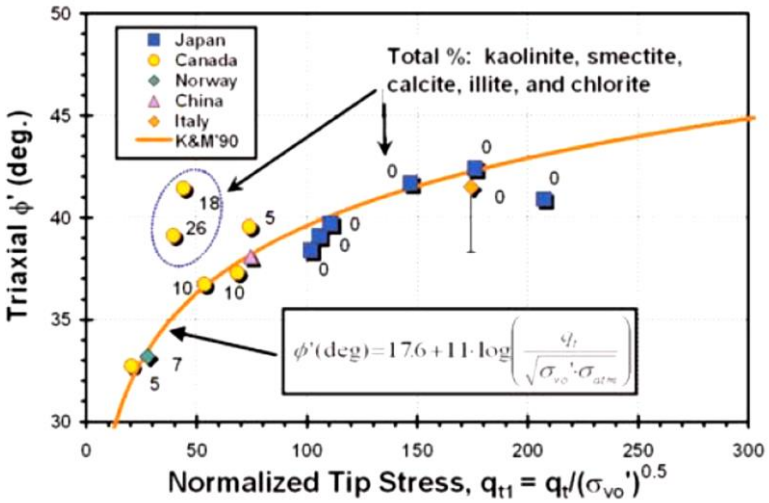


Figure 5-7 Peak triaxial friction angle from undisturbed sands with normalised cone resistance.

Fine grained soils

The effective friction angle for fine grained soils was calculated based on the Senneset *et al.* (1988, 1989) method by applying the approximate closed form solution by Mayne & Campanella (2005) as a direct function of the pore pressure parameter Bq and normalised tip resistance Q. The method is applicable where 0.1 < B_q < 1.0 and 20° < ϕ' < 45° and generally appropriate for non-cemented normally consolidated to lightly overconsolidated soils.

$$\phi' = 29.5° \, B_q{}^{0.121} [0.256 + 0.336 \, B_q + \log Q]$$

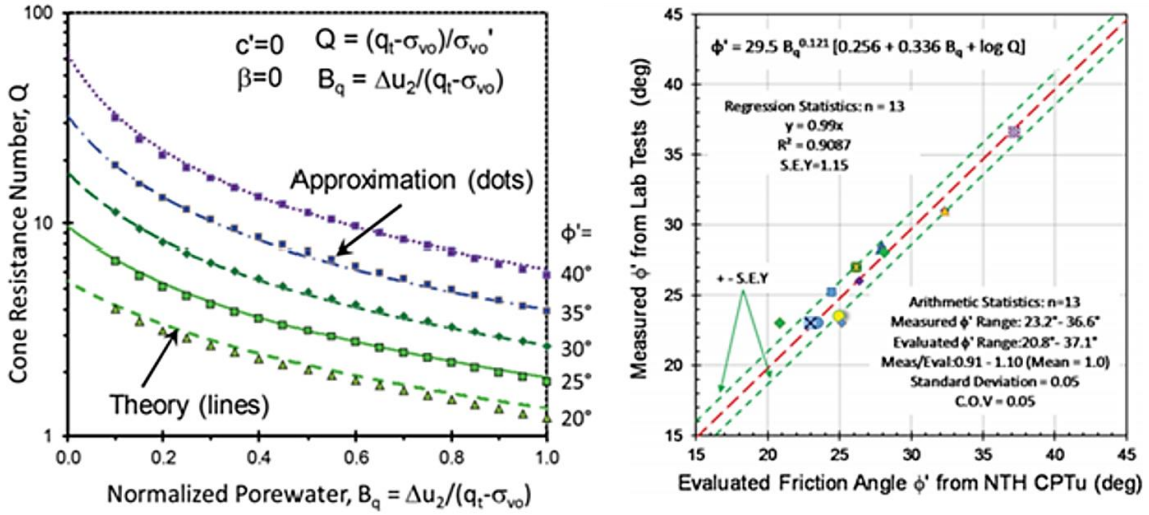


Figure 5-8 [Left] Theoretical curves with function approximation (dots) overlay [Right] calibration data from geotechnical centrifuge tests for a variety of soils. Redrawn from Ouyang & Mayne (2018).

The results are presented in Appendix F.

5.12 COEFFICIENT OF VOLUME CHANGE

Coefficient of volume change m_v defined as the inverse of the constrained modulus M, is evaluated for all soil types using the constrained modulus method proposed by Mayne (2006) cited in Mayne (2007). The value may be used to predict settlement at the end of primary consolidation and is applicable to the present state of vertical effective stress up to the pre-consolidation stress for overconsolidated soils.

$$m_v = \frac{1}{M}$$

Where:

$$M = \alpha \cdot (q_t - \sigma_v)$$

$$\alpha = 5$$

An alpha factor of 8.25 reported by Kulhawy & Mayne (1990) for fine grained soils appears to provide a better fit through the data for intact non-organic clays, reducing to around 1 to 2 for organic plastic clays.

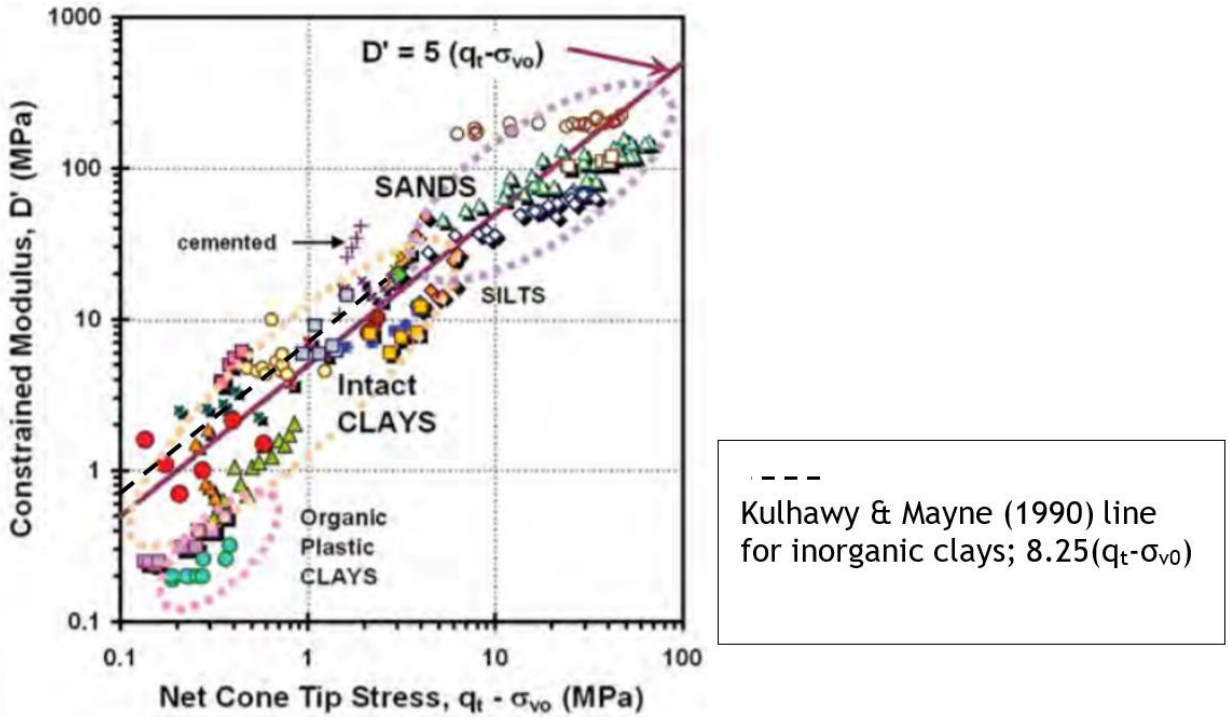


Figure 5-9 Constrained modulus of Mayne (2006). Annotated/redrawn from NCHRP Synthesis 368 (2007).

The results are presented in Appendix E.

5.13 YOUNG'S MODULUS

The secant Young's modulus E' at 25% mobilised shear strength (FOS = 4) was calculated according to the method proposed by Robertson (2009):

$E' = \alpha(q_t - \sigma_v)$
Where:

$\alpha = 0.015(10^{0.55\boldsymbol{Ic}+1.68})$

The method described by Robertson may be adapted to estimate E' for loading at different percentages of mobilised shear strength.

The results are presented in Appendix F.

6 CPT INTERPRETATION NOTES

Provided below is a non-exhaustive set of notes on interpretation of the acquired CPT data with reference to examples within the dataset where appropriate.

DRAINED AND UNDRAINED SOIL BEHAVIOUR

Geotechnical parameters appropriate for drained and undrained cone penetration conditions are derived for drained and undrained soil behaviour types (SBTs) respectively, however, to help mitigate the uncertainty in the SBT correlation with drainage behaviour, all parameters are derived over the Soil Behaviour Type range $2.4 < I_c < 2.7$. For partially drained conditions, error will be introduced within derived parameters.

Piezocone dynamic pore pressure and dissipation tests may be used to identify drainage conditions. Dissipation t_{50} values exceeding 50 seconds indicate undrained penetration behaviour based on the findings of Kim *et al.* (2008).

In partially drained materials the friction sleeve resistance may rise significantly immediately following a pause in penetration due to consolidation and increased effective stress on the friction sleeve.

DYNAMIC PORE PRESSURE u_2 (CPTu)

While the piezo system is saturated before use, testing through unsaturated soils may result in some degree of desaturation leading to a less accurate and more 'sluggish' pore pressure response. Desaturation can also occur during penetration due to suction pressure causing cavitation during dilative shear at the cone shoulder. Dissipation tests that are undertaken following desaturation are likely to have a more pronounced initial rise and the results of analysis may have some degree of error.

If the piezometer system becomes desaturated it may re-saturate at higher excess pressures later in the test as gas dissolves under pressure. The pore pressure response in saturated contractive soils should normally have a dynamic 'peaky' appearance.

The tip resistance in lower strength contractive soils without pore pressure measurement in the u_2 position is likely to be significantly lower (up to 20%, typically ~10%) than the equivalent corrected tip resistance depending on the magnitude of excess pore pressure generated during penetration.

CONE TIP AND SLEEVE OFFSET

The accuracy of the SBT over thin layers and at layer boundaries is sensitive to offset error in the friction ratio often resulting in sharp peaks or troughs at boundaries. The friction ratio is often inaccurate in heavily disturbed soils with a 'blocky' macro fabric. The last ~8 cm of data is also not included in the SBT material description as no friction sleeve measurements are recorded.

FRICTION SLEEVE DATA

There are three common causes of friction sleeve measurement error; 1) unequal pore pressure acting on the sleeve end areas as the sleeve passes though materials of different permeability and hence excess pore pressure Δu_2, often resulting in a negative/positive spike, 2) Accuracy limitations and temperature effects in very low strength or sensitive soils, and 3) error associated with bending strain that occurs while the cone inclination deviates rapidly. Temperature effects

are generally mitigated by temperature stabilisation during the test and at the time of zero output measurement.

CONE TYPE

The reference cone type has a 10 cm^2 projected cone tip area and 150 cm^2 friction sleeve area, however it is common to use a larger 15 cm^2 cone with a 225 cm^2 friction sleeve area for improved sensitivity, temperature stability, damage prevention and penetration depth potential due to the higher bending strength. Use of a 15 cm^2 cone does however require higher penetration force (reaction force) for a given penetration pressure and produces more pronounced transitions zones and thin layer effects due to the larger influence zone.

TRANSITION ZONES AND THIN LAYER EFFECTS

During penetration at the boundary between soils of contrasting stiffness, a transition zone is often evident prior to mobilisation of the true soil stiffness. These should be cautiously ignored in assessment of soil behaviour type and parameter evaluation. Where the stiff layer is thin (<~1 m) mobilised resistance may be significantly less than that of an equivalent thick layer. The effect for thin low stiffness layers is less significant. Procedures for thin-layer effect correction are provided by Robertson and Wride (1998) and Boulanger & DeJong (2018).

GRAVELS

The presence of gravel or larger clasts in a soil is often characterised by short peaks in the CPT tip and sleeve readings, possibly with associate inclinometer ‘shake’ and/or short sharp reductions in pore water readings due to dilation effects. Frequent gravels in soft or loose soils may generate localised erroneous friction ratio values.

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APPENDICES

Appendix A	**SUMMARY TABLES**
Appendix B	**GENERAL INFORMATION**
Appendix C	**CONE PENETRATION TEST RESULTS**
Appendix D	**SOIL BEHAVIOUR TYPE RESULTS**
Appendix E	**PARAMETER RESULTS 1 – s_u, m_v, OCR, SBT, I_c**
Appendix F	**PARAMETER RESULTS 2 – SPT N60, Phi, D_r, E, I_c**
Appendix G	**PENETROMETER TEMPERATURE RESULTS**

APPENDIX A SUMMARY TABLES

Table 3 CPT summary

Location ID	Stroke number	Final depth (m)	Cone ID	Piezocone test	Pre-drilled (m)	Pre-drilling details	Rig	Primary refusal factor	Applied zero values: qc, fs, u2	Tip zero drift (kPa)	Sleeve zero drift (subtraction) (kPa)	Piezo zero drift (kPa)	Nr dissipation tests	Raw File Name	Easting (m)	Northing (m)	Elevation (m)	Date	Remarks
CPT22/01	1	2.72	S15-CFIPT.1766	YES	1.20	IP-BF	UK20	Lateral support at surface	pre, pre, pre	-44.20	2.10	-1.80		108203-V1-171122-UK20-LP77.L08				17/11/2022	
CPT22/02	1	14.80	S15-CFIPT.1766	YES	1.20	IP-BF	UK20	Lateral support at surface	pre, pre, pre	-12.20	0.00	0.40		108203-V1-171122-UK20-LP77.L04				17/11/2022	
CPT22/03	1	14.38	S15-CFIPT.1766	YES	1.20	IP-BF	UK20	Lateral support at surface	pre, pre, pre	-13.00	-0.50	-0.50		108203-V1-171122-UK20-LP77.L07				17/11/2022	
CPT22/04	1	1.46	S15-CFIPT.1766	YES	1.20	IP-BF	UK20	Tip load	pre, pre, pre	17.40	0.30	0.60		108203-V1-171122-UK20-LP77.L02				17/11/2022	
CPT22/05A	1	9.40	S15-CFIPT.1766	YES	1.20	IP-BF	UK20	Lateral support at surface	pre, pre, pre	-50.00	-2.40	-9.00		108203-V1-171122-UK20-LP77.L03				17/11/2022	
CPT22/06	1	1.24	S15-CFIPT.1766	YES	1.20	IP-BF	UK20	Tip load	pre, pre, pre	22.20	3.60	3.20		108203-V1-171122-UK20-LP77.L05				17/11/2022	
CPT22/07	1	1.96	S15-CFIPT.1766	YES	1.20	IP-BF	UK20	Tip load	pre, pre, pre	19.00	-3.80	-2.90		108203-V1-171122-UK20-LP77.L06				17/11/2022	
CPT22/08	1	1.88	S15-CFIPT.1766	YES	1.20	IP-BF	UK20	Sleeve load	pre, pre, pre	16.20	-2.50	-6.60		108203-V1-171122-UK20-LP77.L01				17/11/2022	

CPT test plots are presented in Appendix C.

APPENDIX B GENERAL INFORMATION

LIST OF FIGURES

Cone calibration certificate: S15-CFIIP.1766

Data sheet: 17.9-tonne track-truck mounted CPT unit (UK20)

CERTIFICATE OF CALIBRATION

Certificate Number: 1449

Cone Serial Number: S15-CFIIPT.1766

Instrument:	**Digital-Geopoint-S15-150kN-2MPa**	**Location:**	**Lankelma Calibration Laboratory**
Serial number:	**S15-CFIIPT.1766**	**Temperature (°C):**	**20.9**
Manufacturer:	**Geopoint**	**Temperature change (°C):**	**0.35**
Calibration standard:	**Conforms to ISO 376:2011 & ISO 22476-1:2012**	**Calibration engineer:**	**P Metcalf**
ISO 22476-1:2012 application class:	**Class 1**	**Date of calibration:**	**20/09/2022**
		Calibration expiry:	**20/03/2023**

This calibration certificate is valid for 6 months.

Calibration signed and dated by:	**Calibration checked and dated by:**	**Calibration verification signed and dated by:**
P Metcalf	A Harman	

REFERENCE INSTRUMENTS	SERIAL NUMBER	UNCERTAINTY OF RECORDED VALUE	CALIBRATION DATE
AM DSCCHA-100kN Load Cell	66914	0.02%	29/04/2021
AM DSCCHA-5kN Load Cell	61065	0.05%	29/04/2021
Omega MMG750V	502273	0.01%	01/09/2022
Keithley 3706A Multimeter	4067652	10ppm	11/08/2022
LD Solar2-45	168558	0.04°	01/08/2022
ETI Ref Thermometer	D20345255	0.01°C	08/09/2022

The calibration tests were made in the Lankelma force standards machine. The applied forces of which are within an uncertainty of:
± 0.050 % of nominal value from 0.5kN up to 10kN, then 0.02% of nominal from 10kN up to 100kN.

MEASUREMENTS
1. The forces applied, and the resulting deflections are given in Tables 1. No corrections for temperature have been applied to these results.
2. The cone was loaded to full range 3 times for no less than 1 minute before calibration and after each rotation.
3. The cone was calibrated in low and high range using two reference load cells. The low range calibration consisted of a maximum load of 5kN with 4 sets of increasing forces and 2 sets of decreasing forces. The high range calibration consisted of a maximum load of 100kN with 3 sets of increasing forces and 2 sets of decreasing forces.
4. The difference in deflection for each applied force with rotation is the relative reproducibility error b, shown as a percentage of the recorded value and in units of pressure MPa. The uncertainty relating to the difference in deflection for increasing forces against degreasing forces is the reversibility uncertainty U_rev, shown as a percentage of the recorded value and in units of pressure MPa.
5. For each application of force, the coefficients of a linear and third order equation relating the estimate of the mean deflection as a function of the applied calibration force were calculated. Table 2.
6. The combined expanded uncertainty of deflection U for each force is shown as a percentage of the recorded value and in units of pressure MPa.
7. The coefficients of a third order equation relating a given applied force to the estimate of the mean deflection were also calculated. The coefficients are given in Table 3.
8. In use the forces acting on the sleeve load cell element are a combination of tip resistance and sleeve friction, with the tip resistance from the tip load cell element being subtracted to give the sleeve friction value. The resultant error values for differing tip and sleeve values are shown in Table 4.
* The combined expanded uncertainties shown are to k=2 with a 95% coverage factor.

The calibration uncertainty is the uncertainty in the force value calculated from the interpolation equation at any deflection.

At each calibration point a combined standard uncertainty *uc* is calculated from the readings obtained during the calibration.

$$uc = \sqrt{\sum_{i=1}^{8} ui^2}$$

and

$$U = k \times uc$$

where

u1 is the standard uncertainty associated with the applied calibration force.
u2 is the standard uncertainty associated with the reproducibility of the calibration results.
u3 is the standard uncertainty associated with the repeatability of the calibration results.
u4 is the standard uncertainty associated with the resolution and noise of the system.
u5 is the standard uncertainty associated with the creep of the instrument.
u6 is the standard uncertainty associated with the drift in zero output.
u7 is the standard uncertainty associated with temperature of the instrument.
u8 is the standard uncertainty associated with interpolation best fit of the linear or 3rd order polynomial equation.

Symbols and their designations

Symbol	Designation
Ref LC	Reference load cell with calibration force in kN
cts	Counts. Base digital cone units.
0.1N	Interpolated digital cone units from counts
b	Relative reproducibility error
U_rev	Reversibility uncertainty
Uc	Combined standard uncertainty
Uc_sub	Combined standard uncertainty including sleeve subtraction
U	Combined expanded uncertainty
k=2	95% uncertainty coverage factor

Cone tempreture effect profile:

This section deals with the apparent pressure readings obtained from sensors due to static and transient temperature change. The parameters for post-processing temperature correction are established and the apparent pressures after correction are presented. Depending on the design or temperature performance, correction of the friction sleeve and/or piezometer readings may not be warranted

LANKELMA

CERTIFICATE OF CALIBRATION

Certificate Number: 1449

Cone Serial Number: S15-CFIIPT.1766

CONE END RESISTANCE CALIBRATION

Table 1-a.

Low range calibration									High range calibration							
	Tip change In output (cts)				Reproducibility error *b*		Reversibility error *U_rev*			Tip change in output (cts)			Reproducibility error *b*		Reversibility error *U_rev*	
Ref LC	1	2	3	4					Ref LC	1	2	3				
(kN)	0°	120°	240°	240°	MPa	%	MPa	%	(kN)	0°	120°	240°	MPa	%	MPa	%
0.100	1.168E+05	1.197E+05	1.135E+05	1.135E+05	0.001	1.53			5.000	5.862E+06	5.831E+06	5.841E+06	0.005	0.16		
0.500	5.864E+05	5.897E+05	5.817E+05	5.801E+05	0.001	0.40			10.000	1.172E+07	1.168E+07	1.170E+07	0.007	0.10		
1.000	1.171E+06	1.178E+06	1.164E+06	1.163E+06	0.002	0.33			15.000	1.757E+07	1.751E+07	1.757E+07	0.013	0.13		
1.500	1.759E+06	1.767E+06	1.747E+06	1.746E+06	0.003	0.34			20.000	2.343E+07	2.338E+07	2.343E+07	0.010	0.07		
2.000	2.344E+06	2.354E+06	2.332E+06	2.331E+06	0.004	0.27			30.000	3.514E+07	3.504E+07	3.515E+07	0.020	0.10		
2.500	2.932E+06	2.942E+06	2.914E+06	2.914E+06	0.005	0.27			40.000	4.683E+07	4.672E+07	4.684E+07	0.023	0.09		
3.000	3.517E+06	3.530E+06	3.503E+06	3.497E+06	0.004	0.22			50.000	5.853E+07	5.840E+07	5.854E+07	0.026	0.08		
3.500	4.104E+06	4.118E+06	4.089E+06	4.086E+06	0.005	0.21			60.000	7.021E+07	7.007E+07	7.022E+07	0.027	0.07		
4.000	4.690E+06	4.706E+06	4.674E+06	4.669E+06	0.005	0.20			80.000	9.349E+07	9.332E+07	9.354E+07	0.038	0.07		
5.000	5.863E+06	5.882E+06	5.851E+06	5.850E+06	0.005	0.15			100.000	1.167E+08	1.165E+08	1.168E+08	0.045	0.07		
4.000	4.694E+06	4.711E+06			0.003	0.13	-0.001	-0.05	80.000	9.345E+07	9.326E+07		0.038	0.07	0.017	0.03
3.500	4.108E+06	4.124E+06			0.003	0.13	-0.002	-0.07	60.000	7.017E+07	7.003E+07		0.029	0.07	0.013	0.03
3.000	3.522E+06	3.535E+06			0.003	0.13	-0.002	-0.09	50.000	5.852E+07	5.836E+07		0.031	0.09	0.008	0.02
2.500	2.936E+06	2.947E+06			0.002	0.13	-0.001	-0.09	40.000	4.684E+07	4.670E+07		0.029	0.11	0.001	0.00
2.000	2.350E+06	2.359E+06			0.002	0.13	-0.002	-0.14	30.000	3.516E+07	3.504E+07		0.023	0.11	-0.002	-0.01
1.500	1.762E+06	1.772E+06			0.002	0.19	-0.001	-0.14	20.000	2.346E+07	2.338E+07		0.016	0.12	-0.004	-0.03
1.000	1.176E+06	1.185E+06			0.002	0.28	-0.002	-0.28	15.000	1.763E+07	1.753E+07		0.020	0.20	-0.014	-0.14
0.500	5.886E+05	5.949E+05			0.001	0.37	-0.001	-0.36	10.000	1.177E+07	1.172E+07		0.010	0.15	-0.014	-0.20
0.100	1.193E+05	1.217E+05			0.000	0.72	-0.001	-1.10	5.000	5.888E+06	5.864E+06		0.005	0.14	-0.010	-0.29

Table 2-a.

Low range calibration								High range calibration							
Reference output		Linear equation			3rd order equation			Reference output		Linear equation			3rd order equation		
Ref Load Cell Nom. (MPa)	Ref Load Cell (0.1N)	Cone output (0.1N)	Expanded uncertainty *U** MPa	%	Equation output (0.1N)	Expanded uncertainty *U** MPa	%	Ref Load Cell Nom. (MPa)	Ref Load Cell (0.1N)	Cone output (0.1N)	Expanded uncertainty *U** MPa	%	Equation output (0.1N)	Expanded uncertainty *U** MPa	%
0.067	1000	999	0.002	3.22	984	0.003	4.59	3.333	50000	50050	0.014	0.41	49876	0.020	0.61
0.333	5000	5017	0.003	0.92	4988	0.003	1.02	6.667	100000	100180	0.029	0.44	99866	0.025	0.37
0.667	10000	10029	0.005	0.75	9983	0.005	0.80	10.000	150000	150289	0.048	0.48	149855	0.035	0.35
1.000	15000	15049	0.008	0.78	14987	0.007	0.72	13.333	200000	200487	0.070	0.53	199956	0.029	0.21
1.333	20000	20065	0.009	0.68	19986	0.008	0.58	20.000	300000	300653	0.100	0.50	299994	0.050	0.25
1.667	25000	25085	0.012	0.71	24989	0.010	0.58	26.667	400000	400728	0.114	0.43	400028	0.060	0.23
2.000	30000	30114	0.014	0.69	30002	0.010	0.50	33.333	500000	500857	0.134	0.40	500206	0.076	0.23
2.333	35000	35138	0.017	0.72	35010	0.011	0.45	40.000	600000	600814	0.135	0.34	600301	0.090	0.22
2.667	40000	40160	0.019	0.73	40017	0.012	0.45	53.333	800000	800218	0.116	0.22	800252	0.118	0.22
3.333	50000	50225	0.028	0.85	50050	0.014	0.41	66.667	1000000	999078	0.188	0.28	1000024	0.142	0.21
2.667	40000	40268	0.037	1.37	40124	0.018	0.69	53.333	800000	799390	0.138	0.26	799422	0.136	0.25
2.333	35000	35245	0.033	1.43	35117	0.017	0.73	40.000	600000	600252	0.089	0.22	599738	0.090	0.22
2.000	30000	30218	0.030	1.49	30106	0.015	0.77	33.333	500000	500428	0.097	0.29	499776	0.084	0.25
1.667	25000	25188	0.026	1.54	25092	0.013	0.80	26.667	400000	400515	0.098	0.37	399815	0.074	0.28
1.333	20000	20161	0.022	1.63	20081	0.012	0.87	20.000	300000	300552	0.091	0.46	299892	0.056	0.28
1.000	15000	15132	0.018	1.81	15069	0.010	1.01	13.333	200000	200510	0.077	0.58	199979	0.038	0.28
0.667	10000	10107	0.015	2.24	10061	0.009	1.36	10.000	150000	150554	0.085	0.85	150120	0.046	0.46
0.333	5000	5067	0.009	2.85	5038	0.006	1.72	6.667	100000	100537	0.075	1.12	100222	0.037	0.55
0.067	1000	1032	0.005	7.21	1016	0.002	3.70	3.333	50000	50316	0.044	1.31	50142	0.022	0.65

Table 3-a. Third order equation

For a given cone indicated output of D (0.1N units), the corrected applied force

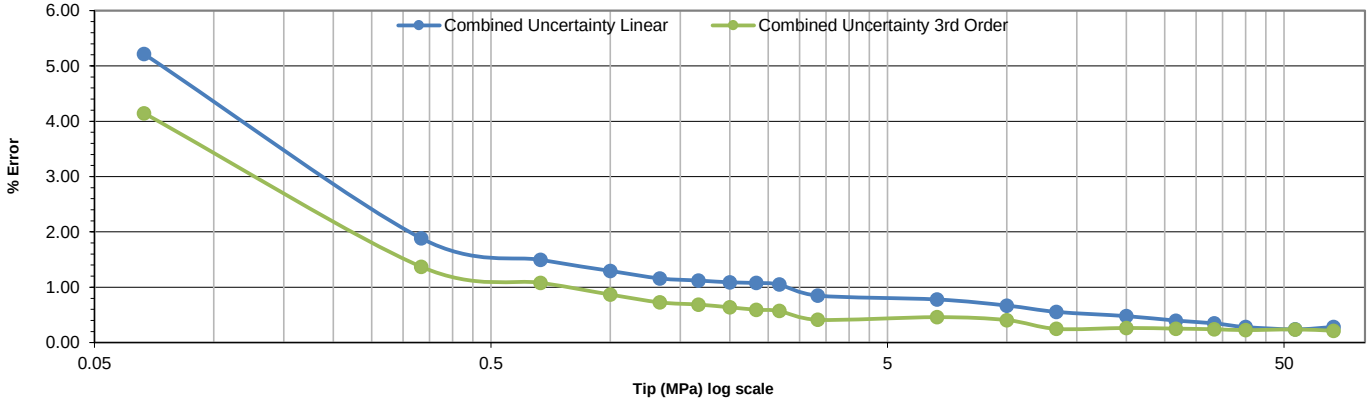
F (in 0.1N units) is calculated from :

$F = (a3 \times D^3) + (a2 \times D^2) + (a1 \times D) + a0$

a0	=	-11.87508
a1	=	0.99655
a2	=	4.26732E-09
a3	=	1.46461E-16

Maximum tip zero drift during the calibration (MPa) =	0.001
Maximum load cell zero drift during the calibration (MPa) =	0.000
Factor used to convert from counts to 0.1N units =	0.0085631
Maximum tip full scale reading (MPa) =	100.00
Tip resolution (Pa) =	66.7
Tip area (cm^2) =	15
Tip area ratio factor =	0.775

COMBINED EXPANDED UNCERTAINTY TIP



* The combined expanded uncertainties shown are to k=2 with a 95% coverage factor.

LANKELMA

CERTIFICATE OF CALIBRATION

Certificate Number: 1449

Cone Serial Number: S15-CFIIPT.1766

SLEEVE FRICTION CALIBRATION

Table1-b.

Low range calibration									High range calibration							
	Sleeve change In output (cts)				Reproducibility error *b*		Reversibility error *U_rev*			Sleeve change in output (cts)			Reproducibility error *b*		Reversibility error *U_rev*	
Ref LC	1	2	3	4					Ref LC	1	2	3				
(kN)	0°	120°	240°	240°	kPa	%	kPa	%	(kN)	0°	120°	240°	kPa	%	kPa	%
0.100	1.197E+05	1.204E+05	1.193E+05	1.193E+05	0.012	0.27			5.000	6.029E+06	6.004E+06	6.005E+06	0.292	0.13		
0.500	6.023E+05	6.044E+05	6.033E+05	6.030E+05	0.022	0.10			10.000	1.205E+07	1.202E+07	1.202E+07	0.405	0.09		
1.000	1.205E+06	1.211E+06	1.205E+06	1.203E+06	0.068	0.15			15.000	1.807E+07	1.802E+07	1.806E+07	0.615	0.09		
1.500	1.809E+06	1.815E+06	1.804E+06	1.804E+06	0.115	0.17			20.000	2.410E+07	2.407E+07	2.408E+07	0.358	0.04		
2.000	2.413E+06	2.419E+06	2.405E+06	2.405E+06	0.151	0.17			30.000	3.614E+07	3.608E+07	3.614E+07	0.705	0.05		
2.500	3.017E+06	3.024E+06	3.006E+06	3.005E+06	0.192	0.17			40.000	4.817E+07	4.809E+07	4.816E+07	0.862	0.05		
3.000	3.619E+06	3.629E+06	3.606E+06	3.606E+06	0.235	0.18			50.000	6.018E+07	6.010E+07	6.019E+07	0.985	0.04		
3.500	4.222E+06	4.233E+06	4.209E+06	4.207E+06	0.260	0.17			60.000	7.218E+07	7.211E+07	7.219E+07	0.968	0.04		
4.000	4.825E+06	4.837E+06	4.810E+06	4.808E+06	0.289	0.16			80.000	9.614E+07	9.607E+07	9.617E+07	1.075	0.03		
5.000	6.031E+06	6.046E+06	6.014E+06	6.012E+06	0.332	0.15			100.000	1.200E+08	1.200E+08	1.201E+08	1.530	0.03		
4.000	4.828E+06	4.843E+06			0.188	0.11	-0.093	-0.05	80.000	9.615E+07	9.604E+07		1.328	0.04	0.209	0.01
3.500	4.225E+06	4.238E+06			0.170	0.11	-0.085	-0.05	60.000	7.221E+07	7.213E+07		1.065	0.04	-0.486	-0.02
3.000	3.624E+06	3.635E+06			0.146	0.11	-0.111	-0.08	50.000	6.022E+07	6.013E+07		1.146	0.05	-0.602	-0.03
2.500	3.020E+06	3.030E+06			0.136	0.12	-0.095	-0.09	40.000	4.821E+07	4.812E+07		1.193	0.07	-0.767	-0.04
2.000	2.418E+06	2.425E+06			0.087	0.10	-0.108	-0.12	30.000	3.619E+07	3.611E+07		0.931	0.07	-0.839	-0.06
1.500	1.814E+06	1.821E+06			0.100	0.15	-0.115	-0.17	20.000	2.414E+07	2.409E+07		0.685	0.08	-0.697	-0.08
1.000	1.210E+06	1.218E+06			0.098	0.22	-0.126	-0.29	15.000	1.814E+07	1.806E+07		1.069	0.16	-1.106	-0.17
0.500	6.047E+05	6.122E+05			0.096	0.44	-0.107	-0.49	10.000	1.210E+07	1.206E+07		0.472	0.11	-0.929	-0.21
0.100	1.211E+05	1.231E+05			0.026	0.58	-0.043	-0.98	5.000	6.050E+06	6.031E+06		0.253	0.11	-0.505	-0.23

Table 2-b.

Low range calibration							
Reference output		Linear factor output			3rd order equation		
Ref Load Cell Nom. (kPa)	Ref Load Cell (0.1N)	Cone output (0.1N)	Expanded uncertainty *U** kPa	%	Equation output (0.1N)	Expanded uncertainty *U** kPa	%
4	1000	997	0.049	1.10	991	0.094	2.13
22	5000	5021	0.211	0.96	5000	0.094	0.43
44	10000	10044	0.437	0.99	10006	0.202	0.46
66	15000	15060	0.589	0.89	15004	0.264	0.40
88	20000	20078	0.761	0.86	20004	0.337	0.38
110	25000	25097	0.952	0.86	25007	0.425	0.39
132	30000	30112	1.111	0.84	30005	0.515	0.39
154	35000	35132	1.297	0.84	35009	0.578	0.37
176	40000	40148	1.453	0.82	40008	0.645	0.37
220	50000	50189	1.835	0.83	50017	0.784	0.36
176	40000	40243	2.191	1.24	40103	1.017	0.58
154	35000	35218	1.961	1.27	35094	0.922	0.60
132	30000	30204	1.834	1.39	30097	0.925	0.70
110	25000	25174	1.570	1.43	25084	0.806	0.73
88	20000	20151	1.351	1.53	20078	0.721	0.82
66	15000	15127	1.144	1.73	15071	0.667	1.01
44	10000	10101	0.919	2.09	10062	0.593	1.35
22	5000	5064	0.599	2.72	5043	0.429	1.95
4	1000	1016	0.156	3.55	1009	0.104	2.36

High range calibration							
Reference output		Linear factor output			3rd order equation		
Ref Load Cell Nom. (kPa)	Ref Load Cell (0.1N)	Cone output (0.1N)	Expanded uncertainty *U** kPa	%	Equation output (0.1N)	Expanded uncertainty *U** kPa	%
220	50000	50042	0.777	0.35	49870	1.333	0.61
441	100000	100130	1.538	0.35	99811	1.954	0.22
661	150000	150219	2.474	0.37	149774	2.521	0.19
881	200000	200432	4.075	0.46	199883	1.787	0.10
1322	300000	300604	5.817	0.44	299914	2.458	0.09
1762	400000	400665	6.563	0.37	399925	3.037	0.09
2203	500000	500668	6.893	0.31	499973	3.590	0.08
2643	600000	600554	6.358	0.24	600001	4.075	0.08
3524	800000	800020	5.247	0.15	800052	5.265	0.07
4405	1000000	999004	11.037	0.25	1000040	6.702	0.08
3524	800000	799762	5.795	0.16	799792	5.702	0.08
2643	600000	600614	6.798	0.26	600061	4.153	0.08
2203	500000	500786	7.867	0.36	500091	3.819	0.09
1762	400000	400885	8.487	0.48	400145	3.588	0.10
1322	300000	300863	8.026	0.61	300173	2.986	0.11
881	200000	200699	6.415	0.73	200149	2.237	0.13
661	150000	150610	5.853	0.89	150165	2.733	0.21
441	100000	100522	4.737	1.08	100203	2.108	0.24
220	50000	50272	2.470	1.12	50100	1.067	0.24

Table 3-b. Third order equation

For a given cone indicated output of D (0.1N units), the corrected applied force

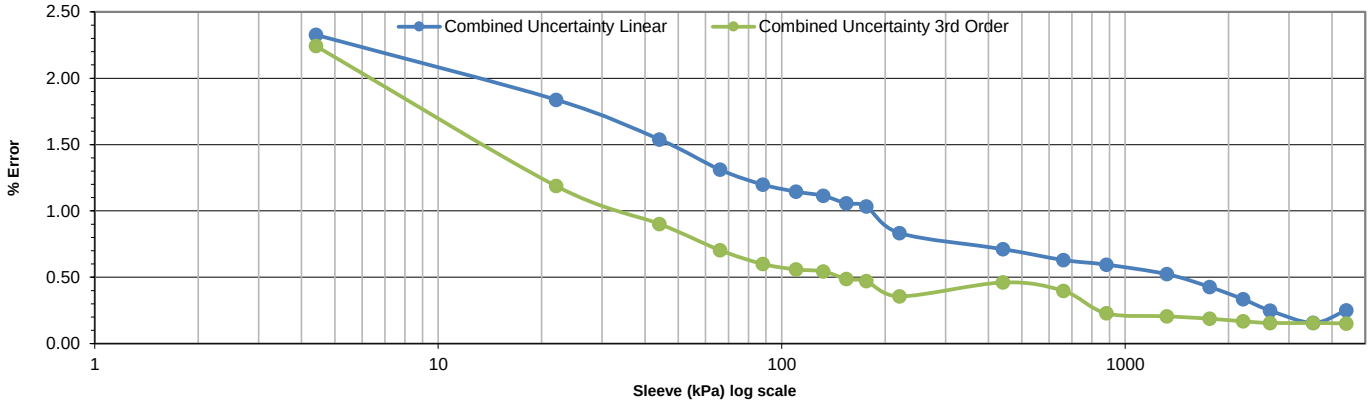
F (in 0.1N units) is calculated from :

$F = (a3 \times D^3) + (a2 \times D^2) + (a1 \times D) + a0$

a0	=	-3.20131
a1	=	0.99643
a2	=	4.12113E-09
a3	=	4.92471E-16

Maximum sleeve zero drift during the calibration (kPa) =	0.091
Maximum load cell zero drift during the calibration (kPa) =	0.008
Factor used to convert from counts to 0.1N units =	0.0083226
Physical strength limited maximum sleeve reading (MPa) =	1.333
Sleeve resolution (Pa) =	4.4
Sleeve area (cm^2) =	227
Sleeve area ratio factor =	0.000

COMBINED EXPANDED UNCERTAINTY SLEEVE



* The combined expanded uncertainties shown are to k=2 with a 95% coverage factor.

LANKELMA

CERTIFICATE OF CALIBRATION

Certificate Number: 1449

Cone Serial Number: S15-CFIIPT.1766

Table 4-b Sleeve friction - tip subtraction combined standard uncertainty Uc_sub

Tip MPa	Sleeve linear equation subtraction error (%) Sleeve kPa → 4	22	44	66	110	154	220	661
0.07	4.9	1.7	1.1	0.9	0.7	0.6	0.5	0.3
0.33	10.5	2.8	1.7	1.3	0.9	0.8	0.7	0.4
0.67	16.3	4.0	2.3	1.7	1.2	1.0	0.7	0.4
1.00	20.7	4.8	2.7	2.0	1.4	1.1	0.8	0.4
1.67	29.5	6.6	3.6	2.5	1.7	1.3	1.0	0.4
2.33	38.5	8.4	4.5	3.1	2.1	1.6	1.2	0.5
3.33	43.2	9.3	5.0	3.5	2.3	1.7	1.3	0.5
10.00	98.6	20.4	10.5	7.1	4.5	3.3	2.4	0.8
13.33	116.1	23.9	12.3	10.7	5.2	3.8	3.4	1.0

Tip MPa	Sleeve 3rd order equation subtraction error (%) Sleeve kPa → 4	22	44	66	110	154	220	661
0.07	4.3	1.2	0.8	0.6	0.4	0.3	0.2	0.2
0.33	7.5	1.9	1.1	0.8	0.5	0.4	0.3	0.2
0.67	11.0	2.6	1.4	1.0	0.7	0.5	0.4	0.3
1.00	12.9	3.0	1.6	1.1	0.8	0.6	0.4	0.3
1.67	16.7	3.7	2.0	1.4	0.9	0.7	0.5	0.3
2.33	20.0	4.4	2.3	1.6	1.0	0.8	0.6	0.3
3.33	20.3	4.4	2.4	1.6	1.0	0.8	0.6	0.3
10.00	61.4	12.6	6.5	4.4	2.7	2.0	1.4	0.6
13.33	48.7	10.1	5.2	5.1	2.2	1.6	1.1	0.5

PORE PRESSURE CALIBRATION

Table1-c.

Ref PR (kPa)	PWP change in output (cts) 1 0°	2 120°	3 240°	Reproducibility error *b* kPa	%	Reversibility error *U_rev* kPa	%
50	2.004E+07	2.021E+07	2.015E+07	0.1	0.25		
100	4.010E+07	4.022E+07	4.018E+07	0.1	0.09		
200	8.021E+07	8.036E+07	8.041E+07	0.2	0.08		
300	1.204E+08	1.205E+08	1.206E+08	0.1	0.04		
400	1.607E+08	1.608E+08	1.607E+08	0.1	0.02		
500	2.009E+08	2.008E+08	2.008E+08	0.1	0.01		
600	2.411E+08	2.410E+08	2.411E+08	0.1	0.02		
800	3.212E+08	3.212E+08	3.213E+08	0.1	0.01		
1000	4.013E+08	4.013E+08	4.013E+08	0.0	0.00		
1200	4.813E+08	4.815E+08	4.813E+08	0.2	0.01		
1000	4.014E+08	4.015E+08		0.1	0.01	-0.2	-0.02
800	3.212E+08	3.214E+08		0.2	0.02	-0.1	-0.02
600	2.410E+08	2.412E+08		0.2	0.03	-0.1	-0.01
500	2.009E+08	2.010E+08		0.1	0.02	-0.1	-0.03
400	1.607E+08	1.608E+08		0.1	0.02	0.0	-0.01
300	1.206E+08	1.206E+08		0.0	0.01	-0.3	-0.09
200	8.033E+07	8.045E+07		0.1	0.05	-0.2	-0.08
100	4.007E+07	4.019E+07		0.1	0.11	0.0	0.04
50	2.004E+07	2.024E+07		0.2	0.35	0.0	-0.04

Table 2-c.

Reference output: Ref Pressure (kPa)	Ref Pressure (0.1Pa)	Linear factor output: Cone output (0.1Pa)	Expanded uncertainty *U** kPa	%	3rd order equation: Equation output (0.1N)	Expanded uncertainty *U** kPa	%
50	500000	501712	0.447	0.89	499919	0.292	0.58
100	1000000	1001056	0.338	0.34	998446	0.407	0.41
200	2000000	2001957	0.585	0.29	1997784	0.619	0.31
300	3000000	3002610	0.725	0.24	2997040	0.774	0.26
400	4000000	4006051	1.326	0.33	3999323	0.546	0.14
500	5000000	5005853	1.344	0.27	4998293	0.737	0.15
600	6000000	6007386	1.680	0.28	5999389	0.800	0.13
800	8000000	8005213	1.472	0.18	7997844	1.120	0.14
1000	10000000	10001371	1.350	0.14	9997138	1.440	0.14
1200	12000000	11997496	1.962	0.16	11999520	1.899	0.16
1000	10000000	10004480	1.612	0.16	10000254	1.337	0.13
800	8000000	8006742	1.741	0.22	7999374	1.096	0.14
600	6000000	6008251	1.864	0.31	6000253	0.845	0.14
500	5000000	5008553	1.846	0.37	5000991	0.697	0.14
400	4000000	4007159	1.540	0.39	4000431	0.536	0.13
300	3000000	3005954	1.282	0.43	3000380	0.442	0.15
200	2000000	2003477	0.798	0.40	1999302	0.397	0.20
100	1000000	1000117	0.290	0.29	997509	0.576	0.58
50	500000	501874	0.548	1.10	500081	0.384	0.77

Table 3-c. Third order equation

For a given cone indicated output of D (0.1N units), the corrected applied force

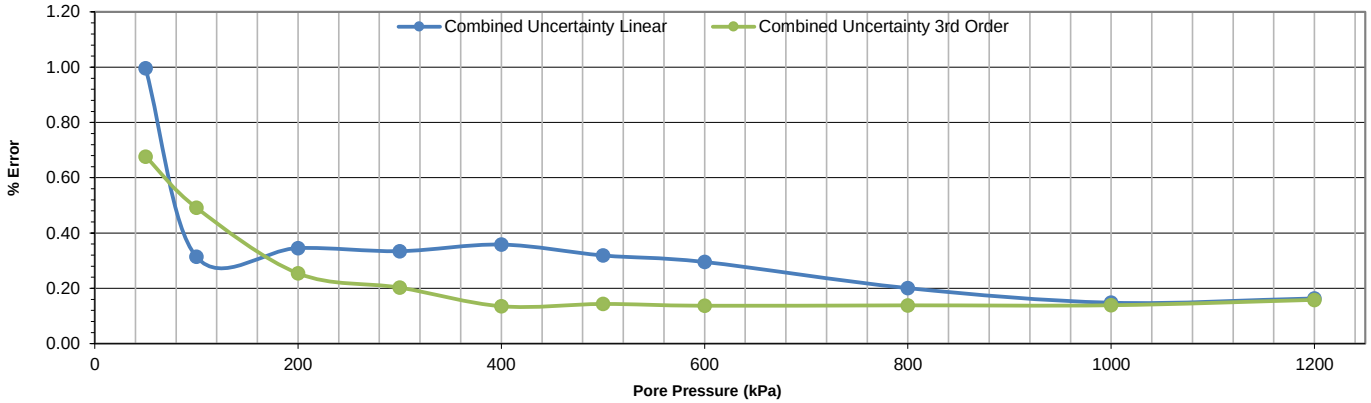
F (in 0.1N units) is calculated from :

$F = (a3 \times D^3) + (a2 \times D^2) + (a1 \times D) + a0$

a0	=	-959.36500
a1	=	0.99833
a2	=	4.95856E-12
a3	=	1.28929E-17

Maximum PWP zero drift during the calibration (kPa) =	0.23
Maximum reference zero drift during the calibration (kPa) =	0.066
Factor used to convert from counts to 0.1Pa units =	0.0249228
Maximum PWP full scale reading (kPa) =	2000
PWP resolution (Pa) =	0.1

COMBINED EXPANDED UNCERTAINTY PORE PRESSURE



* The combined expanded uncertainties shown are to k=2 with a 95% coverage factor.

LANKELMA

CERTIFICATE OF CALIBRATION

Certificate Number: 1449

Cone Serial Number: S15-CFIIPT.1766

INCLINATION CALIBRATION

Ref Inclination (°C)	Cone inclination output X Inc (cts)	Y Inc (cts)
-25	-25912	-26103
0	0	-741
25	25786	24463

Ref Inclination (°)	Cone inclination output X Inc (°)	Y Inc (°)
-25	-25.1	-25.1
0	0.0	0.0
25	24.9	24.9

	X inc	Y inc
Factor used to convert from counts to 0.1m° units =	9.67153488	9.8880349
Inclination error (°) =	0.1	0.1

TEMPERATURE CALIBRATION

Recorded temp (°C)	Cone output (cts)	
7.47	-200776891	
10.70	-160602599	
15.25	-103759636	
20.38	-38698976	
25.54	27486197	

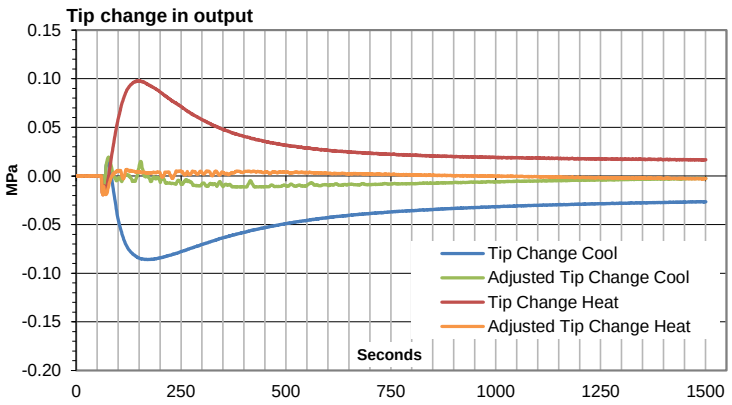
Recorded temp (°C)	Cone output (°C)	
7.47	7.51	
10.70	10.69	
15.25	15.19	
20.38	20.35	
25.54	25.59	

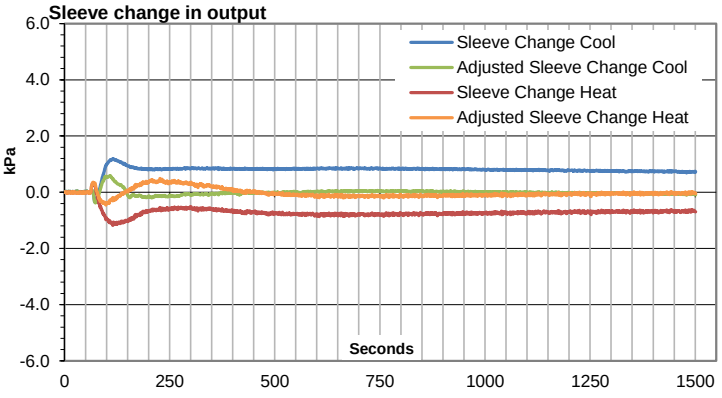
Factor used to convert from counts to 0.00001°C units =	0.000791829	
Temperature error (°C) =	0.05	

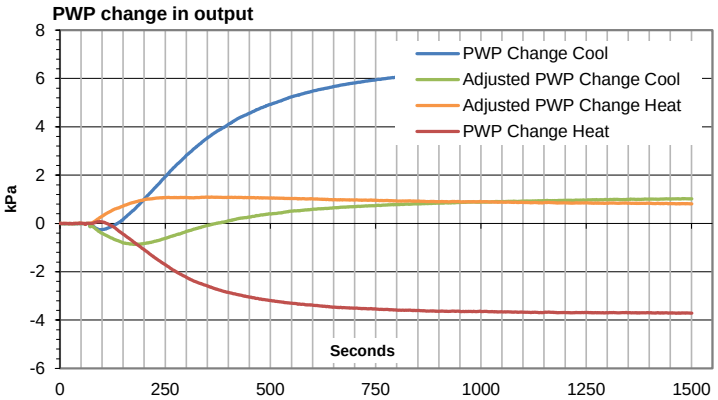
CONE TEMPERATURE EFFECT

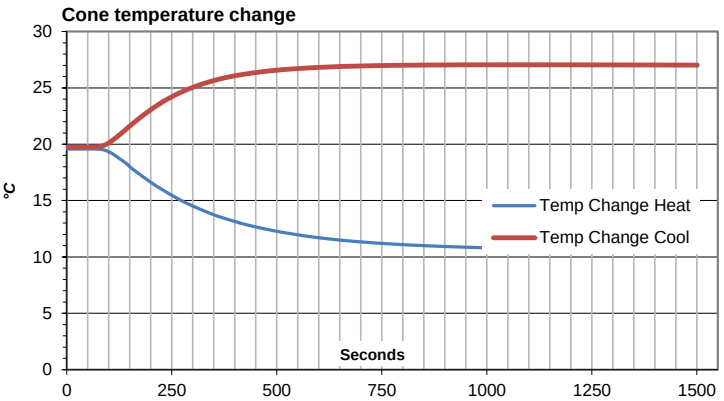
	Cooling	Heating
Start temperature =	19.58	19.74
End temperature =	10.59	27.05
Temperature change =	-8.98	7.31

	Cooling	Heating
Tip maximum rate of change (MPa/°C/min) =	0.042	0.051
Tip end change (MPa/°C) =	-0.003	0.002
Adjusted tip end change (MPa/°C) =	0.000	0.000
Sleeve maximum rate of change (kPa/°C/min) =	2.35	2.87
Sleeve end change (kPa/°C) =	0.08	-0.10
Adjusted sleeve end change (kPa/°C) =	-0.01	-0.01
PWP end change (kPa/°C) =	0.74	-0.51
Adjusted PWP end change (kPa/°C) =	-0.11	0.11











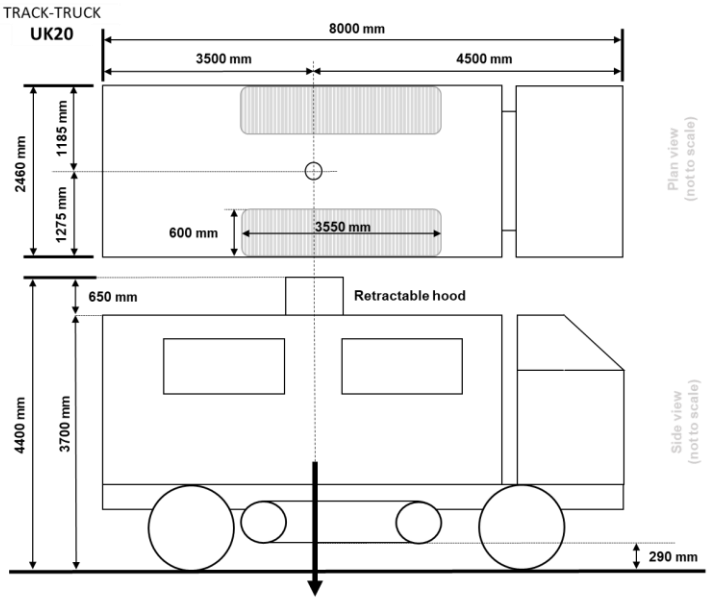
UK20
Track-truck

LANKELMA
01797 280050 – www.lankelma.com

The versatile track-truck is suitable for most geotechnical sites. The rig is driven to site as a self-contained HGV with tracks that can be deployed to cope with soft or uneven terrain.

Remote-controlled tracking to assist with manoeuvring onto location.

Complies with Euro 6 emission standards for use in London's low emissions zones (LEZ).



Rig weight	17.9 T
Max. operating ram capacity	17.5 T
Max. travelling speed	86 km/h
Track material	Steel
Track length	3550 mm
Track width	600 mm
Jack plate dimensions	Tracks act as jacks
Jack arrangements	1nr. on each side
Max. ground clearance on jacks	290 mm
Max. ground bearing pressure	Wheels – 300 kPa Tracks – 48 kPa
Max. testing gradient	10 degrees
Max. traversing gradient	20 degrees (operator assessed)
Noise output at 2 m	Testing - 69.5 dBA Driving – 78.7 dBA
Clamp arrangement	Hydraulic catching – semi automatic
Ram stroke	1.2 m
Max. casing size	55 mm
Typical production	100 m+ of standard CPTu testing per day (depending on conditions and access)

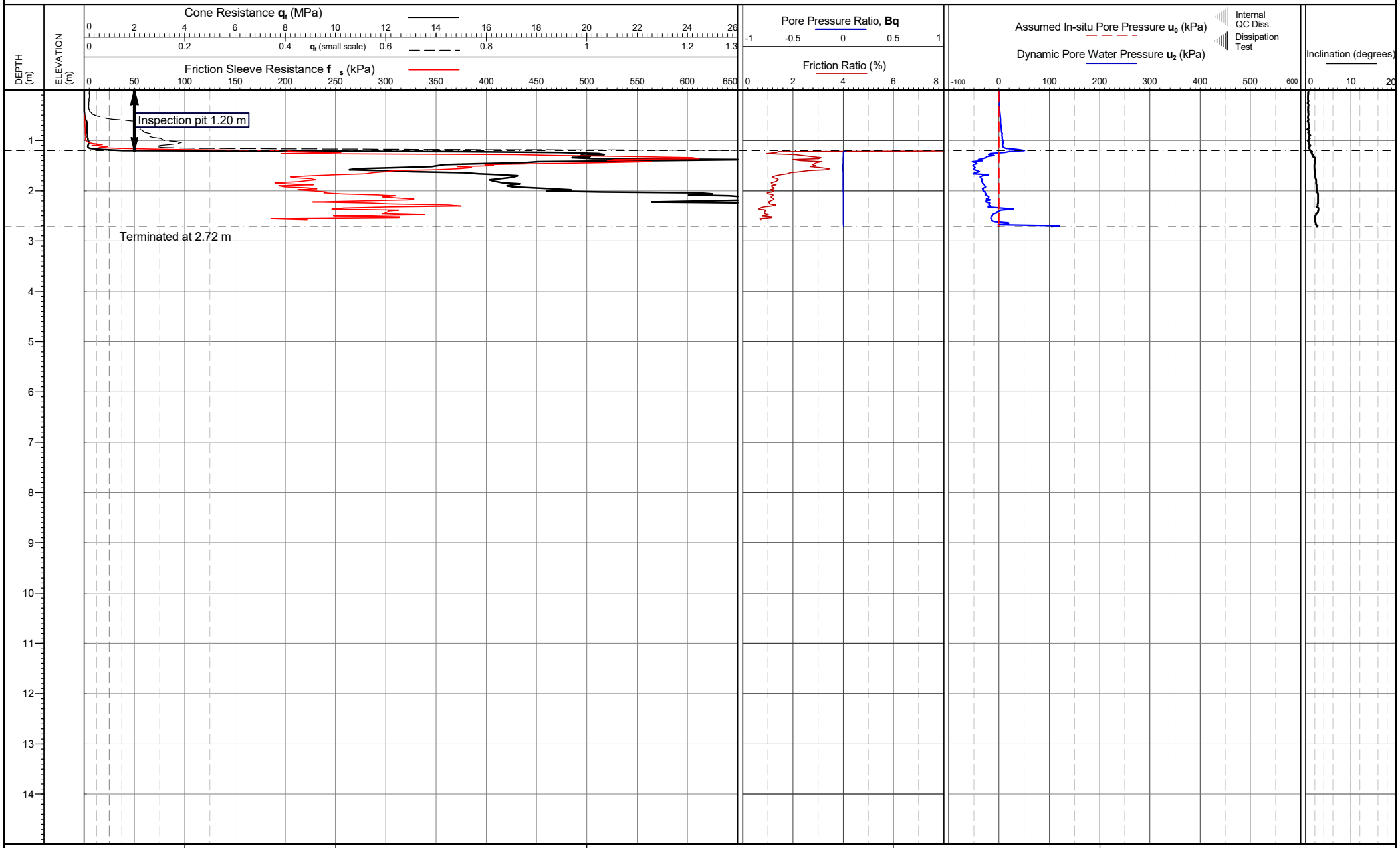
APPENDIX C CONE PENETRATION TEST RESULTS

Measured CPT parameters

intermediate parameters R_f and B_q

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING

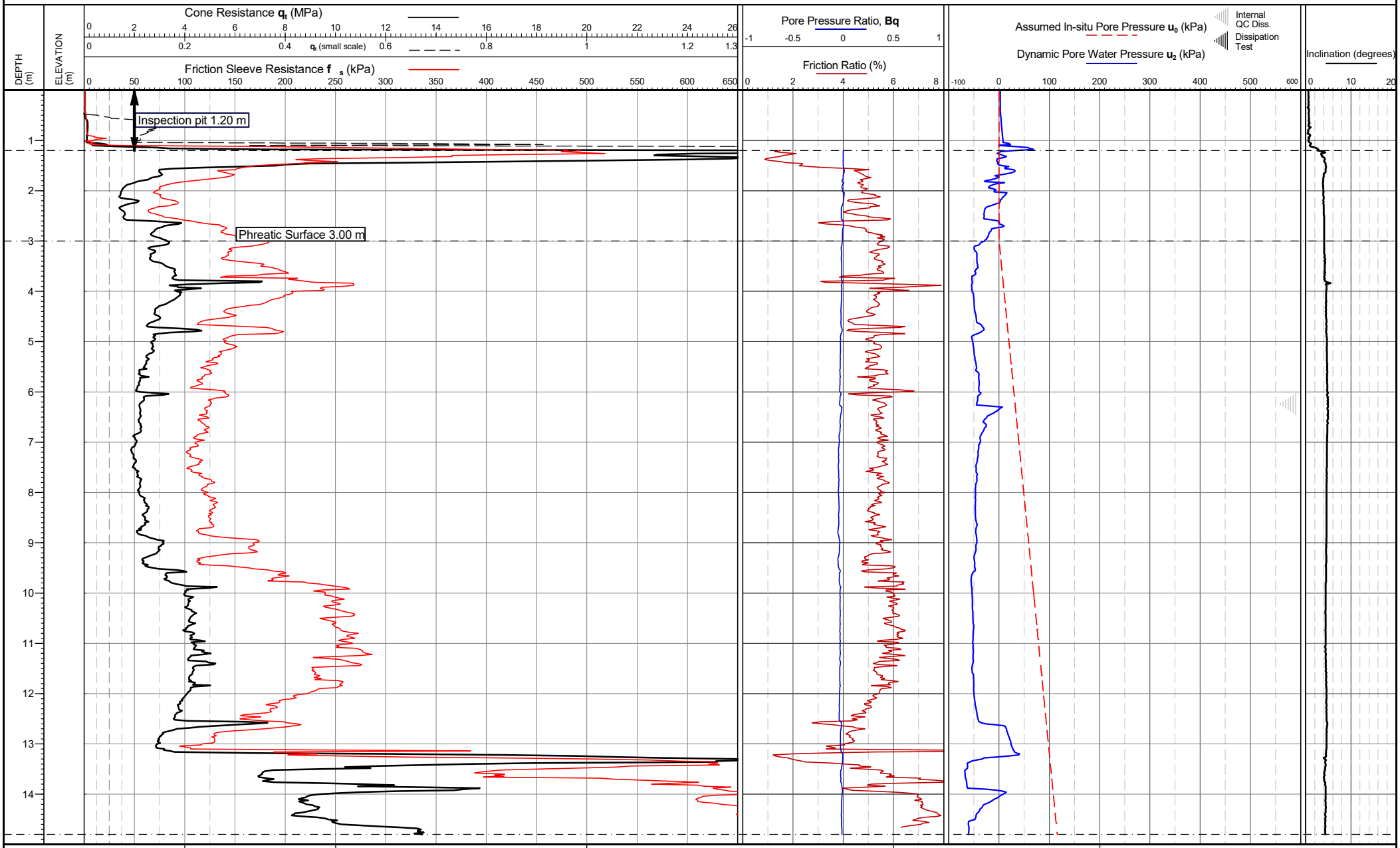


Cone area (mm2): Cone ID: S15-CFIPT.1766 Operator: Jamie Butterworth Rig Used: UK20 Date of test: 17/11/2022 15:10:02	Zero drift (Pre/post test) q_c (kPa): -44.2 f_s (kPa): 2.1 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): -1.8	Location: Greater Manchester, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Arbitrary value Termination Remark: Lateral support at surface	Date of plot: 18-11-22 Checked by: Chris Player	Lankelma Project Ref: P-108203-1

TEST ID: CPT22/01

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING

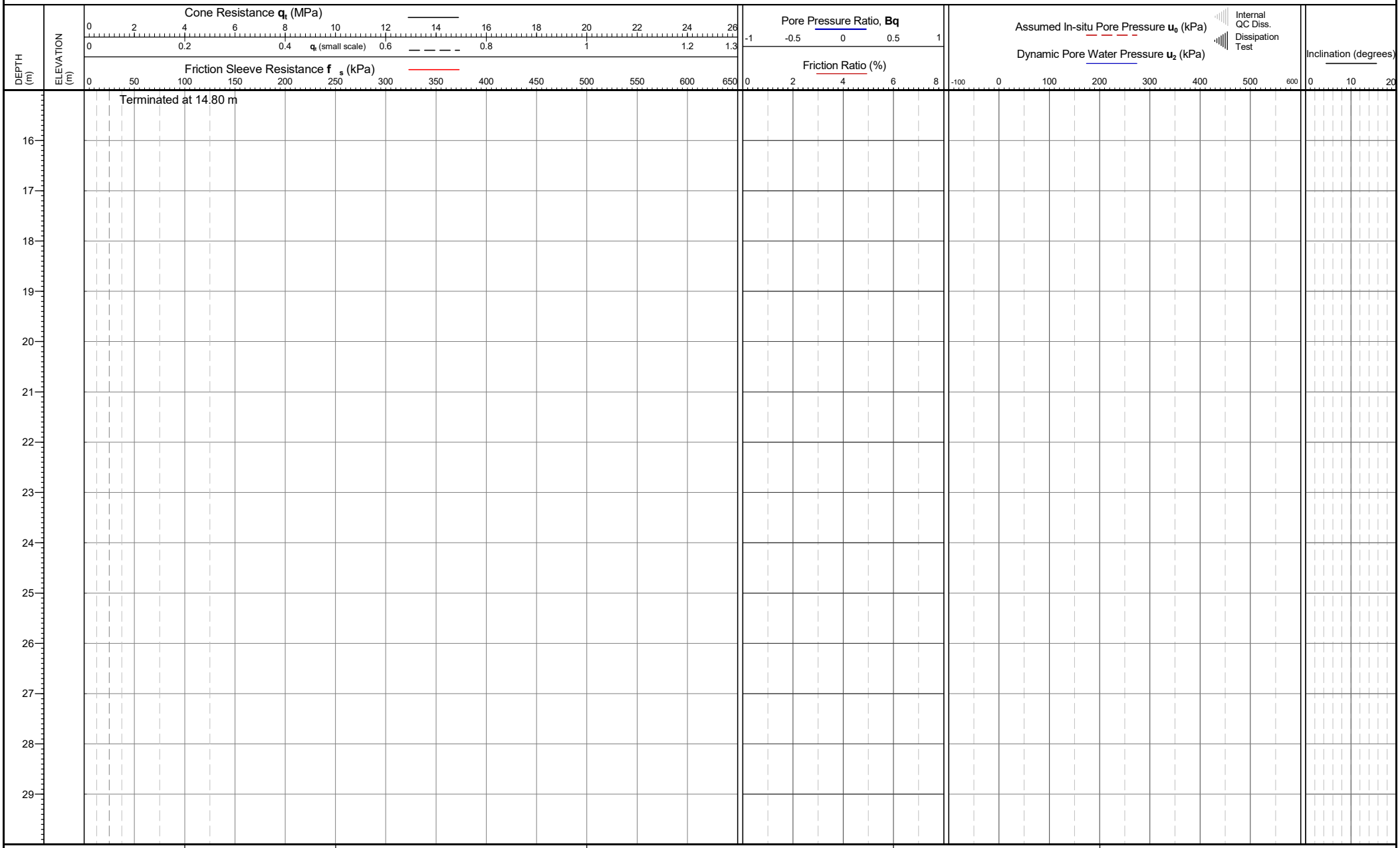


Cone area (mm2): Cone ID: S15-CFIPT.1766 Operator: Phillip Case Rig Used: UK20 Date of test: 17/11/2022 11:09:44	Zero drift (Pre/post test) q_c (kPa): -12.2 f_s (kPa): 0.0 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): 0.5	Location: Greater Manchester, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Arbitrary value Termination Remark: Lateral support at surface	Date of plot: 18-11-22 Checked by: Chris Player	Lankelma Project Ref: P-108203-1

TEST ID: CPT22/02

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
Cone ID: S15-CFIPT.1766
Operator: Phillip Case
Rig Used: UK20
Date of test: 17/11/2022 11:09:44

Zero drift (Pre/post test)
q_c (kPa): -12.2
f_s (kPa): 0.0 ($f_{s\,drift}$ - $q_{c\,drift}$)
u_2 (kPa): 0.5

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks:
*Phreatic surface origin: Arbitrary value

Termination Remark: Lateral support at surface

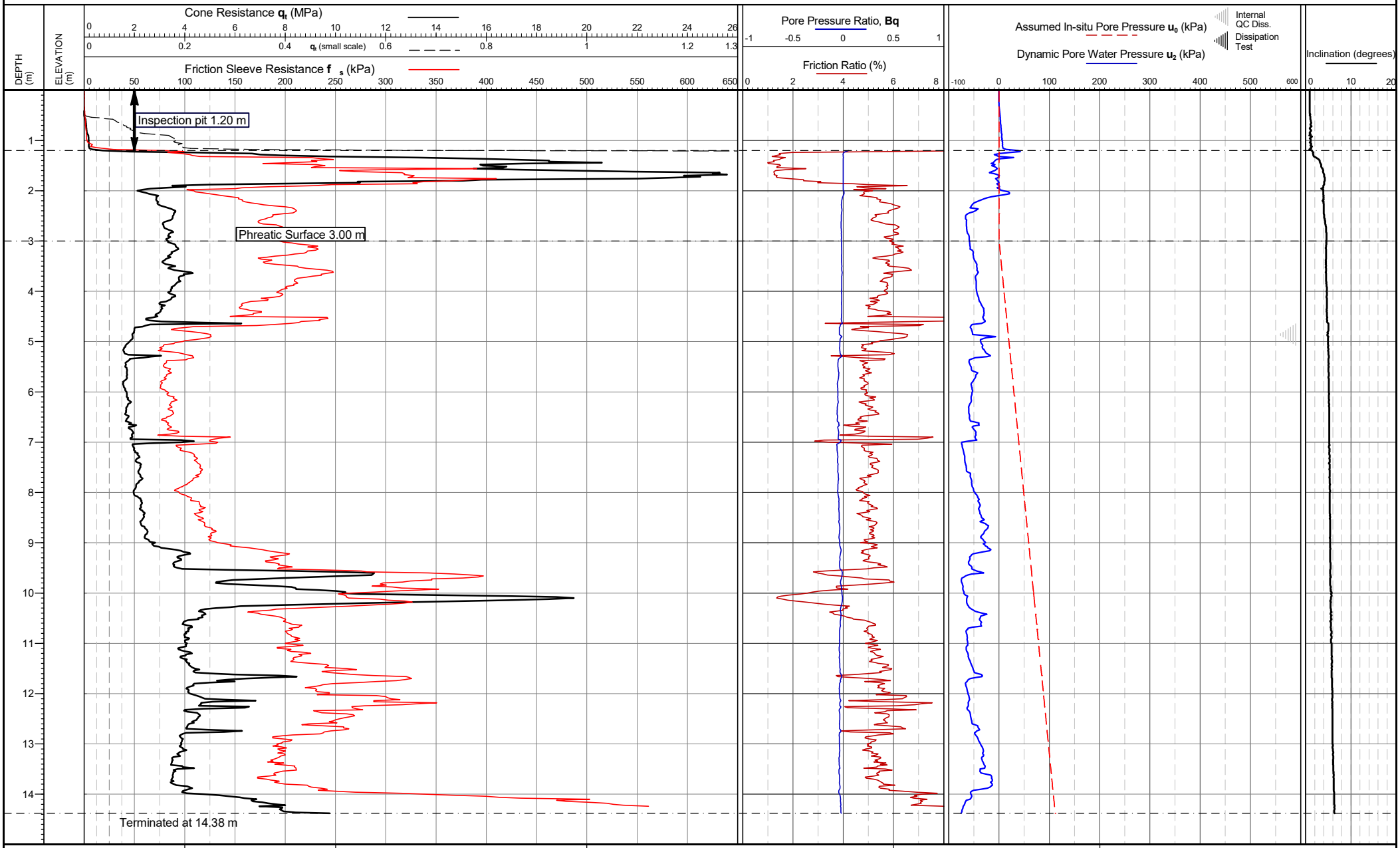
Date of plot: 18-11-22
Lankelma Project Ref: P-108203-1

Checked by: Chris Player

TEST ID: CPT22/02

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



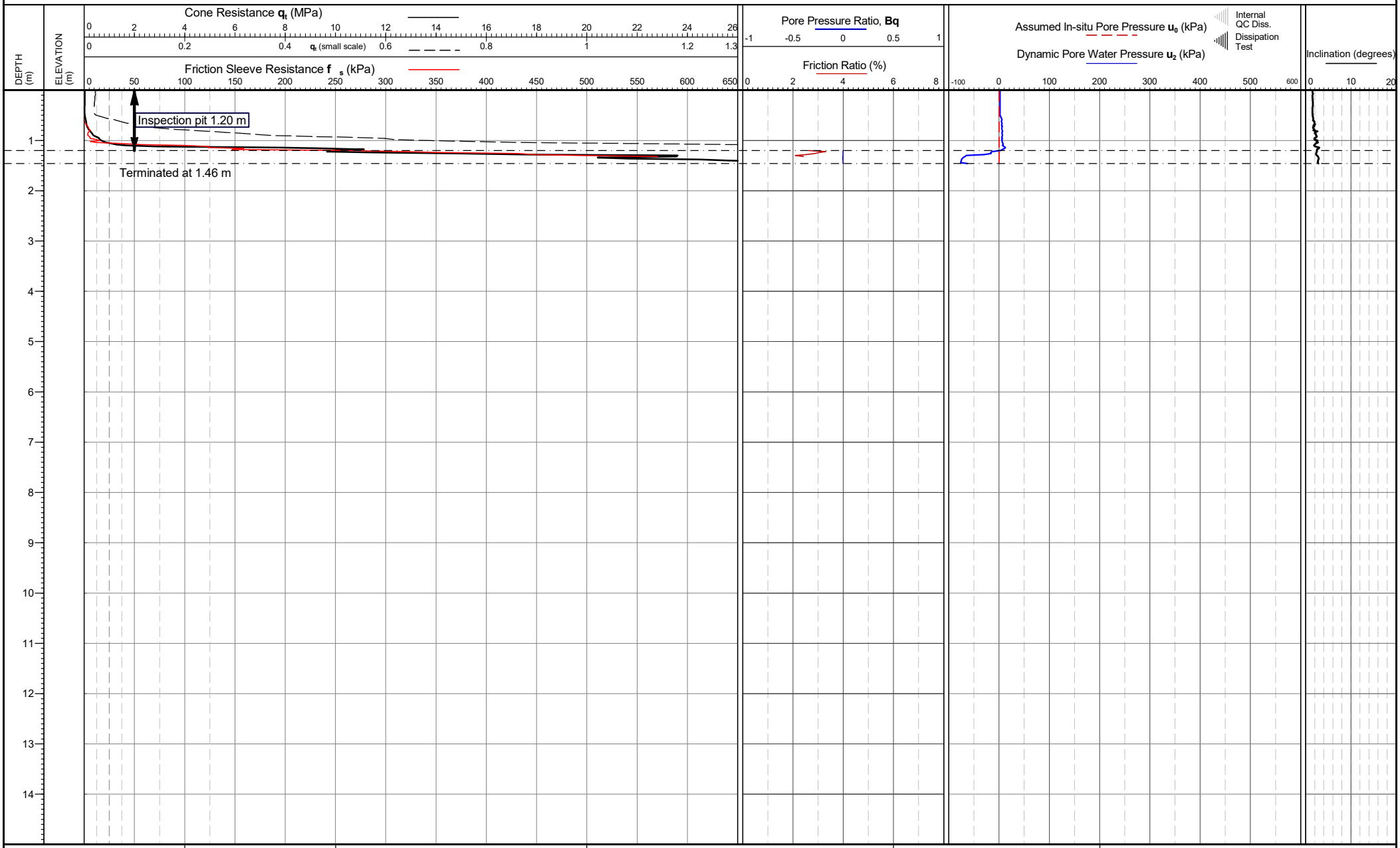
Cone area (mm2): Cone ID: S15-CFIPT.1766 Operator: Phillip Case Rig Used: UK20 Date of test: 17/11/2022 13:28:31	Zero drift (Pre/post test) q_c (kPa): -13.0 f_s (kPa): -0.5 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): -0.5	Location: Greater Manchester, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Arbitrary value Termination Remark: Lateral support at surface	Date of plot: 18-11-22 Checked by: Chris Player	Lankelma Project Ref: P-108203-1

TEST ID: CPT22/03

LANKELMA

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING

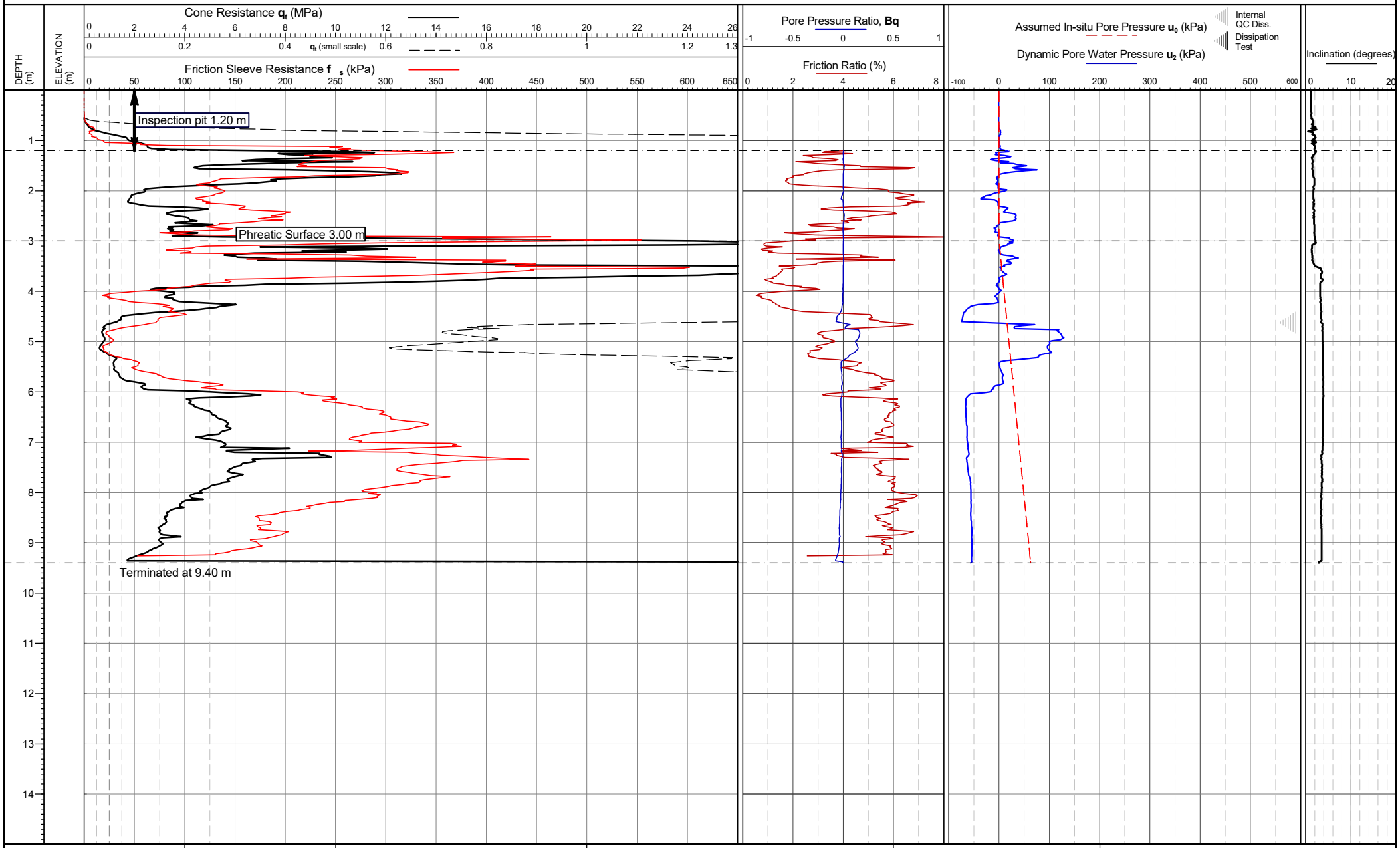


Cone area (mm2): Cone ID: S15-CFIPT.1766 Operator: Jamie Butterworth Rig Used: UK20 Date of test: 17/11/2022 09:14:20	Zero drift (Pre/post test) q_c (kPa): 17.4 f_s (kPa): 0.3 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): 0.6	Location: Greater Manchester, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Arbitrary value Termination Remark: Tip load	Date of plot: 18-11-22 Checked by: Chris Player	Lankelma Project Ref: P-108203-1

TEST ID: CPT22/04

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



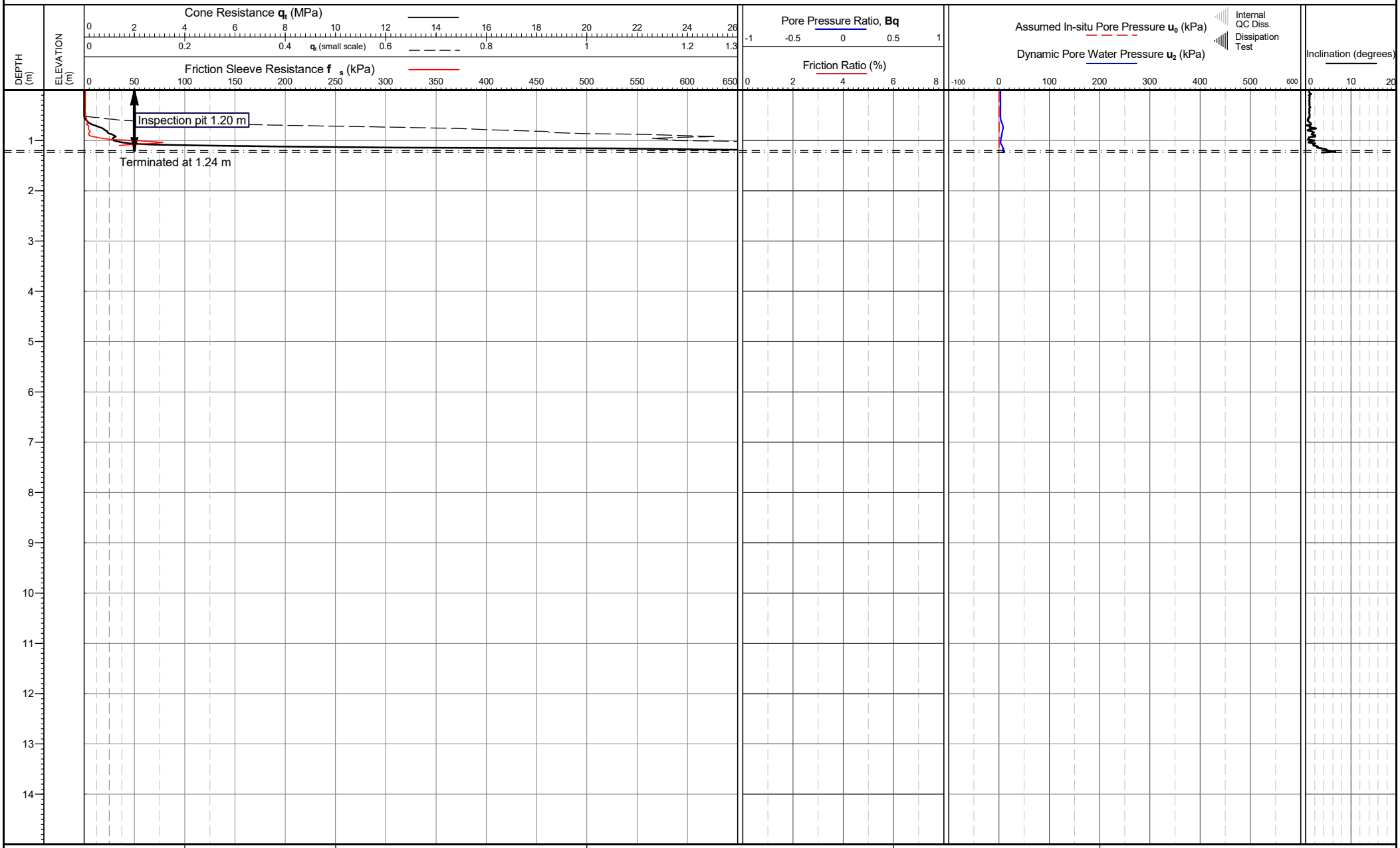
Cone area (mm2): Cone ID: S15-CFIPT.1766 Operator: Phillip Case Rig Used: UK20 Date of test: 17/11/2022 10:26:18	Zero drift (Pre/post test) q_c (kPa): -50.0 f_s (kPa): -2.4 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): -9.0	Location: Greater Manchester, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Arbitrary value Termination Remark: Lateral support at surface	Date of plot: 18-11-22 Checked by: Chris Player	Lankelma Project Ref: P-108203-1

TEST ID: CPT22/05A

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Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



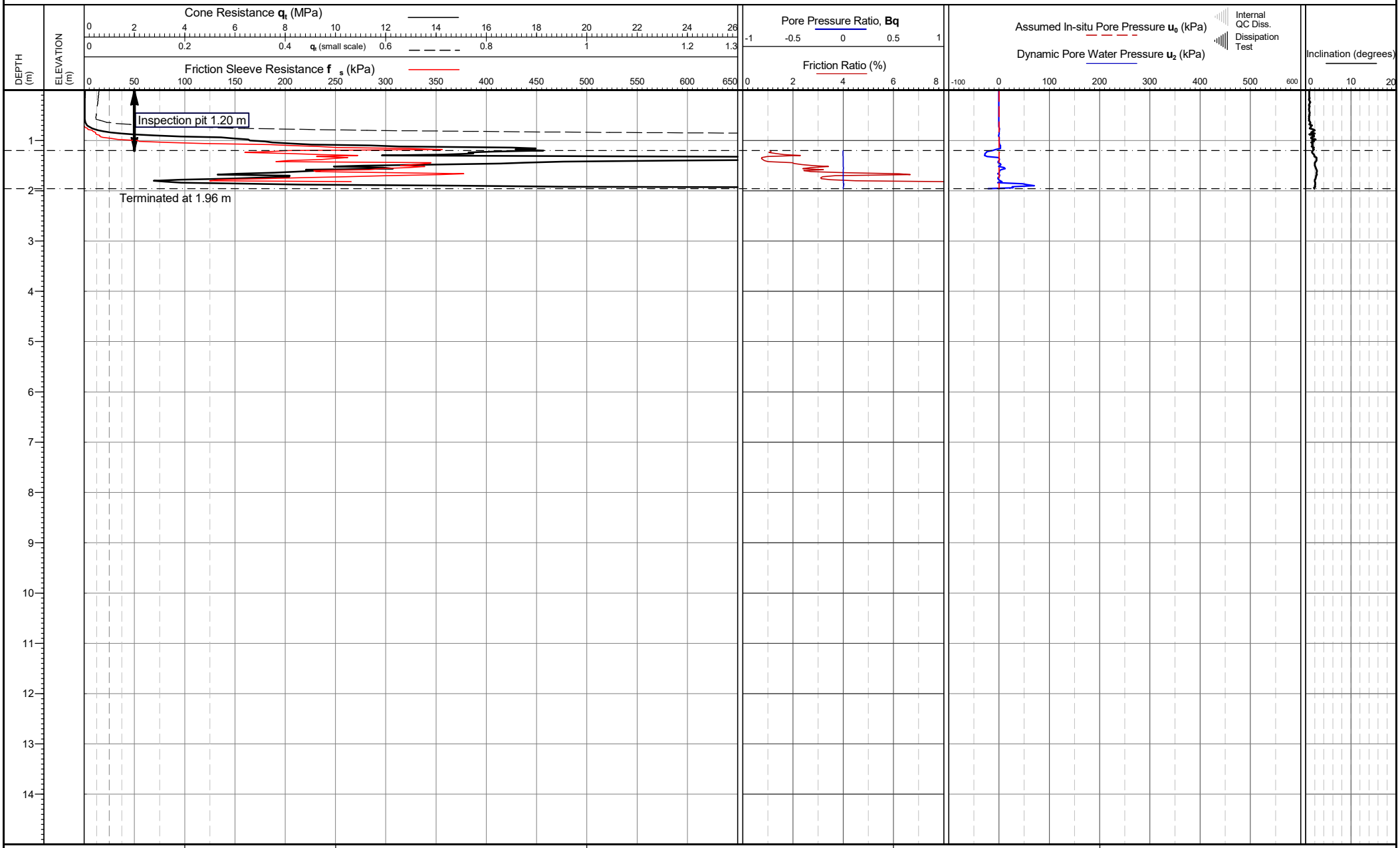
Cone area (mm2): Cone ID: S15-CFIPT.1766 Operator: Jamie Butterworth Rig Used: UK20 Date of test: 17/11/2022 12:05:23	Zero drift (Pre/post test) q_c (kPa): 22.2 f_s (kPa): 3.6 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): 3.3	Location: Greater Manchester, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Arbitrary value Termination Remark: Tip load	Date of plot: 18-11-22 Checked by: Chris Player	Lankelma Project Ref: P-108203-1

TEST ID: CPT22/06

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Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



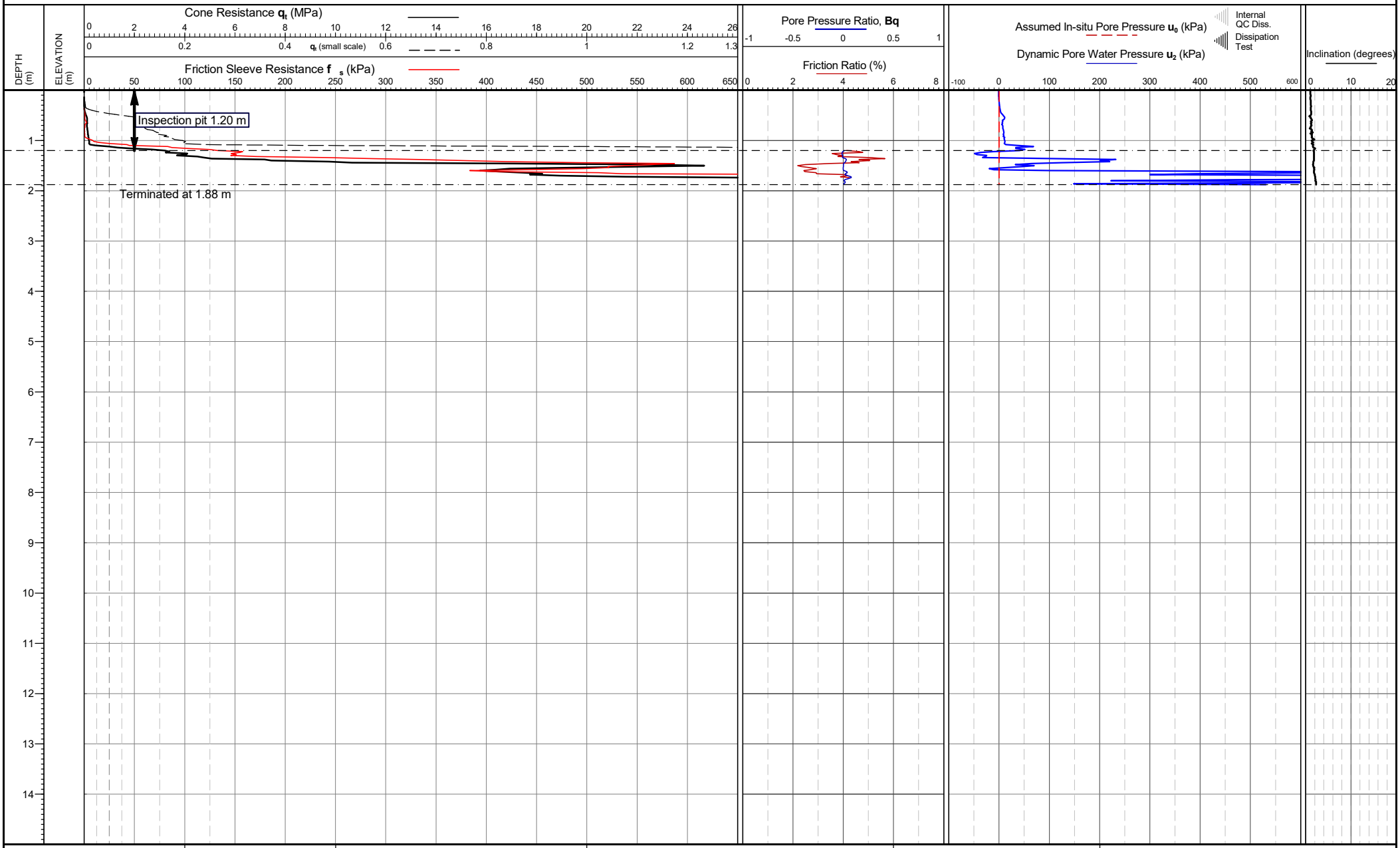
Cone area (mm2): Cone ID: S15-CFIPT.1766 Operator: Phillip Case Rig Used: UK20 Date of test: 17/11/2022 12:35:54	Zero drift (Pre/post test) q_c (kPa): 19.0 f_s (kPa): -3.8 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): -2.9	Location: Greater Manchester, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Arbitrary value Termination Remark: Tip load	Date of plot: 18-11-22 Checked by: Chris Player	Lankelma Project Ref: P-108203-1

TEST ID: CPT22/07

LANKELMA

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2): Cone ID: S15-CFIPT.1766 Operator: Phillip Case Rig Used: UK20 Date of test: 17/11/2022 08:41:03	Zero drift (Pre/post test) q_c (kPa): 16.2 f_s (kPa): -2.5 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): -6.6	Location: Greater Manchester, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Arbitrary value Termination Remark: Sleeve load	Date of plot: 18-11-22 Checked by: Chris Player	Lankelma Project Ref: P-108203-1

TEST ID: CPT22/08

APPENDIX D SOIL BEHAVIOUR TYPE RESULTS

Soil behaviour type (SBT) point data evaluation according to:

Schneider et al (2008)

Robertson (2016)

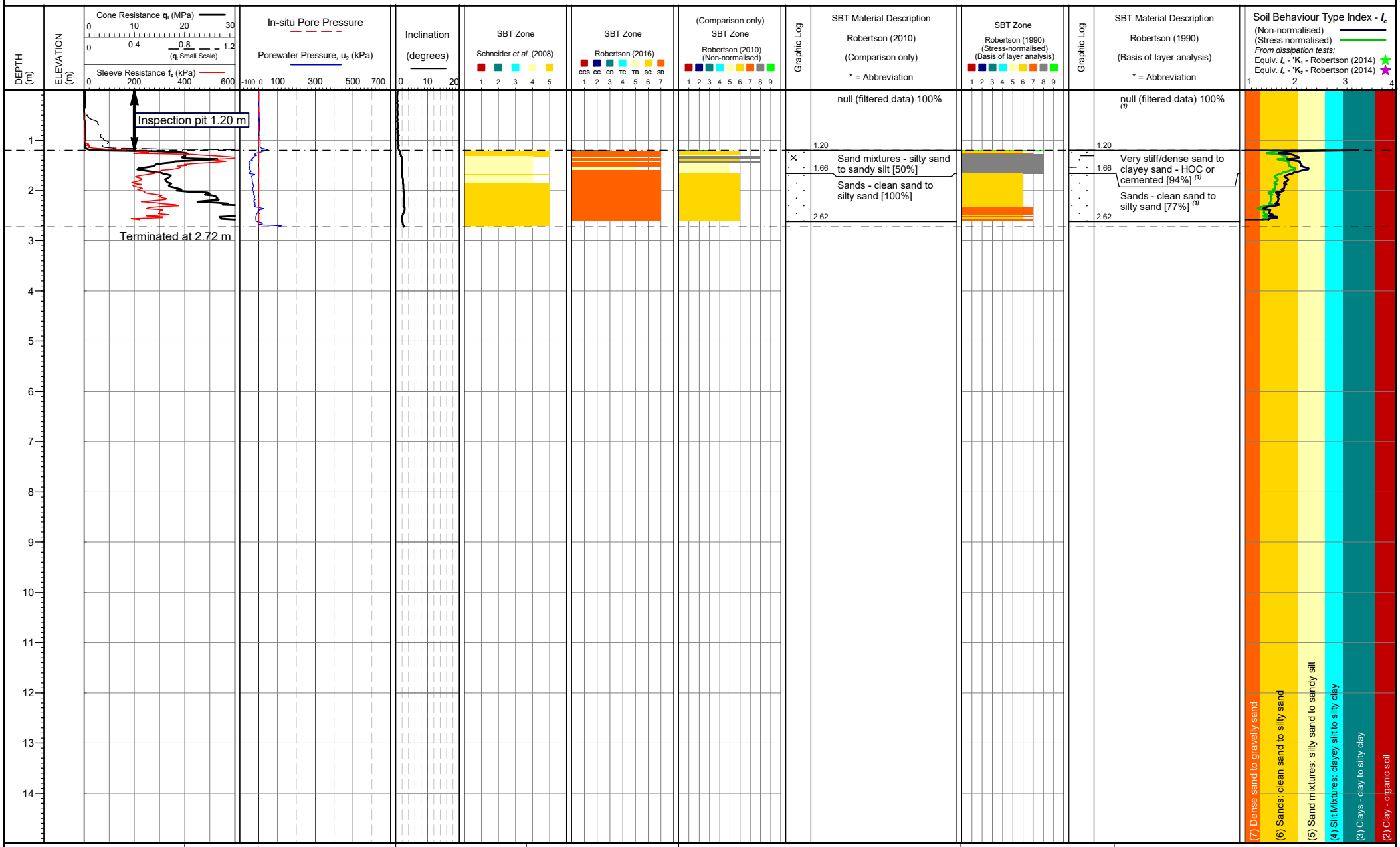
Robertson (2010) with aggregate layer descriptions

Robertson (1990) with aggregate layer descriptions

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING

Lankelma Project Ref: P-108203-1



Cone area (mm2):
ConeID: S15-CFIPT.1766
Location: Greater Manchester, UK
Rig Used: UK20
Date of test: 17/11/2022 15:10:02

Remarks: *Phreatic surface origin: Arbitrary value

Coordinates: ,
Elevation:

Schneider *et al.* (2008) Material Type
1 - (1c) Sensitive clays
2 - (1b) Clays
3 - (1a) Silts & low I, clays
4 - (3) Transitional soils
5 - (2) Essentially drained sands

Robertson (2016) Material Type
1 - **CCS** - Clay-like - Contractive - Sensitive
2 - **CC** - Clay-like - Contractive
3 - **CD** - Clay-like - Dilative
4 - **TC** - Transitional - Contractive
5 - **TD** - Transitional - Dilative
6 - **SC** - Sand-like - Contractive
7 - **SD** - Sand-like - Dilative

Robertson (1990 & 2010) Material Type
1 - Sensitive fine-grained
2 - Organic soils
3 - Clays - clay to silty clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to sand
8 - Very stiff/dense sand to clayey sand
9 - Very stiff fine grained

(1) 0-3 m: Normalised SBT often artificially coarse/stiff at very low in-situ stresses

Internal QA Diss.
Dissipation Test

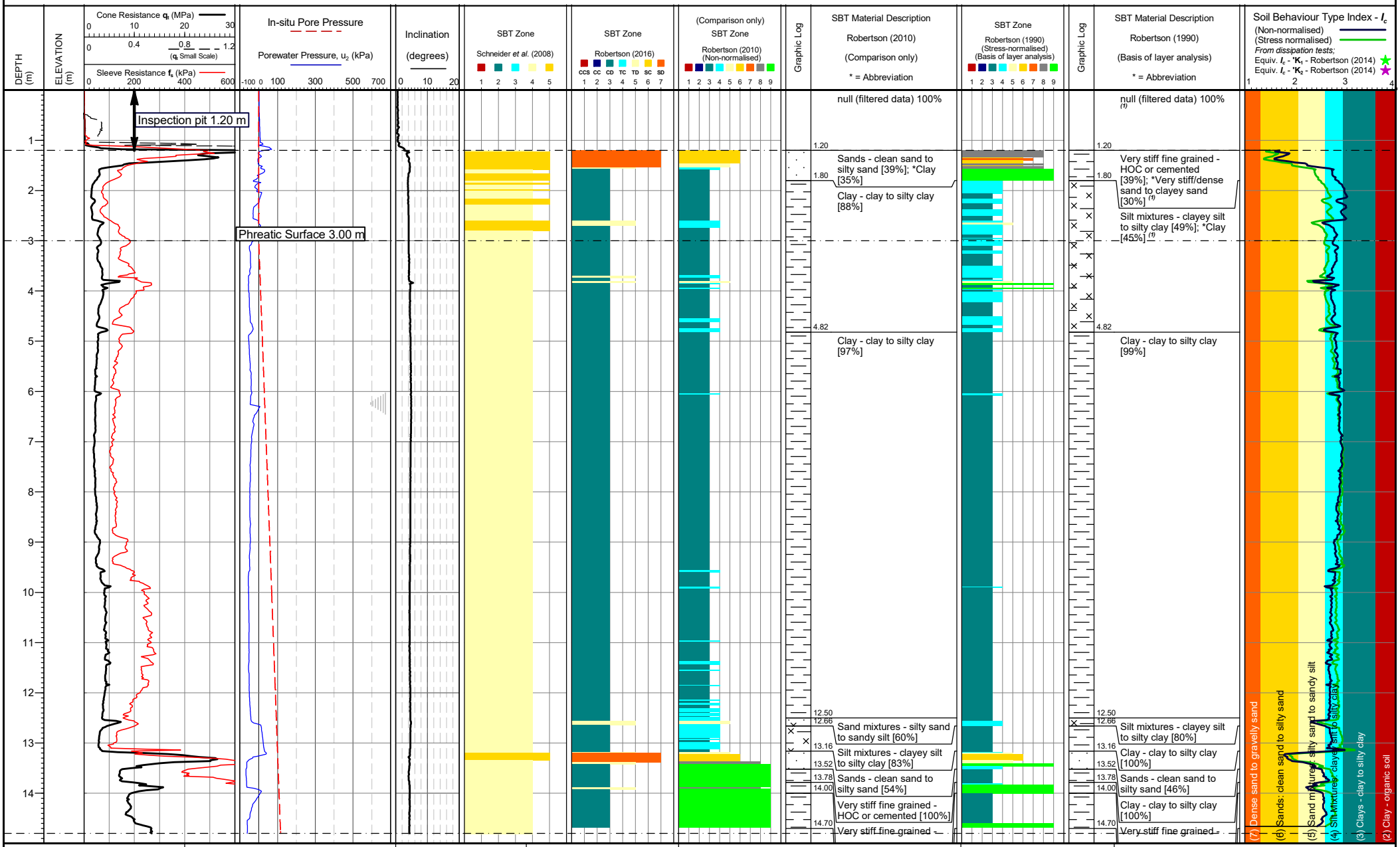
TEST ID: CPT22/01

LANKELMA

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING

Lankelma Project Ref: P-108203-1



Cone area (mm2):
ConeID: S15-CFIPT.1766
Location: Greater Manchester, UK
Rig Used: UK20
Date of test: 17/11/2022 11:09:44

Remarks: *Phreatic surface origin: Arbitrary value

Coordinates: ,
Elevation:

Schneider *et al.* (2008) Material Type
1 - (1c) Sensitive clays
2 - (1b) Clays
3 - (1a) Silts & low I, clays
4 - (3) Transitional soils
5 - (2) Essentially drained sands

Robertson (2016) Material Type
1 - **CCS** - Clay-like - Contractive - Sensitive
2 - **CC** - Clay-like - Contractive
3 - **CD** - Clay-like - Dilative
4 - **TC** - Transitional - Contractive
5 - **TD** - Transitional - Dilative
6 - **SC** - Sand-like - Contractive
7 - **SD** - Sand-like - Dilative

Robertson (1990 & 2010) Material Type
1 - Sensitive fine-grained
2 - Organic soils
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5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to sand
8 - Very stiff/dense sand to clayey sand
9 - Very stiff fine grained

(1) 0-3 m: Normalised SBT often artificially coarse/stiff at very low in-situ stresses

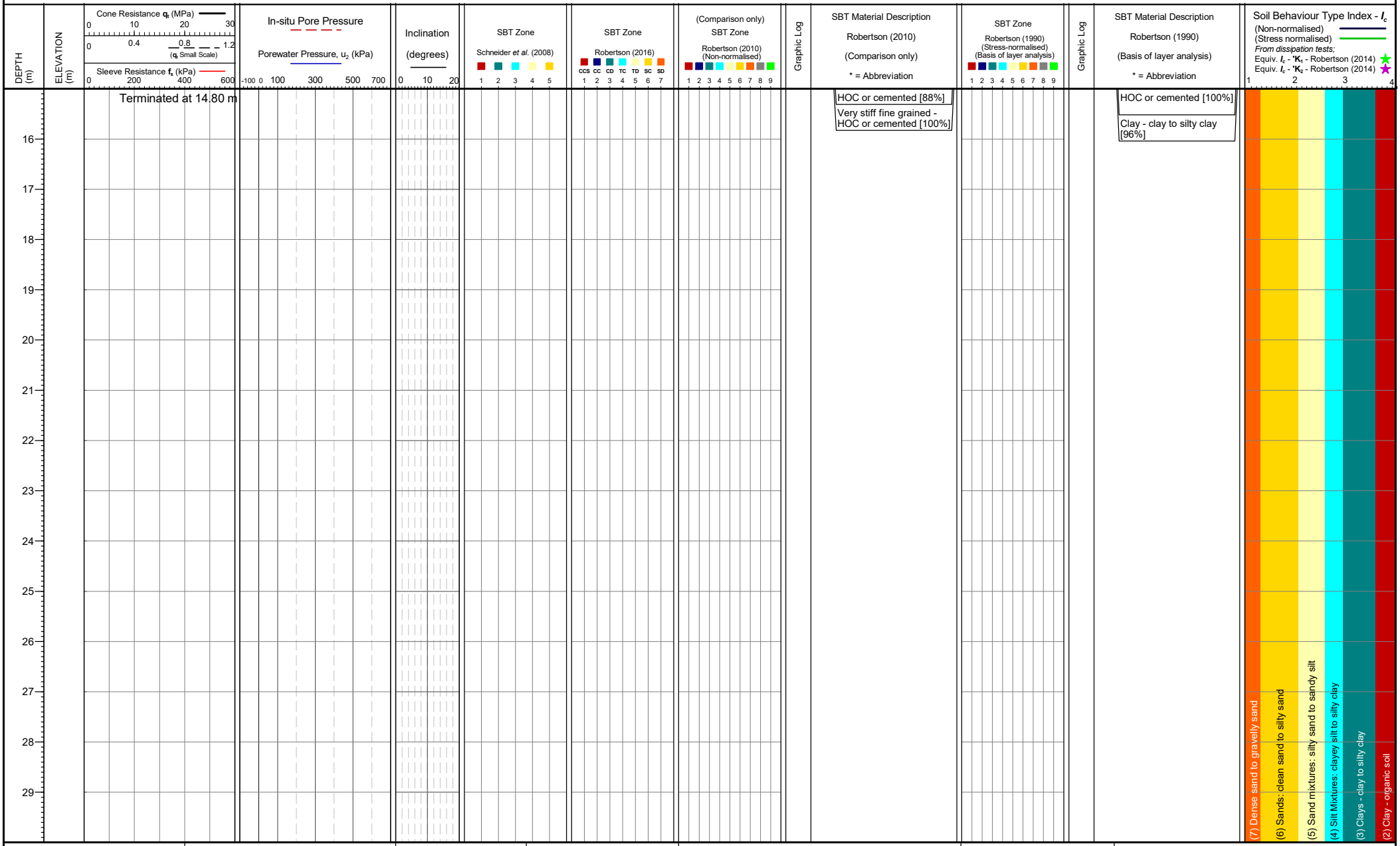
Internal QA Diss.
Dissipation Test

TEST ID: CPT22/02

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING

Lankelma Project Ref: P-108203-1



Cone area (mm2):
ConeID: S15-CFIPT.1766
Location: Greater Manchester, UK
Rig Used: UK20
Date of test: 17/11/2022 11:09:44

Remarks: *Phreatic surface origin: Arbitrary value

Coordinates: ,
Elevation:

Schneider *et al.* (2008) Material Type
1 - (1c) Sensitive clays
2 - (1b) Clays
3 - (1a) Silts & low I, clays
4 - (3) Transitional soils
5 - (2) Essentially drained sands

Robertson (2016) Material Type
1 - **CCS** - Clay-like - Contractive - Sensitive
2 - **CC** - Clay-like - Contractive
3 - **CD** - Clay-like - Dilative
4 - **TC** - Transitional - Contractive
5 - **TD** - Transitional - Dilative
6 - **SC** - Sand-like - Contractive
7 - **SD** - Sand-like - Dilative

Robertson (1990 & 2010) Material Type
1 - Sensitive fine-grained
2 - Organic soils
3 - Clays - clay to silty clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to sand
8 - Very stiff/dense sand to clayey sand
9 - Very stiff fine grained

(1) 0-3 m: Normalised SBT often artificially coarse/stiff at very low in-situ stresses

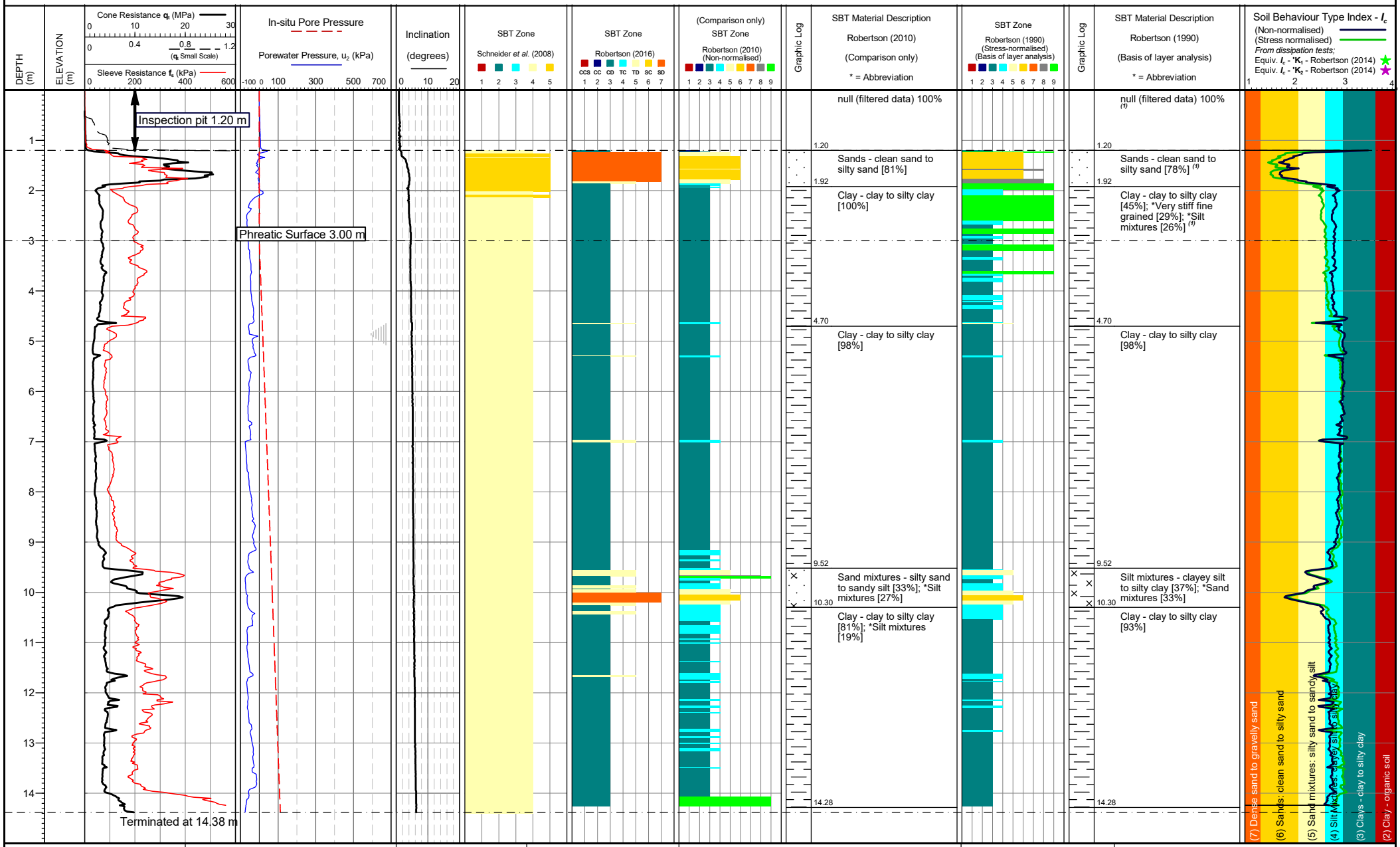
Internal QA Diss.
Dissipation Test

TEST ID: CPT22/02

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING

Lankelma Project Ref: P-108203-1



Cone area (mm2):
ConeID: S15-CFIPT.1766
Location: Greater Manchester, UK
Rig Used: UK20
Date of test: 17/11/2022 13:28:31

Remarks: *Phreatic surface origin: Arbitrary value

Coordinates: ,
Elevation:

Schneider *et al.* (2008) Material Type
1 - (1c) Sensitive clays
2 - (1b) Clays
3 - (1a) Silts & low I, clays
4 - (3) Transitional soils
5 - (2) Essentially drained sands

Robertson (2016) Material Type
1 - **CCS** - Clay-like - Contractive - Sensitive
2 - **CC** - Clay-like - Contractive
3 - **CD** - Clay-like - Dilative
4 - **TC** - Transitional - Contractive
5 - **TD** - Transitional - Dilative
6 - **SC** - Sand-like - Contractive
7 - **SD** - Sand-like - Dilative

Robertson (1990 & 2010) Material Type
1 - Sensitive fine-grained
2 - Organic soils
3 - Clays - clay to silty clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to sand
8 - Very stiff/dense sand to clayey sand
9 - Very stiff fine grained

(1) 0-3 m: Normalised SBT often artificially coarse/stiff at very low in-situ stresses

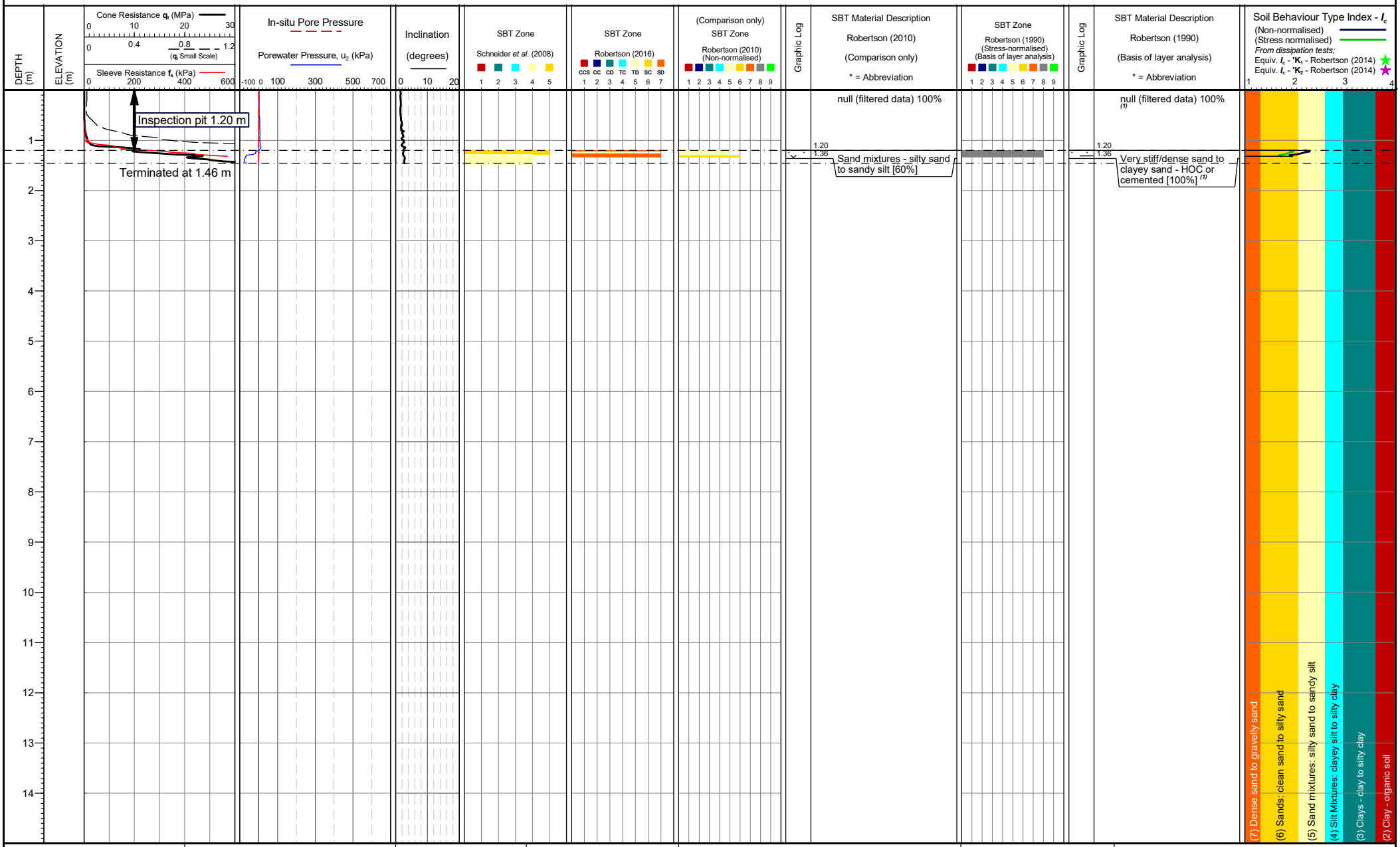
Internal QA Diss.
Dissipation Test

TEST ID: CPT22/03

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING

Lankelma Project Ref: P-108203-1



Cone area (mm2):
ConeID: S15-CFIPT.1766
Location: Greater Manchester, UK
Rig Used: UK20
Date of test: 17/11/2022 09:14:20

Remarks: *Phreatic surface origin: Arbitrary value

Coordinates: ,
Elevation:

Schneider *et al.* (2008) Material Type
1 - (1c) Sensitive clays
2 - (1b) Clays
3 - (1a) Silts & low I, clays
4 - (3) Transitional soils
5 - (2) Essentially drained sands

Robertson (2016) Material Type
1 - **CCS** - Clay-like - Contractive - Sensitive
2 - **CC** - Clay-like - Contractive
3 - **CD** - Clay-like - Dilative
4 - **TC** - Transitional - Contractive
5 - **TD** - Transitional - Dilative
6 - **SC** - Sand-like - Contractive
7 - **SD** - Sand-like - Dilative

Robertson (1990 & 2010) Material Type
1 - Sensitive fine-grained
2 - Organic soils
3 - Clays - clay to silty clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to sand
8 - Very stiff/dense sand to clayey sand
9 - Very stiff fine grained

(1) 0-3 m: Normalised SBT often artificially coarse/stiff at very low in-situ stresses

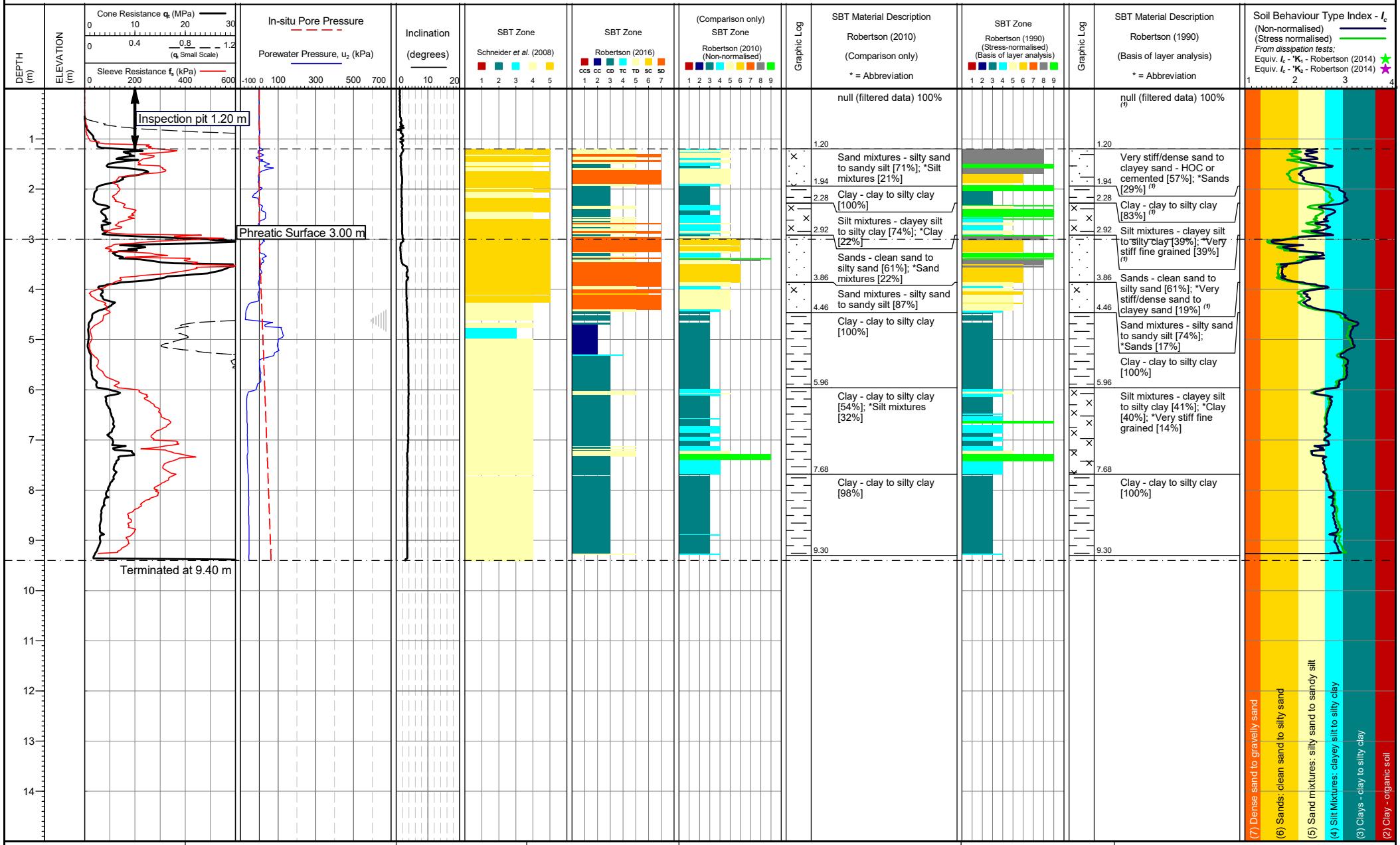
Internal QA Diss.
Dissipation Test

TEST ID: CPT22/04

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING

Lankelma Project Ref: P-108203-1



Cone area (mm2):
ConeID: S15-CFIPT.1766
Location: Greater Manchester, UK
Rig Used: UK20
Date of test: 17/11/2022 10:26:18

Remarks: *Phreatic surface origin: Arbitrary value

Coordinates: ,
Elevation:

Schneider *et al.* (2008) Material Type
1 - (1c) Sensitive clays
2 - (1b) Clays
3 - (1a) Silts & low I, clays
4 - (3) Transitional soils
5 - (2) Essentially drained sands

Robertson (2016) Material Type
1 - **CCS** - Clay-like - Contractive - Sensitive
2 - **CC** - Clay-like - Contractive
3 - **CD** - Clay-like - Dilative
4 - **TC** - Transitional - Contractive
5 - **TD** - Transitional - Dilative
6 - **SC** - Sand-like - Contractive
7 - **SD** - Sand-like - Dilative

Robertson (1990 & 2010) Material Type
1 - Sensitive fine-grained
2 - Organic soils
3 - Clays - clay to silty clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to sand
8 - Very stiff/dense sand to clayey sand
9 - Very stiff fine grained

(1) 0-3 m: Normalised SBT often artificially coarse/stiff at very low in-situ stresses

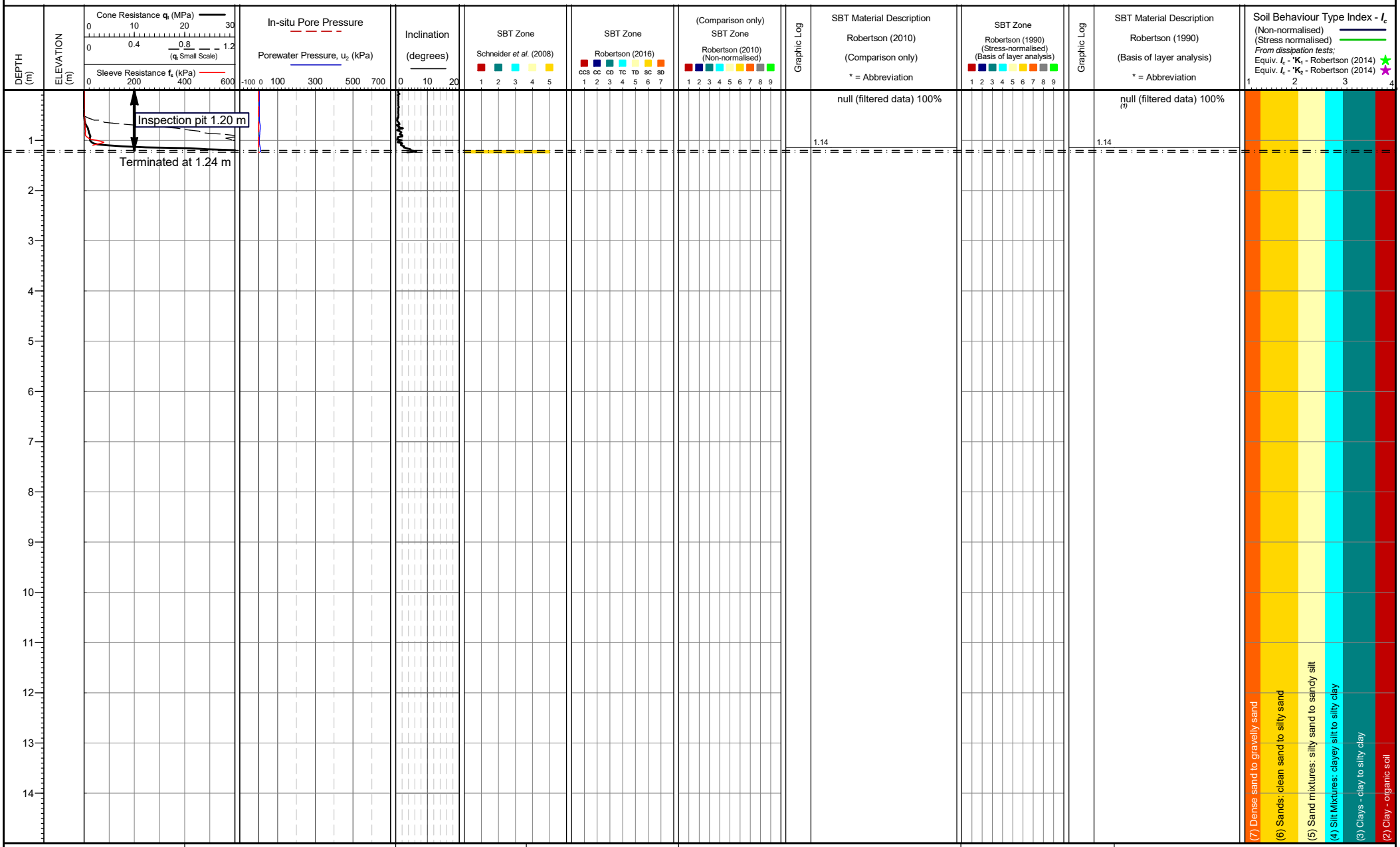
Internal QA Diss.
Dissipation Test

TEST ID: CPT22/05A

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING

Lankelma Project Ref: P-108203-1



Cone area (mm2):
ConeID: S15-CFIPT.1766
Location: Greater Manchester, UK
Rig Used: UK20
Date of test: 17/11/2022 12:05:23

Remarks: *Phreatic surface origin: Arbitrary value

Coordinates: ,
Elevation:

Schneider *et al.* (2008) Material Type
1 - (1c) Sensitive clays
2 - (1b) Clays
3 - (1a) Silts & low I, clays
4 - (3) Transitional soils
5 - (2) Essentially drained sands

Robertson (2016) Material Type
1 - **CCS** - Clay-like - Contractive - Sensitive
2 - **CC** - Clay-like - Contractive
3 - **CD** - Clay-like - Dilative
4 - **TC** - Transitional - Contractive
5 - **TD** - Transitional - Dilative
6 - **SC** - Sand-like - Contractive
7 - **SD** - Sand-like - Dilative

Robertson (1990 & 2010) Material Type
1 - Sensitive fine-grained
2 - Organic soils
3 - Clays - clay to silty clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to sand
8 - Very stiff/dense sand to clayey sand
9 - Very stiff fine grained

(7) 0-3 m: Normalised SBT often artificially coarse/stiff at very low in-situ stresses

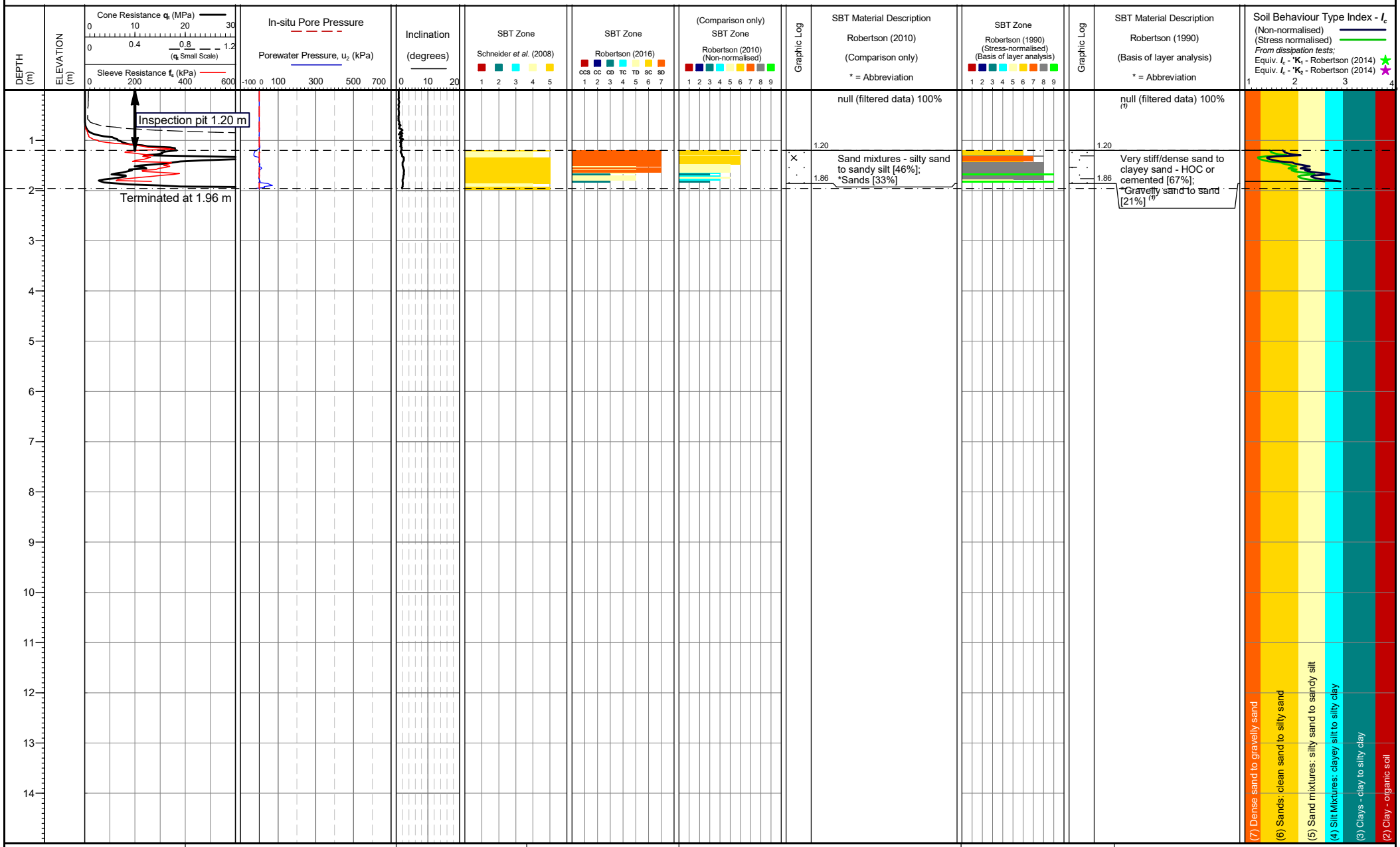
Internal QA Diss.
Dissipation Test

TEST ID: CPT22/06

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING

Lankelma Project Ref: P-108203-1



Cone area (mm2):
ConeID: S15-CFIPT.1766
Location: Greater Manchester, UK
Rig Used: UK20
Date of test: 17/11/2022 12:35:54

Remarks: *Phreatic surface origin: Arbitrary value

Coordinates: ,
Elevation:

Schneider *et al.* (2008) Material Type
1 - (1c) Sensitive clays
2 - (1b) Clays
3 - (1a) Silts & low I, clays
4 - (3) Transitional soils
5 - (2) Essentially drained sands

Robertson (2016) Material Type
1 - **CCS** - Clay-like - Contractive - Sensitive
2 - **CC** - Clay-like - Contractive
3 - **CD** - Clay-like - Dilative
4 - **TC** - Transitional - Contractive
5 - **TD** - Transitional - Dilative
6 - **SC** - Sand-like - Contractive
7 - **SD** - Sand-like - Dilative

Robertson (1990 & 2010) Material Type
1 - Sensitive fine-grained
2 - Organic soils
3 - Clays - clay to silty clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to sand
8 - Very stiff/dense sand to clayey sand
9 - Very stiff fine grained

(1) 0-3 m: Normalised SBT often artificially coarse/stiff at very low in-situ stresses

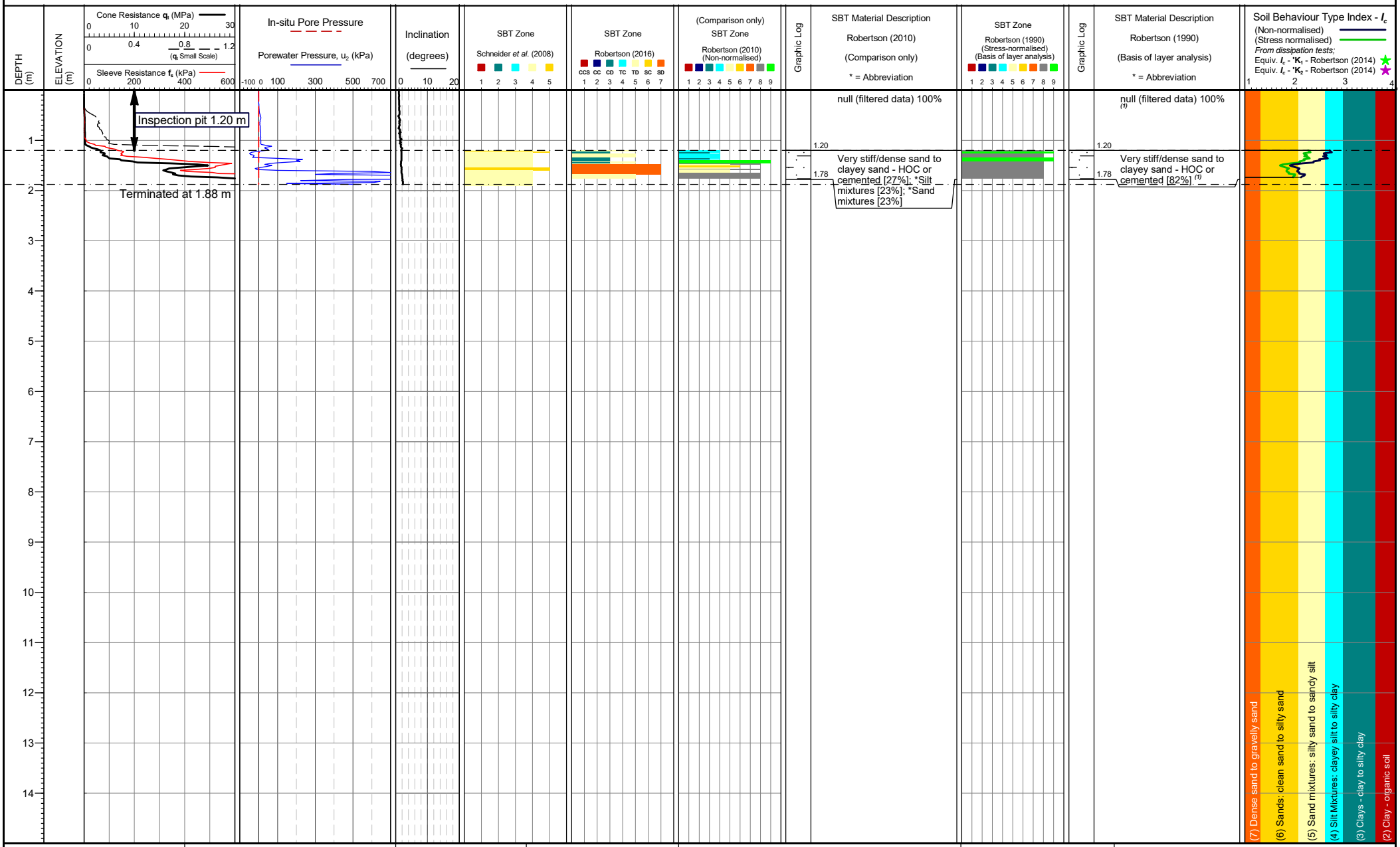
Internal QA Diss.
Dissipation Test

TEST ID: CPT22/07

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING

Lankelma Project Ref: P-108203-1



Cone area (mm2):
ConeID: S15-CFIPT.1766
Location: Greater Manchester, UK
Rig Used: UK20
Date of test: 17/11/2022 08:41:03

Remarks: *Phreatic surface origin: Arbitrary value

Coordinates: ,
Elevation:

Schneider *et al.* (2008) Material Type
1 - (1c) Sensitive clays
2 - (1b) Clays
3 - (1a) Silts & low I, clays
4 - (3) Transitional soils
5 - (2) Essentially drained sands

Robertson (2016) Material Type
1 - **CCS** - Clay-like - Contractive - Sensitive
2 - **CC** - Clay-like - Contractive
3 - **CD** - Clay-like - Dilative
4 - **TC** - Transitional - Contractive
5 - **TD** - Transitional - Dilative
6 - **SC** - Sand-like - Contractive
7 - **SD** - Sand-like - Dilative

Robertson (1990 & 2010) Material Type
1 - Sensitive fine-grained
2 - Organic soils
3 - Clays - clay to silty clay
4 - Silt mixtures - clayey silt to silty clay
5 - Sand mixtures - silty sand to sandy silt
6 - Sands - clean sand to silty sand
7 - Gravelly sand to sand
8 - Very stiff/dense sand to clayey sand
9 - Very stiff fine grained

(1) 0-3 m: Normalised SBT often artificially coarse/stiff at very low in-situ stresses

Internal QA Diss.
Dissipation Test

TEST ID: CPT22/08

APPENDIX E PARAMETER RESULTS 1 – S_U, M_V, OCR, SBT, I_C

Undrained shear strength

Coefficient of volume change

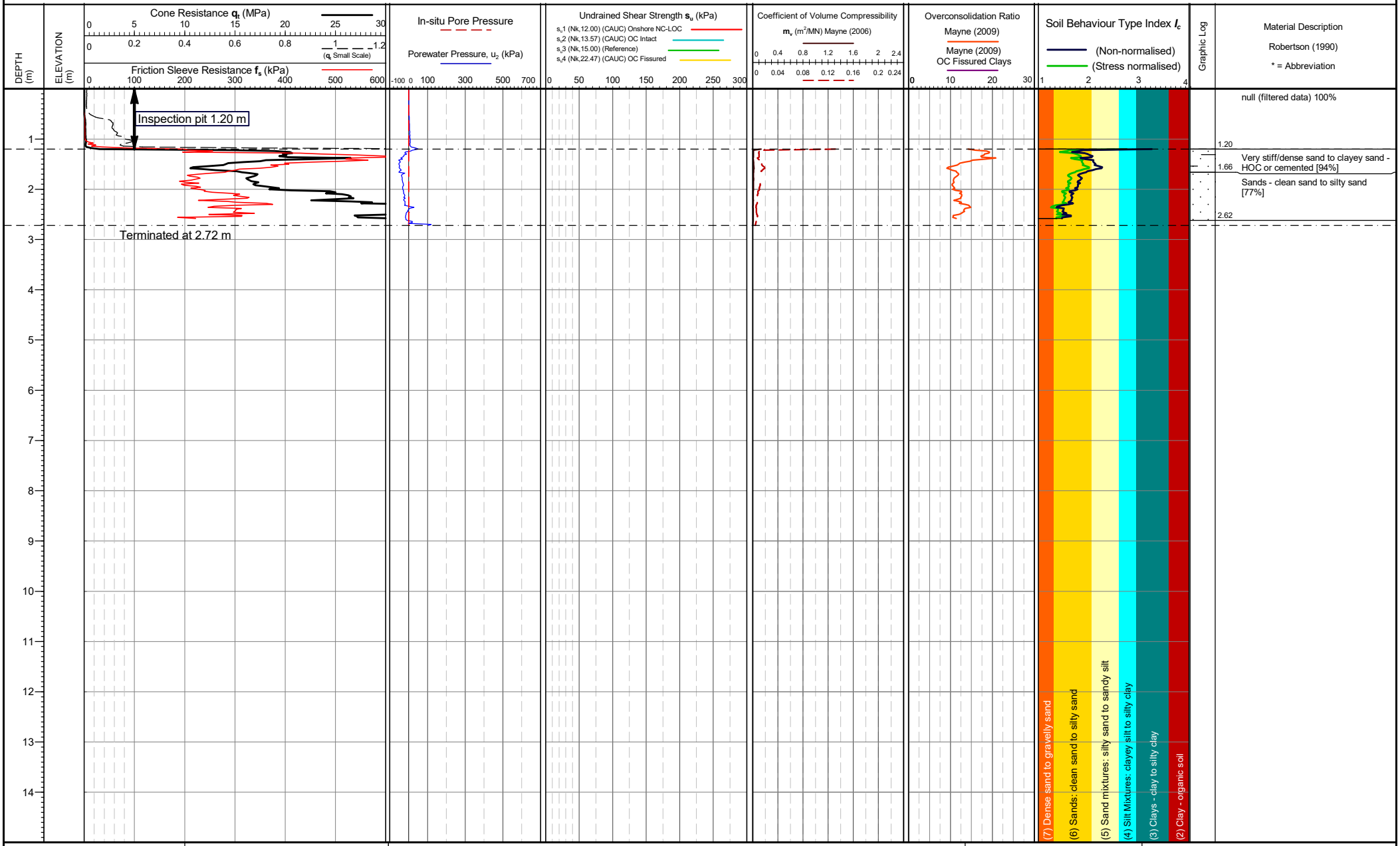
Overconsolidation ratio

Robertson 1990 SBT descriptions & SBT index I_c

LANKELMA

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
ConeID: S15-CFIPT.1766
Operator: Jamie Butterworth
Rig Used: UK20
Date of test: 17/11/2022 15:10:02

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Phreatic surface origin: Arbitrary value

Termination Remark:
Lateral support at surface

Internal QA Diss.
Dissipation Test
Penetration Pause (<1cm/s)

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

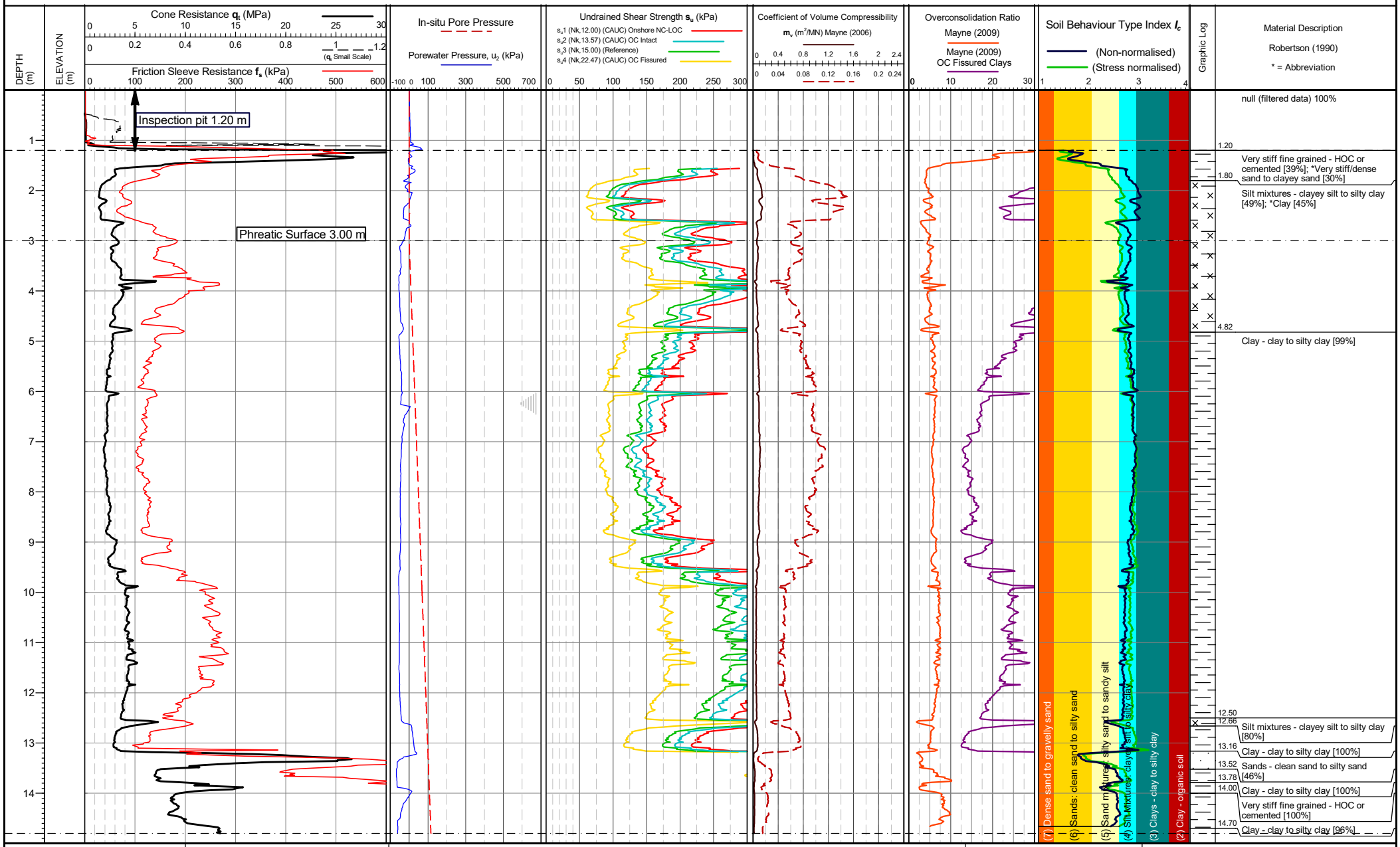
Date of plot: 18-11-22
Lankelma Project Ref: P-108203-1

Checked by:
Chris Player

TEST ID: CPT22/01

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
ConeID: S15-CFIPT.1766
Operator: Phillip Case
Rig Used: UK20
Date of test: 17/11/2022 11:09:44

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Phreatic surface origin: Arbitrary value

Termination Remark:
Lateral support at surface

Internal QA Diss.
Dissipation Test
Penetration Pause (<1cm/s)

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

Date of plot: 18-11-22
Lankelma Project Ref: P-108203-1

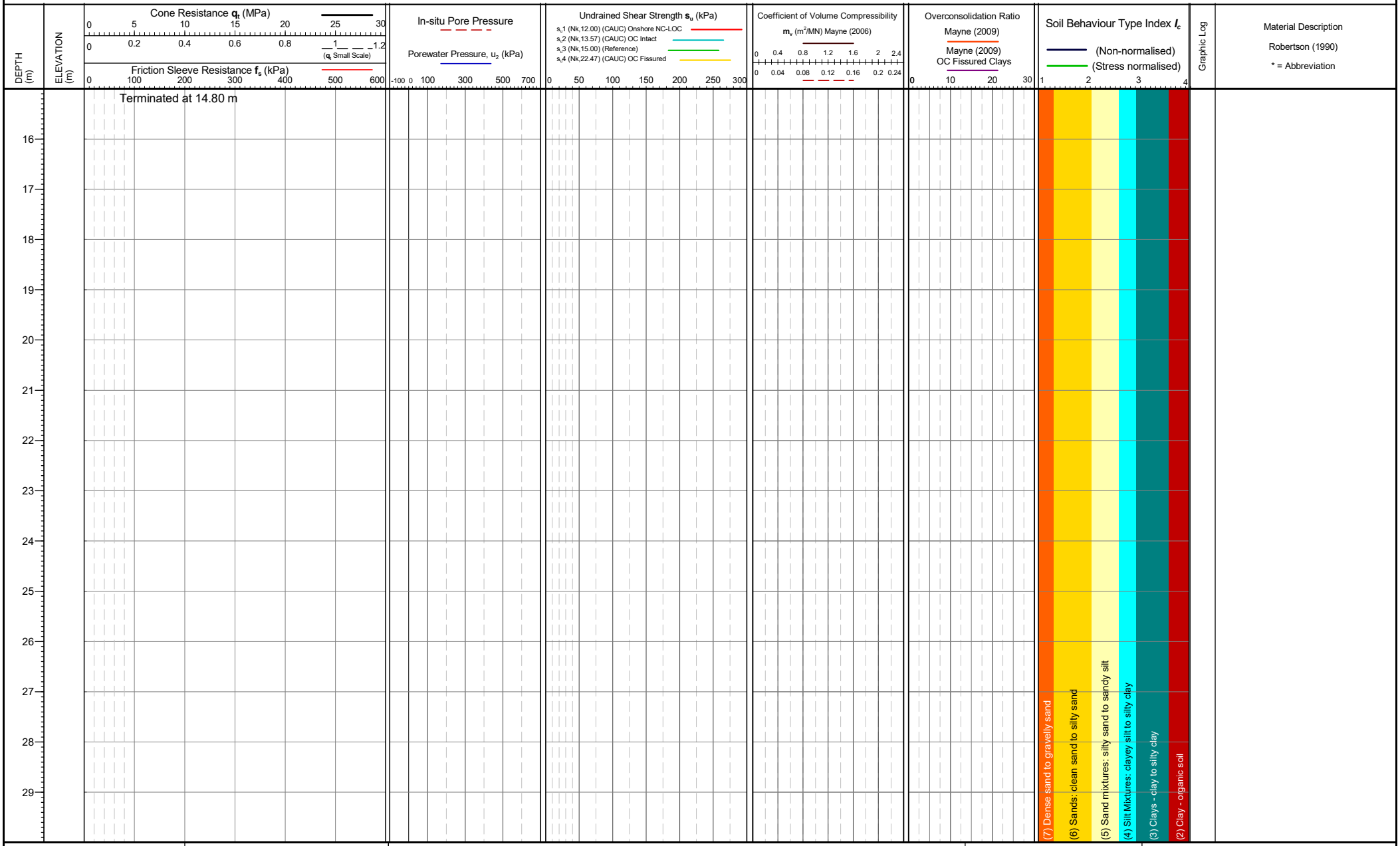
Checked by:
Chris Player

TEST ID: CPT22/02

LANKELMA

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
ConeID: S15-CFIPT.1766
Operator: Phillip Case
Rig Used: UK20
Date of test: 17/11/2022 11:09:44

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Phreatic surface origin: Arbitrary value

Termination Remark:
Lateral support at surface

Internal QA Diss.
Dissipation Test
Penetration Pause (<1cm/s)

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

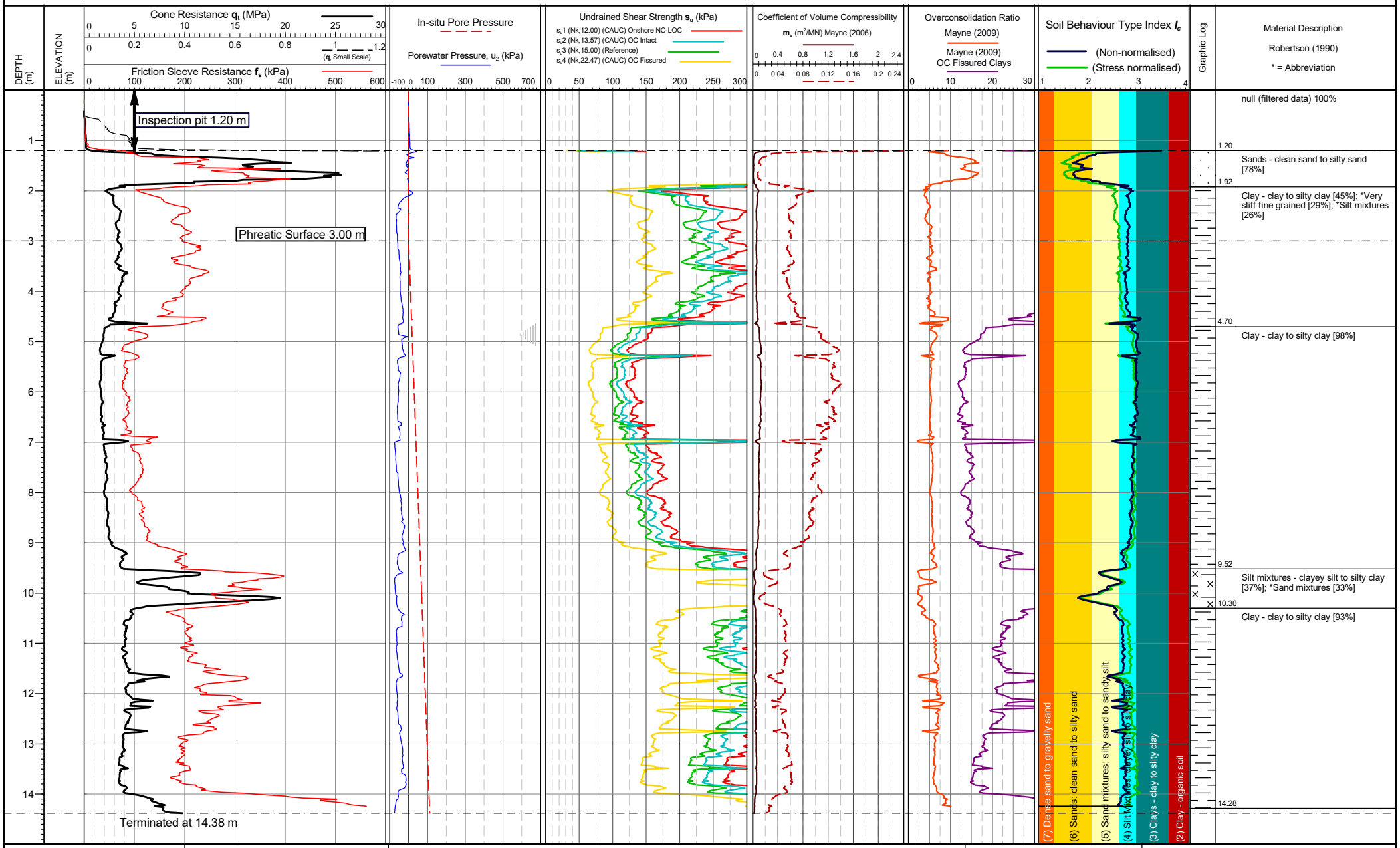
Date of plot: 18-11-22
Lankelma Project Ref: P-108203-1

Checked by:
Chris Player

TEST ID: CPT22/02

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
ConeID: S15-CFIPT.1766
Operator: Phillip Case
Rig Used: UK20
Date of test: 17/11/2022 13:28:31

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Phreatic surface origin: Arbitrary value

Termination Remark:
Lateral support at surface

Internal QA Diss.
Dissipation Test
Penetration Pause (<1cm/s)

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

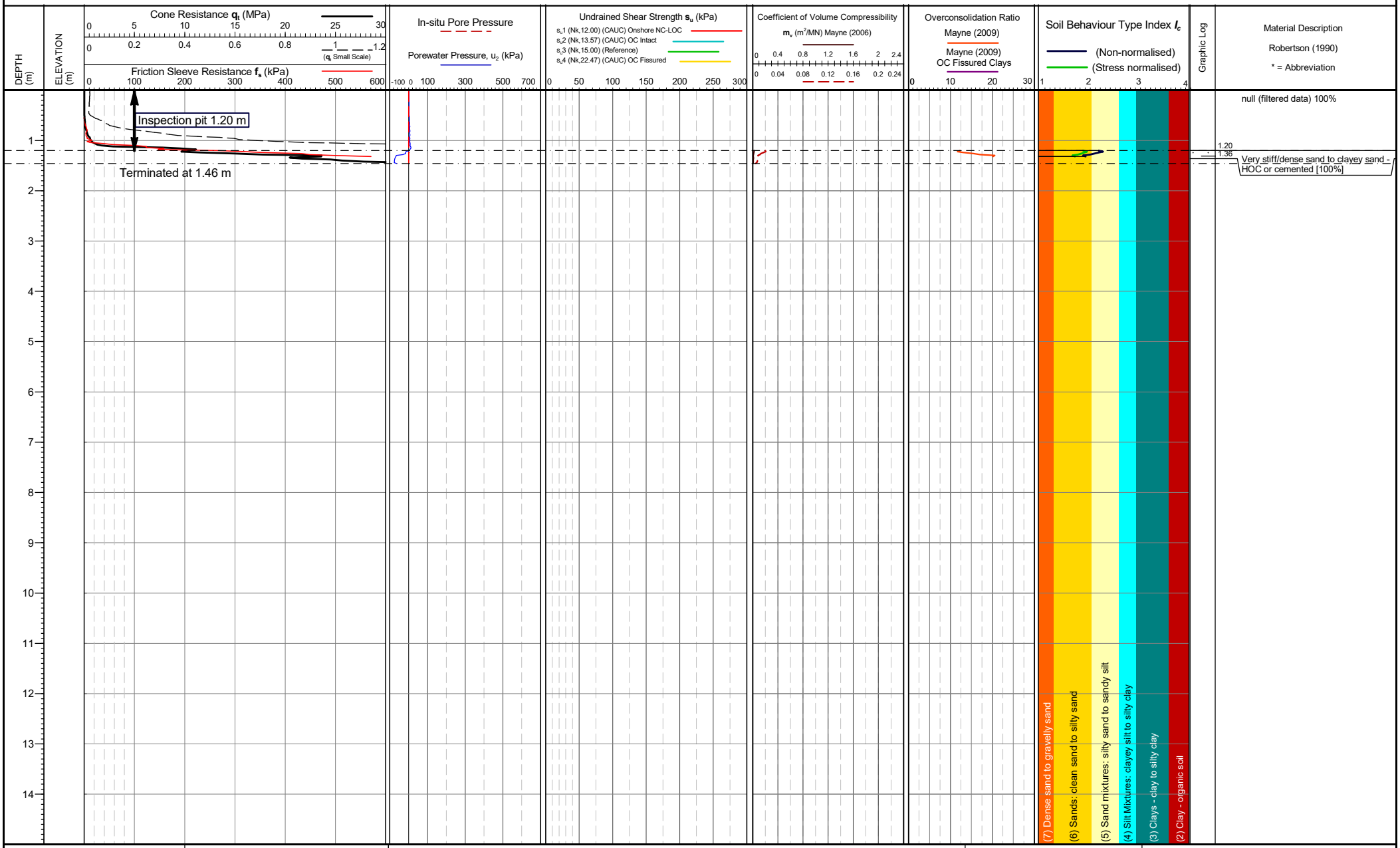
Date of plot: 18-11-22
Lankelma Project Ref: P-108203-1

Checked by:
Chris Player

TEST ID: CPT22/03

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
ConeID: S15-CFIPT.1766
Operator: Jamie Butterworth
Rig Used: UK20
Date of test: 17/11/2022 09:14:20

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Phreatic surface origin: Arbitrary value

Termination Remark:
Tip load

Internal QA Diss.
Dissipation Test
Penetration Pause (<1cm/s)

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

Date of plot: 18-11-22
Lankelma Project Ref: P-108203-1

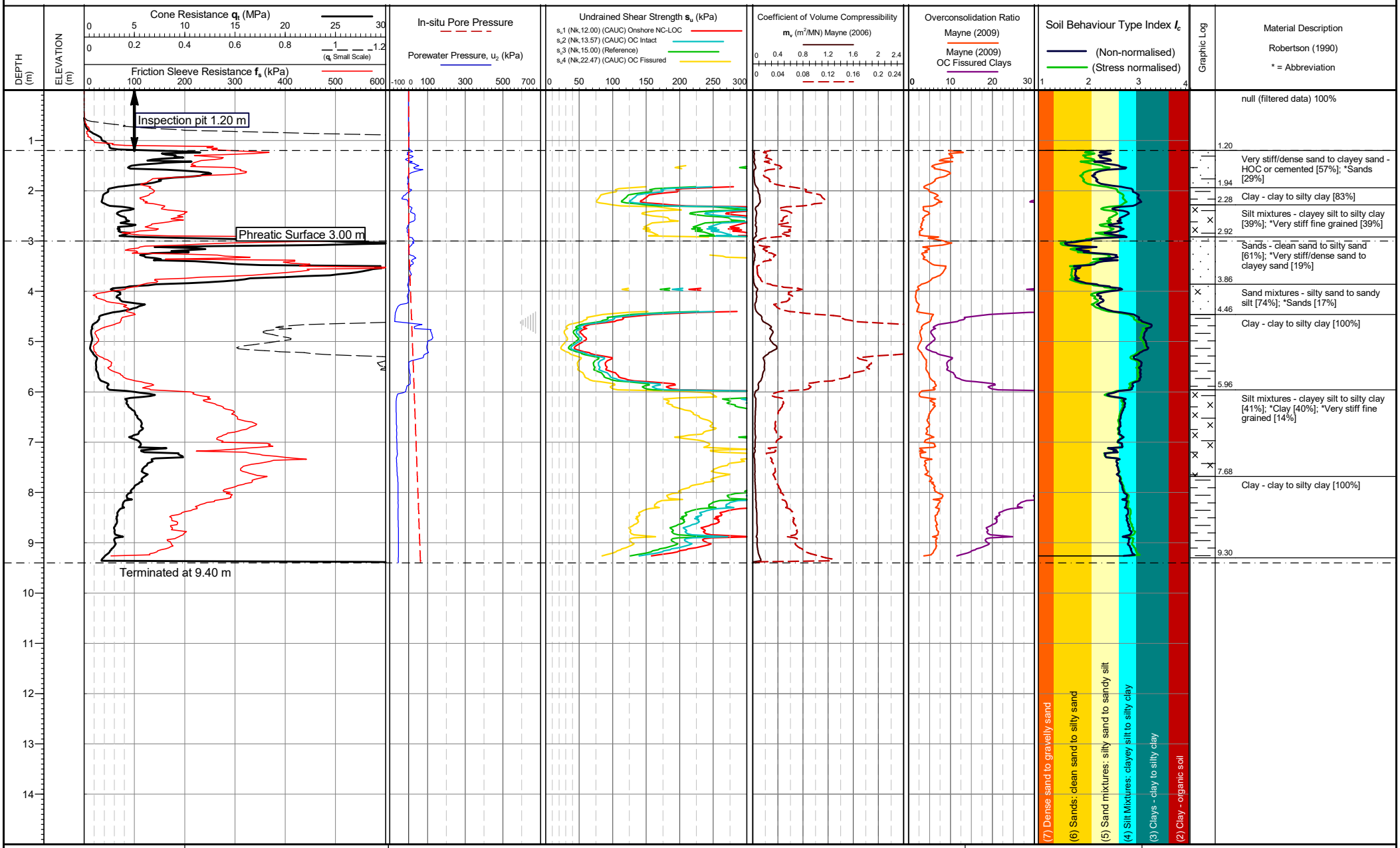
Checked by:
Chris Player

TEST ID: CPT22/04

LANKELMA

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
ConeID: S15-CFIPT.1766
Operator: Phillip Case
Rig Used: UK20
Date of test: 17/11/2022 10:26:18

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Phreatic surface origin: Arbitrary value

Termination Remark:
Lateral support at surface

Internal QA Diss.
Dissipation Test
Penetration Pause (<1cm/s)

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

Date of plot: 18-11-22

Checked by: Chris Player

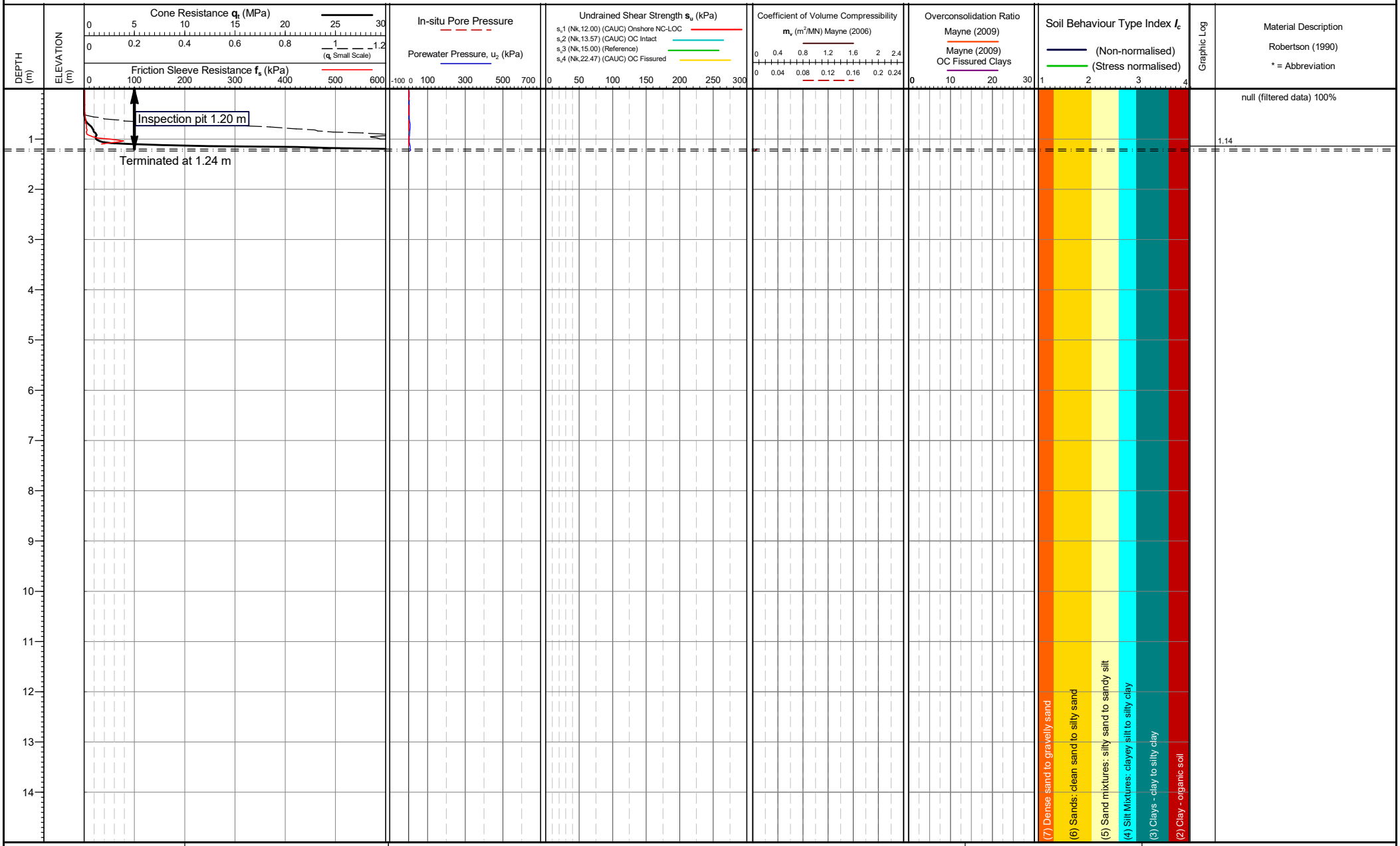
Lankelma Project Ref: P-108203-1

TEST ID: CPT22/05A

LANKELMA

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
ConeID: S15-CFIPT.1766
Operator: Jamie Butterworth
Rig Used: UK20
Date of test: 17/11/2022 12:05:23

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Phreatic surface origin: Arbitrary value

Termination Remark:
Tip load

Internal QA Diss.
Dissipation Test
Penetration Pause (<1cm/s)

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

Date of plot: 18-11-22
Checked by: Chris Player

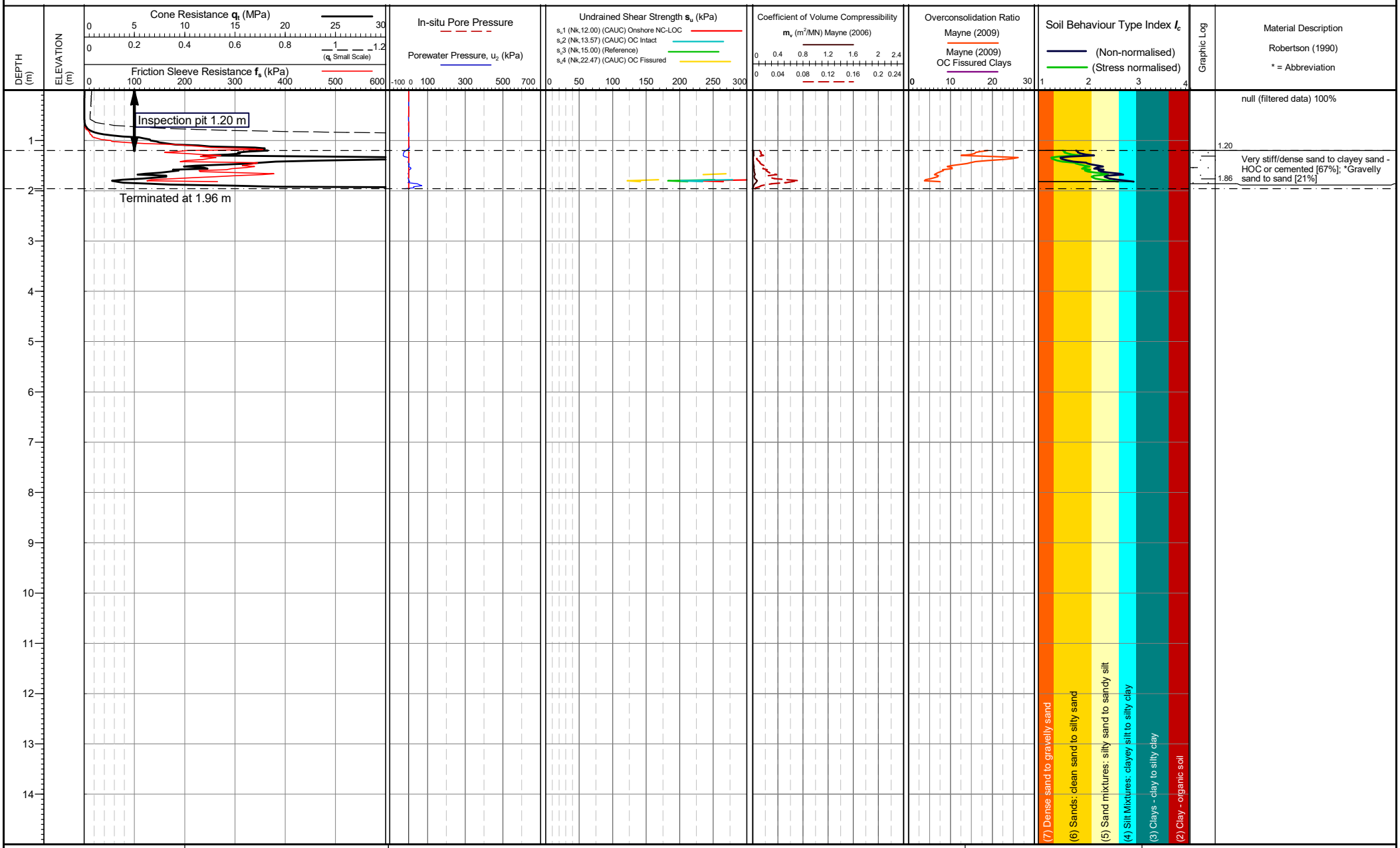
Lankelma Project Ref: P-108203-1

TEST ID: CPT22/06

LANKELMA

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
ConeID: S15-CFIPT.1766
Operator: Phillip Case
Rig Used: UK20
Date of test: 17/11/2022 12:35:54

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Phreatic surface origin: Arbitrary value

Termination Remark:
Tip load

Internal QA Diss.
Dissipation Test
Penetration Pause (<1cm/s)

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

Date of plot: 18-11-22
Lankelma Project Ref: P-108203-1

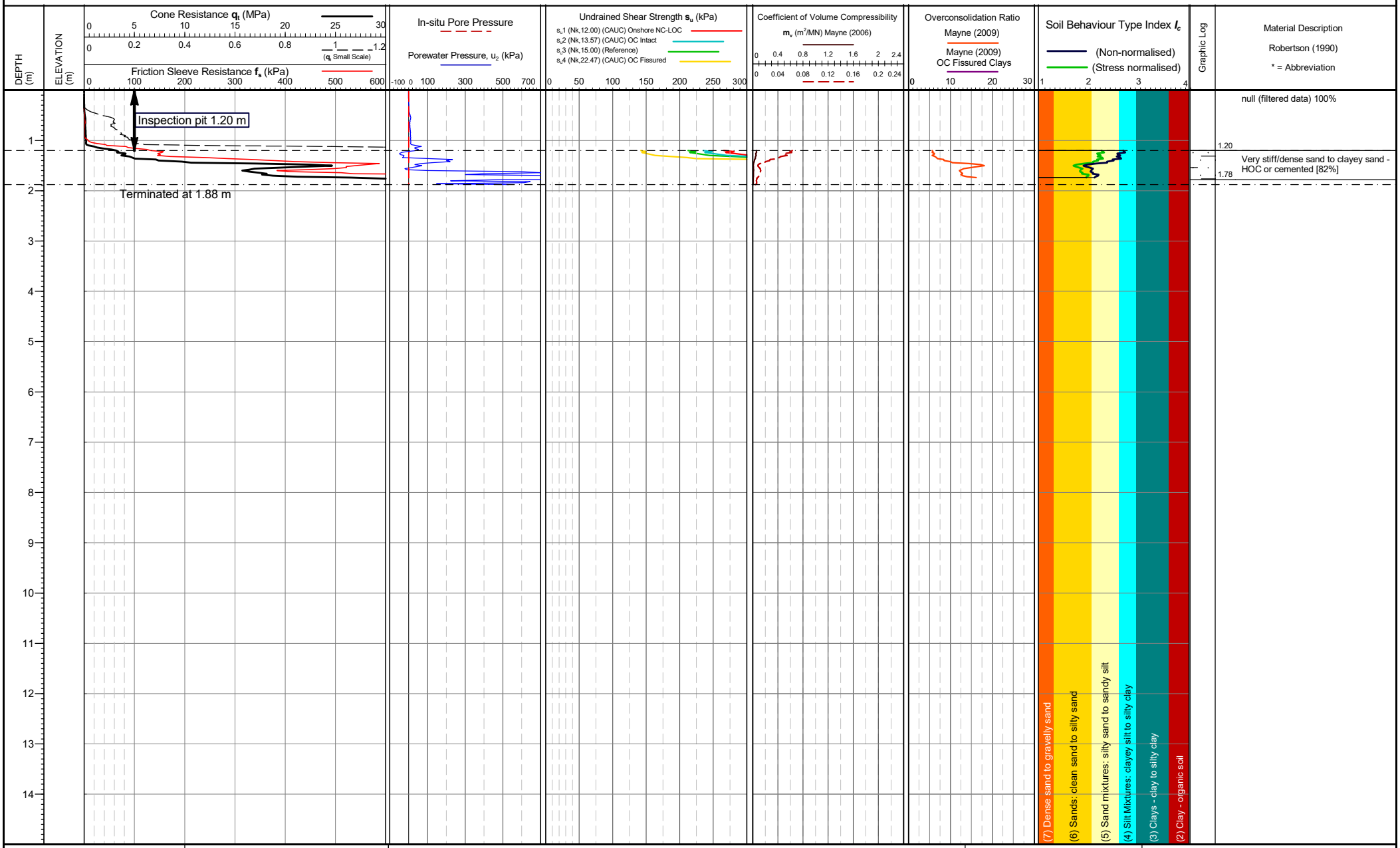
Checked by:
Chris Player

TEST ID: CPT22/07

LANKELMA

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
ConeID: S15-CFIPT.1766
Operator: Phillip Case
Rig Used: UK20
Date of test: 17/11/2022 08:41:03

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks: *Phreatic surface origin: Arbitrary value

Termination Remark:
Sleeve load

Internal QA Diss.
Dissipation Test
Penetration Pause (<1cm/s)

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

Date of plot: 18-11-22
Checked by: Chris Player

Lankelma Project Ref: P-108203-1

TEST ID: CPT22/08

APPENDIX F PARAMETER RESULTS 2 – SPT N60, PHI, D_R, E, I_C

Equivalent SPT N60

Peak friction angle

Relative density

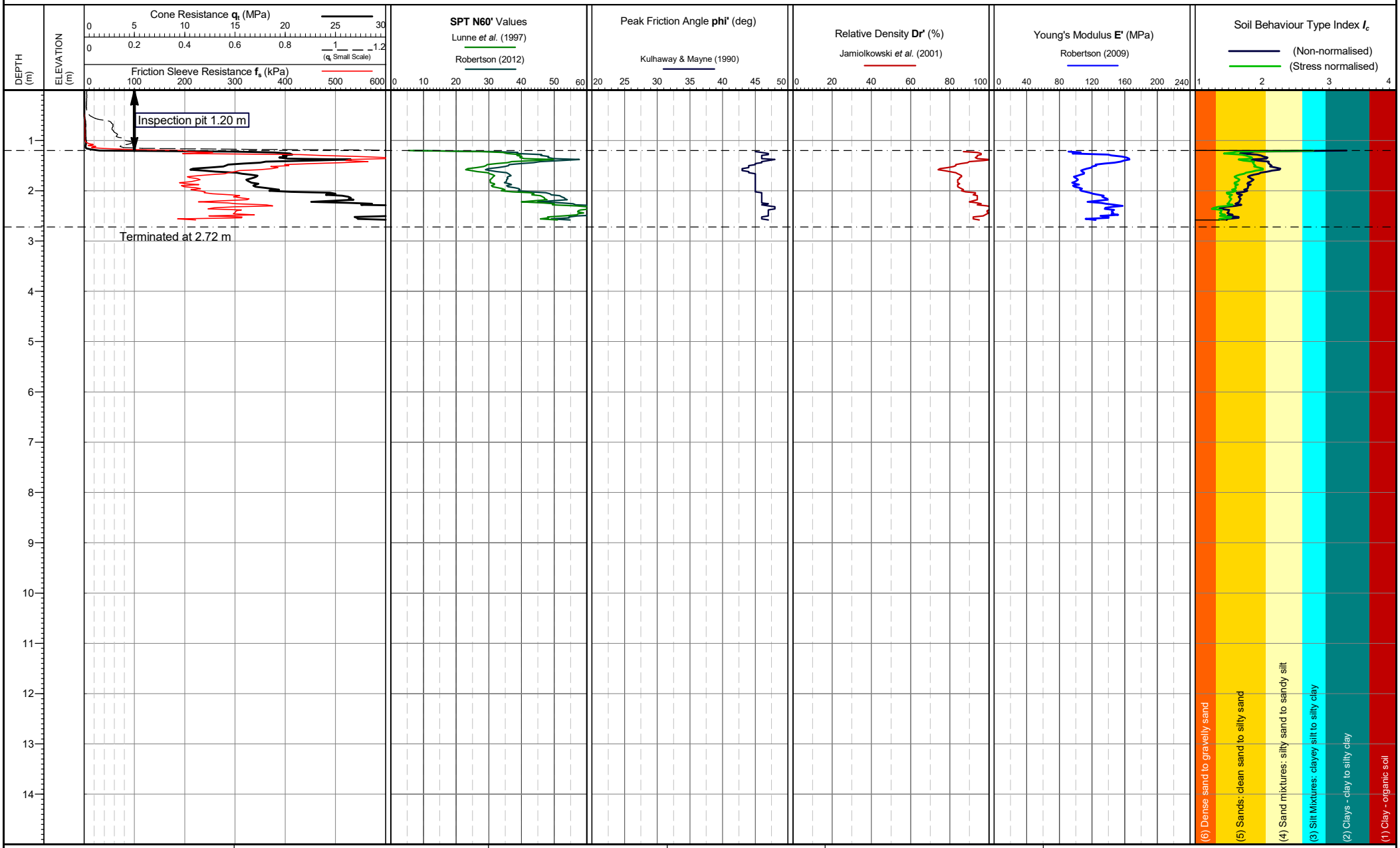
Young's modulus

SBT index I_c

LANKELMA

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
Cone ID: S15-CFIPT.1766
Operator: Jamie Butterworth
Date of test: 17/11/2022 15:10:02

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

Date of plot: 18-11-22
Checked by: Chris Player

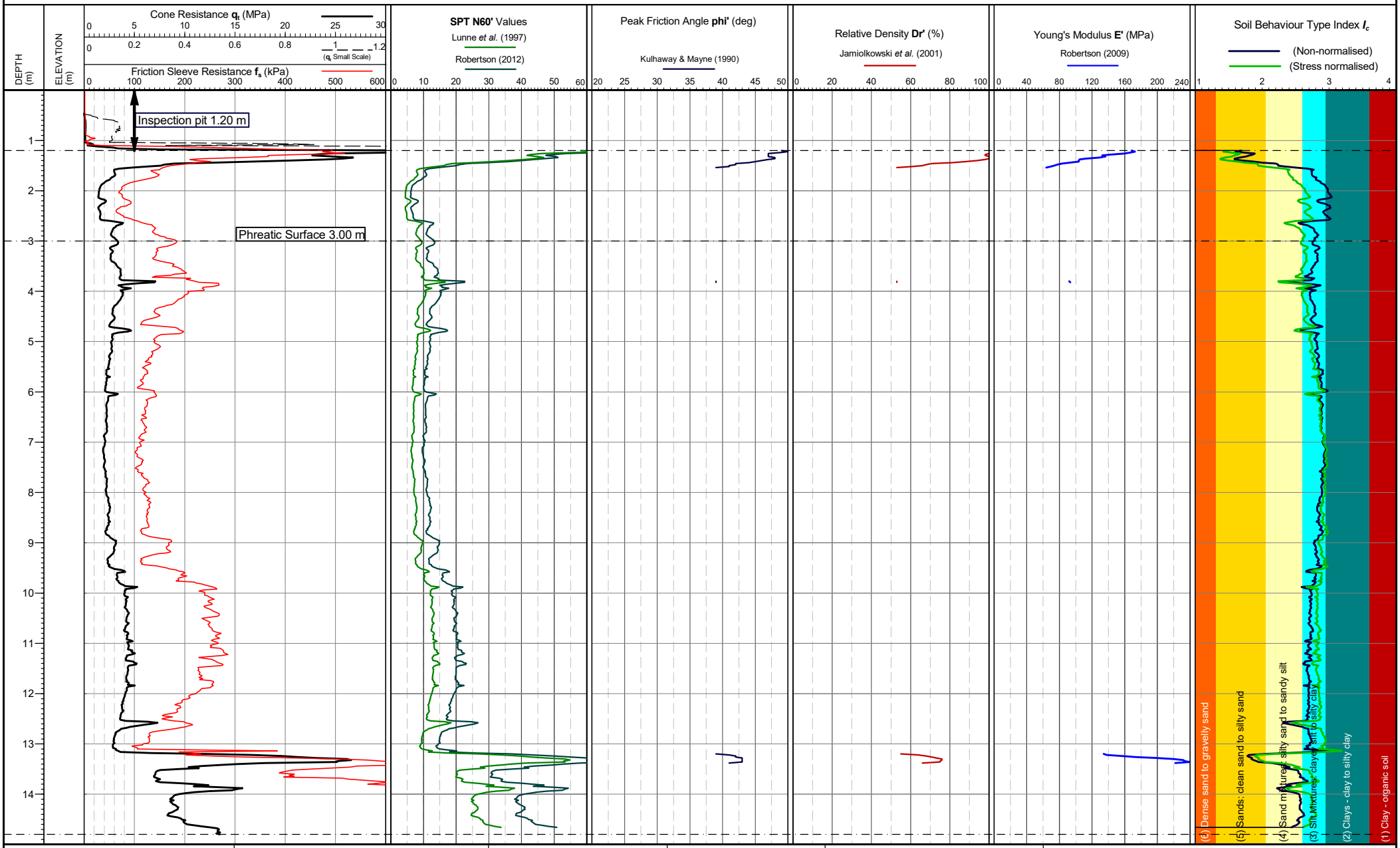
Lankelma Project Ref: P-108203-1

TEST ID: CPT22/01

LANKELMA

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
Cone ID: S15-CFIPT.1766
Operator: Phillip Case
Date of test: 17/11/2022 11:09:44

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

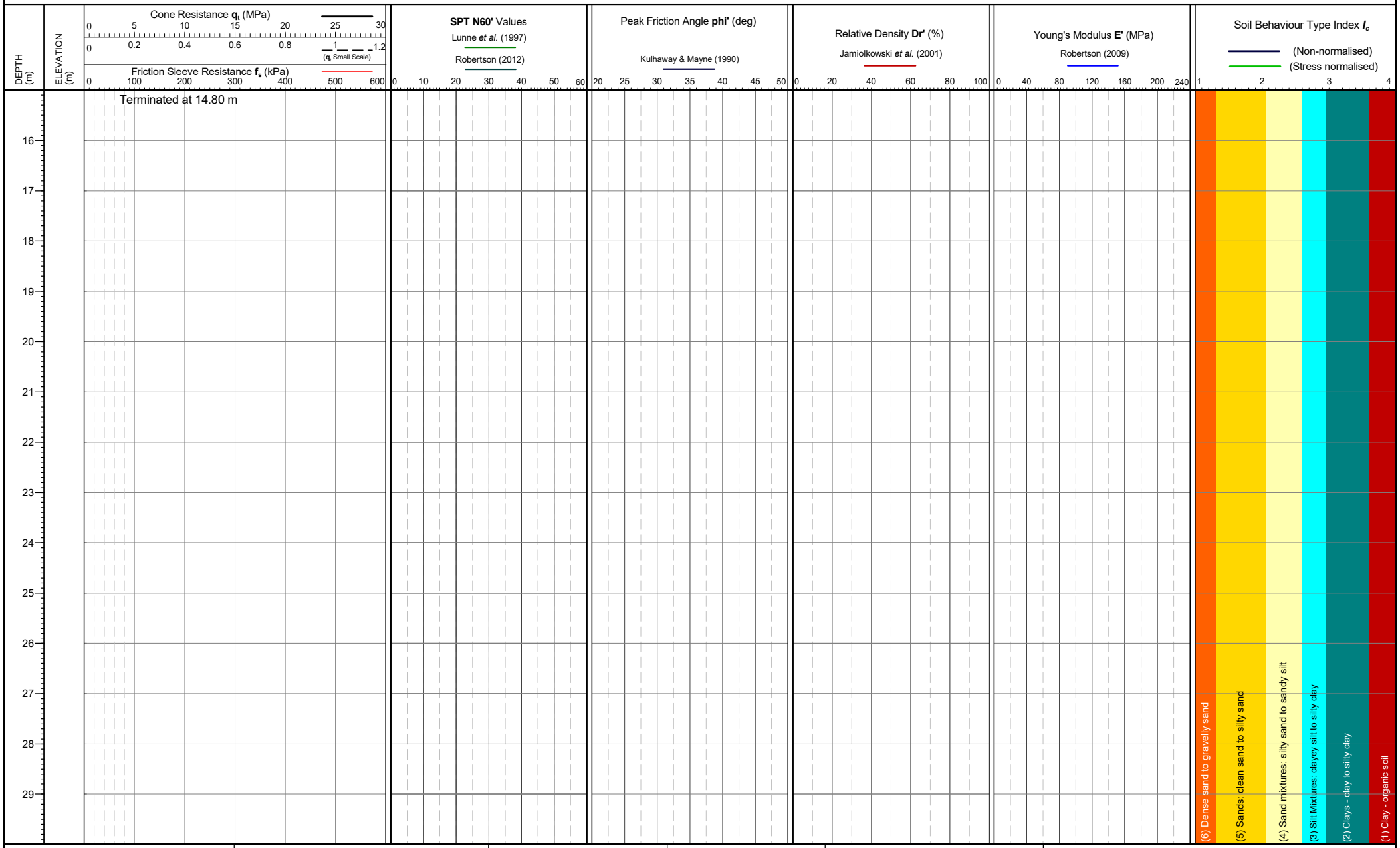
Date of plot: 18-11-22
Checked by: Chris Player

Lankelma Project Ref: P-108203-1

TEST ID: CPT22/02

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
Cone ID: S15-CFIPT.1766
Operator: Phillip Case
Date of test: 17/11/2022 11:09:44

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

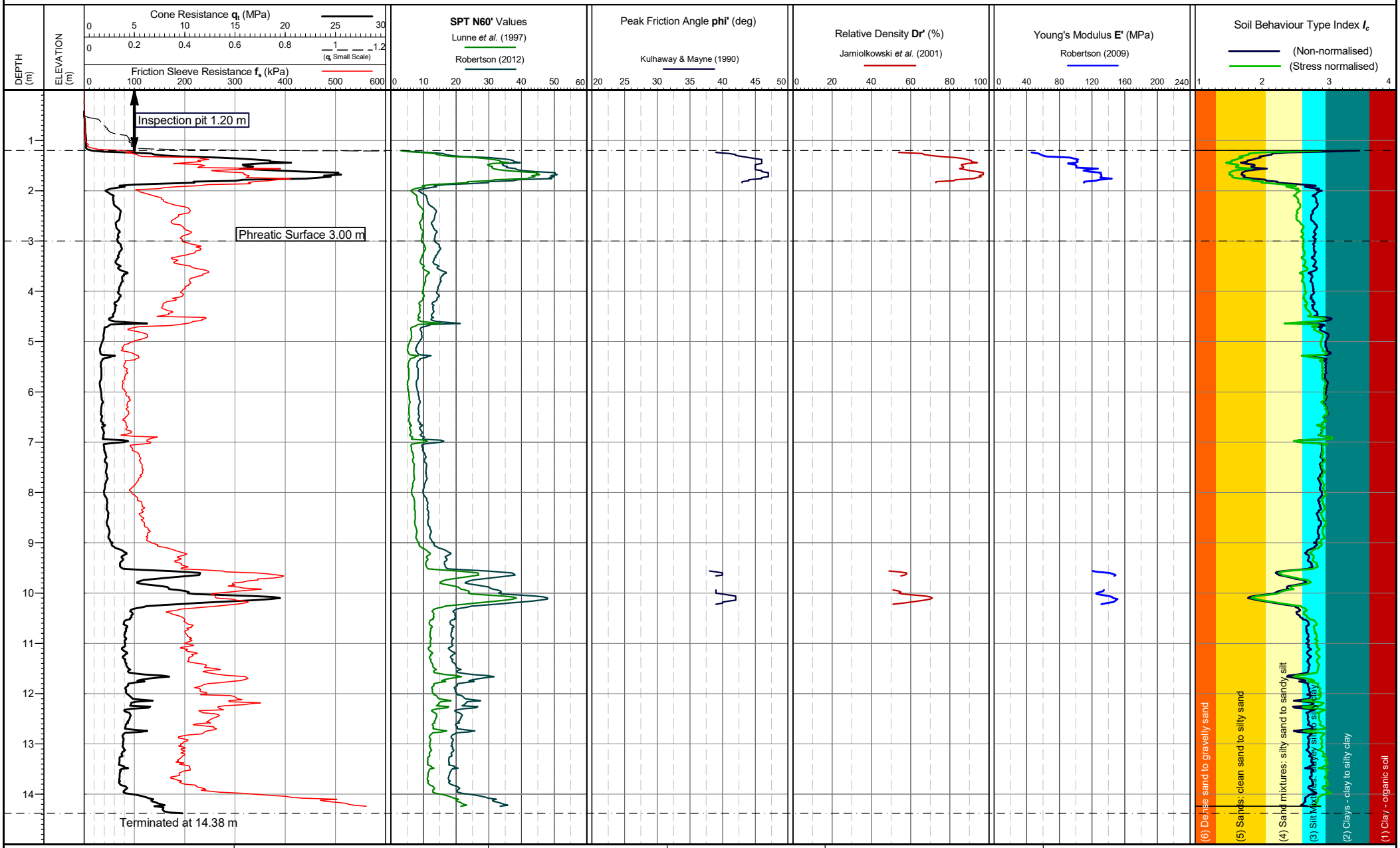
Date of plot: 18-11-22
Checked by: Chris Player

Lankelma Project Ref: P-108203-1

TEST ID: CPT22/02

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
Cone ID: S15-CFIPT.1766
Operator: Phillip Case
Date of test: 17/11/2022 13:28:31

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

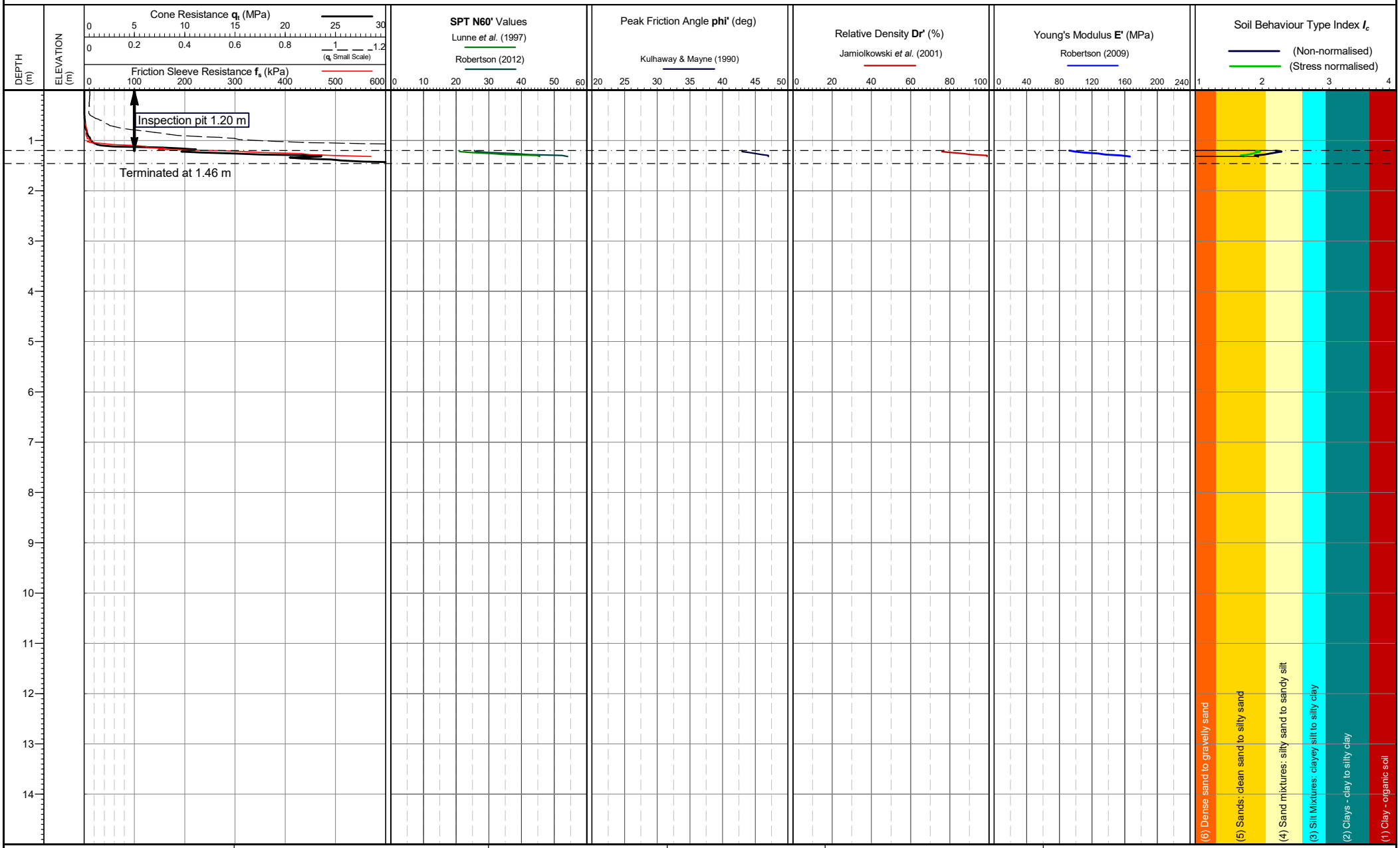
Date of plot: 18-11-22
Checked by: Chris Player

Lankelma Project Ref: P-108203-1

TEST ID: CPT22/03

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
Cone ID: S15-CFIPT.1766
Operator: Jamie Butterworth
Date of test: 17/11/2022 09:14:20

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

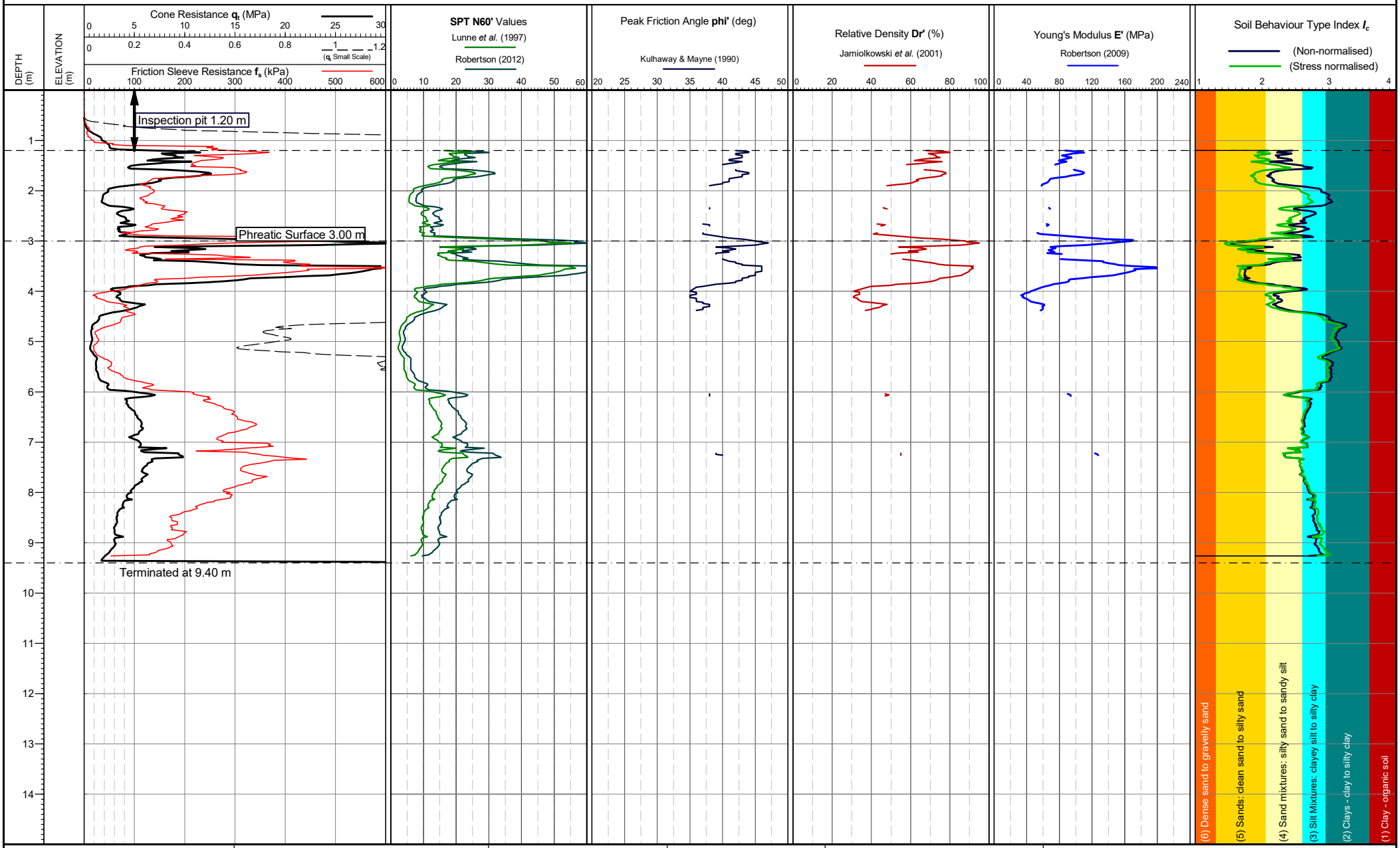
Date of plot: 18-11-22
Checked by: Chris Player

Lankelma Project Ref: P-108203-1

TEST ID: CPT22/04

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
Cone ID: S15-CFIPT.1766
Operator: Phillip Case
Date of test: 17/11/2022 10:26:18

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

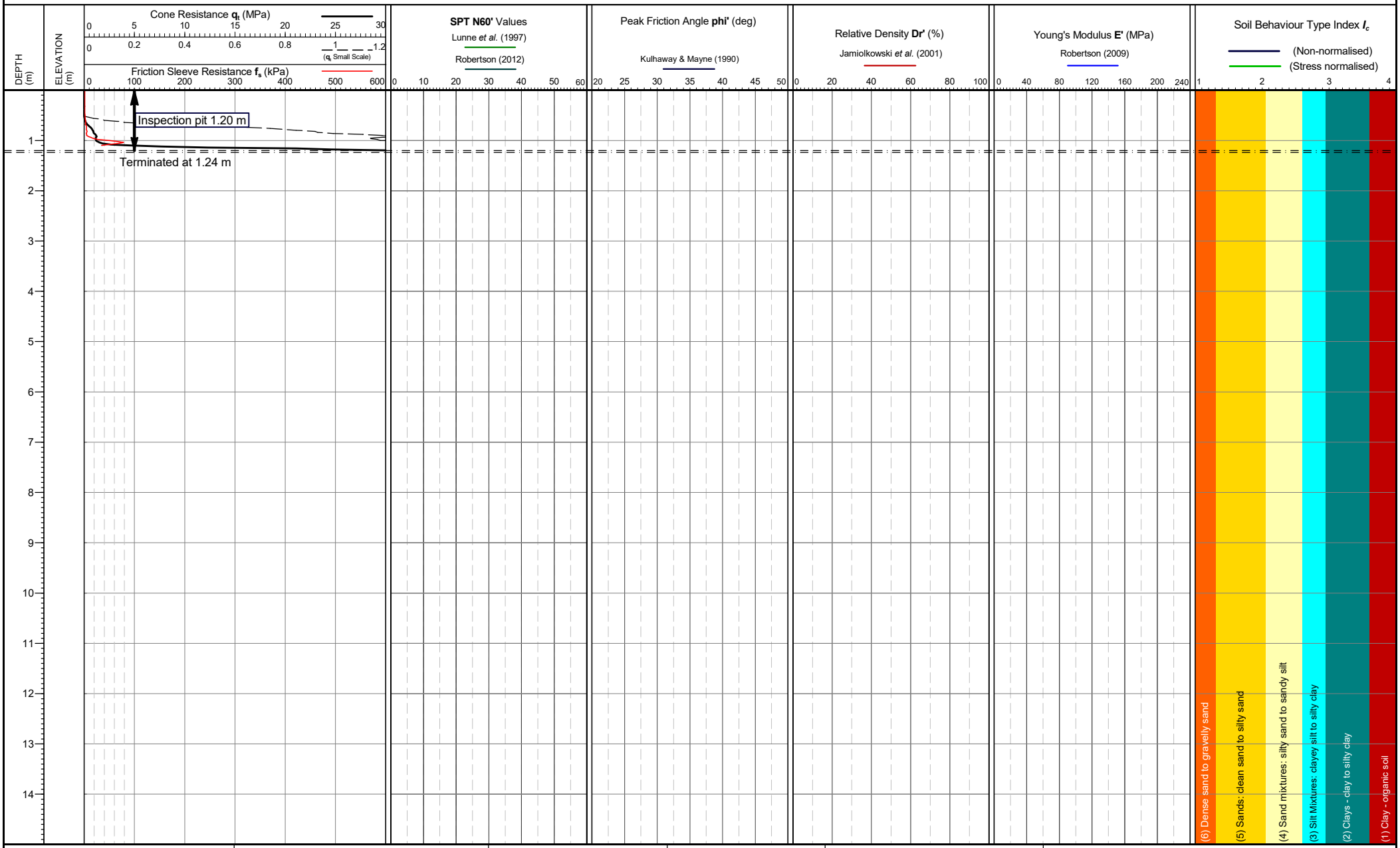
Date of plot: 18-11-22
Checked by: Chris Player

Lankelma Project Ref: P-108203-1

TEST ID: CPT22/05A

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
Cone ID: S15-CFIPT.1766
Operator: Jamie Butterworth
Date of test: 17/11/2022 12:05:23

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

Date of plot: 18-11-22
Checked by: Chris Player

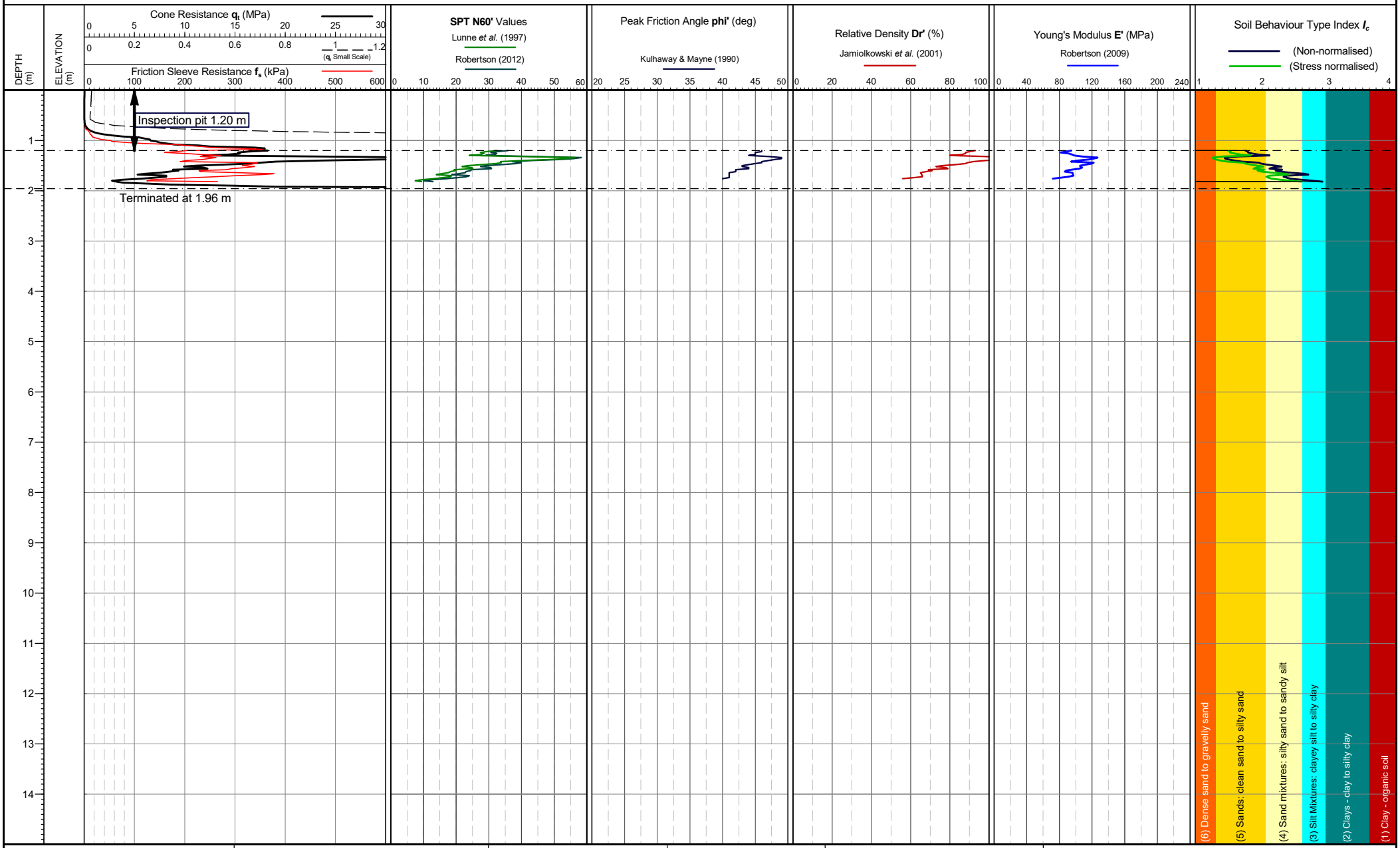
Lankelma Project Ref: P-108203-1

TEST ID: CPT22/06

LANKELMA

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
Cone ID: S15-CFIPT.1766
Operator: Phillip Case
Date of test: 17/11/2022 12:35:54

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

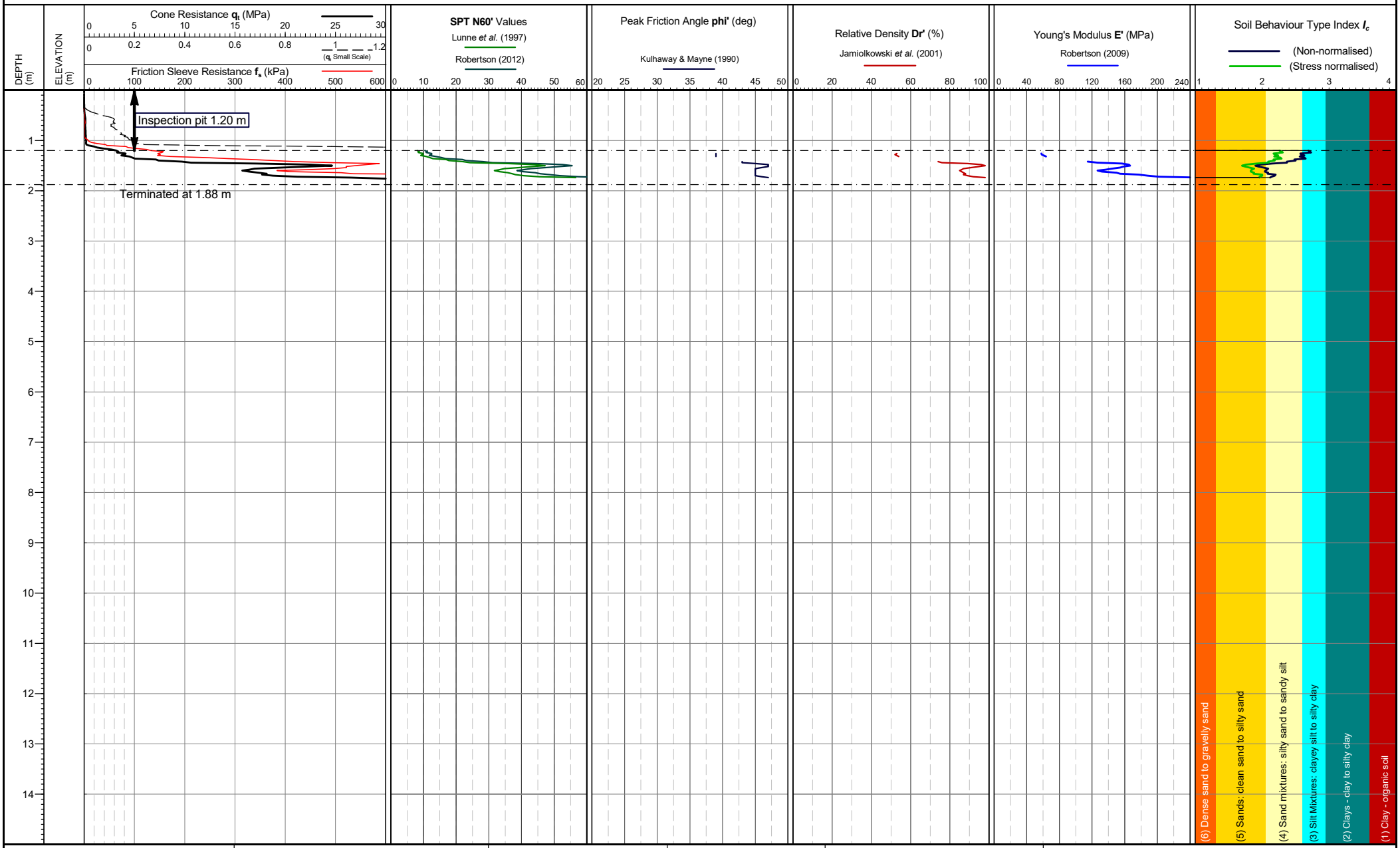
Date of plot: 18-11-22
Checked by: Chris Player

Lankelma Project Ref: P-108203-1

TEST ID: CPT22/07

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
Cone ID: S15-CFIPT.1766
Operator: Phillip Case
Date of test: 17/11/2022 08:41:03

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Both drained and undrained parameters are calculated for mixed SBTs = Ic 2.40-2.70. See report text for methods and discussion of parameter evaluation.

Date of plot: 18-11-22
Checked by: Chris Player

Lankelma Project Ref: P-108203-1

TEST ID: CPT22/08

APPENDIX G PENETROMETER TEMPERATURE RESULTS

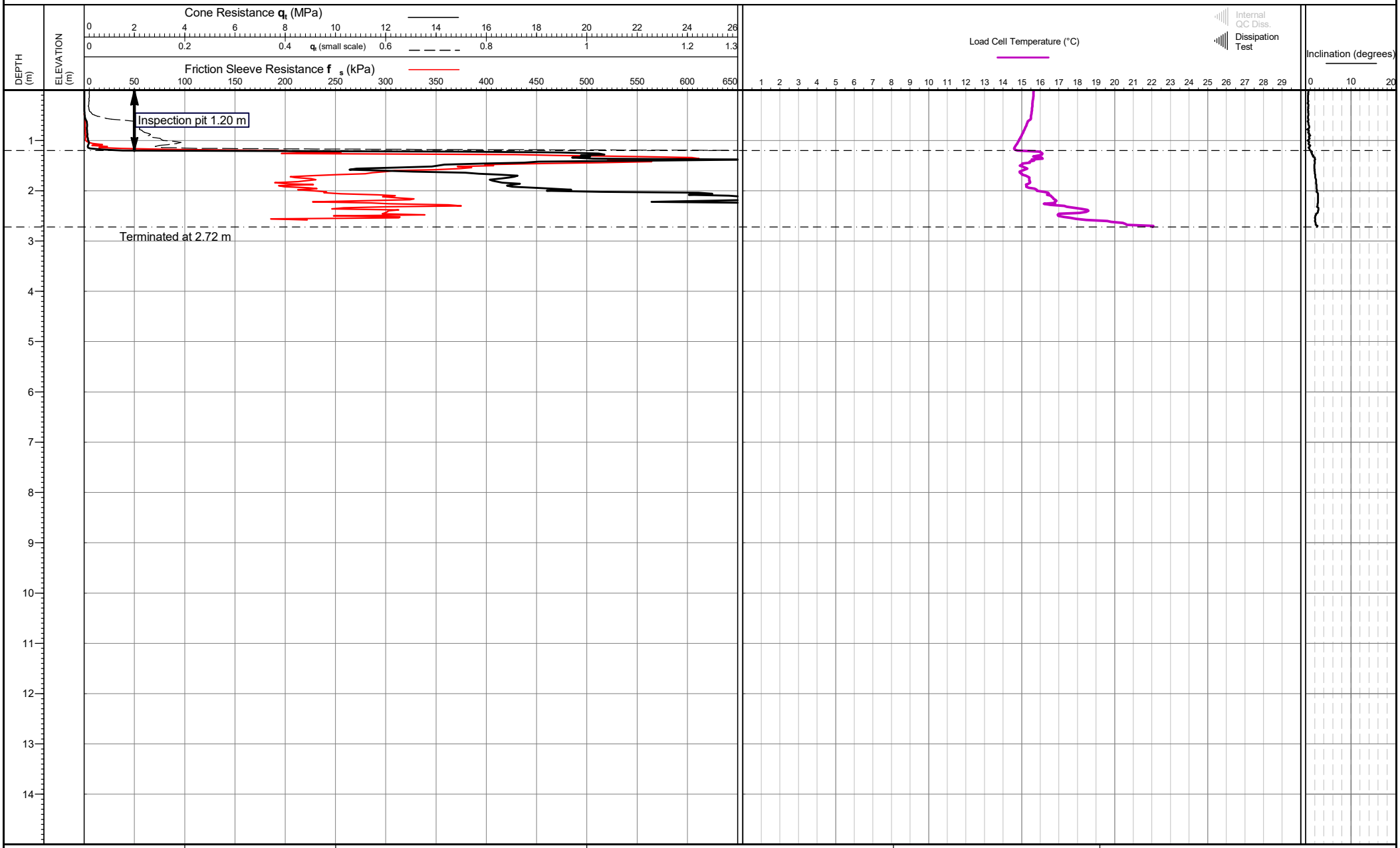
The temperature values in these logs represent the internal load cell temperature of the penetrometer and are used for QC purposes by comparison to the measured temperature response indicated on the calibration certificate. The CPT results have been corrected for transient and static temperature effects during post processing.

Ground temperature is only represented following a penetration pause of > 11 minutes.

Plots are provided for locations performed with a digital penetrometer measuring internal load cell temperature.

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING

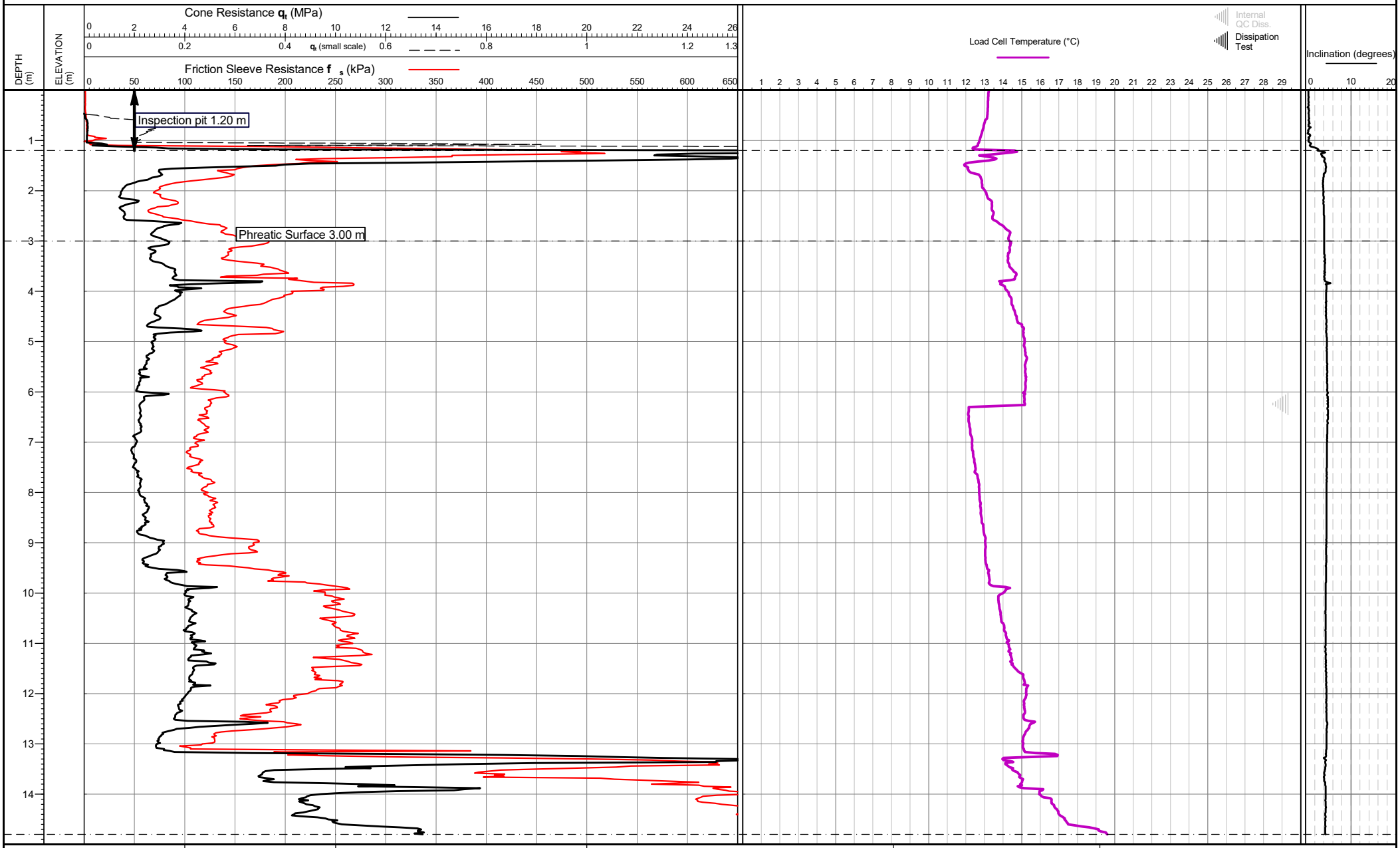


Cone area (mm2): Cone ID: S15-CFIPT.1766 Operator: Jamie Butterworth Rig Used: UK20 Date of test: 17/11/2022 15:10:02	Zero drift (Pre/post test) q_c (kPa): -44.2 f_s (kPa): 2.1 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): -1.8	Location: Greater Manchester, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Arbitrary value Termination Remark: Lateral support at surface	Date of plot: 18-11-22 Checked by: Chris Player	Lankelma Project Ref: P-108203-1

TEST ID: CPT22/01

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING

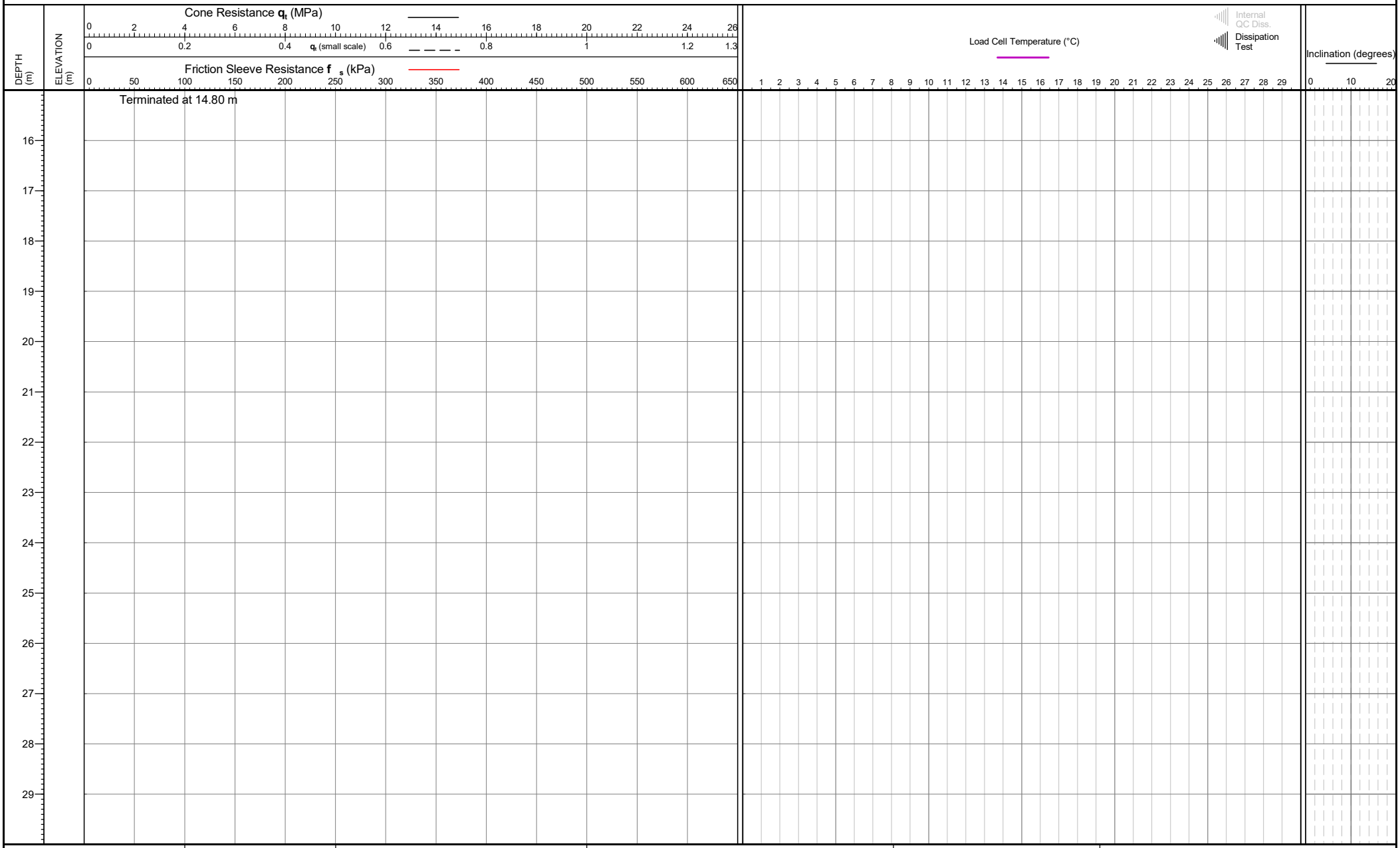


Cone area (mm2): Cone ID: S15-CFIPT.1766 Operator: Phillip Case Rig Used: UK20 Date of test: 17/11/2022 11:09:44	Zero drift (Pre/post test) q_c (kPa): -12.2 f_s (kPa): 0.0 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): 0.5	Location: Greater Manchester, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Arbitrary value Termination Remark: Lateral support at surface	Date of plot: 18-11-22 Checked by: Chris Player	Lankelma Project Ref: P-108203-1

TEST ID: CPT22/02

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
Cone ID: S15-CFIPT.1766
Operator: Phillip Case
Rig Used: UK20
Date of test: 17/11/2022 11:09:44

Zero drift (Pre/post test)
q_c (kPa): -12.2
f_s (kPa): 0.0 ($f_{s\,drift}$ - $q_{c\,drift}$)
u_2 (kPa): 0.5

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks:
*Phreatic surface origin: Arbitrary value

Termination Remark: Lateral support at surface

Date of plot: 18-11-22

Lankelma Project Ref: P-108203-1

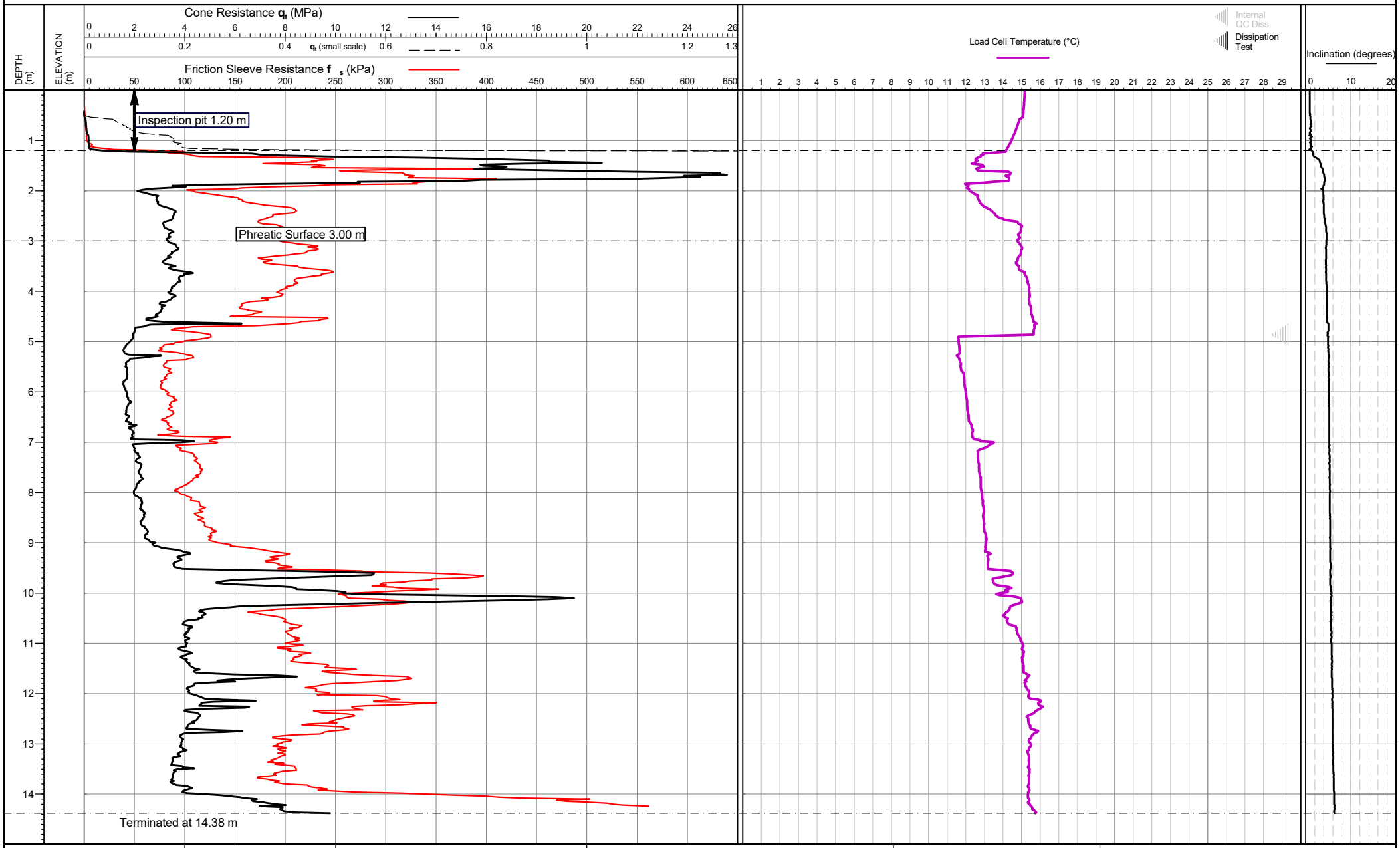
Checked by: Chris Player

TEST ID: CPT22/02

LANKELMA

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING

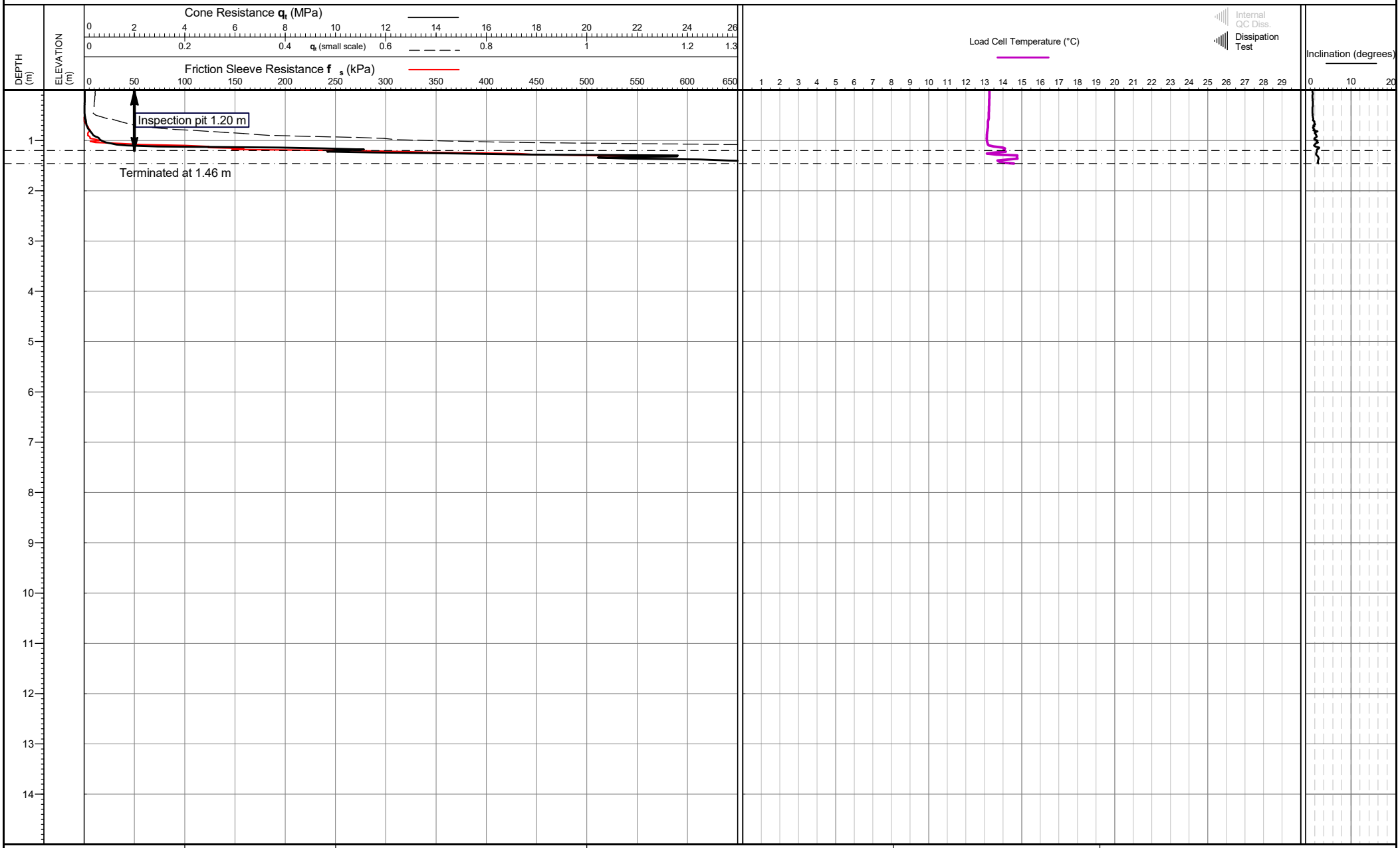


Cone area (mm2): Cone ID: S15-CFIPT.1766 Operator: Phillip Case Rig Used: UK20 Date of test: 17/11/2022 13:28:31	Zero drift (Pre/post test) q_c (kPa): -13.0 f_s (kPa): -0.5 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): -0.5	Location: Greater Manchester, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Arbitrary value Termination Remark: Lateral support at surface	Date of plot: 18-11-22 Checked by: Chris Player	Lankelma Project Ref: P-108203-1

TEST ID: CPT22/03

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



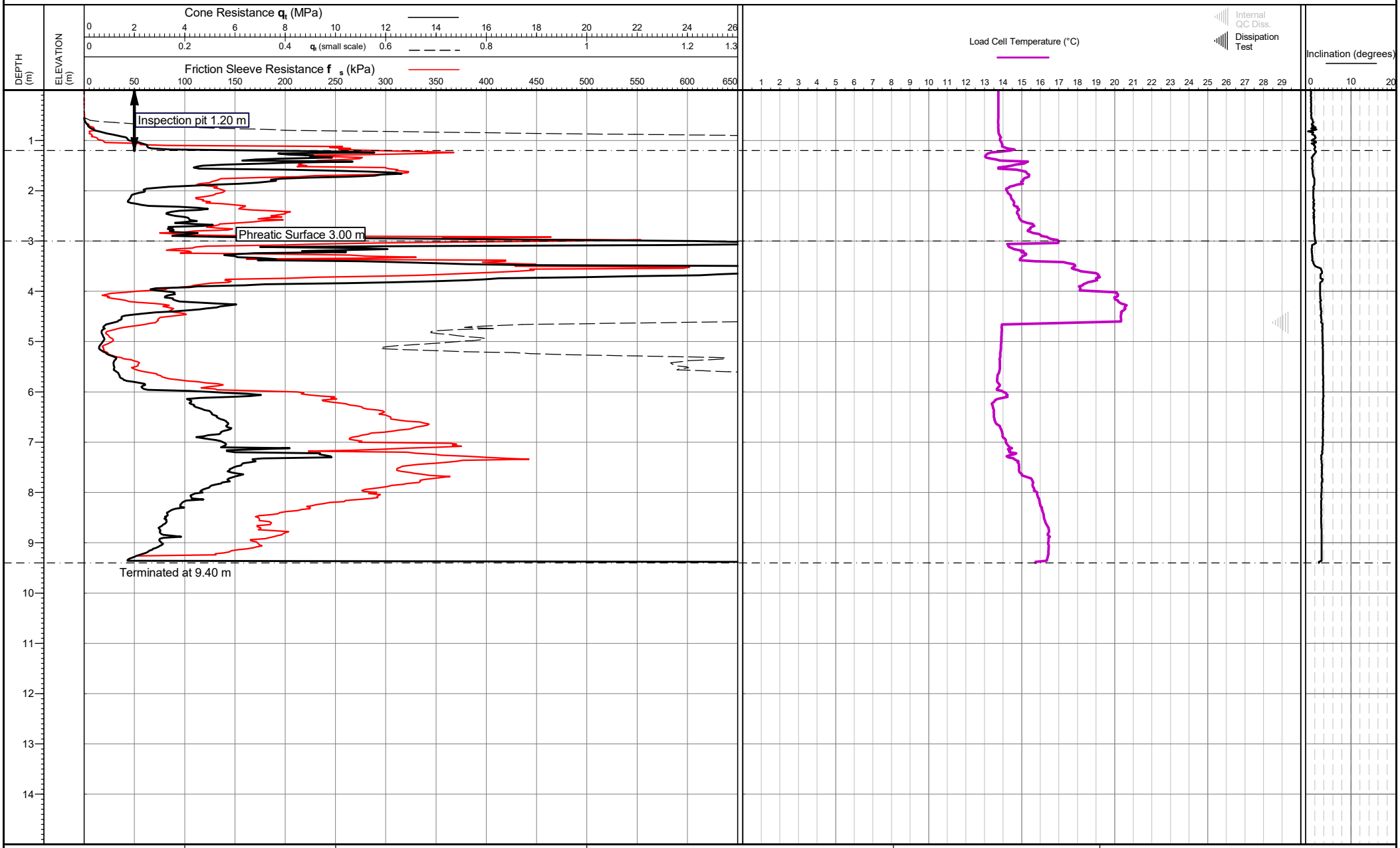
Cone area (mm2): Cone ID: S15-CFIPT.1766 Operator: Jamie Butterworth Rig Used: UK20 Date of test: 17/11/2022 09:14:20	Zero drift (Pre/post test) q_c (kPa): 17.4 f_s (kPa): 0.3 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): 0.6	Location: Greater Manchester, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Arbitrary value Termination Remark: Tip load	Date of plot: 18-11-22 Checked by: Chris Player	Lankelma Project Ref: P-108203-1

TEST ID: CPT22/04

LANKELMA

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING

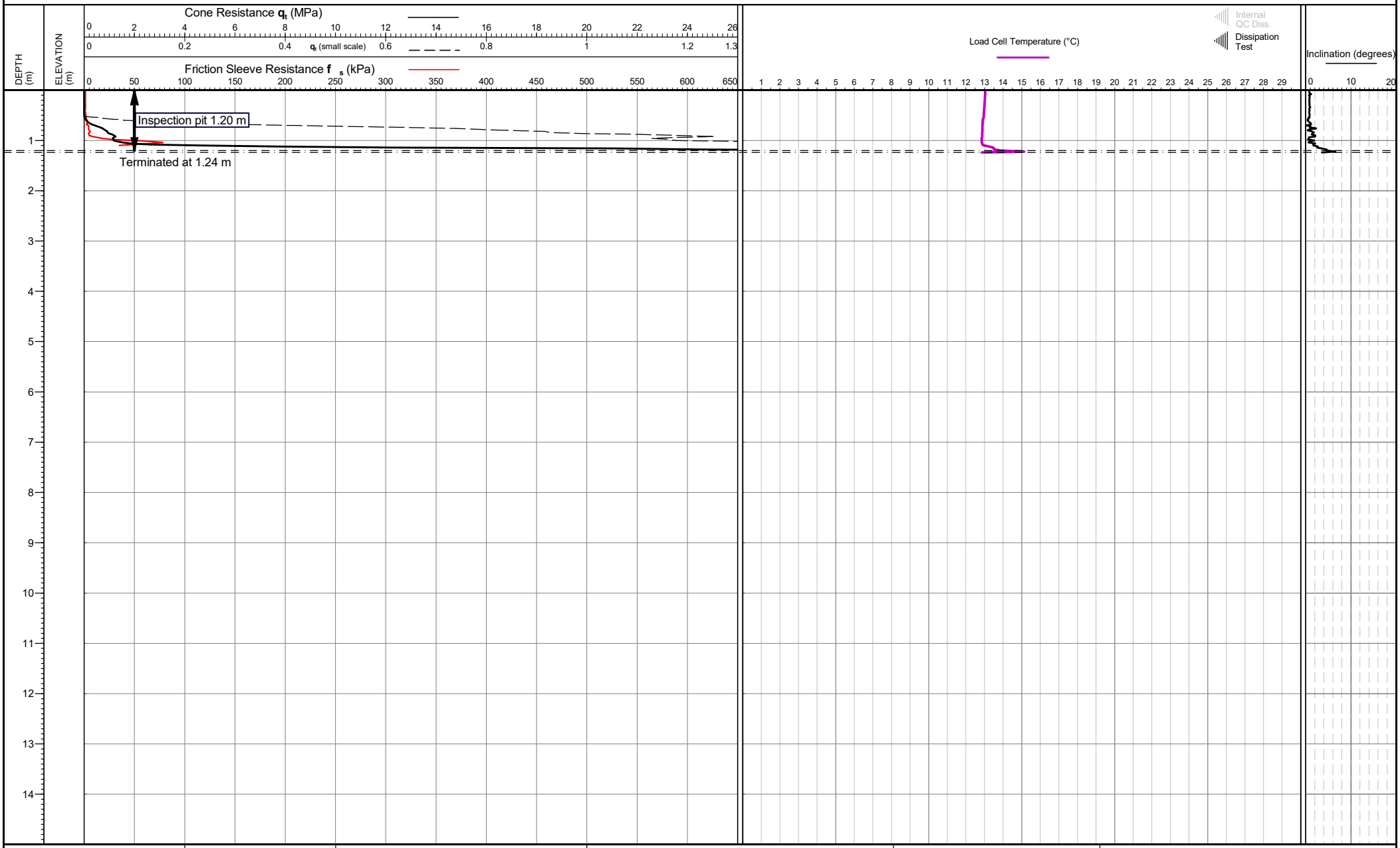


Cone area (mm2): Cone ID: S15-CFIPT.1766 Operator: Phillip Case Rig Used: UK20 Date of test: 17/11/2022 10:26:18	Zero drift (Pre/post test) q_c (kPa): -50.0 f_s (kPa): -2.4 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): -9.0	Location: Greater Manchester, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Arbitrary value Termination Remark: Lateral support at surface	Date of plot: 18-11-22 Checked by: Chris Player	Lankelma Project Ref: P-108203-1

TEST ID: CPT22/05A

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING

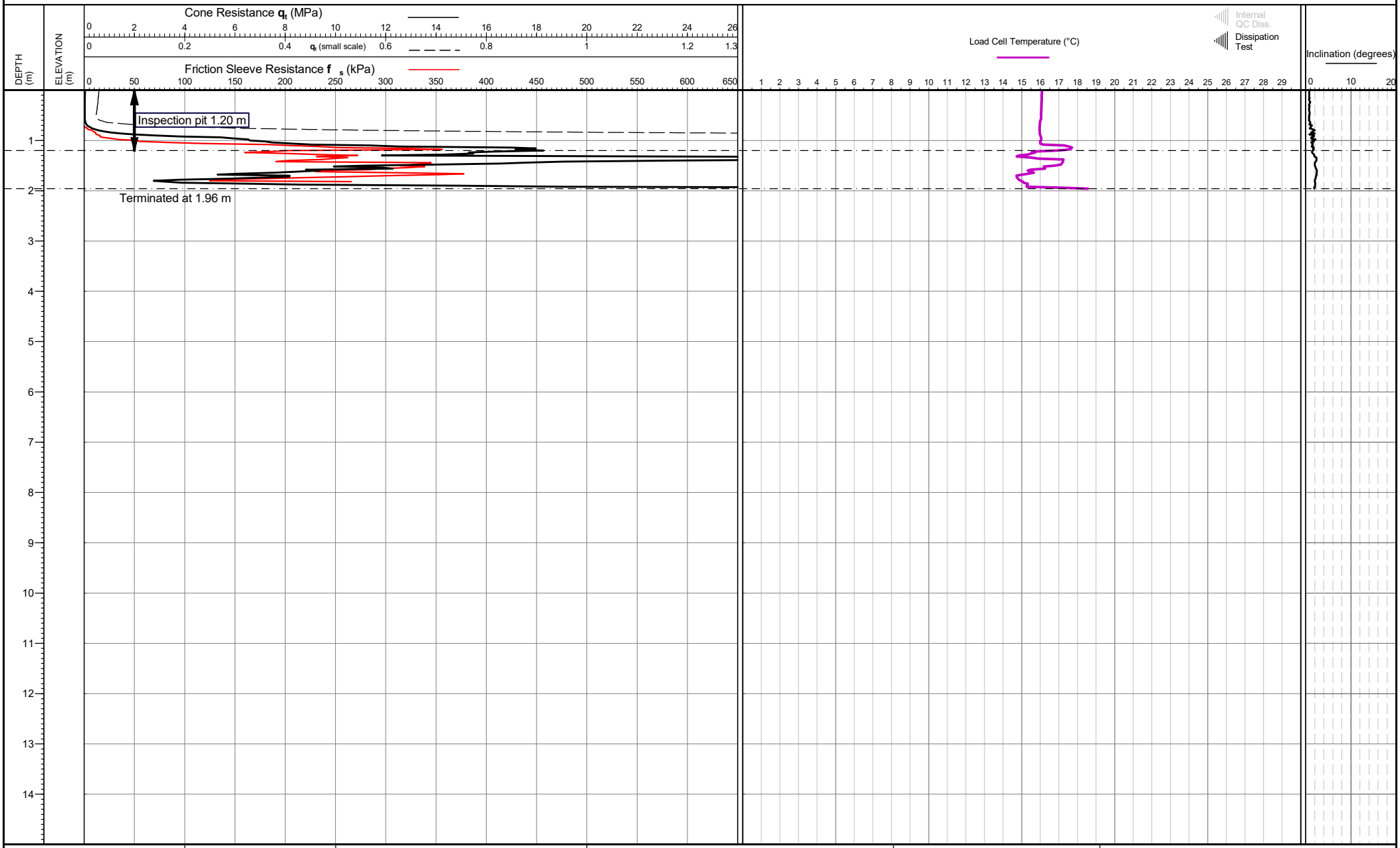


Cone area (mm2): Cone ID: S15-CFIPT.1766 Operator: Jamie Butterworth Rig Used: UK20 Date of test: 17/11/2022 12:05:23	Zero drift (Pre/post test) q_c (kPa): 22.2 f_s (kPa): 3.6 ($f_{s\,drift}$ - $q_{c\,drift}$) u_2 (kPa): 3.3	Location: Greater Manchester, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Arbitrary value Termination Remark: Tip load	Date of plot: 18-11-22 Checked by: Chris Player	Lankelma Project Ref: P-108203-1

TEST ID: CPT22/06

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2):
Cone ID: S15-CFIPT.1766
Operator: Phillip Case
Rig Used: UK20
Date of test: 17/11/2022 12:35:54

Zero drift (Pre/post test)
q_c (kPa): 19.0
f_s (kPa): -3.8 ($f_{s\ drift}$ - $q_{c\ drift}$)
u_2 (kPa): -2.9

Location: Greater Manchester, UK
Coordinates: ,
Elevation:
Coordinate system:

Remarks:
*Phreatic surface origin: Arbitrary value

Termination Remark: Tip load

Date of plot: 18-11-22

Lankelma Project Ref: P-108203-1

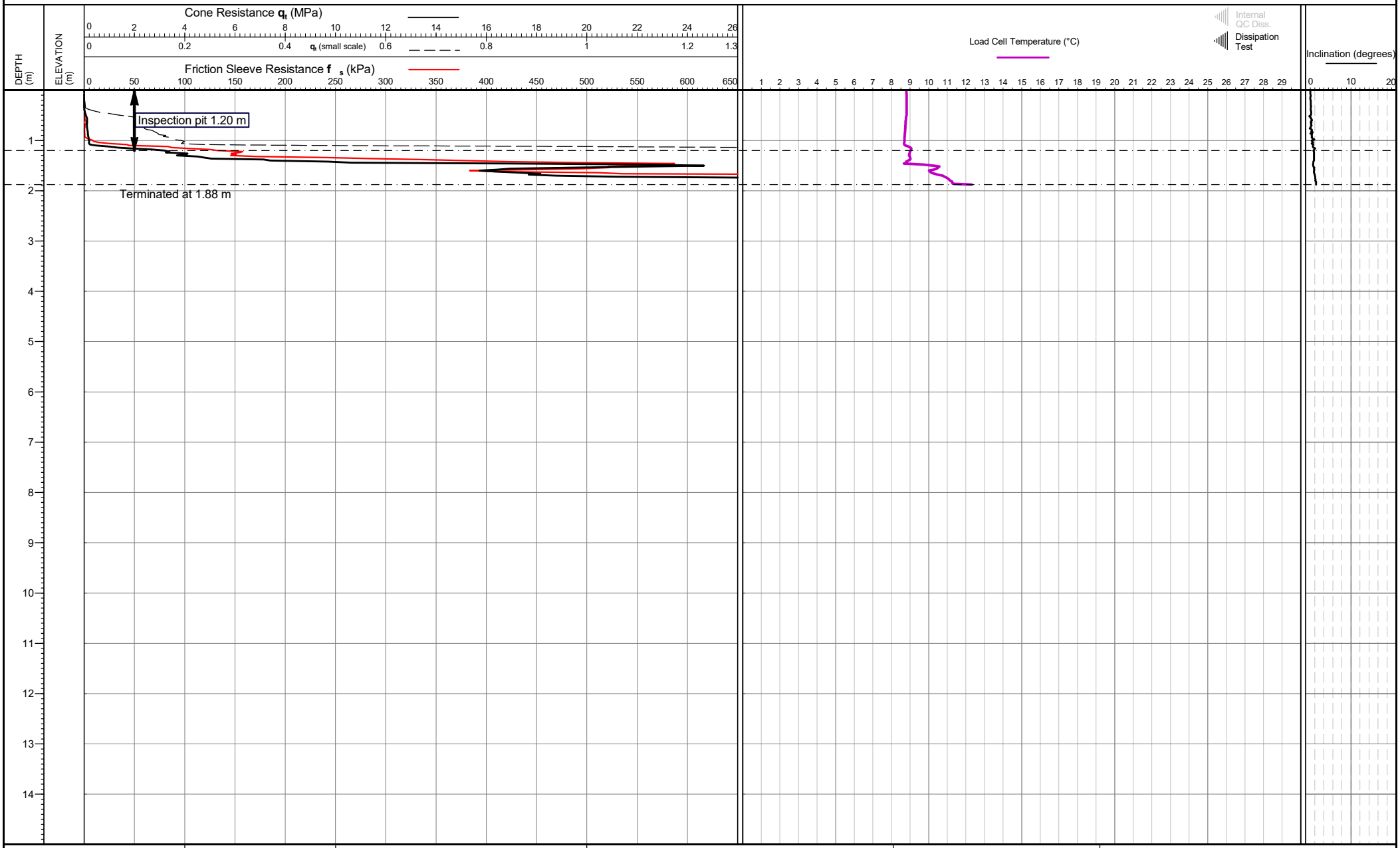
Checked by: Chris Player

TEST ID: CPT22/07

LANKELMA

Project: MANCHESTER

Client: GEOTECHNICAL ENGINEERING



Cone area (mm2): Cone ID: S15-CFIPT.1766 Operator: Phillip Case Rig Used: UK20 Date of test: 17/11/2022 08:41:03	Zero drift (Pre/post test) q_c (kPa): 16.2 f_s (kPa): -2.5 ($f_{s\ drift}$ - $q_{c\ drift}$) u_2 (kPa): -6.6	Location: Greater Manchester, UK Coordinates: , Elevation: Coordinate system:	Remarks: *Phreatic surface origin: Arbitrary value Termination Remark: Sleeve load	Date of plot: 18-11-22 Checked by: Chris Player	Lankelma Project Ref: P-108203-1

TEST ID: CPT22/08

APPENDIX B

MONITORING DATA

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GFM436 Instrument Specification

General	
Ex. Rating to:	EEx ib IIB T1
Ambient Temp Range	-10 to 40 C
Battery Life	8 hours typical
Battery charge time	2 to 4 hours
Aspiration Rate	300 ml/min typical
Storage Capacity	>3000 Readings
Protection Rating	IP65
Dimensions	200 x 100 x 60 mm (approx)
Weight	750g typical depending on options installed

GFM436 Standard Channels			
	Range	Typical Accuracy	Typical Response
Methane	0 to 100% (0.1)	0.3% @ 5%, 3.0% @ 60%, 3.0% @ 100%	20s
	0 to 100% LEL (0.1)	4% LEL	30s
Carbon Dioxide	0 to 100% (0.1)	0.3% @ 5%, 3.0% @ 40%, 3.0% @ 40%	20s
Oxygen	0 to 25% (0.1)	0.5%	20s
Atmospheric Pressure	800 to 1200 mbar	5 mbar, 1 mbar resolution	20s
H2S	2000 ppm (10.0)	5% of fs	30s
CO	2000 ppm (1.0)	5% of fs	30s
Static Pressure	-200mbar - +200mbar	+/- 1 mbar	10s
Flow Range	+100 to -60 l/hr	+/- 0.1l/hr to +/-3l/hr	10s
Flow Resolution	0.1 l/hr		
Differential Pressure	+1250/-1250 Pa	+/-3Pa to +/- 250Pa	10s

Standard Accessories
Battery Charger, Carry Case, Sample Pipe, Manual, Calibration Certificate

Other Optional Channels			
Temperature (with external probe)	-10 to 100c	+/-1.0c	60s
Gas Velocity (with optional vane anemometer)	0-40 m/s	+/-0.51 m/s resolution	30s

TEST DATE AND CONDITIONS		
Date	24/05/2022	
Atmospheric Pressure	987	mB
Ambient Temperature	19.1	°C
Environics Serial No.	5089	

GFM435 Final Inspection & Calibration Check Certificate

GAS DATA LTD
Unit 4, Fairfield Court
Seven Stars Estate
Wheler Rd
Coventry
CV3 4LJ
Tel 02476303311 Fax 02476307711

Customer	Geotechnical Engineering Ltd
Certificate Number	123228
Order Number	331049

Serial Number	11858
Software Version	G435-00.0024/0004

Recalibration DUE Date
24/05/23

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						
	CH_4		CO_2		O_2	
	Instrument Gas Readings %	True Gas Value %	Instrument Gas Readings %	True Gas Value %	Instrument Gas Readings %	True Gas Value %
Sensor	59.6 *Accept ±3.0*	*60*	39.7 *Accept ±3.0*	*40*	20.9 *Accept ±0.5*	*20.9*
	5.0 *Accept ±0.3*	*5*	5.0 *Accept ±0.3*	*5*	6.0 *Accept ±0.3*	*6*
Zero Reading 100% N2	0.0 *Accept ±0.0*	*0*	0.0 *Accept ±0.0*	*0*	0.0 *Accept ±0.1*	*0*

Optional Gas Checks						
Applied Gas & Range		Concentration Tested @ (ppm)	Instrument Readings *(ppm)*			
			Zero Reading		Instrument Gas Reading	
Gas Type	Range *(ppm)*					
H2S	5000	*1500*	0	*Accept ±0.0*	1500	*Accept ±5.0*
CO	2000	*1000*	0	*Accept ±0.0*	1001	*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		
H2S	*1500*	1500		0		0			
CO	*1000*	70		1001		0			
Hexane	*2.0%*	0		0		1.99			

Pressure Checks			
Atmospheric Pressure [AP] *(mB)*			
Current Atmospheric Pressure (mB)		Instrument Atmospheric Pressure Reading (mB)	
AP Open Ports		987	*Accept ±2.0*
AP Port (Internal)	*+800 mB*	800	*Accept ±5.0*
	+1200mb	1200	*Accept ±5.0*

Flow Checks					
Borehole Flow			Differential Pressure		
Applied Reading *(l/h)*	Instrument Reading *(l/h)*		Applied Pressure *(Pa)*	Instrument Reading *(Pa)*	
-30	-30.4	*Accept ±3.0*	-244	-251	*Accept ±50*
-3	-3.0	*Accept ±1.0*	-12	-12	*Accept ±6.0*
0	0.0	*Accept ±0.0*	0	0	*Accept ±0.5*
3	3.0	*Accept ±0.5*	12	12	*Accept ±3.0*
30	30.0	*Accept ±3.0*	249	249	*Accept ±50*
60	59.8	*Accept ±6.0*	742	741	*Accept ±130*
90	90.9	*Accept ±9.0*	1447	1486	*Accept ±250*

Temperature Checks		
Calibration Temperature Applied Temperature ^{0}C	Instrument Temperature Reading ^{0}C	
-10	-10.0	*Accept ±2.0*
0	0.0	*Accept ±1.0*
30	30.0	*Accept ±1.0*
60	60.0	*Accept ±1.0*
100	100.0	*Accept ±1.0*

Technician:	Date Tested:
Jack Rutland	*25/05/2022*

The instrument identified by the serial number stated above has been tested by Gas Data personnel for calibration accuracy on the date and under the ambient conditions stated. Gas Data Ltd internal BS EN ISO9001:2015, BS EN ISO14001:2015, BS EN ISO45001:2018 compliant workshop procedures were followed to apply known calibration test gases, gas flow rates, pressures and temperatures of the values stated. The results displayed on the instrument at each stage are recorded above.

TEST DATE AND CONDITIONS		
Date	24.5.22	
Atmospheric Pressure	987	mB
Ambient Temperature	19.1	°C
Environics Serial No.	5089	

GAS DATA LTD
Unit 4
Fairfield Court
Seven Stars Estate
Coventry
CV3 4LJ
UK
+44 (0)24 7630 3311

GAS DATA
LISTEN · ANALYSE · INFORM

GFM435-1 (MCERTS) OUTWARD INSPECTION & QUALITY CHECK SHEET

INSTRUMENT DETAILS			
SO Number	Instrument Type	Instrument Serial Number + SW Version	Job Number(s)
331049	GFM435	11858 Q435-24/04	123228

Calibration Technician ..... **Date** 24.5.22

Inspection Technician ..... **Date** 26.5.22

INSTRUMENT CHECKS		Pass (P), Fail (F) or not applicable (NA)	INSTRUMENT PACKING LIST		Tick if included
Function Tests	Dust Caps Fitted	P	Instrument		✓
	Keyboard Test (All Keys)	P	Leather Case		X
	Backlight	P	Instrument Strap		✓
	Clock Set / Running	P	AC Battery Charger (UK)		✓
	Comms Test	P	AC Battery Charger (EURO)		X
	Pump Flow Test (In & Out)	P	AC Battery Charger (US)		X
	Overall Leak Test (30mB)	n/a	AC Battery Charger (AUS)		X
	Battery Charge Test	P	Gas Sample Pipe - *(new issue)*		✓
	Service Date set to?	24.5.23	Flow Sample Pipe - *(new issue)*		✓
Channel Tests	Data Logging Enabled?	P	Hard Carry Case	PELI	✓
	Verify CH4/LEL/Hexane/PID	P	Spares Pot		X
	Verify CO2	P	Allen Key		X
	Verify O2	P	Temperature Probe		X
	Verify H2S	P	Vane Anemometer		X
	Verify CO	P	USB Cable		X
	Verify LEL	P	USB Memory stick		X
	Verify 1st Option Gas	N/A	SiteMan Software	Ver 4.15	✓
	Verify Atmospheric pressure	P	Internal Filter Pack	Qty	X
	Verify differential pressure	P	External Filter Pack	Qty	X
	Verify flow	P	Field Guide		X
	Verify temperature probe input	P	**Extra Items:**		
	Verify vane anemometer input	P	SAMPLE TUBE		
DataBase Checks	Jobcard(s) completed and signed	P			
	Jobcard(s) booked off database	P			
	Calibration certificate completed	P			
	Complete & print QI record	n/a			
Label Checks	No. of Calibration label fitted	GDC 11450	**Comments:**		
	MCERTS label displayed	P			
	Warranty label fitted	P			
H2S Range	H2S Range from Sales Order	5000 ppm			
	H2S Range from Cal Cert	5000 ppm			
	Over-range value correct?	P			

shawcity
Life-saving solutions

CERTIFICATE OF CALIBRATION
MiniRAE Lite

CALIBRATION CERTIFICATE NO: 74520

ISSUED BY: SHAWCITY LIMITED
DATE: 12.9.22

APPROVED SIGNATORY:

NAME: D House

CUSTOMER: Geotechnical Engineering Ltd
INSTRUMENT: MiniRAE Lite
SERIAL NUMBER: 595-003334

CALIBRATION METHOD: CM03
AMBIENT CONDITIONS: 20°C ± 2°C and 50% (± 20%) RH

Prior to calibration the instrument was allowed to stabilise in the laboratory for at least 30 minutes.
The instrument was calibrated by exposing the sensor to known values of gas concentrations.
All gases were sampled through the complete probe and in line filter, where applicable.
The reference value is that generated by the certified source and the indicated value is that measured by the instrument.

CALIBRATION RESULTS

GAS	LOT No	REF. VALUE	INDICATED VALUE
Isobutylene	WO363184-1	100 ppm	101.4ppm

COMMENTS:
The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of $k=2$.
This provides a level of confidence of uncertainty of approximately 95%.
The uncertainty of measurement is ±2 %
The results indicate that the instrument conforms to the applicable parts of the published specification.

Tel: 01793 780622 Instrument House, 91-92 Shrivenham Hundred Business Park Fax: 01793 784466
www.shawcity.co.uk Watchfield, Oxfordshire, SN6 8TY rvice@shawcity.co.uk

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **(WS)TP22/01**

INSTALLED PIPE DEPTH (m) 2.60

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
08/12/2022 16:15												Dry
09/12/2022 11:40												Dry
12/12/2022 14:35												Dry
13/12/2022 10:25												Dry
14/12/2022 10:25												Dry
15/12/2022 13:00												Dry
16/12/2022 13:25												Dry
19/12/2022 16:45												Dry
20/12/2022 15:55												Dry
21/12/2022 11:35												Dry
03/01/2023 16:25	1001 / 0.00	8								0.0		
03/01/2023 16:26	1001 / 0.00	8								0.0		
03/01/2023 16:27	1001 / 0.00	8								0.0		
03/01/2023 16:28	1001 / 0.00	8								0.0		
03/01/2023 16:29	1001 / 0.00	8								0.0		
03/01/2023 16:31			0.0	0.0	20.2	0.0	0.0	0.0	0.7			
03/01/2023 16:32			0.0	0.0	19.9	0.0	0.0	0.0	0.8			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **(WS)TP22/01**

INSTALLED PIPE DEPTH (m) 2.60

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
03/01/2023 16:33			0.0	0.0	19.9	0.0	0.0	0.0	0.8			
03/01/2023 16:34			0.0	0.0	19.9	0.0	0.0	0.0	0.8			
03/01/2023 16:35			0.0	0.0	19.9	0.0	0.0	0.0	0.8			
03/01/2023 16:36												Dry
09/01/2023 16:15	1001 / 0.00	7								0.0		
09/01/2023 16:16	1002 / 0.00	7								0.0		
09/01/2023 16:17	1001 / 0.00	7								0.0		
09/01/2023 16:18	1000 / 0.00	7								0.0		
09/01/2023 16:19	1000 / 0.00	7								0.0		
09/01/2023 16:20	1000 / 0.00	7								0.0		
09/01/2023 16:21			0.0	0.0	20.3	0.0	0.0	0.0	0.3			
09/01/2023 16:22			0.0	0.0	19.8	0.0	0.0	0.0	0.3			
09/01/2023 16:23			0.0	0.0	20.2	0.0	0.0	0.0	0.2			
09/01/2023 16:24			0.0	0.0	20.2	0.0	0.0	0.0	0.4			
09/01/2023 16:25			0.0	0.0	20.2	0.0	0.0	0.0	0.2			
09/01/2023 16:26			0.0	0.0	20.2	0.0	0.0	0.0	0.2			
09/01/2023 16:27			0.0	0.0	20.2	0.0	0.0	0.0	0.2			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **(WS)TP22/01**

INSTALLED PIPE DEPTH (m) 2.60

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
09/01/2023 16:28			0.0	0.0	20.2	0.0	0.0	0.0	0.2			
09/01/2023 16:29												Dry
17/01/2023 16:54	981 / 0.00	1								0.0		
17/01/2023 16:55	981 / 0.00	1								0.0		
17/01/2023 16:56	981 / 0.00	1								0.0		
17/01/2023 16:57	981 / 0.00	1								0.0		
17/01/2023 16:58	981 / 0.00	1								0.0		
17/01/2023 16:59			0.0	0.0	20.2	0.0	0.0	0.0	0.5			
17/01/2023 17:00			0.0	0.0	19.9	0.0	0.0	0.0	0.7			
17/01/2023 17:01			0.0	0.0	19.9	0.0	0.0	0.0	0.7			
17/01/2023 17:02			0.0	0.0	19.9	0.0	0.0	0.0	0.7			
17/01/2023 17:03			0.0	0.0	19.9	0.0	0.0	0.0	0.7			
17/01/2023 17:04												Dry
24/01/2023 10:36	1033 / 0.00	4								0.0		
24/01/2023 10:37	1033 / 0.01	4								0.1		
24/01/2023 10:38	1033 / 0.01	4								0.1		
24/01/2023 10:39	1033 / 0.01	4								0.1		

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **(WS)TP22/01**

INSTALLED PIPE DEPTH (m) 2.60

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
24/01/2023 10:40	1033 / 0.01	4								0.1		
24/01/2023 10:41			0.3	0.0	12.4	0.0	0.0	0.0	14.9			
24/01/2023 10:42			0.4	0.0	7.7	0.0	0.0	0.0	15.4			
24/01/2023 10:43			0.4	0.0	7.9	0.0	0.0	0.0	15.1			
24/01/2023 10:44			0.4	0.0	8.4	0.0	0.0	0.0	15.0			
24/01/2023 10:45			0.3	0.0	9.0	0.0	0.0	0.0	14.8			
24/01/2023 10:46			0.1	0.0	13.9	0.0	0.0	0.0	14.0			
24/01/2023 10:47			0.2	0.0	12.5	0.0	0.0	0.0	10.4			
24/01/2023 10:48			0.1	0.0	13.3	0.0	0.0	0.0	11.2			
24/01/2023 10:49			0.0	0.0	13.4	0.0	0.0	0.0	11.4			
24/01/2023 10:50												Dry
30/01/2023 13:05	1020 / 0.00	6								0.1		
30/01/2023 13:06	1020 / 0.00	6								-0.1		
30/01/2023 13:07	1020 / 0.00	6								0.1		
30/01/2023 13:08	1020 / 0.00	6								0.0		
30/01/2023 13:09	1020 / 0.00	6								0.0		
30/01/2023 13:11			0.0	0.0	20.3	0.0	0.0	0.0	0.0			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
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Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **(WS)TP22/01**

INSTALLED PIPE DEPTH (m) 2.60

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
30/01/2023 13:12			0.1	0.0	19.2	0.0	0.0	0.0	0.0			
30/01/2023 13:13			0.1	0.0	18.1	0.0	0.0	0.0	0.0			
30/01/2023 13:14			0.1	0.0	18.0	0.0	0.0	0.0	0.0			
30/01/2023 13:15			0.1	0.0	18.0	0.0	0.0	0.0	0.0			
30/01/2023 13:16			0.1	0.0	17.9	0.0	0.0	0.0	0.0			
30/01/2023 13:17			0.1	0.0	18.1	0.0	0.0	0.0	0.0			
30/01/2023 13:18			0.1	0.0	18.1	0.0	0.0	0.0	0.0			
30/01/2023 13:19			0.1	0.0	18.2	0.0	0.0	0.0	0.0			
30/01/2023 13:20			0.2	0.0	18.2	0.0	0.0	0.0	0.0			
30/01/2023 13:21												Dry
07/02/2023 10:37												Dry

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/01**

INSTALLED PIPE DEPTH (m) 4.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
01/12/2022 11:22											2.22	Pre-development.
05/12/2022 15:52											2.28	Pre-development.
06/12/2022 09:02											2.56	Pre-development.
07/12/2022 15:07											2.35	Pre-development.
08/12/2022 16:07											2.42	Pre-development.
09/12/2022 11:32											2.40	Pre-development.
12/12/2022 13:12											2.25	Pre-development.
13/12/2022 10:17											2.30	Pre-development.
14/12/2022 10:17											2.28	Pre-development.
15/12/2022 12:57											2.25	Pre-development.
16/12/2022 13:22											2.26	Pre-development.
19/12/2022 16:42											2.25	Pre-development.
20/12/2022 15:52											2.25	Pre-development.
21/12/2022 11:32											2.25	Pre-development.
03/01/2023 15:25	1002 / 0.00	8								0.0		
03/01/2023 15:26	1001 / 0.00	8								0.0		
03/01/2023 15:27	1001 / 0.00	8								0.0		

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/01**

INSTALLED PIPE DEPTH (m) 4.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
03/01/2023 15:28	1002 / 0.00	8								0.0		
03/01/2023 15:29	1001 / 0.00	8								0.0		
03/01/2023 15:31			0.0	0.0	20.2	0.0	0.0	0.0	1.0			
03/01/2023 15:32			0.0	0.0	20.1	0.0	0.0	0.0	1.0			
03/01/2023 15:33			0.0	0.0	20.2	0.0	0.0	0.0	0.7			
03/01/2023 15:34			0.0	0.0	20.1	0.0	0.0	0.0	0.3			
03/01/2023 15:35			0.0	0.0	20.1	0.0	0.0	0.0	0.2			
03/01/2023 15:36			0.0	0.0	20.2	0.0	0.0	0.0	0.5			
03/01/2023 15:37			0.0	0.0	20.2	0.0	0.0	0.0	0.3			
03/01/2023 15:38											2.20	Pre-development.
09/01/2023 14:50	1000 / 0.00	7								0.0		
09/01/2023 14:51	1000 / 0.00	7								0.0		
09/01/2023 14:52	1000 / 0.00	7								0.0		
09/01/2023 14:53	1000 / 0.00	7								0.0		
09/01/2023 14:54	1000 / 0.00	7								0.0		
09/01/2023 14:55	1000 / 0.00	7								0.0		
09/01/2023 14:56			0.0	0.0	19.8	0.0	0.0	0.0	0.2			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/01**

INSTALLED PIPE DEPTH (m) 4.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
09/01/2023 14:57			0.0	0.0	19.9	0.0	0.0	0.0	0.6			
09/01/2023 14:58			0.0	0.0	20.0	0.0	0.0	0.0	1.0			
09/01/2023 14:59			0.0	0.0	20.0	0.0	0.0	0.0	0.5			
09/01/2023 15:00			0.0	0.0	20.0	0.0	0.0	0.0	0.5			
09/01/2023 15:01			0.0	0.0	20.0	0.0	0.0	0.0	0.5			
09/01/2023 15:02											2.00	
17/01/2023 14:35	979 / 0.00	1								0.0		
17/01/2023 14:36	979 / 0.00	1								0.0		
17/01/2023 14:37	979 / 0.00	1								0.0		
17/01/2023 14:38	979 / 0.00	1								0.0		
17/01/2023 14:39	979 / 0.00	1								0.0		
17/01/2023 14:40			0.0	0.0	20.1	0.0	0.0	0.0	1.2			
17/01/2023 14:41			0.0	0.0	20.1	0.0	0.0	0.0	1.1			
17/01/2023 14:42			0.0	0.0	20.1	0.0	0.0	0.0	0.9			
17/01/2023 14:43			0.0	0.0	20.1	0.0	0.0	0.0	0.6			
17/01/2023 14:44			0.0	0.0	20.1	0.0	0.0	0.0	0.3			
17/01/2023 14:45			0.0	0.0	20.1	0.0	0.0	0.0	0.3			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
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Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/01**

INSTALLED PIPE DEPTH (m) 4.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
17/01/2023 14:46			0.0	0.0	20.1	0.0	0.0	0.0	0.3			
17/01/2023 14:47											2.25	
24/01/2023 09:40	1035 / 0.00	4								0.0		
24/01/2023 09:41	1035 / 0.00	4								0.0		
24/01/2023 09:42	1035 / 0.00	4								0.0		
24/01/2023 09:43	1035 / 0.00	4								0.0		
24/01/2023 09:44	1035 / 0.00	4								0.0		
24/01/2023 09:45			0.0	0.0	15.7	0.0	0.0	0.0	0.6			
24/01/2023 09:46			0.0	0.0	11.8	0.0	0.0	0.2	0.6			
24/01/2023 09:47			0.0	0.0	14.4	0.0	0.0	0.0	0.6			
24/01/2023 09:48			0.0	0.0	19.8	0.0	0.0	0.0	0.5			
24/01/2023 09:49			0.0	0.0	19.9	0.0	0.0	0.0	0.4			
24/01/2023 09:50											2.43	
30/01/2023 12:25	1020 / -0.01	6								-0.4		
30/01/2023 12:26	1021 / -0.01	6								-0.4		
30/01/2023 12:27	1020 / 0.00	6								0.0		
30/01/2023 12:28	1021 / 0.00	6								0.0		

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
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Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/01**

INSTALLED PIPE DEPTH (m) 4.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
30/01/2023 12:29	1021 / 0.00	6								0.0		
30/01/2023 12:31			0.0	0.0	20.3	0.0	0.0	0.0	0.0			
30/01/2023 12:32			0.0	0.0	20.0	0.0	0.0	0.0	0.0			
30/01/2023 12:33			0.0	0.0	20.0	0.0	0.0	0.0	0.0			
30/01/2023 12:34			0.0	0.0	19.9	0.0	0.0	0.0	0.0			
30/01/2023 12:35			0.0	0.0	20.0	0.0	0.0	0.0	0.0			
30/01/2023 12:36											2.37	
07/02/2023 10:28											2.35	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/01**

INSTALLED PIPE DEPTH (m) 52.00

PIPE DIAMETER (mm) 35

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
01/12/2022 11:20											19.00	Pre-development.
05/12/2022 15:50											23.60	Pre-development.
06/12/2022 09:00											23.65	Pre-development.
07/12/2022 15:05											19.20	Pre-development.
08/12/2022 16:05											19.10	Pre-development.
09/12/2022 11:30											19.20	Pre-development.
12/12/2022 13:10											19.25	Pre-development.
13/12/2022 10:15											19.30	
14/12/2022 10:15											19.20	
15/12/2022 12:55											19.13	
16/12/2022 13:20											19.25	
19/12/2022 16:40											19.20	
20/12/2022 15:50											19.23	
21/12/2022 11:30											19.22	
04/01/2023 14:19											19.30	
09/01/2023 14:12											19.20	
17/01/2023 14:48											19.20	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/01**

INSTALLED PIPE DEPTH (m) 52.00

PIPE DIAMETER (mm) 35

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
24/01/2023 09:51											19.40	
30/01/2023 12:37											19.30	
07/02/2023 10:26											19.35	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/02**

INSTALLED PIPE DEPTH (m) 3.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
09/12/2022 11:52												Dry
12/12/2022 15:22												Dry
13/12/2022 10:12												Dry
14/12/2022 10:12												Dry
15/12/2022 12:47												Dry
16/12/2022 13:17												Dry
19/12/2022 16:37												Dry
20/12/2022 15:47												Dry
21/12/2022 11:12												Dry
04/01/2023 09:35	1003 / 0.00	11								0.0		
04/01/2023 09:36	1003 / 0.00	11								0.0		
04/01/2023 09:37	1003 / 0.00	11								0.0		
04/01/2023 09:38	1003 / 0.00	11								0.0		
04/01/2023 09:39	1003 / 0.00	11								0.0		
04/01/2023 09:41			0.0	0.0	20.3	0.0	0.0	0.0	3.4			
04/01/2023 09:42			0.0	0.0	19.8	0.0	0.0	0.0	3.9			
04/01/2023 09:43			0.0	0.0	19.8	0.0	0.0	0.0	4.1			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/02**

INSTALLED PIPE DEPTH (m) 3.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
04/01/2023 09:44			0.0	0.0	19.8	0.0	0.0	0.0	4.2			
04/01/2023 09:45			0.0	0.0	19.8	0.0	0.0	0.0	4.3			
04/01/2023 09:46			0.0	0.0	19.8	0.0	0.0	0.0	4.5			
04/01/2023 09:47			0.0	0.0	19.8	0.0	0.0	0.0	4.6			
04/01/2023 09:48			0.0	0.0	19.8	0.0	0.0	0.0	4.9			
04/01/2023 09:49			0.0	0.0	19.8	0.0	0.0	0.0	5.3			
04/01/2023 09:50			0.0	0.0	19.8	0.0	0.0	0.0	5.7			
04/01/2023 09:51												Dry
09/01/2023 14:20	1001 / 0.00	7								0.0		
09/01/2023 14:21	1002 / 0.00	7								0.0		
09/01/2023 14:22	1003 / 0.00	7								0.0		
09/01/2023 14:23	1003 / 0.00	7								0.0		
09/01/2023 14:24	1003 / 0.00	7								0.0		
09/01/2023 14:25			0.0	0.0	20.1	0.0	0.0	0.0	3.4			
09/01/2023 14:26			0.0	0.0	19.9	0.0	0.0	0.0	4.1			
09/01/2023 14:27			0.0	0.0	19.8	0.0	0.0	0.0	5.4			
09/01/2023 14:28			0.0	0.0	19.8	0.0	0.0	0.0	5.4			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/02**

INSTALLED PIPE DEPTH (m) 3.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
09/01/2023 14:30												Dry
17/01/2023 14:50	980 / 0.00	1								0.0		
17/01/2023 14:51	979 / 0.00	1								0.0		
17/01/2023 14:52	979 / 0.00	1								0.0		
17/01/2023 14:53	979 / 0.00	1								0.0		
17/01/2023 14:54	979 / 0.00	1								0.0		
17/01/2023 14:55			0.0	0.0	19.7	0.0	0.0	0.0	3.3			
17/01/2023 14:56			0.0	0.0	19.7	0.0	0.0	0.0	3.7			
17/01/2023 14:57			0.0	0.0	19.7	0.0	0.0	0.0	4.1			
17/01/2023 14:58			0.0	0.0	19.7	0.0	0.0	0.0	4.6			
17/01/2023 14:59			0.0	0.0	19.7	0.0	0.0	0.0	4.6			
17/01/2023 15:00			0.0	0.0	19.7	0.0	0.0	0.0	4.6			
17/01/2023 15:01			0.0	0.0	19.7	0.0	0.0	0.0	4.9			
17/01/2023 15:02			0.0	0.0	19.7	0.0	0.0	0.0	4.9			
17/01/2023 15:03												Dry
24/01/2023 09:58	1003 / 0.00	4								0.0		
24/01/2023 09:59	1003 / 0.00	4								0.0		

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/02**

INSTALLED PIPE DEPTH (m) 3.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
24/01/2023 10:00	1003 / 0.00	4								0.0		
24/01/2023 10:01	1003 / 0.00	4								0.0		
24/01/2023 10:02	1003 / 0.00	4								0.0		
24/01/2023 10:03			0.0	0.0	20.3	0.0	0.0	0.0	3.4			
24/01/2023 10:04			0.0	0.0	19.8	0.0	0.0	0.0	3.9			
24/01/2023 10:05			0.0	0.0	19.8	0.0	0.0	0.0	4.1			
24/01/2023 10:06			0.0	0.0	19.8	0.0	0.0	0.0	4.2			
24/01/2023 10:07			0.0	0.0	19.8	0.0	0.0	0.0	4.3			
24/01/2023 10:08			0.0	0.0	19.8	0.0	0.0	0.0	4.5			
24/01/2023 10:09			0.0	0.0	19.8	0.0	0.0	0.0	4.6			
24/01/2023 10:10			0.0	0.0	19.8	0.0	0.0	0.0	4.9			
24/01/2023 10:11			0.0	0.0	19.8	0.0	0.0	0.0	5.3			
24/01/2023 10:12			0.0	0.0	19.8	0.0	0.0	0.0	5.7			
24/01/2023 10:13												Dry
30/01/2023 15:30	1018 / 0.00	6								0.0		
30/01/2023 15:31	1018 / 0.00	6								0.0		
30/01/2023 15:32	1018 / 0.00	6								0.0		

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/02**

INSTALLED PIPE DEPTH (m) 3.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
30/01/2023 15:33	1018 / 0.00	6								0.0		
30/01/2023 15:34	1018 / 0.00	6								0.0		
30/01/2023 15:36			0.0	0.0	20.3	0.0	0.0	0.0	0.0			
30/01/2023 15:37			0.0	0.0	20.1	0.0	0.0	0.0	0.0			
30/01/2023 15:38			0.0	0.0	20.1	0.0	0.0	0.0	0.0			
30/01/2023 15:39			0.0	0.0	20.1	0.0	0.0	0.0	0.0			
30/01/2023 15:40			0.0	0.0	20.1	0.0	0.0	0.0	0.0			
30/01/2023 15:41			0.0	0.0	20.2	0.0	0.0	0.0	0.0			
30/01/2023 15:42			0.0	0.0	20.2	0.0	0.0	0.0	0.0			
30/01/2023 15:43			0.0	0.0	20.2	0.0	0.0	0.0	0.0			
30/01/2023 15:44			0.0	0.0	20.2	0.0	0.0	0.0	0.0			
30/01/2023 15:45			0.0	0.0	20.2	0.0	0.0	0.0	0.0			
30/01/2023 15:46												Dry
07/02/2023 10:22												Dry

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/02**

INSTALLED PIPE DEPTH (m) 40.00

PIPE DIAMETER (mm) 35

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
09/12/2022 11:50											19.55	Pre-development.
12/12/2022 15:20											19.65	Pre-development.
13/12/2022 10:10											19.65	Pre-development.
14/12/2022 10:10											19.42	
15/12/2022 12:45											19.36	
16/12/2022 13:15											19.21	
19/12/2022 16:35											19.25	
20/12/2022 15:45											19.28	
21/12/2022 11:10											19.28	
04/01/2023 15:16											19.33	
09/01/2023 14:30											19.26	
17/01/2023 15:04											19.93	
24/01/2023 10:14											19.47	
30/01/2023 15:47											19.35	
07/02/2023 10:20											19.37	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/03**

INSTALLED PIPE DEPTH (m) 3.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
05/12/2022 15:57											2.56	Pre-development.
06/12/2022 09:07											2.42	Pre-development.
07/12/2022 15:12											2.40	Pre-development.
08/12/2022 16:12											2.35	Pre-development.
09/12/2022 11:27											2.24	Pre-development.
12/12/2022 15:17											2.15	Pre-development.
13/12/2022 10:02											2.15	Pre-development.
14/12/2022 10:02											2.12	Pre-development.
15/12/2022 12:42											2.10	Pre-development.
16/12/2022 13:12											2.10	Pre-development.
19/12/2022 16:27											2.10	Pre-development.
20/12/2022 15:42											2.12	Pre-development.
21/12/2022 11:07											2.11	Pre-development.
04/01/2023 10:00	1001 / 0.00	11								0.0		
04/01/2023 10:01	1002 / 0.00	11								0.0		
04/01/2023 10:02	1001 / 0.00	11								0.0		
04/01/2023 10:03	1002 / 0.00	11								0.0		

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/03**

INSTALLED PIPE DEPTH (m) 3.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
04/01/2023 10:04	1002 / 0.00	11								0.0		
04/01/2023 10:06			0.0	0.0	20.3	0.0	0.0	0.0	4.3			
04/01/2023 10:07			0.0	0.0	19.7	0.0	0.0	0.0	4.4			
04/01/2023 10:08			0.0	0.0	19.7	0.0	0.0	0.0	4.4			
04/01/2023 10:09			0.0	0.0	19.8	0.0	0.0	0.0	4.5			
04/01/2023 10:10			0.0	0.0	19.8	0.0	0.0	0.0	4.5			
04/01/2023 10:11											2.02	Pre-development.
09/01/2023 13:55	1000 / 0.19	7								0.0		
09/01/2023 13:56	1000 / 0.20	7								0.0		
09/01/2023 13:57	1000 / 0.20	7								0.0		
09/01/2023 13:58	1000 / 0.20	7								0.0		
09/01/2023 13:59	1000 / 0.20	7								0.0		
09/01/2023 14:00			0.0	0.0	19.9	0.0	0.0	0.0	4.1			
09/01/2023 14:01			0.0	0.0	20.0	0.0	0.0	0.0	4.3			
09/01/2023 14:02			0.0	0.0	20.0	0.0	0.0	0.0	4.4			
09/01/2023 14:03			0.0	0.0	20.0	0.0	0.0	0.0	4.5			
09/01/2023 14:04			0.0	0.0	20.0	0.0	0.0	0.0	4.5			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/03**

INSTALLED PIPE DEPTH (m) 3.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
09/01/2023 14:05			0.0	0.0	20.0	0.0	0.0	0.0	4.5			
09/01/2023 14:10											1.90	
17/01/2023 15:08	981 / 0.00	1								0.0		
17/01/2023 15:09	981 / 0.00	1								0.0		
17/01/2023 15:10	981 / 0.00	1								0.0		
17/01/2023 15:11	981 / 0.00	1								0.0		
17/01/2023 15:12	981 / 0.00	1								0.0		
17/01/2023 15:13			0.0	0.0	20.0	0.0	0.0	0.0	4.1			
17/01/2023 15:14			0.0	0.0	19.9	0.0	0.0	0.0	4.3			
17/01/2023 15:15			0.0	0.0	19.8	0.0	0.0	0.0	4.3			
17/01/2023 15:16			0.0	0.0	19.8	0.0	0.0	0.0	4.2			
17/01/2023 15:17			0.0	0.0	19.8	0.0	0.0	0.0	4.2			
17/01/2023 15:18			0.0	0.0	19.8	0.0	0.0	0.0	4.2			
17/01/2023 15:19			0.0	0.0	19.8	0.0	0.0	0.0	4.2			
17/01/2023 15:20											2.00	
24/01/2023 11:00	1033 / 0.00	4								0.0		
24/01/2023 11:01	1033 / 0.00	4								0.0		

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/03**

INSTALLED PIPE DEPTH (m) 3.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
24/01/2023 11:02	1033 / 0.00	4								0.0		
24/01/2023 11:03	1033 / 0.00	4								0.0		
24/01/2023 11:04	1033 / 0.00	4								0.0		
24/01/2023 11:05			0.4	0.0	7.4	0.0	0.0	0.0	5.5			
24/01/2023 11:06			0.6	0.0	7.4	0.0	0.0	0.0	6.2			
24/01/2023 11:07			0.6	0.0	7.4	0.0	0.0	0.0	6.2			
24/01/2023 11:08			0.0	0.0	7.4	0.0	0.0	0.0	6.4			
24/01/2023 11:09			0.6	0.0	6.8	0.0	0.0	0.0	6.5			
24/01/2023 11:10			0.6	0.0	6.8	0.0	0.0	0.0	6.5			
24/01/2023 11:11											2.07	
30/01/2023 14:00	1018 / 0.00	6								0.0		
30/01/2023 14:01	1018 / 0.00	6								0.0		
30/01/2023 14:02	1018 / 0.00	6								0.0		
30/01/2023 14:03	1018 / 0.00	6								0.0		
30/01/2023 14:04	1018 / 0.00	6								0.0		
30/01/2023 14:06			0.0	0.0	16.1	0.0	0.0	0.0	0.5			
30/01/2023 14:07			0.0	0.0	19.4	0.0	0.0	0.0	0.0			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT **37349**

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Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/03**

INSTALLED PIPE DEPTH (m) 3.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
30/01/2023 14:08			0.0	0.0	19.3	0.0	0.0	0.0	0.0			
30/01/2023 14:09			0.0	0.0	19.4	0.0	0.0	0.0	0.0			
30/01/2023 14:10			0.0	0.0	19.3	0.0	0.0	0.0	0.0			
30/01/2023 14:11											2.09	
07/02/2023 10:08											2.10	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/03**

INSTALLED PIPE DEPTH (m) 62.00

PIPE DIAMETER (mm) 35

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
05/12/2022 15:55											23.60	Pre-development.
06/12/2022 09:05											19.20	Pre-development.
07/12/2022 15:10											22.50	Pre-development.
08/12/2022 16:10											22.56	Pre-development.
09/12/2022 11:25											22.55	
12/12/2022 15:15											22.60	
13/12/2022 10:00											22.60	
14/12/2022 10:00											22.61	
15/12/2022 12:40											22.62	
16/12/2022 13:10											22.82	
19/12/2022 16:25											22.55	
20/12/2022 15:40											22.61	
21/12/2022 11:05											22.60	
04/01/2023 13:18											22.55	
09/01/2023 14:05											21.85	
17/01/2023 15:21											22.37	
24/01/2023 11:12											22.49	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/03**

INSTALLED PIPE DEPTH (m) 62.00

PIPE DIAMETER (mm) 35

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
30/01/2023 14:12											22.47	
07/02/2023 10:06											22.53	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/04**

INSTALLED PIPE DEPTH (m) 40.00

PIPE DIAMETER (mm) 35

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
21/12/2022 11:20											19.19	Pre-development.
03/01/2023 16:13											19.15	Pre-development.
09/01/2023 15:30											19.80	
17/01/2023 15:28											21.40	
24/01/2023 10:30											19.38	
30/01/2023 12:56											19.31	
07/02/2023 10:33											19.36	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/04**

INSTALLED PIPE DEPTH (m) 5.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
21/12/2022 11:22											0.75	Pre-development.
03/01/2023 16:00	1001 / 0.00	8								0.0		
03/01/2023 16:01	1001 / 0.00	8								0.0		
03/01/2023 16:02	1001 / 0.00	8								0.0		
03/01/2023 16:03	1001 / 0.00	8								0.0		
03/01/2023 16:04	1001 / 0.00	8								0.0		
03/01/2023 16:06			0.0	0.0	20.5	0.0	0.0	0.0	0.2			
03/01/2023 16:07			0.0	0.0	20.5	0.0	0.0	0.0	0.3			
03/01/2023 16:08			0.0	0.0	20.3	0.0	0.0	0.0	0.1			
03/01/2023 16:09			0.0	0.0	20.3	0.0	0.0	0.0	0.2			
03/01/2023 16:10			0.0	0.0	20.3	0.0	0.0	0.0	0.1			
03/01/2023 16:11											0.65	Pre-development.
09/01/2023 15:20	1000 / 0.00	7								0.0		
09/01/2023 15:21	1001 / 0.00	7								0.0		
09/01/2023 15:22	1001 / 0.00	7								0.0		
09/01/2023 15:23	1001 / 0.00	7								0.0		
09/01/2023 15:24	1001 / 0.00	7								0.0		

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT **37349**

CHECKED **CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/04**

INSTALLED PIPE DEPTH (m) 5.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
09/01/2023 15:25			0.0	0.0	20.1	0.0	0.0	0.0	0.3			
09/01/2023 15:26			0.0	0.0	20.3	0.0	0.0	0.0	0.4			
09/01/2023 15:27			0.0	0.0	20.3	0.0	0.0	0.0	0.4			
09/01/2023 15:28			0.0	0.0	20.3	0.0	0.0	0.0	0.4			
09/01/2023 15:29			0.0	0.0	20.3	0.0	0.0	0.0	0.4			
09/01/2023 15:30			0.0	0.0	20.3	0.0	0.0	0.0	0.4			
09/01/2023 15:35											0.70	
17/01/2023 15:27	980 / 0.00	1								0.0		
17/01/2023 15:28	980 / 0.00	1								0.0		
17/01/2023 15:29	980 / 0.00	1								0.0		
17/01/2023 15:30	980 / 0.00	1								0.0		
17/01/2023 15:31	980 / 0.00	1								0.0		
17/01/2023 15:32			0.0	0.0	20.2	0.0	0.0	0.0	0.1			
17/01/2023 15:33			0.0	0.0	20.2	0.0	0.0	0.0	0.1			
17/01/2023 15:34			0.0	0.0	20.2	0.0	0.0	0.0	0.1			
17/01/2023 15:35			0.0	0.0	20.2	0.0	0.0	0.0	0.2			
17/01/2023 15:36			0.0	0.0	20.2	0.0	0.0	0.0	0.1			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/04**

INSTALLED PIPE DEPTH (m) 5.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
17/01/2023 15:37											1.85	
24/01/2023 10:19	1035 / -0.01	4								-0.2		
24/01/2023 10:20	1035 / -0.01	4								-0.2		
24/01/2023 10:21	1035 / 0.00	4								0.0		
24/01/2023 10:22	1035 / -0.01	4								-0.2		
24/01/2023 10:23	1035 / 0.00	4								0.0		
24/01/2023 10:24			0.0	0.0	19.9	0.0	0.0	0.0	8.3			
24/01/2023 10:25			0.0	0.0	19.9	0.0	0.0	0.0	9.9			
24/01/2023 10:26			0.0	0.0	19.9	0.0	0.0	0.0	9.9			
24/01/2023 10:27			0.0	0.0	19.9	0.0	0.0	0.0	9.9			
24/01/2023 10:28			0.0	0.0	19.9	0.0	0.0	0.0	9.7			
24/01/2023 10:29											1.73	
30/01/2023 12:43	1020 / 0.01	6								0.4		
30/01/2023 12:44	1020 / 0.01	6								0.4		
30/01/2023 12:45	1020 / 0.01	6								0.2		
30/01/2023 12:46	1020 / 0.01	6								0.4		
30/01/2023 12:47	1020 / 0.01	6								0.2		

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/04**

INSTALLED PIPE DEPTH (m) 5.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
30/01/2023 12:49			0.0	0.0	20.4	0.0	0.0	0.0	0.0			
30/01/2023 12:50			0.0	0.0	20.0	0.0	0.0	0.0	0.0			
30/01/2023 12:51			0.0	0.0	20.1	0.0	0.0	0.0	0.0			
30/01/2023 12:52			0.0	0.0	20.0	0.0	0.0	0.0	0.0			
30/01/2023 12:53			0.0	0.0	20.1	0.0	0.0	0.0	0.0			
30/01/2023 12:54			0.0	0.0	20.1	0.0	0.0	0.0	0.0			
30/01/2023 12:55											1.95	
07/02/2023 10:35											1.94	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/05**

INSTALLED PIPE DEPTH (m) 3.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
05/12/2022 15:42												Dry
06/12/2022 12:02												Dry
07/12/2022 15:02												Dry
08/12/2022 16:02												Dry
09/12/2022 11:47												Dry
12/12/2022 14:42												Dry
13/12/2022 10:32												Dry
14/12/2022 10:32												Dry
15/12/2022 13:07												Dry
16/12/2022 13:32												Dry
19/12/2022 16:52												Dry
20/12/2022 16:02												Dry
21/12/2022 11:42												Dry
03/01/2023 16:35	1002 / 0.00	8								0.0		
03/01/2023 16:36	1001 / 0.00	8								0.0		
03/01/2023 16:37	1001 / 0.00	8								0.0		
03/01/2023 16:38	1001 / 0.00	8								0.0		

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
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Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/05**

INSTALLED PIPE DEPTH (m) 3.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
03/01/2023 16:39	1001 / 0.00	8								0.0		
03/01/2023 16:41			0.0	0.0	20.4	0.0	0.0	0.0	3.5			
03/01/2023 16:42			0.0	0.0	20.3	0.0	0.0	0.0	4.8			
03/01/2023 16:43			0.0	0.0	20.3	0.0	0.0	0.0	4.0			
03/01/2023 16:44			0.0	0.0	20.3	0.0	0.0	0.0	4.4			
03/01/2023 16:45			0.0	0.0	20.2	0.0	0.0	0.0	5.7			
03/01/2023 16:46			0.0	0.0	20.2	0.0	0.0	0.0	6.3			
03/01/2023 16:47			0.0	0.0	20.2	0.0	0.0	0.0	6.9			
03/01/2023 16:48			0.0	0.0	20.2	0.0	0.0	0.0	7.4			
03/01/2023 16:49			0.0	0.0	20.2	0.0	0.0	0.0	7.6			
03/01/2023 16:50			0.0	0.0	20.2	0.0	0.0	0.0	7.8			
03/01/2023 16:51												Dry
09/01/2023 15:50	1002 / 0.00	6								0.0		
09/01/2023 15:51	1000 / 0.00	6								0.0		
09/01/2023 15:52	1000 / 0.00	6								0.0		
09/01/2023 15:53	1000 / 0.00	6								0.0		
09/01/2023 15:54	1000 / 0.00	6								0.0		

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/05**

INSTALLED PIPE DEPTH (m) 3.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
09/01/2023 15:55			0.0	0.0	20.2	0.0	0.0	0.0	4.8			
09/01/2023 15:56			0.0	0.0	20.4	0.0	0.0	0.0	5.0			
09/01/2023 15:57			0.0	0.0	20.4	0.0	0.0	0.0	6.2			
09/01/2023 15:58			0.0	0.0	20.4	0.0	0.0	0.0	6.9			
09/01/2023 15:59			0.0	0.0	20.3	0.0	0.0	0.0	7.2			
09/01/2023 16:00			0.0	0.0	20.2	0.0	0.0	0.0	7.5			
09/01/2023 16:01			0.0	0.0	20.2	0.0	0.0	0.0	7.5			
09/01/2023 16:02			0.0	0.0	20.2	0.0	0.0	0.0	7.5			
09/01/2023 16:03			0.0	0.0	20.2	0.0	0.0	0.0	7.5			
09/01/2023 16:04			0.0	0.0	20.2	0.0	0.0	0.0	7.5			
09/01/2023 16:15												Dry
17/01/2023 15:49	980 / 0.00	1								0.0		
17/01/2023 15:50	980 / 0.00	1								0.0		
17/01/2023 15:51	980 / 0.00	1								0.0		
17/01/2023 15:52	981 / 0.00	1								0.0		
17/01/2023 15:53	980 / 0.00	1								0.0		
17/01/2023 15:54			0.0	0.0	19.9	0.0	0.0	0.0	3.8			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/05**

INSTALLED PIPE DEPTH (m) 3.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
17/01/2023 15:55			0.0	0.0	19.8	0.0	0.0	0.0	4.3			
17/01/2023 15:56			0.0	0.0	19.8	0.0	0.0	0.0	4.3			
17/01/2023 15:57			0.0	0.0	19.7	0.0	0.0	0.0	4.4			
17/01/2023 15:58			0.0	0.0	19.7	0.0	0.0	0.0	4.9			
17/01/2023 15:59			0.0	0.0	19.7	0.0	0.0	0.0	4.9			
17/01/2023 16:00			0.0	0.0	19.7	0.0	0.0	0.0	5.2			
17/01/2023 16:01			0.0	0.0	19.7	0.0	0.0	0.0	5.6			
17/01/2023 16:02			0.0	0.0	19.7	0.0	0.0	0.0	5.6			
17/01/2023 16:03			0.0	0.0	19.7	0.0	0.0	0.0	5.6			
17/01/2023 16:04												Dry
23/01/2023 15:44	1032 / 0.00	5								0.0		
23/01/2023 15:45	1033 / 0.00	5								0.0		
23/01/2023 15:46	1033 / 0.00	5								0.0		
23/01/2023 15:47	1033 / 0.00	5								0.0		
23/01/2023 15:48	1033 / 0.00	5								0.0		
23/01/2023 15:49			0.0	0.0	20.2	0.0	0.0	0.0	1.4			
23/01/2023 15:50			0.0	0.0	19.9	0.0	0.0	0.0	2.1			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/05**

INSTALLED PIPE DEPTH (m) 3.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
23/01/2023 15:51			0.0	0.0	20.0	0.0	0.0	0.0	2.7			
23/01/2023 15:52			0.0	0.0	20.2	0.0	0.0	0.0	2.9			
23/01/2023 15:53			0.0	0.0	20.2	0.0	0.0	0.0	2.9			
23/01/2023 15:54			0.0	0.0	20.1	0.0	0.0	0.0	2.9			
23/01/2023 15:55												Dry
30/01/2023 14:00	1019 / 0.00	6								0.0		
30/01/2023 14:01	1019 / 0.00	6								0.0		
30/01/2023 14:02	1020 / 0.00	6								0.0		
30/01/2023 14:03	1020 / 0.00	6								0.0		
30/01/2023 14:04	1020 / 0.00	6								0.0		
30/01/2023 14:06			2.0	0.0	15.5	0.0	0.0	0.0	0.8			
30/01/2023 14:07			2.3	0.0	12.0	0.0	0.0	0.0	1.7			
30/01/2023 14:08			2.5	0.0	11.1	0.0	0.0	0.0	2.2			
30/01/2023 14:09			2.7	0.0	10.4	0.0	0.0	0.0	2.4			
30/01/2023 14:10			2.7	0.0	10.4	0.0	0.0	0.0	2.7			
30/01/2023 14:11			2.5	0.0	10.6	0.0	0.0	0.0	2.5			
30/01/2023 14:12			2.6	0.0	10.7	0.0	0.0	0.0	2.7			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT **37349**

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Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/05**

INSTALLED PIPE DEPTH (m) 3.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
30/01/2023 14:13			2.5	0.0	11.1	0.0	0.0	0.0	2.6			
30/01/2023 14:14			2.7	0.0	11.0	0.0	0.0	0.0	2.9			
30/01/2023 14:15			2.5	0.0	11.3	0.0	0.0	0.0	2.7			
30/01/2023 14:16												Dry
07/02/2023 10:44												Dry

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/05**

INSTALLED PIPE DEPTH (m) 40.00

PIPE DIAMETER (mm) 35

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
05/12/2022 15:40											20.00	Pre-development.
06/12/2022 12:00											20.00	Pre-development.
07/12/2022 15:00											19.00	
08/12/2022 16:00											19.00	
09/12/2022 11:45											19.75	
12/12/2022 14:40											19.75	
13/12/2022 10:30											19.75	
14/12/2022 10:30											19.75	
15/12/2022 13:05											19.75	
16/12/2022 13:30											19.60	
19/12/2022 16:50											19.65	
20/12/2022 16:00											19.68	
21/12/2022 11:40											19.60	
04/01/2023 16:25											19.72	
09/01/2023 16:10											19.69	
17/01/2023 16:05											19.67	
23/01/2023 15:56											19.77	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/05**

INSTALLED PIPE DEPTH (m) 40.00

PIPE DIAMETER (mm) 35

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
30/01/2023 14:17											19.75	
07/02/2023 10:42											19.75	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/06A**

INSTALLED PIPE DEPTH (m) 4.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
21/12/2022 11:52											2.17	Pre-development.
04/01/2023 09:50	1001 / 0.00	11								0.0		
04/01/2023 09:51	1002 / 0.00	11								0.0		
04/01/2023 09:52	1002 / 0.00	11								0.0		
04/01/2023 09:53	1002 / 0.00	11								0.0		
04/01/2023 09:54	1002 / 0.00	11								0.0		
04/01/2023 09:56			0.0	0.0	19.6	0.0	0.0	0.0	6.3			
04/01/2023 09:57			0.0	0.0	20.0	0.0	0.0	0.0	7.3			
04/01/2023 09:58			0.0	0.0	19.8	0.0	0.0	0.0	7.9			
04/01/2023 09:59			0.0	0.0	19.8	0.0	0.0	0.0	8.5			
04/01/2023 10:00			0.0	0.0	19.8	0.0	0.0	0.0	8.9			
04/01/2023 10:01			0.0	0.0	19.8	0.0	0.0	0.0	9.6			
04/01/2023 10:02			0.0	0.0	19.8	0.0	0.0	0.0	9.9			
04/01/2023 10:03			0.0	0.0	19.8	0.0	0.0	0.0	10.6			
04/01/2023 10:04			0.0	0.0	19.8	0.0	0.0	0.0	11.2			
04/01/2023 10:05			0.0	0.0	19.8	0.0	0.0	0.0	11.9			
04/01/2023 10:06											2.14	Pre-development.

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/06A**

INSTALLED PIPE DEPTH (m) 4.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
09/01/2023 13:00	1002 / 0.00	7								0.0		
09/01/2023 13:01	1001 / 0.00	7								0.0		
09/01/2023 13:02	1001 / 0.00	7								0.0		
09/01/2023 13:03	1001 / 0.00	7								0.0		
09/01/2023 13:04	1000 / 0.00	7								0.0		
09/01/2023 13:05	1000 / 0.00	7								0.0		
09/01/2023 13:06	1000 / 0.00	7								0.0		
09/01/2023 13:07	1000 / 0.00	7								0.0		
09/01/2023 13:08			0.0	0.0	20.0	0.0	0.0	0.0	9.0			
09/01/2023 13:09			0.0	0.0	19.9	0.0	0.0	0.0	9.2			
09/01/2023 13:10			0.0	0.0	19.8	0.0	0.0	0.0	9.2			
09/01/2023 13:11			0.0	0.0	19.9	0.0	0.0	0.0	9.2			
09/01/2023 13:12			0.0	0.0	19.8	0.0	0.0	0.0	11.5			
09/01/2023 13:13			0.0	0.0	19.8	0.0	0.0	0.0	11.5			
09/01/2023 13:14			0.0	0.0	19.8	0.0	0.0	0.0	11.6			
09/01/2023 13:15			0.0	0.0	19.8	0.0	0.0	0.0	11.6			
09/01/2023 13:16			0.0	0.0	19.8	0.0	0.0	0.0	11.6			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/06A**

INSTALLED PIPE DEPTH (m) 4.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
09/01/2023 13:20											2.34	
17/01/2023 16:10	980 / 0.00	1								0.0		
17/01/2023 16:11	980 / 0.00	1								0.0		
17/01/2023 16:12	980 / 0.00	1								0.0		
17/01/2023 16:13	980 / 0.00	1								0.0		
17/01/2023 16:14	980 / 0.00	1								0.0		
17/01/2023 16:15			0.0	0.0	19.8	0.0	0.0	0.0	6.1			
17/01/2023 16:16			0.0	0.0	19.9	0.0	0.0	0.0	6.8			
17/01/2023 16:17			0.0	0.0	19.9	0.0	0.0	0.0	7.1			
17/01/2023 16:18			0.0	0.0	19.9	0.0	0.0	0.0	7.5			
17/01/2023 16:19			0.0	0.0	19.9	0.0	0.0	0.0	8.0			
17/01/2023 16:20			0.0	0.0	19.9	0.0	0.0	0.0	8.7			
17/01/2023 16:21			0.0	0.0	19.9	0.0	0.0	0.0	9.0			
17/01/2023 16:22			0.0	0.0	19.9	0.0	0.0	0.0	9.3			
17/01/2023 16:23			0.0	0.0	19.9	0.0	0.0	0.0	9.3			
17/01/2023 16:24			0.0	0.0	19.9	0.0	0.0	0.0	9.3			
17/01/2023 16:25											2.15	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/06A**

INSTALLED PIPE DEPTH (m) 4.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
23/01/2023 16:30	1035 / 0.00	5								0.0		
23/01/2023 16:31	1035 / 0.00	5								0.0		
23/01/2023 16:32	1035 / 0.00	5								0.0		
23/01/2023 16:33	1035 / 0.00	5								0.0		
23/01/2023 16:34	1035 / 0.00	5								0.0		
23/01/2023 16:35			0.0	0.0	19.9	0.0	0.0	0.0	0.6			
23/01/2023 16:36			0.0	0.0	19.8	0.0	0.0	0.0	0.6			
23/01/2023 16:37			0.0	0.0	19.7	0.0	0.0	0.0	0.5			
23/01/2023 16:38			0.0	0.0	19.7	0.0	0.0	0.0	0.5			
23/01/2023 16:39			0.0	0.0	19.8	0.0	0.0	0.0	0.4			
23/01/2023 16:40			0.0	0.0	19.9	0.0	0.0	0.0	0.4			
23/01/2023 16:41			0.0	0.0	19.9	0.0	0.0	0.0	0.4			
23/01/2023 16:42											2.30	
30/01/2023 13:40	1019 / 0.00	6								0.0		
30/01/2023 13:41	1019 / 0.00	6								0.0		
30/01/2023 13:42	1019 / 0.00	6								0.0		
30/01/2023 13:43	1019 / 0.00	6								0.0		

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/06A**

INSTALLED PIPE DEPTH (m) 4.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
30/01/2023 13:44	1019 / 0.00	6								0.0		
30/01/2023 13:46			0.0	0.0	12.1	0.0	0.0	0.0	9.9			
30/01/2023 13:47			0.0	0.0	10.9	0.0	0.0	0.0	12.2			
30/01/2023 13:48			0.0	0.0	11.2	0.0	0.0	0.0	12.5			
30/01/2023 13:49			0.0	0.0	11.3	0.0	0.0	0.0	13.5			
30/01/2023 13:50			0.0	0.0	11.1	0.0	0.0	0.0	13.3			
30/01/2023 13:51			0.0	0.0	12.0	0.0	0.0	0.0	13.7			
30/01/2023 13:52			0.0	0.0	12.1	0.0	0.0	0.0	14.0			
30/01/2023 13:53			0.0	0.0	11.9	0.0	0.0	0.0	14.0			
30/01/2023 13:54			0.0	0.0	12.2	0.0	0.0	0.0	14.0			
30/01/2023 13:55			0.0	0.0	12.4	0.0	0.0	0.0	13.5			
30/01/2023 13:56											2.30	
07/02/2023 10:16											2.37	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/06A**

INSTALLED PIPE DEPTH (m) 50.00

PIPE DIAMETER (mm) 35

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
21/12/2022 11:50											20.31	Pre-development.
04/01/2023 10:08											20.29	Pre-development.
09/01/2023 13:17											20.35	
17/01/2023 16:26											20.70	
23/01/2023 16:43											20.96	
30/01/2023 13:57											20.89	
07/02/2023 10:14											20.95	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/07**

INSTALLED PIPE DEPTH (m) 4.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
20/12/2022 15:32												Dry
21/12/2022 11:47											1.52	Pre-development.
03/01/2023 16:50	1000 / 0.00	8								0.0		
03/01/2023 16:51	1000 / 0.00	8								0.0		
03/01/2023 16:52	1000 / 0.00	8								0.0		
03/01/2023 16:53	1000 / 0.00	8								0.0		
03/01/2023 16:54	1000 / 0.00	8								0.0		
03/01/2023 16:56			0.0	0.0	20.2	0.0	0.0	0.0	11.9			
03/01/2023 16:57			0.0	0.0	20.0	0.0	0.0	0.0	19.2			
03/01/2023 16:58			0.0	0.0	19.9	0.0	0.0	0.0	21.3			
03/01/2023 16:59			0.0	0.0	19.9	0.0	0.0	0.0	23.7			
03/01/2023 17:00			0.0	0.0	19.9	0.0	0.0	0.0	25.1			
03/01/2023 17:01			0.0	0.0	19.9	0.0	0.0	0.0	25.9			
03/01/2023 17:02			0.0	0.0	19.9	0.0	0.0	0.0	26.8			
03/01/2023 17:03			0.0	0.0	19.9	0.0	0.0	0.0	27.6			
03/01/2023 17:04			0.0	0.0	19.9	0.0	0.0	0.0	28.1			
03/01/2023 17:05			0.0	0.0	19.9	0.0	0.0	0.0	28.5			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/07**

INSTALLED PIPE DEPTH (m) 4.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
03/01/2023 17:06											1.88	Pre-development.
09/01/2023 12:20	990 / 0.00	7								0.0		
09/01/2023 12:21	1000 / 0.00	7								0.0		
09/01/2023 12:22	1000 / 0.00	7								0.0		
09/01/2023 12:23	1000 / 0.00	7								0.0		
09/01/2023 12:24			0.0	0.0	19.9	0.0	0.0	0.0	21.0			
09/01/2023 12:25			0.0	0.0	19.9	0.0	0.0	0.0	22.5			
09/01/2023 12:26			0.0	0.0	20.0	0.0	0.0	0.0	22.7			
09/01/2023 12:27			0.0	0.0	20.0	0.0	0.0	0.0	23.9			
09/01/2023 12:28			0.0	0.0	20.0	0.0	0.0	0.0	26.8			
09/01/2023 12:29			0.0	0.0	20.0	0.0	0.0	0.0	28.0			
09/01/2023 12:30			0.0	0.0	20.0	0.0	0.0	0.0	28.0			
09/01/2023 12:31			0.0	0.0	20.0	0.0	0.0	0.0	28.0			
09/01/2023 12:32			0.0	0.0	20.0	0.0	0.0	0.0	28.0			
09/01/2023 12:40											1.88	
17/01/2023 16:31	981 / 0.00	1								0.0		
17/01/2023 16:32	981 / 0.00	1								0.0		

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/07**

INSTALLED PIPE DEPTH (m) 4.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
17/01/2023 16:33	981 / 0.00	1								0.0		
17/01/2023 16:34	981 / 0.00	1								0.0		
17/01/2023 16:35	981 / 0.00	1								0.0		
17/01/2023 16:36			0.0	0.0	20.2	0.0	0.0	0.0	13.4			
17/01/2023 16:37			0.0	0.0	20.0	0.0	0.0	0.0	14.3			
17/01/2023 16:38			0.0	0.0	19.9	0.0	0.0	0.0	17.2			
17/01/2023 16:39			0.0	0.0	19.9	0.0	0.0	0.0	17.5			
17/01/2023 16:40			0.0	0.0	19.9	0.0	0.0	0.0	19.8			
17/01/2023 16:41			0.0	0.0	19.9	0.0	0.0	0.0	22.7			
17/01/2023 16:42			0.0	0.0	19.9	0.0	0.0	0.0	23.4			
17/01/2023 16:43			0.0	0.0	19.9	0.0	0.0	0.0	24.0			
17/01/2023 16:44			0.0	0.0	19.9	0.0	0.0	0.0	24.1			
17/01/2023 16:45			0.0	0.0	19.9	0.0	0.0	0.0	24.1			
17/01/2023 16:46											2.28	
23/01/2023 16:00	1031 / 0.00	5								0.0		
23/01/2023 16:01	1031 / 0.00	5								0.0		
23/01/2023 16:02	1031 / 0.00	5								0.0		

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/07**

INSTALLED PIPE DEPTH (m) 4.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
23/01/2023 16:03	1031 / 0.00	5								0.0		
23/01/2023 16:04	1030 / 0.00	5								0.0		
23/01/2023 16:05			0.0	0.0	16.3	0.0	0.0	0.0	16.7			
23/01/2023 16:06			0.0	0.0	16.1	0.0	0.0	0.0	21.4			
23/01/2023 16:07			0.0	0.0	16.1	0.0	0.0	0.0	25.7			
23/01/2023 16:08			0.0	0.0	15.4	0.0	0.0	0.0	28.8			
23/01/2023 16:09			0.0	0.0	13.4	0.0	0.0	0.0	33.6			
23/01/2023 16:10			0.0	0.0	13.2	0.0	0.0	0.0	34.3			
23/01/2023 16:11			0.0	0.0	13.2	0.0	0.0	0.0	34.3			
23/01/2023 16:12											2.23	
30/01/2023 13:30	1019 / 0.00	6								0.0		
30/01/2023 13:31	1020 / 0.00	6								0.0		
30/01/2023 13:32	1020 / 0.00	6								0.0		
30/01/2023 13:33	1020 / 0.00	6								0.0		
30/01/2023 13:34	1020 / 0.00	6								0.0		
30/01/2023 13:36			0.0	0.0	15.0	0.0	0.0	0.0	0.4			
30/01/2023 13:37			0.0	0.0	19.4	0.0	0.0	0.0	0.2			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/07**

INSTALLED PIPE DEPTH (m) 4.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
30/01/2023 13:38			0.0	0.0	20.0	0.0	0.0	0.0	0.0			
30/01/2023 13:39			0.0	0.0	20.1	0.0	0.0	0.0	0.0			
30/01/2023 13:40			0.0	0.0	20.2	0.0	0.0	0.0	0.0			
30/01/2023 13:41			0.0	0.0	20.1	0.0	0.0	0.0	0.0			
30/01/2023 13:42			0.0	0.0	20.1	0.0	0.0	0.0	0.0			
30/01/2023 13:43											2.25	
07/02/2023 09:56											2.26	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/07**

INSTALLED PIPE DEPTH (m) 40.00

PIPE DIAMETER (mm) 35

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
20/12/2022 15:30											20.45	Pre-development.
21/12/2022 11:45											20.66	Pre-development.
05/01/2023 13:56											21.30	Pre-development.
09/01/2023 12:35											21.30	
17/01/2023 16:47											21.65	
23/01/2023 16:13											21.31	
30/01/2023 13:44											21.26	
07/02/2023 09:54											21.31	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/08**

INSTALLED PIPE DEPTH (m) 50.00

PIPE DIAMETER (mm) 35

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
21/12/2022 11:00											23.38	Pre-development.
04/01/2023 17:23											23.00	Pre-development.
09/01/2023 12:15											23.00	
17/01/2023 14:15											23.10	
24/01/2023 11:32											23.23	
30/01/2023 14:57											23.13	
07/02/2023 10:37											23.30	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/08**

INSTALLED PIPE DEPTH (m) 8.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
21/12/2022 11:02											1.14	Pre-development.
04/01/2023 17:10	1001 / 0.00	11								0.0		
04/01/2023 17:11	1002 / 0.00	11								0.0		
04/01/2023 17:12	1001 / 0.00	11								0.0		
04/01/2023 17:13	1002 / 0.00	11								0.0		
04/01/2023 17:14	1001 / 0.00	11								0.0		
04/01/2023 17:16			0.0	0.0	20.3	0.0	0.0	0.0	2.4			
04/01/2023 17:17			0.0	0.0	20.0	0.0	0.0	0.0	2.9			
04/01/2023 17:18			0.0	0.0	20.0	0.0	0.0	0.0	2.6			
04/01/2023 17:19			0.0	0.0	19.9	0.0	0.0	0.0	2.0			
04/01/2023 17:20			0.0	0.0	19.9	0.0	0.0	0.0	1.9			
04/01/2023 17:21											1.80	Pre-development.
09/01/2023 12:00	1000 / 0.00	7								0.0		
09/01/2023 12:01	1001 / 0.00	7								0.0		
09/01/2023 12:02	1000 / 0.00	7								0.0		
09/01/2023 12:03	1000 / 0.00	7								0.0		
09/01/2023 12:04	1000 / 0.00	7								0.0		

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/08**

INSTALLED PIPE DEPTH (m) 8.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
09/01/2023 12:05	1000 / 0.00	7								0.0		
09/01/2023 12:06			0.0	0.0	20.8	0.0	0.0	0.0	2.0			
09/01/2023 12:07			0.0	0.0	20.5	0.0	0.0	0.0	2.0			
09/01/2023 12:08			0.0	0.0	20.1	0.0	0.0	0.0	2.0			
09/01/2023 12:09			0.0	0.0	20.0	0.0	0.0	0.0	1.9			
09/01/2023 12:10			0.0	0.0	20.0	0.0	0.0	0.0	1.9			
09/01/2023 12:11			0.0	0.0	20.0	0.0	0.0	0.0	1.9			
09/01/2023 12:12			0.0	0.0	20.0	0.0	0.0	0.0	1.9			
09/01/2023 12:20											1.80	
17/01/2023 14:20	980 / 0.00	1								0.0		
17/01/2023 14:21	980 / 0.00	1								0.0		
17/01/2023 14:22	980 / 0.00	1								0.0		
17/01/2023 14:23	980 / 0.00	1								0.0		
17/01/2023 14:24	980 / 0.00	1								0.0		
17/01/2023 14:25			0.0	0.0	20.0	0.0	0.0	0.0	2.1			
17/01/2023 14:26			0.0	0.0	20.1	0.0	0.0	0.0	2.3			
17/01/2023 14:27			0.0	0.0	20.0	0.0	0.0	0.0	2.3			

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/08**

INSTALLED PIPE DEPTH (m) 8.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
17/01/2023 14:28			0.0	0.0	20.0	0.0	0.0	0.0	2.3			
17/01/2023 14:29			0.0	0.0	20.0	0.0	0.0	0.0	2.3			
17/01/2023 14:30											3.30	
24/01/2023 11:20	1033 / 0.00	4								0.0		
24/01/2023 11:21	1033 / 0.00	4								0.0		
24/01/2023 11:22	1033 / 0.00	4								0.0		
24/01/2023 11:23	1033 / 0.00	4								0.0		
24/01/2023 11:24	1033 / 0.00	4								0.0		
24/01/2023 11:25			0.0	0.0	9.1	0.0	0.0	0.0	3.6			
24/01/2023 11:26			0.0	0.0	8.3	0.0	0.0	0.0	3.6			
24/01/2023 11:27			0.0	0.0	8.5	0.0	0.0	0.0	3.6			
24/01/2023 11:28			0.0	0.0	9.3	0.0	0.0	0.0	3.6			
24/01/2023 11:29			0.0	0.0	9.0	0.0	0.0	0.0	3.6			
24/01/2023 11:30			0.0	0.0	9.0	0.0	0.0	0.0	3.6			
24/01/2023 11:31											2.80	
30/01/2023 14:45	1025 / -0.01	6								-5.4		
30/01/2023 14:46	1025 / 0.00	6								0.1		

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID **BH22/08**

INSTALLED PIPE DEPTH (m) 8.00

PIPE DIAMETER (mm) 50

date and time	barometric pressure / differentiation (mb)	termperature (°C)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	water level (m - bgl)	remarks
30/01/2023 14:47	1024 / 0.00	6								0.1		
30/01/2023 14:48	1023 / 0.00	6								0.1		
30/01/2023 14:49	1022 / 0.00	6								0.1		
30/01/2023 14:51			0.0	0.0	19.4	0.0	0.0	0.0	0.5			
30/01/2023 14:52			0.0	0.0	20.4	0.0	0.0	0.0	0.0			
30/01/2023 14:53			0.0	0.0	20.4	0.0	0.0	0.0	0.0			
30/01/2023 14:54			0.0	0.0	20.4	0.0	0.0	0.0	0.0			
30/01/2023 14:55			0.0	0.0	20.4	0.0	0.0	0.0	0.0			
30/01/2023 14:56											2.97	
07/02/2023 10:39											2.92	

remarks

denotes results exceeding capacity of gas monitoring equipment

VOC - Photoionisation Detector Mini RAE Lite measures VOC vapours with 10.6eV lamp calibrated against isobutylene

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GROUNDWATER LEVELS

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Borehole /trial pit no.	Installation base depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Remarks
(WS)TP22/01	2.60	1.00 - 2.60	08/12/2022 16:15			Dry
(WS)TP22/01	2.60	1.00 - 2.60	09/12/2022 11:40			Dry
(WS)TP22/01	2.60	1.00 - 2.60	12/12/2022 14:35			Dry
(WS)TP22/01	2.60	1.00 - 2.60	13/12/2022 10:25			Dry
(WS)TP22/01	2.60	1.00 - 2.60	14/12/2022 10:25			Dry
(WS)TP22/01	2.60	1.00 - 2.60	15/12/2022 13:00			Dry
(WS)TP22/01	2.60	1.00 - 2.60	16/12/2022 13:25			Dry
(WS)TP22/01	2.60	1.00 - 2.60	19/12/2022 16:45			Dry
(WS)TP22/01	2.60	1.00 - 2.60	20/12/2022 15:55			Dry
(WS)TP22/01	2.60	1.00 - 2.60	21/12/2022 11:35			Dry
(WS)TP22/01	2.60	1.00 - 2.60	03/01/2023 16:36			Dry
(WS)TP22/01	2.60	1.00 - 2.60	09/01/2023 16:29			Dry
(WS)TP22/01	2.60	1.00 - 2.60	17/01/2023 17:04			Dry
(WS)TP22/01	2.60	1.00 - 2.60	24/01/2023 10:50			Dry
(WS)TP22/01	2.60	1.00 - 2.60	30/01/2023 13:21			Dry
(WS)TP22/01	2.60	1.00 - 2.60	07/02/2023 10:37			Dry
BH22/01	4.00	0.50 - 4.00	01/12/2022 11:22	2.22	58.33	Pre-development.
BH22/01	4.00	0.50 - 4.00	05/12/2022 15:52	2.28	58.27	Pre-development.
BH22/01	4.00	0.50 - 4.00	06/12/2022 09:02	2.56	57.99	Pre-development.
BH22/01	4.00	0.50 - 4.00	07/12/2022 15:07	2.35	58.20	Pre-development.
BH22/01	4.00	0.50 - 4.00	08/12/2022 16:07	2.42	58.13	Pre-development.
BH22/01	4.00	0.50 - 4.00	09/12/2022 11:32	2.40	58.15	Pre-development.
BH22/01	4.00	0.50 - 4.00	12/12/2022 13:12	2.25	58.30	Pre-development.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GROUNDWATER LEVELS

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Borehole /trial pit no.	Installation base depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Remarks
BH22/01	4.00	0.50 - 4.00	13/12/2022 10:17	2.30	58.25	Pre-development.
BH22/01	4.00	0.50 - 4.00	14/12/2022 10:17	2.28	58.27	Pre-development.
BH22/01	4.00	0.50 - 4.00	15/12/2022 12:57	2.25	58.30	Pre-development.
BH22/01	4.00	0.50 - 4.00	16/12/2022 13:22	2.26	58.29	Pre-development.
BH22/01	4.00	0.50 - 4.00	19/12/2022 16:42	2.25	58.30	Pre-development.
BH22/01	4.00	0.50 - 4.00	20/12/2022 15:52	2.25	58.30	Pre-development.
BH22/01	4.00	0.50 - 4.00	21/12/2022 11:32	2.25	58.30	Pre-development.
BH22/01	4.00	0.50 - 4.00	03/01/2023 15:38	2.20	58.35	Pre-development.
BH22/01	4.00	0.50 - 4.00	09/01/2023 15:02	2.00	58.55	
BH22/01	4.00	0.50 - 4.00	17/01/2023 14:47	2.25	58.30	
BH22/01	4.00	0.50 - 4.00	24/01/2023 09:50	2.43	58.12	
BH22/01	4.00	0.50 - 4.00	30/01/2023 12:36	2.37	58.18	
BH22/01	4.00	0.50 - 4.00	07/02/2023 10:28	2.35	58.20	
BH22/01	52.00	42.00 - 52.00	01/12/2022 11:20	19.00	41.55	Pre-development.
BH22/01	52.00	42.00 - 52.00	05/12/2022 15:50	23.60	36.95	Pre-development.
BH22/01	52.00	42.00 - 52.00	06/12/2022 09:00	23.65	36.90	Pre-development.
BH22/01	52.00	42.00 - 52.00	07/12/2022 15:05	19.20	41.35	Pre-development.
BH22/01	52.00	42.00 - 52.00	08/12/2022 16:05	19.10	41.45	Pre-development.
BH22/01	52.00	42.00 - 52.00	09/12/2022 11:30	19.20	41.35	Pre-development.
BH22/01	52.00	42.00 - 52.00	12/12/2022 13:10	19.25	41.30	Pre-development.
BH22/01	52.00	42.00 - 52.00	13/12/2022 10:15	19.30	41.25	
BH22/01	52.00	42.00 - 52.00	14/12/2022 10:15	19.20	41.35	
BH22/01	52.00	42.00 - 52.00	15/12/2022 12:55	19.13	41.42	

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GROUNDWATER LEVELS

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Borehole /trial pit no.	Installation base depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Remarks
BH22/01	52.00	42.00 - 52.00	16/12/2022 13:20	19.25	41.30	
BH22/01	52.00	42.00 - 52.00	19/12/2022 16:40	19.20	41.35	
BH22/01	52.00	42.00 - 52.00	20/12/2022 15:50	19.23	41.32	
BH22/01	52.00	42.00 - 52.00	21/12/2022 11:30	19.22	41.33	
BH22/01	52.00	42.00 - 52.00	04/01/2023 14:19	19.30	41.25	
BH22/01	52.00	42.00 - 52.00	09/01/2023 14:12	19.20	41.35	
BH22/01	52.00	42.00 - 52.00	17/01/2023 14:48	19.20	41.35	
BH22/01	52.00	42.00 - 52.00	24/01/2023 09:51	19.40	41.15	
BH22/01	52.00	42.00 - 52.00	30/01/2023 12:37	19.30	41.25	
BH22/01	52.00	42.00 - 52.00	07/02/2023 10:26	19.35	41.20	
BH22/02	3.00	0.90 - 3.10	09/12/2022 11:52			Dry
BH22/02	3.00	0.90 - 3.10	12/12/2022 15:22			Dry
BH22/02	3.00	0.90 - 3.10	13/12/2022 10:12			Dry
BH22/02	3.00	0.90 - 3.10	14/12/2022 10:12			Dry
BH22/02	3.00	0.90 - 3.10	15/12/2022 12:47			Dry
BH22/02	3.00	0.90 - 3.10	16/12/2022 13:17			Dry
BH22/02	3.00	0.90 - 3.10	19/12/2022 16:37			Dry
BH22/02	3.00	0.90 - 3.10	20/12/2022 15:47			Dry
BH22/02	3.00	0.90 - 3.10	21/12/2022 11:12			Dry
BH22/02	3.00	0.90 - 3.10	04/01/2023 09:51			Dry
BH22/02	3.00	0.90 - 3.10	09/01/2023 14:30			Dry
BH22/02	3.00	0.90 - 3.10	17/01/2023 15:03			Dry
BH22/02	3.00	0.90 - 3.10	24/01/2023 10:13			Dry

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GROUNDWATER LEVELS

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Borehole /trial pit no.	Installation base depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Remarks
BH22/02	3.00	0.90 - 3.10	30/01/2023 15:46			Dry
BH22/02	3.00	0.90 - 3.10	07/02/2023 10:22			Dry
BH22/02	40.00	29.90 - 40.00	09/12/2022 11:50	19.55	41.00	Pre-development.
BH22/02	40.00	29.90 - 40.00	12/12/2022 15:20	19.65	40.90	Pre-development.
BH22/02	40.00	29.90 - 40.00	13/12/2022 10:10	19.65	40.90	Pre-development.
BH22/02	40.00	29.90 - 40.00	14/12/2022 10:10	19.42	41.13	
BH22/02	40.00	29.90 - 40.00	15/12/2022 12:45	19.36	41.19	
BH22/02	40.00	29.90 - 40.00	16/12/2022 13:15	19.21	41.34	
BH22/02	40.00	29.90 - 40.00	19/12/2022 16:35	19.25	41.30	
BH22/02	40.00	29.90 - 40.00	20/12/2022 15:45	19.28	41.27	
BH22/02	40.00	29.90 - 40.00	21/12/2022 11:10	19.28	41.27	
BH22/02	40.00	29.90 - 40.00	04/01/2023 15:16	19.33	41.22	
BH22/02	40.00	29.90 - 40.00	09/01/2023 14:30	19.26	41.29	
BH22/02	40.00	29.90 - 40.00	17/01/2023 15:04	19.93	40.62	
BH22/02	40.00	29.90 - 40.00	24/01/2023 10:14	19.47	41.08	
BH22/02	40.00	29.90 - 40.00	30/01/2023 15:47	19.35	41.20	
BH22/02	40.00	29.90 - 40.00	07/02/2023 10:20	19.37	41.18	
BH22/03	3.00	0.80 - 3.10	05/12/2022 15:57	2.56	58.29	Pre-development.
BH22/03	3.00	0.80 - 3.10	06/12/2022 09:07	2.42	58.43	Pre-development.
BH22/03	3.00	0.80 - 3.10	07/12/2022 15:12	2.40	58.45	Pre-development.
BH22/03	3.00	0.80 - 3.10	08/12/2022 16:12	2.35	58.50	Pre-development.
BH22/03	3.00	0.80 - 3.10	09/12/2022 11:27	2.24	58.61	Pre-development.
BH22/03	3.00	0.80 - 3.10	12/12/2022 15:17	2.15	58.70	Pre-development.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GROUNDWATER LEVELS

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Borehole /trial pit no.	Installation base depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Remarks
BH22/03	3.00	0.80 - 3.10	13/12/2022 10:02	2.15	58.70	Pre-development.
BH22/03	3.00	0.80 - 3.10	14/12/2022 10:02	2.12	58.73	Pre-development.
BH22/03	3.00	0.80 - 3.10	15/12/2022 12:42	2.10	58.75	Pre-development.
BH22/03	3.00	0.80 - 3.10	16/12/2022 13:12	2.10	58.75	Pre-development.
BH22/03	3.00	0.80 - 3.10	19/12/2022 16:27	2.10	58.75	Pre-development.
BH22/03	3.00	0.80 - 3.10	20/12/2022 15:42	2.12	58.73	Pre-development.
BH22/03	3.00	0.80 - 3.10	21/12/2022 11:07	2.11	58.74	Pre-development.
BH22/03	3.00	0.80 - 3.10	04/01/2023 10:11	2.02	58.83	Pre-development.
BH22/03	3.00	0.80 - 3.10	09/01/2023 14:10	1.90	58.95	
BH22/03	3.00	0.80 - 3.10	17/01/2023 15:20	2.00	58.85	
BH22/03	3.00	0.80 - 3.10	24/01/2023 11:11	2.07	58.78	
BH22/03	3.00	0.80 - 3.10	30/01/2023 14:11	2.09	58.76	
BH22/03	3.00	0.80 - 3.10	07/02/2023 10:08	2.10	58.75	
BH22/03	62.00	49.80 - 62.00	05/12/2022 15:55	23.60	37.25	Pre-development.
BH22/03	62.00	49.80 - 62.00	06/12/2022 09:05	19.20	41.65	Pre-development.
BH22/03	62.00	49.80 - 62.00	07/12/2022 15:10	22.50	38.35	Pre-development.
BH22/03	62.00	49.80 - 62.00	08/12/2022 16:10	22.56	38.29	Pre-development.
BH22/03	62.00	49.80 - 62.00	09/12/2022 11:25	22.55	38.30	
BH22/03	62.00	49.80 - 62.00	12/12/2022 15:15	22.60	38.25	
BH22/03	62.00	49.80 - 62.00	13/12/2022 10:00	22.60	38.25	
BH22/03	62.00	49.80 - 62.00	14/12/2022 10:00	22.61	38.24	
BH22/03	62.00	49.80 - 62.00	15/12/2022 12:40	22.62	38.23	
BH22/03	62.00	49.80 - 62.00	16/12/2022 13:10	22.82	38.03	

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GROUNDWATER LEVELS

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Borehole /trial pit no.	Installation base depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Remarks
BH22/03	62.00	49.80 - 62.00	19/12/2022 16:25	22.55	38.30	
BH22/03	62.00	49.80 - 62.00	20/12/2022 15:40	22.61	38.24	
BH22/03	62.00	49.80 - 62.00	21/12/2022 11:05	22.60	38.25	
BH22/03	62.00	49.80 - 62.00	04/01/2023 13:18	22.55	38.30	
BH22/03	62.00	49.80 - 62.00	09/01/2023 14:05	21.85	39.00	
BH22/03	62.00	49.80 - 62.00	17/01/2023 15:21	22.37	38.48	
BH22/03	62.00	49.80 - 62.00	24/01/2023 11:12	22.49	38.36	
BH22/03	62.00	49.80 - 62.00	30/01/2023 14:12	22.47	38.38	
BH22/03	62.00	49.80 - 62.00	07/02/2023 10:06	22.53	38.32	
BH22/04	5.00	1.00 - 5.00	21/12/2022 11:22	0.75	59.85	Pre-development.
BH22/04	5.00	1.00 - 5.00	03/01/2023 16:11	0.65	59.95	Pre-development.
BH22/04	5.00	1.00 - 5.00	09/01/2023 15:35	0.70	59.90	
BH22/04	5.00	1.00 - 5.00	17/01/2023 15:37	1.85	58.75	
BH22/04	5.00	1.00 - 5.00	24/01/2023 10:29	1.73	58.87	
BH22/04	5.00	1.00 - 5.00	30/01/2023 12:55	1.95	58.65	
BH22/04	5.00	1.00 - 5.00	07/02/2023 10:35	1.94	58.66	
BH22/04	40.00	30.00 - 40.00	21/12/2022 11:20	19.19	41.41	Pre-development.
BH22/04	40.00	30.00 - 40.00	03/01/2023 16:13	19.15	41.45	Pre-development.
BH22/04	40.00	30.00 - 40.00	09/01/2023 15:30	19.80	40.80	
BH22/04	40.00	30.00 - 40.00	17/01/2023 15:28	21.40	39.20	
BH22/04	40.00	30.00 - 40.00	24/01/2023 10:30	19.38	41.22	
BH22/04	40.00	30.00 - 40.00	30/01/2023 12:56	19.31	41.29	
BH22/04	40.00	30.00 - 40.00	07/02/2023 10:33	19.36	41.24	

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GROUNDWATER LEVELS

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Borehole /trial pit no.	Installation base depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Remarks
BH22/05	3.00	1.00 - 3.00	05/12/2022 15:42			Dry
BH22/05	3.00	1.00 - 3.00	06/12/2022 12:02			Dry
BH22/05	3.00	1.00 - 3.00	07/12/2022 15:02			Dry
BH22/05	3.00	1.00 - 3.00	08/12/2022 16:02			Dry
BH22/05	3.00	1.00 - 3.00	09/12/2022 11:47			Dry
BH22/05	3.00	1.00 - 3.00	12/12/2022 14:42			Dry
BH22/05	3.00	1.00 - 3.00	13/12/2022 10:32			Dry
BH22/05	3.00	1.00 - 3.00	14/12/2022 10:32			Dry
BH22/05	3.00	1.00 - 3.00	15/12/2022 13:07			Dry
BH22/05	3.00	1.00 - 3.00	16/12/2022 13:32			Dry
BH22/05	3.00	1.00 - 3.00	19/12/2022 16:52			Dry
BH22/05	3.00	1.00 - 3.00	20/12/2022 16:02			Dry
BH22/05	3.00	1.00 - 3.00	21/12/2022 11:42			Dry
BH22/05	3.00	1.00 - 3.00	03/01/2023 16:51			Dry
BH22/05	3.00	1.00 - 3.00	09/01/2023 16:15			Dry
BH22/05	3.00	1.00 - 3.00	17/01/2023 16:04			Dry
BH22/05	3.00	1.00 - 3.00	23/01/2023 15:55			Dry
BH22/05	3.00	1.00 - 3.00	30/01/2023 14:16			Dry
BH22/05	3.00	1.00 - 3.00	07/02/2023 10:44			Dry
BH22/05	40.00	30.00 - 40.00	05/12/2022 15:40	20.00	40.95	Pre-development.
BH22/05	40.00	30.00 - 40.00	06/12/2022 12:00	20.00	40.95	Pre-development.
BH22/05	40.00	30.00 - 40.00	07/12/2022 15:00	19.00	41.95	
BH22/05	40.00	30.00 - 40.00	08/12/2022 16:00	19.00	41.95	

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GROUNDWATER LEVELS

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Borehole /trial pit no.	Installation base depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Remarks
BH22/05	40.00	30.00 - 40.00	09/12/2022 11:45	19.75	41.20	
BH22/05	40.00	30.00 - 40.00	12/12/2022 14:40	19.75	41.20	
BH22/05	40.00	30.00 - 40.00	13/12/2022 10:30	19.75	41.20	
BH22/05	40.00	30.00 - 40.00	14/12/2022 10:30	19.75	41.20	
BH22/05	40.00	30.00 - 40.00	15/12/2022 13:05	19.75	41.20	
BH22/05	40.00	30.00 - 40.00	16/12/2022 13:30	19.60	41.35	
BH22/05	40.00	30.00 - 40.00	19/12/2022 16:50	19.65	41.30	
BH22/05	40.00	30.00 - 40.00	20/12/2022 16:00	19.68	41.27	
BH22/05	40.00	30.00 - 40.00	21/12/2022 11:40	19.60	41.35	
BH22/05	40.00	30.00 - 40.00	04/01/2023 16:25	19.72	41.23	
BH22/05	40.00	30.00 - 40.00	09/01/2023 16:10	19.69	41.26	
BH22/05	40.00	30.00 - 40.00	17/01/2023 16:05	19.67	41.28	
BH22/05	40.00	30.00 - 40.00	23/01/2023 15:56	19.77	41.18	
BH22/05	40.00	30.00 - 40.00	30/01/2023 14:17	19.75	41.20	
BH22/05	40.00	30.00 - 40.00	07/02/2023 10:42	19.75	41.20	
BH22/06A	4.00	1.00 - 4.00	21/12/2022 11:52	2.17	58.43	Pre-development.
BH22/06A	4.00	1.00 - 4.00	04/01/2023 10:06	2.14	58.46	Pre-development.
BH22/06A	4.00	1.00 - 4.00	09/01/2023 13:20	2.34	58.26	
BH22/06A	4.00	1.00 - 4.00	17/01/2023 16:25	2.15	58.45	
BH22/06A	4.00	1.00 - 4.00	23/01/2023 16:42	2.30	58.30	
BH22/06A	4.00	1.00 - 4.00	30/01/2023 13:56	2.30	58.30	
BH22/06A	4.00	1.00 - 4.00	07/02/2023 10:16	2.37	58.23	
BH22/06A	50.00	40.00 - 50.00	21/12/2022 11:50	20.31	40.29	Pre-development.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GROUNDWATER LEVELS

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Borehole /trial pit no.	Installation base depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Remarks
BH22/06A	50.00	40.00 - 50.00	04/01/2023 10:08	20.29	40.31	Pre-development.
BH22/06A	50.00	40.00 - 50.00	09/01/2023 13:17	20.35	40.25	
BH22/06A	50.00	40.00 - 50.00	17/01/2023 16:26	20.70	39.90	
BH22/06A	50.00	40.00 - 50.00	23/01/2023 16:43	20.96	39.64	
BH22/06A	50.00	40.00 - 50.00	30/01/2023 13:57	20.89	39.71	
BH22/06A	50.00	40.00 - 50.00	07/02/2023 10:14	20.95	39.65	
BH22/07	4.00	0.90 - 4.20	20/12/2022 15:32			Dry
BH22/07	4.00	0.90 - 4.20	21/12/2022 11:47	1.52	59.48	Pre-development.
BH22/07	4.00	0.90 - 4.20	03/01/2023 17:06	1.88	59.12	Pre-development.
BH22/07	4.00	0.90 - 4.20	09/01/2023 12:40	1.88	59.12	
BH22/07	4.00	0.90 - 4.20	17/01/2023 16:46	2.28	58.72	
BH22/07	4.00	0.90 - 4.20	23/01/2023 16:12	2.23	58.77	
BH22/07	4.00	0.90 - 4.20	30/01/2023 13:43	2.25	58.75	
BH22/07	4.00	0.90 - 4.20	07/02/2023 09:56	2.26	58.74	
BH22/07	40.00	29.90 - 40.00	20/12/2022 15:30	20.45	40.55	Pre-development.
BH22/07	40.00	29.90 - 40.00	21/12/2022 11:45	20.66	40.34	Pre-development.
BH22/07	40.00	29.90 - 40.00	05/01/2023 13:56	21.30	39.70	Pre-development.
BH22/07	40.00	29.90 - 40.00	09/01/2023 12:35	21.30	39.70	
BH22/07	40.00	29.90 - 40.00	17/01/2023 16:47	21.65	39.35	
BH22/07	40.00	29.90 - 40.00	23/01/2023 16:13	21.31	39.69	
BH22/07	40.00	29.90 - 40.00	30/01/2023 13:44	21.26	39.74	
BH22/07	40.00	29.90 - 40.00	07/02/2023 09:54	21.31	39.69	
BH22/08	8.00	1.00 - 8.00	21/12/2022 11:02	1.14	60.01	Pre-development.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

GROUNDWATER LEVELS

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

Borehole /trial pit no.	Installation base depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Remarks
BH22/08	8.00	1.00 - 8.00	04/01/2023 17:21	1.80	59.35	Pre-development.
BH22/08	8.00	1.00 - 8.00	09/01/2023 12:20	1.80	59.35	
BH22/08	8.00	1.00 - 8.00	17/01/2023 14:30	3.30	57.85	
BH22/08	8.00	1.00 - 8.00	24/01/2023 11:31	2.80	58.35	
BH22/08	8.00	1.00 - 8.00	30/01/2023 14:56	2.97	58.18	
BH22/08	8.00	1.00 - 8.00	07/02/2023 10:39	2.92	58.23	
BH22/08	50.00	40.00 - 50.00	21/12/2022 11:00	23.38	37.77	Pre-development.
BH22/08	50.00	40.00 - 50.00	04/01/2023 17:23	23.00	38.15	Pre-development.
BH22/08	50.00	40.00 - 50.00	09/01/2023 12:15	23.00	38.15	
BH22/08	50.00	40.00 - 50.00	17/01/2023 14:15	23.10	38.05	
BH22/08	50.00	40.00 - 50.00	24/01/2023 11:32	23.23	37.92	
BH22/08	50.00	40.00 - 50.00	30/01/2023 14:57	23.13	38.02	
BH22/08	50.00	40.00 - 50.00	07/02/2023 10:37	23.30	37.85	

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

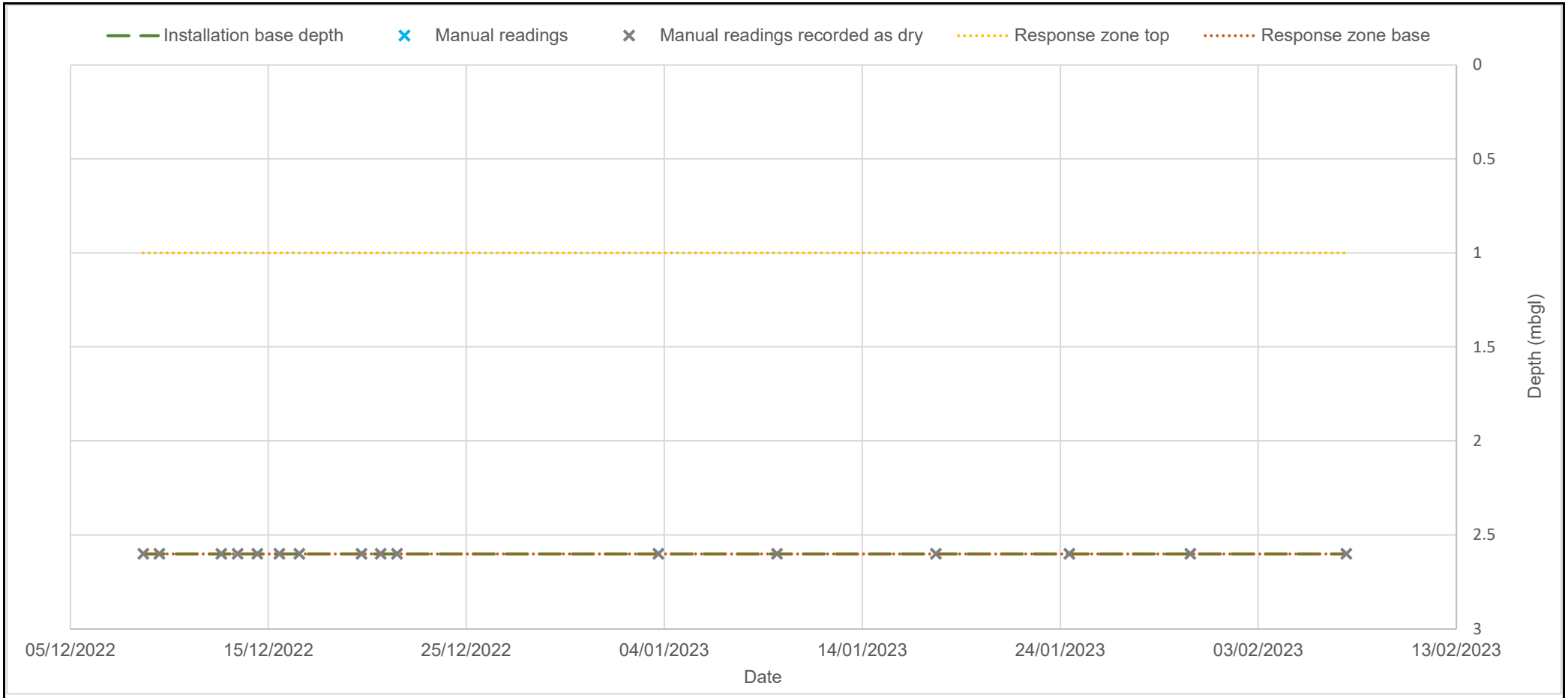
GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID: **(WS)TP22/01**

INSTALLATION BASE DEPTH (m) 2.60



Notes:
Water levels recorded as dry are plotted at the installed base of pipework for visual representation only.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

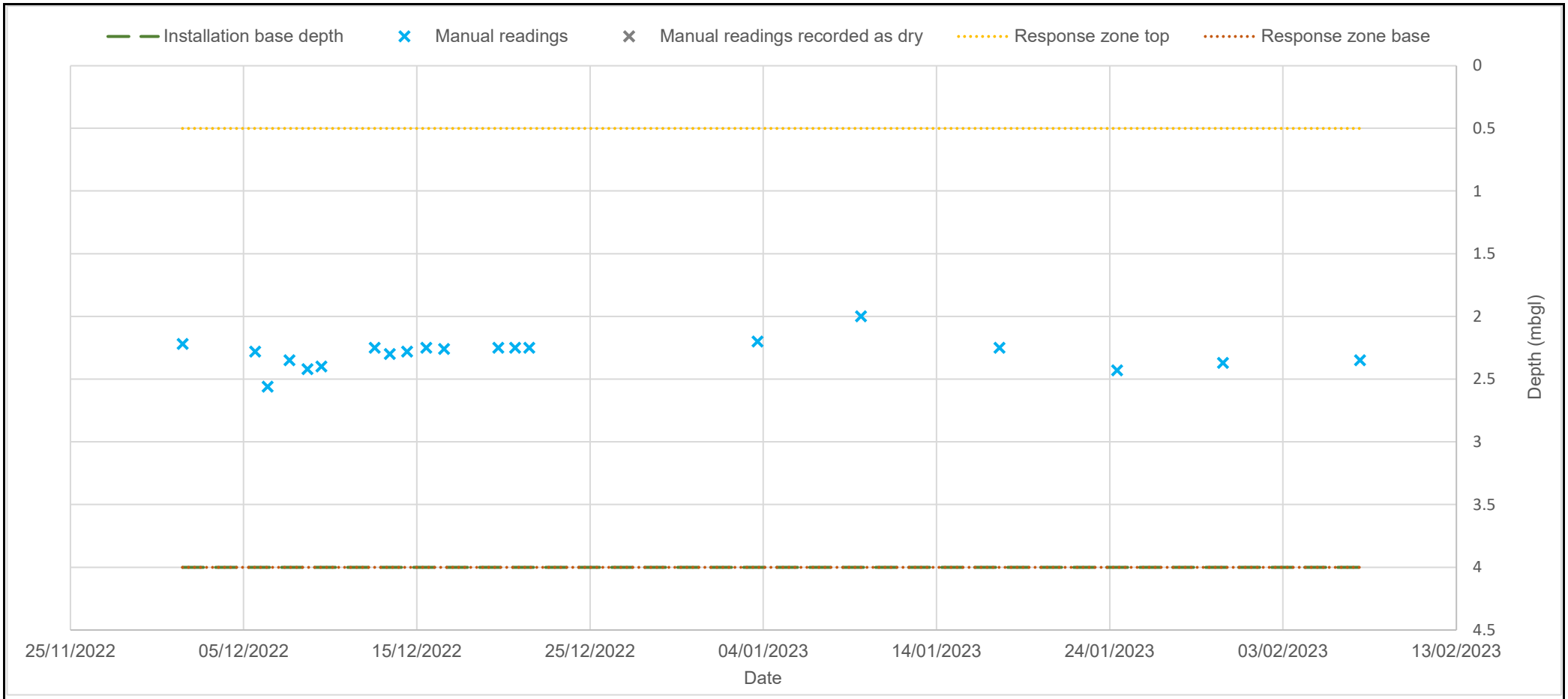
GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID: **BH22/01**

INSTALLATION BASE DEPTH (m) 4.00



Notes:
Water levels recorded as dry are plotted at the installed base of pipework for visual representation only.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

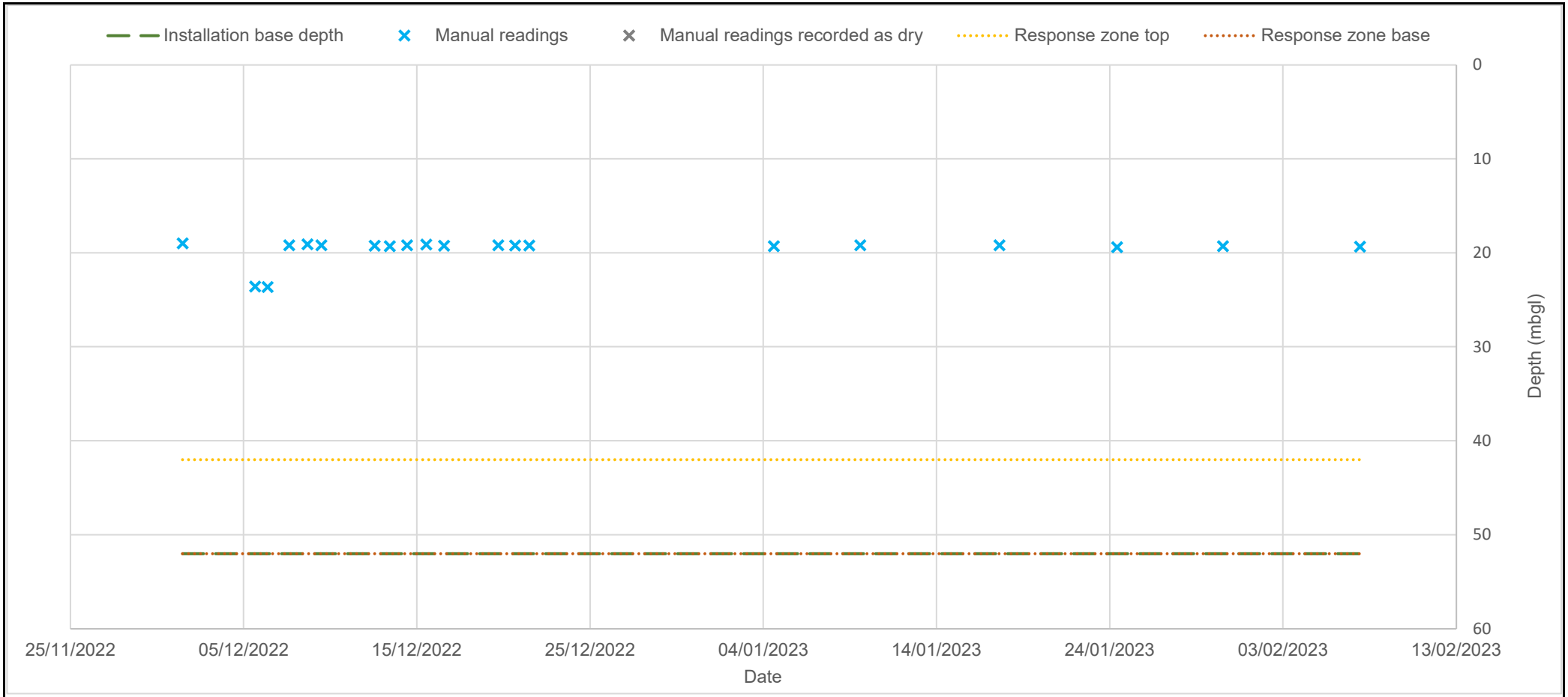
GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID: **BH22/01**

INSTALLATION BASE DEPTH (m) 52.00



Notes:
Water levels recorded as dry are plotted at the installed base of pipework for visual representation only.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

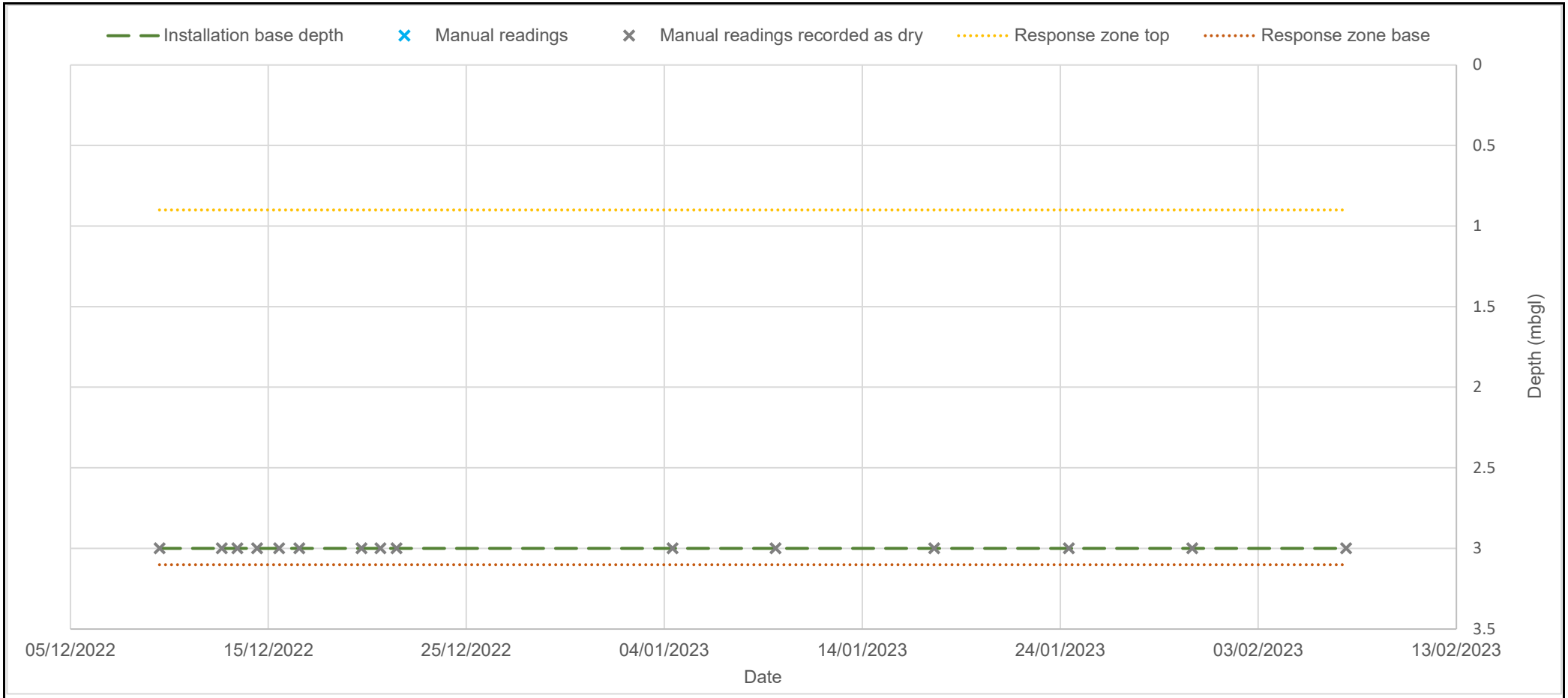
GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID: **BH22/02**

INSTALLATION BASE DEPTH (m) 3.00



Notes:
Water levels recorded as dry are plotted at the installed base of pipework for visual representation only.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

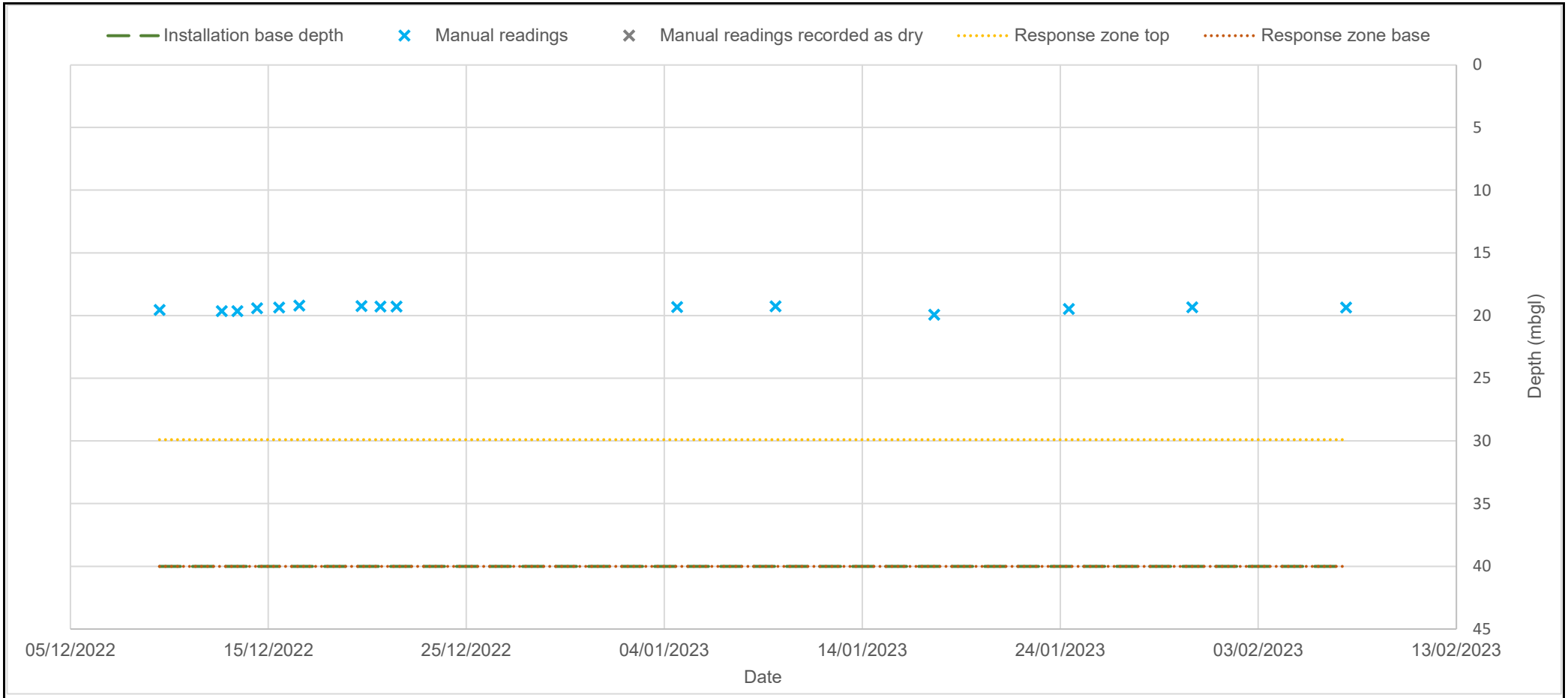
GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID: **BH22/02**

INSTALLATION BASE DEPTH (m) 40.00



Notes:
Water levels recorded as dry are plotted at the installed base of pipework for visual representation only.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

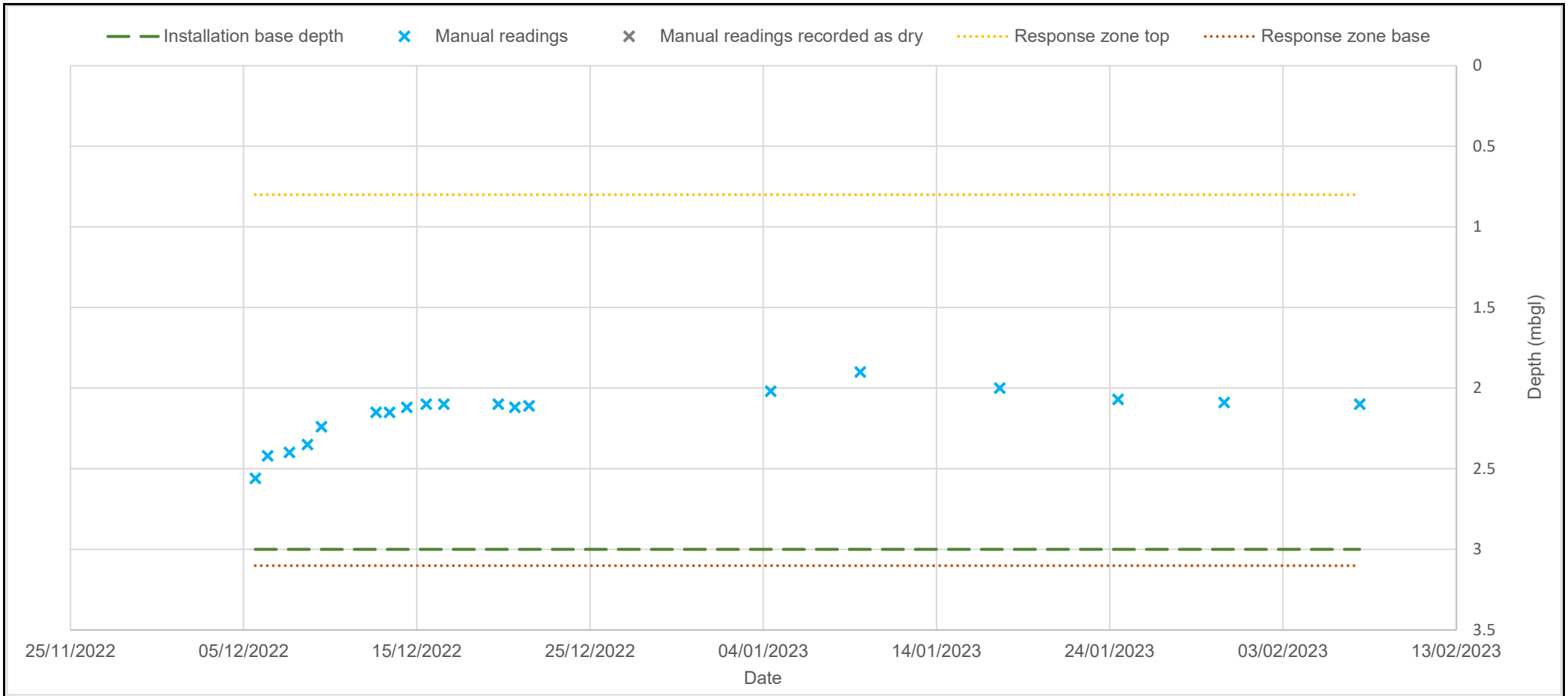
GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID: **BH22/03**

INSTALLATION BASE DEPTH (m) 3.00



Notes:
Water levels recorded as dry are plotted at the installed base of pipework for visual representation only.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

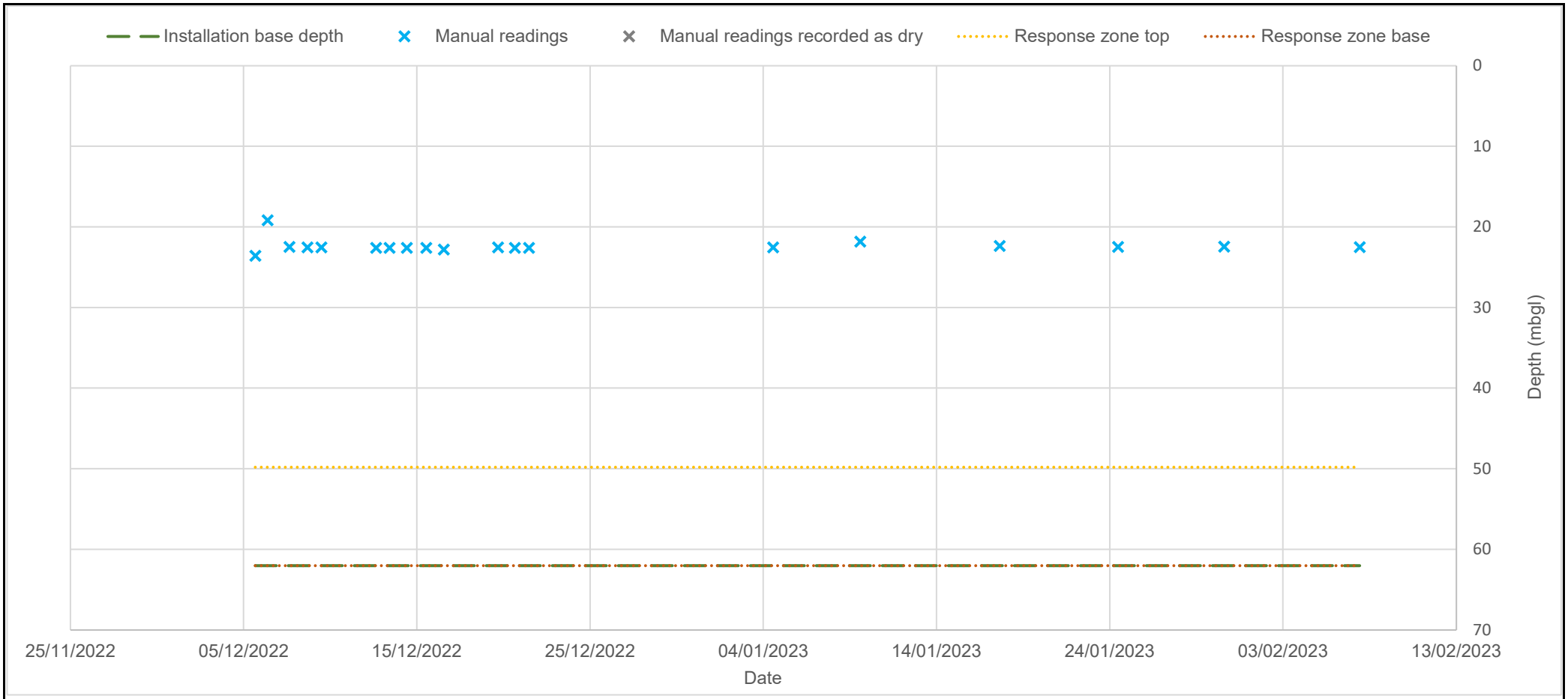
GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID: **BH22/03**

INSTALLATION BASE DEPTH (m) 62.00



Notes:
Water levels recorded as dry are plotted at the installed base of pipework for visual representation only.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

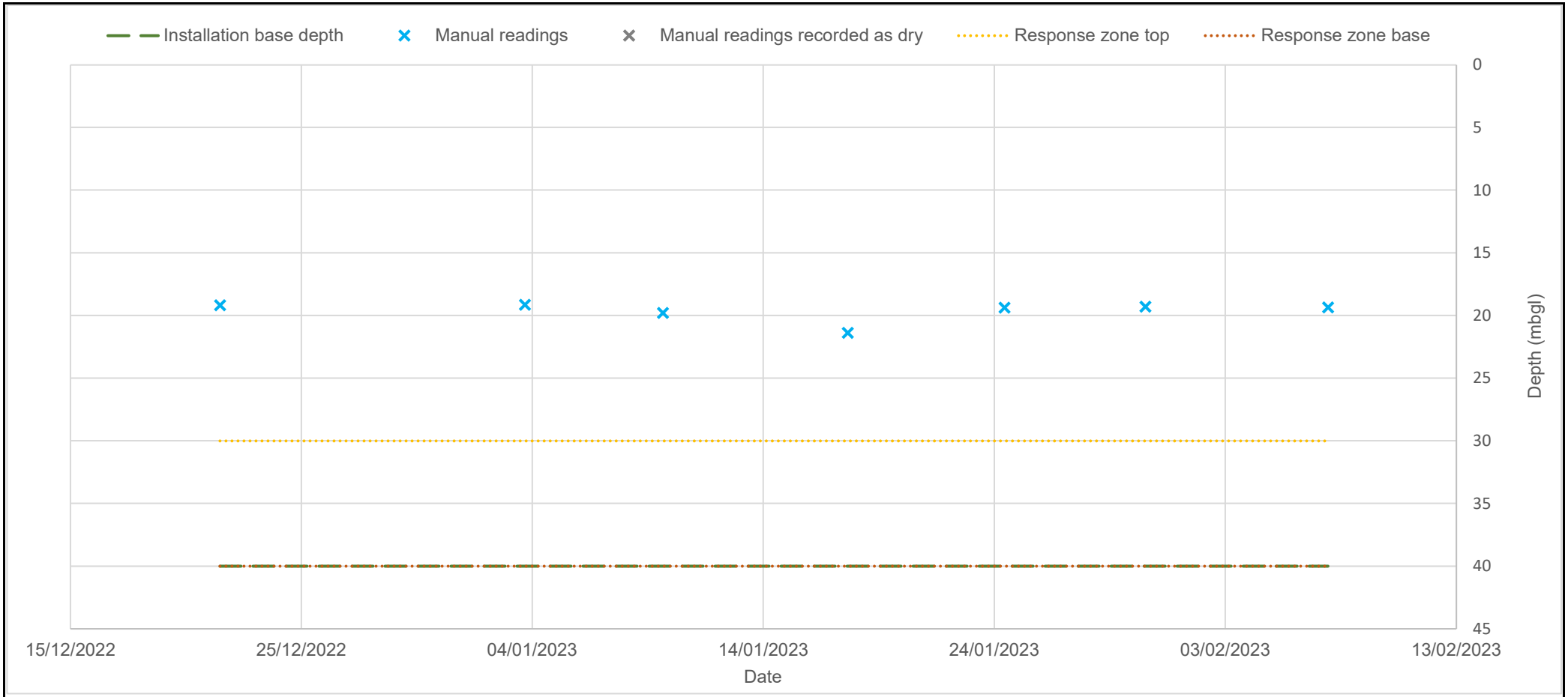
GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID: **BH22/04**

INSTALLATION BASE DEPTH (m) 40.00



Notes:
Water levels recorded as dry are plotted at the installed base of pipework for visual representation only.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

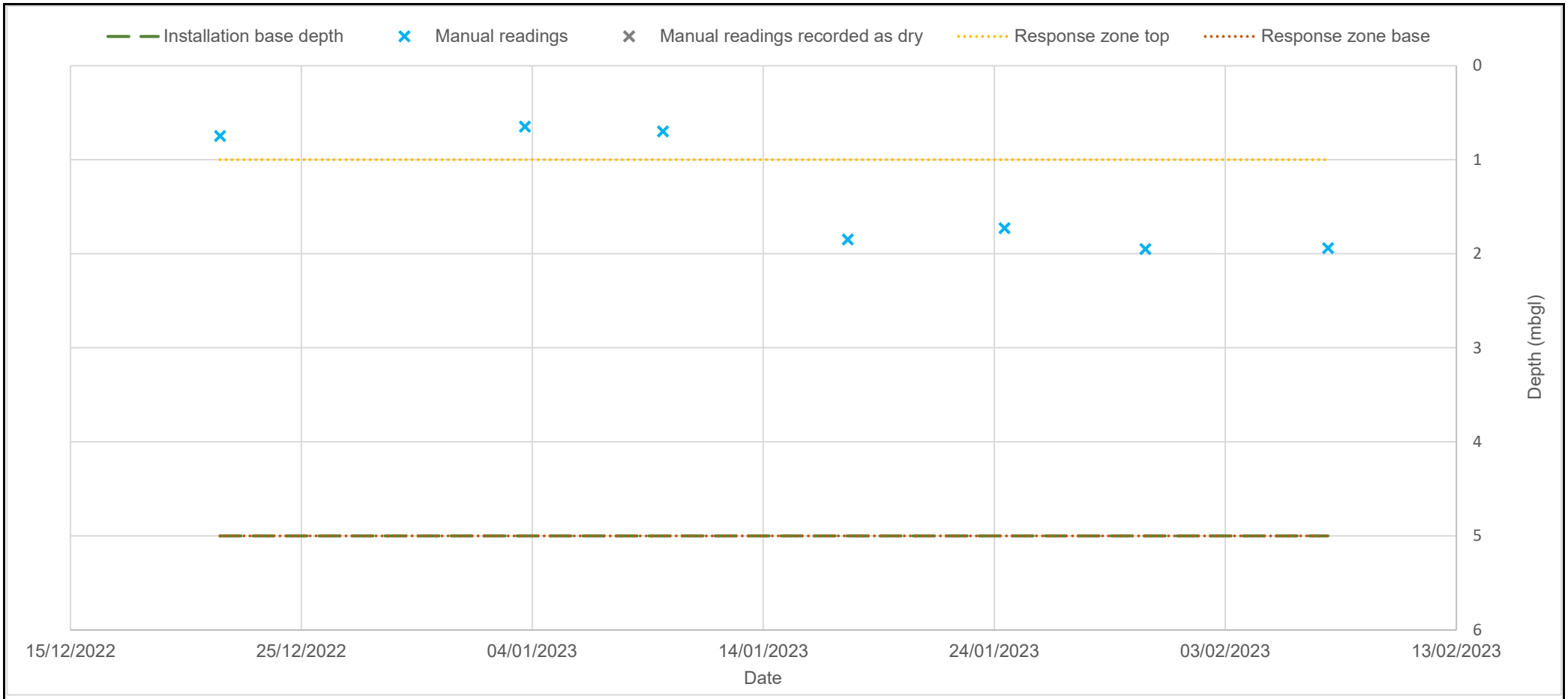
GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID: **BH22/04**

INSTALLATION BASE DEPTH (m) 5.00



Notes:
Water levels recorded as dry are plotted at the installed base of pipework for visual representation only.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

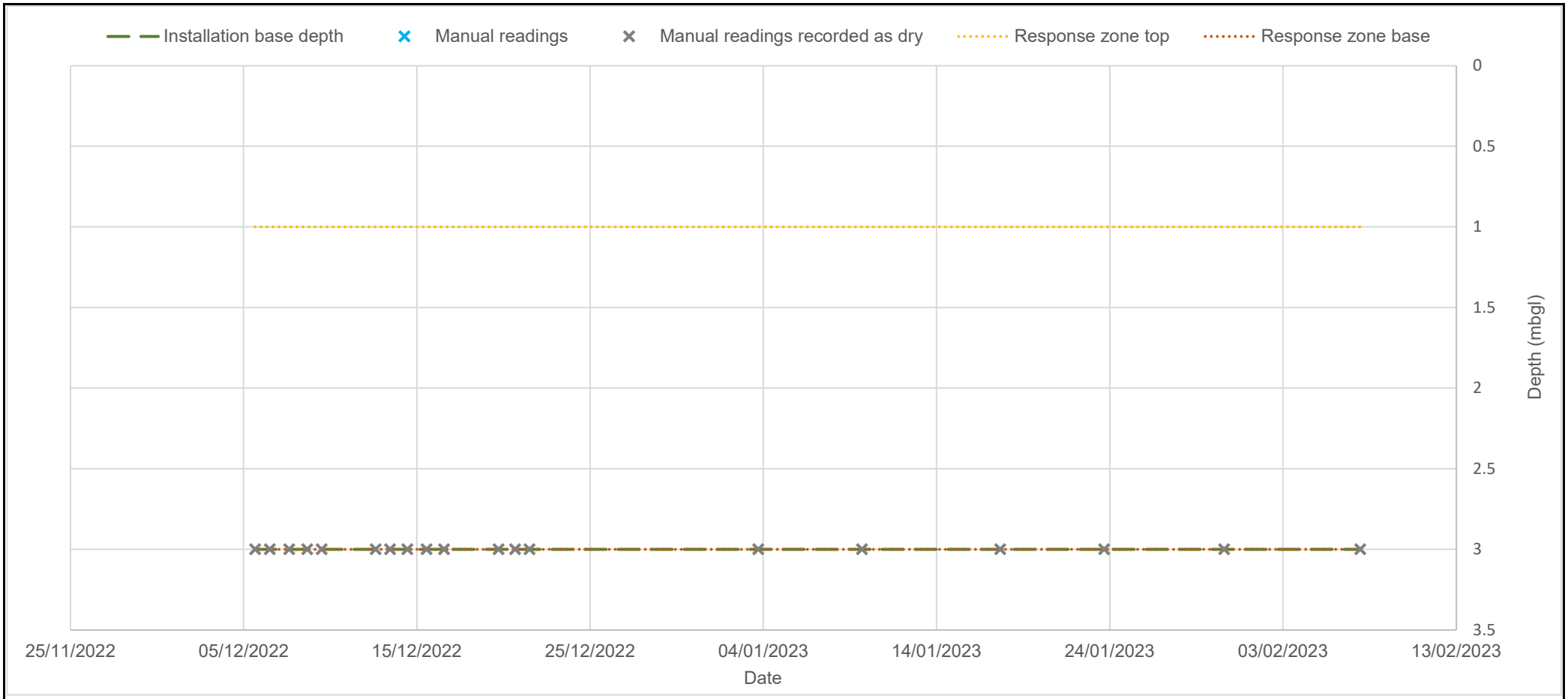
GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID: **BH22/05**

INSTALLATION BASE DEPTH (m) 3.00



Notes:
Water levels recorded as dry are plotted at the installed base of pipework for visual representation only.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

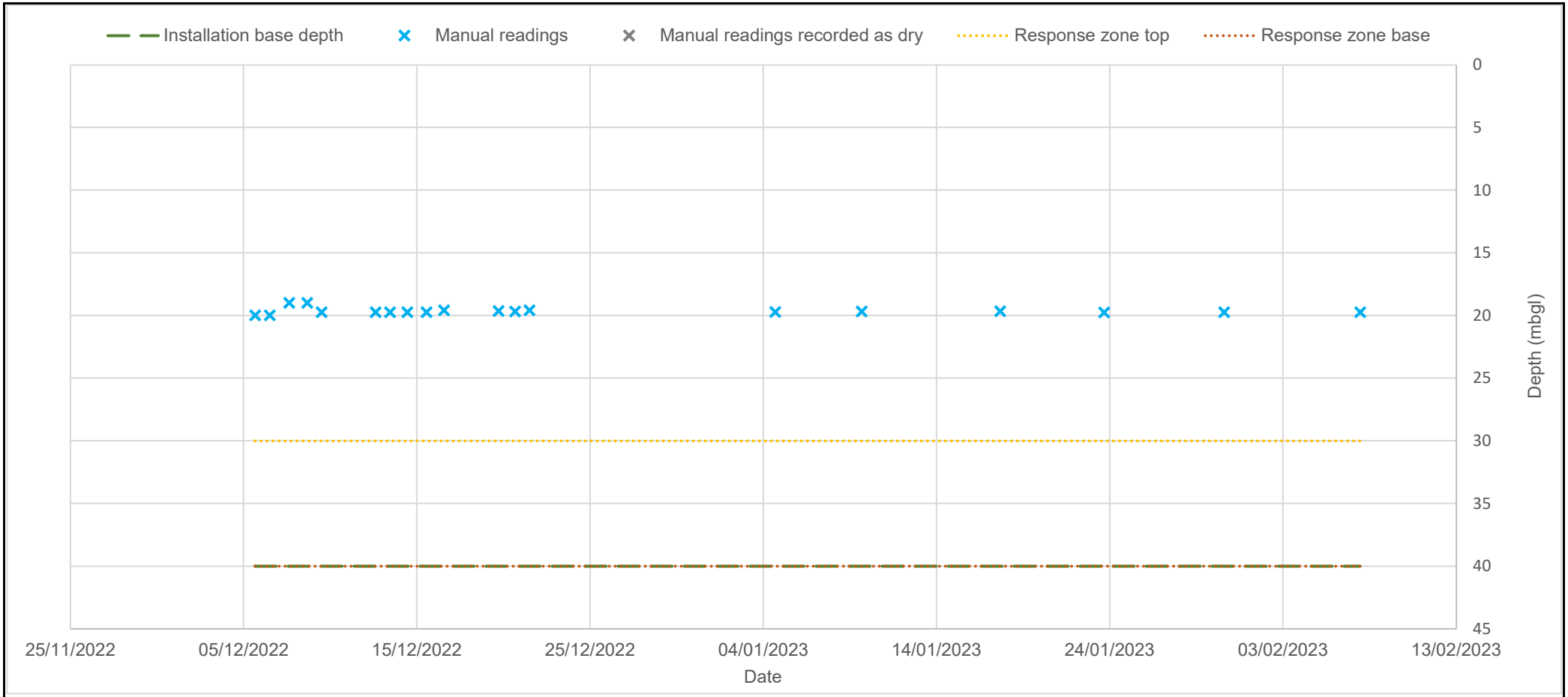
GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID: **BH22/05**

INSTALLATION BASE DEPTH (m) 40.00



Notes:
Water levels recorded as dry are plotted at the installed base of pipework for visual representation only.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

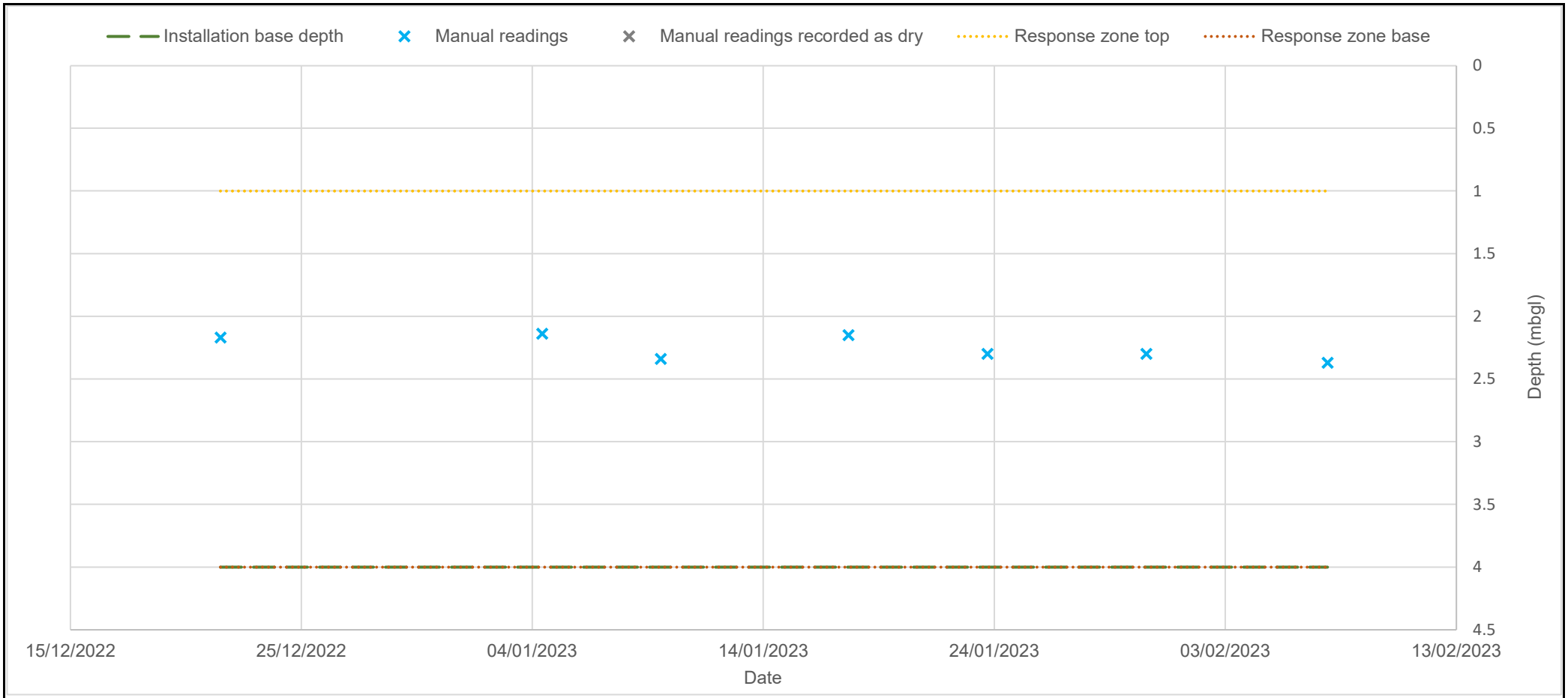
GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID: **BH22/06A**

INSTALLATION BASE DEPTH (m) 4.00



Notes:
Water levels recorded as dry are plotted at the installed base of pipework for visual representation only.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

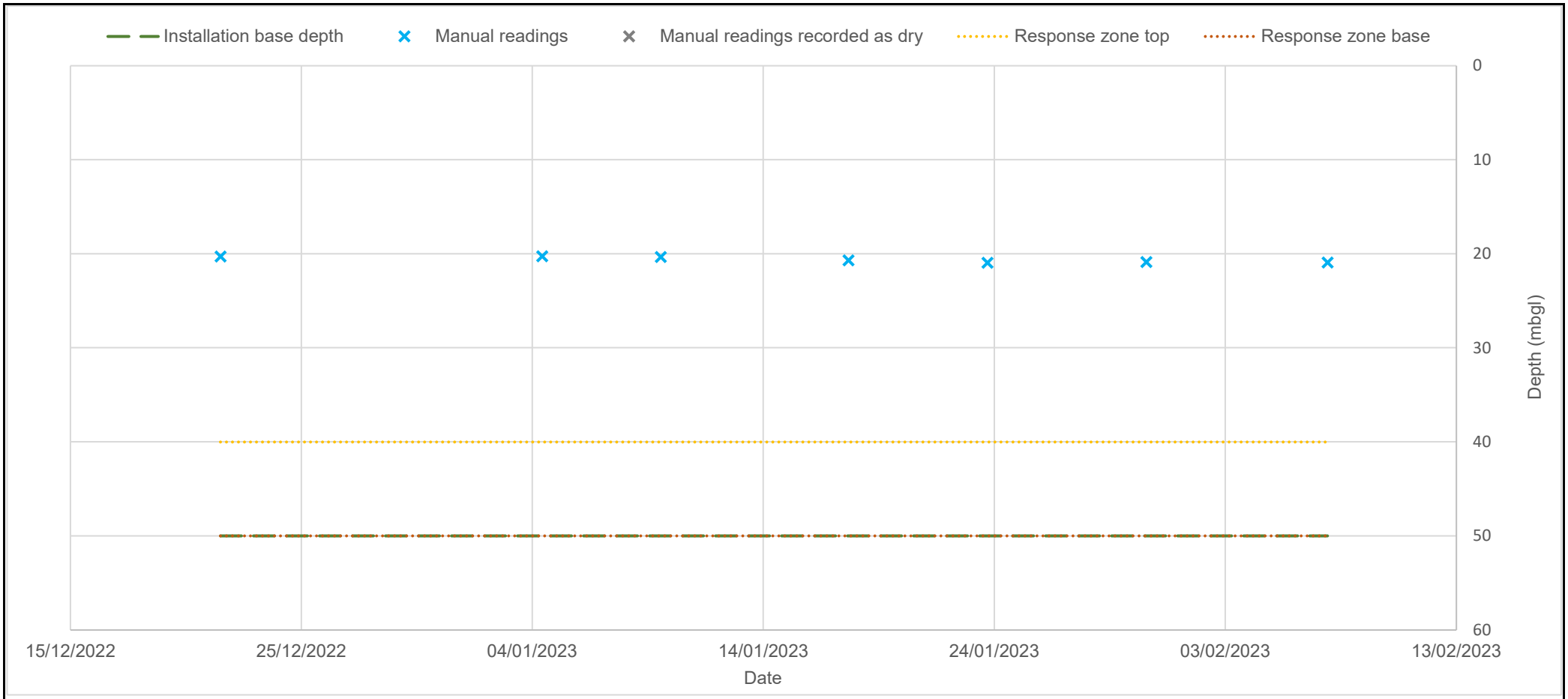
GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID: **BH22/06A**

INSTALLATION BASE DEPTH (m) 50.00



Notes:
Water levels recorded as dry are plotted at the installed base of pipework for visual representation only.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

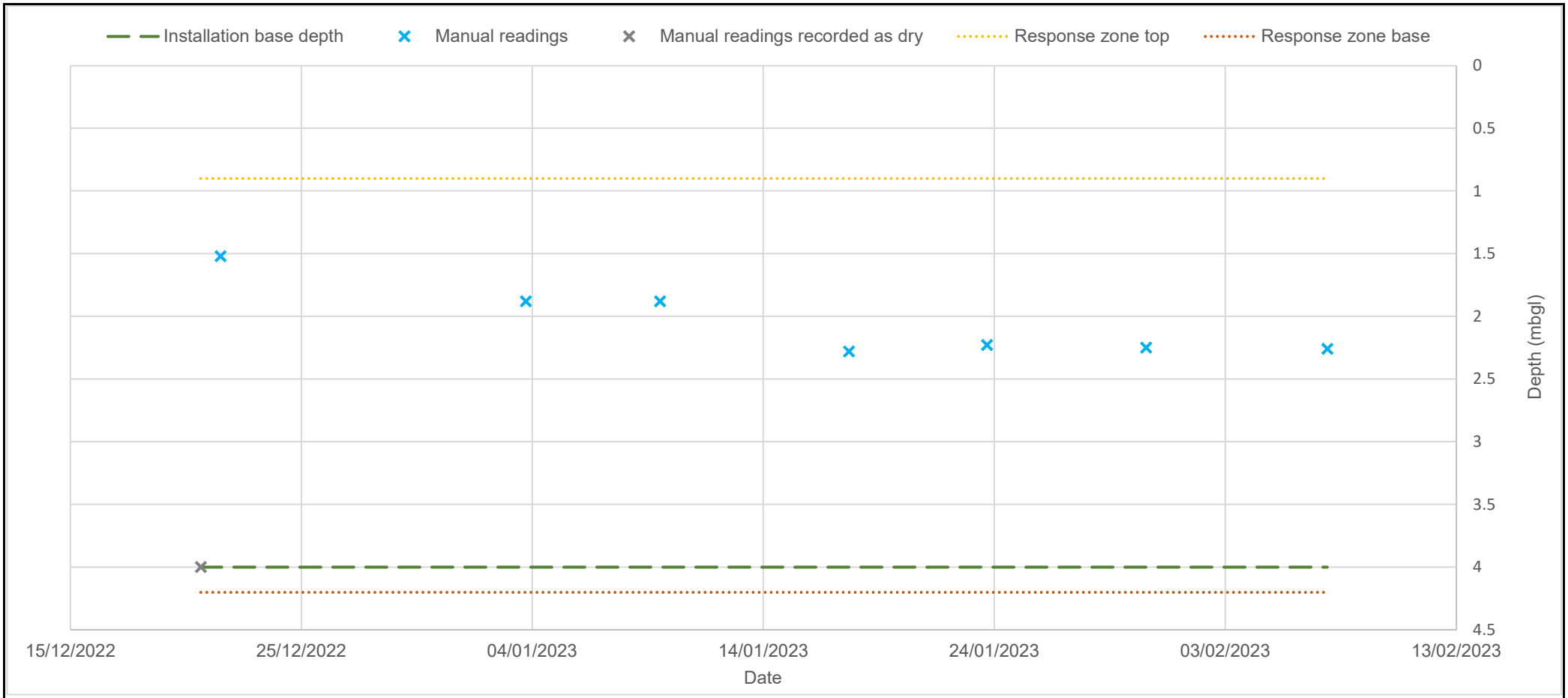
GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID: **BH22/07**

INSTALLATION BASE DEPTH (m) 4.00



Notes:
Water levels recorded as dry are plotted at the installed base of pipework for visual representation only.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

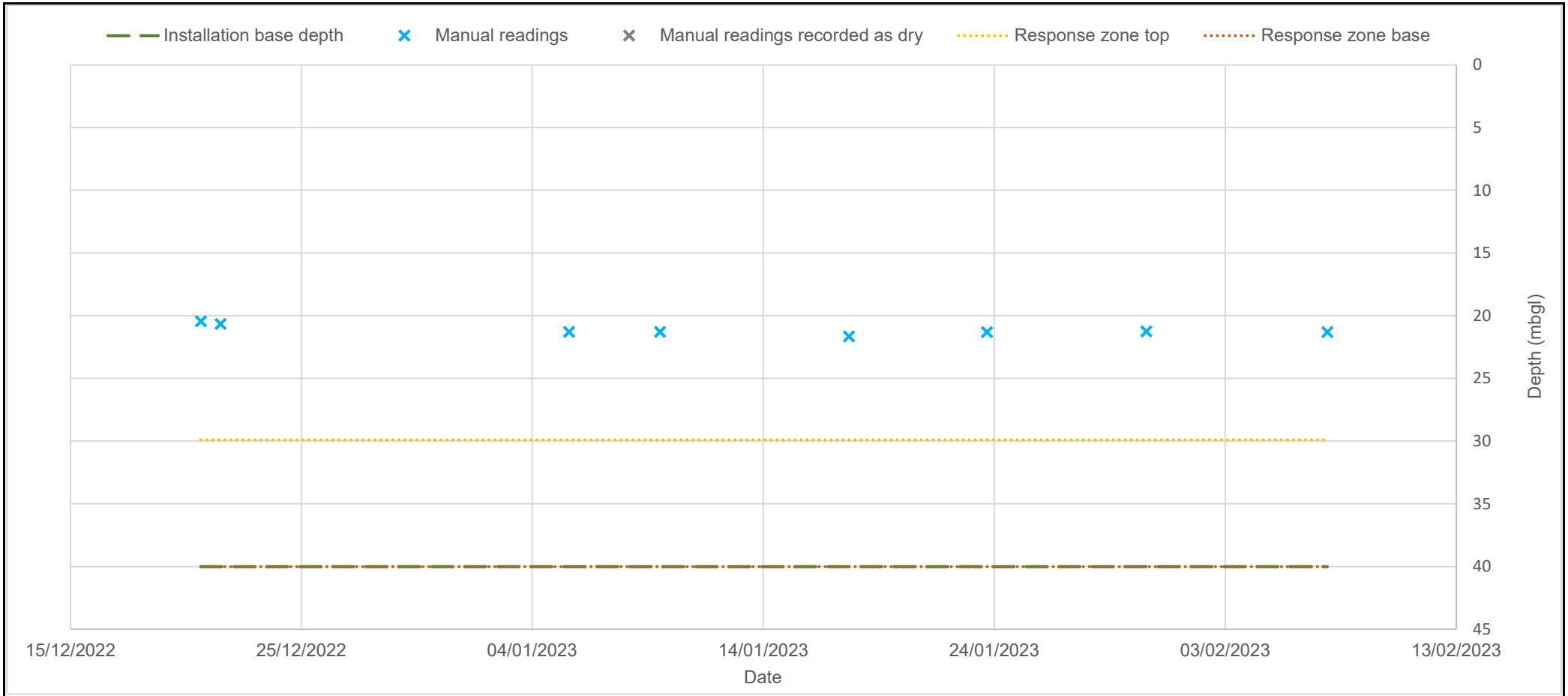
GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID: **BH22/07**

INSTALLATION BASE DEPTH (m) 40.00



Notes:
Water levels recorded as dry are plotted at the installed base of pipework for visual representation only.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

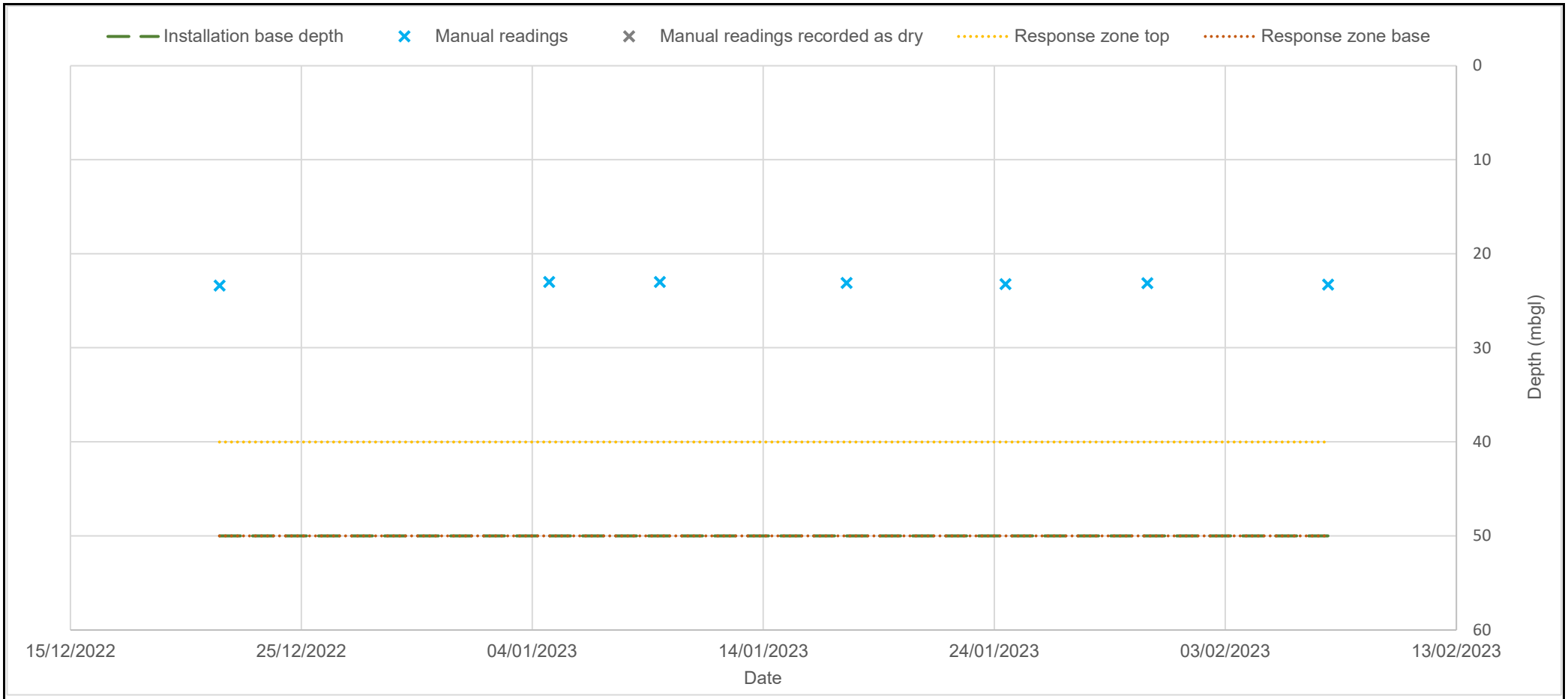
GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID: **BH22/08**

INSTALLATION BASE DEPTH (m) 50.00



Notes:
Water levels recorded as dry are plotted at the installed base of pipework for visual representation only.

CONTRACT	CHECKED
37349	**CT**

Geotechnical Engineering Limited

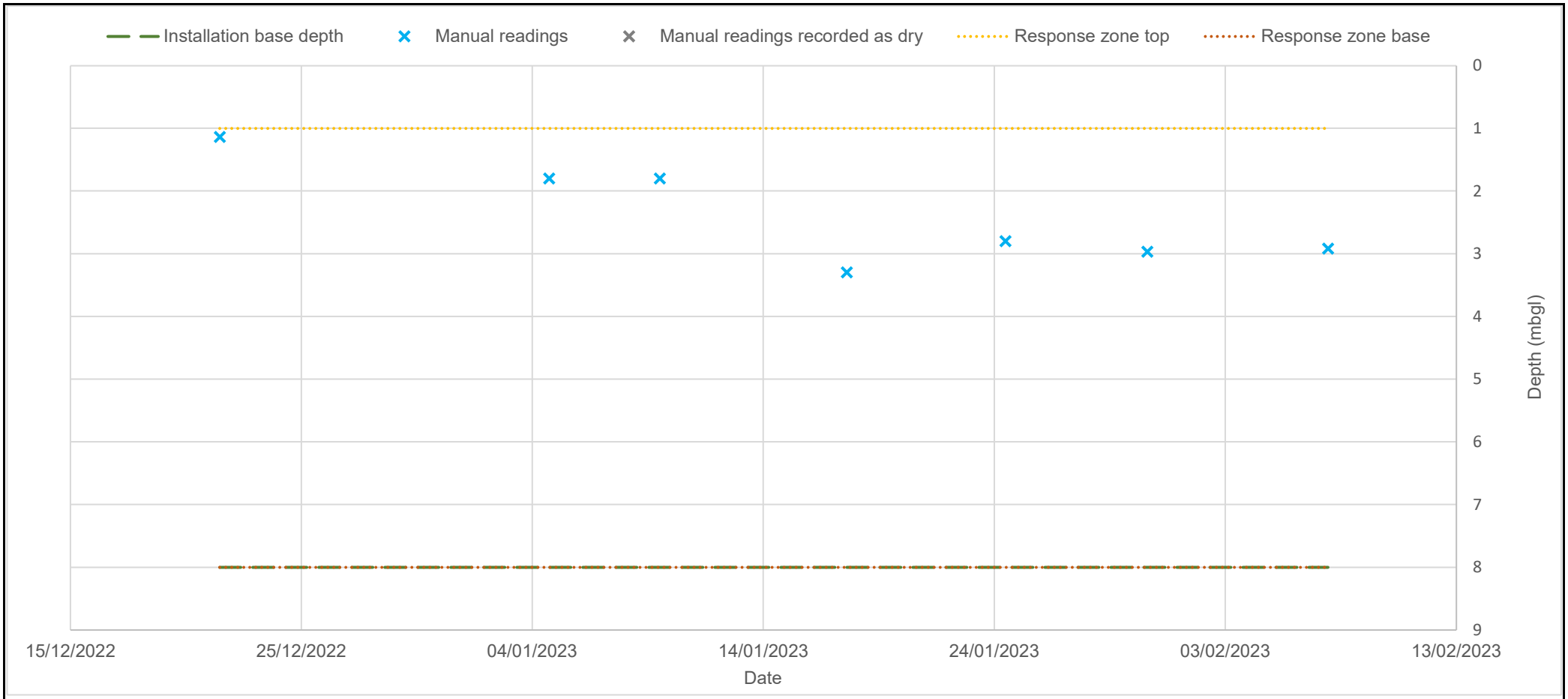
GROUNDWATER LEVELS

CLIENT: CITY FOOTBALL GROUP LIMITED

SITE: ETIHAD GROUND INVESTIGATION

LOCATION ID: **BH22/08**

INSTALLATION BASE DEPTH (m) 8.00



Notes:
Water levels recorded as dry are plotted at the installed base of pipework for visual representation only.

CONTRACT	CHECKED
37349	**CT**

APPENDIX C

LABORATORY TESTING

2718

GEOTECHNICAL ENGINEERING LIMITED

Version No.	2
Reason for update	Amendments
For the attention of Richard Heath / Tony Hastings	Page No. 1 of 117
	Date of Issue 02/03/2023

TEST REPORT

PROJECT/SITE	Etihad Ground Investigation	Samples received	29/11/2022
GEL REPORT NUMBER	37349	Schedule received	23/01/2023
Your ref/PO:		Testing commenced	26/01/2023
Test report refers to	Schedule 1	Status	Final

SUMMARY OF RESULTS ATTACHED

TEST METHOD & DESCRIPTION	QUANTITY	ACCREDITED TEST
BS EN ISO 17892-1: 2014:5, Water Content	121	YES
BS EN ISO 17892-12:2018, Liquid & Plastic Limits	48	YES
BS EN ISO 17892-4: 2016: 5.2, Particle Size Distribution - Wet Sieve	49	YES
BS EN ISO 17892-4: 2016: 5.4, Particle Size Distribution - Pipette	16	YES
BS1377: Part 4: 1990:3, Dry Density/Moisture Content Relationship	2	YES
BS EN ISO 17892-8:2018, Unconsolidated Undrained Triaxial Test	13	YES
Hand Vane	10	NO
ISRM: Suggested Methods: 2007: Uniaxial Compressive Strength of Rock	9	YES
ISRM: Suggested Methods: 2006: UCS with Young's Modulus (Subcontracted)	5	YES
ISRM: Suggested Methods: 2007: Point Load Strength Test	102	YES
ISRM: Suggested Methods: 2006: Point Load Strength Test (Subcontracted)	1	YES
BRE SD1 Suite D (Subcontracted)	62	YES/NO

General Remarks

This report may not be partially reproduced without written permission from this laboratory.

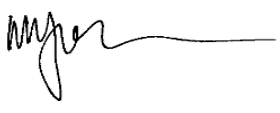
The results reported relate to samples received in the laboratory and the items tested.

Report Specific Remarks

Approved Signatories:

W Jones (Laboratory Manager) T Best (Deputy Laboratory Manager)

J Hanson (Director) N Parry (Director)



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Sort code: 30-93-48 **Bank account**: 1713840

Geotechnical Engineering Limited

LIQUID AND PLASTIC LIMITS

BS EN ISO 17892-12:2018

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample no./type	sample depth (m)	specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
BH22/01	2B	0.10	0.10	1.6	E					Grey sandy GRAVEL
BH22/01	12B	2.50	2.50	15.6	BXE	75	36	24	12	Brown clayey very sandy GRAVEL
BH22/01	15B	3.50	3.50	17.0	E					Brown sandy very clayey GRAVEL
BH22/01	18B	4.10	4.10	19.4	BXE	50	35	18	17	Brown slightly sandy gravelly CLAY
BH22/01	35B	10.50	10.50	19.6	E					Brown slightly sandy slightly gravelly CLAY
BH22/01	37B	11.00	11.00	13.2	BXE	19	30	14	16	Brown slightly sandy slightly gravelly CLAY
BH22/01	51C	15.20	16.00	6.6	BXE	44	29	15	14	Light grey slightly sandy slightly gravelly silty CLAY
BH22/01	56D	16.90	16.90	9.0	BXE	29	33	17	16	Light grey slightly sandy slightly gravelly silty CLAY
BH22/01	62D	19.70	19.70	6.9	E					Light grey slightly sandy gravelly silty CLAY
BH22/01	80D	28.60	28.60	5.9	E#					Light grey silty CLAY tending to mudstone
BH22/01	101D	39.10	39.10	5.6	E#					Light grey silty CLAY tending to mudstone
BH22/01	110C	43.70	43.70	19.7	BXE	31	22	17	5	Grey slightly gravelly sandy clayey SILT
BH22/01	116D	47.80	47.80	8.3	E#					Dark grey slightly sandy silty CLAY tending to mudstone
BH22/02	2B	0.50	0.50	10.4	E					Brown slightly silty very sandy GRAVEL
BH22/02	7D	2.00	2.00	19.1	E#					Brown slightly sandy gravelly CLAY
BH22/02	10B	2.50	2.50	24.9	BXE	20	41	20	21	Brown slightly gravelly slightly sandy CLAY
BH22/02	12D	3.00	3.00	22.6	E					Brown slightly gravelly slightly sandy CLAY
BH22/02	16D	4.00	4.00	17.5	BXE	7	41	19	22	Brown slightly sandy slightly gravelly CLAY
BH22/02	32D	9.00	9.00	12.6	BXE	16	33	15	18	Brown slightly gravelly slightly sandy CLAY

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

denotes sample tested is smaller than that which is recommended in accordance with BS EN ISO 17892 or BS1377

specimen preparation

A - as received
B - washed on 0.425mm sieve
C - air dried
D - oven dried (60oC)
E - oven dried (105oC)
F - not known

test method

X - cone penetrometer (4 point)
Y - cone penetrometer (1 point)
Z - casagrande apparatus

CONTRACT **37349**

CHECKED **WNJ**

Geotechnical Engineering Limited

LIQUID AND PLASTIC LIMITS

BS EN ISO 17892-12:2018

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample no./type	sample depth (m)	specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
BH22/02	42B	12.00	12.00	12.3	E					Brown slightly gravelly slightly sandy CLAY
BH22/02	51D	15.00	15.00	11.2	BYE	29	26	12	14	Brown slightly gravelly sandy CLAY
BH22/02	55C	16.50	16.80	10.1	BXE	37	35	21	14	Light grey slightly sandy gravelly silty CLAY
BH22/02	70C	24.00	24.30	8.6	BXE	83	42	21	21	Dark grey clayey very sandy GRAVEL
BH22/02	71D	24.90	24.90	10.4	E					Dark grey slightly sandy silty CLAY tending to mudstone
BH22/02	87D	34.40	34.40	4.2	E					Dark grey slightly sandy silty CLAY tending to mudstone
BH22/02	109CS	46.10	46.10	4.7	E#					Dark grey slightly sandy silty CLAY tending to mudstone
BH22/02	123D	55.50	55.50	6.0	E#					Dark grey slightly sandy silty CLAY tending to mudstone
BH22/03	5B	0.90	0.90	15.7	E					Brown slightly sandy slightly gravelly CLAY
BH22/03	7B	1.20	1.20	18.1	BXE	13	36	17	19	Brown slighlty sandy slightly gravelly CLAY
BH22/03	12B	3.00	3.00	26.7	BXE	27	42	20	22	Brown slightly sandy slightly gravelly CLAY
BH22/03	29B	8.50	8.50	18.2	BXE	22	37	17	20	Brown slightly sandy slightly gravelly CLAY
BH22/03	32B	9.00	9.00	16.4	E					Brown slightly sandy slightly gravelly CLAY
BH22/03	46D	13.90	13.90	12.3	BXE	19	28	13	15	Brown slightly gravelly sandy CLAY
BH22/03	48D	15.00	15.00	11.5	E					Brown slightly sandy slightly gravelly CLAY
BH22/03	49C	15.00	15.70	9.4	BXE	55	42	21	21	Dark grey slightly sandy gravelly silty CLAY
BH22/03	69D	25.40	25.40	9.8	E					Dark grey slightly sandy silty CLAY tending to mudstone
BH22/03	74D	27.70	27.70	4.9	E#					Dark grey slightly sandy silty CLAY tending to mudstone
BH22/03	102D	43.40	43.40	7.3	E#					Brown slightly clayey SAND tending to sandstone

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

denotes sample tested is smaller than that which is recommended in accordance with BS EN ISO 17892 or BS1377

specimen preparation

A - as received
B - washed on 0.425mm sieve
C - air dried
D - oven dried (60oC)
E - oven dried (105oC)
F - not known

test method

X - cone penetrometer (4 point)
Y - cone penetrometer (1 point)
Z - casagrande apparatus

CONTRACT **37349**

CHECKED **WNJ**

Geotechnical Engineering Limited

LIQUID AND PLASTIC LIMITS

BS EN ISO 17892-12:2018

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample no./type	sample depth (m)	specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
BH22/03	113D	49.35	49.35	3.6	E#					Dark brown slightly sandy silty CLAY tending to mudstone
BH22/03	130D	58.40	58.40	6.1	E					Grey slightly sandy silty CLAY tending to mudstone
BH22/04	14D	3.40	3.40	21.1	BXE	54	38	22	16	Dark brown slightly sandy gravelly silty CLAY
BH22/04	16D	3.90	3.90	15.0	E					Orangish brown clayey SAND
BH22/04	17L	4.00	4.00	10.3	E					Orangish brown gravelly clayey SAND
BH22/04	26D	8.10	8.10	16.9	BXE	9	39	17	22	Brown slightly sandy slightly gravelly CLAY
BH22/04	30D	10.10	10.10	17.0	E					Brown slightly sandy slightly gravelly CLAY
BH22/04	45D	16.10	16.10	15.1	BXE	2	48	24	24	Grey slightly sandy slightly gravelly silty CLAY
BH22/04	47C	16.70	17.10	12.4	BXE	40	36	21	15	Light grey slightly sandy gravelly silty CLAY
BH22/04	51D	19.10	19.10	14.2	BXE	8	46	21	25	Dark grey mottled brown slightly sandy slightly gravelly silty CLAY
BH22/04	52D	19.60	19.60	7.3	E					Light grey slightly sandy silty CLAY tending to MUDSTONE
BH22/04	56C	21.20	21.90	11.0	BXE	43	49	25	24	Light grey slightly sandy gravelly silty CLAY
BH22/04	72D	30.70	30.70	6.5	E#					Grey slightly sandy silty CLAY tending to mudstone
BH22/04	80C	34.70	34.70	12.4	BXE	64	48	24	24	Grey sandy very clayey GRAVEL
BH22/04	82C	36.20	36.20	11.8	BXE	12	44	21	23	Grey slightly sandy slightly gravelly silty CLAY
BH22/04	83D	37.60	37.60	9.9	E					Dark grey slightly sandy silty CLAY tending to mudstone
BH22/04	92CS	42.60	42.60	4.8	E					Dark grey slightly sandy silty CLAY tending to mudstone
BH22/04	96D	45.10	45.10	14.4	E					Light grey slightly sandy slightly gravelly silty CLAY
BH22/05	5B	0.90	0.90	15.2	E					Greyish brown slightly sandy gravelly CLAY

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

denotes sample tested is smaller than that which is recommended in accordance with BS EN ISO 17892 or BS1377

specimen preparation

A - as received
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C - air dried
D - oven dried (60oC)
E - oven dried (105oC)
F - not known

test method

X - cone penetrometer (4 point)
Y - cone penetrometer (1 point)
Z - casagrande apparatus

CONTRACT **37349**

CHECKED **WNJ**

Geotechnical Engineering Limited

LIQUID AND PLASTIC LIMITS

BS EN ISO 17892-12:2018

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample no./type	sample depth (m)	specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
BH22/05	9D	2.10	2.10	26.0	E					Browsn mottled grey slightly sandy slightly gravelly CLAY
BH22/05	15D	4.10	4.10	62.4	BYE	60	55	47	8	Dark brown very silty very sandy GRAVEL
BH22/05	17UT	4.70	4.70	28.4	E					Brown clayey sandy GRAVEL (very wet)
BH22/05	19D	5.40	5.40	23.6	BXE	10	46	20	26	Brown mottled grey and orange slightly gravelly slightly sandy CLAY
BH22/05	30D	9.10	9.10	14.6	BXE	13	37	16	21	Brown slightly gravelly slightly sandy CLAY
BH22/05	39D	12.90	12.90	11.0	E#					Brown slightly sandy gravelly CLAY
BH22/05	42D	13.90	13.90	14.2	BXE	22	34	15	19	Brown slightly sandy slightly gravelly CLAY
BH22/05	45C	15.10	15.50	16.9	BXE	12	31	18	13	Grey mottled brown slightly gravelly slightly sandy silty CLAY
BH22/05	46D	15.90	15.90	14.8	E					Brown mottled grey slightly gravelly slightly sandy CLAY
BH22/05	60C	22.60	23.00	12.1	BXE	34	42	23	19	Light gray slightly sandy gravelly silty CLAY
BH22/05	64C	25.60	26.20	14.3	BX	68	45	20	25	Grey very clayey very sandy GRAVEL
BH22/05	70D	30.00	30.00	11.7	E#					Dark grey slightly sandy silty CLAY tending to mudstone
BH22/05	75D	33.00	33.00	14.6	E					Black COAL
BH22/05	86D	38.40	38.40	4.2	E#					Light grey slightly sandy silty CLAY tending to mudstone
BH22/05	100D	46.25	46.25	3.5	E#					Light grey slightly sandy silty CLAY tending to mudstone
BH22/05	112D	52.60	52.60	4.7	E#					Pinkish brown silty SAND tending to sandstone
BH22/05	126D	59.80	59.80	3.3	E					Dark grey slightly sandy silty CLAY tending to mudtone
BH22/06A	12D	3.90	3.90	17.3	E#					Brown slightly sandy very clayey GRAVEL
BH22/06A	13D	4.00	4.00	17.5	BXE	20	38	18	20	Brown slightly gravelly slightly sandy CLAY

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

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specimen preparation

A - as received
B - washed on 0.425mm sieve
C - air dried
D - oven dried (60oC)
E - oven dried (105oC)
F - not known

test method

X - cone penetrometer (4 point)
Y - cone penetrometer (1 point)
Z - casagrande apparatus

CONTRACT **37349**

CHECKED **WNJ**

Geotechnical Engineering Limited

LIQUID AND PLASTIC LIMITS

BS EN ISO 17892-12:2018

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample no./type	sample depth (m)	specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
BH22/06A	30D	8.90	8.90	15.9	BXE	12	37	16	21	Brown slightly sandy slightly gravelly CLAY
BH22/06A	36D	10.60	10.60	12.6	E					Brown slightly sandy slightly gravelly CLAY
BH22/06A	46D	15.20	15.20	11.3	BXE	14	30	14	16	Brown slightly gravelly sandy CLAY
BH22/06A	51C	16.70	17.60	7.9	E					Grey slightly clayey sandy GRAVEL
BH22/06A	52D	18.00	18.00	3.7	E#					Dark grey slightly sandy silty CLAY tending to mudstone
BH22/06A	55D	18.90	18.90	11.9	BXE	5	42	20	22	Light and dark grey slightly gravelly slightly sandy silty CLAY
BH22/06A	62D	22.70	22.70	12.7	E					Light grey slightly sandy silty CLAY tending to mudstone
BH22/06A	78D	31.15	31.15	4.4	E#					Light grey slightly sandy silty CLAY tending to mudstone
BH22/06A	84CS	34.52	34.52	6.2	E#					Light brown slightly clayey SAND tending to sandstone
BH22/06A	95D	42.10	42.10	6.5	E					Greyish brown slightly sandy silty CLAY tending to mudstone
BH22/06A	112D	52.60	52.60	5.0	E#					Light grey slightly sandy SILT tending to siltstone
BH22/07	5B	0.90	0.90	22.4	E					Grey silty very sandy GRAVEL
BH22/07	19L	3.50	3.50	19.0	BXE	38	42	20	22	Dark brown slightly sandy gravelly CLAY
BH22/07	20D	3.90	3.90	19.9	BXE	23	40	20	20	Brown mottled black slightly sandy gravelly CLAY
BH22/07	24D	4.95	4.95	15.8	E					Brown mottled grey slightly sandy slightly gravelly CLAY
BH22/07	25D	5.05	5.05	17.1	BXE	8	39	17	22	Brown mottled grey slightly gravelly slightly sandy CLAY
BH22/07	35D	7.50	7.50	15.4	BXE	12	36	16	20	Brown slightly gravelly slightly sandy CLAY
BH22/07	42D	10.50	10.50	15.5	E					Brown slightly sandy slightly gravelly CLAY
BH22/07	54D	16.00	16.00	13.9	BXE	7	34	20	14	Light grey slightly gravelly slightly sandy silty CLAY

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

denotes sample tested is smaller than that which is recommended in accordance with BS EN ISO 17892 or BS1377

specimen preparation

A - as received
B - washed on 0.425mm sieve
C - air dried
D - oven dried (60oC)
E - oven dried (105oC)
F - not known

test method

X - cone penetrometer (4 point)
Y - cone penetrometer (1 point)
Z - casagrande apparatus

CONTRACT **37349**

CHECKED **WNJ**

Geotechnical Engineering Limited

LIQUID AND PLASTIC LIMITS

BS EN ISO 17892-12:2018

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample no./type	sample depth (m)	specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
BH22/07	55D	16.50	16.50	11.9	E					Light grey slightly gravelly slightly sandy silty CLAY
BH22/07	59CS	19.02	19.02	8.4	E					Grey slightly sandy silty CLAY tending to mudstone
BH22/07	67D	22.50	22.50	10.0	E					Light grey slightly gravelly slightly sandy silty CLAY
BH22/07	80CS	30.81	30.81	7.5	E#					Multi-coloured slightly sandy silty CLAY tending to mudstone
BH22/07	90D	38.00	38.00	10.3	E					Light grey slightly sandy slightly gravelly silty CLAY tending to mudstone
BH22/07	99CS	43.50	43.50	4.1	E#					Dark grey slightly sandy silty CLAY tending to mudstone
BH22/08	3B	0.80	0.80	19.8	E					Grey silty very sandy GRAVEL
BH22/08	11B	3.50	3.50	20.8	E					Brown slightly sandy gravelly CLAY
BH22/08	22B	7.00	7.00	15.8	BXE	11	39	17	22	Brown slightly sandy slightly gravelly CLAY
BH22/08	25B	8.50	8.50	18.3	BXE	13	38	18	20	Brown slightly gravelly slightly sandy CLAY
BH22/08	27D	9.00	9.00	14.8	E					Brown slightly sandy slightly gravelly CLAY
BH22/08	33B	11.00	11.00	18.3	BXE	20	33	15	18	Brown slightly gravelly slightly sandy CLAY
BH22/08	38B	13.00	13.00	14.5	BXE	25	30	14	16	Brown slightly gravelly slightly sandy CLAY
BH22/08	49D	16.80	16.80	6.3	BXE	4	35	19	16	Light grey slightly gravelly slightly sandy silty CLAY
BH22/08	54D	19.70	19.70	5.4	E#					Light grey slightly sandy silty CLAY tending to mudstone
BH22/08	69D	28.70	28.70	7.5	E#					Dark grey slightly sandy silty CLAY tending to mudstone
BH22/08	81D	37.40	37.40	8.1	E#					Light grey slightly sandy silty CLAY tending to mudstone
BH22/08	94D	46.70	46.70	8.6	E#					Dark grey slightly sandy silty CLAY tending to mudstone
BH22/08	110CS	58.80	58.80	26.4	E#					Dark grey slightly sandy silty CLAY

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

denotes sample tested is smaller than that which is recommended in accordance with BS EN ISO 17892 or BS1377

specimen preparation

A - as received
B - washed on 0.425mm sieve
C - air dried
D - oven dried (60oC)
E - oven dried (105oC)
F - not known

test method

X - cone penetrometer (4 point)
Y - cone penetrometer (1 point)
Z - casagrande apparatus

CONTRACT **37349**

CHECKED **WNJ**

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LIQUID AND PLASTIC LIMITS

BS EN ISO 17892-12:2018

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample no./type	sample depth (m)	specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
CBR22/01	1B	0.30	0.30	4.6	E					Light grey clayey sandy GRAVEL
TP22/02	6B	1.10	1.10	14.9	E					Dark grey very sandy very clayey GRAVEL
TP22/02	11D	3.00	3.00	15.4	BXE	56	35	20	15	Brown slightly sandy gravelly silty CLAY
TP22/03	3B	0.40	0.40	5.8	E					Grey slightly silty sandy GRAVEL
TP22/03	8D	1.26	1.26	16.2	BXE	46	41	20	21	Brown slightly sandy gravelly CLAY
TP22/06	3B	0.50	0.50	20.4	E					Greyish brown very clayey very sandy GRAVEL
TP22/07	5B	2.00	2.20	33.5	E					Greyish brown very sandy very clayey GRAVEL

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

denotes sample tested is smaller than that which is recommended in accordance with BS EN ISO 17892 or BS1377

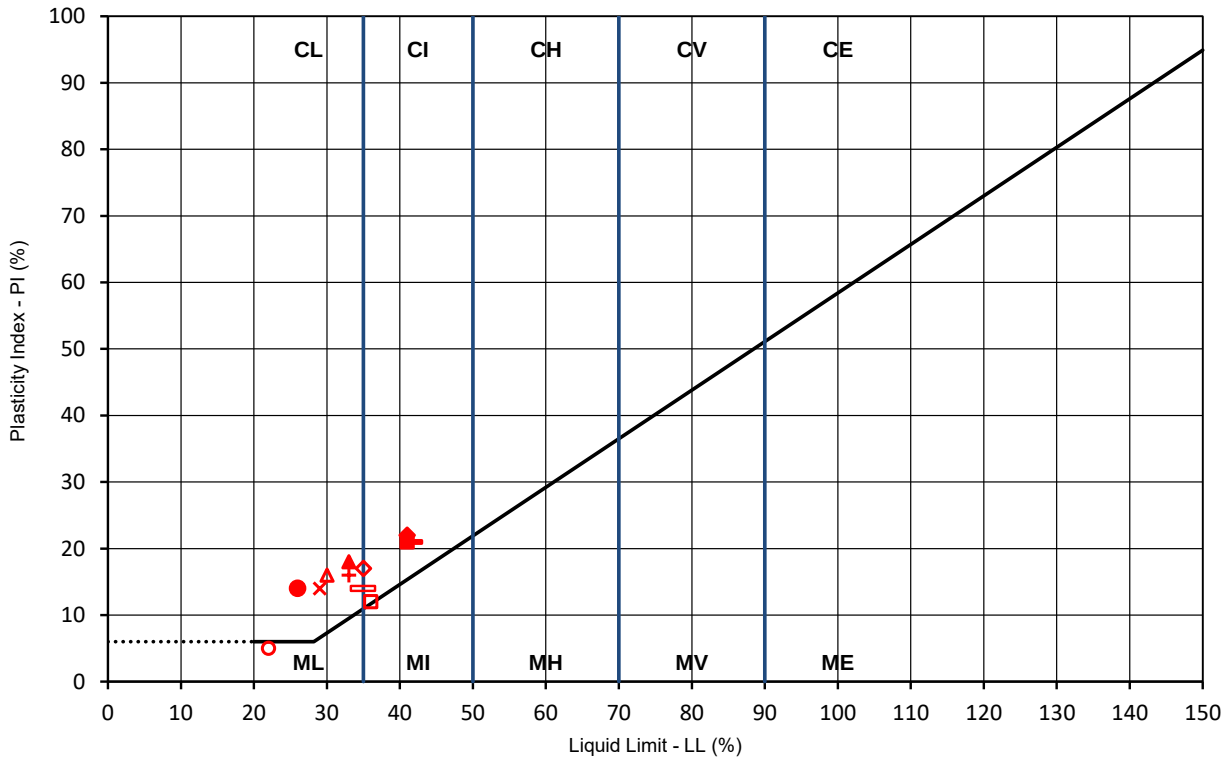
specimen preparation		test method	CONTRACT	CHECKED
A - as received	D - oven dried (60oC)	X - cone penetrometer (4 point)		
B - washed on 0.425mm sieve	E - oven dried (105oC)	Y - cone penetrometer (1 point)	**37349**	**WNJ**
C - air dried	F - not known	Z - casagrande apparatus		

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ATTERBERG LINE PLOT

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	BH22/01	2.50	36	24	12	
◇	BH22/01	4.10	35	18	17	
△	BH22/01	11.00	30	14	16	
×	BH22/01	16.00	29	15	14	
+	BH22/01	16.90	33	17	16	
○	BH22/01	43.70	22	17	5	
■	BH22/02	2.50	41	20	21	
◆	BH22/02	4.00	41	19	22	
▲	BH22/02	9.00	33	15	18	
●	BH22/02	15.00	26	12	14	
▭	BH22/02	16.80	35	21	14	
▪	BH22/02	24.30	42	21	21	

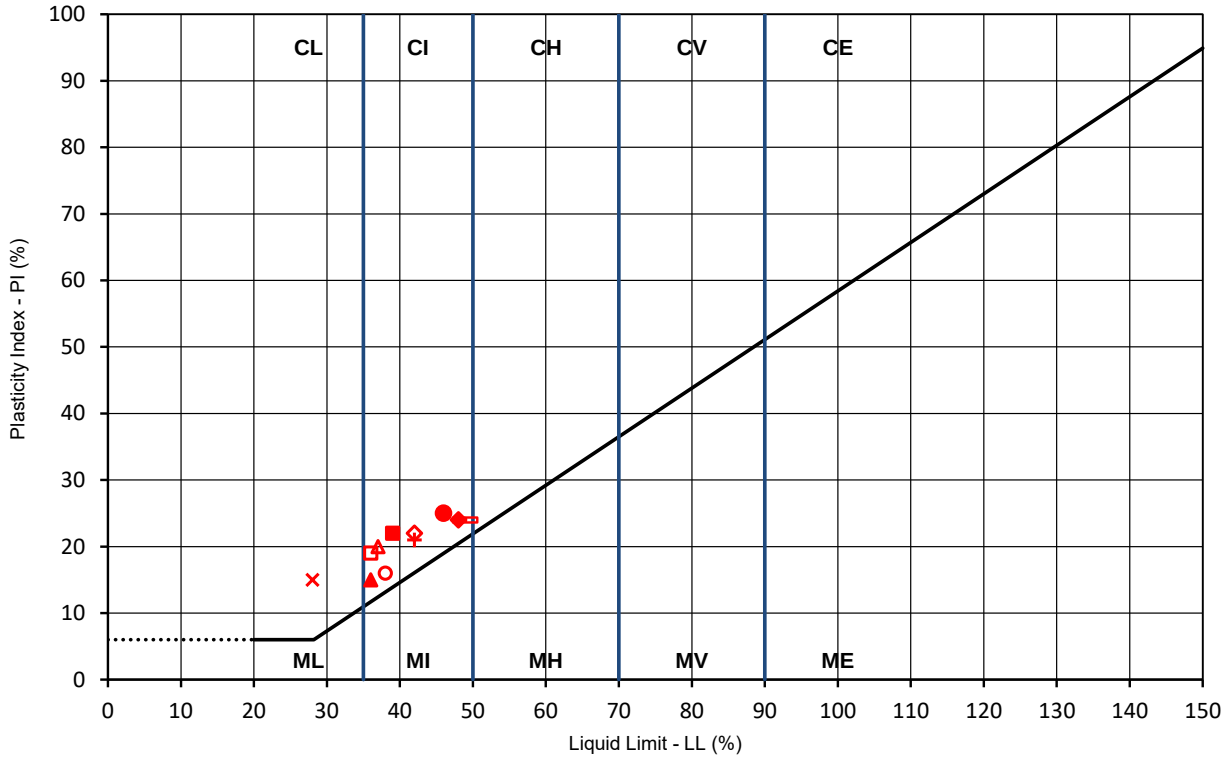
CONTRACT	CHECKED
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ATTERBERG LINE PLOT

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	BH22/03	1.20	36	17	19	
◇	BH22/03	3.00	42	20	22	
△	BH22/03	8.50	37	17	20	
×	BH22/03	13.90	28	13	15	
+	BH22/03	15.70	42	21	21	
○	BH22/04	3.40	38	22	16	
■	BH22/04	8.10	39	17	22	
◆	BH22/04	16.10	48	24	24	
▲	BH22/04	17.10	36	21	15	
●	BH22/04	19.10	46	21	25	
▭	BH22/04	21.90	49	25	24	
▪	BH22/04	34.70	48	24	24	

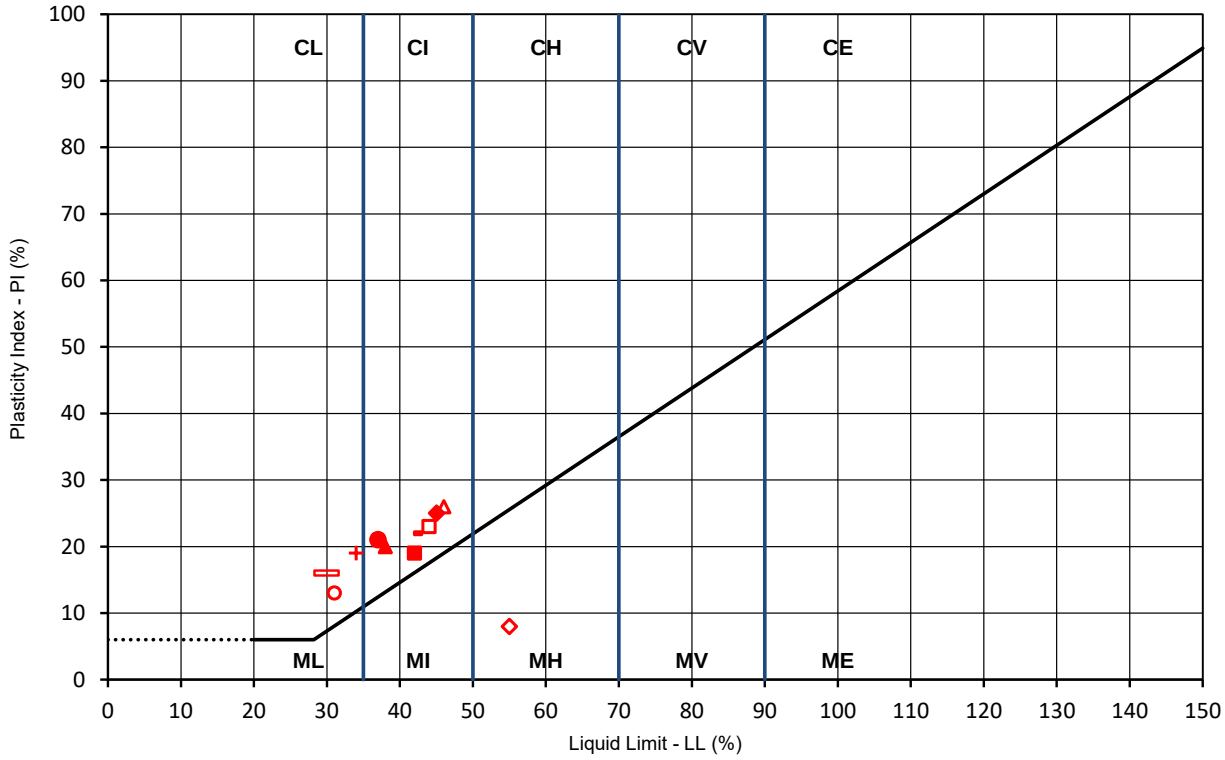
CONTRACT	CHECKED
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ATTERBERG LINE PLOT

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	BH22/04	36.20	44	21	23	
◇	BH22/05	4.10	55	47	8	
△	BH22/05	5.40	46	20	26	
×	BH22/05	9.10	37	16	21	
+	BH22/05	13.90	34	15	19	
○	BH22/05	15.50	31	18	13	
■	BH22/05	23.00	42	23	19	
◆	BH22/05	26.20	45	20	25	
▲	BH22/06A	4.00	38	18	20	
●	BH22/06A	8.90	37	16	21	
▭	BH22/06A	15.20	30	14	16	
▪	BH22/06A	18.90	42	20	22	

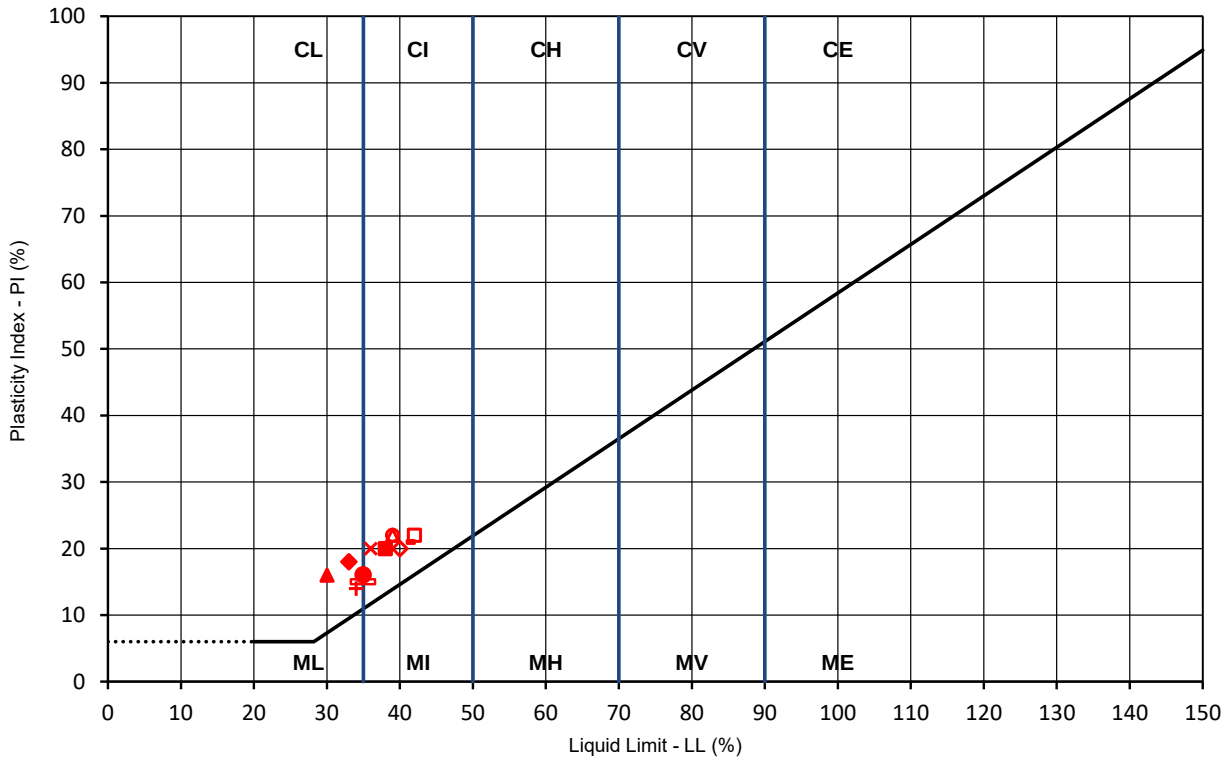
CONTRACT	CHECKED
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ATTERBERG LINE PLOT

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	BH22/07	3.50	42	20	22	
◇	BH22/07	3.90	40	20	20	
△	BH22/07	5.05	39	17	22	
×	BH22/07	7.50	36	16	20	
+	BH22/07	16.00	34	20	14	
○	BH22/08	7.00	39	17	22	
■	BH22/08	8.50	38	18	20	
◆	BH22/08	11.00	33	15	18	
▲	BH22/08	13.00	30	14	16	
●	BH22/08	16.80	35	19	16	
▭	TP22/02	3.00	35	20	15	
▪	TP22/03	1.26	41	20	21	

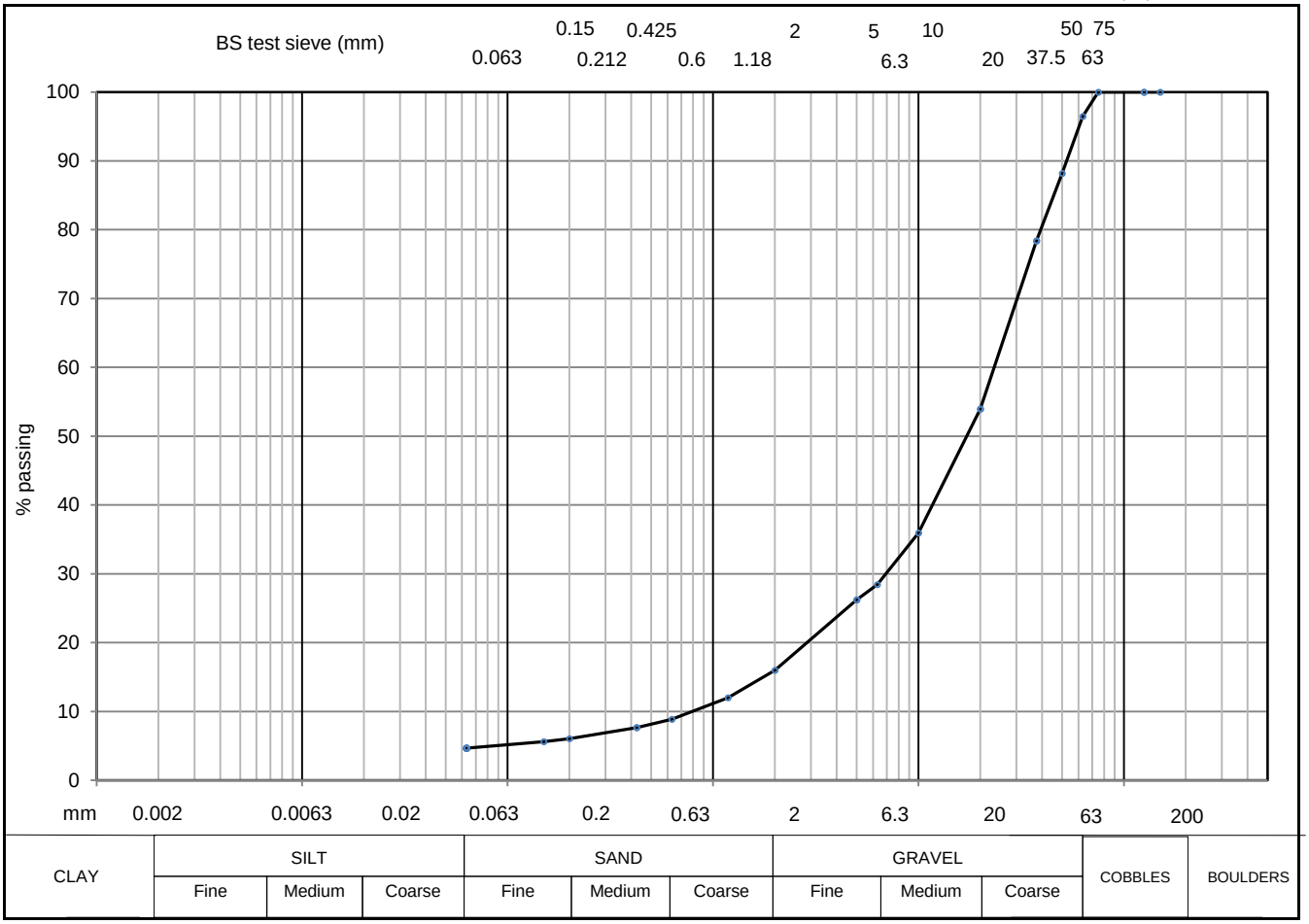
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/01
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	2B
		SAMPLE DEPTH (m)	0.10
DESCRIPTION	Grey clayey sandy GRAVEL with low cobble content	SPECIMEN TOP (m)	0.10
		SPECIMEN BASE (m)	0.35



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	5
SAND	11
GRAVEL	80
COBBLE & BOULDER	4
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	26	20	
75	100	2	16	6	
63	96	1.18	12	2	
50	88	0.63	9		
37.5	78	0.425	8		
20	54	0.2	6		
10	36	0.15	6		
6.3	28	0.063	5		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

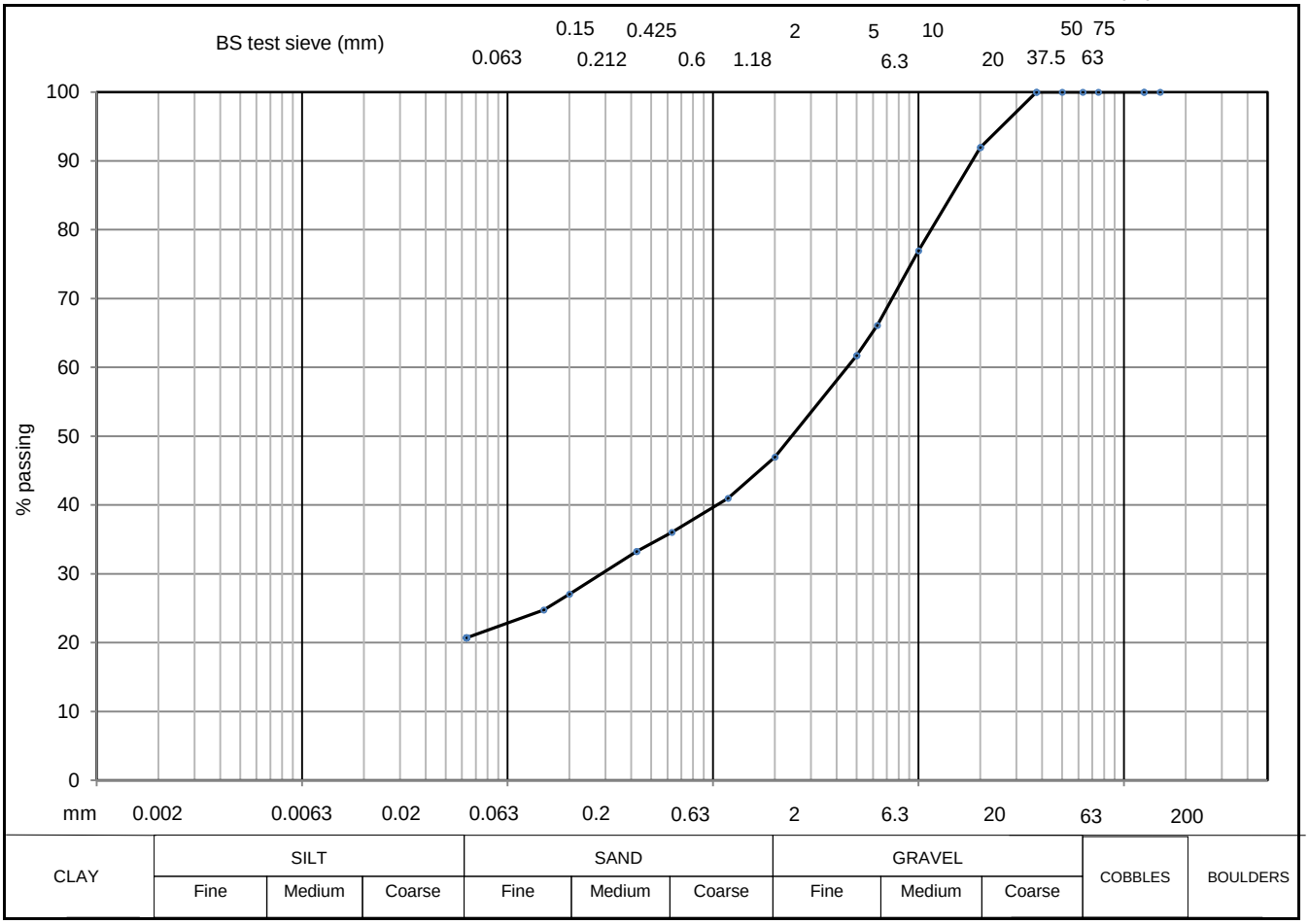
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/01
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	6B
		SAMPLE DEPTH (m)	0.90
DESCRIPTION	Greyish brown very clayey very sandy GRAVEL	SPECIMEN TOP (m)	0.90
		SPECIMEN BASE (m)	1.20



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	21
SAND	26
GRAVEL	53
COBBLE & BOULDER	0
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing
150	
75	
63	
50	
37.5	100
20	92
10	77
6.3	66

BS test sieve (mm)	% passing
5	62
2	47
1.18	41
0.63	36
0.425	33
0.2	27
0.15	25
0.063	21

BS test sieve (µm)	% finer
20	
6	
2	

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

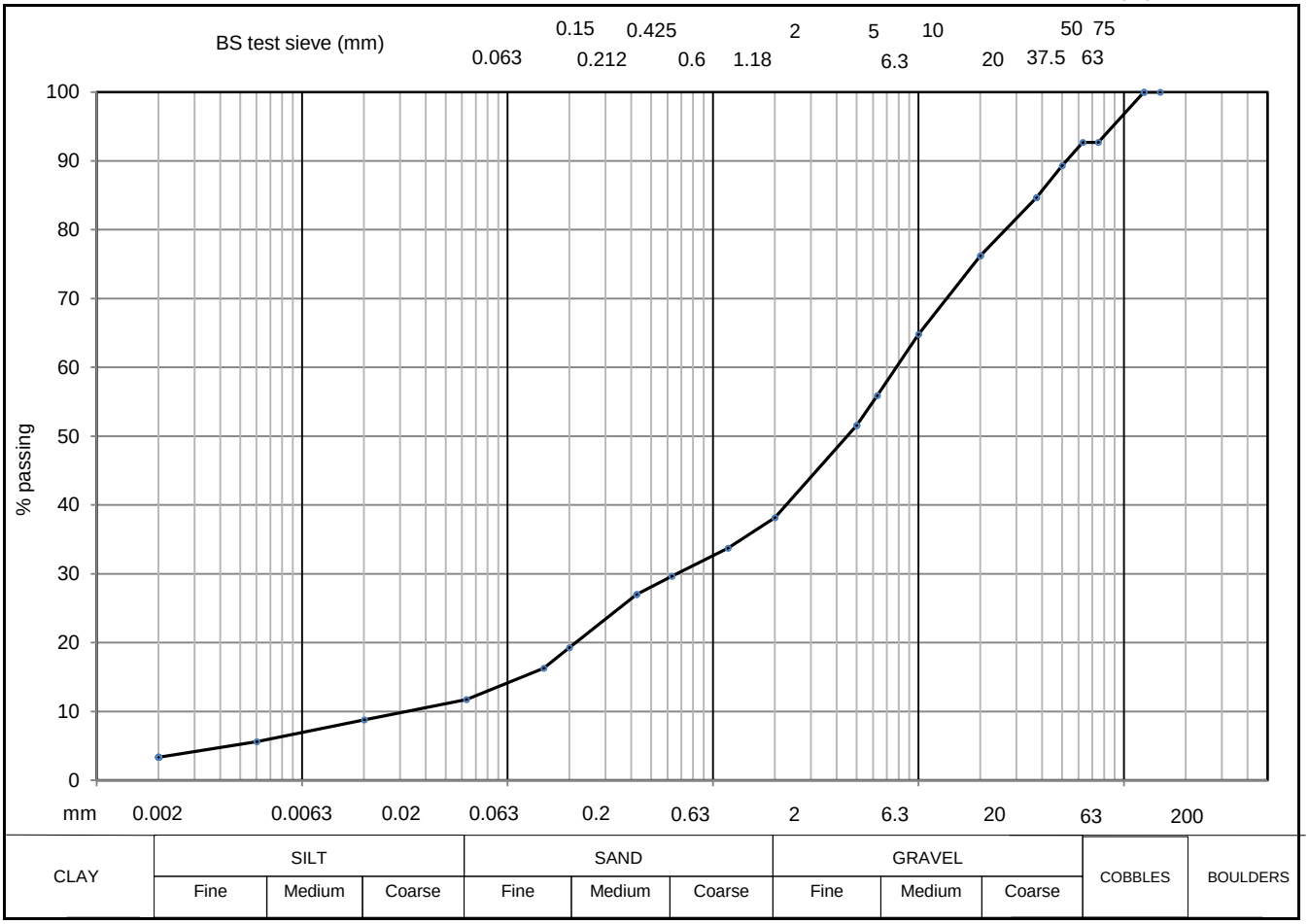
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/01
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	12B
		SAMPLE DEPTH (m)	2.50
DESCRIPTION	Brown clayey very sandy GRAVEL with medium cobble content	SPECIMEN TOP (m)	2.50
		SPECIMEN BASE (m)	2.84



soil type	% fraction
CLAY	3
SILT	8
SILT & CLAY	12
SAND	26
GRAVEL	55
COBBLE & BOULDER	7
test method(s)	5.2# & 5.4

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (μm)	% finer
150	100	5	52	20	9
75	93	2	38	6	6
63	93	1.18	34	2	3
50	89	0.63	30		
37.5	85	0.425	27		
20	76	0.2	19		
10	65	0.15	16		
6.3	56	0.063	12		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

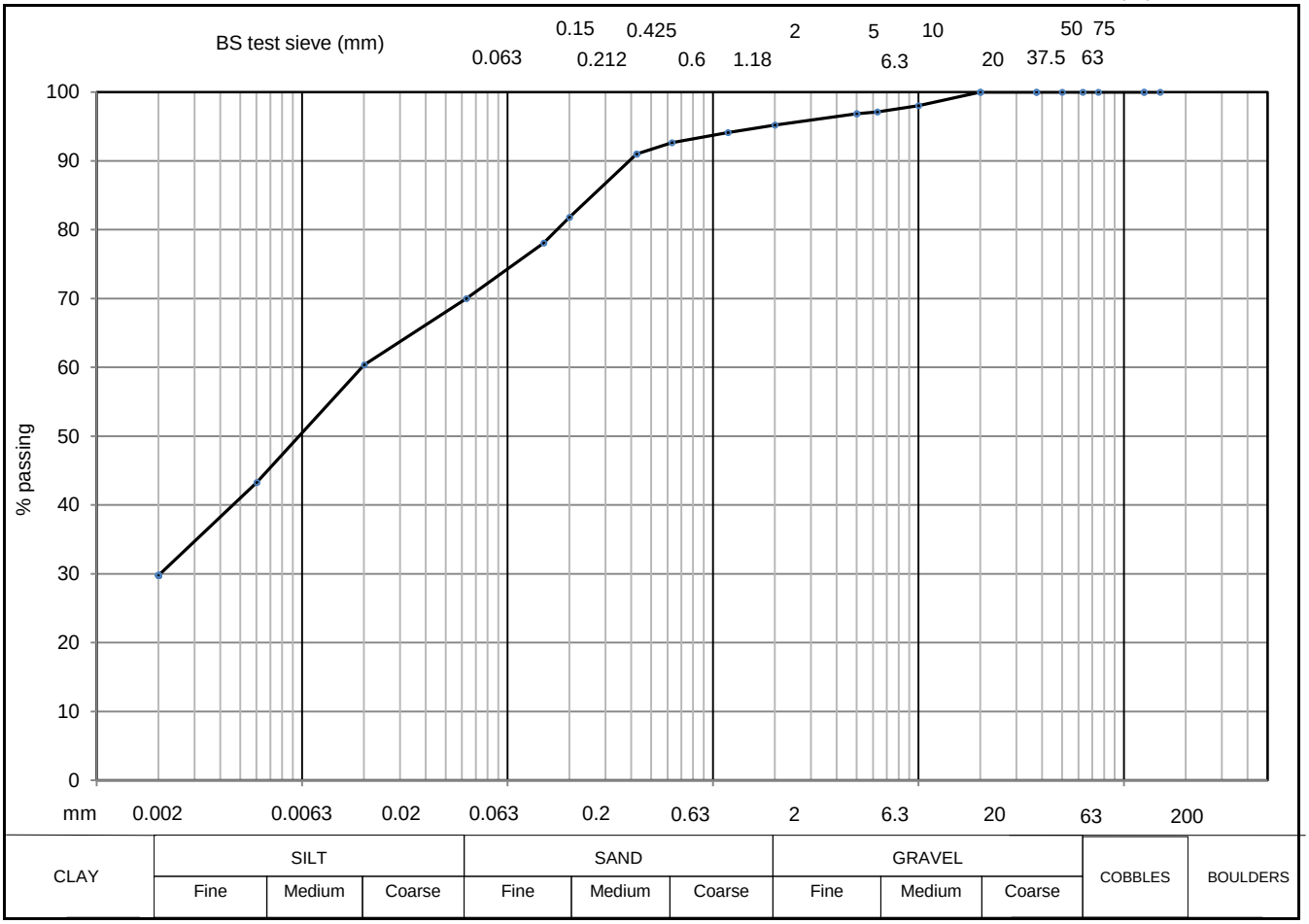
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/01
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	25B
		SAMPLE DEPTH (m)	6.50
DESCRIPTION	Brown slightly gravelly slightly sandy CLAY	SPECIMEN TOP (m)	6.50
		SPECIMEN BASE (m)	7.00



soil type	% fraction
CLAY	30
SILT	40
SILT & CLAY	70
SAND	25
GRAVEL	5
COBBLE & BOULDER	0
test method(s)	5.2 & 5.4

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	97	20	60
75		2	95	6	43
63		1.18	94	2	30
50		0.63	93		
37.5		0.425	91		
20	100	0.2	82		
10	98	0.15	78		
6.3	97	0.063	70		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

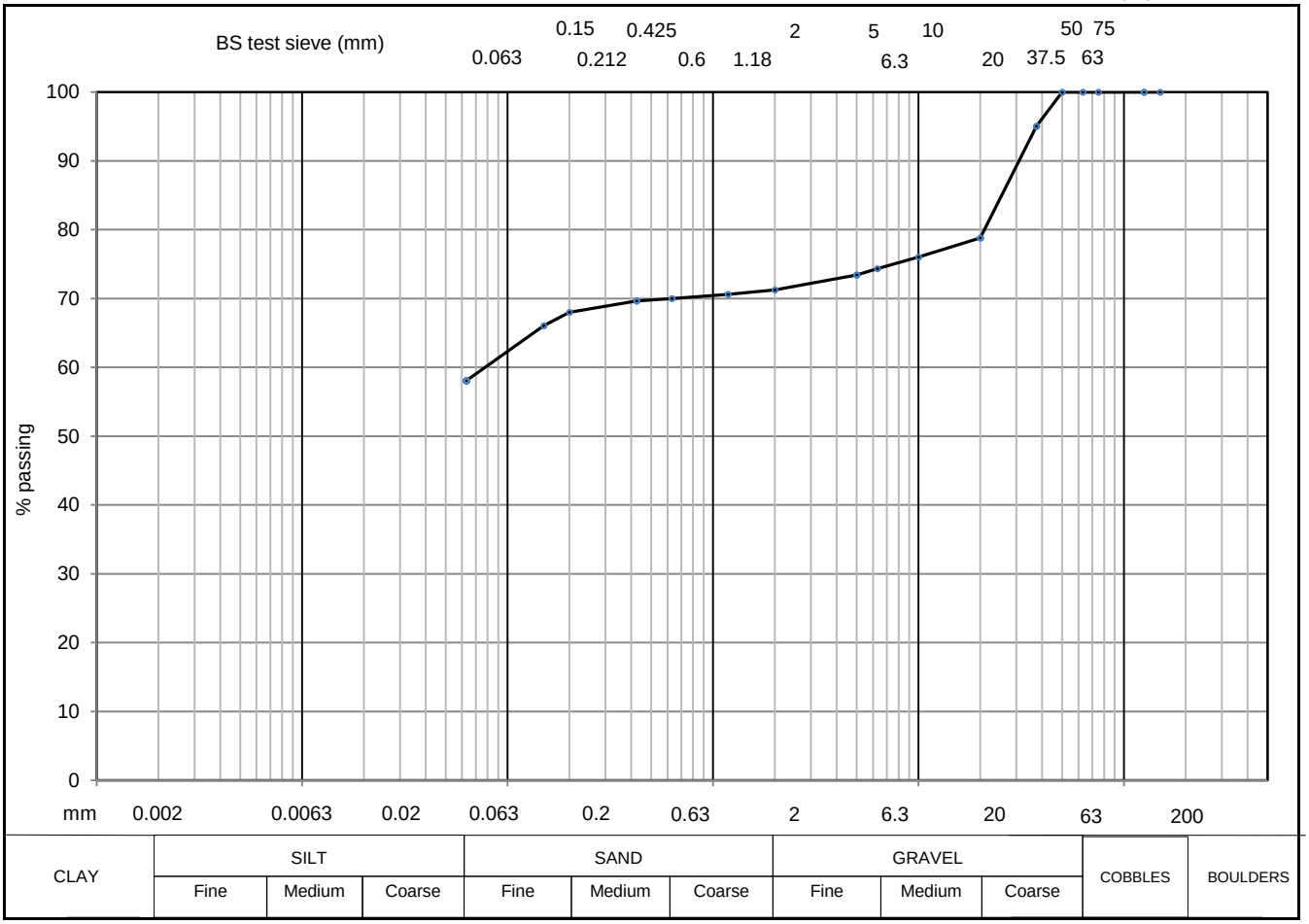
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/01
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	51C
		SAMPLE DEPTH (m)	15.20
DESCRIPTION	Light grey slightly sandy slightly gravelly CLAY	SPECIMEN TOP (m)	16.00
		SPECIMEN BASE (m)	16.60



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	58
SAND	13
GRAVEL	29
COBBLE & BOULDER	0
test method(s)	5.2
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	73	20	
75		2	71	6	
63		1.18	71	2	
50	100	0.63	70		
37.5	95	0.425	70		
20	79	0.2	68		
10	76	0.15	66		
6.3	74	0.063	58		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

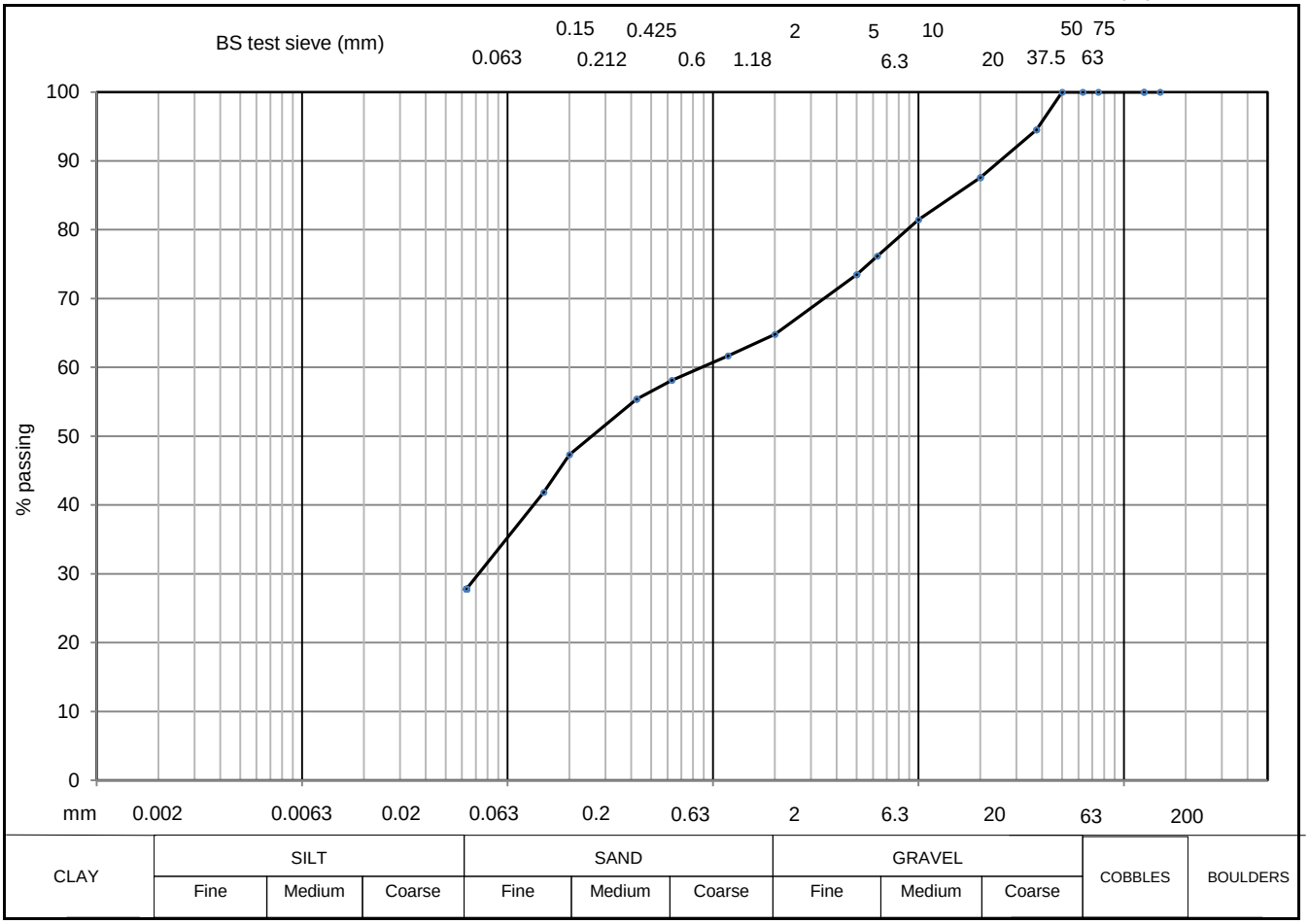
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/01
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	110C
		SAMPLE DEPTH (m)	43.70
DESCRIPTION	Grey very silty very gravelly SAND with frequent coal fragments	SPECIMEN TOP (m)	43.70
		SPECIMEN BASE (m)	45.20



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	28
SAND	37
GRAVEL	35
COBBLE & BOULDER	0
test method(s)	5.2
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	73	20	
75		2	65	6	
63		1.18	62	2	
50	100	0.63	58		
37.5	95	0.425	55		
20	88	0.2	47		
10	81	0.15	42		
6.3	76	0.063	28		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

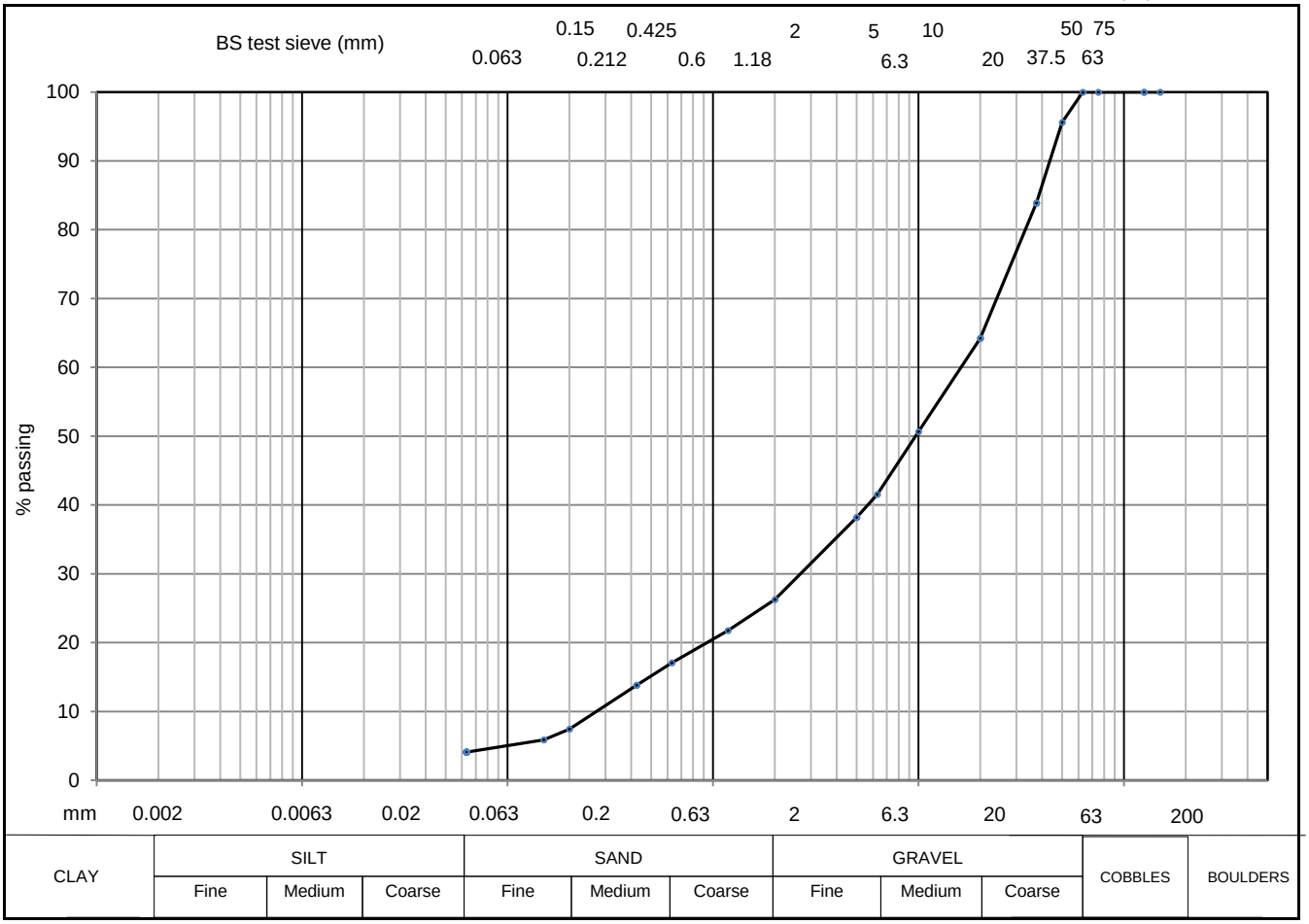
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/02
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	2B
		SAMPLE DEPTH (m)	0.50
DESCRIPTION	Brown slightly silty very sandy GRAVEL	SPECIMEN TOP (m)	0.50
		SPECIMEN BASE (m)	0.70



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	4
SAND	22
GRAVEL	74
COBBLE & BOULDER	0
test method(s)	5.2
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	38	20	
75		2	26	6	
63	100	1.18	22	2	
50	96	0.63	17		
37.5	84	0.425	14		
20	64	0.2	7		
10	51	0.15	6		
6.3	42	0.063	4		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

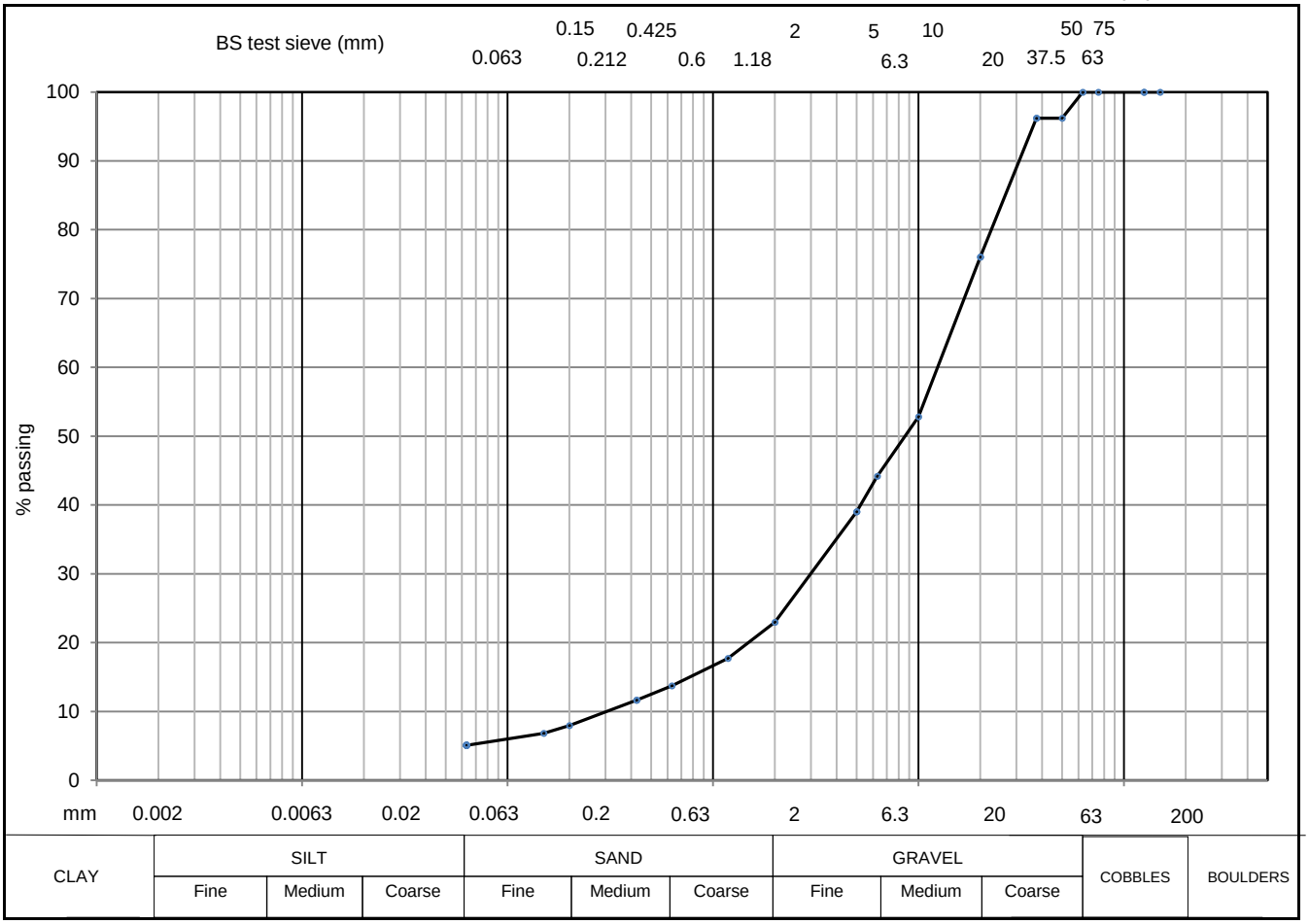
CONTRACT	CHECKED
37349	**WNJ**

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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/02
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	4B
		SAMPLE DEPTH (m)	0.90
DESCRIPTION	Light grey silty sandy GRAVEL	SPECIMEN TOP (m)	0.90
		SPECIMEN BASE (m)	1.10



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	5
SAND	18
GRAVEL	77
COBBLE & BOULDER	0
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	39	20	
75		2	23	6	
63	100	1.18	18	2	
50	96	0.63	14		
37.5	96	0.425	12		
20	76	0.2	8		
10	53	0.15	7		
6.3	44	0.063	5		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

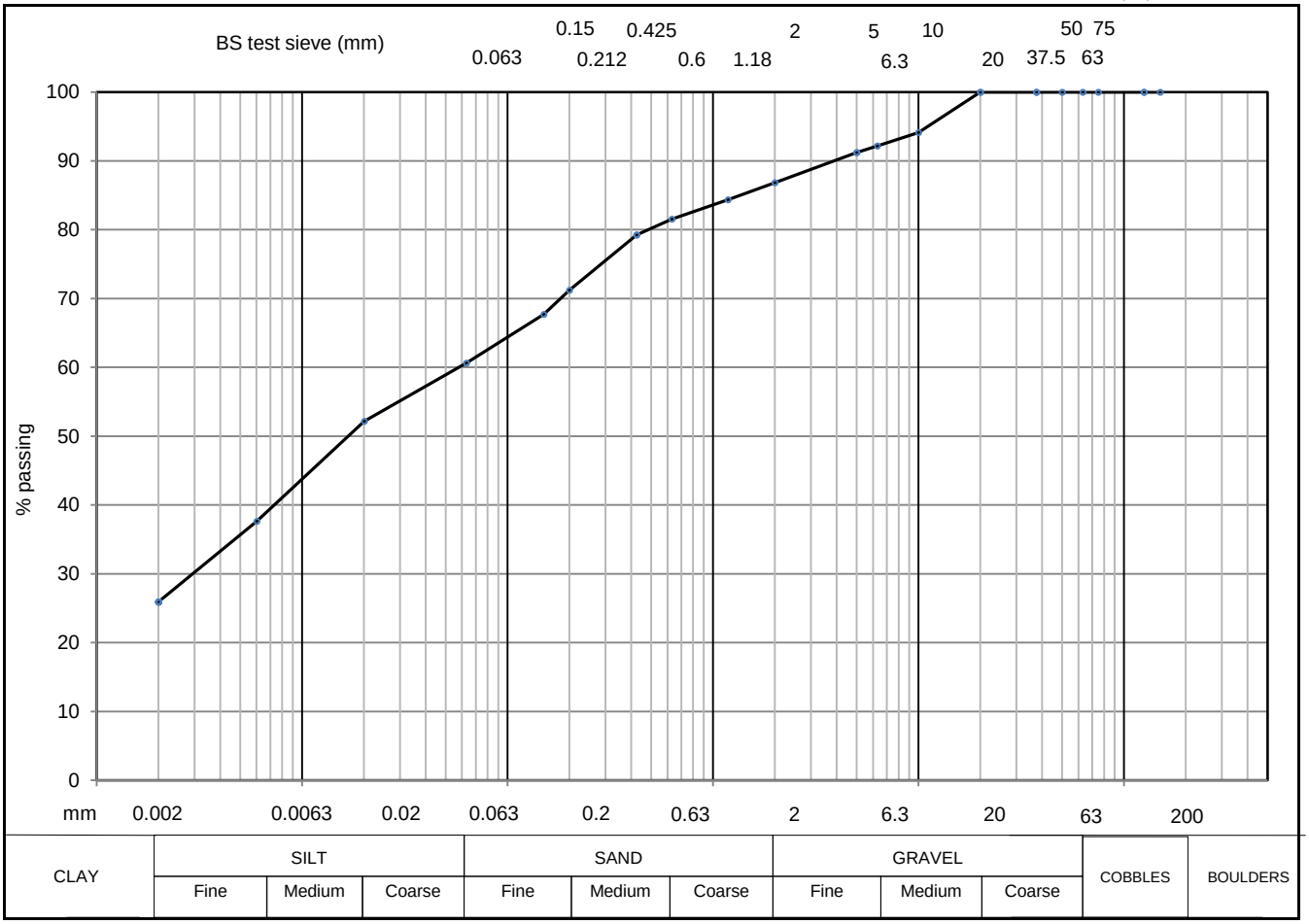
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/02
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	10B
		SAMPLE DEPTH (m)	2.50
DESCRIPTION	Brown slightly gravelly slightly sandy CLAY	SPECIMEN TOP (m)	2.50
		SPECIMEN BASE (m)	2.95



soil type	% fraction
CLAY	26
SILT	35
SILT & CLAY	61
SAND	26
GRAVEL	13
COBBLE & BOULDER	0
test method(s)	5.2 & 5.4
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing
150	
75	
63	
50	
37.5	
20	100
10	94
6.3	92

BS test sieve (mm)	% passing
5	91
2	87
1.18	84
0.63	82
0.425	79
0.2	71
0.15	68
0.063	61

BS test sieve (µm)	% finer
20	52
6	38
2	26

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

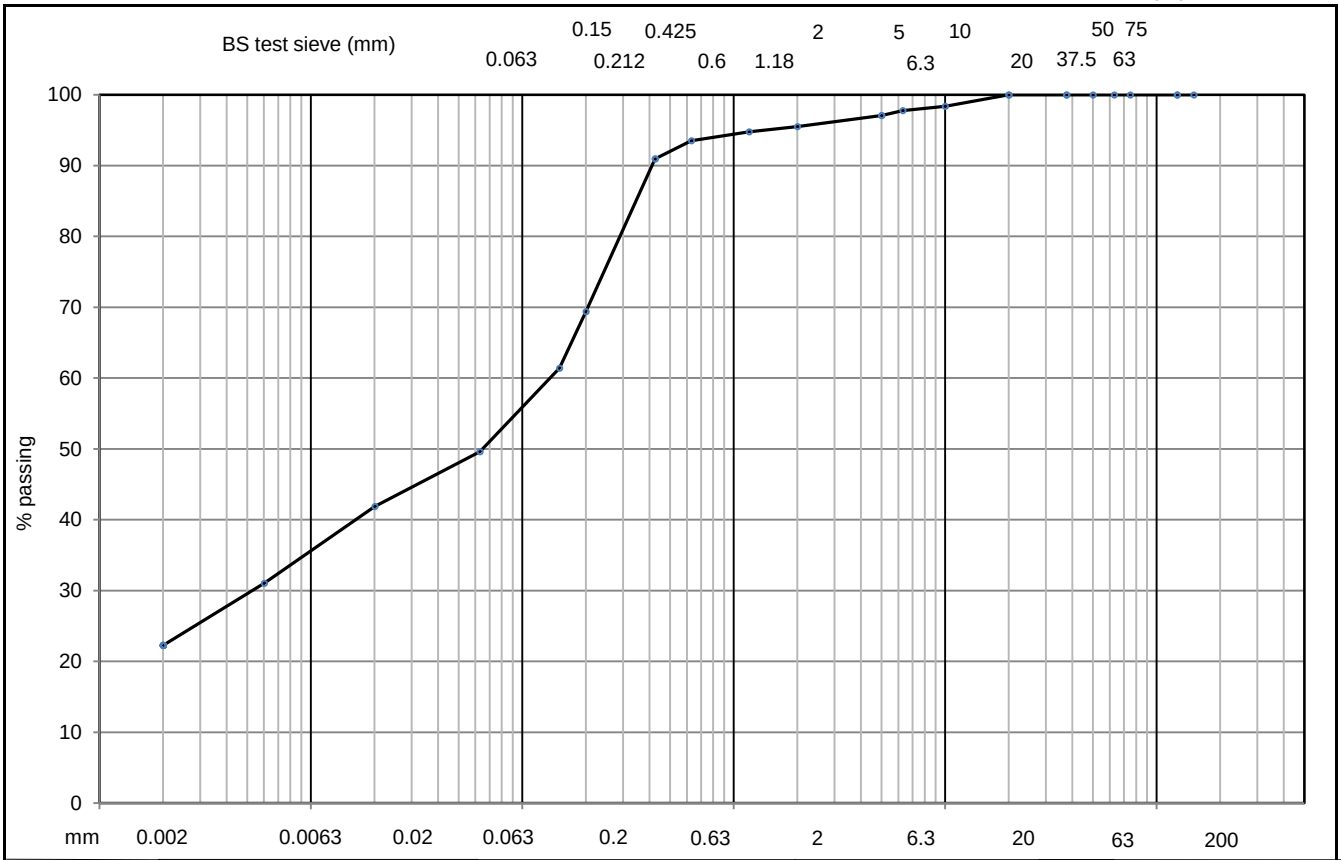
CONTRACT	CHECKED
37349	**WNJ**

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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/02
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	39B
		SAMPLE DEPTH (m)	11.50
DESCRIPTION	Brown slightly gravelly sandy CLAY	SPECIMEN TOP (m)	11.50
		SPECIMEN BASE (m)	12.00



soil type	% fraction
CLAY	22
SILT	27
SILT & CLAY	50
SAND	46
GRAVEL	4
COBBLE & BOULDER	0
test method(s)	5.2 & 5.4
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing
150	
75	
63	
50	
37.5	
20	100
10	98
6.3	98

BS test sieve (mm)	% passing
5	97
2	96
1.18	95
0.63	94
0.425	91
0.2	69
0.15	61
0.063	50

BS test sieve (µm)	% finer
20	42
6	31
2	22

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

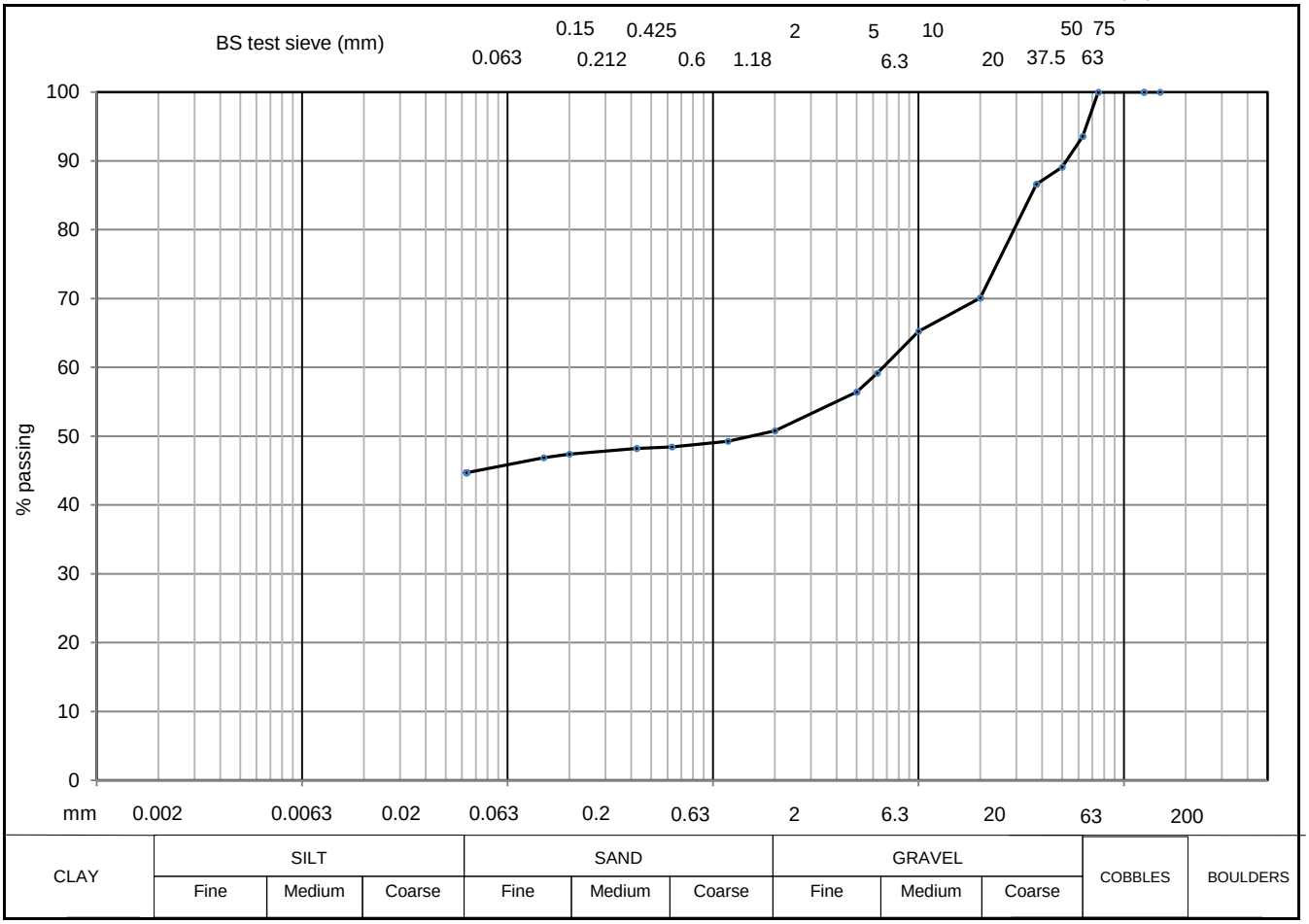
CONTRACT	CHECKED
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BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/02
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	55C
		SAMPLE DEPTH (m)	16.50
DESCRIPTION	Light grey slightly sandy gravelly silty CLAY with low cobble content	SPECIMEN TOP (m)	16.80
		SPECIMEN BASE (m)	17.30



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	45
SAND	6
GRAVEL	43
COBBLE & BOULDER	6
test method(s)	5.2
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	56	20	
75	100	2	51	6	
63	94	1.18	49	2	
50	89	0.63	48		
37.5	87	0.425	48		
20	70	0.2	47		
10	65	0.15	47		
6.3	59	0.063	45		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

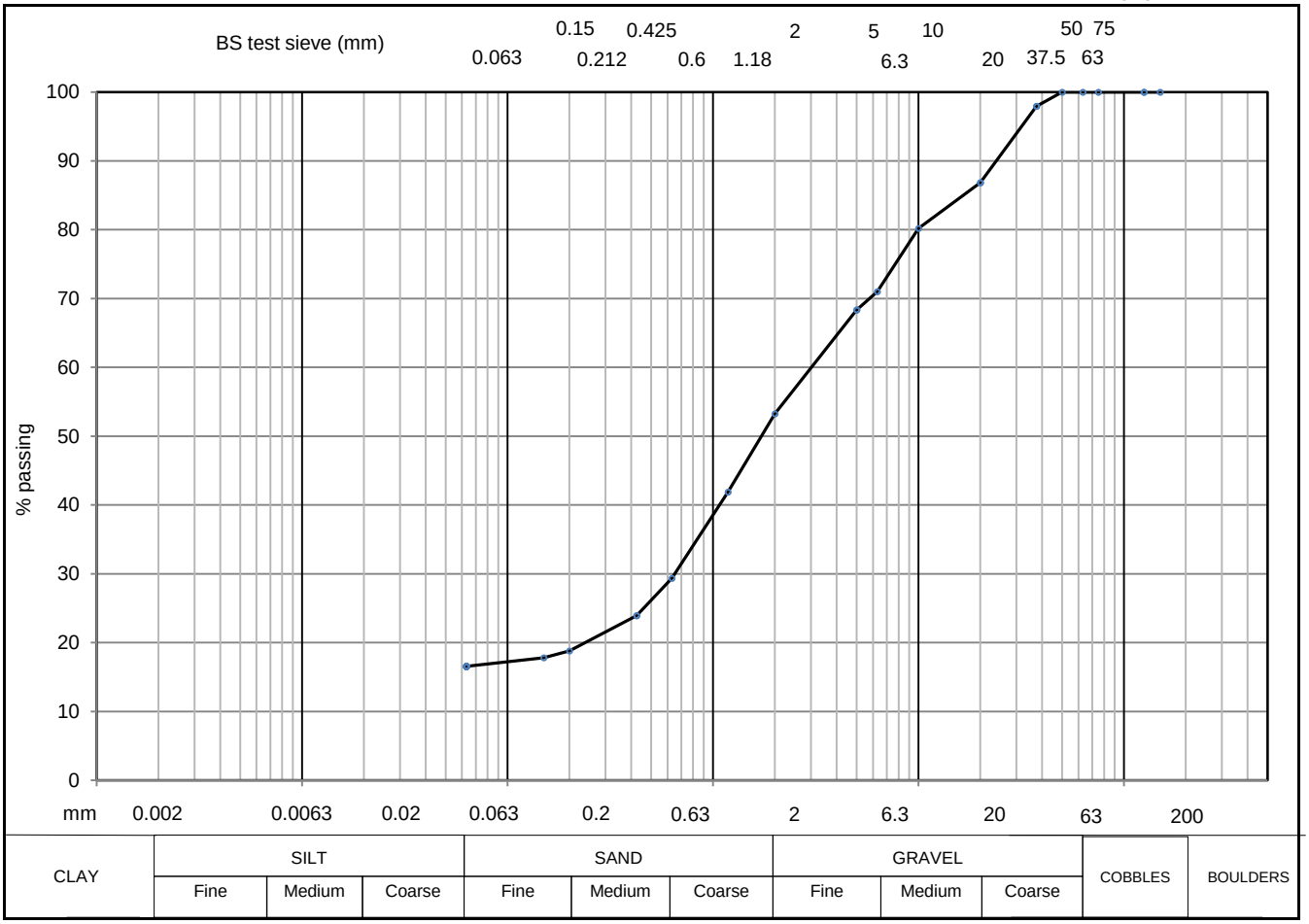
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CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/02
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	70C
		SAMPLE DEPTH (m)	24.00
DESCRIPTION	Dark grey clayey very sandy GRAVEL	SPECIMEN TOP (m)	24.30
		SPECIMEN BASE (m)	24.80



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	17
SAND	37
GRAVEL	47
COBBLE & BOULDER	0
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing
150	
75	
63	
50	100
37.5	98
20	87
10	80
6.3	71

BS test sieve (mm)	% passing
5	68
2	53
1.18	42
0.63	29
0.425	24
0.2	19
0.15	18
0.063	17

BS test sieve (µm)	% finer
20	
6	
2	

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

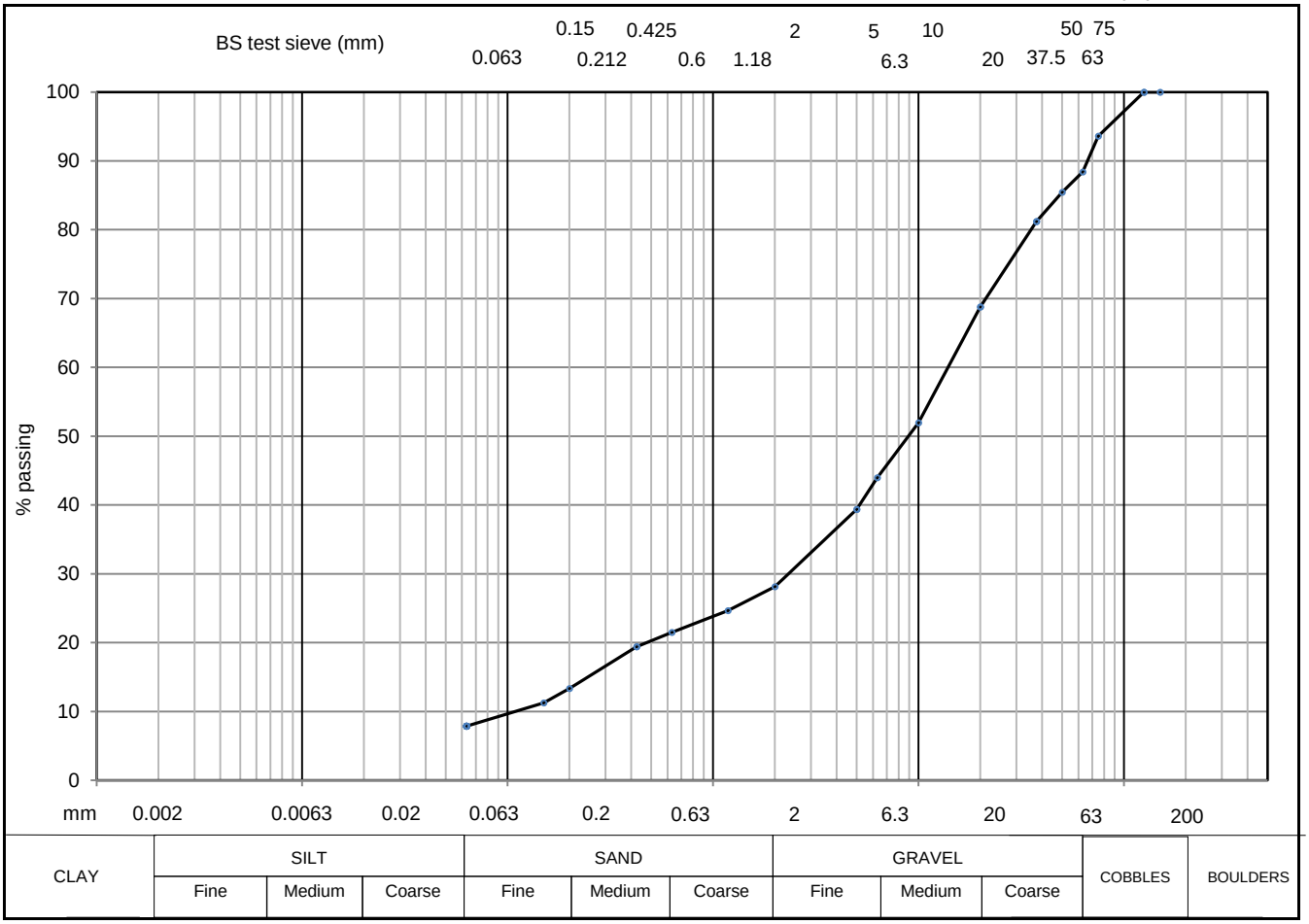
CONTRACT	CHECKED
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CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/03
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	3B
		SAMPLE DEPTH (m)	0.25
DESCRIPTION	Brown clayey sandy GRAVEL with medium cobble content	SPECIMEN TOP (m)	0.25
		SPECIMEN BASE (m)	0.50



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	8
SAND	20
GRAVEL	60
COBBLE & BOULDER	12
test method(s)	5.2#
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150	100	5	39	20	
75	94	2	28	6	
63	88	1.18	25	2	
50	85	0.63	22		
37.5	81	0.425	19		
20	69	0.2	13		
10	52	0.15	11		
6.3	44	0.063	8		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

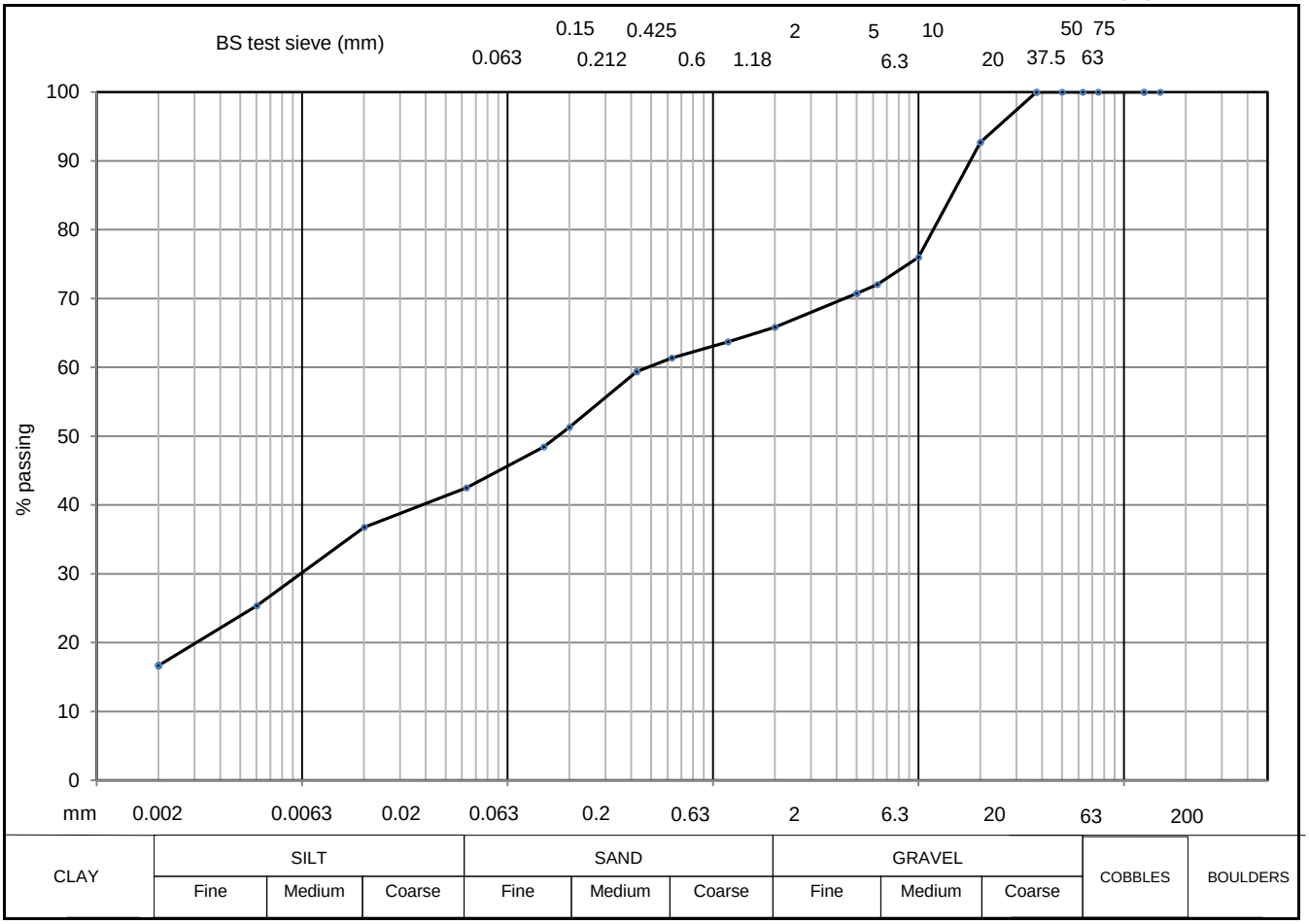
CONTRACT	CHECKED
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CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/03
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	9B
		SAMPLE DEPTH (m)	2.00
DESCRIPTION	Brown slightly sandy slightly gravelly CLAY	SPECIMEN TOP (m)	2.00
		SPECIMEN BASE (m)	2.45



soil type	% fraction
CLAY	17
SILT	26
SILT & CLAY	43
SAND	23
GRAVEL	34
COBBLE & BOULDER	0
test method(s)	5.2 & 5.4
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing
150	
75	
63	
50	
37.5	100
20	93
10	76
6.3	72

BS test sieve (mm)	% passing
5	71
2	66
1.18	64
0.63	61
0.425	59
0.2	51
0.15	48
0.063	43

BS test sieve (µm)	% finer
20	37
6	25
2	17

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

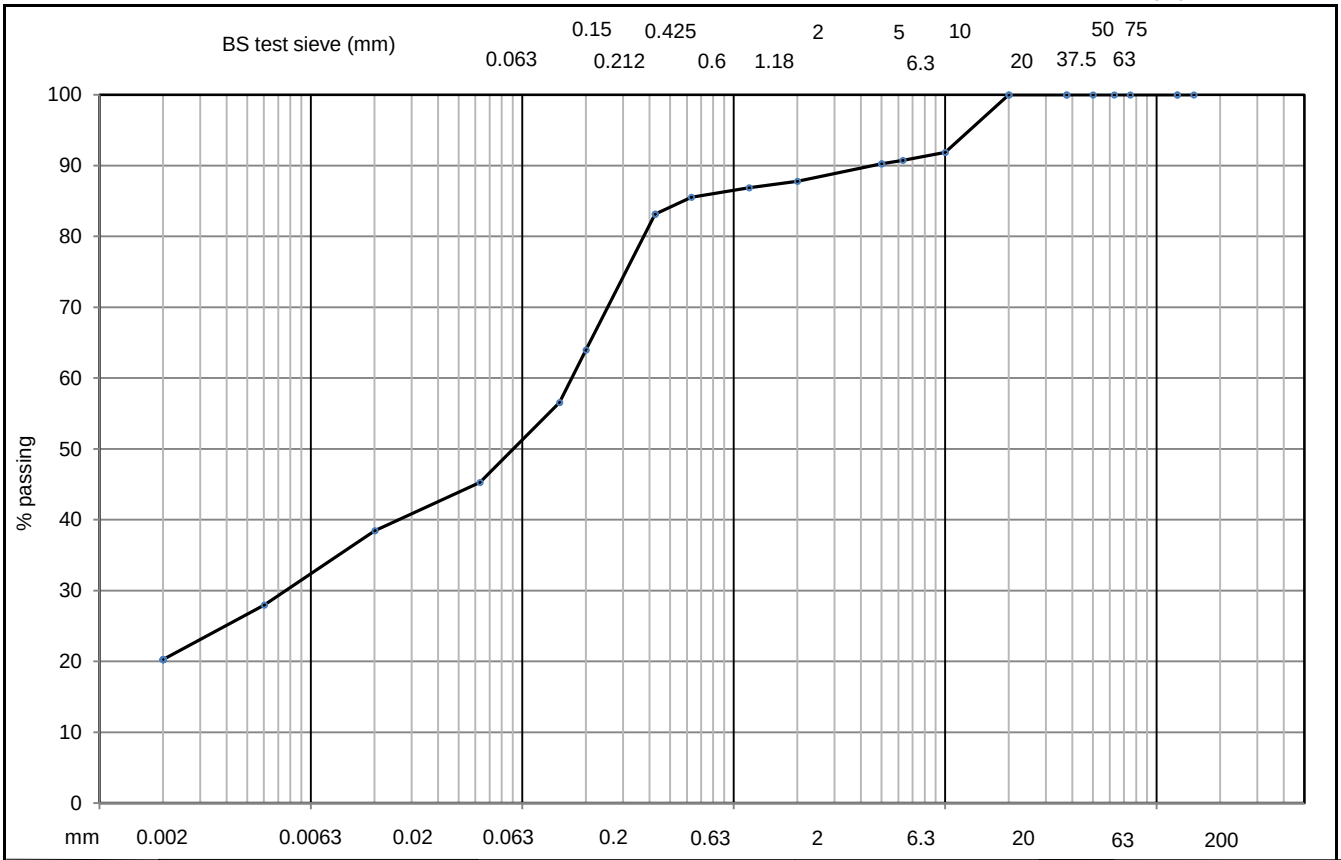
CONTRACT	CHECKED
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CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/03
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	44D
		SAMPLE DEPTH (m)	13.50
DESCRIPTION	Brown slightly gravelly sandy CLAY	SPECIMEN TOP (m)	13.50
		SPECIMEN BASE (m)	13.95



soil type	% fraction
CLAY	20
SILT	25
SILT & CLAY	45
SAND	43
GRAVEL	12
COBBLE & BOULDER	0
test method(s)	5.2 & 5.4
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	90	20	38
75		2	88	6	28
63		1.18	87	2	20
50		0.63	86		
37.5		0.425	83		
20	100	0.2	64		
10	92	0.15	57		
6.3	91	0.063	45		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

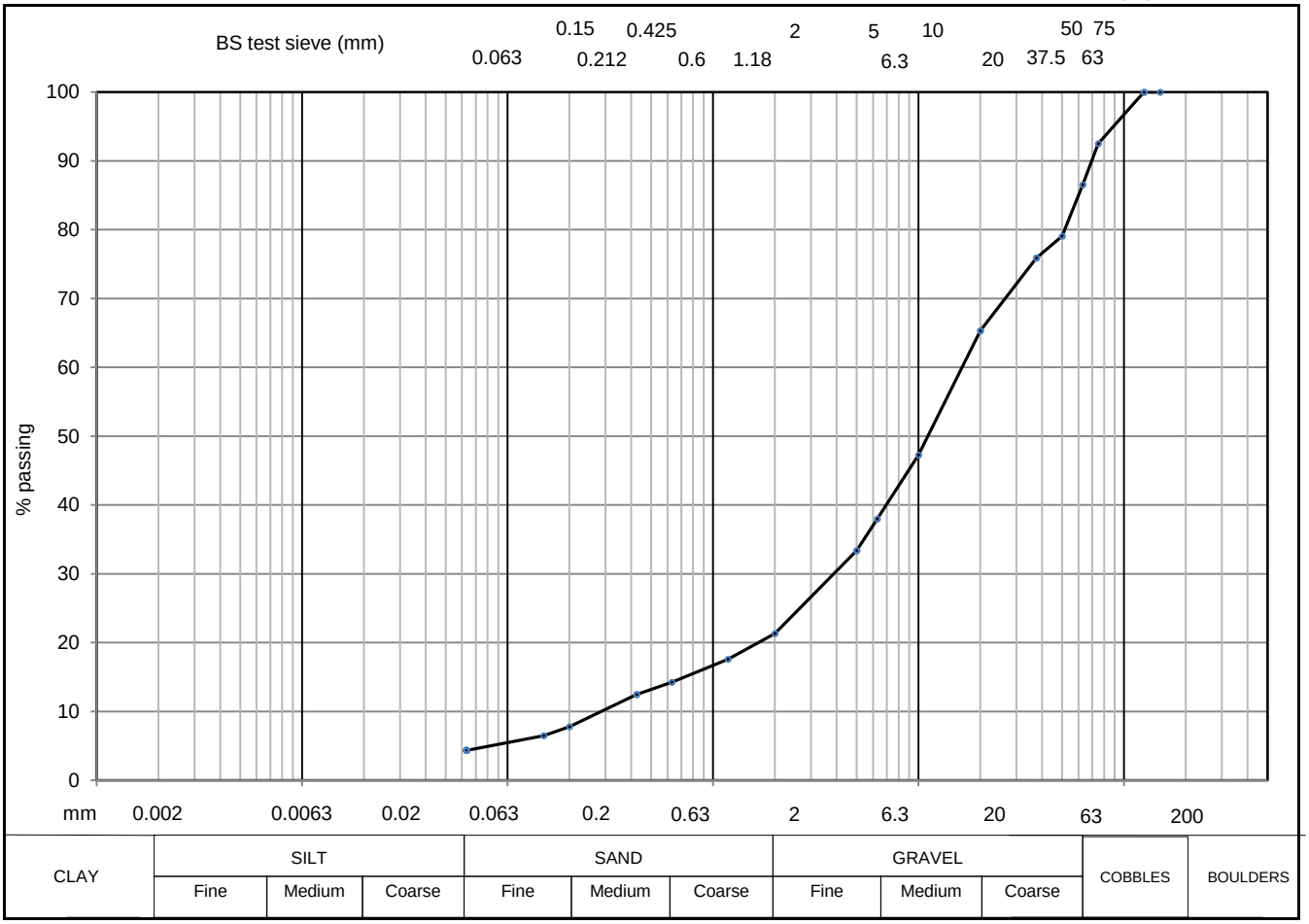
CONTRACT	CHECKED
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CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/04
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	7B
		SAMPLE DEPTH (m)	1.20
DESCRIPTION	Briwn slighty clayey sandy GRAVEL with low cobble content	SPECIMEN TOP (m)	1.20
		SPECIMEN BASE (m)	1.65



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	4
SAND	17
GRAVEL	65
COBBLE & BOULDER	13
test method(s)	5.2#
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150	100	5	33	20	
75	93	2	21	6	
63	87	1.18	18	2	
50	79	0.63	14		
37.5	76	0.425	12		
20	65	0.2	8		
10	47	0.15	6		
6.3	38	0.063	4		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

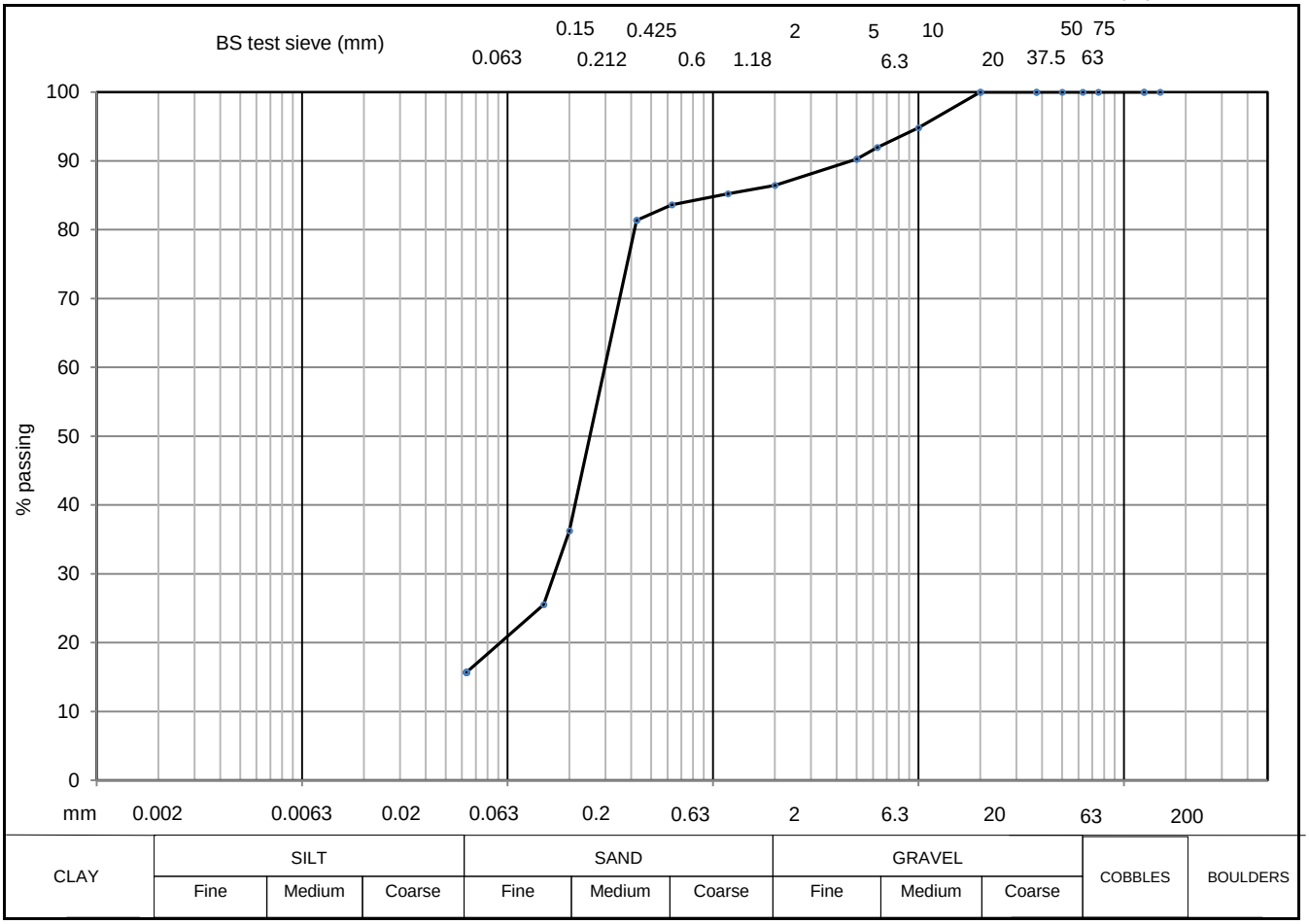
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

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CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/04
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	17L
		SAMPLE DEPTH (m)	4.00
DESCRIPTION	Orangish brown gravelly clayey SAND	SPECIMEN TOP (m)	4.00
		SPECIMEN BASE (m)	4.50



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	16
SAND	71
GRAVEL	14
COBBLE & BOULDER	0
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	90	20	
75		2	86	6	
63		1.18	85	2	
50		0.63	84		
37.5		0.425	81		
20	100	0.2	36		
10	95	0.15	26		
6.3	92	0.063	16		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

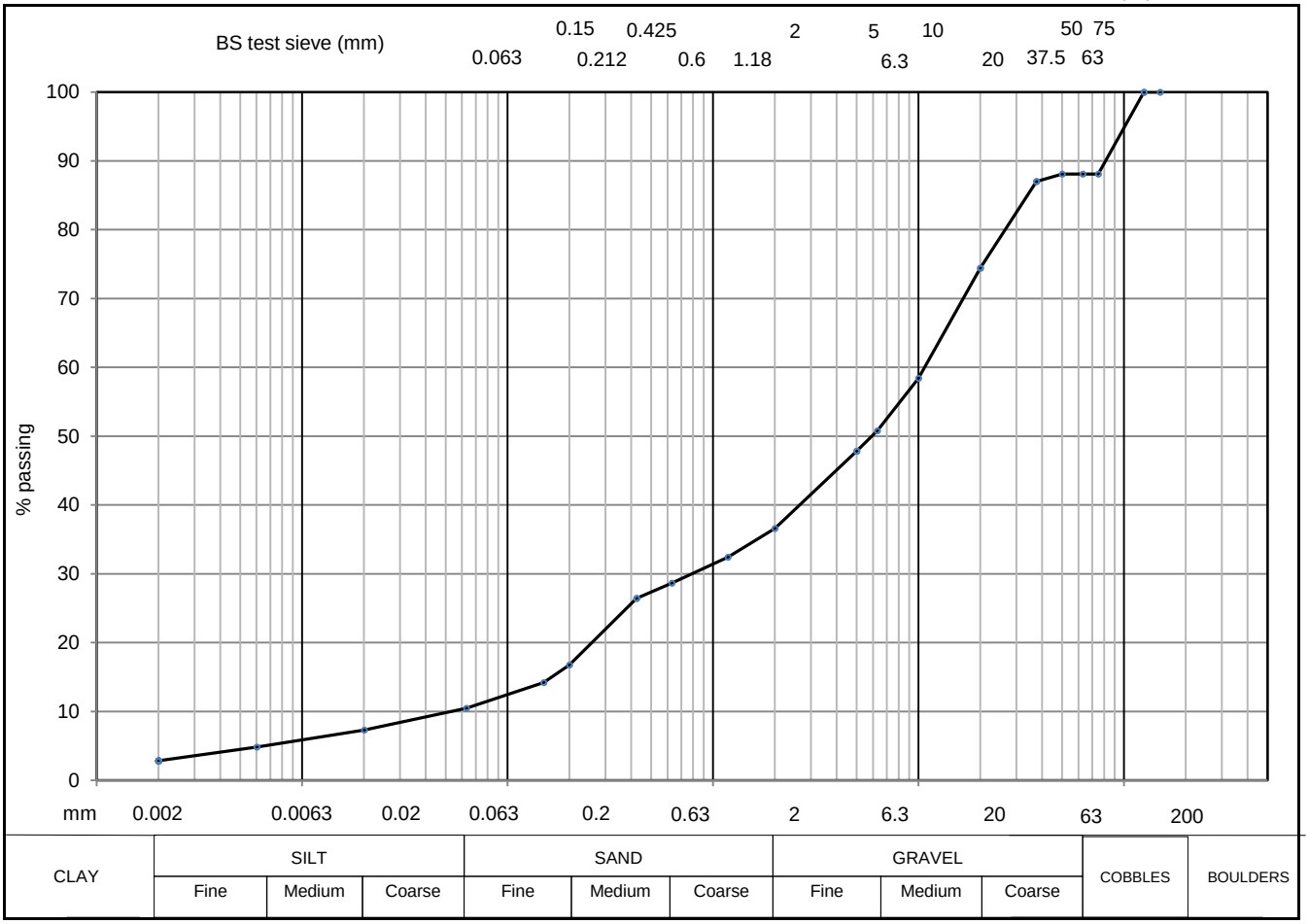
CONTRACT	CHECKED
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CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/04
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	19L
		SAMPLE DEPTH (m)	4.50
DESCRIPTION	Brown clayey very sandy GRAVEL with low cobble content	SPECIMEN TOP (m)	4.50
		SPECIMEN BASE (m)	5.20



soil type	% fraction
CLAY	3
SILT	8
SILT & CLAY	10
SAND	26
GRAVEL	51
COBBLE & BOULDER	12
test method(s)	5.2# & 5.4

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150	100	5	48	20	7
75	88	2	37	6	5
63	88	1.18	32	2	3
50	88	0.63	29		
37.5	87	0.425	26		
20	74	0.2	17		
10	58	0.15	14		
6.3	51	0.063	10		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

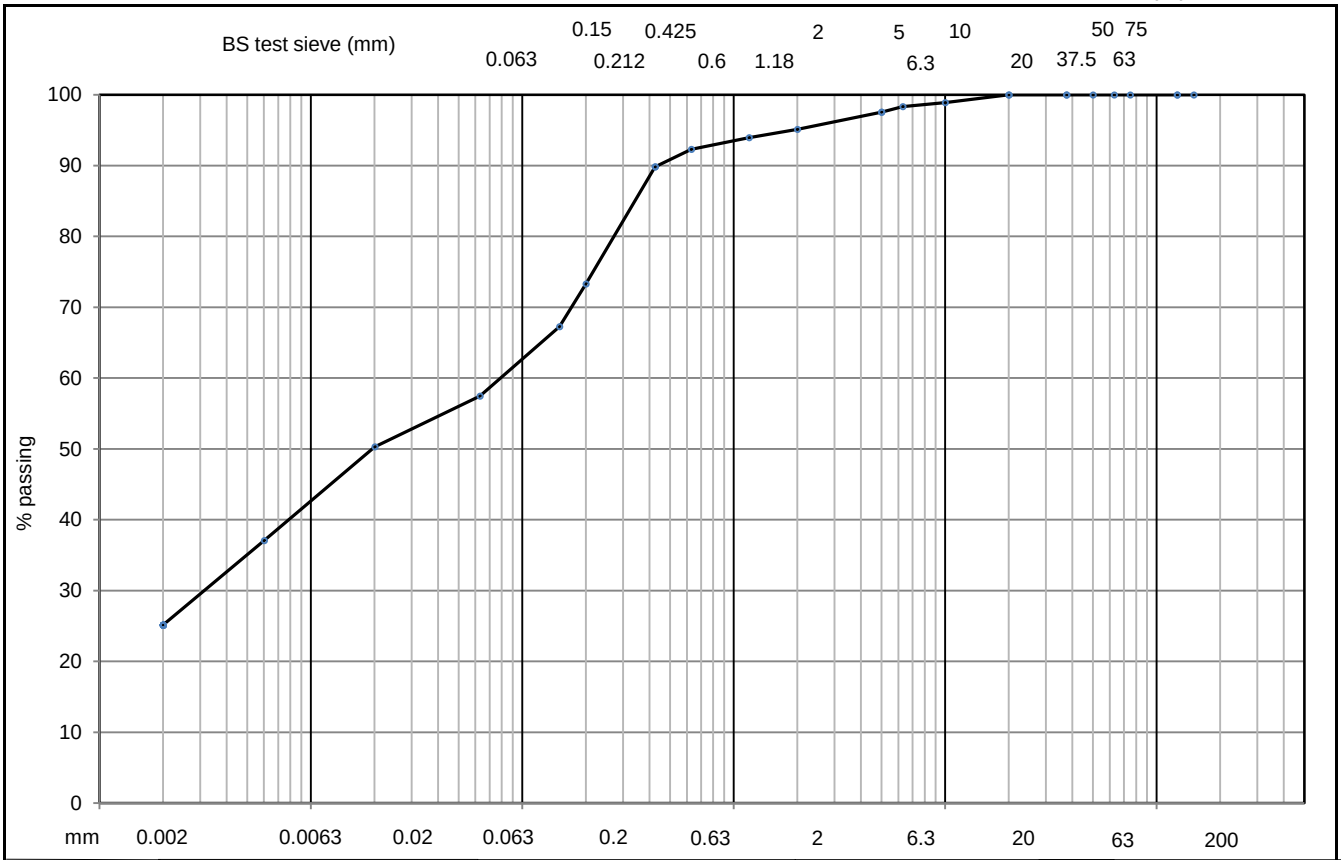
CONTRACT	CHECKED
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BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/04
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	29L
		SAMPLE DEPTH (m)	9.20
DESCRIPTION	Brown slightly gravelly sandy CLAY	SPECIMEN TOP (m)	9.20
		SPECIMEN BASE (m)	9.50



soil type	% fraction
CLAY	25
SILT	32
SILT & CLAY	57
SAND	38
GRAVEL	5
COBBLE & BOULDER	0
test method(s)	5.2 & 5.4
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	98	20	50
75		2	95	6	37
63		1.18	94	2	25
50		0.63	92		
37.5		0.425	90		
20	100	0.2	73		
10	99	0.15	67		
6.3	98	0.063	57		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

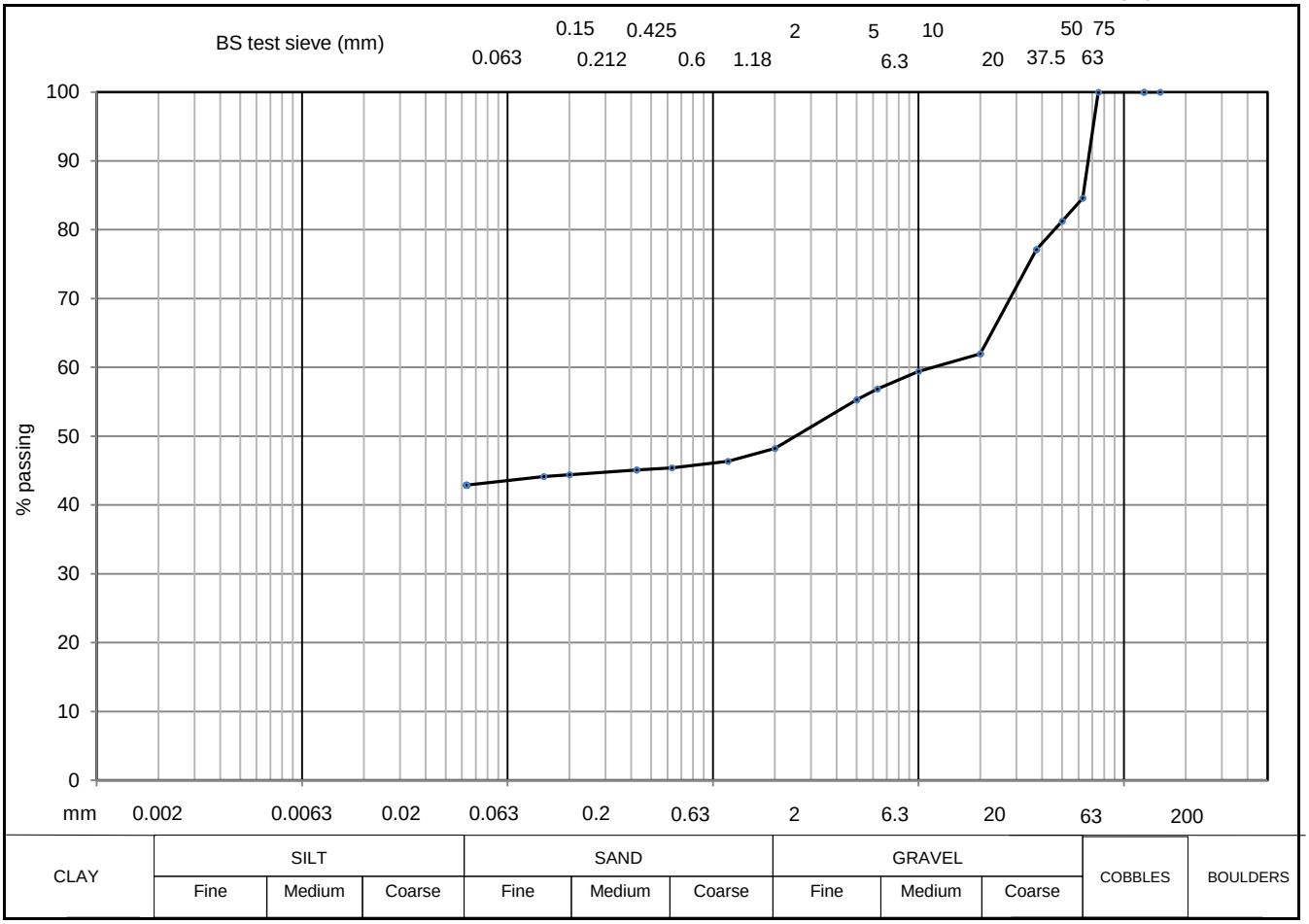
CONTRACT	CHECKED
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CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/04
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	47C
		SAMPLE DEPTH (m)	16.70
DESCRIPTION	Light grey slightly sandy gravelly silty CLAY with low cobble content	SPECIMEN TOP (m)	17.10
		SPECIMEN BASE (m)	17.70



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	43
SAND	5
GRAVEL	36
COBBLE & BOULDER	15
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	55	20	
75	100	2	48	6	
63	85	1.18	46	2	
50	81	0.63	45		
37.5	77	0.425	45		
20	62	0.2	44		
10	59	0.15	44		
6.3	57	0.063	43		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

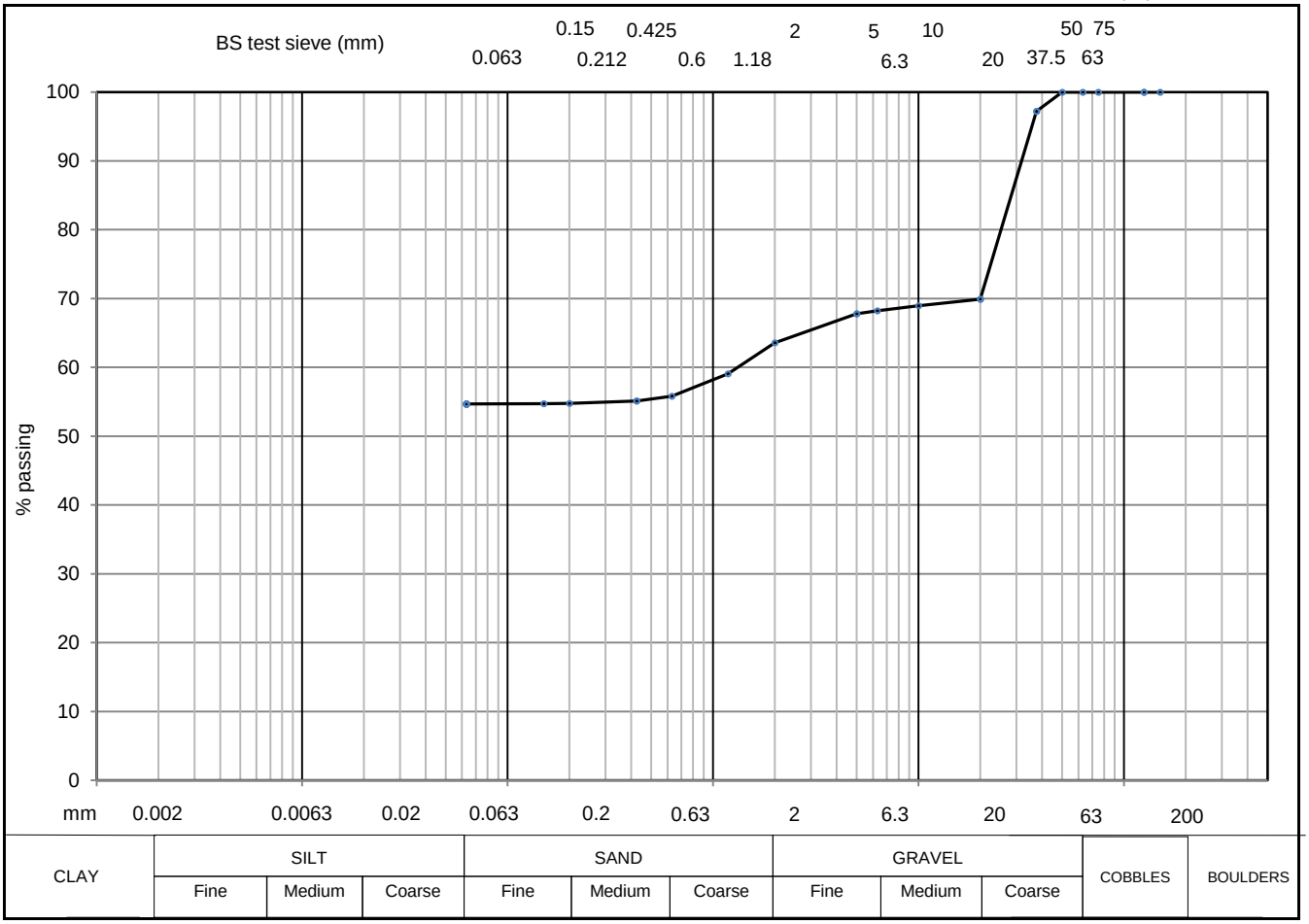
CONTRACT	CHECKED
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CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/04
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	56C
		SAMPLE DEPTH (m)	21.20
DESCRIPTION	Light grey slightly sandy gravelly silty CLAY	SPECIMEN TOP (m)	21.90
		SPECIMEN BASE (m)	22.50



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	55
SAND	9
GRAVEL	36
COBBLE & BOULDER	0
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing
150	
75	
63	
50	100
37.5	97
20	70
10	69
6.3	68

BS test sieve (mm)	% passing
5	68
2	64
1.18	59
0.63	56
0.425	55
0.2	55
0.15	55
0.063	55

BS test sieve (μm)	% finer
20	
6	
2	

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

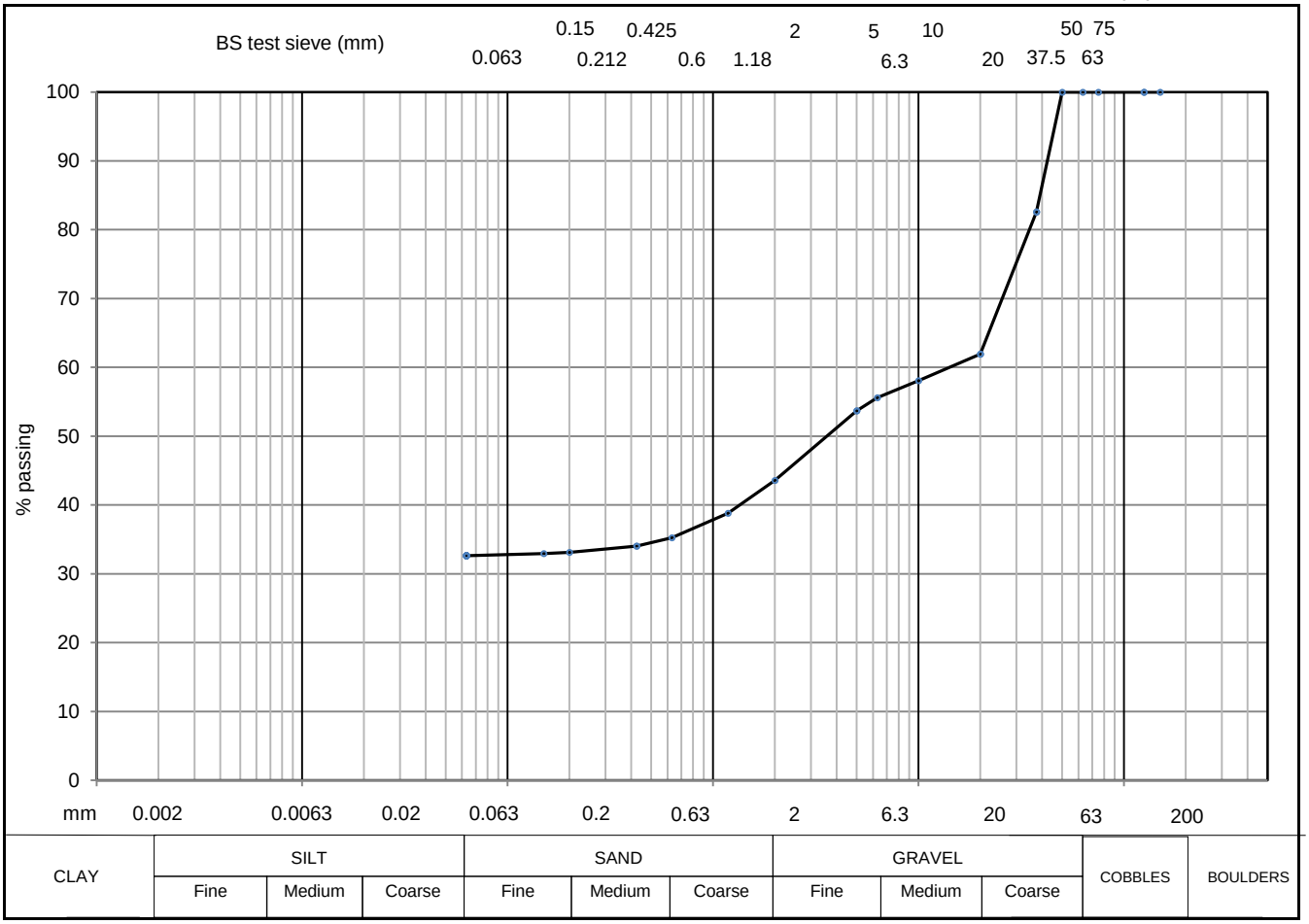
CONTRACT	CHECKED
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CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/04
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	80C
		SAMPLE DEPTH (m)	34.70
DESCRIPTION	Grey sandy very clayey GRAVEL	SPECIMEN TOP (m)	34.70
		SPECIMEN BASE (m)	35.30



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	33
SAND	11
GRAVEL	56
COBBLE & BOULDER	0
test method(s)	5.2#
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	54	20	
75		2	44	6	
63		1.18	39	2	
50	100	0.63	35		
37.5	83	0.425	34		
20	62	0.2	33		
10	58	0.15	33		
6.3	56	0.063	33		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

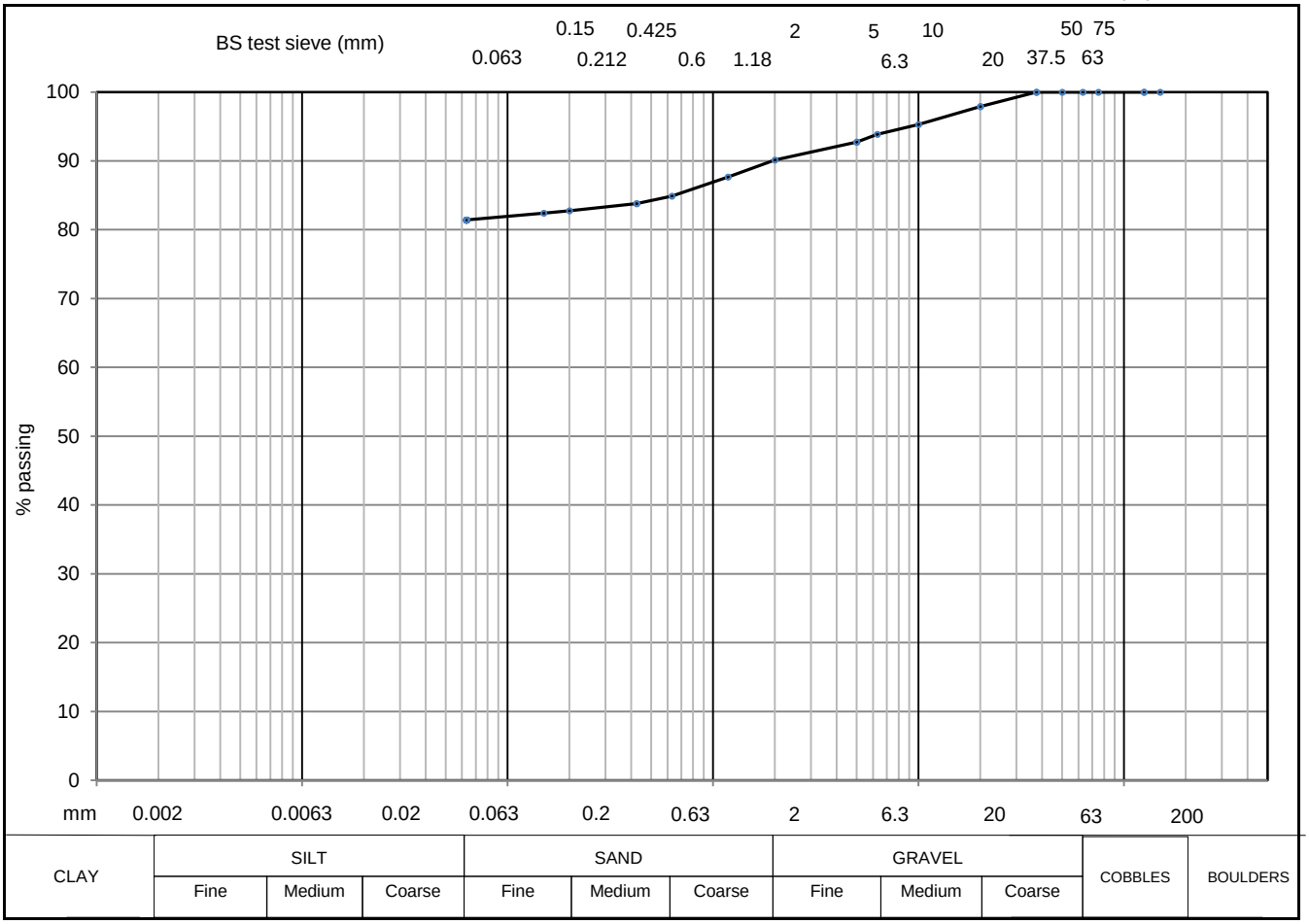
CONTRACT	CHECKED
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CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/04
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	82C
		SAMPLE DEPTH (m)	36.20
DESCRIPTION	Grey slightly sandy slightly gravelly silty CLAY	SPECIMEN TOP (m)	36.20
		SPECIMEN BASE (m)	36.80



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	81
SAND	9
GRAVEL	10
COBBLE & BOULDER	0
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing
150	
75	
63	
50	
37.5	100
20	98
10	95
6.3	94

BS test sieve (mm)	% passing
5	93
2	90
1.18	88
0.63	85
0.425	84
0.2	83
0.15	82
0.063	81

BS test sieve (µm)	% finer
20	
6	
2	

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

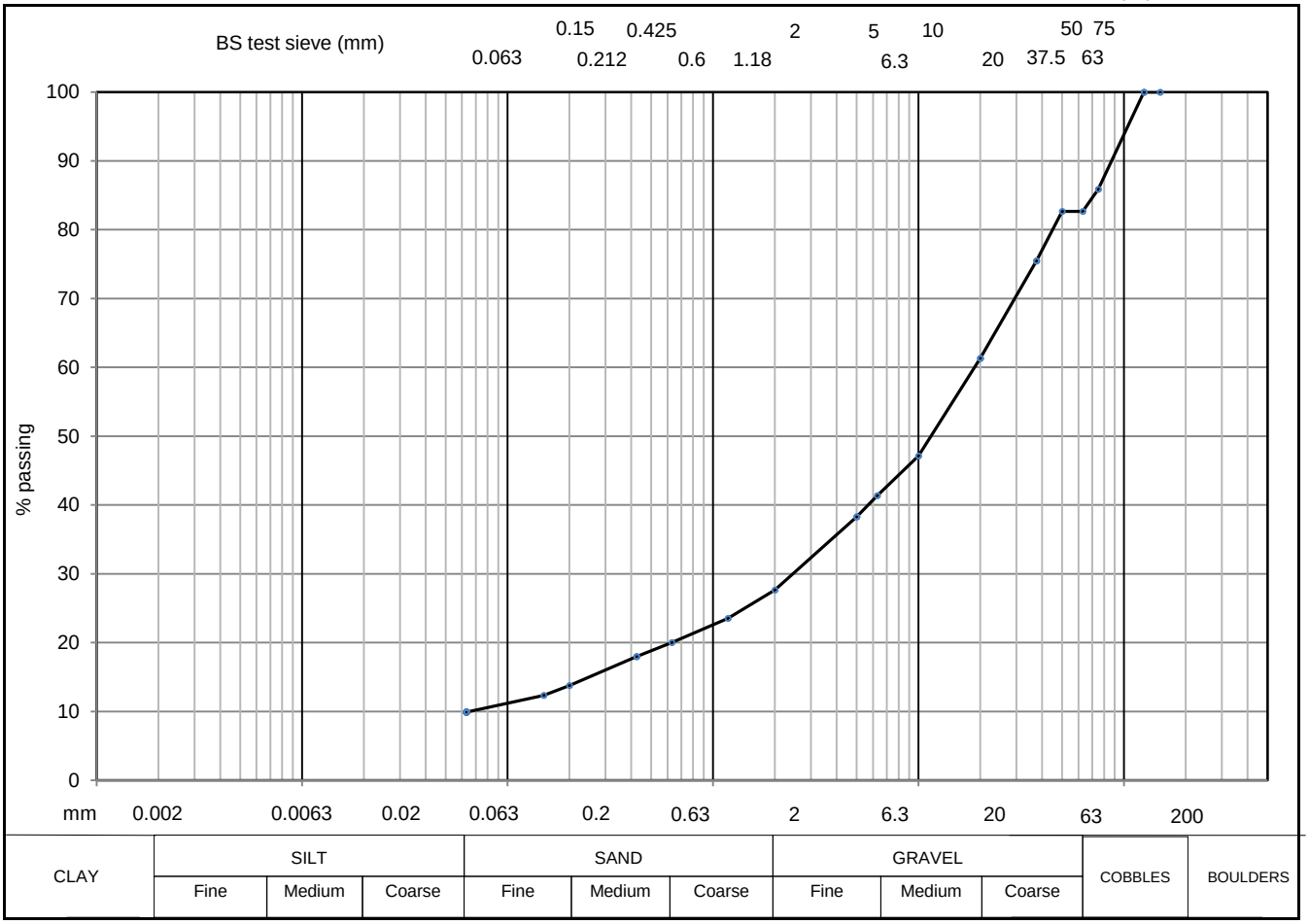
CONTRACT	CHECKED
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CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/05
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	3B
		SAMPLE DEPTH (m)	0.50
DESCRIPTION	Light brown silty sandy GRAVEL with low cobble content	SPECIMEN TOP (m)	0.50
		SPECIMEN BASE (m)	0.70



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	10
SAND	18
GRAVEL	55
COBBLE & BOULDER	17
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150	100	5	38	20	
75	86	2	28	6	
63	83	1.18	24	2	
50	83	0.63	20		
37.5	75	0.425	18		
20	61	0.2	14		
10	47	0.15	12		
6.3	41	0.063	10		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

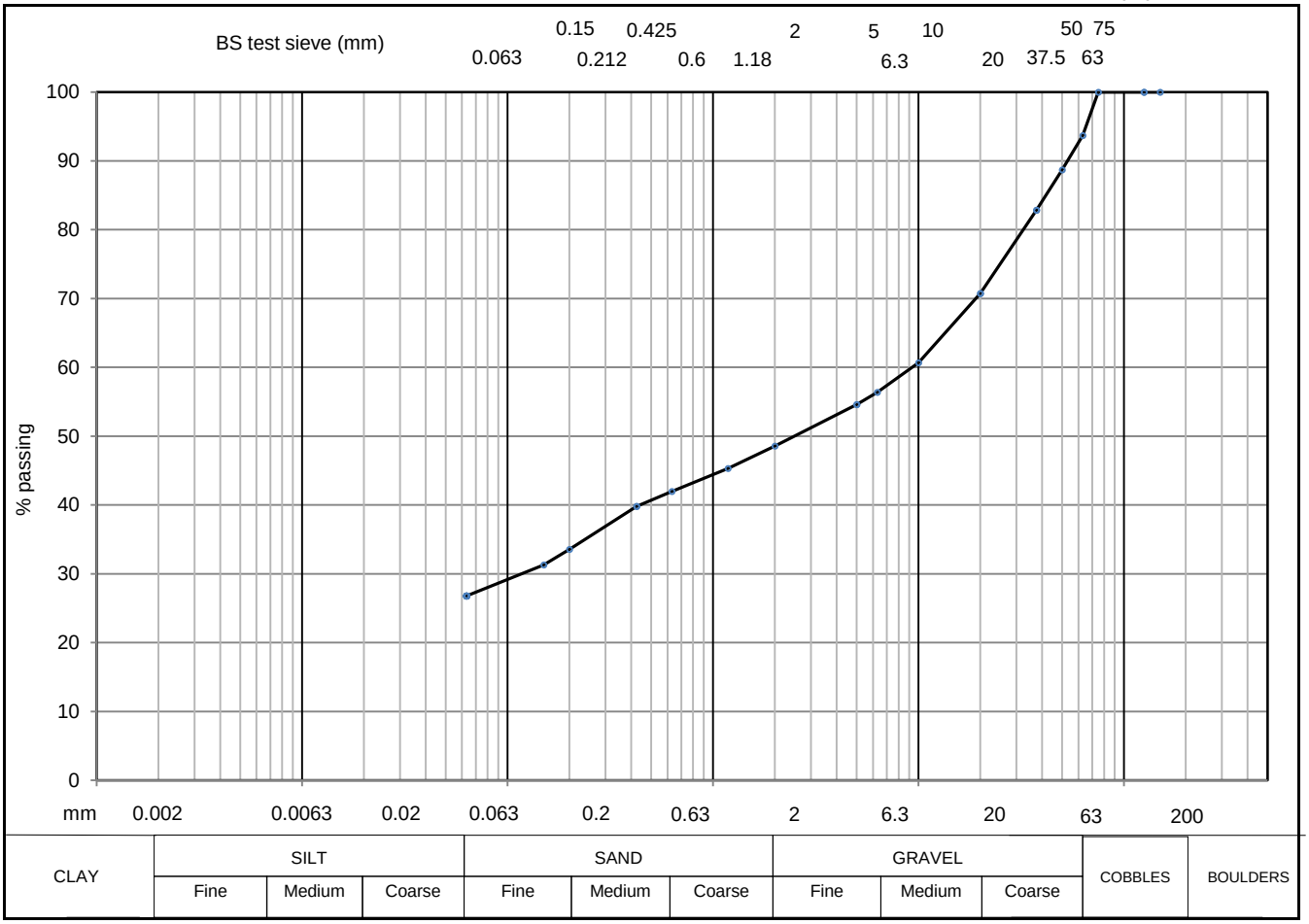
CONTRACT	CHECKED
37349	**WNJ**

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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/05
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	5B
		SAMPLE DEPTH (m)	0.90
DESCRIPTION	Greyish brown very sandy very clayey GRAVEL with low cobble content	SPECIMEN TOP (m)	0.90
		SPECIMEN BASE (m)	1.10



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	27
SAND	22
GRAVEL	45
COBBLE & BOULDER	6
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	55	20	
75	100	2	49	6	
63	94	1.18	45	2	
50	89	0.63	42		
37.5	83	0.425	40		
20	71	0.2	34		
10	61	0.15	31		
6.3	56	0.063	27		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

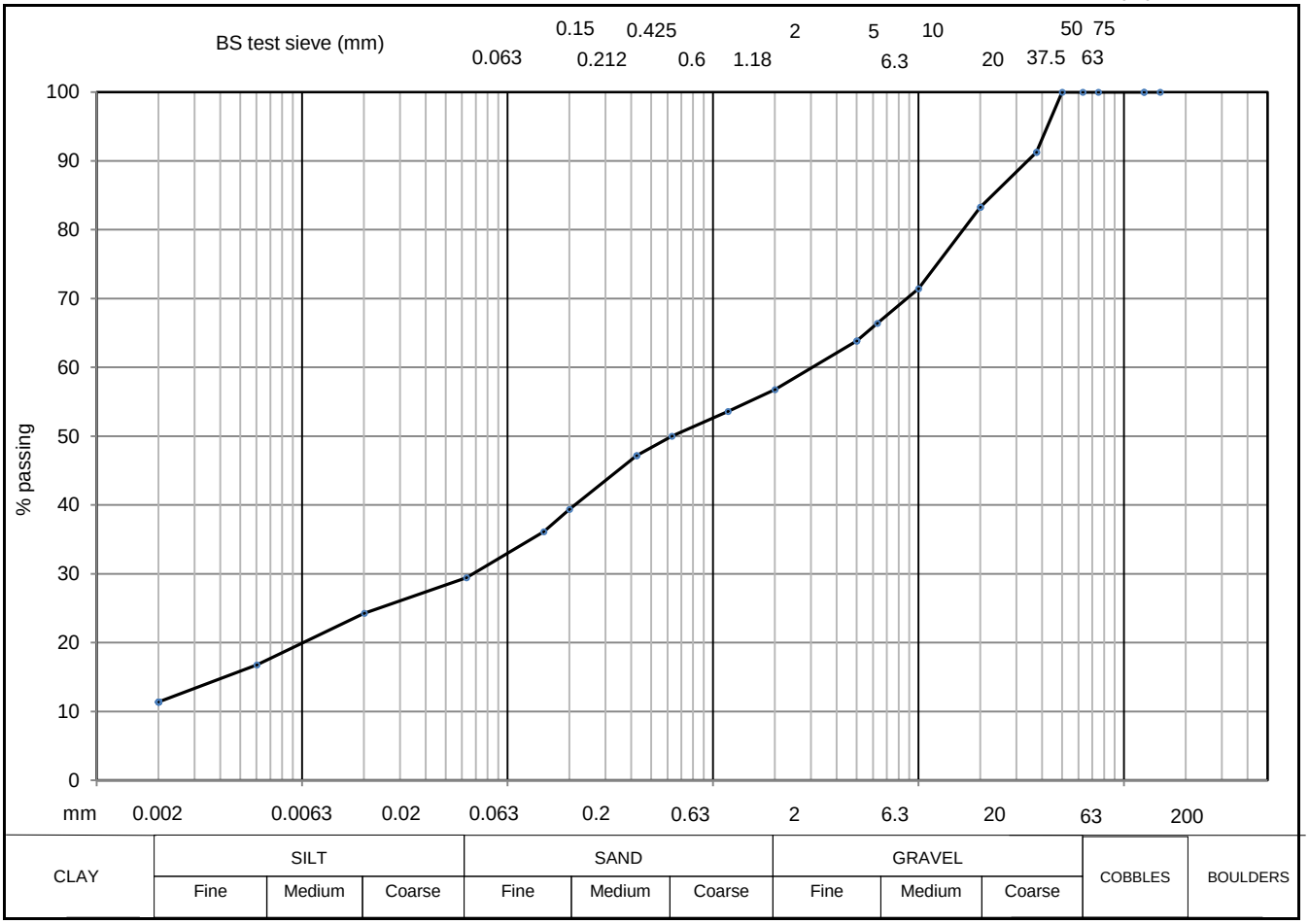
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/05
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	12D
		SAMPLE DEPTH (m)	3.10
DESCRIPTION	Brown very sandy very clayey GRAVEL	SPECIMEN TOP (m)	3.10
		SPECIMEN BASE (m)	3.20



soil type	% fraction
CLAY	11
SILT	18
SILT & CLAY	29
SAND	27
GRAVEL	43
COBBLE & BOULDER	0
test method(s)	5.2 & 5.4
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	64	20	24
75		2	57	6	17
63		1.18	54	2	11
50	100	0.63	50		
37.5	91	0.425	47		
20	83	0.2	39		
10	71	0.15	36		
6.3	66	0.063	29		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

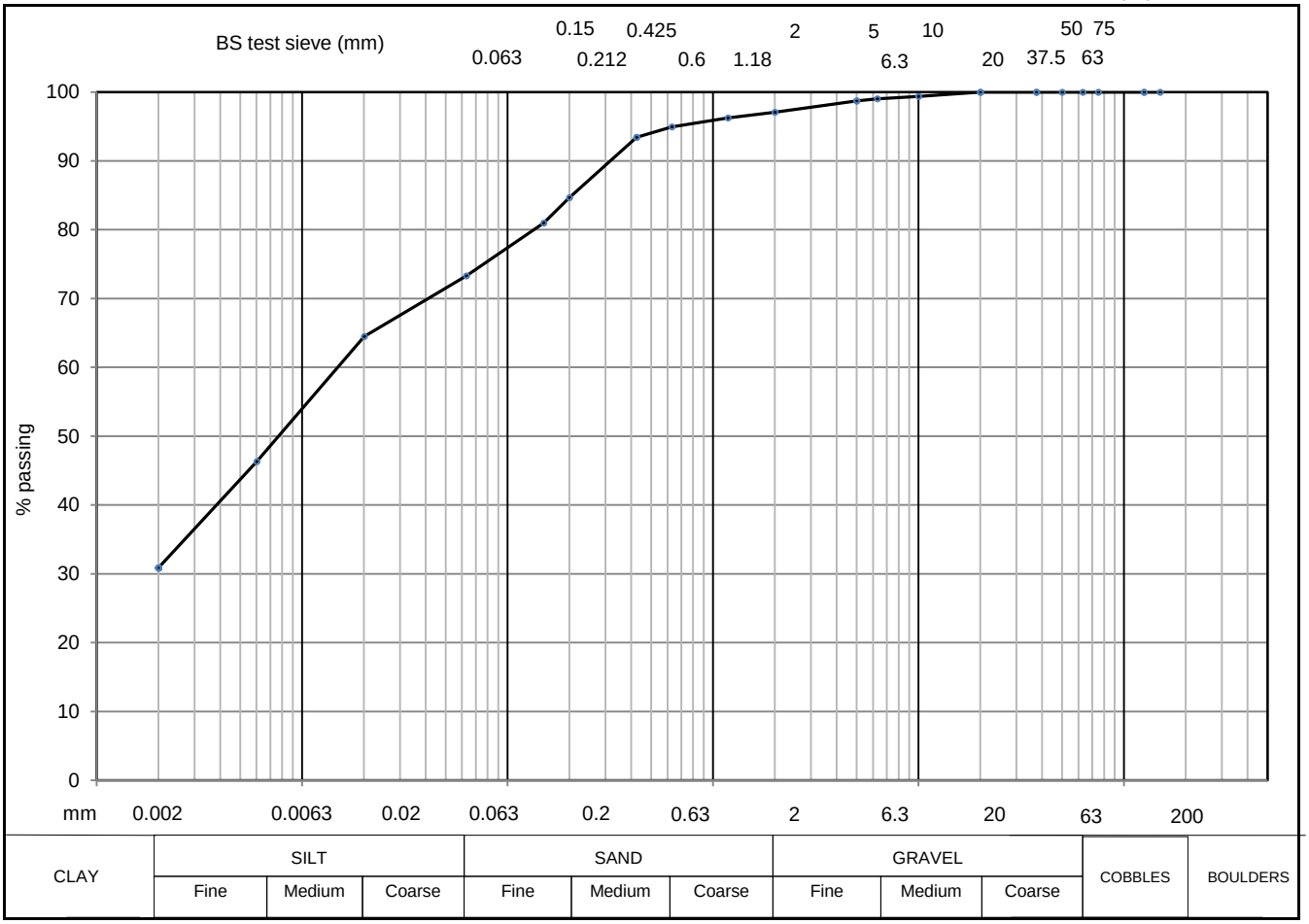
CONTRACT	CHECKED
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BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/05
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	26D
		SAMPLE DEPTH (m)	7.90
DESCRIPTION	Brown slightly gravelly slightly sandy CLAY	SPECIMEN TOP (m)	7.90
		SPECIMEN BASE (m)	8.00



soil type	% fraction
CLAY	31
SILT	42
SILT & CLAY	73
SAND	24
GRAVEL	3
COBBLE & BOULDER	0
test method(s)	5.2 & 5.4

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	99	20	64
75		2	97	6	46
63		1.18	96	2	31
50		0.63	95		
37.5		0.425	93		
20	100	0.2	85		
10	99	0.15	81		
6.3	99	0.063	73		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

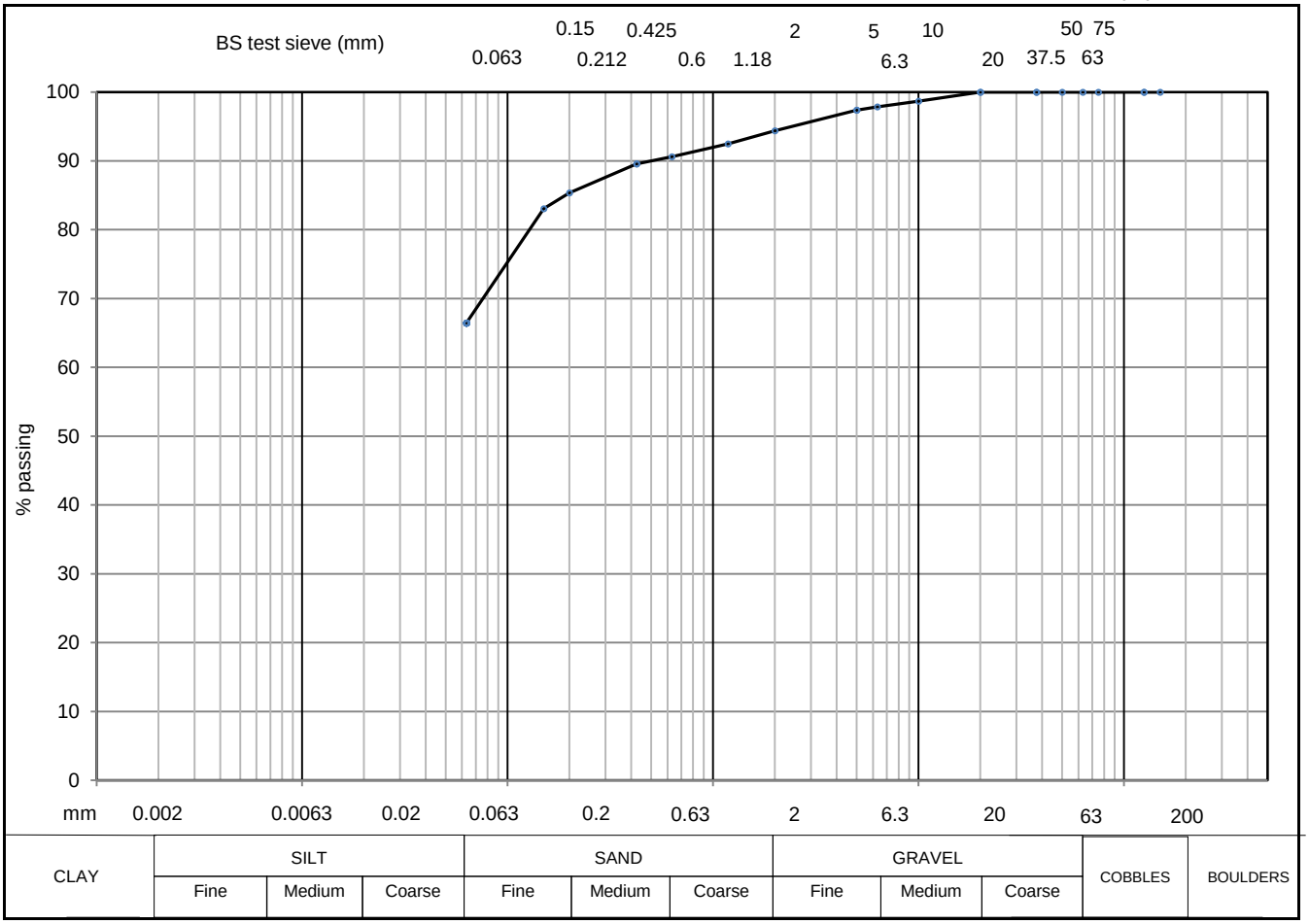
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

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CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/05
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	45C
		SAMPLE DEPTH (m)	15.10
DESCRIPTION	Grey mottled brown slightly gravelly slightly sandy silty CLAY	SPECIMEN TOP (m)	15.50
		SPECIMEN BASE (m)	15.90



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	66
SAND	28
GRAVEL	6
COBBLE & BOULDER	0
test method(s)	5.2
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	97	20	
75		2	94	6	
63		1.18	92	2	
50		0.63	91		
37.5		0.425	90		
20	100	0.2	85		
10	99	0.15	83		
6.3	98	0.063	66		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

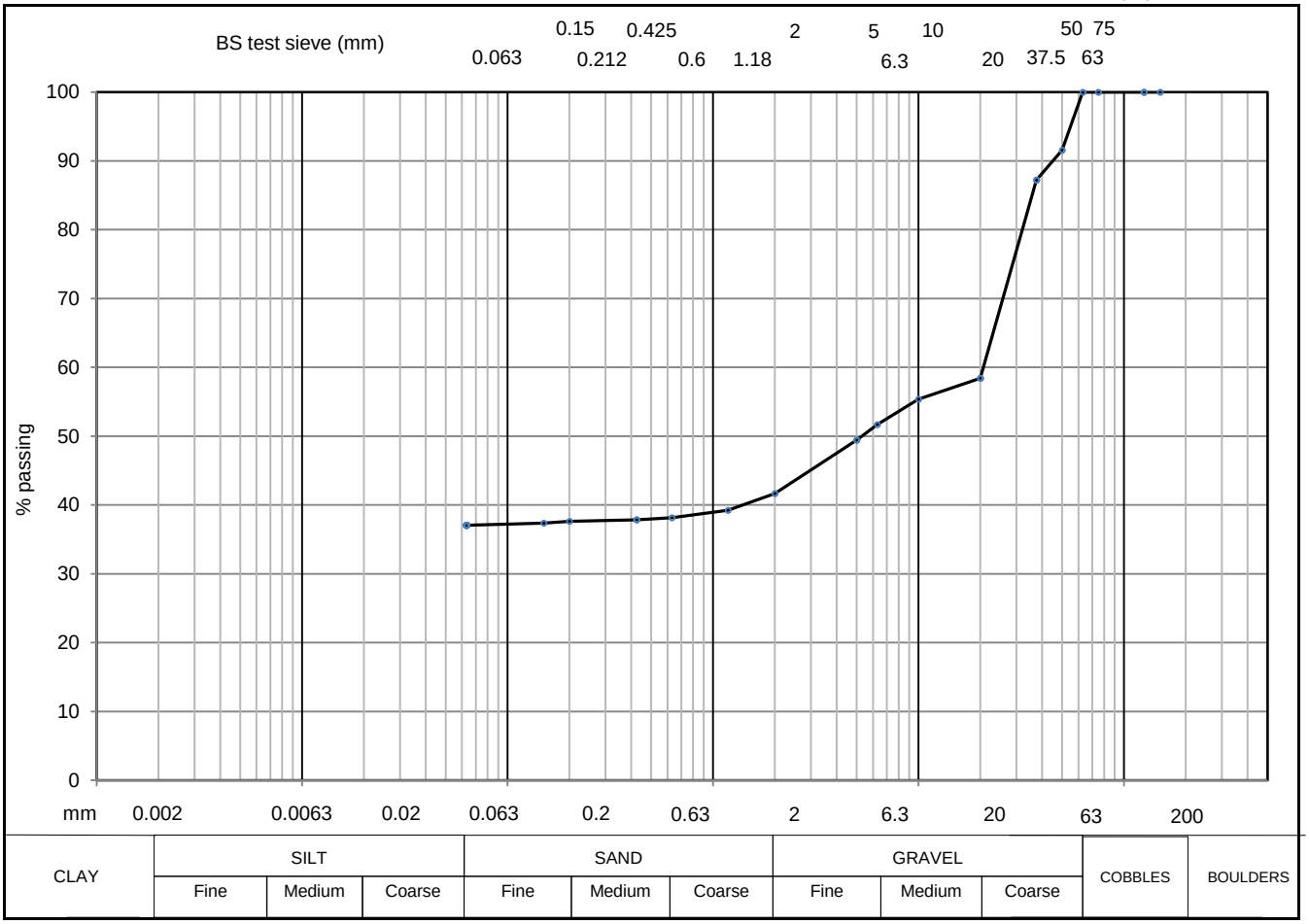
CONTRACT	CHECKED
37349	**WNJ**

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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/05
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	60C
		SAMPLE DEPTH (m)	22.60
DESCRIPTION	Light grey slightly sandy gravelly silty CLAY	SPECIMEN TOP (m)	23.00
		SPECIMEN BASE (m)	23.60



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	37
SAND	5
GRAVEL	58
COBBLE & BOULDER	0
test method(s)	5.2#
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	49	20	
75		2	42	6	
63	100	1.18	39	2	
50	92	0.63	38		
37.5	87	0.425	38		
20	58	0.2	38		
10	55	0.15	37		
6.3	52	0.063	37		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

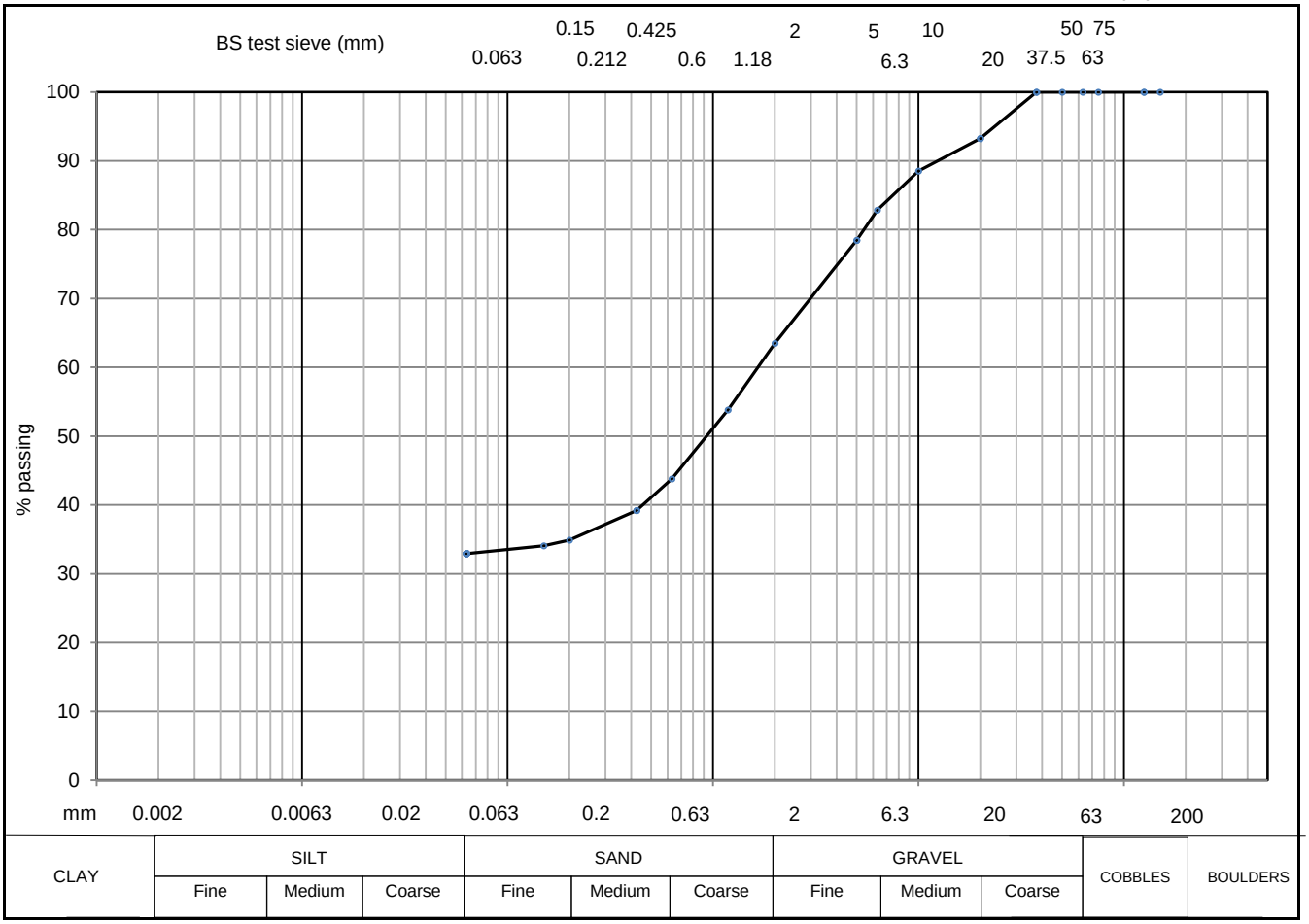
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/05
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	64C
		SAMPLE DEPTH (m)	25.60
DESCRIPTION	Grey very sandy very clayey GRAVEL	SPECIMEN TOP (m)	26.20
		SPECIMEN BASE (m)	26.80



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	33
SAND	31
GRAVEL	37
COBBLE & BOULDER	0
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	78	20	
75		2	63	6	
63		1.18	54	2	
50		0.63	44		
37.5	100	0.425	39		
20	93	0.2	35		
10	89	0.15	34		
6.3	83	0.063	33		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

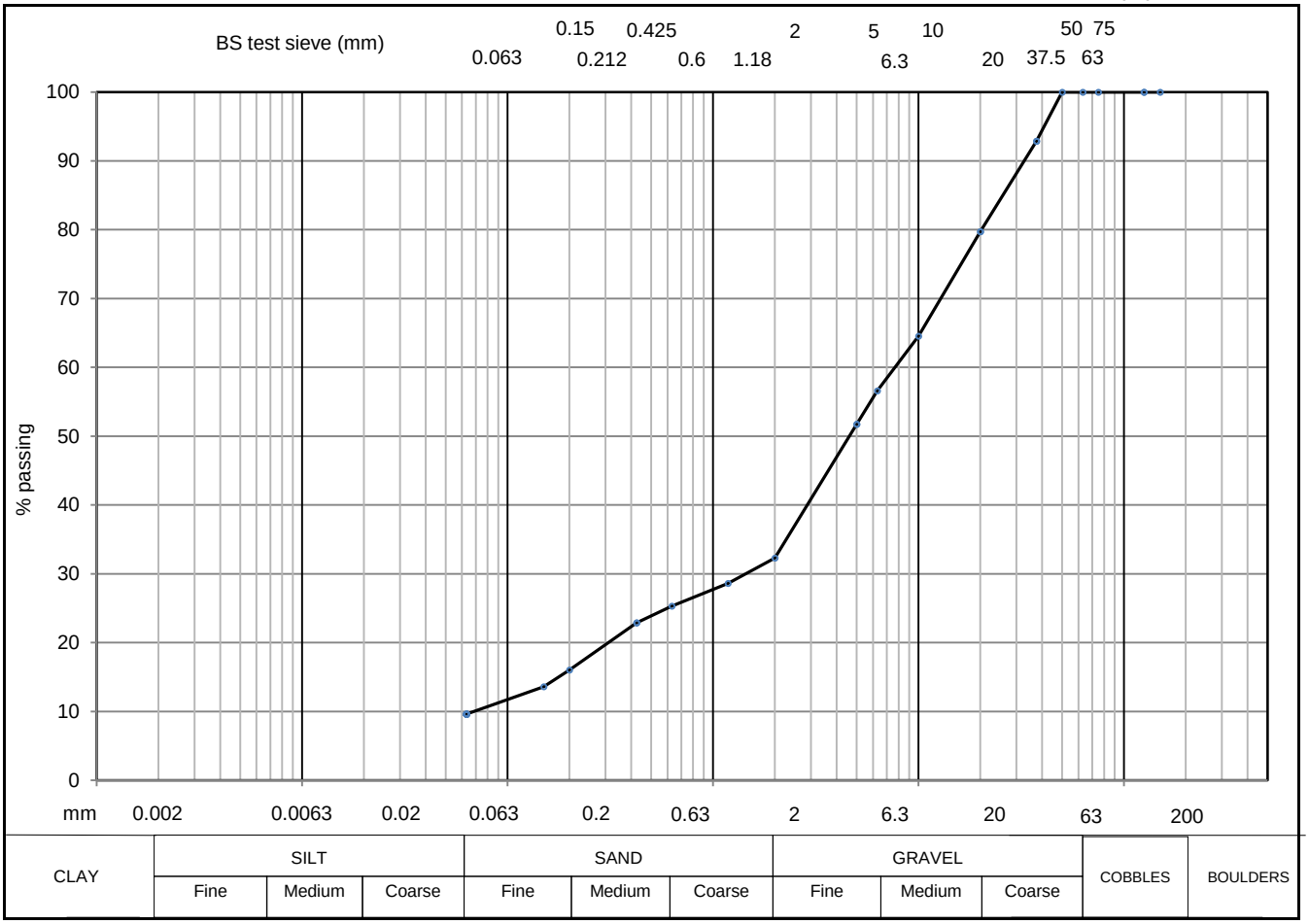
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/06A
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	2L
		SAMPLE DEPTH (m)	1.50
DESCRIPTION	Brown clayey very sandy GRAVEL	SPECIMEN TOP (m)	1.50
		SPECIMEN BASE (m)	2.00



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	10
SAND	23
GRAVEL	68
COBBLE & BOULDER	0
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	52	20	
75		2	32	6	
63		1.18	29	2	
50	100	0.63	25		
37.5	93	0.425	23		
20	80	0.2	16		
10	65	0.15	14		
6.3	57	0.063	10		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

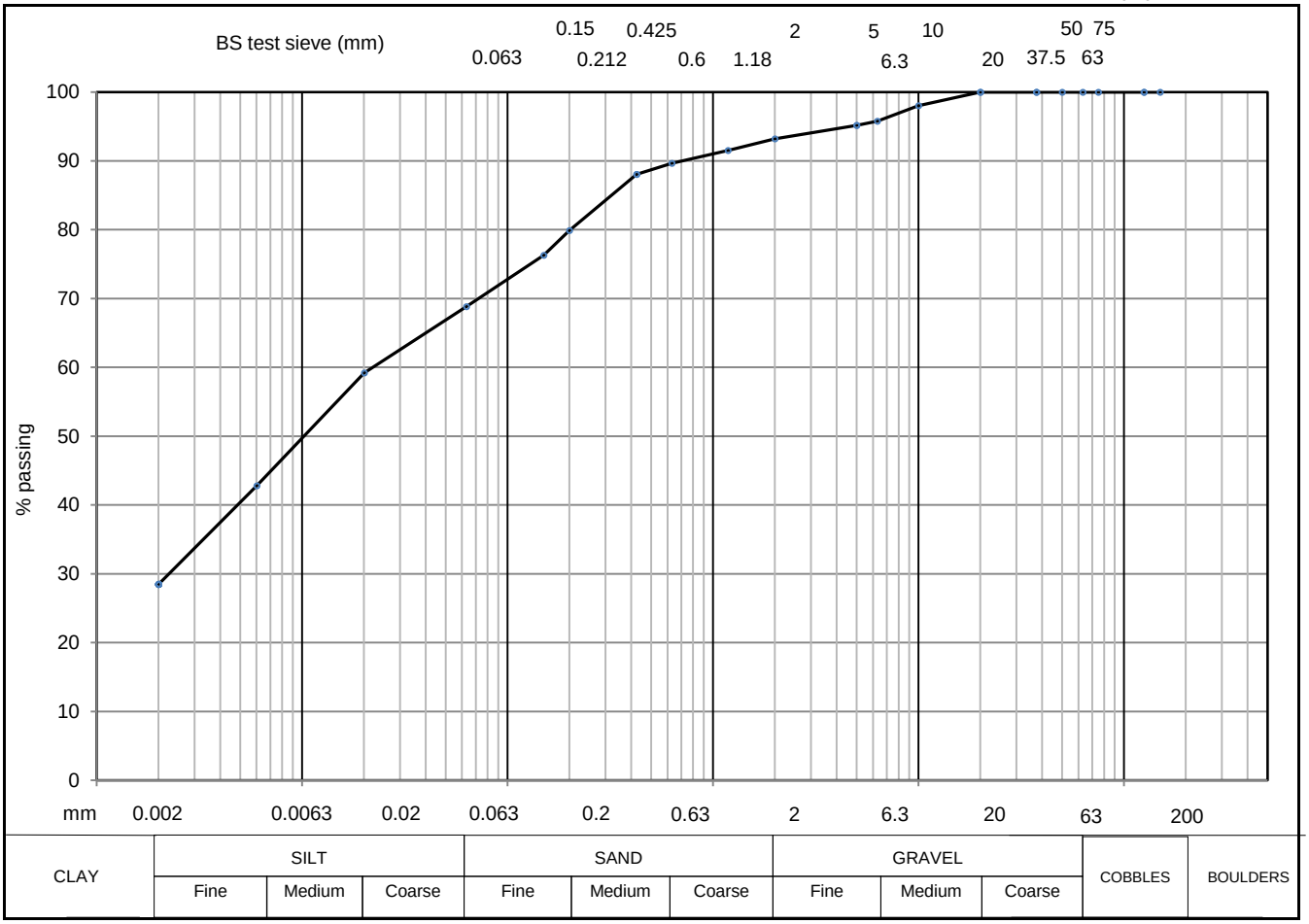
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/06A
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	16D
		SAMPLE DEPTH (m)	4.50
DESCRIPTION	Brown slightly gravelly slightly sandy CLAY	SPECIMEN TOP (m)	4.50
		SPECIMEN BASE (m)	4.95



soil type	% fraction
CLAY	29
SILT	40
SILT & CLAY	69
SAND	24
GRAVEL	7
COBBLE & BOULDER	0
test method(s)	5.2 & 5.4
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	95	20	59
75		2	93	6	43
63		1.18	92	2	28
50		0.63	90		
37.5		0.425	88		
20	100	0.2	80		
10	98	0.15	76		
6.3	96	0.063	69		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

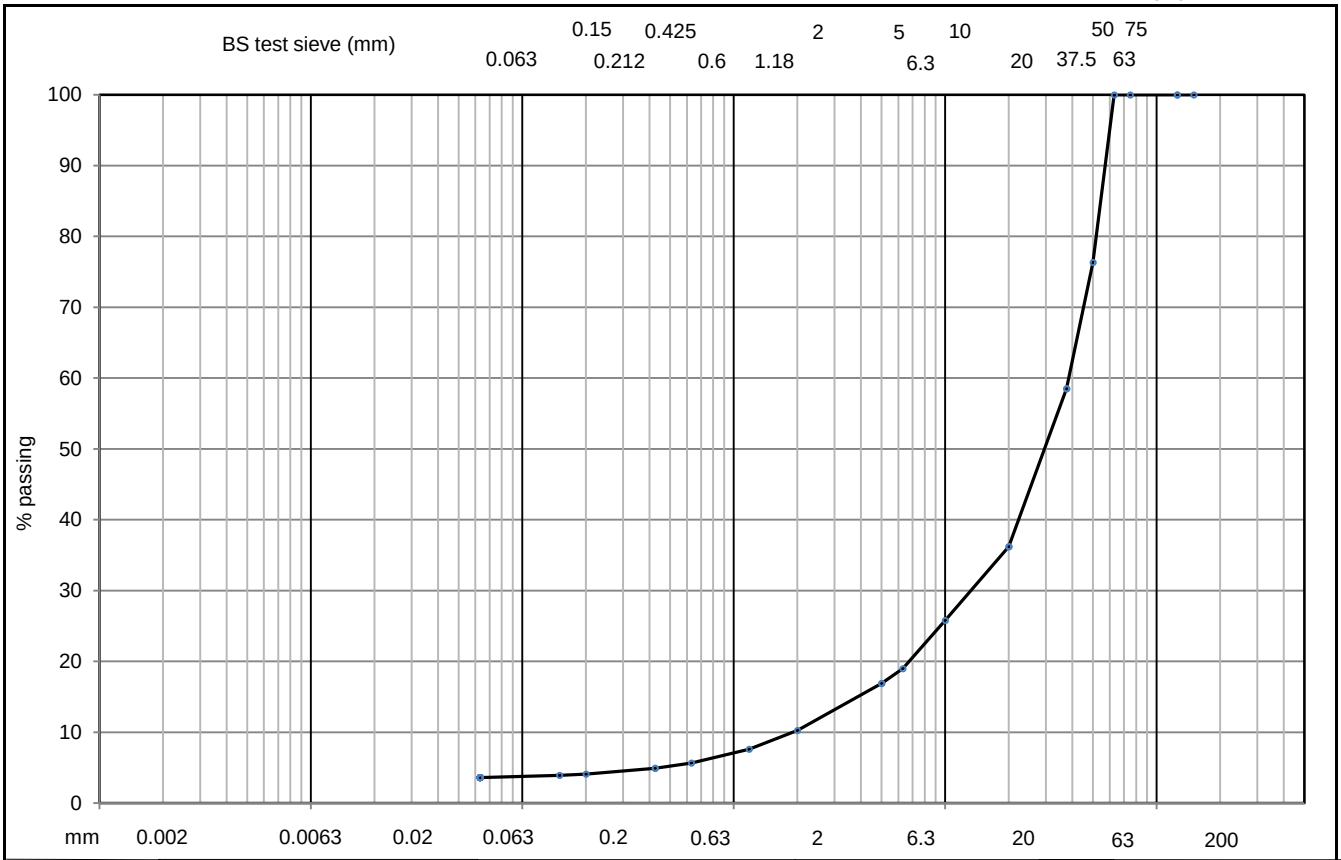
CONTRACT	CHECKED
37349	**WNJ**

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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/06A
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	51C
		SAMPLE DEPTH (m)	16.70
DESCRIPTION	Grey slightly clayey sandy GRAVEL	SPECIMEN TOP (m)	17.60
		SPECIMEN BASE (m)	18.20



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	4
SAND	7
GRAVEL	90
COBBLE & BOULDER	0
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	17	20	
75		2	10	6	
63	100	1.18	8	2	
50	76	0.63	6		
37.5	59	0.425	5		
20	36	0.2	4		
10	26	0.15	4		
6.3	19	0.063	4		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

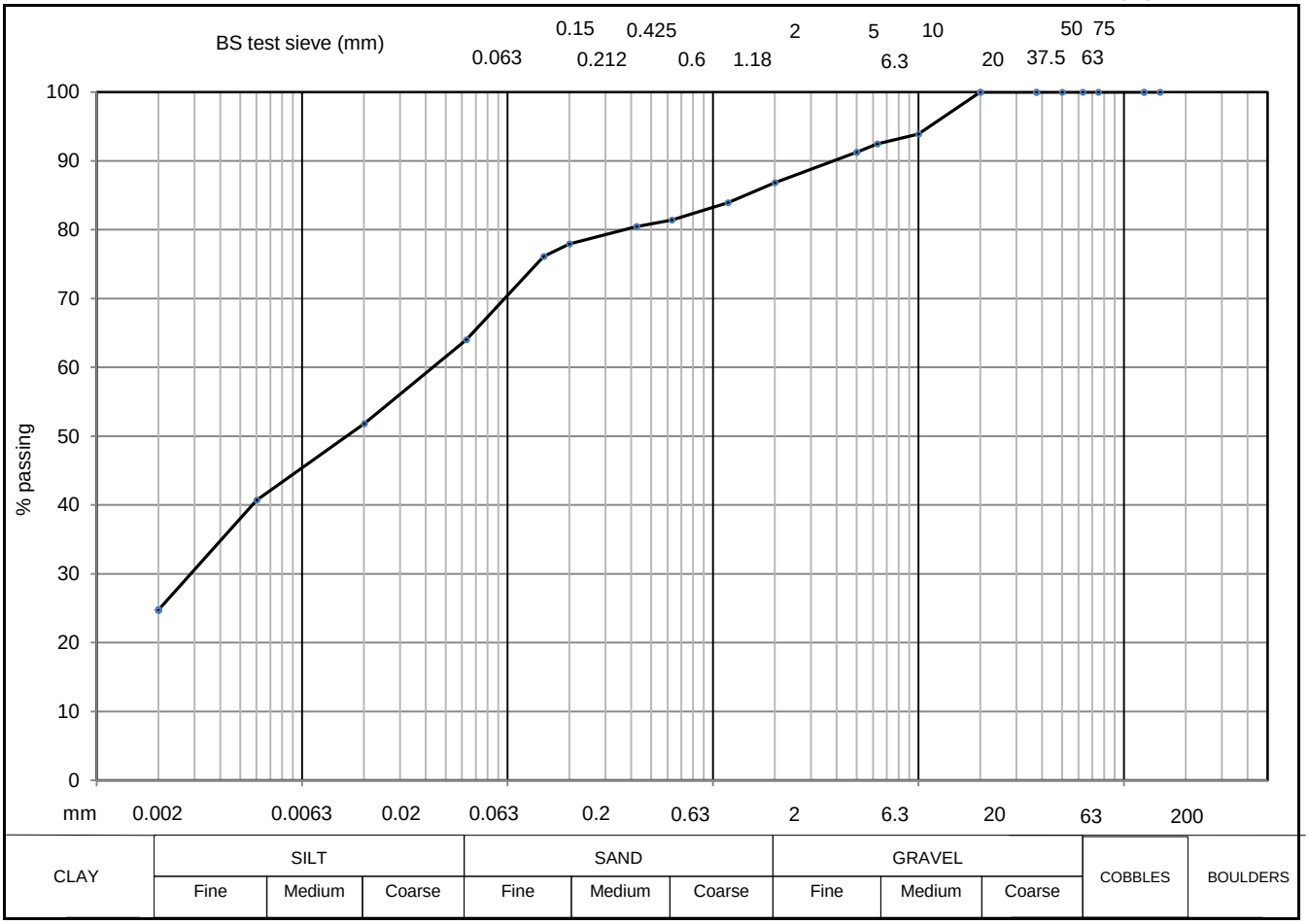
CONTRACT	CHECKED
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CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/06A
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	58D
		SAMPLE DEPTH (m)	20.80
DESCRIPTION	Light grey slightly gravelly slightly sandy silty CLAY	SPECIMEN TOP (m)	20.80
		SPECIMEN BASE (m)	20.90



soil type	% fraction
CLAY	25
SILT	39
SILT & CLAY	64
SAND	23
GRAVEL	13
COBBLE & BOULDER	0
test method(s)	5.2 & 5.4
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing
150	
75	
63	
50	
37.5	
20	100
10	94
6.3	92

BS test sieve (mm)	% passing
5	91
2	87
1.18	84
0.63	81
0.425	80
0.2	78
0.15	76
0.063	64

BS test sieve (µm)	% finer
20	52
6	41
2	25

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

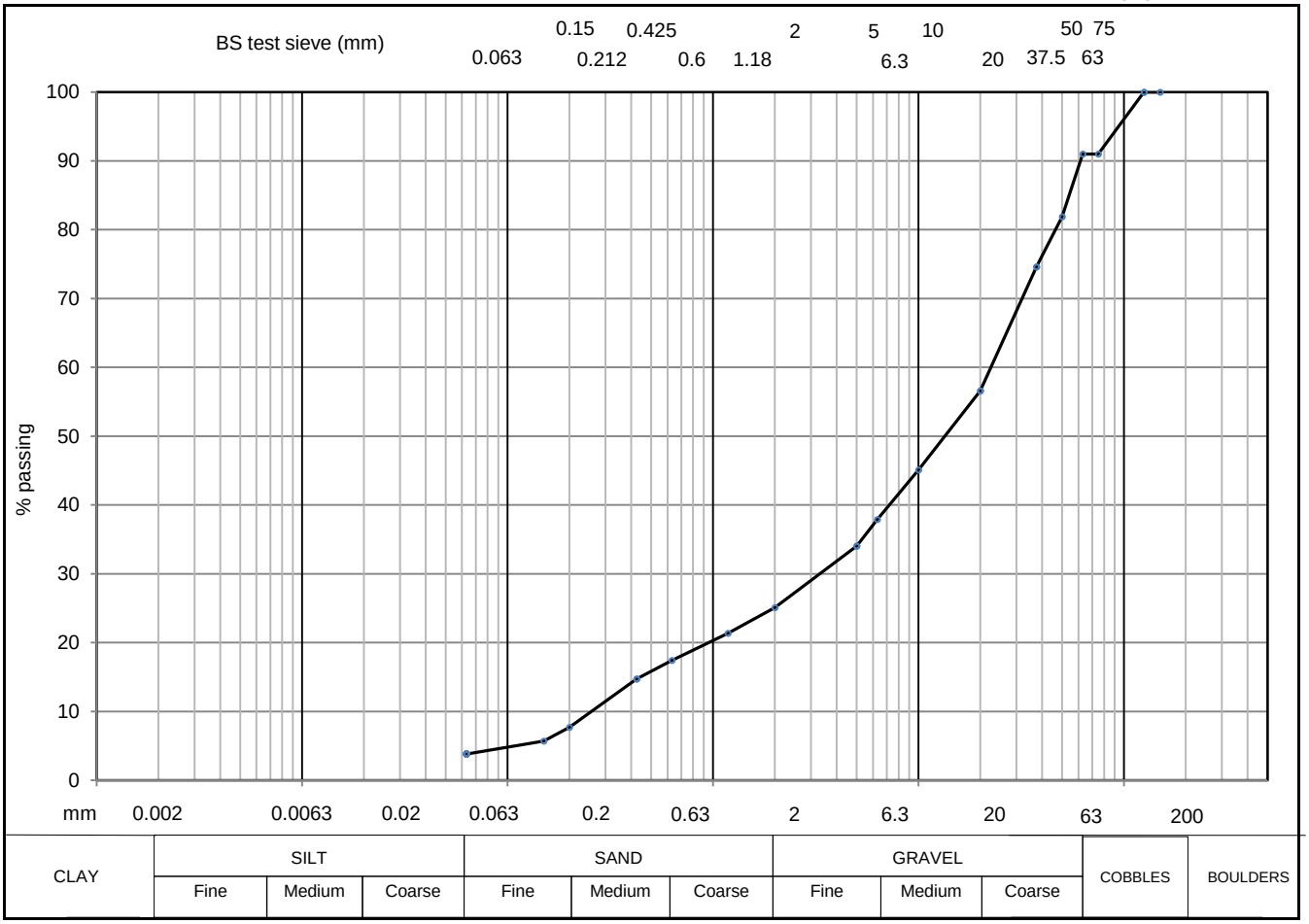
CONTRACT	CHECKED
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CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/07
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	3B
		SAMPLE DEPTH (m)	0.30
DESCRIPTION	Brown slightly slightly clayey very sandy GRAVEL with low cobble content	SPECIMEN TOP (m)	0.30
		SPECIMEN BASE (m)	0.50



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	4
SAND	21
GRAVEL	66
COBBLE & BOULDER	9
test method(s)	5.2#
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150	100	5	34	20	
75	91	2	25	6	
63	91	1.18	21	2	
50	82	0.63	17		
37.5	75	0.425	15		
20	57	0.2	8		
10	45	0.15	6		
6.3	38	0.063	4		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

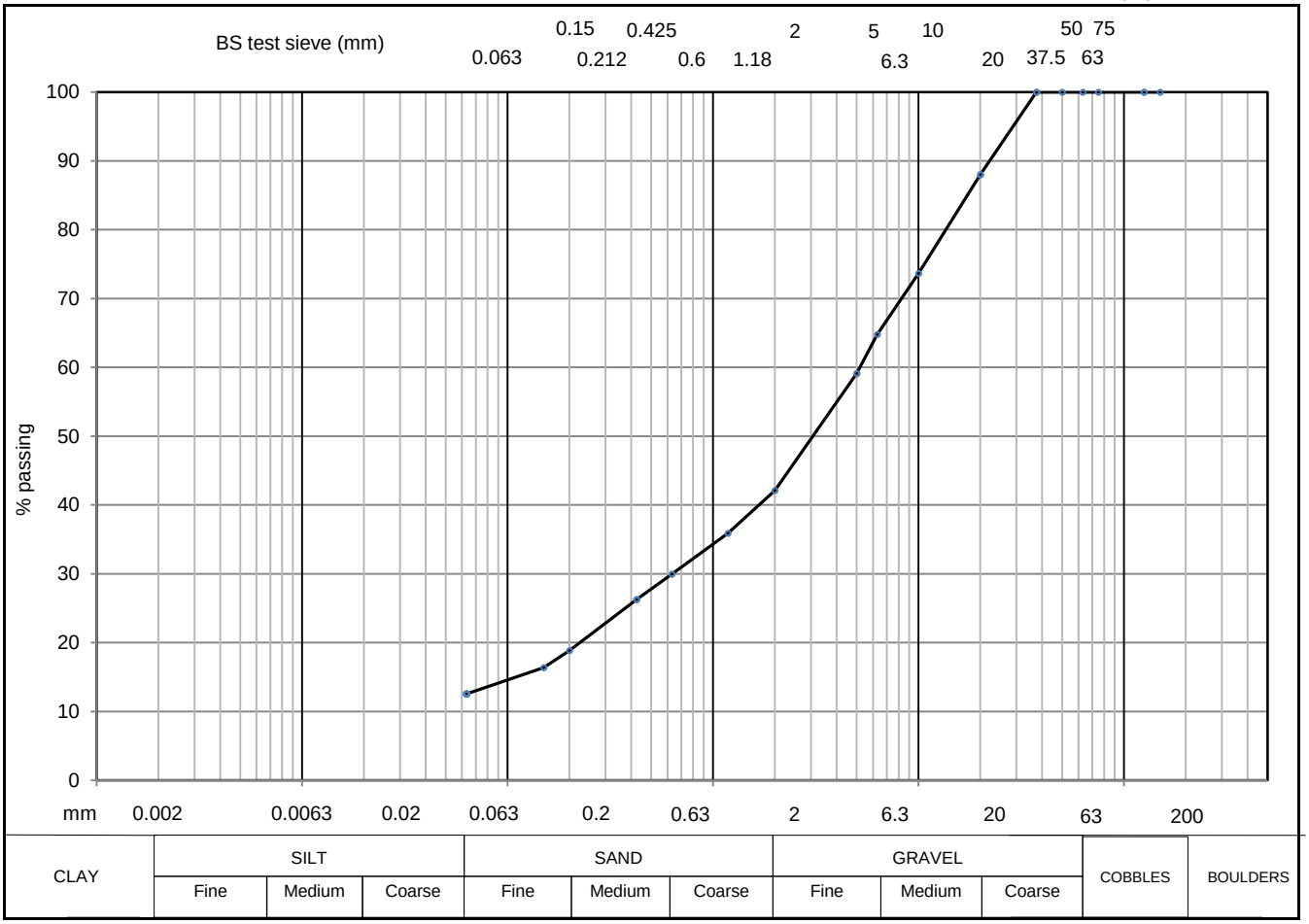
CONTRACT	CHECKED
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BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/07
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	5B
		SAMPLE DEPTH (m)	0.90
DESCRIPTION	Grey silty very sandy GRAVEL	SPECIMEN TOP (m)	0.90
		SPECIMEN BASE (m)	1.10



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	13
SAND	30
GRAVEL	58
COBBLE & BOULDER	0
test method(s)	5.2
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing
150	
75	
63	
50	
37.5	100
20	88
10	74
6.3	65

BS test sieve (mm)	% passing
5	59
2	42
1.18	36
0.63	30
0.425	26
0.2	19
0.15	16
0.063	13

BS test sieve (µm)	% finer
20	
6	
2	

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

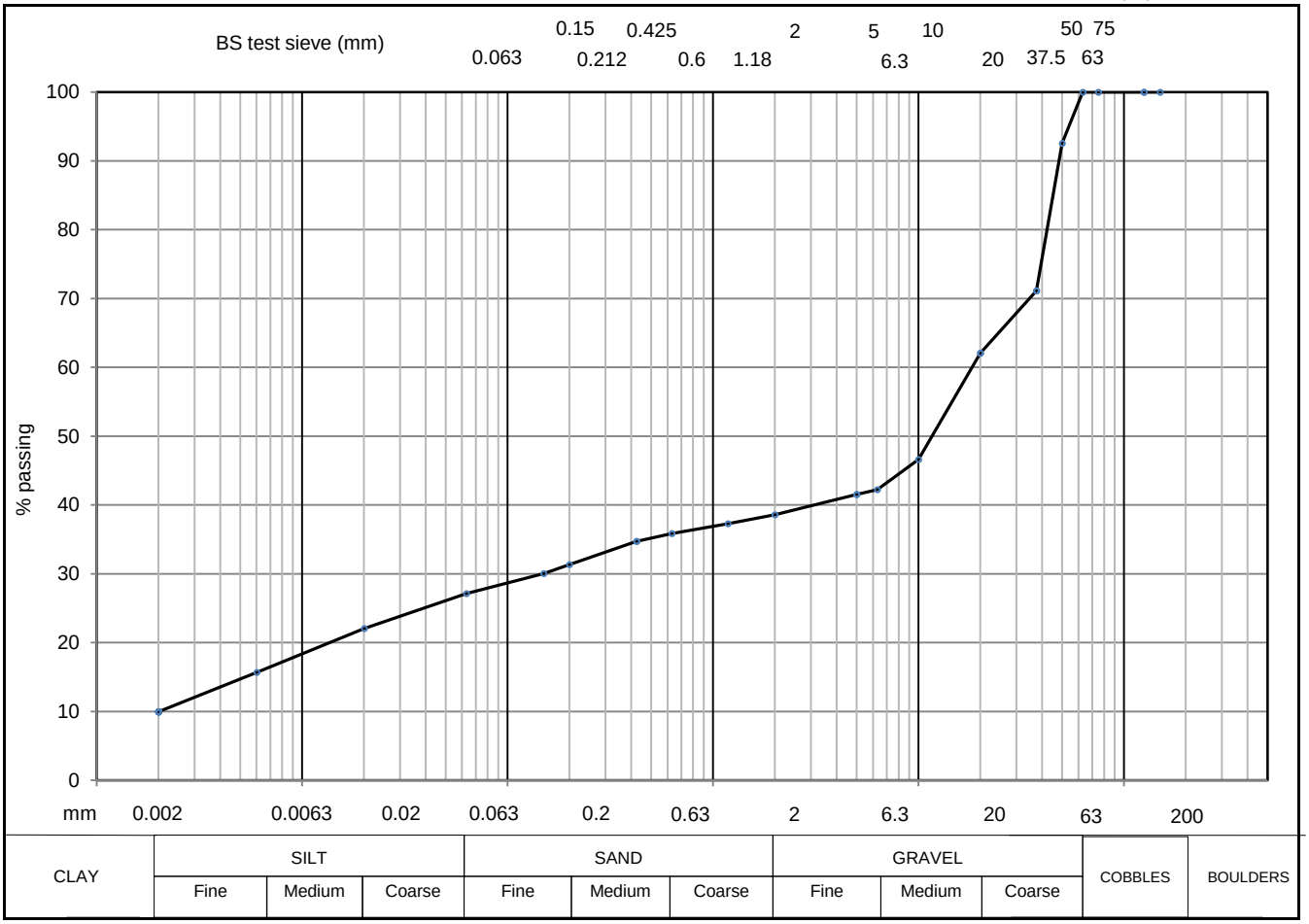
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CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/07
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	15C
		SAMPLE DEPTH (m)	2.50
DESCRIPTION	Brown sandy very clayey GRAVEL	SPECIMEN TOP (m)	2.50
		SPECIMEN BASE (m)	3.00



soil type	% fraction
CLAY	10
SILT	17
SILT & CLAY	27
SAND	11
GRAVEL	61
COBBLE & BOULDER	0
test method(s)	5.2 & 5.4
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	42	20	22
75		2	39	6	16
63	100	1.18	37	2	10
50	93	0.63	36		
37.5	71	0.425	35		
20	62	0.2	31		
10	47	0.15	30		
6.3	42	0.063	27		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

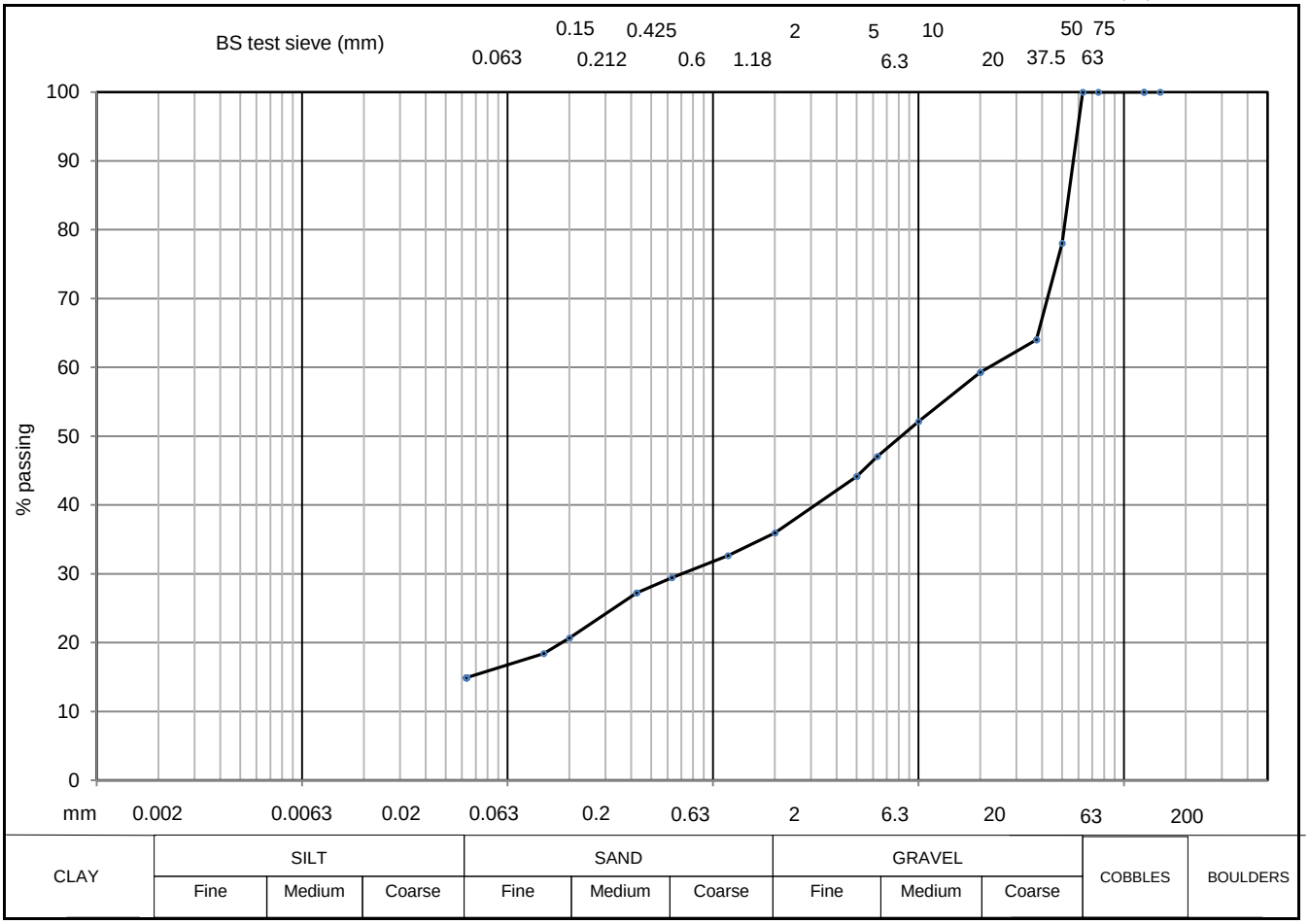
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

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CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/07
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	17L
		SAMPLE DEPTH (m)	3.00
DESCRIPTION	Greyish brown clayey very sandy GRAVEL	SPECIMEN TOP (m)	3.00
		SPECIMEN BASE (m)	3.50



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	15
SAND	21
GRAVEL	64
COBBLE & BOULDER	0
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	44	20	
75		2	36	6	
63	100	1.18	33	2	
50	78	0.63	29		
37.5	64	0.425	27		
20	59	0.2	21		
10	52	0.15	18		
6.3	47	0.063	15		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

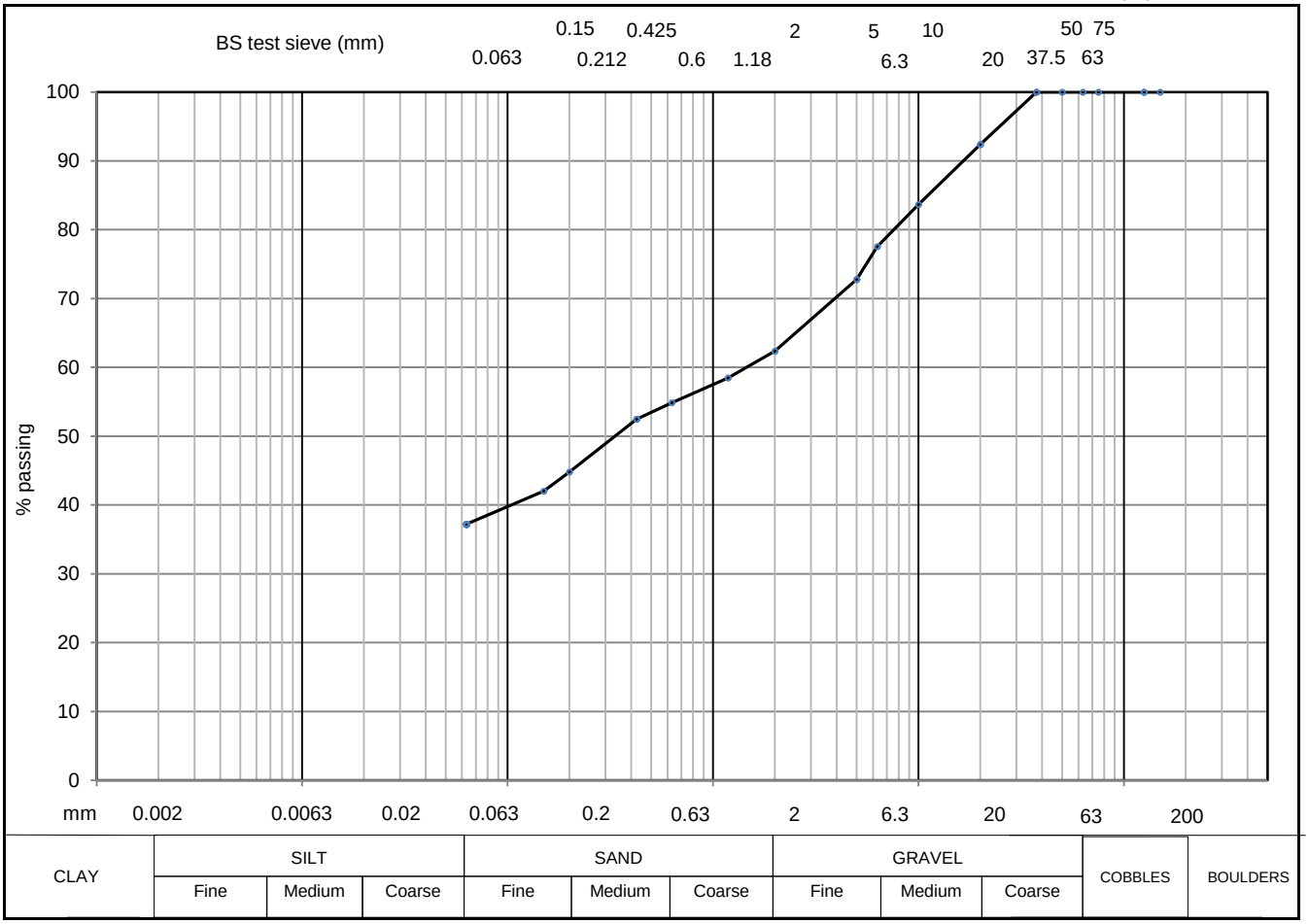
CONTRACT	CHECKED
37349	**WNJ**

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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/07
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	19L
		SAMPLE DEPTH (m)	3.50
DESCRIPTION	Dark brown slightly sandy gravelly CLAY	SPECIMEN TOP (m)	3.50
		SPECIMEN BASE (m)	4.00



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	37
SAND	25
GRAVEL	38
COBBLE & BOULDER	0
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing
150	
75	
63	
50	
37.5	100
20	92
10	84
6.3	78

BS test sieve (mm)	% passing
5	73
2	62
1.18	58
0.63	55
0.425	52
0.2	45
0.15	42
0.063	37

BS test sieve (µm)	% finer
20	
6	
2	

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

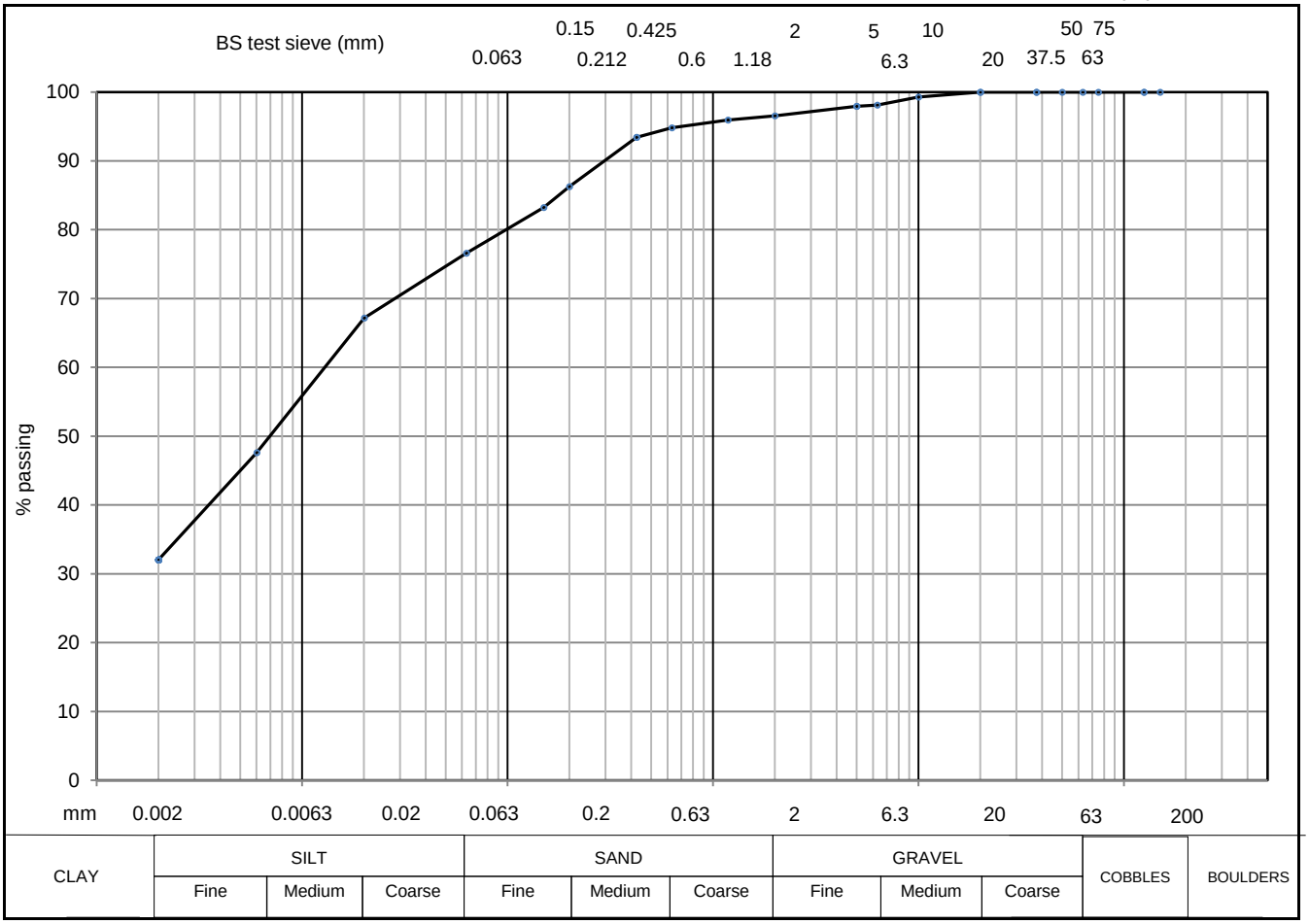
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/07
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	29D
		SAMPLE DEPTH (m)	5.90
DESCRIPTION	Brown mottled grey slightly gravelly slightly sandy CLAY	SPECIMEN TOP (m)	5.90
		SPECIMEN BASE (m)	6.00



soil type	% fraction
CLAY	32
SILT	45
SILT & CLAY	77
SAND	20
GRAVEL	3
COBBLE & BOULDER	0
test method(s)	5.2 & 5.4
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	98	20	67
75		2	97	6	48
63		1.18	96	2	32
50		0.63	95		
37.5		0.425	93		
20	100	0.2	86		
10	99	0.15	83		
6.3	98	0.063	77		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

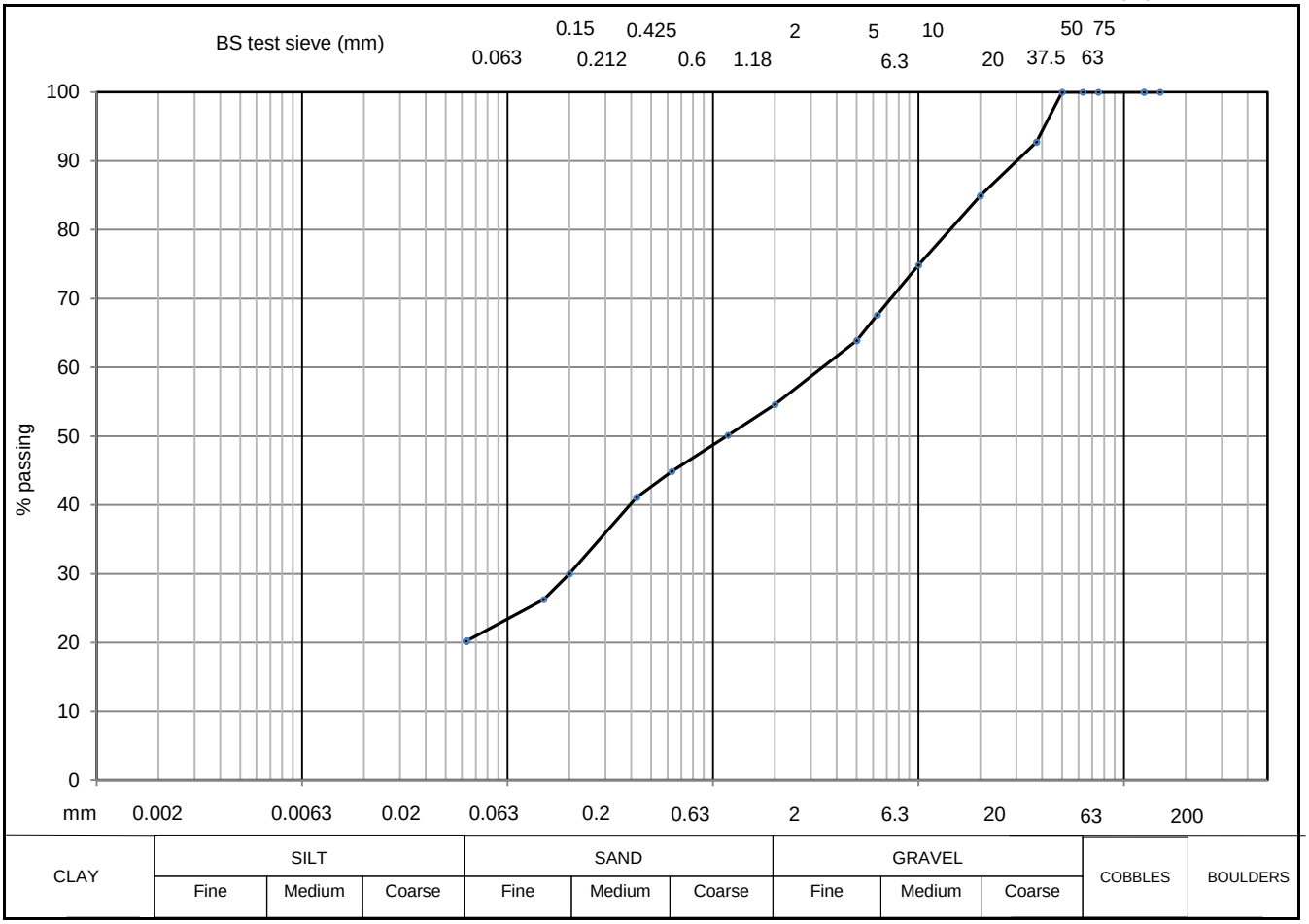
CONTRACT	CHECKED
37349	**WNJ**

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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/08
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	3B
		SAMPLE DEPTH (m)	0.80
DESCRIPTION	Grey silty very sandy GRAVEL	SPECIMEN TOP (m)	0.80
		SPECIMEN BASE (m)	1.20



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	20
SAND	34
GRAVEL	45
COBBLE & BOULDER	0
test method(s)	5.2
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	64	20	
75		2	55	6	
63		1.18	50	2	
50	100	0.63	45		
37.5	93	0.425	41		
20	85	0.2	30		
10	75	0.15	26		
6.3	68	0.063	20		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

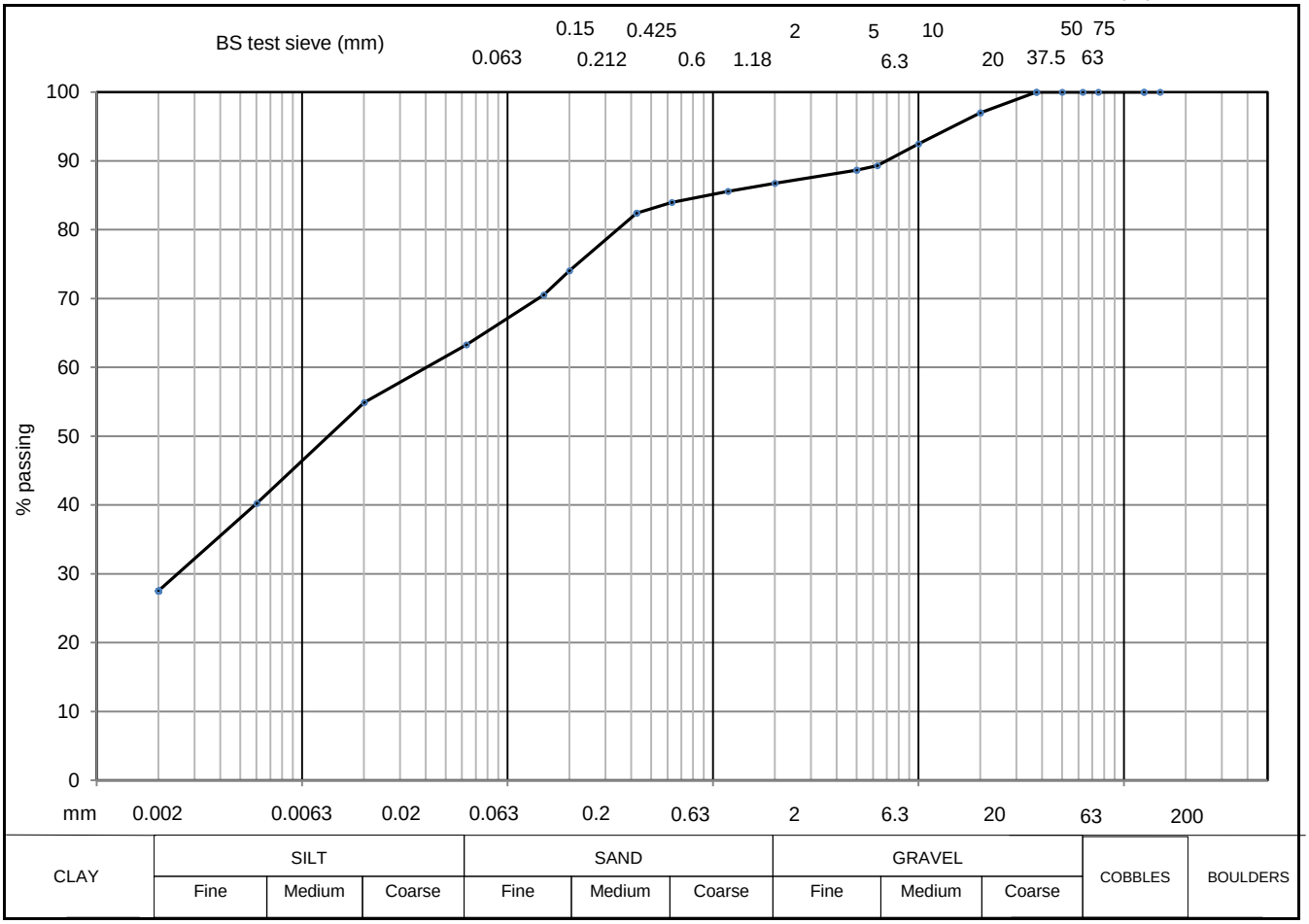
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/08
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	14B
		SAMPLE DEPTH (m)	4.50
DESCRIPTION	Brown slightly gravelly slightly sandy CLAY	SPECIMEN TOP (m)	4.50
		SPECIMEN BASE (m)	4.95



soil type	% fraction
CLAY	28
SILT	36
SILT & CLAY	63
SAND	23
GRAVEL	13
COBBLE & BOULDER	0
test method(s)	5.2 & 5.4
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	89	20	55
75		2	87	6	40
63		1.18	86	2	28
50		0.63	84		
37.5	100	0.425	82		
20	97	0.2	74		
10	92	0.15	71		
6.3	89	0.063	63		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

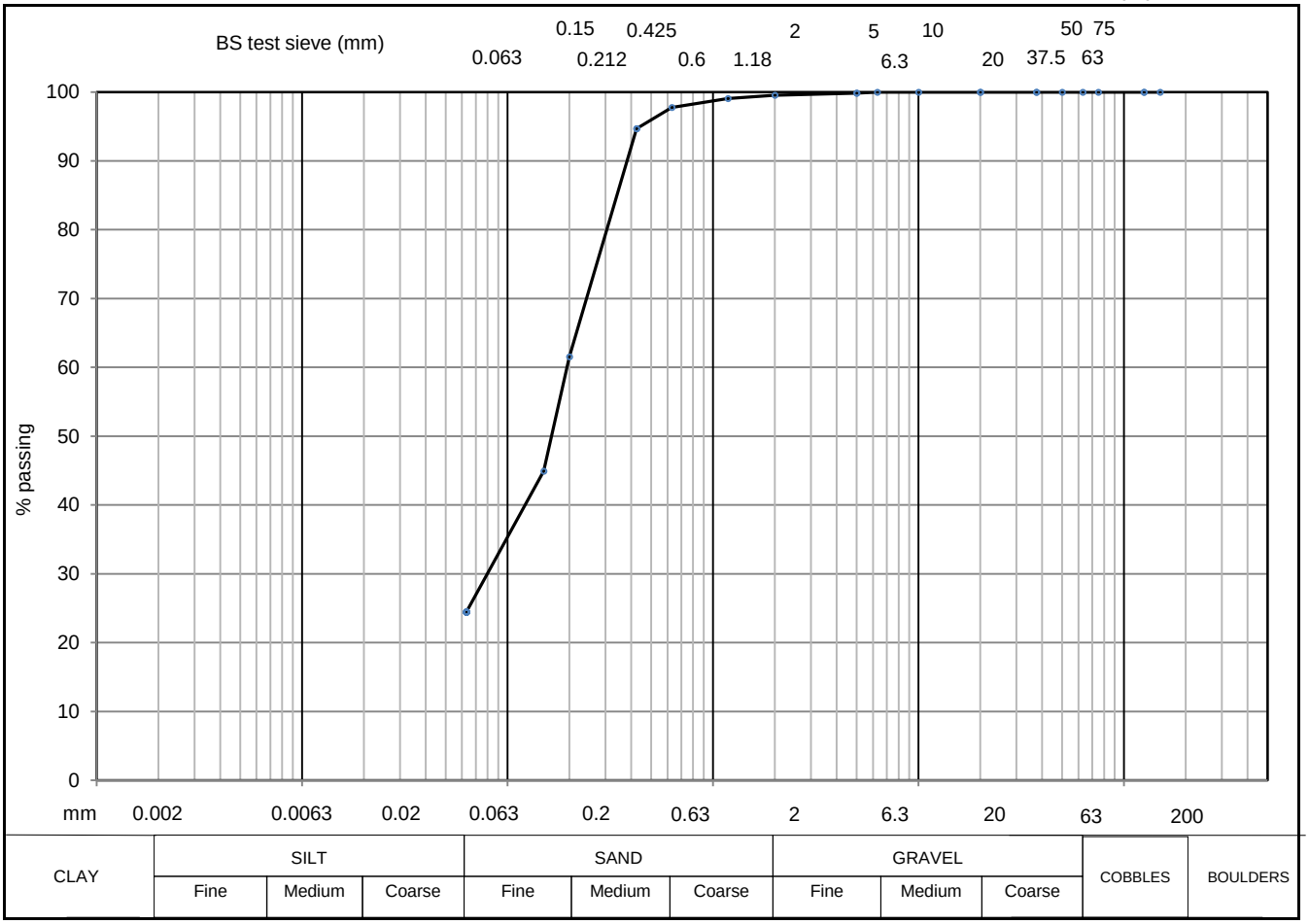
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/08
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	35B
		SAMPLE DEPTH (m)	12.00
DESCRIPTION	Brown very clayey SAND	SPECIMEN TOP (m)	12.00
		SPECIMEN BASE (m)	12.50



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	24
SAND	75
GRAVEL	0
COBBLE & BOULDER	0
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing
150	
75	
63	
50	
37.5	
20	
10	
6.3	100

BS test sieve (mm)	% passing
5	100
2	100
1.18	99
0.63	98
0.425	95
0.2	62
0.15	45
0.063	24

BS test sieve (µm)	% finer
20	
6	
2	

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

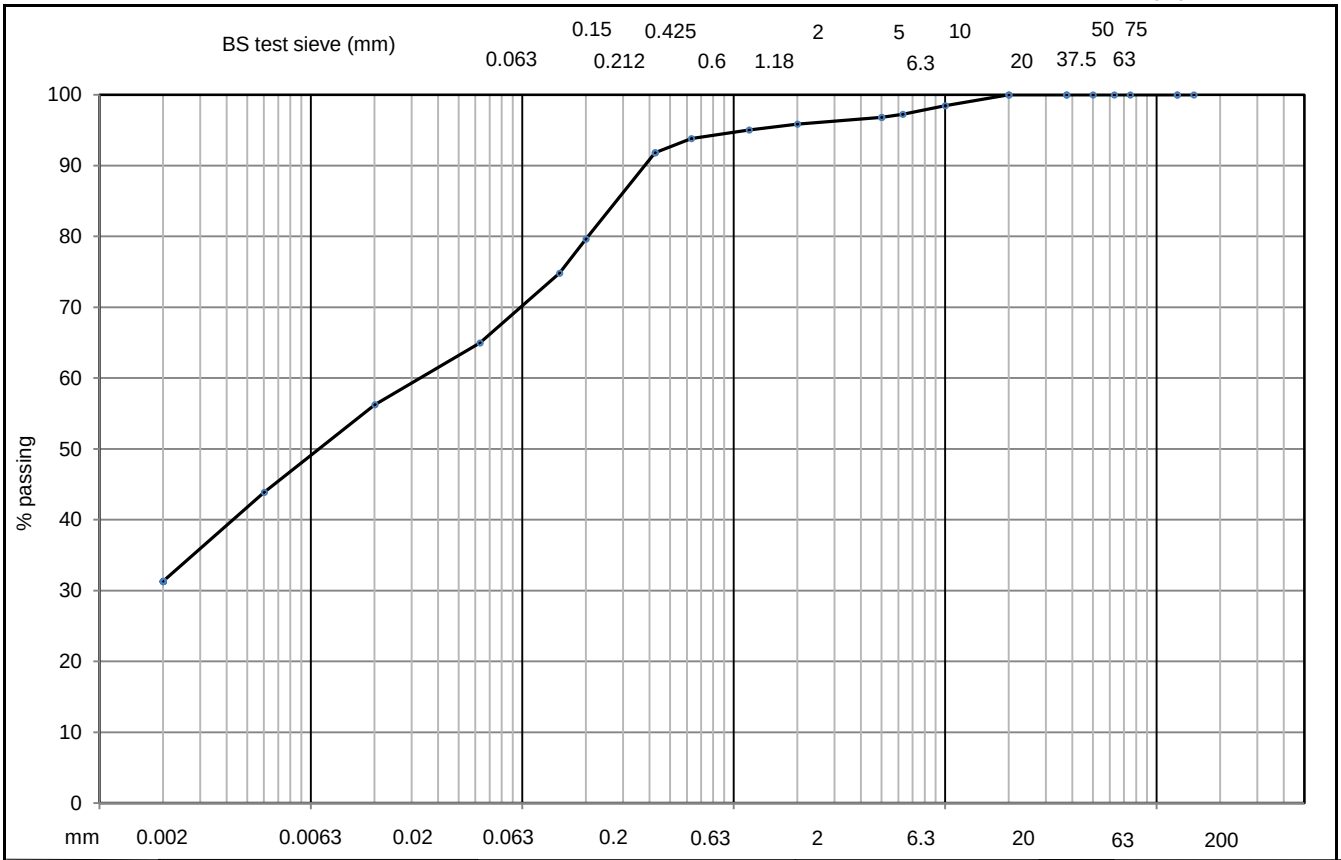
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/08
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	44C
		SAMPLE DEPTH (m)	15.00
DESCRIPTION	Brown slightly gravelly slightly sandy CLAY	SPECIMEN TOP (m)	15.00
		SPECIMEN BASE (m)	15.10



soil type	% fraction
CLAY	31
SILT	34
SILT & CLAY	65
SAND	31
GRAVEL	4
COBBLE & BOULDER	0
test method(s)	5.2 & 5.4
test method	
5.2 - sieving	
5.3 - sedimentation by hydrometer	
5.4 - sedimentation by pipette	

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	97	20	56
75		2	96	6	44
63		1.18	95	2	31
50		0.63	94		
37.5		0.425	92		
20	100	0.2	80		
10	98	0.15	75		
6.3	97	0.063	65		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

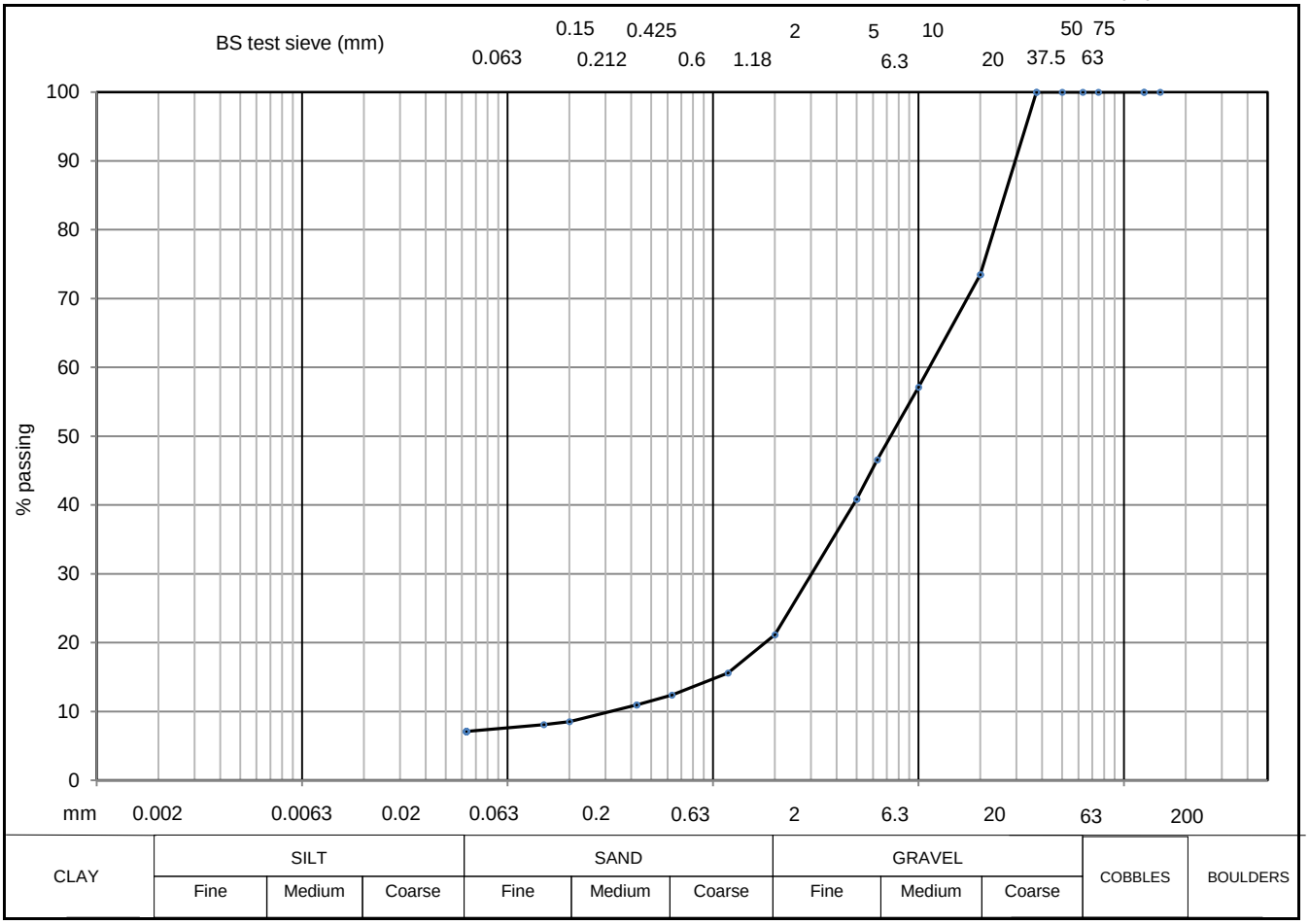
CONTRACT	CHECKED
37349	**WNJ**

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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	CBR22/01
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	1B
		SAMPLE DEPTH (m)	0.30
DESCRIPTION	Light grey clayey sandy GRAVEL	SPECIMEN TOP (m)	0.30
		SPECIMEN BASE (m)	0.40



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	7
SAND	14
GRAVEL	79
COBBLE & BOULDER	0
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing
150	
75	
63	
50	
37.5	100
20	73
10	57
6.3	47

BS test sieve (mm)	% passing
5	41
2	21
1.18	16
0.63	12
0.425	11
0.2	8
0.15	8
0.063	7

BS test sieve (µm)	% finer
20	
6	
2	

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

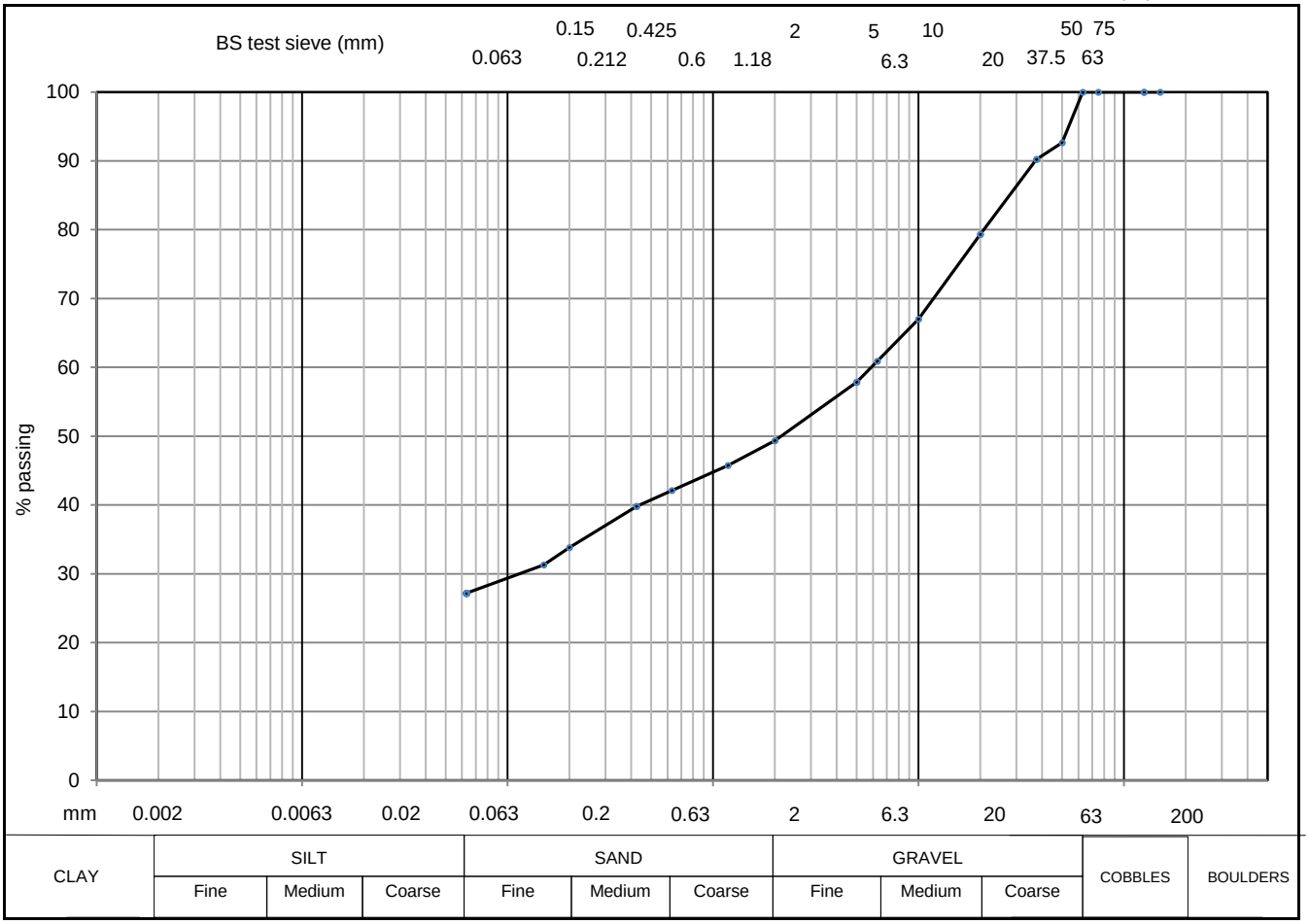
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	TP22/02
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	6B
		SAMPLE DEPTH (m)	1.10
DESCRIPTION	Dark grey very sandy very clayey GRAVEL	SPECIMEN TOP (m)	1.10
		SPECIMEN BASE (m)	2.60



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	27
SAND	22
GRAVEL	51
COBBLE & BOULDER	0
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	58	20	
75		2	49	6	
63	100	1.18	46	2	
50	93	0.63	42		
37.5	90	0.425	40		
20	79	0.2	34		
10	67	0.15	31		
6.3	61	0.063	27		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

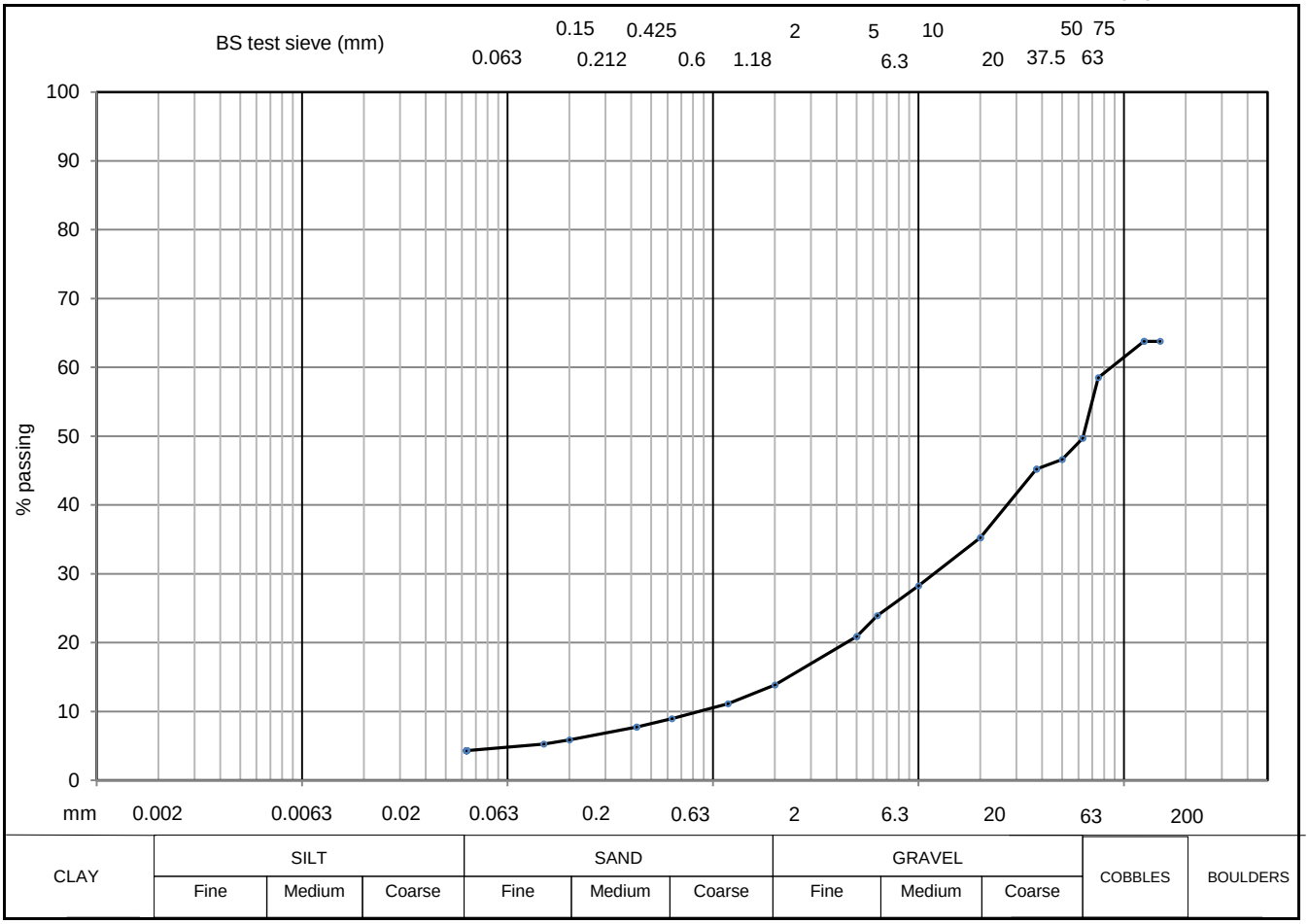
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	TP22/03
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	3B
		SAMPLE DEPTH (m)	0.40
DESCRIPTION	Grey slightly silty sandy GRAVEL with medium cobble content	SPECIMEN TOP (m)	0.40
		SPECIMEN BASE (m)	1.26



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	4
SAND	10
GRAVEL	36
COBBLE & BOULDER	50
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150	64	5	21	20	
75	58	2	14	6	
63	50	1.18	11	2	
50	47	0.63	9		
37.5	45	0.425	8		
20	35	0.2	6		
10	28	0.15	5		
6.3	24	0.063	4		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

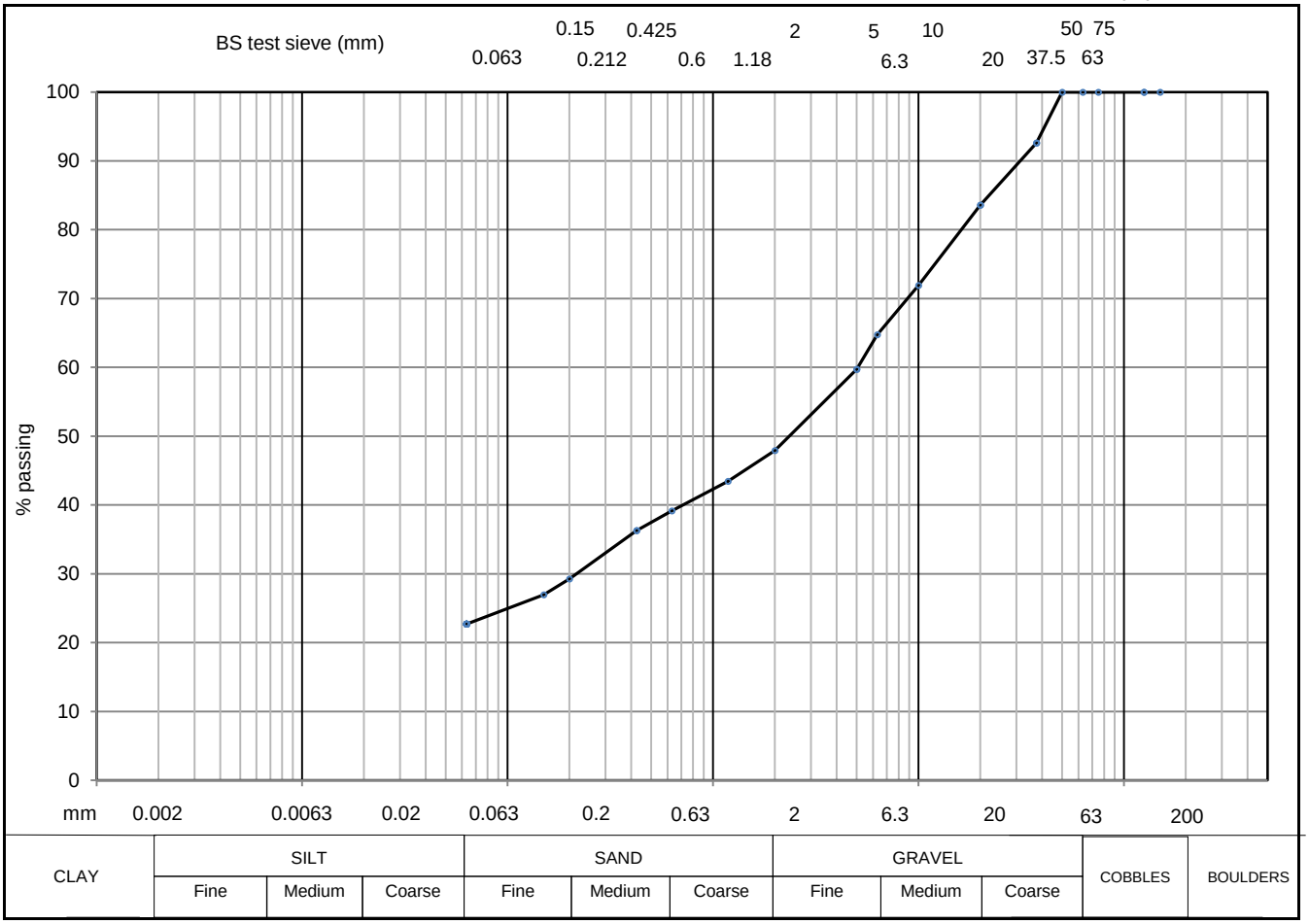
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	TP22/06
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	3B
		SAMPLE DEPTH (m)	0.50
DESCRIPTION	Greyish brown very clayey very sandy GRAVEL	SPECIMEN TOP (m)	0.50
		SPECIMEN BASE (m)	0.80



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	23
SAND	25
GRAVEL	52
COBBLE & BOULDER	0
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	60	20	
75		2	48	6	
63		1.18	43	2	
50	100	0.63	39		
37.5	93	0.425	36		
20	84	0.2	29		
10	72	0.15	27		
6.3	65	0.063	23		

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

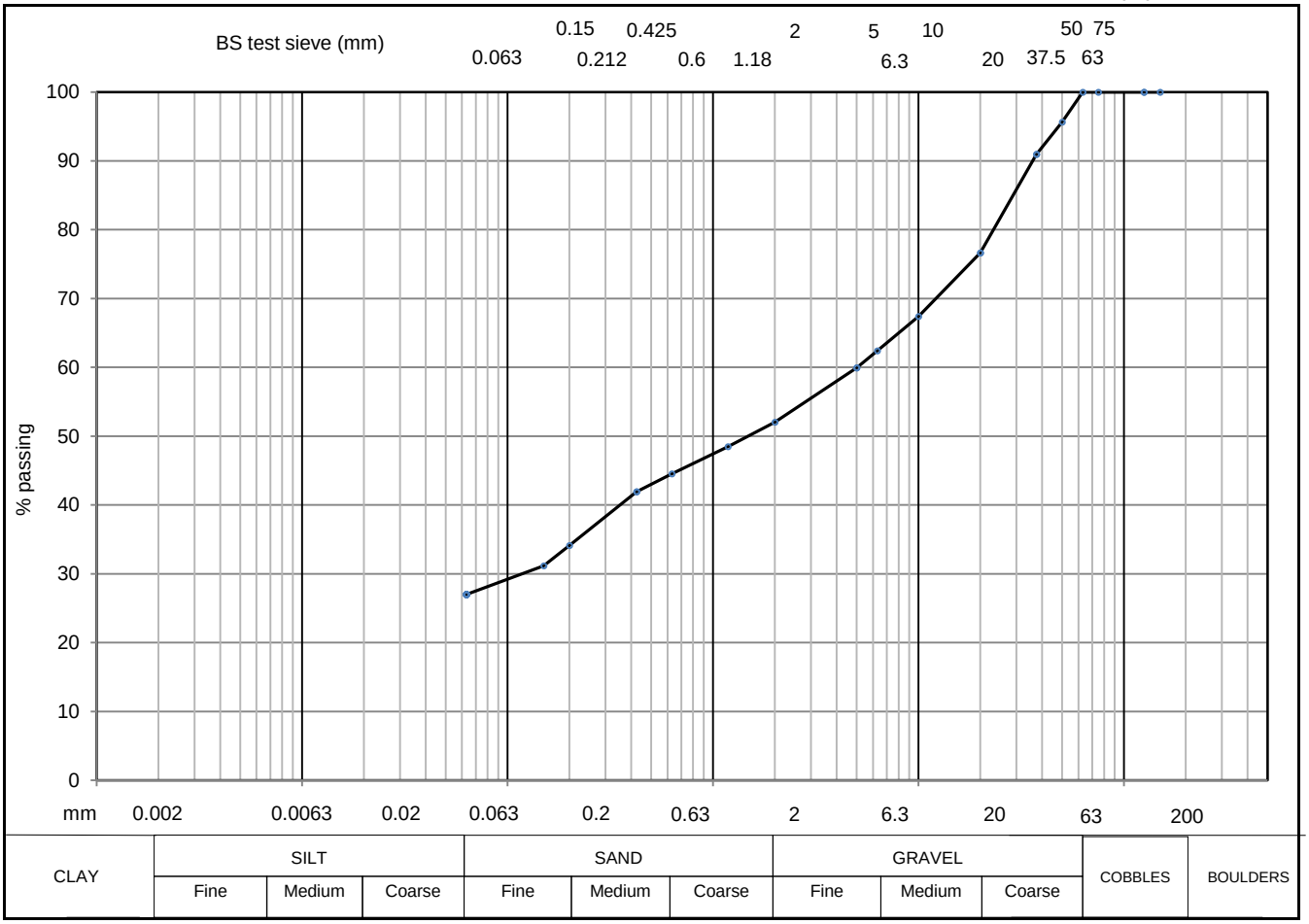
CONTRACT	CHECKED
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PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	TP22/07
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	5B
		SAMPLE DEPTH (m)	2.00
DESCRIPTION	Greyish brown very sandy very clayey GRAVEL	SPECIMEN TOP (m)	2.20
		SPECIMEN BASE (m)	2.40



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	27
SAND	25
GRAVEL	48
COBBLE & BOULDER	0
test method(s)	5.2

test method

5.2 - sieving

5.3 - sedimentation by hydrometer

5.4 - sedimentation by pipette

BS test sieve (mm)	% passing
150	
75	
63	100
50	96
37.5	91
20	77
10	67
6.3	62

BS test sieve (mm)	% passing
5	60
2	52
1.18	48
0.63	45
0.425	42
0.2	34
0.15	31
0.063	27

BS test sieve (µm)	% finer
20	
6	
2	

remarks

denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892

Particle density assigned an assumed value of 2.70 Mg/m3

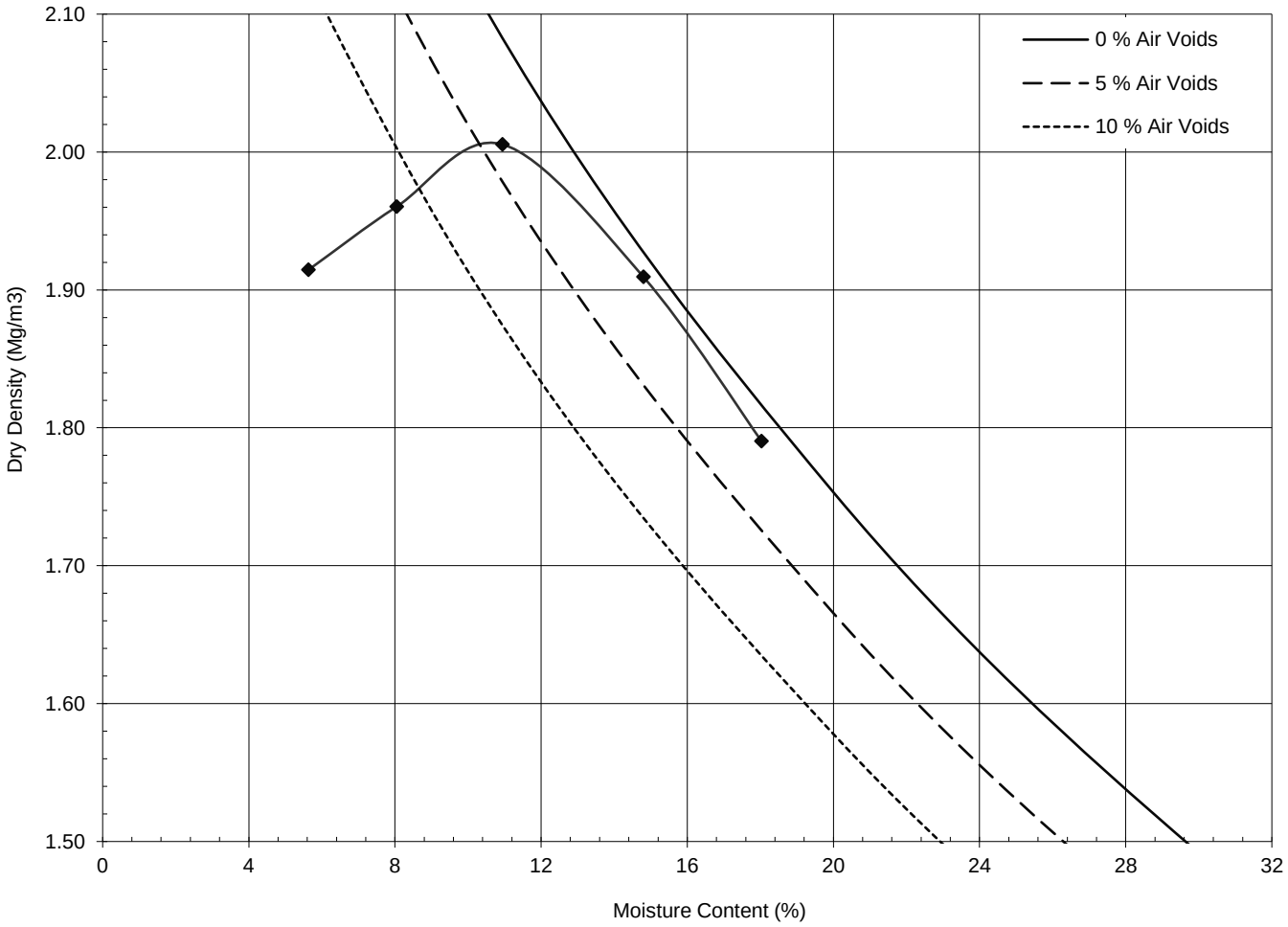
CONTRACT	CHECKED
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Geotechnical Engineering Limited

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

BS. 1377 : Part 4 : 1990 : 3

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/03
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	14B
DESCRIPTION	Greyish brown slightly gravelly slightly sandy CLAY	SAMPLE DEPTH (m)	3.50
		SPECIMEN DEPTH (m)	3.50



test method		3.5.4.1 4.5kg dynamic compaction - 1L mould			
preparation procedure		3.2.4.1 (grading zone 1)			
sample preparation		C R			
proportion retained on 37.5mm sieve	%	0	initial moisture content	%	19
proportion retained on 20mm sieve	%	0	maximum dry density	(Mg/m3)	2.01
particle density	(Mg/m3)	#2.70	optimum moisture content	%	11

remarks

denotes particle density has been assigned an assumed value

C denotes sample has been chopped to pass 20mm sieve

S denotes sample has been shredded to pass 20mm sieve

R denotes sample material has been recycled between/for points

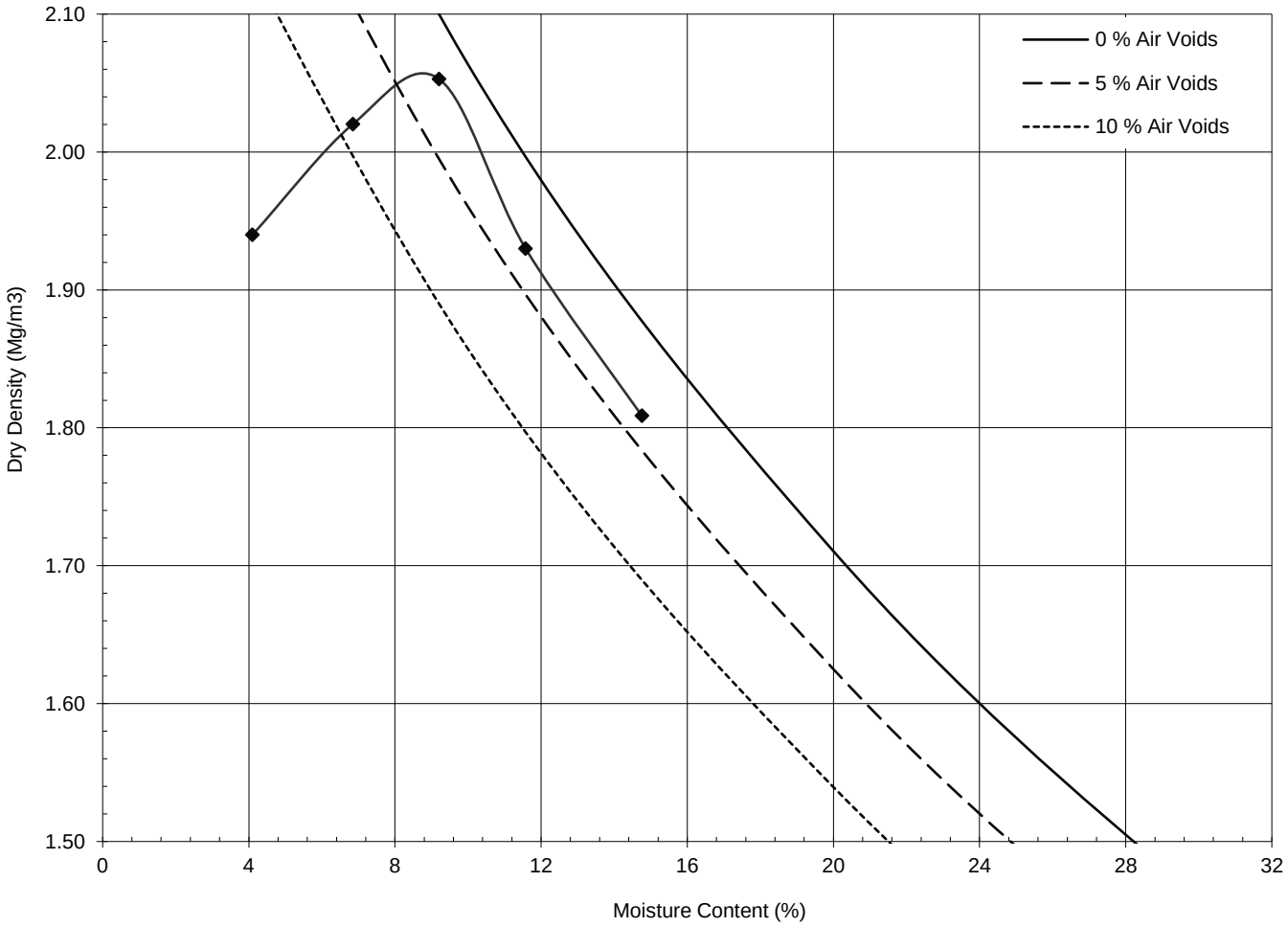
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Geotechnical Engineering Limited

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

BS. 1377 : Part 4 : 1990 : 3

CLIENT	CITY FOOTBALL GROUP LIMITED	BH/TP No.	BH22/04
SITE	ETIHAD GROUND INVESTIGATION	SAMPLE No./TYPE	9B
DESCRIPTION	Brownish grey slightly sandy slightly gravelly silty CLAY	SAMPLE DEPTH (m)	2.00
		SPECIMEN DEPTH (m)	2.00



test method		3.6.4.1 4.5kg dynamic compaction - CBR mould			
preparation procedure		3.2.5.2 (grading zone 4)			
sample preparation		C R			
proportion retained on 37.5mm sieve	%	2	initial moisture content	%	19
proportion retained on 20mm sieve	%	6	maximum dry density	(Mg/m3)	2.06
particle density	(Mg/m3)	#2.60	optimum moisture content	%	9

remarks

denotes particle density has been assigned an assumed value

C denotes sample has been chopped to pass 20mm sieve

S denotes sample has been shredded to pass 20mm sieve

R denotes sample material has been recycled between/for points

CONTRACT	CHECKED
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Geotechnical Engineering Limited

UNDRAINED TRIAXIAL COMPRESSION

BS EN ISO 17892-8: 2018

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample		specimen depth	code	water content		dimensions		density		cell pressure	rate of strain	undrained shear strength	failure strain	failure mode	shear strength*	description and remarks
	no./type	depth (m)	(m)		initial (%)	final (%)	length (mm)	diameter (mm)	bulk (Mg/m^3)	dry (Mg/m^3)	(kPa)	(%/min)	(kPa)	(%)		(kPa)	
BH22/01	34UT	10.00	10.05	UU70	15.1	15.0	140	71	2.20	1.91	200	2.0	302	15.0	I	151	Brown slightly sandy slightly gravelly CLAY. lathed to 70mm diameter due to fractures
BH22/02	14UT	3.50	3.70	UU100	22.4	26.5	196	103	2.07	1.69	70	2.0	78	14.8	I	39	Brown slightly gravelly slightly sandy CLAY
BH22/03	13UT	3.50	3.75	UU100	17.2	16.4	205	103	2.18	1.86	70	2.0	565	8.3	S	283	Brown slightly sandy slightly gravelly CLAY. Test terminated at 8% strain. Load ring capacity reached
BH22/03	28UT	8.00	8.15	UU100	32.2	16.5	205	103	2.17	1.64	160	2.0	275	14.1	B	137	Brown slightly sandy gravelly CLAY
BH22/03	42C	12.00	12.50	UU100	12.0	12.1	205	103	2.27	2.03	240	2.0	284	11.2	B	142	Brown slightly sandy slightly gravelly CLAY
BH22/04	39C	13.70	14.30	UU100	9.9	10.7	205	102	2.32	2.11	274	2.0	533	14.6	B	267	Brown slightly sandy slightly gravelly CLAY
BH22/05	34C	10.60	11.70	UU100	13.4	12.7	196	103	2.24	1.98	212	2.0	253	14.8	B	127	Brown slightly gravelly slightly sandy CLAY
BH22/06A	44C	13.70	14.40	UU100	10.7	11.5	205	103	2.30	2.08	274	2.0	715	15.1	B	357	Brown slightly sandy slightly gravelly CLAY
BH22/07	23UT	4.50	4.70	UU100	18.3	18.4	205	104	2.16	1.82	90	2.0	197	15.1	I	99	Brown slightly gravelly slightly sandy CLAY
BH22/07	40C	9.00	9.95	UU100	13.2	13.6	205	103	2.24	1.98	180	2.0	213	6.3	B	107	Brown slightly sandy slightly gravelly CLAY
BH22/07	53C	15.00	15.55	UU100	12.3	12.6	205	102	2.23	1.99	300	2.0	511	14.1	B	255	Brown slightly sandy gravelly CLAY
BH22/08	18UT	6.00	5.00	UU100	16.3	16.3	205	103	2.17	1.86	100	2.0	512	11.7	I	256	Brown slightly gravelly slightly sandy CLAY
BH22/08	30UT	10.00	10.00	UU100	14.0	15.2	205	103	2.22	1.95	200	2.0	321	15.1	I	160	Brown slightly sandy slightly gravelly CLAY

general remarks:

* shear strength taken as half undrained shear strength at failure for each stage
membrane correction applied
sample taken vertically (unless otherwise specified)

code:

UU - unconsolidated undrained
M - multi stage
S - set of three
R - remoulded

failure mode:

B - barrel (plastic failure)
S - shear (brittle failure)
I - intermediate
O - other (see remarks)

membrane type/thickness:

latex membrane used (unless otherwise specified)
38 - 0.2mm
70 - 0.4mm
100 - 0.4mm

CONTRACT	CHECKED
37349	**WNJ**

Geotechnical Engineering Limited

DETERMINATION OF SHEAR STRENGTH BY HAND VANE

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample		specimen depth (m)	vane strength				description and remarks
	no./type	depth (m)		reading 1 (kPa)	reading 2 (kPa)	reading 3 (kPa)	average (kPa)	
BH22/01	24UT	6.00	6.25	70	56	77	68	Brown slightly gravelly slightly sandy silty CLAY
BH22/01	29UT	8.00	8.25	120	114	99	111	Brown slightly gravelly slightly sandy silty CLAY
BH22/02	23UT	6.00	6.25	57	93	72	74	Brown slightly gravelly slightly sandy silty CLAY
BH22/02	29UT	8.00	8.25	114	126	79	106	Brown slightly gravelly slightly sandy silty CLAY
BH22/02	49C	14.20	14.40	145	140	111	132	Brown slightly gravelly slightly sandy silty CLAY
BH22/03	17UT	4.50	4.75	118	116	142	125	Brown slightly gravelly slightly sandy silty CLAY
BH22/03	34UT	10.00	10.25	74	75	44	64	Brown slightly gravelly slightly sandy silty CLAY
BH22/04	27L	8.20	8.40	101	91	107	100	Brown slightly gravelly slightly sandy silty CLAY
BH22/06A	19UT	5.00	5.25	48	41	37	42	Brown slightly gravelly slightly sandy silty CLAY
BH22/06A	25UT	7.00	7.25	41	28	31	33	Brown slightly gravelly sandy CLAY

general remarks

Re* - denotes vane test refusal

CONTRACT	CHECKED
37349	**WNJ**

Geotechnical Engineering Limited

UNIAXIAL COMPRESSIVE STRENGTH OF ROCK

I.S.R.M. Suggested Methods : 2007 Edition

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample no./type	sample depth (m)	specimen depth (m)	diameter D (mm)	height H (mm)	H/D	moisture content (%)	bulk density (Mg/m^3)	loading rate (kN/min)	time to failure (min:sec)	UCS (MPa)	description, codes and remarks
BH22/01	60CS	18.60	18.60	102.3	267.3	2.61	5.4	2.51	20	02:16	3.65	Light grey SILTSTONE, N, Ax.
BH22/01	97CS	36.96	39.96	101.9	269.6	2.65	4.3	2.54	20	02:55	6.72	Grey MUDSTONE, N, Ax.
BH22/01	117CS	47.90	47.90	100.5	254.3	2.53	5.5	24.08	20	01:28	1.66	Dark grey MUDSTONE, N, Sh.
BH22/02	115CS	50.20	50.20	101.8	266.5	2.62	5.6	2.45	40	03:34	22.00	Orangish brown SANDSTONE, N, AxCa.
BH22/04	61CS	23.20	23.20	92.9	252.7	2.72	4.4	2.59	10	03:45	4.03	Grey SILTSTONE, N, AxSh.
BH22/04	70CS	29.38	29.38	96.9	265.9	2.74	4.8	2.51	20	02:51	4.21	Grey MUDSTONE, N, AxSh.
BH22/04	100CS	47.48	47.48	98.6	271.3	2.75	4.4	2.51	40	05:50	32.51	Light grey SANDSTONE, N, AxCa.
BH22/05	97CS	44.40	44.40	94.7	267.9	2.83	3.3	2.57	30	02:36	5.41	Grey MUDSTONE, N, ShOt.
BH22/08	89CS	43.20	43.20	100.5	253.6	2.52	4.7	2.50	30	03:11	9.99	Grey SANDSTONE, N, Sh.

general remarks

sample obtained from vertically drilled core (unless specified), test machine - VJT6000

coding:

moisture condition	sample storage	failure mode
N - natural moisture content	U - not wrapped	Ax - axial cleavage
F - fully saturated	F - wrapped in cling film/foil	Ca - cataclasis
S - soaked	W - waxed	Sh - shear
P - air/partially dried	G - contained in sealed Geoline	Ex - explosive
		Ot - other

CONTRACT	CHECKED
37349	**WNJ**

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNIAXIAL COMPRESSIVE STRENGTH OF ROCK MATERIALS

Sample details						Density		Uniaxial Compression Test (LF0879C (1000kN) compression frame used)							
								Mean after prep.							
Borehole Ref.	Sample Ref.	Depth (m)	Description	MC (%)	Degree of Saturation (%)	Bulk (Mg/m³)	Dry (Mg/m³)	Diameter (mm)	Height (mm)	H/D Ratio	Load at Failure (kN)	UCS (MPa) 3 sig. fig.	Failure Sketch	D. Tested	Remarks
BH22/01	64	20.70-21.00	Weak thinly laminated dark grey SILTSTONE. Slightly weathered	7.3	82.1	2.47	2.31	102.20	239.60	2.3	3.9	0.475		14/02/23	Sample failed on weakness
BH22/03	71	25.74-26.27	Weak foliated dark grey SILTSTONE. Fresh to slightly weathered	4.3	65.0	2.54	2.44	101.80	202.60	2.0	52.6	6.46		14/02/23	
BH22/05	50	17.70-18.10	Weak thinly laminated dark grey SILTSTONE. Slightly weathered	6.0	71.3	2.47	2.33	101.50	212.00	2.1	3.4	0.42		14/02/23	Sample failed on weakness
BH22/07	74	25.50-25.89	Weak thinly laminated light grey SILTSTONE. Slightly weathered	5.7	68.3	2.47	2.33	101.40	242.00	2.4	193.8	24		14/02/23	
BH22/08	64	25.49-25.80	Medium strong thinly laminated light brown fine grained SANDSTONE. Fresh	7.7	77.8	2.43	2.25	101.00	237.30	2.3	231.8	28.9		14/02/23	

Note: The dimensional requirements of flatness (<0.02 mm), perpendicularity (<0.05 / 50 mm) and straightness (0.3 mm deviation) are all met. Specific Gravity used for Degree of Saturation is assumed unless specified by the client.

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 15/02/2023

Project Number:

GEO / 37362

Project Name:

ETIHAD GROUND INVESTIGATION

37349001

GEOLABS®

UKAS TESTING 1982

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BH22/01
Sample Ref.:	64
Depth (m):	20.70-21.00

Description:
Weak thinly laminated dark grey SILTSTONE. Slightly weathered

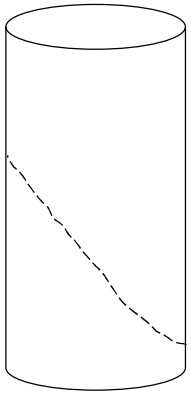
LF0879C (1000kN) compression frame used

Diameter	102.20 mm
Height	239.60 mm
Bulk Density	2.47 Mg/m³
Dry Density	2.31 Mg/m³
Water Content	7.3 %

Degree of Saturation: 82.1 % Specific Gravity: 2.9 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Along foliation



Solid lines for material failures.
Dashed lines for apparent weakness failure.

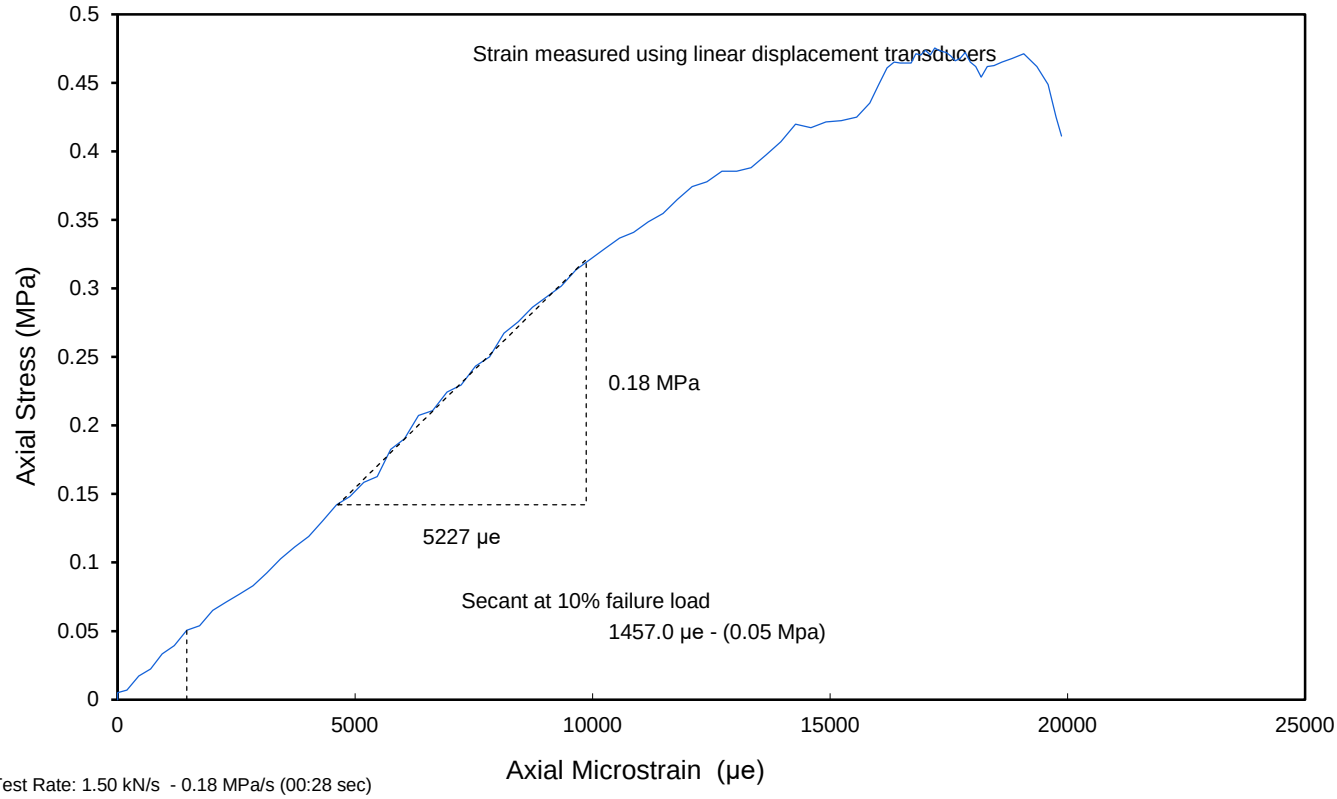
Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: n/a

Date tested: 14/02/2023

Test results

Unconfined Compressive Strength (Maximum load (kN): 3.90)	0.475 MPa
Young's Modulus (tangential at 50% failure load)	0.0343 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	0.0347 GPa
Poisson's Ratio (secant at 10% failure load)	n/a

Sample type	**C**



Test Rate: 1.50 kN/s - 0.18 MPa/s (00:28 sec)

Remarks: Sample failed on weakness

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are all met.

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 15/02/2023

Project Number:

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ETIHAD GROUND INVESTIGATION
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ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BH22/03
Sample Ref.:	71
Depth (m):	25.74-26.27

Description:
Weak foliated dark grey SILTSTONE. Fresh to slightly weathered

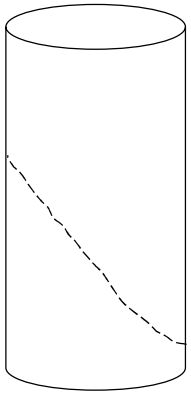
LF0879C (1000kN) compression frame used

Diameter	101.80 mm
Height	202.60 mm
Bulk Density	2.54 Mg/m³
Dry Density	2.44 Mg/m³
Water Content	4.3 %

Degree of Saturation: 65.0 % Specific Gravity: 2.9 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

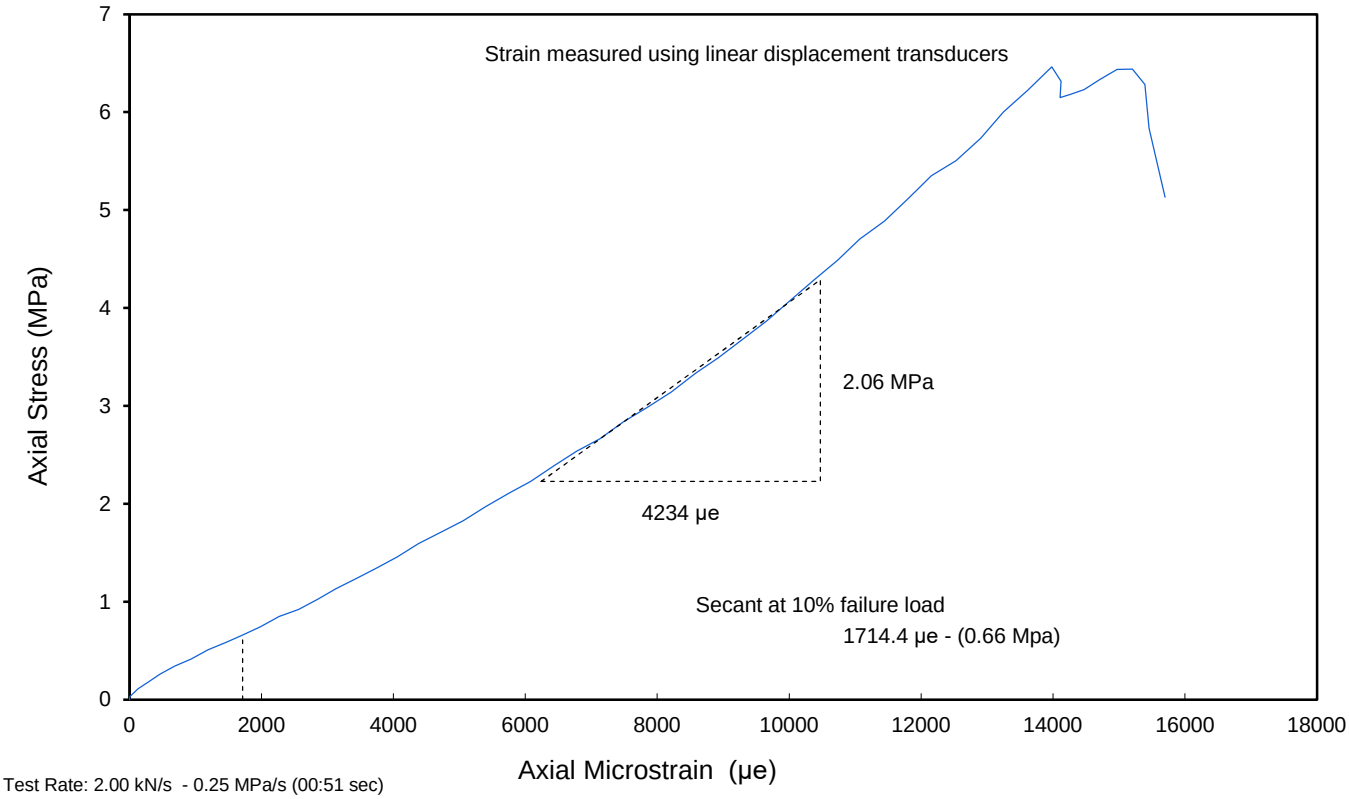
Date tested: 14/02/2023

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: n/a

Sample type	C

Test results

Unconfined Compressive Strength Maximum load (kN): 52.60	6.46 MPa
Young's Modulus (tangential at 50% failure load)	0.487 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	0.384 GPa
Poisson's Ratio (secant at 10% failure load)	n/a



Test Rate: 2.00 kN/s - 0.25 MPa/s (00:51 sec)

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are all met.

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 15/02/2023

Project Number:

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Project Name:

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UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BH22/05
Sample Ref.:	50
Depth (m):	17.70-18.10

Description:
Weak thinly laminated dark grey SILTSTONE. Slightly weathered

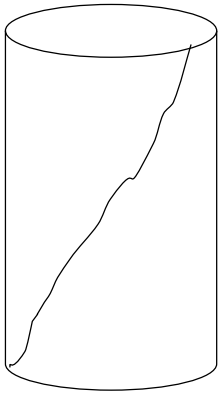
LF0879C (1000kN) compression frame used

Diameter	101.50 mm
Height	212.00 mm
Bulk Density	2.47 Mg/m³
Dry Density	2.33 Mg/m³
Water Content	6.0 %

Degree of Saturation: 71.3 % Specific Gravity: 2.9 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Along foliation



Solid lines for material failures.
Dashed lines for apparent weakness failure.

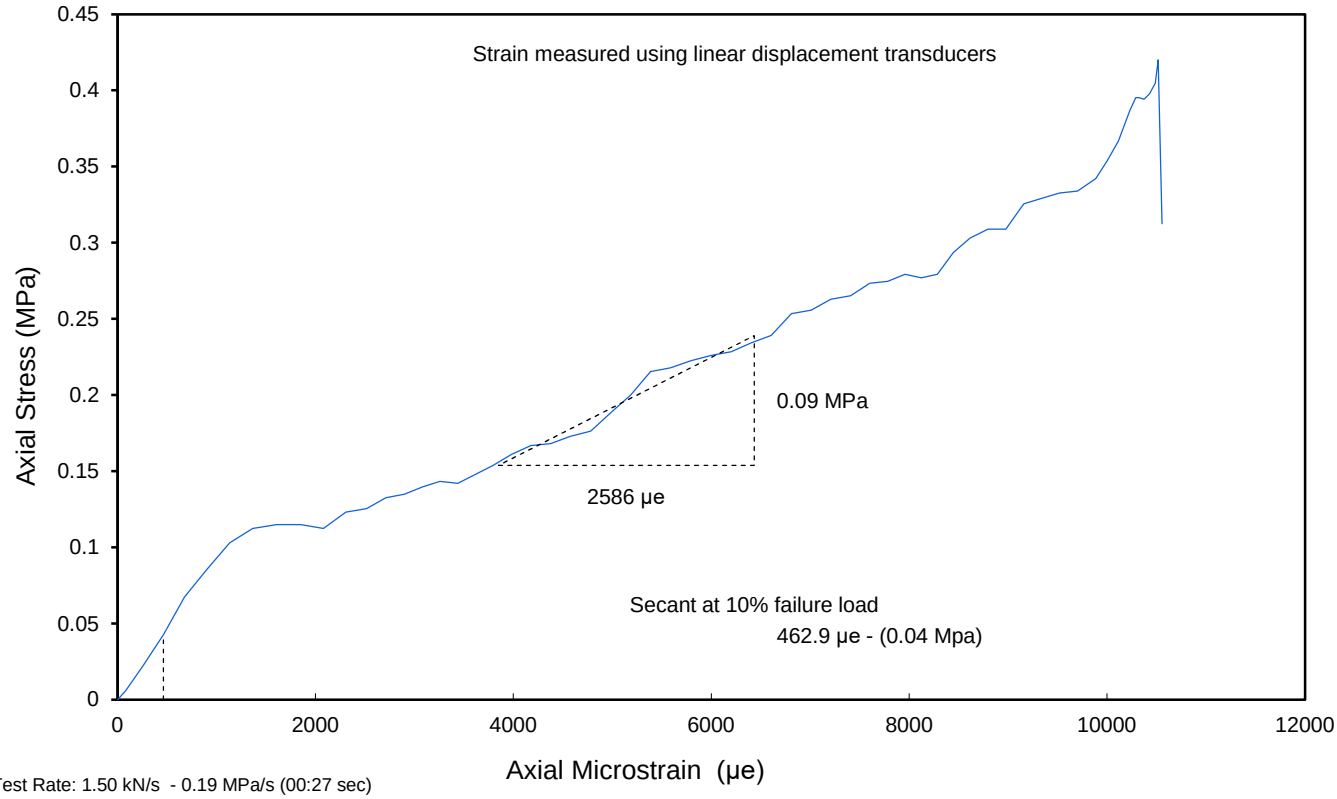
Date tested: 14/02/2023

Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: n/a

Sample type	C

Test results

Unconfined Compressive Strength (Maximum load (kN): 3.40)	0.42 MPa
Young's Modulus (tangential at 50% failure load)	0.033 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	0.092 GPa
Poisson's Ratio (secant at 10% failure load)	n/a



Test Rate: 1.50 kN/s - 0.19 MPa/s (00:27 sec)

Remarks: Sample failed on weakness

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are all met.

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 15/02/2023

Project Number:

GEO / 37362

Project Name:

ETIHAD GROUND INVESTIGATION
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ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BH22/07
Sample Ref.:	74
Depth (m):	25.50-25.89

Description:
Weak thinly laminated light grey SILTSTONE. Slightly weathered

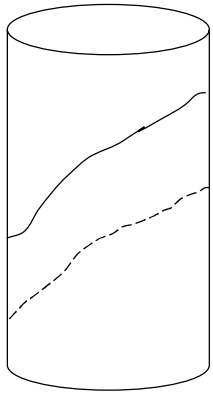
LF0879C (1000kN) compression frame used

Diameter	101.40 mm
Height	242.00 mm
Bulk Density	2.47 Mg/m³
Dry Density	2.33 Mg/m³
Water Content	5.7 %

Degree of Saturation: 68.3 % Specific Gravity: 2.9 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

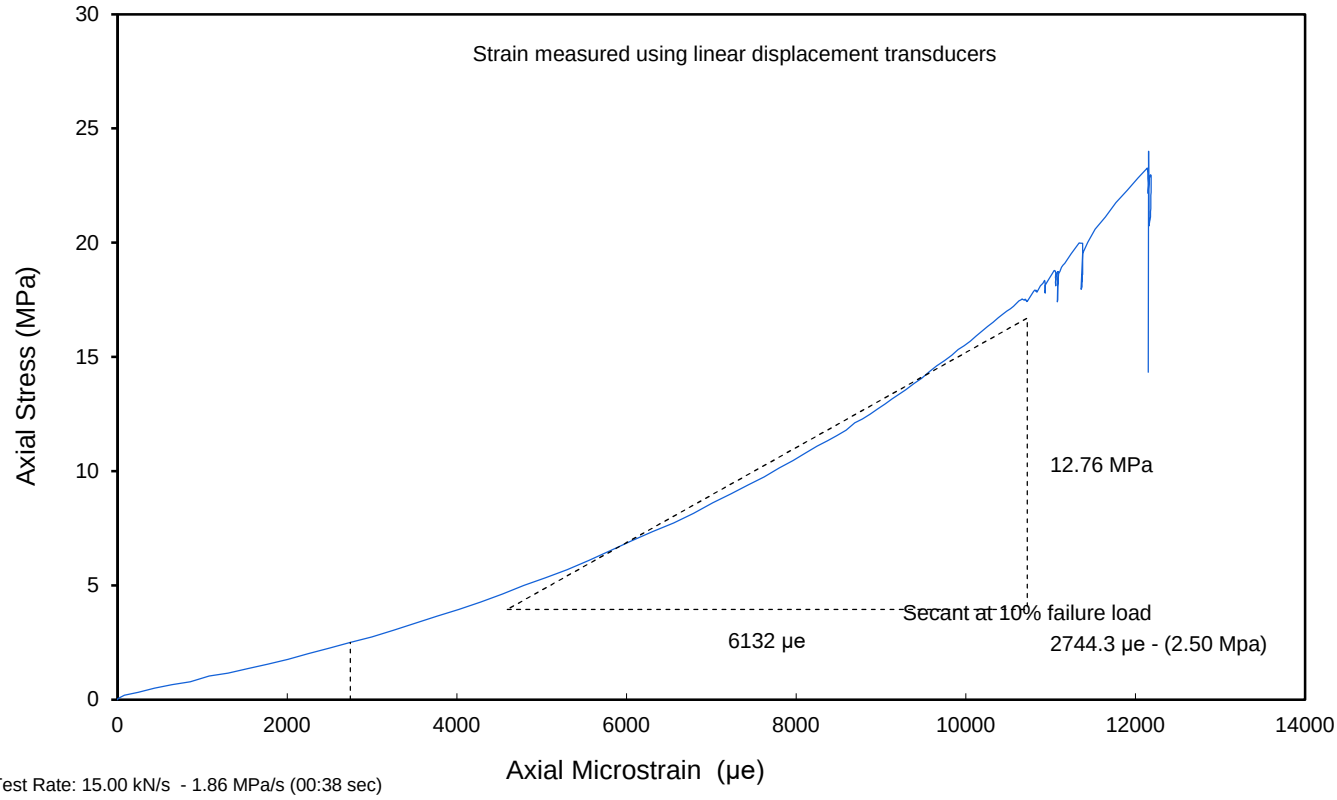
Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: n/a

Date tested: 14/02/2023

Test results

Unconfined Compressive Strength Maximum load (kN): 193.80	24 MPa
Young's Modulus (tangential at 50% failure load)	2.08 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	0.913 GPa
Poisson's Ratio (secant at 10% failure load)	n/a

Sample type	C



Test Rate: 15.00 kN/s - 1.86 MPa/s (00:38 sec)

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are all met.

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 15/02/2023

Project Number:

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Project Name:

ETIHAD GROUND INVESTIGATION
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ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

UNCONFINED COMPRESSIVE STRENGTH WITH YOUNG'S MODULUS

Borehole Ref.:	BH22/08
Sample Ref.:	64
Depth (m):	25.49-25.80

Description:
Medium strong thinly laminated light brown fine grained SANDSTONE. Fresh

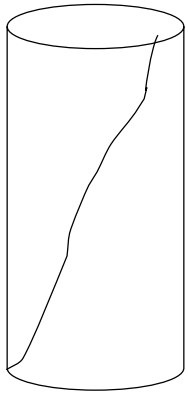
LF0879C (1000kN) compression frame used

Diameter	101.00 mm
Height	237.30 mm
Bulk Density	2.43 Mg/m³
Dry Density	2.25 Mg/m³
Water Content	7.7 %

Degree of Saturation: 77.8 % Specific Gravity: 2.9 Mg/m³ (Assumed)

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

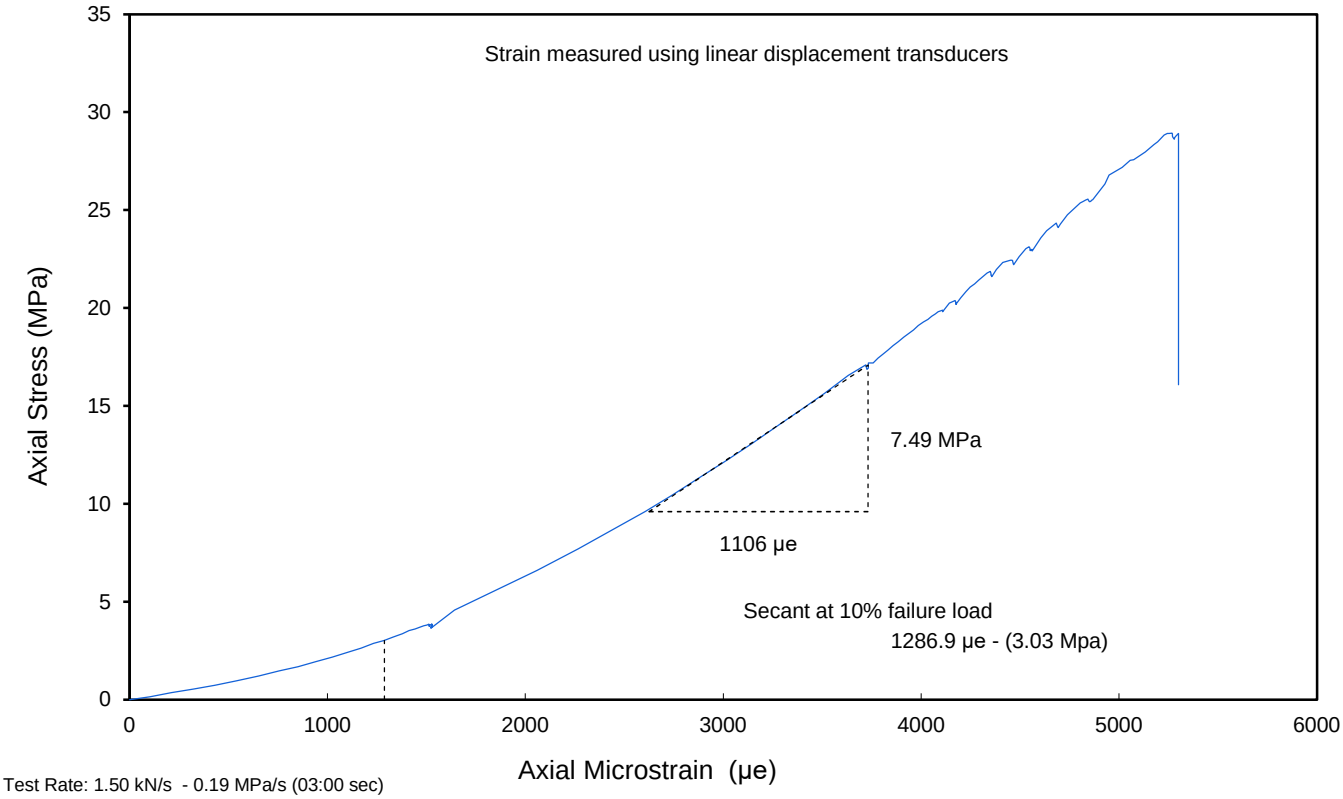
Angle of foliation/Axis of loading: n/a
Angle of shear plane/Axis of loading: n/a

Date tested: 14/02/2023

Test results

Unconfined Compressive Strength Maximum load (kN): 231.80	28.9 MPa
Young's Modulus (tangential at 50% failure load)	6.77 GPa
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	2.35 GPa
Poisson's Ratio (secant at 10% failure load)	n/a

Sample type	**C**



Test Rate: 1.50 kN/s - 0.19 MPa/s (03:00 sec)

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are all met.

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 15/02/2023

Project Number:

GEO / 37362

Project Name:

ETIHAD GROUND INVESTIGATION
37349001

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Geotechnical Engineering Limited

POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample depth (m)	test type	test orien-tation	moisture condition	width W (mm)	length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
BH22/01	18.00	D	Y	N		50	100	0.68	100.00	0.07	1.37	0.09	Grey MUDSTONE
BH22/01	18.00	A	X	N	100		50	0.33	79.79	0.05	1.23	0.06	Grey MUDSTONE
BH22/01	21.20	D	Y	N		80	100	0.52	100.00	0.05	1.37	0.07	Grey MUDSTONE
BH22/01	21.20	A	X	N	100		80	0.35	100.93	0.03	1.37	0.05	Grey MUDSTONE
BH22/01	25.45	D	Y	N		65	100	1.97	100.00	0.20	1.37	0.27	Grey MUDSTONE
BH22/01	25.45	A	X	N	100		65	2.14	90.97	0.26	1.31	0.34	Grey MUDSTONE
BH22/01	26.10	D	Y	P		50	100	0.11	100.00	0.01	1.37	0.02	Grey MUDSTONE
BH22/01	26.10	A	X	P	100		50	1.03	79.79	0.16	1.23	0.20	Grey MUDSTONE
BH22/01	31.03	D	Y	N		70	100	0.39	100.00	0.04	1.37	0.05	Grey MUDSTONE
BH22/01	31.03	A	X	N	100		70	0.72	94.41	0.08	1.33	0.11	Grey MUDSTONE
BH22/01	32.20	D	Y	P		40	100	2.64	100.00	0.26	1.37	0.36	Grey MUDSTONE
BH22/01	32.20	A	X	P	100		40	3.11	71.36	0.61	1.17	0.72	Grey MUDSTONE
BH22/01	35.50	D	Y	P		50	100	2.72	100.00	0.27	1.37	0.37	Grey MUDSTONE
BH22/01	35.50	A	X	P	100		60	3.04	87.40	0.40	1.29	0.51	Grey MUDSTONE
BH22/01	36.96	D	Y	N		40	100	3.33	100.00	0.33	1.37	0.45	Grey MUDSTONE
BH22/01	36.96	A	X	N	100		40	2.62	71.36	0.51	1.17	0.60	Grey MUDSTONE
BH22/01	39.80	D	Y	P		30	100	2.37	100.00	0.24	1.37	0.32	Grey SILTSTONE
BH22/01	39.80	A	X	P	100		50	3.66	79.79	0.57	1.23	0.71	Grey SILTSTONE
BH22/01	41.20	D	Y	P		50	100	3.17	100.00	0.32	1.37	0.43	Grey MUDSTONE

general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength

test machine PLM02

test type	test orientation relative to discontinuities		moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular	U - unknown	N - natural moisture content		
D - diametral	Y - parallel		P - partially air dried	**37349**	**WNJ**
I - irregular lump	Z - oblique		S - soaked		

Geotechnical Engineering Limited

POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample depth (m)	test type	test orien-tation	moisture condition	width W (mm)	length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
BH22/01	41.20	A	X	P	100		50	2.78	79.79	0.44	1.23	0.54	Grey MUDSTONE
BH22/01	49.44	D	Y	N		60	90	0.94	90.00	0.12	1.30	0.15	Dark grey MUDSTONE
BH22/01	49.44	A	X	N	90		50	0.74	75.69	0.13	1.21	0.16	Dark grey MUDSTONE
BH22/01	53.06	D	Y	N		50	100	0.14	100.00	0.01	1.37	0.02	Grey MUDSTONE
BH22/01	53.06	A	X	N	100		40	0.05	71.36	0.01	1.17	0.01	Grey MUDSTONE
BH22/02	16.30	D	Y	P		50	100	0.14	100.00	0.01	1.37	0.02	Grey MUDSTONE
BH22/02	16.30	A	X	P	100		70	0.05	94.41	0.01	1.33	0.01	Grey MUDSTONE
BH22/02	19.50	D	Y	N		30	105	0.05	105.00	0.00	1.40	0.01	Grey MUDSTONE
BH22/02	19.50	A	X	N	105		30	1.40	63.33	0.35	1.11	0.39	Grey MUDSTONE
BH22/02	31.00	D	Y	N		80	105	0.15	105.00	0.01	1.40	0.02	Grey MUDSTONE
BH22/02	31.00	A	X	N	105		80	0.28	103.42	0.03	1.39	0.04	Grey MUDSTONE
BH22/02	32.10	D	Y	P		40	100	0.03	100.00	0.00	1.37	0.00	Grey MUDSTONE
BH22/02	32.10	A	X	P	100		50	0.33	79.79	0.05	1.23	0.06	Grey MUDSTONE
BH22/02	33.40	D	Y	N		30	105	3.95	105.00	0.36	1.40	0.50	Grey SILTSTONE
BH22/02	33.40	A	X	N	105		30	7.20	63.33	1.80	1.11	2.00	Grey SILTSTONE
BH22/02	36.20	D	Y	P		40	100	0.23	100.00	0.02	1.37	0.03	Grey SILTSTONE
BH22/02	36.20	A	X	P	100		40	2.50	71.36	0.49	1.17	0.58	Grey SILTSTONE
BH22/02	37.60	D	Y	N		50	100	0.03	100.00	0.00	1.37	0.00	Grey SILTSTONE
BH22/02	37.60	A	X	N	100		60	0.93	87.40	0.12	1.29	0.16	Grey SILTSTONE

general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength

test machine PLM02

test type	test orientation relative to discontinuities		moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular	U - unknown	N - natural moisture content		
D - diametral	Y - parallel		P - partially air dried	**37349**	**WNJ**
I - irregular lump	Z - oblique		S - soaked		

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POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample depth (m)	test type	test orien-tation	moisture condition	width W (mm)	length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
BH22/02	42.30	D	Y	P		60	100	3.19	100.00	0.32	1.37	0.44	Grey SILTSTONE
BH22/02	42.30	A	X	P	100		60	7.19	87.40	0.94	1.29	1.21	Grey SILTSTONE
BH22/02	44.20	D	Y	P		50	100	5.82	100.00	0.58	1.37	0.80	Grey SANDSTONE
BH22/02	44.20	A	X	P	100		60	7.46	87.40	0.98	1.29	1.26	Grey SANDSTONE
BH22/02	50.30	D	Y	N		50	100	6.40	100.00	0.64	1.37	0.87	Orangish brown SANDSTONE
BH22/02	50.30	A	X	N	100		50	6.65	79.79	1.04	1.23	1.29	Orangish brown SANDSTONE
BH22/02	52.70	D	Y	P		30	100	4.40	100.00	0.44	1.37	0.60	Brown SANDSTONE
BH22/02	52.70	A	X	P	100		40	4.79	71.36	0.94	1.17	1.10	Brown SANDSTONE
BH22/02	55.30	D	Y	N		20	100	0.14	100.00	0.01	1.37	0.02	Dark grey SILTSTONE
BH22/02	55.30	A	X	N	100		30	0.93	61.80	0.24	1.10	0.27	Dark grey SILTSTONE
BH22/02	59.30	D	Y	P		40	100	0.87	100.00	0.09	1.37	0.12	Grey SILTSTONE
BH22/02	59.30	A	X	P	100		40	0.45	71.36	0.09	1.17	0.10	Grey SILTSTONE
BH22/03	20.70	D	Y	N		50	100	0.09	100.00	0.01	1.37	0.01	Grey MUDSTONE
BH22/03	20.70	A	X	N	100		50	0.04	79.79	0.01	1.23	0.01	Grey MUDSTONE
BH22/03	22.12	D	Y	N		40	105	2.08	105.00	0.19	1.40	0.26	Dark grey MUDSTONE
BH22/03	22.12	A	X	N	105		40	3.11	73.13	0.58	1.19	0.69	Dark grey MUDSTONE
BH22/03	23.05	D	Y	N		40	100	0.04	100.00	0.00	1.37	0.01	Black COAL
BH22/03	23.05	A	X	N	100		50	0.07	79.79	0.01	1.23	0.01	Black COAL
BH22/03	24.70	I	Y	P	100	50	60	0.02	87.40	0.00	1.29	0.00	Grey SILTSTONE

general remarks

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test machine PLM02

test type	test orientation relative to discontinuities		moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular	U - unknown	N - natural moisture content		
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POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition

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SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample depth (m)	test type	test orien-tation	moisture condition	width W (mm)	length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
BH22/03	28.90	D	Y	P		30	100	0.42	100.00	0.04	1.37	0.06	Grey MUDSTONE
BH22/03	28.90	A	X	P	100		60	1.13	87.40	0.15	1.29	0.19	Grey MUDSTONE
BH22/03	30.15	D	Y	N		60	100	2.54	100.00	0.25	1.37	0.35	Grey SILTSTONE
BH22/03	30.15	A	X	N	100		60	2.69	87.40	0.35	1.29	0.45	Grey SILTSTONE
BH22/03	31.50	D	Y	N		50	100	0.30	100.00	0.03	1.37	0.04	Dark grey MUDSTONE
BH22/03	31.50	A	X	N	100		60	0.50	87.40	0.07	1.29	0.08	Dark grey MUDSTONE
BH22/03	33.80	D	Y	P		40	100	0.86	100.00	0.09	1.37	0.12	Grey SILTSTONE
BH22/03	33.80	A	X	P	100		50	0.51	79.79	0.08	1.23	0.10	Grey SILTSTONE
BH22/03	34.15	D	Y	N		80	100	0.60	100.00	0.06	1.37	0.08	Light grey SILTSTONE
BH22/03	34.15	A	X	N	100		80	0.99	100.93	0.10	1.37	0.13	Light grey SILTSTONE
BH22/03	36.85	D	Y	P		60	100	3.20	100.00	0.32	1.37	0.44	Grey SILTSTONE
BH22/03	36.85	A	X	P	100		80	4.34	100.93	0.43	1.37	0.58	Grey SILTSTONE
BH22/03	39.00	D	Y	P		70	100	5.66	100.00	0.57	1.37	0.77	Grey SANDSTONE
BH22/03	39.00	A	X	P	100		80	5.71	100.93	0.56	1.37	0.77	Grey SANDSTONE
BH22/03	45.30	D	Y	N		50	100	3.36	100.00	0.34	1.37	0.46	Grey SANDSTONE
BH22/03	45.30	A	X	N	100		50	5.26	79.79	0.83	1.23	1.02	Grey SANDSTONE
BH22/03	47.55	D	Y	N		60	100	0.32	100.00	0.03	1.37	0.04	Grey MUDSTONE
BH22/03	47.55	A	X	N	100		60	3.34	87.40	0.44	1.29	0.56	Grey MUDSTONE
BH22/03	51.95	D	Y	N		60	100	1.26	100.00	0.13	1.37	0.17	Dark grey MUDSTONE

general remarks

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test machine PLM02

test type	test orientation relative to discontinuities		moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular	U - unknown	N - natural moisture content		
D - diametral	Y - parallel		P - partially air dried	**37349**	**WNJ**
I - irregular lump	Z - oblique		S - soaked		

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POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition

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SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample depth (m)	test type	test orien-tation	moisture condition	width W (mm)	length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
BH22/03	51.95	A	X	N	100		40	1.49	71.36	0.29	1.17	0.34	Dark grey MUDSTONE
BH22/03	54.25	D	Y	P		40	100	0.30	100.00	0.03	1.37	0.04	Grey SILTSTONE
BH22/03	54.25	A	X	P	100		40	2.87	71.36	0.56	1.17	0.66	Grey SILTSTONE
BH22/03	58.00	D	Y	N		50	100	1.70	100.00	0.17	1.37	0.23	Grey MUDSTONE
BH22/03	58.00	A	X	N	100		50	3.22	79.79	0.51	1.23	0.62	Grey MUDSTONE
BH22/03	60.25	D	Y	N		60	100	1.22	100.00	0.12	1.37	0.17	Grey LIMESTONE
BH22/03	60.25	A	X	N	100		60	4.13	87.40	0.54	1.29	0.70	Grey LIMESTONE
BH22/03	61.68	D	Y	N		50	100	1.86	100.00	0.19	1.37	0.25	Grey SILTSTONE
BH22/03	61.68	A	X	N	100		60	1.16	87.40	0.15	1.29	0.20	Grey SILTSTONE
BH22/04	22.90	I	Y	P	90	90	60	2.90	82.92	0.42	1.26	0.53	Grey SILTSTONE
BH22/04	25.90	D	Y	P		40	100	0.15	100.00	0.02	1.37	0.02	Grey MUDSTONE
BH22/04	25.90	A	X	P	100		50	2.52	79.79	0.40	1.23	0.49	Grey MUDSTONE
BH22/04	31.96	D	Y	P		80	95	3.14	95.00	0.35	1.33	0.46	Grey MUDSTONE
BH22/04	31.96	A	X	P	90		80	3.62	95.75	0.39	1.34	0.53	Grey MUDSTONE
BH22/04	33.45	D	Y	N		60	90	0.27	90.00	0.03	1.30	0.04	Grey MUDSTONE
BH22/04	33.45	A	X	N	90		60	0.45	82.92	0.07	1.26	0.08	Grey MUDSTONE
BH22/04	38.00	D	Y	P		20	100	0.02	100.00	0.00	1.37	0.00	Dark grey MUDSTONE
BH22/04	38.00	A	X	P	100		30	0.12	61.80	0.03	1.10	0.03	Dark grey MUDSTONE
BH22/04	43.40	I	Y	P	100	70	70	3.18	94.41	0.36	1.33	0.47	Dark grey MUDSTONE

general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength

test machine PLM02

test type	test orientation relative to discontinuities		moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular	U - unknown	N - natural moisture content		
D - diametral	Y - parallel		P - partially air dried	**37349**	**WNJ**
I - irregular lump	Z - oblique		S - soaked		

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POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition

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SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample depth (m)	test type	test orien-tation	moisture condition	width W (mm)	length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
BH22/04	47.58	D	Y	N		50	100	2.98	100.00	0.30	1.37	0.41	Light Grey SANDSTONE
BH22/04	47.58	A	X	N	100		50	0.35	79.79	0.05	1.23	0.07	Light Grey SANDSTONE
BH22/05	18.60	I	X	P	100	40	40	1.35	71.36	0.27	1.17	0.31	Grey MUDSTONE
BH22/05	20.69	D	Y	N		40	100	0.03	100.00	0.00	1.37	0.00	Grey MUDSTONE
BH22/05	20.69	A	X	N	100		40	1.41	71.36	0.28	1.17	0.32	Grey MUDSTONE
BH22/05	31.31	D	Y	N		65	100	1.75	100.00	0.18	1.37	0.24	Black MUDSTONE
BH22/05	31.31	A		N	100		45	1.74	75.69	0.30	1.21	0.37	Black MUDSTONE
BH22/05	32.80	D	Y	P		30	100	0.16	100.00	0.02	1.37	0.02	Black MUDSTONE
BH22/05	32.80	A	X	P	100		30	1.04	61.80	0.27	1.10	0.30	Black MUDSTONE
BH22/05	35.84	D	Y	N		50	100	3.47	100.00	0.35	1.37	0.47	Grey SANDSTONE
BH22/05	35.84	A	X	N	100		60	6.46	87.40	0.85	1.29	1.09	Grey SANDSTONE
BH22/05	37.20	D	Y	N		60	100	1.61	100.00	0.16	1.37	0.22	Light grey MUDSTONE
BH22/05	37.20	A	X	N	100		50	2.23	79.79	0.35	1.23	0.43	Light grey MUDSTONE
BH22/05	39.60	D	Y	N		50	100	2.15	100.00	0.22	1.37	0.29	Grey MUDSTONE
BH22/05	39.60	A	X	N	100		40	1.88	71.36	0.37	1.17	0.43	Grey MUDSTONE
BH22/05	41.00	D	Y	N		50	100	0.43	100.00	0.04	1.37	0.06	Grey MUDSTONE
BH22/05	41.00	A	X	N	100		50	1.12	79.79	0.18	1.23	0.22	Grey MUDSTONE
BH22/05	46.60	D	Y	N		50	100	3.07	100.00	0.31	1.37	0.42	Grey MUDSTONE
BH22/05	46.60	A	X	N	100		50	4.15	79.79	0.65	1.23	0.80	Grey MUDSTONE

general remarks

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test machine PLM02

test type	test orientation relative to discontinuities		moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular	U - unknown	N - natural moisture content		
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I - irregular lump	Z - oblique		S - soaked		

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POINT LOAD STRENGTH TEST

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SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample depth (m)	test type	test orien-tation	moisture condition	width W (mm)	length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
BH22/05	48.73	D	Y	N		60	100	3.99	100.00	0.40	1.37	0.55	Pinkish brown and grey SANDSTONE
BH22/05	48.73	A	X	N	100		70	9.24	94.41	1.04	1.33	1.38	Pinkish brown and grey SANDSTONE
BH22/05	53.60	D	Y	N		40	90	9.76	90.00	1.20	1.30	1.57	Brown SANDSTONE
BH22/05	53.60	A	X	N	90		40	9.54	67.70	2.08	1.15	2.39	Brown SANDSTONE
BH22/05	56.75	D	Y	N		50	90	0.38	90.00	0.05	1.30	0.06	Black MUDSTONE
BH22/05	56.75	A	X	N	90		50	2.19	75.69	0.38	1.21	0.46	Black MUDSTONE
BH22/05	63.65	D	Y	N		50	100	4.90	100.00	0.49	1.37	0.67	Grey SANDSTONE
BH22/05	63.65	A	X	N	100		40	6.50	71.36	1.28	1.17	1.50	Grey SANDSTONE
BH22/06A	15.45	D	Y	P		50	100	3.47	100.00	0.35	1.37	0.47	Brown MUDSTONE
BH22/06A	15.45	A	X	P	100		60	6.46	87.40	0.85	1.29	1.09	Brown MUDSTONE
BH22/06A	19.20	D	Y	P		50	100	0.07	100.00	0.01	1.37	0.01	Grey MUDSTONE
BH22/06A	19.20	A	X	P	100		50	0.08	79.79	0.01	1.23	0.02	Grey MUDSTONE
BH22/06A	21.68	D	Y	N		50	100	8.47	100.00	0.85	1.37	1.16	Light grey SILTSTONE
BH22/06A	21.68	A	X	N	100		70	7.83	94.41	0.88	1.33	1.17	Light grey SILTSTONE
BH22/06A	25.45	D	Y	N		60	100	0.25	100.00	0.03	1.37	0.03	Grey MUDSTONE
BH22/06A	25.45	A	X	N	100		70	2.08	94.41	0.23	1.33	0.31	Grey MUDSTONE
BH22/06A	27.18	D	Y	N		60	100	0.01	100.00	0.00	1.37	0.00	Grey MUDSTONE
BH22/06A	27.18	A	X	N	100		60	0.53	87.40	0.07	1.29	0.09	Grey MUDSTONE
BH22/06A	30.46	D	Y	N		40	90	0.06	90.00	0.01	1.30	0.01	Grey MUDSTONE

general remarks

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test machine PLM02

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SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample depth (m)	test type	test orien-tation	moisture condition	width W (mm)	length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
BH22/06A	30.46	A	X	N	90		50	0.37	75.69	0.06	1.21	0.08	Grey MUDSTONE
BH22/06A	32.53	D	Y	N		40	100	0.48	100.00	0.05	1.37	0.07	Grey SILTSTONE
BH22/06A	32.53	A	X	N	100		40	1.15	71.36	0.23	1.17	0.27	Grey SILTSTONE
BH22/06A	35.05	D	I	P	100	50	100	0.96	100.00	0.10	1.37	0.13	Grey SANDSTONE
BH22/06A	35.05	A	I	P	100	30	50	3.03	79.79	0.48	1.23	0.59	Grey SANDSTONE
BH22/06A	38.25	D	Y	N		70	100	9.71	100.00	0.97	1.37	1.33	Grey SANDSTONE
BH22/06A	38.25	A	X	N	100		70	7.77	94.41	0.87	1.33	1.16	Grey SANDSTONE
BH22/06A	40.70	D	Y	N		70	100	3.03	100.00	0.30	1.37	0.41	Dark grey MUDSTONE
BH22/06A	40.70	A	X	N	100		90	6.44	107.05	0.56	1.41	0.79	Brown SANDSTONE
BH22/06A	43.70	D	Y	N		20	100	0.12	100.00	0.01	1.37	0.02	Grey MUDSTONE
BH22/06A	43.70	A	X	N	100		30	1.96	61.80	0.51	1.10	0.56	Grey MUDSTONE
BH22/06A	45.55	I	Y	P	100	80	100	0.21	112.84	0.02	1.44	0.02	Grey MUDSTONE
BH22/06A	45.55	I	X	P	100	20	30	0.59	61.80	0.15	1.10	0.17	Grey MUDSTONE
BH22/06A	48.25	D	Y	P		50	100	0.60	100.00	0.06	1.37	0.08	Grey SILTSTONE
BH22/06A	48.25	A	X	P	100		50	1.85	79.79	0.29	1.23	0.36	Grey SILTSTONE
BH22/06A	53.32	D	Y	N		50	100	0.10	100.00	0.01	1.37	0.01	Dark grey SILTSTONE
BH22/06A	53.32	A	X	N	100		50	0.97	79.79	0.15	1.23	0.19	Dark grey SILTSTONE
BH22/06A	54.37	D	Y	N		50	100	0.18	100.00	0.02	1.37	0.02	Dark grey MUDSTONE
BH22/06A	54.37	A	X	N	100		50	1.89	79.79	0.30	1.23	0.37	Dark grey MUDSTONE

general remarks

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test machine PLM02

test type	test orientation relative to discontinuities		moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular	U - unknown	N - natural moisture content		
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POINT LOAD STRENGTH TEST

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CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample depth (m)	test type	test orien-tation	moisture condition	width W (mm)	length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
BH22/06A	57.50	D	Y	P		70	100	2.76	100.00	0.28	1.37	0.38	Grey SILTSTONE
BH22/06A	57.50	A	X	P	100		70	11.23	94.41	1.26	1.33	1.68	Grey SILTSTONE
BH22/07	20.80	D	Y	N		60	122	0.30	122.00	0.02	1.49	0.03	Grey MUDSTONE
BH22/07	20.80	A	X	N	100		60	0.20	87.40	0.03	1.29	0.03	Grey MUDSTONE
BH22/07	22.13	D	Y	N		60	100	0.82	100.00	0.08	1.37	0.11	Grey SILTSTONE
BH22/07	22.80	D	Y	N		60	100	0.18	100.00	0.02	1.37	0.02	Grey SILTSTONE
BH22/07	22.80	A	X	N	100		50	0.47	79.79	0.07	1.23	0.09	Grey SILTSTONE
BH22/07	25.15	D	Y	N		50	100	4.65	100.00	0.47	1.37	0.64	Grey SANDSTONE
BH22/07	25.15	A	X	N	100		50	4.16	79.79	0.65	1.23	0.81	Grey SANDSTONE
BH22/07	28.26	D	Y	N		50	100	4.48	100.00	0.45	1.37	0.61	Grey SANDSTONE
BH22/07	28.26	A	X	N	100		60	6.06	87.40	0.79	1.29	1.02	Grey SANDSTONE
BH22/07	33.25	D	Y	P		50	100	7.95	100.00	0.80	1.37	1.09	Grey SANDSTONE
BH22/07	33.25	A	X	P	100		60	9.85	87.40	1.29	1.29	1.66	Grey SANDSTONE
BH22/07	36.05	D	Y	P		40	100	0.18	100.00	0.02	1.37	0.02	Dark grey MUDSTONE
BH22/07	36.05	A	X	P	100		50	2.43	79.79	0.38	1.23	0.47	Dark grey MUDSTONE
BH22/07	40.18	D	Y	N		50	100	0.42	100.00	0.04	1.37	0.06	Grey MUDSTONE
BH22/07	40.18	A	X	N	100		60	2.13	87.40	0.28	1.29	0.36	Grey MUDSTONE
BH22/07	42.00	D	Y	N		60	100	1.13	100.00	0.11	1.37	0.15	Grey MUDSTONE
BH22/07	42.00	A	X	N	100		60	2.30	87.40	0.30	1.29	0.39	Grey MUDSTONE

general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength

test machine PLM02

test type	test orientation relative to discontinuities		moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular	U - unknown	N - natural moisture content		
D - diametral	Y - parallel		P - partially air dried	**37349**	**WNJ**
I - irregular lump	Z - oblique		S - soaked		

Geotechnical Engineering Limited

POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample depth (m)	test type	test orien-tation	moisture condition	width W (mm)	length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
BH22/08	19.56	D	Y	N		50	100	0.31	100.00	0.03	1.37	0.04	Grey SILTSTONE
BH22/08	19.56	A	X	N	100		40	0.91	71.36	0.18	1.17	0.21	Grey SILTSTONE
BH22/08	20.17	D	Y	N		50	100	0.88	100.00	0.09	1.37	0.12	Grey SILTSTONE
BH22/08	20.17	A	X	N	100		50	1.20	79.79	0.19	1.23	0.23	Grey SILTSTONE
BH22/08	23.90	D	Y	P		20	100	1.90	100.00	0.19	1.37	0.26	Grey SANDSTONE
BH22/08	23.90	A	X	P	100		20	1.42	50.46	0.56	1.00	0.56	Grey SANDSTONE
BH22/08	28.20	D	Y	P		20	100	0.06	100.00	0.01	1.37	0.01	Dark grey MUDSTONE
BH22/08	28.20	A	X	P	100		30	0.24	61.80	0.06	1.10	0.07	Dark grey MUDSTONE
BH22/08	31.40	D	Y	N		50	100	0.30	100.00	0.03	1.37	0.04	Grey SILTSTONE
BH22/08	31.40	A	X	N	100		50	6.69	79.79	1.05	1.23	1.30	Grey SILTSTONE
BH22/08	35.38	D	Y	N		50	100	6.62	100.00	0.66	1.37	0.90	Grey SILTSTONE
BH22/08	35.38	A	X	N	100		60	7.79	87.40	1.02	1.29	1.31	Grey SILTSTONE
BH22/08	41.20	D	Y	P		30	100	0.35	100.00	0.04	1.37	0.05	Grey MUDSTONE
BH22/08	41.20	A	X	P	100		30	1.68	61.80	0.44	1.10	0.48	Grey MUDSTONE
BH22/08	43.55	I	Y	N	100	40	60	1.17	87.40	0.15	1.29	0.20	Grey SANDSTONE
BH22/08	43.55	I	X	N	100	30	50	6.11	79.79	0.96	1.23	1.18	Grey SANDSTONE
BH22/08	44.20	D	Y	N		80	100	0.76	100.00	0.08	1.37	0.10	Grey MUDSTONE
BH22/08	44.20	A	X	N	100		80	2.95	100.93	0.29	1.37	0.40	Grey MUDSTONE
BH22/08	51.85	D	Y	N		60	100	1.21	100.00	0.12	1.37	0.17	Dark grey MUDSTONE

general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength

test machine PLM02

test type	test orientation relative to discontinuities		moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular	U - unknown	N - natural moisture content		
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I - irregular lump	Z - oblique		S - soaked		

Geotechnical Engineering Limited

POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition

CLIENT CITY FOOTBALL GROUP LIMITED

SITE ETIHAD GROUND INVESTIGATION

borehole /trial pit no.	sample depth (m)	test type	test orien-tation	moisture condition	width W (mm)	length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
BH22/08	51.85	A	X	N	100		60	2.95	87.40	0.39	1.29	0.50	Dark grey MUDSTONE
BH22/08	54.30	I	X	P	90	50	50	2.85	75.69	0.50	1.21	0.60	Grey MUDSTONE
BH22/08	57.30	D	Y	N		50	100	3.82	100.00	0.38	1.37	0.52	Grey SILTSTONE
BH22/08	57.30	A	X	N	100		40	2.20	71.36	0.43	1.17	0.51	Grey SILTSTONE

general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength

test machine PLM02

test type	test orientation relative to discontinuities		moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular	U - unknown	N - natural moisture content		
D - diametral	Y - parallel		P - partially air dried	**37349**	**WNJ**
I - irregular lump	Z - oblique		S - soaked		

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006 In-house Technical Procedure TP35

DETERMINATION OF POINT LOAD STRENGTH ON ROCK

Sample details				Point Load test											
Borehole Ref.	Sample Ref.	Depth (m)	Description	D. Tested	Test type & Direction		Sample width W (mm)	Platen separation (mm)		Water Content (%)	Equiv. Diameter D_e (mm)	Failure Load P (kN)	I_s P/De^2 (MPa)	Correction Factor F	Point Load Index $I_{s(50)}$ (MPa)
								Start D	End D'						
BH22/07	74	25.50-25.89	Weak thinly laminated light grey SILTSTONE. Slightly weathered	14/02/23	A	P	101.6	55.1	52.6		82.5	4.12	0.60	1.25	0.75

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **I** - Irregular lump **P** - Perpendicular to planes of weakness **U** - Random or unknown orientation **L** - Parallel to planes of weakness

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 15/02/2023

Project Number:

GEO / 37362

Project Name:

ETIHAD GROUND INVESTIGATION

37349001

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UKAS TESTING 1982

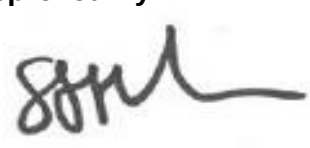
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	23-02762-1
Initial Date of Issue:	02-Feb-2023
Client	Geotechnical Engineering Ltd
Client Address:	Centurion House, Olympus Park Quedgeley Gloucester Gloucestershire GL2 4NF
Contact(s):	GEL Tom Best
Project	37349 001 Etihad Ground Investigation

Quotation No.:		**Date Received:**	30-Jan-2023
Order No.:	6471	**Date Instructed:**	30-Jan-2023
No. of Samples:	5		
Turnaround (Wkdays):	5	**Results Due:**	03-Feb-2023
Date Approved:	02-Feb-2023		

Approved By:



Details: Stuart Henderson, Technical Manager

Results - Soil

Project: 37349 001 Etihad Ground Investigation

Client: Geotechnical Engineering Ltd			**Chemtest Job No.:**		23-02762	23-02762	23-02762	23-02762	23-02762
Quotation No.:			**Chemtest Sample ID.:**		1581020	1581021	1581022	1581023	1581024
Order No.: 6471			Client Sample Ref.:		24	57	76	85	109
			Sample Location:		BH22/05	BH22/05	BH22/05	BH22/05	BH22/05
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		7.30	21.10	33.10	37.60	51.10
			Bottom Depth (m):		7.75	22.60	34.60	39.10	52.60
			Date Sampled:		26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023
			Time Sampled:		12:30	12:30	12:30	12:30	12:30
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
Moisture	N	2030	%	0.020	12	15	11	3.8	3.7
pH (2.5:1)	N	2010		4.0	8.3	8.6	8.4	8.3	9.6
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.20
Total Sulphur	U	2175	%	0.010	0.029	0.051	0.18	0.24	0.073
Sulphate (Acid Soluble)	U	2430	%	0.010	0.011	0.012	0.017	0.040	0.053

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

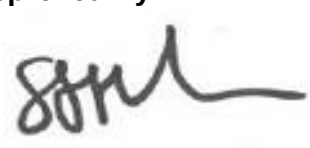
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	23-02800-1
Initial Date of Issue:	03-Feb-2023
Client	Geotechnical Engineering Ltd
Client Address:	Centurion House, Olympus Park Quedgeley Gloucester Gloucestershire GL2 4NF
Contact(s):	GEL Tom Best
Project	37349 001 Etihad Ground Investigation

Quotation No.:		**Date Received:**	30-Jan-2023
Order No.:	6471	**Date Instructed:**	30-Jan-2023
No. of Samples:	10		
Turnaround (Wkdays):	5	**Results Due:**	03-Feb-2023
Date Approved:	03-Feb-2023		

Approved By:



Details: Stuart Henderson, Technical Manager

Results - Soil

Project: 37349 001 Etihad Ground Investigation

Client: Geotechnical Engineering Ltd				**Chemtest Job No.:**	23-02800	23-02800	23-02800	23-02800	23-02800	23-02800	23-02800	23-02800	23-02800
Quotation No.:				**Chemtest Sample ID.:**	1581150	1581151	1581152	1581153	1581154	1581155	1581156	1581157	1581158
Order No.: 6471				Client Sample Ref.:	5	13	17	45	57	64	74	88	97
				Sample Location:	BH22/02	BH22/02	BH22/02	BH22/02	BH22/02	BH22/02	BH22/02	BH22/02	BH22/02
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	0.90	3.00	4.00	13.50	18.00	21.00	27.00	34.50	39.00
				Bottom Depth (m):	1.10		4.45	14.00	19.50	22.50	28.50	36.00	40.50
				Date Sampled:	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023
				Time Sampled:	12:30	12:30	12:30	12:30	12:30	12:30	12:30	12:30	12:30
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
Moisture	N	2030	%	0.020	8.8	15	17	11	12	7.3	8.6	5.5	0.33
pH (2.5:1)	N	2010		4.0	9.0	8.9	8.8	8.9	8.8	8.6	8.3	8.5	8.9
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.021	0.022	< 0.010	0.030	0.096	< 0.010	0.042	< 0.010	< 0.010
Total Sulphur	U	2175	%	0.010	0.092	0.034	0.035	0.073	0.023	0.047	0.20	0.086	0.037
Sulphate (Acid Soluble)	U	2430	%	0.010	0.060	0.062	0.062	0.052	0.022	0.043	0.046	0.015	0.024

Results - Soil

Project: 37349 001 Etihad Ground Investigation

Client: Geotechnical Engineering Ltd			**Chemtest Job No.:**		23-02800
Quotation No.:			**Chemtest Sample ID.:**		1581159
Order No.: 6471			Client Sample Ref.:		112
			Sample Location:		BH22/02
			Sample Type:		SOIL
			Top Depth (m):		48.00
			Bottom Depth (m):		49.50
			Date Sampled:		26-Jan-2023
			Time Sampled:		12:30
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Moisture	N	2030	%	0.020	12
pH (2.5:1)	N	2010		4.0	8.8
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.040
Total Sulphur	U	2175	%	0.010	0.080
Sulphate (Acid Soluble)	U	2430	%	0.010	0.010

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

Report Information

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I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
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All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

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All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

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All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
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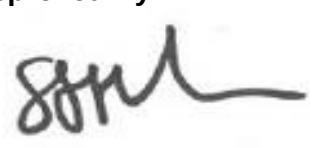
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	23-02799-1
Initial Date of Issue:	03-Feb-2023
Client	Geotechnical Engineering Ltd
Client Address:	Centurion House, Olympus Park Quedgeley Gloucester Gloucestershire GL2 4NF
Contact(s):	GEL Tom Best
Project	37349 001 Etihad Ground Investigation

Quotation No.:		**Date Received:**	30-Jan-2023
Order No.:	6471	**Date Instructed:**	30-Jan-2023
No. of Samples:	5		
Turnaround (Wkdays):	5	**Results Due:**	03-Feb-2023
Date Approved:	03-Feb-2023		

Approved By:



Details: Stuart Henderson, Technical Manager

Results - Soil

Project: 37349 001 Etihad Ground Investigation

Client: Geotechnical Engineering Ltd			**Chemtest Job No.:**		23-02799	23-02799	23-02799	23-02799	23-02799
Quotation No.:			**Chemtest Sample ID.:**		1581145	1581146	1581147	1581148	1581149
Order No.: 6471			Client Sample Ref.:		32	58	63	81	97
			Sample Location:		BH22/04	BH22/04	BH22/04	BH22/04	BH22/04
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		10.20	22.10	24.20	35.40	45.20
			Bottom Depth (m):		11.20	22.20	25.70	35.50	46.70
			Date Sampled:		26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023
			Time Sampled:		12:30	12:30	12:30	12:30	12:30
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
Moisture	N	2030	%	0.020	14	8.9	4.3	12	9.4
pH (2.5:1)	N	2010		4.0	8.9	8.4	9.0	8.2	8.3
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	0.026	< 0.010	< 0.010	< 0.010
Total Sulphur	U	2175	%	0.010	0.093	0.72	0.16	0.13	0.061
Sulphate (Acid Soluble)	U	2430	%	0.010	0.055	0.056	0.025	0.075	0.020

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

Report Information

Key

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I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

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Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
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Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
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customerservices@chemtest.com

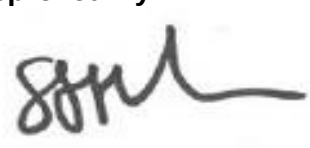
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	23-02796-1
Initial Date of Issue:	03-Feb-2023
Client	Geotechnical Engineering Ltd
Client Address:	Centurion House, Olympus Park Quedgeley Gloucester Gloucestershire GL2 4NF
Contact(s):	GEL Tom Best
Project	37349 001 Etihad Ground Investigation

Quotation No.:		**Date Received:**	30-Jan-2023
Order No.:	6471	**Date Instructed:**	30-Jan-2023
No. of Samples:	7		
Turnaround (Wkdays):	5	**Results Due:**	03-Feb-2023
Date Approved:	03-Feb-2023		

Approved By:



Details: Stuart Henderson, Technical Manager

Results - Soil

Project: 37349 001 Etihad Ground Investigation

Client: Geotechnical Engineering Ltd					**Chemtest Job No.:**	23-02796	23-02796	23-02796	23-02796	23-02796	23-02796
Quotation No.:					**Chemtest Sample ID.:**	1581128	1581129	1581130	1581131	1581132	1581133	1581134
Order No.: 6471					Client Sample Ref.:	11	27	50	54	69	82	101
					Sample Location:	BH22/06A	BH22/06A	BH22/06A	BH22/06A	BH22/06A	BH22/06A	BH22/06A
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	3.50	7.90	16.70	18.20	25.70	33.20	46.00
					Bottom Depth (m):	4.00	8.00	16.89	18.30	27.20	34.70	46.10
					Date Sampled:	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023
					Time Sampled:	12:30	12:30	12:30	12:30	12:30	12:30	12:30
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
Moisture	N	2030	%	0.020		6.6	15	5.2	17	1.6	5.5	12
pH (2.5:1)	N	2010		4.0		10.4	9.2	9.3	5.5	8.8	9.0	8.7
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010		0.98	0.087	0.035	0.29	< 0.010	< 0.010	< 0.010
Total Sulphur	U	2175	%	0.010		0.51	0.059	0.25	3.7	0.96	0.027	0.25
Sulphate (Acid Soluble)	U	2430	%	0.010		1.1	0.058	0.10	0.20	0.11	< 0.010	0.064

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

Report Information

Key

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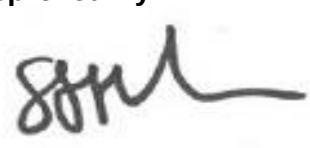
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	23-02794-1
Initial Date of Issue:	02-Feb-2023
Client	Geotechnical Engineering Ltd
Client Address:	Centurion House, Olympus Park Quedgeley Gloucester Gloucestershire GL2 4NF
Contact(s):	GEL Tom Best
Project	37349 001 Etihad Ground Investigation

Quotation No.:		**Date Received:**	30-Jan-2023
Order No.:	6471	**Date Instructed:**	30-Jan-2023
No. of Samples:	9		
Turnaround (Wkdays):	5	**Results Due:**	03-Feb-2023
Date Approved:	02-Feb-2023		

Approved By:



Details: Stuart Henderson, Technical Manager

Results - Soil

Project: 37349 001 Etihad Ground Investigation

Client: Geotechnical Engineering Ltd					**Chemtest Job No.:**	23-02794	23-02794	23-02794	23-02794	23-02794	23-02794	23-02794	23-02794	23-02794
Quotation No.:					**Chemtest Sample ID.:**	1581114	1581115	1581116	1581117	1581118	1581119	1581120	1581121	1581122
Order No.: 6471					Client Sample Ref.:	4	8	22	48	57	69	89	104	111
					Sample Location:	BH22/01	BH22/01	BH22/01	BH22/01	BH22/01	BH22/01	BH22/01	BH22/01	BH22/01
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.35	1.20	5.00	14.50	17.90	22.70	33.10	40.60	45.10
					Bottom Depth (m):	0.55	1.65	5.45	14.90	18.00	22.86	33.20	40.70	45.20
					Date Sampled:	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023
					Time Sampled:	12:30	12:30	12:30	12:30	12:30	12:30	12:30	12:30	12:30
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Moisture	N	2030	%	0.020		16	17	22	9.1	6.7	10	4.3	6.1	12
pH (2.5:1)	N	2010		4.0		10.5	9.5	8.7	8.8	8.5	9.1	9.0	8.8	8.2
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010		0.80	0.083	0.019	< 0.010	0.25	0.010	< 0.010	< 0.010	0.22
Total Sulphur	U	2175	%	0.010		0.15	0.12	0.12	0.079	1.8	0.023	0.75	0.047	6.4
Sulphate (Acid Soluble)	U	2430	%	0.010		0.40	0.097	0.16	0.037	0.18	0.043	0.036	0.025	0.26

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

Report Information

Key

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Sample Deviation Codes

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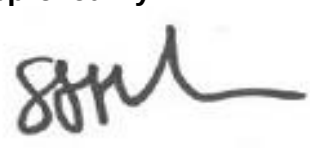
Eurofins Chemtest Ltd
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Tel: 01638 606070
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Final Report

Report No.:	23-02787-1
Initial Date of Issue:	02-Feb-2023
Client	Geotechnical Engineering Ltd
Client Address:	Centurion House, Olympus Park Quedgeley Gloucester Gloucestershire GL2 4NF
Contact(s):	GEL Tom Best
Project	37349 001 Etihad Ground Investigation

Quotation No.:		**Date Received:**	30-Jan-2023
Order No.:	6471	**Date Instructed:**	30-Jan-2023
No. of Samples:	8		
Turnaround (Wkdays):	5	**Results Due:**	03-Feb-2023
Date Approved:	02-Feb-2023		

Approved By:



Details: Stuart Henderson, Technical Manager

Results - Soil

Project: 37349 001 Etihad Ground Investigation

Client: Geotechnical Engineering Ltd					**Chemtest Job No.:**	23-02787	23-02787	23-02787	23-02787	23-02787	23-02787	23-02787
Quotation No.:					**Chemtest Sample ID.:**	1581081	1581082	1581083	1581084	1581085	1581086	1581087	1581088
Order No.: 6471					Client Sample Ref.:	8	28	56	65	76	84	97	106
					Sample Location:	BH22/08	BH22/08	BH22/08	BH22/08	BH22/08	BH22/08	BH22/08	BH22/08
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	2.50	9.00	19.80	25.80	33.30	39.30	48.30	55.80
					Bottom Depth (m):	2.89	9.45	21.30	27.30	34.80	40.80	49.80	57.30
					Date Sampled:	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023
					Time Sampled:	12:30	12:30	12:30	12:30	12:30	12:30	12:30	12:30
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
Moisture	N	2030	%	0.020		16	10	3.8	5.0	5.0	2.4	3.3	2.5
pH (2.5:1)	N	2010		4.0		10.0	9.9	8.5	8.4	8.3	8.4	8.2	8.3
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010		0.050	0.26	0.051	< 0.010	< 0.010	< 0.010	< 0.010	0.013
Total Sulphur	U	2175	%	0.010		0.058	0.059	0.25	0.067	0.071	0.071	0.073	0.090
Sulphate (Acid Soluble)	U	2430	%	0.010		0.066	0.13	0.052	0.014	0.020	0.028	0.023	0.037

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

Report Information

Key

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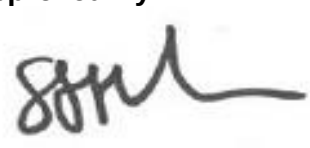
UKAS TESTING
2183

Final Report

Report No.:	23-02779-1
Initial Date of Issue:	03-Feb-2023
Client	Geotechnical Engineering Ltd
Client Address:	Centurion House, Olympus Park Quedgeley Gloucester Gloucestershire GL2 4NF
Contact(s):	GEL Tom Best
Project	37349 001 Etihad Ground Investigation

Quotation No.:		**Date Received:**	30-Jan-2023
Order No.:	6471	**Date Instructed:**	30-Jan-2023
No. of Samples:	9		
Turnaround (Wkdays):	5	**Results Due:**	03-Feb-2023
Date Approved:	03-Feb-2023		

Approved By:



Details: Stuart Henderson, Technical Manager

Results - Soil

Project: 37349 001 Etihad Ground Investigation

Client: Geotechnical Engineering Ltd					**Chemtest Job No.:**	23-02779	23-02779	23-02779	23-02779	23-02779	23-02779	23-02779	23-02779	23-02779
Quotation No.:					**Chemtest Sample ID.:**	1581054	1581055	1581056	1581057	1581058	1581059	1581060	1581061	1581062
Order No.: 6471					Client Sample Ref.:	18	40	53	78	90	105	124	133	139
					Sample Location:	BH22/03	BH22/03	BH22/03	BH22/03	BH22/03	BH22/03	BH22/03	BH22/03	BH22/03
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	5.00	11.90	17.90	29.35	35.30	44.55	55.40	59.90	63.00
					Bottom Depth (m):	5.45	12.00	18.00	29.45	35.40	44.65	55.50	60.00	64.50
					Date Sampled:	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023
					Time Sampled:	12:30	12:30	12:30	12:30	12:30	12:30	12:30	12:30	12:30
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Moisture	N	2030	%	0.020		13	5.5	16	4.0	2.9	6.0	3.8	0.67	22
pH (2.5:1)	N	2010		4.0		8.4	8.4	4.0	7.9	8.0	10.0	8.6	10.4	9.0
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010		0.040	0.029	0.40	< 0.010	0.027	< 0.010	0.046	< 0.010	0.042
Total Sulphur	U	2175	%	0.010		0.092	0.081	7.5	0.26	0.13	0.29	0.32	0.19	0.19
Chloride (Water Soluble)	U	2220	g/l	0.010				< 0.010						
Nitrate (Water Soluble)	N	2220	g/l	0.010				< 0.010						
Sulphate (Acid Soluble)	U	2430	%	0.010		0.046	0.072	0.37	0.015	0.028	0.015	0.042	0.046	0.089

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measuremernt by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

Report Information

Key

U	UKAS accredited
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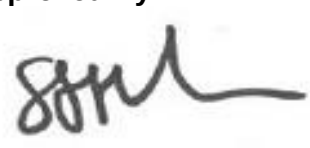
UKAS TESTING
2183

Final Report

Report No.:	23-02766-1
Initial Date of Issue:	02-Feb-2023
Client	Geotechnical Engineering Ltd
Client Address:	Centurion House, Olympus Park Quedgeley Gloucester Gloucestershire GL2 4NF
Contact(s):	GEL Tom Best
Project	37349 001 Etihad Ground Investigation

Quotation No.:		**Date Received:**	30-Jan-2023
Order No.:	6471	**Date Instructed:**	30-Jan-2023
No. of Samples:	9		
Turnaround (Wkdays):	5	**Results Due:**	03-Feb-2023
Date Approved:	02-Feb-2023		

Approved By:



Details: Stuart Henderson, Technical Manager

Results - Soil

Project: 37349 001 Etihad Ground Investigation

Client: Geotechnical Engineering Ltd					**Chemtest Job No.:**	23-02766	23-02766	23-02766	23-02766	23-02766	23-02766	23-02766	23-02766	23-02766
Quotation No.:					**Chemtest Sample ID.:**	1581028	1581029	1581030	1581031	1581032	1581033	1581034	1581035	1581036
Order No.: 6471					Client Sample Ref.:	12	21	26	47	58	66	75	85	98
					Sample Location:	BH22/07	BH22/07	BH22/07	BH22/07	BH22/07	BH22/07	BH22/07	BH22/07	BH22/07
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	2.30	4.00	5.1	12.00	18.00	22.40	27.00	34.50	43.50
					Bottom Depth (m):	2.50	4.45	5.55	13.50	19.50	22.50	28.50	36.00	45.00
					Date Sampled:	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023	26-Jan-2023
					Time Sampled:	12:30	12:30	12:30	12:30	12:30	12:30	12:30	12:30	12:30
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Moisture	N	2030	%	0.020		6.0	20	16	10	5.4	3.4	5.3	16	2.7
pH (2.5:1)	N	2010		4.0		9.9	8.6	8.4	8.4	8.3	8.4	8.8	8.6	8.8
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010		0.13	< 0.010	< 0.010	0.085	< 0.010	< 0.010	< 0.010	< 0.010	0.024
Total Sulphur	U	2175	%	0.010		0.098	0.091	0.052	0.060	0.24	0.19	0.034	0.029	0.043
Sulphate (Acid Soluble)	U	2430	%	0.010		0.21	0.026	0.034	0.037	0.10	0.034	0.027	0.021	0.025

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

APPENDIX D

CHEMICAL ANALYSES

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Analytical Report Number : 22-97792

Project / Site name:	Etihad Ground Investigation - 001	**Samples received on:**	16/11/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	18/11/2022
Your order number:	37349 RH	**Analysis completed by:**	29/11/2022
Report Issue Number:	1	**Report issued on:**	29/11/2022
Samples Analysed:	7 soil samples		

Signed:

Elżbieta Suchy
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-97792
Project / Site name: Etihad Ground Investigation - 001
Your Order No: 37349 RH

Lab Sample Number				2505998	2505999	2506000	2506001	2506002	2506003
Sample Reference				BH22/01	BH22/01	CPT22/01	CPT22/01	CPT22/03	CPT22/04
Sample Number				2	3	1	3	2	1
Depth (m)				0.50	1.00	0.25	1.00	0.35	0.25
Date Sampled				15/11/2022	15/11/2022	15/11/2022	15/11/2022	15/11/2022	15/11/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**						
Stone Content	%	0.1	NONE	70	19	70	< 0.1	< 0.1	89
Moisture Content	%	0.01	NONE	3.8	17	1.7	12	13	1.3
Total mass of sample received	kg	0.001	NONE	0.8	0.8	0.8	0.8	0.8	0.8
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Chrysotile	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	0.002	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	0.002	-	-	-	-
Asbestos Analyst ID	N/A	N/A	N/A	KSZ	KSZ	KSZ	KSZ	KSZ	KSZ
General Inorganics									
pH - Automated	pH Units	N/A	MCERTS	11.2	9.1	9.3	9.6	8.8	9.6
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.22	0.23	0.013	0.29	0.11	0.021
Organic Matter (automated)	%	0.1	MCERTS	0.9	5.2	0.2	5	1.1	0.1
Total Phenols									
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs									
Naphthalene	mg/kg	0.05	NONE	< 0.05	2.8	< 0.05	9.8	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	NONE	< 0.05	0.22	< 0.05	1.5	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	NONE	0.45	2.8	< 0.05	6.6	< 0.05	< 0.05
Fluorene	mg/kg	0.05	NONE	0.27	2.5	< 0.05	7.8	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	NONE	2.5	17	< 0.05	37	< 0.05	< 0.05
Anthracene	mg/kg	0.05	NONE	0.71	4.5	< 0.05	12	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	NONE	3.7	21	0.1	35	0.14	0.17
Pyrene	mg/kg	0.05	NONE	3.6	20	0.13	37	0.19	0.25
Benzo(a)anthracene	mg/kg	0.05	NONE	1.2	11	< 0.05	18	< 0.05	< 0.05
Chrysene	mg/kg	0.05	NONE	1.6	8.9	< 0.05	15	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	NONE	1.4	9.9	< 0.05	15	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	NONE	1	4	< 0.05	7.3	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	NONE	1.5	9.3	< 0.05	15	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	0.77	4.6	< 0.05	6.7	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	0.17	1.2	< 0.05	1.7	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	NONE	0.91	4.9	< 0.05	7.7	< 0.05	< 0.05
Total PAH									
Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	19.8	125	< 0.80	233	< 0.80	< 0.80

Analytical Report Number: 22-97792
Project / Site name: Etihad Ground Investigation - 001
Your Order No: 37349 RH

Lab Sample Number				2505998	2505999	2506000	2506001	2506002	2506003
Sample Reference				BH22/01	BH22/01	CPT22/01	CPT22/01	CPT22/03	CPT22/04
Sample Number				2	3	1	3	2	1
Depth (m)				0.50	1.00	0.25	1.00	0.35	0.25
Date Sampled				15/11/2022	15/11/2022	15/11/2022	15/11/2022	15/11/2022	15/11/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**						
Heavy Metals / Metalloids									
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	5	23	1.3	27	5.2	< 1.0
Boron (water soluble)	mg/kg	0.2	MCERTS	1.8	2.8	0.4	2.6	0.7	< 0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.4	0.9	0.5	1.7	< 0.2	0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	-	-	-	< 1.8	< 1.8	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	24	36	5.9	32	24	4
Copper (aqua regia extractable)	mg/kg	1	MCERTS	20	180	4.8	140	21	4.7
Lead (aqua regia extractable)	mg/kg	1	MCERTS	52	120	3.9	110	11	4.5
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	11	41	1.5	37	29	1.3
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	65	290	17	310	53	11
Monoaromatics & Oxygenates									
Benzene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Toluene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Ethylbenzene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
p & m-xylene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
o-xylene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Petroleum Hydrocarbons									
TPH C10 - C40 $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	NONE	300	380	42	1000	17	< 10
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	< 0.001	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	< 0.001	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	< 0.001	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	NONE	-	1.8	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	NONE	-	8.2	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	NONE	-	21	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	NONE	-	97	-	-	-	-
TPH-CWG - Aliphatic >EC35 - EC40 $_{EH\_CU\_1D\_AL}$	mg/kg	10	NONE	-	27	-	-	-	-
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	< 0.001	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	< 0.001	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	< 0.001	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	NONE	-	1.3	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	NONE	-	15	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	-	78	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	-	110	-	-	-	-
TPH-CWG - Aromatic >EC35 - EC40 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	-	29	-	-	-	-
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	NONE	-	380	-	-	-	-

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Analytical Report Number: 22-97792
Project / Site name: Etihad Ground Investigation - 001
Your Order No: 37349 RH

Lab Sample Number				2505998	2505999	2506000	2506001	2506002	2506003
Sample Reference				BH22/01	BH22/01	CPT22/01	CPT22/01	CPT22/03	CPT22/04
Sample Number				2	3	1	3	2	1
Depth (m)				0.50	1.00	0.25	1.00	0.35	0.25
Date Sampled				15/11/2022	15/11/2022	15/11/2022	15/11/2022	15/11/2022	15/11/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status						
VOCs									
Chloromethane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Chloroethane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Bromomethane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	-	< 1.0	-	-	-	-
1,1-Dichloroethane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
2,2-Dichloropropane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Trichloromethane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
1,1,1-Trichloroethane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
1,2-Dichloroethane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
1,1-Dichloropropene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Benzene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Tetrachloromethane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
1,2-Dichloropropane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Trichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Dibromomethane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Bromodichloromethane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Toluene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
1,1,2-Trichloroethane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
1,3-Dichloropropane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Dibromochloromethane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
1,2-Dibromoethane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Chlorobenzene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Ethylbenzene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
p & m-Xylene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Styrene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Tribromomethane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
o-Xylene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Isopropylbenzene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Bromobenzene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
n-Propylbenzene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
2-Chlorotoluene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
4-Chlorotoluene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
tert-Butylbenzene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
sec-Butylbenzene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
1,3-Dichlorobenzene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
p-Isopropyltoluene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
1,2-Dichlorobenzene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
1,4-Dichlorobenzene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Butylbenzene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	NONE	-	< 1.0	-	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
Hexachlorobutadiene	µg/kg	1	NONE	-	< 1.0	-	-	-	-

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Analytical Report Number: 22-97792
Project / Site name: Etihad Ground Investigation - 001
Your Order No: 37349 RH

Lab Sample Number				2505998	2505999	2506000	2506001	2506002	2506003
Sample Reference				BH22/01	BH22/01	CPT22/01	CPT22/01	CPT22/03	CPT22/04
Sample Number				2	3	1	3	2	1
Depth (m)				0.50	1.00	0.25	1.00	0.35	0.25
Date Sampled				15/11/2022	15/11/2022	15/11/2022	15/11/2022	15/11/2022	15/11/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status						
1,2,3-Trichlorobenzene	µg/kg	1	NONE	-	< 1.0	-	-	-	-
SVOCs									
Aniline	mg/kg	0.1	NONE	-	0.6	-	-	-	-
Phenol	mg/kg	0.2	NONE	-	< 0.2	-	-	-	-
2-Chlorophenol	mg/kg	0.1	NONE	-	< 0.1	-	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	NONE	-	< 0.2	-	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	NONE	-	< 0.2	-	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	NONE	-	< 0.1	-	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	NONE	-	< 0.2	-	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	NONE	-	< 0.1	-	-	-	-
2-Methylphenol	mg/kg	0.3	NONE	-	< 0.3	-	-	-	-
Hexachloroethane	mg/kg	0.05	NONE	-	< 0.05	-	-	-	-
Nitrobenzene	mg/kg	0.3	NONE	-	< 0.3	-	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	< 0.2	-	-	-	-
Isophorone	mg/kg	0.2	NONE	-	< 0.2	-	-	-	-
2-Nitrophenol	mg/kg	0.3	NONE	-	< 0.3	-	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	NONE	-	< 0.3	-	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	NONE	-	< 0.3	-	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	NONE	-	< 0.3	-	-	-	-
Naphthalene	mg/kg	0.05	NONE	-	2.8	-	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	NONE	-	< 0.3	-	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	< 0.1	-	-	-	-
Hexachlorobutadiene	mg/kg	0.1	NONE	-	< 0.1	-	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	< 0.1	-	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	NONE	-	< 0.1	-	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	NONE	-	< 0.2	-	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	2.1	-	-	-	-
2-Chloronaphthalene	mg/kg	0.1	NONE	-	< 0.1	-	-	-	-
Dimethylphthalate	mg/kg	0.1	NONE	-	< 0.1	-	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	NONE	-	< 0.1	-	-	-	-
Acenaphthylene	mg/kg	0.05	NONE	-	0.22	-	-	-	-
Acenaphthene	mg/kg	0.05	NONE	-	2.8	-	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	NONE	-	< 0.2	-	-	-	-
Dibenzofuran	mg/kg	0.2	NONE	-	1.6	-	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	NONE	-	< 0.3	-	-	-	-
Diethyl phthalate	mg/kg	0.2	NONE	-	< 0.2	-	-	-	-
4-Nitroaniline	mg/kg	0.2	NONE	-	< 0.2	-	-	-	-
Fluorene	mg/kg	0.05	NONE	-	2.5	-	-	-	-
Azobenzene	mg/kg	0.3	NONE	-	< 0.3	-	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	NONE	-	< 0.2	-	-	-	-
Hexachlorobenzene	mg/kg	0.3	NONE	-	< 0.3	-	-	-	-
Phenanthrene	mg/kg	0.05	NONE	-	17	-	-	-	-
Anthracene	mg/kg	0.05	NONE	-	4.5	-	-	-	-
Carbazole	mg/kg	0.3	NONE	-	1.1	-	-	-	-
Dibutyl phthalate	mg/kg	0.2	NONE	-	< 0.2	-	-	-	-
Anthraquinone	mg/kg	0.3	NONE	-	0.6	-	-	-	-
Fluoranthene	mg/kg	0.05	NONE	-	21	-	-	-	-
Pyrene	mg/kg	0.05	NONE	-	20	-	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	NONE	-	< 0.3	-	-	-	-
Benzo(a)anthracene	mg/kg	0.05	NONE	-	11	-	-	-	-
Chrysene	mg/kg	0.05	NONE	-	8.9	-	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	NONE	-	9.9	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	NONE	-	4	-	-	-	-
Benzo(a)pyrene	mg/kg	0.05	NONE	-	9.3	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	-	4.6	-	-	-	-

Analytical Report Number: 22-97792
Project / Site name: Etihad Ground Investigation - 001
Your Order No: 37349 RH

Lab Sample Number				2505998	2505999	2506000	2506001	2506002	2506003
Sample Reference				BH22/01	BH22/01	CPT22/01	CPT22/01	CPT22/03	CPT22/04
Sample Number				2	3	1	3	2	1
Depth (m)				0.50	1.00	0.25	1.00	0.35	0.25
Date Sampled				15/11/2022	15/11/2022	15/11/2022	15/11/2022	15/11/2022	15/11/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status						
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	-	1.2	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	NONE	-	4.9	-	-	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 22-97792
Project / Site name: Etihad Ground Investigation - 001
Your Order No: 37349 RH

Lab Sample Number				2506004
Sample Reference				CPT22/04
Sample Number				3
Depth (m)				1.00
Date Sampled				15/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	55
Moisture Content	%	0.01	NONE	15
Total mass of sample received	kg	0.001	NONE	0.8

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-
Asbestos Quantification Total	%	0.001	ISO 17025	-
Asbestos Analyst ID	N/A	N/A	N/A	KSZ

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	10.7
Total Cyanide	mg/kg	1	MCERTS	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.24
Organic Matter (automated)	%	0.1	MCERTS	1.4

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	NONE	< 0.05
Acenaphthylene	mg/kg	0.05	NONE	< 0.05
Acenaphthene	mg/kg	0.05	NONE	0.84
Fluorene	mg/kg	0.05	NONE	0.63
Phenanthrene	mg/kg	0.05	NONE	5.4
Anthracene	mg/kg	0.05	NONE	1.5
Fluoranthene	mg/kg	0.05	NONE	7.9
Pyrene	mg/kg	0.05	NONE	7.4
Benzo(a)anthracene	mg/kg	0.05	NONE	3
Chrysene	mg/kg	0.05	NONE	3.5
Benzo(b)fluoranthene	mg/kg	0.05	NONE	3.5
Benzo(k)fluoranthene	mg/kg	0.05	NONE	1.3
Benzo(a)pyrene	mg/kg	0.05	NONE	3
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	1.6
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	0.26
Benzo(ghi)perylene	mg/kg	0.05	NONE	1.7

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	41.5

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Lab Sample Number				2506004
Sample Reference				CPT22/04
Sample Number				3
Depth (m)				1.00
Date Sampled				15/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Heavy Metals / Metalloids				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	7.2
Boron (water soluble)	mg/kg	0.2	MCERTS	1.6
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.4
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	15
Copper (aqua regia extractable)	mg/kg	1	MCERTS	42
Lead (aqua regia extractable)	mg/kg	1	MCERTS	91
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	16
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	110
Monoaromatics & Oxygenates				
Benzene	µg/kg	1	NONE	< 1.0
Toluene	µg/kg	1	NONE	< 1.0
Ethylbenzene	µg/kg	1	NONE	< 1.0
p & m-xylene	µg/kg	1	NONE	< 1.0
o-xylene	µg/kg	1	NONE	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	< 1.0
Petroleum Hydrocarbons				
TPH C10 - C40 $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	NONE	470
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	NONE	1.3
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	NONE	6.8
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	NONE	17
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	NONE	92
TPH-CWG - Aliphatic >EC35 - EC40 $_{EH\_CU\_1D\_AL}$	mg/kg	10	NONE	27
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	NONE	1.1
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	NONE	8.7
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	49
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	190
TPH-CWG - Aromatic >EC35 - EC40 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	82
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	NONE	470

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Project / Site name: Etihad Ground Investigation - 001
Your Order No: 37349 RH

Lab Sample Number				2506004
Sample Reference				CPT22/04
Sample Number				3
Depth (m)				1.00
Date Sampled				15/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
VOCs				
Chloromethane	µg/kg	1	NONE	-
Chloroethane	µg/kg	1	NONE	-
Bromomethane	µg/kg	1	NONE	-
Vinyl Chloride	µg/kg	1	NONE	-
Trichlorofluoromethane	µg/kg	1	NONE	-
1,1-Dichloroethene	µg/kg	1	NONE	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	NONE	-
Cis-1,2-dichloroethene	µg/kg	1	NONE	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	-
1,1-Dichloroethane	µg/kg	1	NONE	-
2,2-Dichloropropane	µg/kg	1	NONE	-
Trichloromethane	µg/kg	1	NONE	-
1,1,1-Trichloroethane	µg/kg	1	NONE	-
1,2-Dichloroethane	µg/kg	1	NONE	-
1,1-Dichloropropene	µg/kg	1	NONE	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-
Benzene	µg/kg	1	NONE	-
Tetrachloromethane	µg/kg	1	NONE	-
1,2-Dichloropropane	µg/kg	1	NONE	-
Trichloroethene	µg/kg	1	NONE	-
Dibromomethane	µg/kg	1	NONE	-
Bromodichloromethane	µg/kg	1	NONE	-
Cis-1,3-dichloropropene	µg/kg	1	NONE	-
Trans-1,3-dichloropropene	µg/kg	1	NONE	-
Toluene	µg/kg	1	NONE	-
1,1,2-Trichloroethane	µg/kg	1	NONE	-
1,3-Dichloropropane	µg/kg	1	NONE	-
Dibromochloromethane	µg/kg	1	NONE	-
Tetrachloroethene	µg/kg	1	NONE	-
1,2-Dibromoethane	µg/kg	1	NONE	-
Chlorobenzene	µg/kg	1	NONE	-
1,1,1,2-Tetrachloroethane	µg/kg	1	NONE	-
Ethylbenzene	µg/kg	1	NONE	-
p & m-Xylene	µg/kg	1	NONE	-
Styrene	µg/kg	1	NONE	-
Tribromomethane	µg/kg	1	NONE	-
o-Xylene	µg/kg	1	NONE	-
1,1,2,2-Tetrachloroethane	µg/kg	1	NONE	-
Isopropylbenzene	µg/kg	1	NONE	-
Bromobenzene	µg/kg	1	NONE	-
n-Propylbenzene	µg/kg	1	NONE	-
2-Chlorotoluene	µg/kg	1	NONE	-
4-Chlorotoluene	µg/kg	1	NONE	-
1,3,5-Trimethylbenzene	µg/kg	1	NONE	-
tert-Butylbenzene	µg/kg	1	NONE	-
1,2,4-Trimethylbenzene	µg/kg	1	NONE	-
sec-Butylbenzene	µg/kg	1	NONE	-
1,3-Dichlorobenzene	µg/kg	1	NONE	-
p-Isopropyltoluene	µg/kg	1	NONE	-
1,2-Dichlorobenzene	µg/kg	1	NONE	-
1,4-Dichlorobenzene	µg/kg	1	NONE	-
Butylbenzene	µg/kg	1	NONE	-
1,2-Dibromo-3-chloropropane	µg/kg	1	NONE	-
1,2,4-Trichlorobenzene	µg/kg	1	NONE	-
Hexachlorobutadiene	µg/kg	1	NONE	-

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Lab Sample Number				2506004
Sample Reference				CPT22/04
Sample Number				3
Depth (m)				1.00
Date Sampled				15/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
1,2,3-Trichlorobenzene	µg/kg	1	NONE	-
SVOCs				
Aniline	mg/kg	0.1	NONE	-
Phenol	mg/kg	0.2	NONE	-
2-Chlorophenol	mg/kg	0.1	NONE	-
Bis(2-chloroethyl)ether	mg/kg	0.2	NONE	-
1,3-Dichlorobenzene	mg/kg	0.2	NONE	-
1,2-Dichlorobenzene	mg/kg	0.1	NONE	-
1,4-Dichlorobenzene	mg/kg	0.2	NONE	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	NONE	-
2-Methylphenol	mg/kg	0.3	NONE	-
Hexachloroethane	mg/kg	0.05	NONE	-
Nitrobenzene	mg/kg	0.3	NONE	-
4-Methylphenol	mg/kg	0.2	NONE	-
Isophorone	mg/kg	0.2	NONE	-
2-Nitrophenol	mg/kg	0.3	NONE	-
2,4-Dimethylphenol	mg/kg	0.3	NONE	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	NONE	-
1,2,4-Trichlorobenzene	mg/kg	0.3	NONE	-
Naphthalene	mg/kg	0.05	NONE	-
2,4-Dichlorophenol	mg/kg	0.3	NONE	-
4-Chloroaniline	mg/kg	0.1	NONE	-
Hexachlorobutadiene	mg/kg	0.1	NONE	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-
2,4,6-Trichlorophenol	mg/kg	0.1	NONE	-
2,4,5-Trichlorophenol	mg/kg	0.2	NONE	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-
2-Chloronaphthalene	mg/kg	0.1	NONE	-
Dimethylphthalate	mg/kg	0.1	NONE	-
2,6-Dinitrotoluene	mg/kg	0.1	NONE	-
Acenaphthylene	mg/kg	0.05	NONE	-
Acenaphthene	mg/kg	0.05	NONE	-
2,4-Dinitrotoluene	mg/kg	0.2	NONE	-
Dibenzofuran	mg/kg	0.2	NONE	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	NONE	-
Diethyl phthalate	mg/kg	0.2	NONE	-
4-Nitroaniline	mg/kg	0.2	NONE	-
Fluorene	mg/kg	0.05	NONE	-
Azobenzene	mg/kg	0.3	NONE	-
Bromophenyl phenyl ether	mg/kg	0.2	NONE	-
Hexachlorobenzene	mg/kg	0.3	NONE	-
Phenanthrene	mg/kg	0.05	NONE	-
Anthracene	mg/kg	0.05	NONE	-
Carbazole	mg/kg	0.3	NONE	-
Dibutyl phthalate	mg/kg	0.2	NONE	-
Anthraquinone	mg/kg	0.3	NONE	-
Fluoranthene	mg/kg	0.05	NONE	-
Pyrene	mg/kg	0.05	NONE	-
Butyl benzyl phthalate	mg/kg	0.3	NONE	-
Benzo(a)anthracene	mg/kg	0.05	NONE	-
Chrysene	mg/kg	0.05	NONE	-
Benzo(b)fluoranthene	mg/kg	0.05	NONE	-
Benzo(k)fluoranthene	mg/kg	0.05	NONE	-
Benzo(a)pyrene	mg/kg	0.05	NONE	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	-

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Lab Sample Number				2506004
Sample Reference				CPT22/04
Sample Number				3
Depth (m)				1.00
Date Sampled				15/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	-
Benzo(ghi)perylene	mg/kg	0.05	NONE	-

U/S = Unsuitable Sample I/S = Insufficient Sample

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: **22-97792**
Project / Site name: **Etihad Ground Investigation - 001**
Your Order No: **37349 RH**

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006-PL based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
2505999	BH22/01	1.00	162	Loose Fibres	**Chrysotile**	0.002	**0.002**

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

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* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2505998	BH22/01	2	0.5	Brown clay and sand with stones.
2505999	BH22/01	3	1	Brown clay and sand with stones.
2506000	CPT22/01	1	0.25	Brown clay and sand with stones.
2506001	CPT22/01	3	1	Brown clay and sand with gravel.
2506002	CPT22/03	2	0.35	Brown clay and sand with gravel.
2506003	CPT22/04	1	0.25	Brown clay and sand with stones.
2506004	CPT22/04	3	1	Brown clay and sand with stones.

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Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	NONE
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	NONE
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	NONE
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE

Analytical Report Number : 22-97792
Project / Site name: Etihad Ground Investigation - 001

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Sulphate, water soluble, in soil (1hr extraction)	Sulphate, water soluble, in soil (1hr extraction)	In-house method	L038-PL	D	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-97793

Project / Site name:	Etihad Ground Investigation - 001	**Samples received on:**	16/11/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	18/11/2022
Your order number:	37349 RH	**Analysis completed by:**	29/11/2022
Report Issue Number:	1	**Report issued on:**	29/11/2022
Samples Analysed:	10:1 WAC sample		

Signed:

Joanna Wawrzeczko
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing

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Waste Acceptance Criteria Analytical Results

Report No:	**22-97793**							
					Client:	**GEOENG**		
Location	**Etihad Ground Investigation - 001**							
Lab Reference (Sample Number)	2506005 / 2506006				**Landfill Waste Acceptance Criteria Limits**			
Sampling Date	15/11/2022				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID	BH22/01 3							
Depth (m)	1.00							
Solid Waste Analysis								
TOC (%)**	3.0				3%	5%	6%	
Loss on Ignition (%) **	12.1				--	--	10%	
BTEX (µg/kg)	< 10				6000	--	--	
Sum of PCBs (mg/kg)	< 0.007				1	--	--	
Mineral Oil (mg/kg) EH_1D_CU_AL	150				500	--	--	
Total PAH (WAC-17) (mg/kg)	122				100	--	--	
pH (units)**	8.7				--	>6	--	
Acid Neutralisation Capacity (mmol / kg)	18				--	To be evaluated	To be evaluated	
Eluate Analysis (BS EN 12457 - 2 preparation utilising end over end leaching procedure)	10:1			10:1	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg (mg/kg)			
	mg/l			mg/kg				
Arsenic *	0.0061			0.0494	0.5	2	25	
Barium *	0.0180			0.146	20	100	300	
Cadmium *	< 0.0001			< 0.0008	0.04	1	5	
Chromium *	0.0017			0.014	0.5	10	70	
Copper *	0.030			0.25	2	50	100	
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2	
Molybdenum *	0.0207			0.168	0.5	10	30	
Nickel *	0.0020			0.017	0.4	10	40	
Lead *	0.0033			0.027	0.5	10	50	
Antimony *	< 0.0017			< 0.017	0.06	0.7	5	
Selenium *	0.011			0.088	0.1	0.5	7	
Zinc *	0.014			0.11	4	50	200	
Chloride *	9.7			79	800	15000	25000	
Fluoride*	0.61			4.9	10	150	500	
Sulphate *	20			160	1000	20000	50000	
TDS*	87			710	4000	60000	100000	
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-	
DOC	13.5			110	500	800	1000	
Leach Test Information								
Stone Content (%)	19							
Sample Mass (kg)	0.80							
Dry Matter (%)	83							
Moisture (%)	17							

Results are expressed on a dry weight basis, after correction for moisture content where applicable. *= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepencies with current legislation ** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Analytical Report Number : 22-97793
Project / Site name: Etihad Ground Investigation - 001

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2506005	BH22/01	3	1	Brown clay and sand with stones.

Analytical Report Number : 22-97793
Project / Site name: Etihad Ground Investigation - 001

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270.	L064-PL	D	NONE
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	NONE
pH at 20oC in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	NONE
Total BTEX in soil (Poland)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073-PL	W	NONE
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by EC probe using a factor of 0.6.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L031	W	ISO 17025

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Analytical Report Number : 22-97793
Project / Site name: Etihad Ground Investigation - 001

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-97794

Project / Site name:	Etihad Ground Invastigation 002	**Samples received on:**	17/11/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	21/11/2022
Your order number:	37349 RH	**Analysis completed by:**	30/11/2022
Report Issue Number:	1	**Report issued on:**	30/11/2022
Samples Analysed:	5 soil samples		

Signed:

Anna Goc
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Analytical Report Number: 22-97794
Project / Site name: Etihad Ground Invastigation 002
Your Order No: 37349 RH

Lab Sample Number				2506008	2506009	2506010	2506011	2506012
Sample Reference				CPT22/02	CPT22/05	CPT22/06	CPT22/07	BH22/05
Sample Number				2	1	2	2	2
Depth (m)				0.45-0.60	0.15-0.35	0.50-0.70	0.30-0.50	0.50
Date Sampled				16/11/2022	16/11/2022	16/11/2022	16/11/2022	16/11/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	15
Moisture Content	%	0.01	NONE	12	3.4	9.8	7.2	6.5
Total mass of sample received	kg	0.001	NONE	1.2	1.2	1.2	1.2	1.2
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	KSZ	KSZ	KSZ	KSZ	KSZ
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	11.2	9.5	10.8	11.1	9.8
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.3	0.044	0.43	0.25	0.25
Organic Matter (automated)	%	0.1	MCERTS	1.3	0.3	2.3	2.6	2.3
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	NONE	0.25	0.1	4.1	3	0.19
Acenaphthylene	mg/kg	0.05	NONE	0.08	< 0.05	0.13	0.15	< 0.05
Acenaphthene	mg/kg	0.05	NONE	0.29	0.13	3.9	2.8	0.27
Fluorene	mg/kg	0.05	NONE	0.3	0.14	2.9	2.3	0.24
Phenanthrene	mg/kg	0.05	NONE	3.1	0.62	16	15	2.1
Anthracene	mg/kg	0.05	NONE	0.82	0.15	4.3	4	0.63
Fluoranthene	mg/kg	0.05	NONE	5.7	0.53	17	16	3.8
Pyrene	mg/kg	0.05	NONE	5.5	0.51	15	15	4.1
Benzo(a)anthracene	mg/kg	0.05	NONE	2.4	0.23	6.9	6.4	2
Chrysene	mg/kg	0.05	NONE	2.1	0.2	6.5	6.1	1.9
Benzo(b)fluoranthene	mg/kg	0.05	NONE	2	0.19	7.8	5.7	1.9
Benzo(k)fluoranthene	mg/kg	0.05	NONE	1.1	0.11	2.2	3.7	1.2
Benzo(a)pyrene	mg/kg	0.05	NONE	1.8	0.23	6.2	5.7	1.8
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	0.96	0.1	2.8	2.5	0.92
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	0.23	< 0.05	0.62	0.58	0.22
Benzo(ghi)perylene	mg/kg	0.05	NONE	1.1	0.11	2.9	2.8	0.93
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	27.6	3.35	98.8	92.1	22.1
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	7.9	1.7	15	11	8.6
Boron (water soluble)	mg/kg	0.2	MCERTS	2.6	0.3	1.8	2.3	1.5
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.5	0.6	1.9	0.8	1.5
Chromium (hexavalent)	mg/kg	1.8	MCERTS	-	< 1.8	-	-	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	26	6.6	49	39	19
Copper (aqua regia extractable)	mg/kg	1	MCERTS	85	6.8	180	80	69
Lead (aqua regia extractable)	mg/kg	1	MCERTS	93	6.6	150	130	100
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	14	2.8	22	19	13
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	110	26	340	190	250

Analytical Report Number: 22-97794
Project / Site name: Etihad Ground Invastigation 002
Your Order No: 37349 RH

Lab Sample Number				2506008	2506009	2506010	2506011	2506012
Sample Reference				CPT22/02	CPT22/05	CPT22/06	CPT22/07	BH22/05
Sample Number				2	1	2	2	2
Depth (m)				0.45-0.60	0.15-0.35	0.50-0.70	0.30-0.50	0.50
Date Sampled				16/11/2022	16/11/2022	16/11/2022	16/11/2022	16/11/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	NONE	< 1.0	-	-	-	-
Toluene	µg/kg	1	NONE	< 1.0	-	-	-	-
Ethylbenzene	µg/kg	1	NONE	< 1.0	-	-	-	-
p & m-xylene	µg/kg	1	NONE	< 1.0	-	-	-	-
o-xylene	µg/kg	1	NONE	< 1.0	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	< 1.0	-	-	-	-
Petroleum Hydrocarbons								
TPH C10 - C40 EH_CU_1D_TOTAL	mg/kg	10	NONE	440	120	500	370	410
TPH-CWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.001	NONE	< 0.001	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.001	NONE	< 0.001	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.001	NONE	< 0.001	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	NONE	< 1.0	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	NONE	14	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	NONE	50	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	NONE	130	-	-	-	-
TPH-CWG - Aliphatic >EC35 - EC40 EH_CU_1D_AL	mg/kg	10	NONE	40	-	-	-	-
TPH-CWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.001	NONE	< 0.001	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.001	NONE	< 0.001	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.001	NONE	< 0.001	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	NONE	< 1.0	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	NONE	5.8	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	NONE	29	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	NONE	95	-	-	-	-
TPH-CWG - Aromatic >EC35 - EC40 EH_CU_1D_AR	mg/kg	10	NONE	78	-	-	-	-
TPH Total C5 - C40 EH_CU+HS_1D_TOTAL	mg/kg	10	NONE	440	-	-	-	-
VOCs								
Chloromethane	µg/kg	1	NONE	< 1.0	-	-	-	-
Chloroethane	µg/kg	1	NONE	< 1.0	-	-	-	-
Bromomethane	µg/kg	1	NONE	< 1.0	-	-	-	-
Vinyl Chloride	µg/kg	1	NONE	< 1.0	-	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	-	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	-	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	NONE	< 1.0	-	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	< 1.0	-	-	-	-
1,1-Dichloroethane	µg/kg	1	NONE	< 1.0	-	-	-	-
2,2-Dichloropropane	µg/kg	1	NONE	< 1.0	-	-	-	-
Trichloromethane	µg/kg	1	NONE	< 1.0	-	-	-	-
1,1,1-Trichloroethane	µg/kg	1	NONE	< 1.0	-	-	-	-
1,2-Dichloroethane	µg/kg	1	NONE	< 1.0	-	-	-	-
1,1-Dichloropropene	µg/kg	1	NONE	< 1.0	-	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	-	-	-	-
Benzene	µg/kg	1	NONE	< 1.0	-	-	-	-
Tetrachloromethane	µg/kg	1	NONE	< 1.0	-	-	-	-
1,2-Dichloropropane	µg/kg	1	NONE	< 1.0	-	-	-	-
Trichloroethene	µg/kg	1	NONE	< 1.0	-	-	-	-
Dibromomethane	µg/kg	1	NONE	< 1.0	-	-	-	-
Bromodichloromethane	µg/kg	1	NONE	< 1.0	-	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	NONE	< 1.0	-	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	NONE	< 1.0	-	-	-	-

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The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-97794
Project / Site name: Etihad Ground Invastigation 002
Your Order No: 37349 RH

Lab Sample Number				2506008	2506009	2506010	2506011	2506012
Sample Reference				CPT22/02	CPT22/05	CPT22/06	CPT22/07	BH22/05
Sample Number				2	1	2	2	2
Depth (m)				0.45-0.60	0.15-0.35	0.50-0.70	0.30-0.50	0.50
Date Sampled				16/11/2022	16/11/2022	16/11/2022	16/11/2022	16/11/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Toluene	µg/kg	1	NONE	< 1.0	-	-	-	-
1,1,2-Trichloroethane	µg/kg	1	NONE	< 1.0	-	-	-	-
1,3-Dichloropropane	µg/kg	1	NONE	< 1.0	-	-	-	-
Dibromochloromethane	µg/kg	1	NONE	< 1.0	-	-	-	-
Tetrachloroethene	µg/kg	1	NONE	< 1.0	-	-	-	-
1,2-Dibromoethane	µg/kg	1	NONE	< 1.0	-	-	-	-
Chlorobenzene	µg/kg	1	NONE	< 1.0	-	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	NONE	< 1.0	-	-	-	-
Ethylbenzene	µg/kg	1	NONE	< 1.0	-	-	-	-
p & m-Xylene	µg/kg	1	NONE	< 1.0	-	-	-	-
Styrene	µg/kg	1	NONE	< 1.0	-	-	-	-
Tribromomethane	µg/kg	1	NONE	< 1.0	-	-	-	-
o-Xylene	µg/kg	1	NONE	< 1.0	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	NONE	< 1.0	-	-	-	-
Isopropylbenzene	µg/kg	1	NONE	< 1.0	-	-	-	-
Bromobenzene	µg/kg	1	NONE	< 1.0	-	-	-	-
n-Propylbenzene	µg/kg	1	NONE	< 1.0	-	-	-	-
2-Chlorotoluene	µg/kg	1	NONE	< 1.0	-	-	-	-
4-Chlorotoluene	µg/kg	1	NONE	< 1.0	-	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	NONE	< 1.0	-	-	-	-
tert-Butylbenzene	µg/kg	1	NONE	< 1.0	-	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	NONE	< 1.0	-	-	-	-
sec-Butylbenzene	µg/kg	1	NONE	< 1.0	-	-	-	-
1,3-Dichlorobenzene	µg/kg	1	NONE	< 1.0	-	-	-	-
p-Isopropyltoluene	µg/kg	1	NONE	< 1.0	-	-	-	-
1,2-Dichlorobenzene	µg/kg	1	NONE	< 1.0	-	-	-	-
1,4-Dichlorobenzene	µg/kg	1	NONE	< 1.0	-	-	-	-
Butylbenzene	µg/kg	1	NONE	< 1.0	-	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	NONE	< 1.0	-	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	NONE	< 1.0	-	-	-	-
Hexachlorobutadiene	µg/kg	1	NONE	< 1.0	-	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	NONE	< 1.0	-	-	-	-

SVOCs

Analytical Report Number: 22-97794
Project / Site name: Etihad Ground Invastigation 002
Your Order No: 37349 RH

Lab Sample Number				2506008	2506009	2506010	2506011	2506012
Sample Reference				CPT22/02	CPT22/05	CPT22/06	CPT22/07	BH22/05
Sample Number				2	1	2	2	2
Depth (m)				0.45-0.60	0.15-0.35	0.50-0.70	0.30-0.50	0.50
Date Sampled				16/11/2022	16/11/2022	16/11/2022	16/11/2022	16/11/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Aniline	mg/kg	0.1	NONE	0.5	-	-	-	-
Phenol	mg/kg	0.2	NONE	< 0.2	-	-	-	-
2-Chlorophenol	mg/kg	0.1	NONE	< 0.1	-	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	NONE	< 0.2	-	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	NONE	< 0.2	-	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	NONE	< 0.1	-	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	NONE	< 0.2	-	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	NONE	< 0.1	-	-	-	-
2-Methylphenol	mg/kg	0.3	NONE	< 0.3	-	-	-	-
Hexachloroethane	mg/kg	0.05	NONE	< 0.05	-	-	-	-
Nitrobenzene	mg/kg	0.3	NONE	< 0.3	-	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	< 0.2	-	-	-	-
Isophorone	mg/kg	0.2	NONE	< 0.2	-	-	-	-
2-Nitrophenol	mg/kg	0.3	NONE	< 0.3	-	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	NONE	< 0.3	-	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	NONE	< 0.3	-	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	NONE	< 0.3	-	-	-	-
Naphthalene	mg/kg	0.05	NONE	0.25	-	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	NONE	< 0.3	-	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	< 0.1	-	-	-	-
Hexachlorobutadiene	mg/kg	0.1	NONE	< 0.1	-	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	< 0.1	-	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	NONE	< 0.1	-	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	NONE	< 0.2	-	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	0.3	-	-	-	-
2-Chloronaphthalene	mg/kg	0.1	NONE	< 0.1	-	-	-	-
Dimethylphthalate	mg/kg	0.1	NONE	< 0.1	-	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	NONE	< 0.1	-	-	-	-
Acenaphthylene	mg/kg	0.05	NONE	0.08	-	-	-	-
Acenaphthene	mg/kg	0.05	NONE	0.29	-	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	NONE	< 0.2	-	-	-	-
Dibenzofuran	mg/kg	0.2	NONE	0.2	-	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	NONE	< 0.3	-	-	-	-
Diethyl phthalate	mg/kg	0.2	NONE	< 0.2	-	-	-	-
4-Nitroaniline	mg/kg	0.2	NONE	< 0.2	-	-	-	-
Fluorene	mg/kg	0.05	NONE	0.3	-	-	-	-
Azobenzene	mg/kg	0.3	NONE	< 0.3	-	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	NONE	< 0.2	-	-	-	-
Hexachlorobenzene	mg/kg	0.3	NONE	< 0.3	-	-	-	-
Phenanthrene	mg/kg	0.05	NONE	3.1	-	-	-	-
Anthracene	mg/kg	0.05	NONE	0.82	-	-	-	-
Carbazole	mg/kg	0.3	NONE	< 0.3	-	-	-	-
Dibutyl phthalate	mg/kg	0.2	NONE	< 0.2	-	-	-	-
Anthraquinone	mg/kg	0.3	NONE	< 0.3	-	-	-	-
Fluoranthene	mg/kg	0.05	NONE	5.7	-	-	-	-
Pyrene	mg/kg	0.05	NONE	5.5	-	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	NONE	< 0.3	-	-	-	-
Benzo(a)anthracene	mg/kg	0.05	NONE	2.4	-	-	-	-
Chrysene	mg/kg	0.05	NONE	2.1	-	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	NONE	2	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	NONE	1.1	-	-	-	-
Benzo(a)pyrene	mg/kg	0.05	NONE	1.8	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	0.96	-	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	0.23	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	NONE	1.1	-	-	-	-

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Analytical Report Number: 22-97794
Project / Site name: Etihad Ground Invastigation 002
Your Order No: 37349 RH

Lab Sample Number				2506008	2506009	2506010	2506011	2506012
Sample Reference				CPT22/02	CPT22/05	CPT22/06	CPT22/07	BH22/05
Sample Number				2	1	2	2	2
Depth (m)				0.45-0.60	0.15-0.35	0.50-0.70	0.30-0.50	0.50
Date Sampled				16/11/2022	16/11/2022	16/11/2022	16/11/2022	16/11/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 22-97794
Project / Site name: Etihad Ground Invastigation 002

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2506008	CPT22/02	2	0.45-0.60	Brown gravelly clay.
2506009	CPT22/05	1	0.15-0.35	Light brown gravelly clay.
2506010	CPT22/06	2	0.50-0.70	Brown loam and sand with gravel and brick.
2506011	CPT22/07	2	0.30-0.50	Brown loam and sand with gravel and stones.
2506012	BH22/05	2	0.5	Brown loam and sand with gravel and stones.

Analytical Report Number : 22-97794
Project / Site name: Etihad Ground Invastigation 002

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	NONE
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	NONE
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	NONE
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE

Analytical Report Number : 22-97794
Project / Site name: Etihad Ground Invastigation 002

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-97797

Project / Site name:	Etihad Ground Invastigation 002	**Samples received on:**	17/11/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	21/11/2022
Your order number:	37349 RH	**Analysis completed by:**	30/11/2022
Report Issue Number:	1	**Report issued on:**	30/11/2022
Samples Analysed:	10:1 WAC sample		

Signed:

Anna Goc
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Waste Acceptance Criteria Analytical Results

Report No:	**22-97797**						
					Client:	**GEOENG**	
Location	**Etihad Ground Invastigation 002**						
Lab Reference (Sample Number)	2506014 / 2506015				**Landfill Waste Acceptance Criteria**		
					Limits		
Sampling Date	16/11/2022				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	CPT22/02 2						
Depth (m)	0.45-0.60						
Solid Waste Analysis							
TOC (%)**	0.7				3%	5%	6%
Loss on Ignition (%) **	3.4				--	--	10%
BTEX (µg/kg)	< 10				6000	--	--
Sum of PCBs (mg/kg)	0.032				1	--	--
Mineral Oil (mg/kg) EH_1D_CU_AL	420				500	--	--
Total PAH (WAC-17) (mg/kg)	21.7				100	--	--
pH (units)**	10.9				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	90				--	To be evaluated	To be evaluated
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	< 0.0010			< 0.0100	0.5	2	25
Barium *	0.0312			0.296	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0036			0.034	0.5	10	70
Copper *	0.013			0.12	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0046			0.0437	0.5	10	30
Nickel *	< 0.0003			< 0.0030	0.4	10	40
Lead *	< 0.0010			< 0.010	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	0.0066			0.063	0.1	0.5	7
Zinc *	0.0026			0.025	4	50	200
Chloride *	20			190	800	15000	25000
Fluoride*	0.21			2.0	10	150	500
Sulphate *	30			280	1000	20000	50000
TDS*	330			3200	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	4.63			43.9	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.2						
Dry Matter (%)	88						
Moisture (%)	12						

Results are expressed on a dry weight basis, after correction for moisture content where applicable. *= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepencies with current legislation ** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Analytical Report Number : 22-97797
Project / Site name: Etihad Ground Invastigation 002

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Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2506014	CPT22/02	2	0.45-0.60	Brown gravelly clay.

Analytical Report Number : 22-97797
Project / Site name: Etihad Ground Invastigation 002

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270.	L064-PL	D	NONE
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	NONE
pH at 20oC in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	NONE
Total BTEX in soil (Poland)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073-PL	W	NONE
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by EC probe using a factor of 0.6.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L031	W	ISO 17025

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The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number : 22-97797
Project / Site name: Etihad Ground Invastigation 002

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-97790

Project / Site name:	Etihad Ground Investigation 003	**Samples received on:**	17/11/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	21/11/2022
Your order number:	37349 RH	**Analysis completed by:**	30/11/2022
Report Issue Number:	1	**Report issued on:**	30/11/2022
Samples Analysed:	3 soil samples		

Signed:

Anna Goc
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-97790
Project / Site name: Etihad Ground Investigation 003
Your Order No: 37349 RH

Lab Sample Number				2505994	2505995	2505996
Sample Reference				BH22/01	CPT22/08	CPT22/08
Sample Number				6	1	4
Depth (m)				3.50	0.20	1.00
Date Sampled				16/11/2022	16/11/2022	16/11/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Stone Content	%	0.1	NONE	24	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	23	12	12
Total mass of sample received	kg	0.001	NONE	1.5	1.5	1.5
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	PDO	PDO	PDO
General Inorganics						
pH - Automated	pH Units	N/A	MCERTS	9.3	10.2	10.2
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	2.4
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.3	0.49	0.71
Organic Matter (automated)	%	0.1	MCERTS	3.9	1.9	3.3
Total Phenols						
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Speciated PAHs						
Naphthalene	mg/kg	0.05	NONE	1.9	0.75	3.3
Acenaphthylene	mg/kg	0.05	NONE	0.12	0.2	0.56
Acenaphthene	mg/kg	0.05	NONE	3.2	1.2	1.4
Fluorene	mg/kg	0.05	NONE	2.6	0.89	0.91
Phenanthrene	mg/kg	0.05	NONE	13	8.4	10
Anthracene	mg/kg	0.05	NONE	3.8	2.1	2.6
Fluoranthene	mg/kg	0.05	NONE	15	12	9.9
Pyrene	mg/kg	0.05	NONE	13	12	11
Benzo(a)anthracene	mg/kg	0.05	NONE	6	5.7	5.9
Chrysene	mg/kg	0.05	NONE	6.2	5.7	4.1
Benzo(b)fluoranthene	mg/kg	0.05	NONE	6.5	6.9	4.7
Benzo(k)fluoranthene	mg/kg	0.05	NONE	2.3	1.9	2
Benzo(a)pyrene	mg/kg	0.05	NONE	5.5	5.9	4.6
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	2.4	2.5	1.8
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	0.62	0.66	0.46
Benzo(ghi)perylene	mg/kg	0.05	NONE	2.9	2.6	2.1
Total PAH						
Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	85.8	69.8	65.5
Heavy Metals / Metalloids						
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	29	13	15
Boron (water soluble)	mg/kg	0.2	MCERTS	1.6	2	4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	2	0.6	1
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	24	23	43
Copper (aqua regia extractable)	mg/kg	1	MCERTS	190	60	70
Lead (aqua regia extractable)	mg/kg	1	MCERTS	100	120	120
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	25	20	24
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	440	140	250

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Analytical Report Number: 22-97790
Project / Site name: Etihad Ground Investigation 003
Your Order No: 37349 RH

Lab Sample Number				2505994	2505995	2505996
Sample Reference				BH22/01	CPT22/08	CPT22/08
Sample Number				6	1	4
Depth (m)				3.50	0.20	1.00
Date Sampled				16/11/2022	16/11/2022	16/11/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Monoaromatics & Oxygenates						
Benzene	µg/kg	1	NONE	< 1.0	-	-
Toluene	µg/kg	1	NONE	< 1.0	-	-
Ethylbenzene	µg/kg	1	NONE	< 1.0	-	-
p & m-xylene	µg/kg	1	NONE	< 1.0	-	-
o-xylene	µg/kg	1	NONE	< 1.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	< 1.0	-	-
Petroleum Hydrocarbons						
TPH C10 - C40 $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	NONE	1700	520	770
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001	-	-
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001	-	-
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001	-	-
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	NONE	< 1.0	-	-
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	NONE	19	-	-
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	NONE	62	-	-
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	NONE	440	-	-
TPH-CWG - Aliphatic >EC35 - EC40 $_{EH\_CU\_1D\_AL}$	mg/kg	10	NONE	180	-	-
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001	-	-
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001	-	-
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001	-	-
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	NONE	4.4	-	-
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	NONE	23	-	-
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	110	-	-
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	530	-	-
TPH-CWG - Aromatic >EC35 - EC40 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	360	-	-
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	NONE	1700	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number : 22-97790
Project / Site name: Etihad Ground Investigation 003

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2505994	BH22/01	6	3.5	Brown clay and sand with gravel and stones.
2505995	CPT22/08	1	0.2	Brown loam and clay with gravel and brick.
2505996	CPT22/08	4	1	Brown loam and clay with gravel and brick.

Analytical Report Number : 22-97790
Project / Site name: Etihad Ground Investigation 003

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	NONE
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	NONE
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

Analytical Report Number : 22-97790
Project / Site name: Etihad Ground Investigation 003

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-97862

Project / Site name:	Etihad Ground Investigation - 005	**Samples received on:**	18/11/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	22/11/2022
Your order number:	37349 RH	**Analysis completed by:**	29/11/2022
Report Issue Number:	1	**Report issued on:**	29/11/2022
Samples Analysed:	4 soil samples		

Signed:

Joanna Wawrzeczko
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-97862
Project / Site name: Etihad Ground Investigation - 005
Your Order No: 37349 RH

Lab Sample Number				2506310	2506311	2506312	2506313
Sample Reference				BH22/04	BH22/03	BH22/02	BH22/06
Sample Number				2	3	3	2
Depth (m)				0.50-0.70	0.90-1.10	0.90-1.10	0.90-1.10
Date Sampled				17/11/2022	17/11/2022	17/11/2022	17/11/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	19
Moisture Content	%	0.01	NONE	12	11	6.5	3.5
Total mass of sample received	kg	0.001	NONE	1.2	1.2	1.2	1.2

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile	-	Chrysotile	-
Asbestos in Soil	Type	N/A	ISO 17025	Detected	Not-detected	Detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	0.002	-	0.001	-
Asbestos Quantification Total	%	0.001	ISO 17025	0.002	-	0.001	-
Asbestos Analyst ID	N/A	N/A	N/A	JSW	JSW	JSW	JSW

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	10.3	8.9	11.2	8.6
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.37	0.13	0.14	0.13
Organic Matter (automated)	%	0.1	MCERTS	3.5	1.3	0.8	0.3

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	NONE	0.62	0.11	< 0.05	0.21
Acenaphthylene	mg/kg	0.05	NONE	0.21	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	NONE	0.99	0.12	0.13	0.09
Fluorene	mg/kg	0.05	NONE	0.84	0.09	0.1	0.08
Phenanthrene	mg/kg	0.05	NONE	7.7	0.56	1.5	0.63
Anthracene	mg/kg	0.05	NONE	2.6	0.13	0.31	0.13
Fluoranthene	mg/kg	0.05	NONE	15	0.72	2.4	0.88
Pyrene	mg/kg	0.05	NONE	15	0.67	2.8	0.98
Benzo(a)anthracene	mg/kg	0.05	NONE	6.4	0.36	1.3	0.53
Chrysene	mg/kg	0.05	NONE	7	0.3	1.2	0.46
Benzo(b)fluoranthene	mg/kg	0.05	NONE	7.2	0.34	1.6	0.56
Benzo(k)fluoranthene	mg/kg	0.05	NONE	2.9	0.17	0.45	0.22
Benzo(a)pyrene	mg/kg	0.05	NONE	6.8	0.32	1.2	0.47
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	3.3	0.16	0.65	0.25
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	0.6	< 0.05	0.1	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	NONE	3.6	0.2	0.73	0.25

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	80.5	4.25	14.4	5.74

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The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-97862
Project / Site name: Etihad Ground Investigation - 005
Your Order No: 37349 RH

Lab Sample Number				2506310	2506311	2506312	2506313
Sample Reference				BH22/04	BH22/03	BH22/02	BH22/06
Sample Number				2	3	3	2
Depth (m)				0.50-0.70	0.90-1.10	0.90-1.10	0.90-1.10
Date Sampled				17/11/2022	17/11/2022	17/11/2022	17/11/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Heavy Metals / Metalloids							
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	26	6	4.9	2.3
Boron (water soluble)	mg/kg	0.2	MCERTS	2	0.7	1.2	0.8
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	2.2	< 0.2	0.4	0.3
Chromium (hexavalent)	mg/kg	1.8	MCERTS	-	< 1.8	-	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	33	21	18	8.9
Copper (aqua regia extractable)	mg/kg	1	MCERTS	140	24	38	16
Lead (aqua regia extractable)	mg/kg	1	MCERTS	420	17	50	14
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	27	26	8.1	4
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	1100	61	54	26
Monoaromatics & Oxygenates							
Benzene	µg/kg	1	NONE	-	< 1.0	-	-
Toluene	µg/kg	1	NONE	-	< 1.0	-	-
Ethylbenzene	µg/kg	1	NONE	-	< 1.0	-	-
p & m-xylene	µg/kg	1	NONE	-	< 1.0	-	-
o-xylene	µg/kg	1	NONE	-	< 1.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	-	< 1.0	-	-
Petroleum Hydrocarbons							
TPH C10 - C40 $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	NONE	950	27	240	30
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	< 0.001	-	-
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	< 0.001	-	-
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	< 0.001	-	-
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	NONE	-	< 1.0	-	-
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	NONE	-	< 2.0	-	-
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	NONE	-	< 8.0	-	-
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	NONE	-	< 8.0	-	-
TPH-CWG - Aliphatic >EC35 - EC40 $_{EH\_CU\_1D\_AL}$	mg/kg	10	NONE	-	< 10	-	-
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	< 0.001	-	-
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	< 0.001	-	-
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	< 0.001	-	-
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	NONE	-	< 1.0	-	-
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	NONE	-	< 2.0	-	-
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	-	< 10	-	-
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	-	20	-	-
TPH-CWG - Aromatic >EC35 - EC40 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	-	< 10	-	-
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	NONE	-	20	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 22-97862
Project / Site name: Etihad Ground Investigation - 005
Your Order No: 37349 RH

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006-PL based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
2506310	BH22/04	0.50-0.70	152	Loose Fibres	**Chrysotile**	0.002	**0.002**
2506312	BH22/02	0.90-1.10	170	Hard/Cement Type Material	**Chrysotile**	0.001	**0.001**

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

Analytical Report Number : 22-97862
Project / Site name: Etihad Ground Investigation - 005

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2506310	BH22/04	2	0.50-0.70	Brown clay and sand with gravel.
2506311	BH22/03	3	0.90-1.10	Brown clay and sand with gravel.
2506312	BH22/02	3	0.90-1.10	Brown clay and sand with gravel and vegetation.
2506313	BH22/06	2	0.90-1.10	Brown clay and sand with gravel and stones.

Analytical Report Number : 22-97862
Project / Site name: Etihad Ground Investigation - 005

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	NONE
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	NONE
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS

Analytical Report Number : 22-97862
Project / Site name: Etihad Ground Investigation - 005

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-98122

Project / Site name:	Etihad Ground Investigation - 006	**Samples received on:**	18/11/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	22/11/2022
Your order number:	37349 RH	**Analysis completed by:**	29/11/2022
Report Issue Number:	1	**Report issued on:**	29/11/2022
Samples Analysed:	2 soil samples		

Signed:

Joanna Wawrzeczko
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-98122
Project / Site name: Etihad Ground Investigation - 006
Your Order No: 37349 RH

Lab Sample Number				2507635	2507636
Sample Reference				BH22/08	BH22/08
Sample Number				1	4
Depth (m)				0.20	1.00
Date Sampled				18/11/2022	18/11/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	11	12
Total mass of sample received	kg	0.001	NONE	1.4	1.3

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	SFS	SFS

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	9.8	10.1
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.45	0.54
Organic Matter (automated)	%	0.1	MCERTS	1.6	2.9

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	NONE	0.31	2.8
Acenaphthylene	mg/kg	0.05	NONE	0.17	0.24
Acenaphthene	mg/kg	0.05	NONE	0.76	1.7
Fluorene	mg/kg	0.05	NONE	0.68	1.3
Phenanthrene	mg/kg	0.05	NONE	6.6	8.4
Anthracene	mg/kg	0.05	NONE	1.5	2.1
Fluoranthene	mg/kg	0.05	NONE	8.3	8.6
Pyrene	mg/kg	0.05	NONE	8.9	8.6
Benzo(a)anthracene	mg/kg	0.05	NONE	4.6	4
Chrysene	mg/kg	0.05	NONE	3.5	3.8
Benzo(b)fluoranthene	mg/kg	0.05	NONE	4.5	4.5
Benzo(k)fluoranthene	mg/kg	0.05	NONE	1.4	1.2
Benzo(a)pyrene	mg/kg	0.05	NONE	3.7	3.8
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	1.8	1.8
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	0.37	0.36
Benzo(ghi)perylene	mg/kg	0.05	NONE	2.3	2.2

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	49.3	55.4

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.6	16
Boron (water soluble)	mg/kg	0.2	MCERTS	3.7	3.7
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.4	0.8
Chromium (hexavalent)	mg/kg	1.8	MCERTS	-	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	20	43
Copper (aqua regia extractable)	mg/kg	1	MCERTS	47	61
Lead (aqua regia extractable)	mg/kg	1	MCERTS	83	120
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	15	25
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	97	230

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Analytical Report Number: 22-98122
Project / Site name: Etihad Ground Investigation - 006
Your Order No: 37349 RH

Lab Sample Number				2507635	2507636
Sample Reference				BH22/08	BH22/08
Sample Number				1	4
Depth (m)				0.20	1.00
Date Sampled				18/11/2022	18/11/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Monoaromatics & Oxygenates					
Benzene	µg/kg	1	NONE	-	< 1.0
Toluene	µg/kg	1	NONE	-	< 1.0
Ethylbenzene	µg/kg	1	NONE	-	< 1.0
p & m-xylene	µg/kg	1	NONE	-	< 1.0
o-xylene	µg/kg	1	NONE	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	-	< 1.0
Petroleum Hydrocarbons					
TPH C10 - C40 $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	NONE	330	700
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	NONE	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	NONE	-	8.9
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	NONE	-	40
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	NONE	-	140
TPH-CWG - Aliphatic >EC35 - EC40 $_{EH\_CU\_1D\_AL}$	mg/kg	10	NONE	-	48
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	NONE	-	3
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	NONE	-	19
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	-	73
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	-	260
TPH-CWG - Aromatic >EC35 - EC40 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	-	110
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	NONE	-	700

U/S = Unsuitable Sample I/S = Insufficient Sample

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number : 22-98122
Project / Site name: Etihad Ground Investigation - 006

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2507635	BH22/08	1	0.2	Brown loam and sand with gravel and brick.
2507636	BH22/08	4	1	Brown loam and clay with gravel and vegetation.

Analytical Report Number : 22-98122
Project / Site name: Etihad Ground Investigation - 006

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	NONE
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	NONE
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS

Analytical Report Number : 22-98122
Project / Site name: Etihad Ground Investigation - 006

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-98123

Project / Site name:	Etihad Ground Investigation - 006	**Samples received on:**	18/11/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	22/11/2022
Your order number:	37349 RH	**Analysis completed by:**	29/11/2022
Report Issue Number:	1	**Report issued on:**	29/11/2022
Samples Analysed:	1 10:1 WAC sample		

Signed:

Elżbieta Suchy
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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An estimate of measurement uncertainty can be provided on request.

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Waste Acceptance Criteria Analytical Results

Report No:	**22-98123**						
					Client:	**GEOENG**	
Location	**Etihad Ground Investigation - 006**						
Lab Reference (Sample Number)	2507637 / 2507638				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	18/11/2022				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	BH22/08 1						
Depth (m)	0.20						
Solid Waste Analysis							
TOC (%)**	1.0				3%	5%	6%
Loss on Ignition (%) **	-				--	--	10%
BTEX (µg/kg)	-				6000	--	--
Sum of PCBs (mg/kg)	-				1	--	--
Mineral Oil (mg/kg) EH_1D_CU_AL	-				500	--	--
Total PAH (WAC-17) (mg/kg)	-				100	--	--
pH (units)**	9.3				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	46				--	To be evaluated	To be evaluated
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.0043			0.0376	0.5	2	25
Barium *	0.0246			0.217	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0037			0.032	0.5	10	70
Copper *	0.010			0.092	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0042			0.0368	0.5	10	30
Nickel *	0.0038			0.033	0.4	10	40
Lead *	0.0015			0.013	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.0040			0.035	4	50	200
Chloride *	3.8			33	800	15000	25000
Fluoride*	0.28			2.5	10	150	500
Sulphate *	64			560	1000	20000	50000
TDS*	160			1400	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	4.91			43.2	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.3						
Dry Matter (%)	89						
Moisture (%)	11						

Results are expressed on a dry weight basis, after correction for moisture content where applicable. *= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepencies with current legislation ** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Analytical Report Number : 22-98123
Project / Site name: Etihad Ground Investigation - 006

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2507637	BH22/08	1	0.2	Brown loam and sand with gravel and brick.

Analytical Report Number : 22-98123
Project / Site name: Etihad Ground Investigation - 006

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH at 20oC in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by EC probe using a factor of 0.6.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L031	W	ISO 17025
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

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Analytical Report Number : 22-98522

Project / Site name:	Ethad Ground Investigation - 007	**Samples received on:**	22/11/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	24/11/2022
Your order number:	37349 RH	**Analysis completed by:**	02/12/2022
Report Issue Number:	1	**Report issued on:**	02/12/2022
Samples Analysed:	1 soil sample		

Signed:

Adam Fenwick
Technical Reviewer
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Analytical Report Number: 22-98522
Project / Site name: Ethad Ground Investigation - 007
Your Order No: 37349 RH

Lab Sample Number				2509578
Sample Reference				BH22/03
Sample Number				4
Depth (m)				2.50
Date Sampled				21/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	19
Total mass of sample received	kg	0.001	NONE	1

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	MJN

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	9.5
Total Cyanide	mg/kg	1	MCERTS	5.2
Free Cyanide	mg/kg	1	MCERTS	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.68
Organic Matter (automated)	%	0.1	MCERTS	1.7
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	1

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	NONE	0.55
Acenaphthylene	mg/kg	0.05	NONE	0.06
Acenaphthene	mg/kg	0.05	NONE	0.58
Fluorene	mg/kg	0.05	NONE	0.52
Phenanthrene	mg/kg	0.05	NONE	3.8
Anthracene	mg/kg	0.05	NONE	0.93
Fluoranthene	mg/kg	0.05	NONE	4.8
Pyrene	mg/kg	0.05	NONE	4.2
Benzo(a)anthracene	mg/kg	0.05	NONE	2.1
Chrysene	mg/kg	0.05	NONE	2
Benzo(b)fluoranthene	mg/kg	0.05	NONE	2.2
Benzo(k)fluoranthene	mg/kg	0.05	NONE	1.1
Benzo(a)pyrene	mg/kg	0.05	NONE	1.8
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	0.9
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	0.21
Benzo(ghi)perylene	mg/kg	0.05	NONE	1

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	26.7

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Analytical Report Number: 22-98522
Project / Site name: Ethad Ground Investigation - 007
Your Order No: 37349 RH

Lab Sample Number				2509578
Sample Reference				BH22/03
Sample Number				4
Depth (m)				2.50
Date Sampled				21/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Heavy Metals / Metalloids				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.7
Boron (water soluble)	mg/kg	0.2	MCERTS	0.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.5
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	28
Copper (aqua regia extractable)	mg/kg	1	MCERTS	120
Lead (aqua regia extractable)	mg/kg	1	MCERTS	120
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	30
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	140
Petroleum Hydrocarbons				
TPH C10 - C40 $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	NONE	230

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 22-98522
Project / Site name: Ethad Ground Investigation - 007

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Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2509578	BH22/03	4	2.5	Brown clay.

Analytical Report Number : 22-98522
Project / Site name: Ethad Ground Investigation - 007

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

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Analytical Report Number : 22-98522
Project / Site name: Ethad Ground Investigation - 007

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-98945

Project / Site name:	Etihad Ground Investigation - 008	**Samples received on:**	23/11/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	24/11/2022
Your order number:	37349 RH	**Analysis completed by:**	01/12/2022
Report Issue Number:	1	**Report issued on:**	01/12/2022
Samples Analysed:	1 soil sample		

Izabela Wójcik
Signed:

Izabela Wójcik
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
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Analytical Report Number: 22-98945
Project / Site name: Etihad Ground Investigation - 008
Your Order No: 37349 RH

Lab Sample Number				2511958
Sample Reference				BH22/02
Sample Number				4
Depth (m)				1.50
Date Sampled				22/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	18
Total mass of sample received	kg	0.001	NONE	0.8

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	SCA

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	9.3
Total Cyanide	mg/kg	1	MCERTS	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.094
Organic Matter (automated)	%	0.1	MCERTS	2
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	1.1

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	NONE	1.1
Acenaphthylene	mg/kg	0.05	NONE	0.09
Acenaphthene	mg/kg	0.05	NONE	1
Fluorene	mg/kg	0.05	NONE	0.97
Phenanthrene	mg/kg	0.05	NONE	5.9
Anthracene	mg/kg	0.05	NONE	1.5
Fluoranthene	mg/kg	0.05	NONE	5.9
Pyrene	mg/kg	0.05	NONE	5.3
Benzo(a)anthracene	mg/kg	0.05	NONE	2.9
Chrysene	mg/kg	0.05	NONE	2.1
Benzo(b)fluoranthene	mg/kg	0.05	NONE	2.4
Benzo(k)fluoranthene	mg/kg	0.05	NONE	1.1
Benzo(a)pyrene	mg/kg	0.05	NONE	2.2
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	1.1
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	0.3
Benzo(ghi)perylene	mg/kg	0.05	NONE	1.2

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	34.9

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	11
Boron (water soluble)	mg/kg	0.2	MCERTS	0.6
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.4
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	26
Copper (aqua regia extractable)	mg/kg	1	MCERTS	39
Lead (aqua regia extractable)	mg/kg	1	MCERTS	52
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	30
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	220

Monoaromatics & Oxygenates

Benzene	µg/kg	1	NONE	< 1.0
Toluene	µg/kg	1	NONE	< 1.0
Ethylbenzene	µg/kg	1	NONE	< 1.0
p & m-xylene	µg/kg	1	NONE	< 1.0

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The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-98945
Project / Site name: Etihad Ground Investigation - 008
Your Order No: 37349 RH

Lab Sample Number				2511958
Sample Reference				BH22/02
Sample Number				4
Depth (m)				1.50
Date Sampled				22/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
o-xylene	µg/kg	1	NONE	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	< 1.0
Petroleum Hydrocarbons				
TPH C10 - C40 EH_CU_1D_TOTAL	mg/kg	10	NONE	150
TPH-CWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	NONE	2.2
TPH-CWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	NONE	5.2
TPH-CWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	NONE	12
TPH-CWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	NONE	59
TPH-CWG - Aliphatic >EC35 - EC40 EH_CU_1D_AL	mg/kg	10	NONE	16
TPH-CWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	NONE	1.5
TPH-CWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	NONE	6.2
TPH-CWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	NONE	16
TPH-CWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	NONE	27
TPH-CWG - Aromatic >EC35 - EC40 EH_CU_1D_AR	mg/kg	10	NONE	< 10
TPH Total C5 - C40 EH_CU+HS_1D_TOTAL	mg/kg	10	NONE	150

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 22-98945
Project / Site name: Etihad Ground Investigation - 008

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2511958	BH22/02	4	1.5	Brown clay with brick.

Analytical Report Number : 22-98945
Project / Site name: Etihad Ground Investigation - 008

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	NONE
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	NONE
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS

Analytical Report Number : 22-98945
Project / Site name: Etihad Ground Investigation - 008

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-98946

Project / Site name:	Etihad Ground Investigation - 009	**Samples received on:**	23/11/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	24/11/2022
Your order number:	37349 RH	**Analysis completed by:**	05/12/2022
Report Issue Number:	1	**Report issued on:**	05/12/2022
Samples Analysed:	2 soil samples		

Signed:

Dominika Warjan
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-98946
Project / Site name: Etihad Ground Investigation - 009
Your Order No: 37349 RH

Lab Sample Number				2511959	2511960
Sample Reference				BH22/05	BH22/05
Sample Number				3	5
Depth (m)				1.90-2.10	3.90-4.10
Date Sampled				22/11/2022	22/11/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	18	24
Total mass of sample received	kg	0.001	NONE	1.7	1.7

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	SCA	SCA

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.3	8.6
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0
Water Soluble SO4 (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.17	0.1
Organic Matter (automated)	%	0.1	MCERTS	1.9	4.3
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	1.1	2.5

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	NONE	0.65	0.72
Acenaphthylene	mg/kg	0.05	NONE	< 0.05	0.32
Acenaphthene	mg/kg	0.05	NONE	1.1	2.9
Fluorene	mg/kg	0.05	NONE	0.9	3.1
Phenanthrene	mg/kg	0.05	NONE	6.7	20
Anthracene	mg/kg	0.05	NONE	1.7	4.9
Fluoranthene	mg/kg	0.05	NONE	7	18
Pyrene	mg/kg	0.05	NONE	6.1	19
Benzo(a)anthracene	mg/kg	0.05	NONE	3.4	9.4
Chrysene	mg/kg	0.05	NONE	2.2	6.6
Benzo(b)fluoranthene	mg/kg	0.05	NONE	2.4	7.8
Benzo(k)fluoranthene	mg/kg	0.05	NONE	1.4	3
Benzo(a)pyrene	mg/kg	0.05	NONE	2.4	7.3
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	1.2	3.1
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	0.31	0.73
Benzo(ghi)perylene	mg/kg	0.05	NONE	1.3	3.6

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	38.8	110

Analytical Report Number: 22-98946
Project / Site name: Etihad Ground Investigation - 009
Your Order No: 37349 RH

Lab Sample Number				2511959	2511960
Sample Reference				BH22/05	BH22/05
Sample Number				3	5
Depth (m)				1.90-2.10	3.90-4.10
Date Sampled				22/11/2022	22/11/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Heavy Metals / Metalloids					
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.6	32
Boron (water soluble)	mg/kg	0.2	MCERTS	1.1	2.5
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1.2	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	27	23
Copper (aqua regia extractable)	mg/kg	1	MCERTS	38	69
Lead (aqua regia extractable)	mg/kg	1	MCERTS	140	140
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	22	39
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	880	140
Petroleum Hydrocarbons					
TPH C10 - C40 EH_CU_1D_TOTAL	mg/kg	10	NONE	170	290

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 22-98946
Project / Site name: Etihad Ground Investigation - 009

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2511959	BH22/05	3	1.90-2.10	Brown clay and sand.
2511960	BH22/05	5	3.90-4.10	Brown clay and sand with gravel.

Analytical Report Number : 22-98946
Project / Site name: Etihad Ground Investigation - 009

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Sulphate, water soluble, in soil (1hr extraction)	Sulphate, water soluble, in soil (1hr extraction)	In-house method	L038-PL	D	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC

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Analytical Report Number : 22-98946
Project / Site name: Etihad Ground Investigation - 009

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-98940

Project / Site name:	Etihad Ground Investigation 010	**Samples received on:**	24/11/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	24/11/2022
Your order number:	37349 RH	**Analysis completed by:**	07/12/2022
Report Issue Number:	1	**Report issued on:**	07/12/2022
Samples Analysed:	1 soil sample		

Signed:

Joanna Wawrzeczko
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-98940
Project / Site name: Etihad Ground Investigation 010
Your Order No: 37349 RH

Lab Sample Number				2511933
Sample Reference				BH22/02
Sample Number				6
Depth (m)				3.50
Date Sampled				23/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	17
Total mass of sample received	kg	0.001	NONE	2

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	SZS

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.7
Total Cyanide	mg/kg	1	MCERTS	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.15
Organic Matter (automated)	%	0.1	MCERTS	1.8
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	1.1

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	NONE	1.2
Acenaphthylene	mg/kg	0.05	NONE	< 0.05
Acenaphthene	mg/kg	0.05	NONE	0.77
Fluorene	mg/kg	0.05	NONE	0.76
Phenanthrene	mg/kg	0.05	NONE	4.5
Anthracene	mg/kg	0.05	NONE	1.2
Fluoranthene	mg/kg	0.05	NONE	4.8
Pyrene	mg/kg	0.05	NONE	4.3
Benzo(a)anthracene	mg/kg	0.05	NONE	2.2
Chrysene	mg/kg	0.05	NONE	1.8
Benzo(b)fluoranthene	mg/kg	0.05	NONE	2.1
Benzo(k)fluoranthene	mg/kg	0.05	NONE	0.99
Benzo(a)pyrene	mg/kg	0.05	NONE	1.8
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	1
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	0.25
Benzo(ghi)perylene	mg/kg	0.05	NONE	1.1

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	28.8

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Analytical Report Number: 22-98940
Project / Site name: Etihad Ground Investigation 010
Your Order No: 37349 RH

Lab Sample Number				2511933
Sample Reference				BH22/02
Sample Number				6
Depth (m)				3.50
Date Sampled				23/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Heavy Metals / Metalloids				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.9
Boron (water soluble)	mg/kg	0.2	MCERTS	0.6
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	29
Copper (aqua regia extractable)	mg/kg	1	MCERTS	36
Lead (aqua regia extractable)	mg/kg	1	MCERTS	26
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	34
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	120
Petroleum Hydrocarbons				
TPH C10 - C40 EH_CU_1D_TOTAL	mg/kg	10	NONE	45

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 22-98940
Project / Site name: Etihad Ground Investigation 010

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2511933	BH22/02	6	3.5	Brown clay with brick.

Analytical Report Number : 22-98940
Project / Site name: Etihad Ground Investigation 010

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions

Analytical Report Number : 22-98940
Project / Site name: Etihad Ground Investigation 010

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
HS	Headspace Analysis				
MS	Mass spectrometry				
FID	Flame Ionisation Detector				
GC	Gas Chromatography				
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))				
CU	Clean-up - e.g. by Florisil®, silica gel				
1D	GC - Single coil/column gas chromatography				
2D	GC-GC - Double coil/column gas chromatography				
Total	Aliphatics & Aromatics				
AL	Aliphatics				
AR	Aromatics				
#1	EH_2D_Total but with humics mathematically subtracted				
#2	EH_2D_Total but with fatty acids mathematically subtracted				
_	Operator - understore to separate acronyms (exception for +)				
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total				

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Analytical Report Number : 22-10419

Project / Site name:	Etihad Ground Investigation 011	**Samples received on:**	29/11/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	29/11/2022
Your order number:	37349 RH	**Analysis completed by:**	08/12/2022
Report Issue Number:	1	**Report issued on:**	08/12/2022
Samples Analysed:	1 soil sample		

Signed:

Joanna Wawrzeczko
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-10419
Project / Site name: Etihad Ground Investigation 011
Your Order No: 37349 RH

Lab Sample Number				2516612
Sample Reference				BH22/06A
Sample Number				1
Depth (m)				1.50
Date Sampled				24/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	52
Moisture Content	%	0.01	NONE	11
Total mass of sample received	kg	0.001	NONE	1.2
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	DSA

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	11.2
Total Cyanide	mg/kg	1	MCERTS	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.58
Organic Matter (automated)	%	0.1	MCERTS	1.6
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.9

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	NONE	1.6
Acenaphthylene	mg/kg	0.05	NONE	0.26
Acenaphthene	mg/kg	0.05	NONE	2.9
Fluorene	mg/kg	0.05	NONE	2.4
Phenanthrene	mg/kg	0.05	NONE	21
Anthracene	mg/kg	0.05	NONE	5.7
Fluoranthene	mg/kg	0.05	NONE	35
Pyrene	mg/kg	0.05	NONE	33
Benzo(a)anthracene	mg/kg	0.05	NONE	15
Chrysene	mg/kg	0.05	NONE	12
Benzo(b)fluoranthene	mg/kg	0.05	NONE	14
Benzo(k)fluoranthene	mg/kg	0.05	NONE	5.9
Benzo(a)pyrene	mg/kg	0.05	NONE	13
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	6.6
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	1.2
Benzo(ghi)perylene	mg/kg	0.05	NONE	7.5

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	178

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	8.3
Boron (water soluble)	mg/kg	0.2	MCERTS	0.9
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	17
Copper (aqua regia extractable)	mg/kg	1	MCERTS	27
Lead (aqua regia extractable)	mg/kg	1	MCERTS	53
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	17
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	73

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Analytical Report Number: 22-10419
Project / Site name: Etihad Ground Investigation 011
Your Order No: 37349 RH

Lab Sample Number				2516612
Sample Reference				BH22/06A
Sample Number				1
Depth (m)				1.50
Date Sampled				24/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Monoaromatics & Oxygenates				
Benzene	µg/kg	1	NONE	< 1.0
Toluene	µg/kg	1	NONE	< 1.0
Ethylbenzene	µg/kg	1	NONE	< 1.0
p & m-xylene	µg/kg	1	NONE	< 1.0
o-xylene	µg/kg	1	NONE	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	< 1.0
Petroleum Hydrocarbons				
TPH C10 - C40 $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	NONE	390
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	NONE	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	NONE	2.4
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	NONE	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	NONE	24
TPH-CWG - Aliphatic >EC35 - EC40 $_{EH\_CU\_1D\_AL}$	mg/kg	10	NONE	16
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	NONE	3
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	NONE	16
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	88
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	180
TPH-CWG - Aromatic >EC35 - EC40 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	51
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	NONE	380

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number : 22-10419
Project / Site name: Etihad Ground Investigation 011

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2516612	BH22/06A	1	1.5	Brown clay and gravel with stones.

Analytical Report Number : 22-10419
Project / Site name: Etihad Ground Investigation 011

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	NONE
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	NONE
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS

Analytical Report Number : 22-10419
Project / Site name: Etihad Ground Investigation 011

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-10412

Project / Site name:	Etihad Ground Investigation 012	**Samples received on:**	29/11/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	29/11/2022
Your order number:	37349 RH	**Analysis completed by:**	08/12/2022
Report Issue Number:	1	**Report issued on:**	08/12/2022
Samples Analysed:	1 soil sample		

Signed:

Joanna Wawrzeczko
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-10412
Project / Site name: Etihad Ground Investigation 012
Your Order No: 37349 RH

Lab Sample Number				2516565
Sample Reference				BH22/04
Sample Number				4
Depth (m)				1.50
Date Sampled				28/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	46
Moisture Content	%	0.01	NONE	11
Total mass of sample received	kg	0.001	NONE	1.4

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile
Asbestos in Soil	Type	N/A	ISO 17025	Detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	< 0.001
Asbestos Quantification Total	%	0.001	ISO 17025	< 0.001
Asbestos Analyst ID	N/A	N/A	N/A	ASE

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	10.4
Total Cyanide	mg/kg	1	MCERTS	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.48
Organic Matter (automated)	%	0.1	MCERTS	1.4
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.8

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	NONE	0.44
Acenaphthylene	mg/kg	0.05	NONE	0.11
Acenaphthene	mg/kg	0.05	NONE	0.51
Fluorene	mg/kg	0.05	NONE	0.45
Phenanthrene	mg/kg	0.05	NONE	3.3
Anthracene	mg/kg	0.05	NONE	0.94
Fluoranthene	mg/kg	0.05	NONE	5.7
Pyrene	mg/kg	0.05	NONE	5.5
Benzo(a)anthracene	mg/kg	0.05	NONE	2.7
Chrysene	mg/kg	0.05	NONE	2.4
Benzo(b)fluoranthene	mg/kg	0.05	NONE	2.7
Benzo(k)fluoranthene	mg/kg	0.05	NONE	1.4
Benzo(a)pyrene	mg/kg	0.05	NONE	2.6
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	1.1
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	0.27
Benzo(ghi)perylene	mg/kg	0.05	NONE	1.3

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	31.5

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The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-10412
Project / Site name: Etihad Ground Investigation 012
Your Order No: 37349 RH

Lab Sample Number				2516565
Sample Reference				BH22/04
Sample Number				4
Depth (m)				1.50
Date Sampled				28/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Heavy Metals / Metalloids				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	14
Boron (water soluble)	mg/kg	0.2	MCERTS	1
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.9
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	32
Copper (aqua regia extractable)	mg/kg	1	MCERTS	130
Lead (aqua regia extractable)	mg/kg	1	MCERTS	120
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	16
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	360
Monoaromatics & Oxygenates				
Benzene	µg/kg	1	NONE	< 1.0
Toluene	µg/kg	1	NONE	< 1.0
Ethylbenzene	µg/kg	1	NONE	< 1.0
p & m-xylene	µg/kg	1	NONE	< 1.0
o-xylene	µg/kg	1	NONE	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	< 1.0
Petroleum Hydrocarbons				
TPH C10 - C40 $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	NONE	330
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	NONE	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	NONE	2.1
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	NONE	14
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	NONE	70
TPH-CWG - Aliphatic >EC35 - EC40 $_{EH\_CU\_1D\_AL}$	mg/kg	10	NONE	44
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	NONE	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	NONE	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	29
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	130
TPH-CWG - Aromatic >EC35 - EC40 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	48
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	NONE	330
VOCs				
Chloromethane	µg/kg	1	NONE	< 1.0
Chloroethane	µg/kg	1	NONE	< 1.0
Bromomethane	µg/kg	1	NONE	< 1.0
Vinyl Chloride	µg/kg	1	NONE	< 1.0
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	NONE	< 1.0
Cis-1,2-dichloroethene	µg/kg	1	NONE	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	< 1.0
1,1-Dichloroethane	µg/kg	1	NONE	< 1.0
2,2-Dichloropropane	µg/kg	1	NONE	< 1.0
Trichloromethane	µg/kg	1	NONE	< 1.0

Analytical Report Number: 22-10412
Project / Site name: Etihad Ground Investigation 012
Your Order No: 37349 RH

Lab Sample Number				2516565
Sample Reference				BH22/04
Sample Number				4
Depth (m)				1.50
Date Sampled				28/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
1,1,1-Trichloroethane	µg/kg	1	NONE	< 1.0
1,2-Dichloroethane	µg/kg	1	NONE	< 1.0
1,1-Dichloropropene	µg/kg	1	NONE	< 1.0
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0
Benzene	µg/kg	1	NONE	< 1.0
Tetrachloromethane	µg/kg	1	NONE	< 1.0
1,2-Dichloropropane	µg/kg	1	NONE	< 1.0
Trichloroethene	µg/kg	1	NONE	< 1.0
Dibromomethane	µg/kg	1	NONE	< 1.0
Bromodichloromethane	µg/kg	1	NONE	< 1.0
Cis-1,3-dichloropropene	µg/kg	1	NONE	< 1.0
Trans-1,3-dichloropropene	µg/kg	1	NONE	< 1.0
Toluene	µg/kg	1	NONE	< 1.0
1,1,2-Trichloroethane	µg/kg	1	NONE	< 1.0
1,3-Dichloropropane	µg/kg	1	NONE	< 1.0
Dibromochloromethane	µg/kg	1	NONE	< 1.0
Tetrachloroethene	µg/kg	1	NONE	< 1.0
1,2-Dibromoethane	µg/kg	1	NONE	< 1.0
Chlorobenzene	µg/kg	1	NONE	< 1.0
1,1,1,2-Tetrachloroethane	µg/kg	1	NONE	< 1.0
Ethylbenzene	µg/kg	1	NONE	< 1.0
p & m-Xylene	µg/kg	1	NONE	< 1.0
Styrene	µg/kg	1	NONE	< 1.0
Tribromomethane	µg/kg	1	NONE	< 1.0
o-Xylene	µg/kg	1	NONE	< 1.0
1,1,2,2-Tetrachloroethane	µg/kg	1	NONE	< 1.0
Isopropylbenzene	µg/kg	1	NONE	< 1.0
Bromobenzene	µg/kg	1	NONE	< 1.0
n-Propylbenzene	µg/kg	1	NONE	< 1.0
2-Chlorotoluene	µg/kg	1	NONE	< 1.0
4-Chlorotoluene	µg/kg	1	NONE	< 1.0
1,3,5-Trimethylbenzene	µg/kg	1	NONE	< 1.0
tert-Butylbenzene	µg/kg	1	NONE	< 1.0
1,2,4-Trimethylbenzene	µg/kg	1	NONE	< 1.0
sec-Butylbenzene	µg/kg	1	NONE	< 1.0
1,3-Dichlorobenzene	µg/kg	1	NONE	< 1.0
p-Isopropyltoluene	µg/kg	1	NONE	< 1.0
1,2-Dichlorobenzene	µg/kg	1	NONE	< 1.0
1,4-Dichlorobenzene	µg/kg	1	NONE	< 1.0
Butylbenzene	µg/kg	1	NONE	< 1.0
1,2-Dibromo-3-chloropropane	µg/kg	1	NONE	< 1.0
1,2,4-Trichlorobenzene	µg/kg	1	NONE	< 1.0
Hexachlorobutadiene	µg/kg	1	NONE	< 1.0
1,2,3-Trichlorobenzene	µg/kg	1	NONE	< 1.0

SVOCs

Aniline	mg/kg	0.1	NONE	< 0.1
Phenol	mg/kg	0.2	NONE	< 0.2
2-Chlorophenol	mg/kg	0.1	NONE	< 0.1
Bis(2-chloroethyl)ether	mg/kg	0.2	NONE	< 0.2
1,3-Dichlorobenzene	mg/kg	0.2	NONE	< 0.2
1,2-Dichlorobenzene	mg/kg	0.1	NONE	< 0.1
1,4-Dichlorobenzene	mg/kg	0.2	NONE	< 0.2
Bis(2-chloroisopropyl)ether	mg/kg	0.1	NONE	< 0.1
2-Methylphenol	mg/kg	0.3	NONE	< 0.3
Hexachloroethane	mg/kg	0.05	NONE	< 0.05

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Analytical Report Number: 22-10412
Project / Site name: Etihad Ground Investigation 012
Your Order No: 37349 RH

Lab Sample Number				2516565
Sample Reference				BH22/04
Sample Number				4
Depth (m)				1.50
Date Sampled				28/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Nitrobenzene	mg/kg	0.3	NONE	< 0.3
4-Methylphenol	mg/kg	0.2	NONE	< 0.2
Isophorone	mg/kg	0.2	NONE	< 0.2
2-Nitrophenol	mg/kg	0.3	NONE	< 0.3
2,4-Dimethylphenol	mg/kg	0.3	NONE	< 0.3
Bis(2-chloroethoxy)methane	mg/kg	0.3	NONE	< 0.3
1,2,4-Trichlorobenzene	mg/kg	0.3	NONE	< 0.3
Naphthalene	mg/kg	0.05	NONE	0.44
2,4-Dichlorophenol	mg/kg	0.3	NONE	< 0.3
4-Chloroaniline	mg/kg	0.1	NONE	< 0.1
Hexachlorobutadiene	mg/kg	0.1	NONE	< 0.1
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	< 0.1
2,4,6-Trichlorophenol	mg/kg	0.1	NONE	< 0.1
2,4,5-Trichlorophenol	mg/kg	0.2	NONE	< 0.2
2-Methylnaphthalene	mg/kg	0.1	NONE	0.3
2-Chloronaphthalene	mg/kg	0.1	NONE	< 0.1
Dimethylphthalate	mg/kg	0.1	NONE	0.1
2,6-Dinitrotoluene	mg/kg	0.1	NONE	< 0.1
Acenaphthylene	mg/kg	0.05	NONE	0.11
Acenaphthene	mg/kg	0.05	NONE	0.51
2,4-Dinitrotoluene	mg/kg	0.2	NONE	< 0.2
Dibenzofuran	mg/kg	0.2	NONE	0.3
4-Chlorophenyl phenyl ether	mg/kg	0.3	NONE	< 0.3
Diethyl phthalate	mg/kg	0.2	NONE	< 0.2
4-Nitroaniline	mg/kg	0.2	NONE	< 0.2
Fluorene	mg/kg	0.05	NONE	0.45
Azobenzene	mg/kg	0.3	NONE	< 0.3
Bromophenyl phenyl ether	mg/kg	0.2	NONE	< 0.2
Hexachlorobenzene	mg/kg	0.3	NONE	< 0.3
Phenanthrene	mg/kg	0.05	NONE	3.3
Anthracene	mg/kg	0.05	NONE	0.94
Carbazole	mg/kg	0.3	NONE	< 0.3
Dibutyl phthalate	mg/kg	0.2	NONE	< 0.2
Anthraquinone	mg/kg	0.3	NONE	< 0.3
Fluoranthene	mg/kg	0.05	NONE	5.7
Pyrene	mg/kg	0.05	NONE	5.5
Butyl benzyl phthalate	mg/kg	0.3	NONE	< 0.3
Benzo(a)anthracene	mg/kg	0.05	NONE	2.7
Chrysene	mg/kg	0.05	NONE	2.4
Benzo(b)fluoranthene	mg/kg	0.05	NONE	2.7
Benzo(k)fluoranthene	mg/kg	0.05	NONE	1.4
Benzo(a)pyrene	mg/kg	0.05	NONE	2.6
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	1.1
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	0.27
Benzo(ghi)perylene	mg/kg	0.05	NONE	1.3

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 22-10412
Project / Site name: Etihad Ground Investigation 012
Your Order No: 37349 RH

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006-PL based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
2516565	BH22/04	1.50	121	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**

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

Analytical Report Number : 22-10412
Project / Site name: Etihad Ground Investigation 012

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2516565	BH22/04	4	1.5	Brown gravelly sand with stones.

Analytical Report Number : 22-10412
Project / Site name: Etihad Ground Investigation 012

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	NONE
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	NONE
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	NONE

Analytical Report Number : 22-10412
Project / Site name: Etihad Ground Investigation 012

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-11027

Project / Site name:	Etihad Ground Investigation 013	**Samples received on:**	01/12/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	01/12/2022
Your order number:	37349 RH	**Analysis completed by:**	09/12/2022
Report Issue Number:	1	**Report issued on:**	09/12/2022
Samples Analysed:	3 soil samples		

Signed:

Adam Fenwick
Technical Reviewer
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-11027
Project / Site name: Etihad Ground Investigation 013
Your Order No: 37349 RH

Lab Sample Number				2519790	2519791	2519792
Sample Reference				BH22/04	BH22/07	BH22/07
Sample Number				5	3	4
Depth (m)				2.40	1.50	2.40
Date Sampled				29/11/2022	29/11/2022	29/11/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	13	17	20
Total mass of sample received	kg	0.001	NONE	1.5	1.5	1.6
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	JSW	JSW	JSW

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	10.2	10.2	10.1
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.33	0.36	0.19
Organic Matter (automated)	%	0.1	MCERTS	5.4	2.9	3
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	3.1	1.7	1.8
Loss on Ignition @ 450oC	%	0.2	MCERTS	4.6	4.3	4.8

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	NONE	2.5	4.3	8.6
Acenaphthylene	mg/kg	0.05	NONE	0.29	< 0.05	0.22
Acenaphthene	mg/kg	0.05	NONE	4.3	5.3	4.6
Fluorene	mg/kg	0.05	NONE	3.6	5.1	3.8
Phenanthrene	mg/kg	0.05	NONE	23	26	15
Anthracene	mg/kg	0.05	NONE	6.1	6.3	3.8
Fluoranthene	mg/kg	0.05	NONE	28	28	15
Pyrene	mg/kg	0.05	NONE	25	24	14
Benzo(a)anthracene	mg/kg	0.05	NONE	13	13	7
Chrysene	mg/kg	0.05	NONE	11	9.2	5.3
Benzo(b)fluoranthene	mg/kg	0.05	NONE	12	11	5.5
Benzo(k)fluoranthene	mg/kg	0.05	NONE	5.2	3.4	3.6
Benzo(a)pyrene	mg/kg	0.05	NONE	12	9.1	5.9
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	5.3	3.9	2.6
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	1.3	0.95	0.6
Benzo(ghi)perylene	mg/kg	0.05	NONE	5.6	5.1	3.2

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	158	154	98.2

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	10	16	15
Boron (water soluble)	mg/kg	0.2	MCERTS	2.4	2.8	3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.6	0.8	0.9
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	27	82	37
Copper (aqua regia extractable)	mg/kg	1	MCERTS	60	98	160
Lead (aqua regia extractable)	mg/kg	1	MCERTS	200	230	240
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	27	27	27
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	140	210	260

Monoaromatics & Oxygenates

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Analytical Report Number: 22-11027
Project / Site name: Etihad Ground Investigation 013
Your Order No: 37349 RH

Lab Sample Number				2519790	2519791	2519792
Sample Reference				BH22/04	BH22/07	BH22/07
Sample Number				5	3	4
Depth (m)				2.40	1.50	2.40
Date Sampled				29/11/2022	29/11/2022	29/11/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Benzene	µg/kg	1	NONE	-	< 1.0	< 1.0
Toluene	µg/kg	1	NONE	-	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	NONE	-	< 1.0	< 1.0
p & m-xylene	µg/kg	1	NONE	-	< 1.0	< 1.0
o-xylene	µg/kg	1	NONE	-	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	-	< 1.0	< 1.0
Petroleum Hydrocarbons						
TPH C10 - C40 EH_CU_1D_TOTAL	mg/kg	10	NONE	3500	1400	670
TPH-CWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.001	NONE	-	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.001	NONE	-	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.001	NONE	-	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	NONE	-	3.7	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	NONE	-	24	6.5
TPH-CWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	NONE	-	55	34
TPH-CWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	NONE	-	330	170
TPH-CWG - Aliphatic >EC35 - EC40 EH_CU_1D_AL	mg/kg	10	NONE	-	190	82
TPH-CWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.001	NONE	-	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.001	NONE	-	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.001	NONE	-	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	NONE	-	7.9	6
TPH-CWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	NONE	-	55	31
TPH-CWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	NONE	-	160	78
TPH-CWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	NONE	-	440	200
TPH-CWG - Aromatic >EC35 - EC40 EH_CU_1D_AR	mg/kg	10	NONE	-	130	61
TPH Total C5 - C40 EH_CU+HS_1D_TOTAL	mg/kg	10	NONE	-	1400	670
VOCs						
Chloromethane	µg/kg	1	NONE	-	-	< 1.0
Chloroethane	µg/kg	1	NONE	-	-	< 1.0
Bromomethane	µg/kg	1	NONE	-	-	< 1.0
Vinyl Chloride	µg/kg	1	NONE	-	-	< 1.0
Trichlorofluoromethane	µg/kg	1	NONE	-	-	< 1.0
1,1-Dichloroethene	µg/kg	1	NONE	-	-	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	NONE	-	-	< 1.0
Cis-1,2-dichloroethene	µg/kg	1	NONE	-	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	-	-	< 1.0
1,1-Dichloroethane	µg/kg	1	NONE	-	-	< 1.0
2,2-Dichloropropane	µg/kg	1	NONE	-	-	< 1.0
Trichloromethane	µg/kg	1	NONE	-	-	< 1.0
1,1,1-Trichloroethane	µg/kg	1	NONE	-	-	< 1.0
1,2-Dichloroethane	µg/kg	1	NONE	-	-	< 1.0
1,1-Dichloropropene	µg/kg	1	NONE	-	-	< 1.0
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	< 1.0
Benzene	µg/kg	1	NONE	-	-	< 1.0
Tetrachloromethane	µg/kg	1	NONE	-	-	< 1.0
1,2-Dichloropropane	µg/kg	1	NONE	-	-	< 1.0
Trichloroethene	µg/kg	1	NONE	-	-	< 1.0
Dibromomethane	µg/kg	1	NONE	-	-	< 1.0
Bromodichloromethane	µg/kg	1	NONE	-	-	< 1.0
Cis-1,3-dichloropropene	µg/kg	1	NONE	-	-	< 1.0

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Analytical Report Number: 22-11027
Project / Site name: Etihad Ground Investigation 013
Your Order No: 37349 RH

Lab Sample Number				2519790	2519791	2519792
Sample Reference				BH22/04	BH22/07	BH22/07
Sample Number				5	3	4
Depth (m)				2.40	1.50	2.40
Date Sampled				29/11/2022	29/11/2022	29/11/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			
Trans-1,3-dichloropropene	µg/kg	1	NONE	-	-	< 1.0
Toluene	µg/kg	1	NONE	-	-	< 1.0
1,1,2-Trichloroethane	µg/kg	1	NONE	-	-	< 1.0
1,3-Dichloropropane	µg/kg	1	NONE	-	-	< 1.0
Dibromochloromethane	µg/kg	1	NONE	-	-	< 1.0
Tetrachloroethene	µg/kg	1	NONE	-	-	< 1.0
1,2-Dibromoethane	µg/kg	1	NONE	-	-	< 1.0
Chlorobenzene	µg/kg	1	NONE	-	-	< 1.0
1,1,1,2-Tetrachloroethane	µg/kg	1	NONE	-	-	< 1.0
Ethylbenzene	µg/kg	1	NONE	-	-	< 1.0
p & m-Xylene	µg/kg	1	NONE	-	-	< 1.0
Styrene	µg/kg	1	NONE	-	-	< 1.0
Tribromomethane	µg/kg	1	NONE	-	-	< 1.0
o-Xylene	µg/kg	1	NONE	-	-	< 1.0
1,1,2,2-Tetrachloroethane	µg/kg	1	NONE	-	-	< 1.0
Isopropylbenzene	µg/kg	1	NONE	-	-	< 1.0
Bromobenzene	µg/kg	1	NONE	-	-	< 1.0
n-Propylbenzene	µg/kg	1	NONE	-	-	< 1.0
2-Chlorotoluene	µg/kg	1	NONE	-	-	< 1.0
4-Chlorotoluene	µg/kg	1	NONE	-	-	< 1.0
1,3,5-Trimethylbenzene	µg/kg	1	NONE	-	-	< 1.0
tert-Butylbenzene	µg/kg	1	NONE	-	-	< 1.0
1,2,4-Trimethylbenzene	µg/kg	1	NONE	-	-	< 1.0
sec-Butylbenzene	µg/kg	1	NONE	-	-	< 1.0
1,3-Dichlorobenzene	µg/kg	1	NONE	-	-	< 1.0
p-Isopropyltoluene	µg/kg	1	NONE	-	-	< 1.0
1,2-Dichlorobenzene	µg/kg	1	NONE	-	-	< 1.0
1,4-Dichlorobenzene	µg/kg	1	NONE	-	-	< 1.0
Butylbenzene	µg/kg	1	NONE	-	-	< 1.0
1,2-Dibromo-3-chloropropane	µg/kg	1	NONE	-	-	< 1.0
1,2,4-Trichlorobenzene	µg/kg	1	NONE	-	-	< 1.0
Hexachlorobutadiene	µg/kg	1	NONE	-	-	< 1.0
1,2,3-Trichlorobenzene	µg/kg	1	NONE	-	-	< 1.0

SVOCs

Aniline	mg/kg	0.1	NONE	-	-	< 0.1
Phenol	mg/kg	0.2	NONE	-	-	< 0.2
2-Chlorophenol	mg/kg	0.1	NONE	-	-	< 0.1
Bis(2-chloroethyl)ether	mg/kg	0.2	NONE	-	-	< 0.2
1,3-Dichlorobenzene	mg/kg	0.2	NONE	-	-	< 0.2
1,2-Dichlorobenzene	mg/kg	0.1	NONE	-	-	< 0.1
1,4-Dichlorobenzene	mg/kg	0.2	NONE	-	-	< 0.2
Bis(2-chloroisopropyl)ether	mg/kg	0.1	NONE	-	-	< 0.1
2-Methylphenol	mg/kg	0.3	NONE	-	-	< 0.3
Hexachloroethane	mg/kg	0.05	NONE	-	-	< 0.05
Nitrobenzene	mg/kg	0.3	NONE	-	-	< 0.3
4-Methylphenol	mg/kg	0.2	NONE	-	-	< 0.2
Isophorone	mg/kg	0.2	NONE	-	-	< 0.2
2-Nitrophenol	mg/kg	0.3	NONE	-	-	< 0.3
2,4-Dimethylphenol	mg/kg	0.3	NONE	-	-	< 0.3
Bis(2-chloroethoxy)methane	mg/kg	0.3	NONE	-	-	< 0.3
1,2,4-Trichlorobenzene	mg/kg	0.3	NONE	-	-	< 0.3
Naphthalene	mg/kg	0.05	NONE	-	-	8.6

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Analytical Report Number: 22-11027
Project / Site name: Etihad Ground Investigation 013
Your Order No: 37349 RH

Lab Sample Number				2519790	2519791	2519792
Sample Reference				BH22/04	BH22/07	BH22/07
Sample Number				5	3	4
Depth (m)				2.40	1.50	2.40
Date Sampled				29/11/2022	29/11/2022	29/11/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
2,4-Dichlorophenol	mg/kg	0.3	NONE	-	-	< 0.3
4-Chloroaniline	mg/kg	0.1	NONE	-	-	< 0.1
Hexachlorobutadiene	mg/kg	0.1	NONE	-	-	< 0.1
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	-	< 0.1
2,4,6-Trichlorophenol	mg/kg	0.1	NONE	-	-	< 0.1
2,4,5-Trichlorophenol	mg/kg	0.2	NONE	-	-	< 0.2
2-Methylnaphthalene	mg/kg	0.1	NONE	-	-	6.6
2-Chloronaphthalene	mg/kg	0.1	NONE	-	-	< 0.1
Dimethylphthalate	mg/kg	0.1	NONE	-	-	< 0.1
2,6-Dinitrotoluene	mg/kg	0.1	NONE	-	-	< 0.1
Acenaphthylene	mg/kg	0.05	NONE	-	-	0.22
Acenaphthene	mg/kg	0.05	NONE	-	-	4.6
2,4-Dinitrotoluene	mg/kg	0.2	NONE	-	-	< 0.2
Dibenzofuran	mg/kg	0.2	NONE	-	-	3
4-Chlorophenyl phenyl ether	mg/kg	0.3	NONE	-	-	< 0.3
Diethyl phthalate	mg/kg	0.2	NONE	-	-	< 0.2
4-Nitroaniline	mg/kg	0.2	NONE	-	-	< 0.2
Fluorene	mg/kg	0.05	NONE	-	-	3.8
Azobenzene	mg/kg	0.3	NONE	-	-	< 0.3
Bromophenyl phenyl ether	mg/kg	0.2	NONE	-	-	< 0.2
Hexachlorobenzene	mg/kg	0.3	NONE	-	-	< 0.3
Phenanthrene	mg/kg	0.05	NONE	-	-	15
Anthracene	mg/kg	0.05	NONE	-	-	3.8
Carbazole	mg/kg	0.3	NONE	-	-	0.7
Dibutyl phthalate	mg/kg	0.2	NONE	-	-	< 0.2
Anthraquinone	mg/kg	0.3	NONE	-	-	0.4
Fluoranthene	mg/kg	0.05	NONE	-	-	15
Pyrene	mg/kg	0.05	NONE	-	-	14
Butyl benzyl phthalate	mg/kg	0.3	NONE	-	-	< 0.3
Benzo(a)anthracene	mg/kg	0.05	NONE	-	-	7
Chrysene	mg/kg	0.05	NONE	-	-	5.3
Benzo(b)fluoranthene	mg/kg	0.05	NONE	-	-	5.5
Benzo(k)fluoranthene	mg/kg	0.05	NONE	-	-	3.6
Benzo(a)pyrene	mg/kg	0.05	NONE	-	-	5.9
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	-	-	2.6
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	-	-	0.6
Benzo(ghi)perylene	mg/kg	0.05	NONE	-	-	3.2

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number : 22-11027
Project / Site name: Etihad Ground Investigation 013

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2519790	BH22/04	5	2.4	Brown clay.
2519791	BH22/07	3	1.5	Brown clay.
2519792	BH22/07	4	2.4	Brown clay and loam with gravel and vegetation.

Analytical Report Number : 22-11027
Project / Site name: Etihad Ground Investigation 013

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	NONE
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	NONE

Analytical Report Number : 22-11027
Project / Site name: Etihad Ground Investigation 013

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	NONE
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-11028

Project / Site name:	Etihad Ground Investigation 013	**Samples received on:**	01/12/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	01/12/2022
Your order number:	37349 RH	**Analysis completed by:**	09/12/2022
Report Issue Number:	1	**Report issued on:**	09/12/2022
Samples Analysed:	1 leachate sample - 1 soil sample		

Signed:

Adam Fenwick
Technical Reviewer
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-11028
Project / Site name: Etihad Ground Investigation 013
Your Order No: 37349 RH

Lab Sample Number				2519794
Sample Reference				BH22/07
Sample Number				3
Depth (m)				1.50
Date Sampled				29/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	17
Total mass of sample received	kg	0.001	NONE	1.5
General Inorganics				
pH - Manual	pH Units	N/A	MCERTS	10.4
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	1.7
Loss on Ignition @ 450oC	%	0.2	MCERTS	4.1
Acid Neutralisation Capacity	+/- mmol/kg	-999	NONE	130
Speciated PAHs				
Naphthalene	mg/kg	0.05	NONE	4.3
Acenaphthylene	mg/kg	0.05	NONE	< 0.05
Acenaphthene	mg/kg	0.05	NONE	5.3
Fluorene	mg/kg	0.05	NONE	5.2
Phenanthrene	mg/kg	0.05	NONE	26
Anthracene	mg/kg	0.05	NONE	6.3
Fluoranthene	mg/kg	0.05	NONE	27
Pyrene	mg/kg	0.05	NONE	24
Benzo(a)anthracene	mg/kg	0.05	NONE	11
Chrysene	mg/kg	0.05	NONE	10
Benzo(b)fluoranthene	mg/kg	0.05	NONE	9.3
Benzo(k)fluoranthene	mg/kg	0.05	NONE	5.8
Benzo(a)pyrene	mg/kg	0.05	NONE	9
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	4
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	1.1
Benzo(ghi)perylene	mg/kg	0.05	NONE	4.8
Coronene	mg/kg	0.05	NONE	< 0.05
Total PAH				
Total WAC-17 PAHs	mg/kg	0.85	NONE	153
Monoaromatics & Oxygenates				
Benzene	µg/kg	1	NONE	< 1.0
Toluene	µg/kg	1	NONE	< 1.0
Ethylbenzene	µg/kg	1	NONE	< 1.0
p & m-xylene	µg/kg	1	NONE	< 1.0
o-xylene	µg/kg	1	NONE	< 1.0
Total BTEX	µg/kg	10	NONE	< 10
Petroleum Hydrocarbons				
Mineral Oil (C10 - C40) EH_CU_1D_AL	mg/kg	10	NONE	650
PCBs by GC-MS				
PCB Congener 28	mg/kg	0.001	NONE	< 0.001
PCB Congener 52	mg/kg	0.001	NONE	< 0.001
PCB Congener 101	mg/kg	0.001	NONE	< 0.001
PCB Congener 118	mg/kg	0.001	NONE	< 0.001
PCB Congener 138	mg/kg	0.001	NONE	< 0.001
PCB Congener 153	mg/kg	0.001	NONE	< 0.001
PCB Congener 180	mg/kg	0.001	NONE	< 0.001
Total PCBs by GC-MS				

Analytical Report Number: 22-11028
Project / Site name: Etihad Ground Investigation 013
Your Order No: 37349 RH

Lab Sample Number				2519794
Sample Reference				BH22/07
Sample Number				3
Depth (m)				1.50
Date Sampled				29/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Total PCBs	mg/kg	0.007	NONE	< 0.007

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 22-11028
Project / Site name: Etihad Ground Investigation 013

Your Order No: 37349 RH

Lab Sample Number				2519795
Sample Reference				BH22/07
Sample Number				3
Depth (m)				1.50
Date Sampled				29/11/2022
Time Taken				None Supplied
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
10:1 WAC Leachate				
Arsenic	mg/l	0.001	ISO 17025	0.0115
Barium	mg/l	0.00005	ISO 17025	0.0298
Cadmium	mg/l	0.0001	ISO 17025	< 0.0001
Chromium	mg/l	0.0004	ISO 17025	0.003
Copper	mg/l	0.0007	ISO 17025	0.076
Mercury	mg/l	0.0005	ISO 17025	< 0.0005
Molybdenum	mg/l	0.0004	ISO 17025	0.0087
Nickel	mg/l	0.0003	ISO 17025	0.024
Lead	mg/l	0.001	ISO 17025	< 0.0010
Antimony	mg/l	0.0017	ISO 17025	0.013
Selenium	mg/l	0.004	ISO 17025	< 0.0040
Zinc	mg/l	0.0004	ISO 17025	0.0035
Chloride	mg/l	0.15	ISO 17025	12
Fluoride	mg/l	0.05	ISO 17025	0.25
Sulphate	mg/l	0.1	ISO 17025	37
Total dissolved solids	mg/l	4	ISO 17025	210
Total monohydric phenols	mg/l	0.01	ISO 17025	0.049
Dissolved organic carbon	mg/l	0.1	NONE	19.4
10:1 WAC Leachate				
Arsenic	mg/kg	0.01	NONE	0.0894
Barium	mg/kg	0.0005	NONE	0.231
Cadmium	mg/kg	0.0008	NONE	< 0.0008
Chromium	mg/kg	0.004	NONE	0.024
Copper	mg/kg	0.007	NONE	0.59
Mercury	mg/kg	0.005	NONE	< 0.0050
Molybdenum	mg/kg	0.004	NONE	0.0674
Nickel	mg/kg	0.003	NONE	0.18
Lead	mg/kg	0.01	NONE	< 0.010
Antimony	mg/kg	0.017	NONE	0.1
Selenium	mg/kg	0.04	NONE	< 0.040
Zinc	mg/kg	0.004	NONE	0.027
Chloride	mg/kg	1.5	NONE	97
Fluoride	mg/kg	0.5	NONE	2
Sulphate	mg/kg	1	NONE	290
Total dissolved solids	mg/kg	40	ISO 17025	1600
Total monohydric phenols	mg/kg	0.1	NONE	0.38
Dissolved organic carbon	mg/kg	1	NONE	150

U/S = Unsuitable Sample I/S = Insufficient Sample

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Waste Acceptance Criteria Analytical Results

Report No:	**22-11028**						
					Client:	**GEOENG**	
Location	**Etihad Ground Investigation 013**						
Lab Reference (Sample Number)	2519794 / 2519795				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	29/11/2022				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	BH22/07 3						
Depth (m)	1.50						
Solid Waste Analysis							
TOC (%)**	1.7				3%	5%	6%
Loss on Ignition (%) **	4.1				--	--	10%
BTEX (µg/kg)	< 10				6000	--	--
Sum of PCBs (mg/kg)	< 0.007				1	--	--
Mineral Oil (mg/kg) EH_1D_CU_AL	650				500	--	--
Total PAH (WAC-17) (mg/kg)	153				100	--	--
pH (units)**	10.4				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	130				--	To be evaluated	To be evaluated
Eluate Analysis (BS EN 12457 - 2 preparation utilising end over end leaching procedure)	10:1			10:1	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
	mg/l			mg/kg			
Arsenic *	0.0115			0.0894	0.5	2	25
Barium *	0.0298			0.231	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0030			0.024	0.5	10	70
Copper *	0.076			0.59	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0087			0.0674	0.5	10	30
Nickel *	0.024			0.18	0.4	10	40
Lead *	< 0.0010			< 0.010	0.5	10	50
Antimony *	0.013			0.10	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.0035			0.027	4	50	200
Chloride *	12			97	800	15000	25000
Fluoride*	0.25			2.0	10	150	500
Sulphate *	37			290	1000	20000	50000
TDS*	210			1600	4000	60000	100000
Phenol Index (Monohydric Phenols) *	0.049			0.38	1	-	-
DOC	19.4			150	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.5						
Dry Matter (%)	83						
Moisture (%)	17						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.

*= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepencies with current legislation

** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Analytical Report Number : 22-11028
Project / Site name: Etihad Ground Investigation 013

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2519794	BH22/07	3	1.5	Brown clay.

Analytical Report Number : 22-11028
Project / Site name: Etihad Ground Investigation 013

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270.	L064-PL	D	NONE
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	NONE
pH at 20oC in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	NONE
Total BTEX in soil (Poland)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073-PL	W	NONE
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by EC probe using a factor of 0.6.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L031	W	ISO 17025

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Analytical Report Number : 22-11028
Project / Site name: Etihad Ground Investigation 013

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-10969

Replaces Analytical Report Number: 22-10969, issue no. 1
Result correction by laboratory.

Project / Site name:	Etihad Ground Investigation - 014	**Samples received on:**	01/12/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	01/12/2022
Your order number:	37349-RH	**Analysis completed by:**	27/02/2023
Report Issue Number:	2	**Report issued on:**	02/03/2023
Samples Analysed:	3 soil samples		

Signed:

Dominika Warjan
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Analytical Report Number: 22-10969
Project / Site name: Etihad Ground Investigation - 014
Your Order No: 37349-RH

Lab Sample Number				2519482	2519483	2519484
Sample Reference				TP22/02	TP22/02	TP22/02
Sample Number				3	5	6
Depth (m)				1.00-1.10	2.50-2.60	3.00
Date Sampled				29/11/2022	29/11/2022	29/11/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Stone Content	%	0.1	NONE	8.7	18	< 0.1
Moisture Content	%	0.01	NONE	10	16	12
Total mass of sample received	kg	0.001	NONE	1.4	0.8	1.5
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	Amosite
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	0.007
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	0.007
Asbestos Analyst ID	N/A	N/A	N/A	SFS	SFS	SFS
General Inorganics						
pH - Automated	pH Units	N/A	MCERTS	10.1	8.1	8.7
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.41	0.22	0.29
Organic Matter (automated)	%	0.1	MCERTS	3.3	1.7	1.9
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	-	1	1.1
Loss on Ignition @ 450oC	%	0.2	MCERTS	-	4.7	3.6
Total Phenols						
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Speciated PAHs						
Naphthalene	mg/kg	0.05	MCERTS	0.72	0.44	0.7
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.69	0.28	1.8
Fluorene	mg/kg	0.05	MCERTS	0.49	0.22	1.2
Phenanthrene	mg/kg	0.05	MCERTS	5.4	1.2	8.3
Anthracene	mg/kg	0.05	MCERTS	1.1	0.14	1.9
Fluoranthene	mg/kg	0.05	MCERTS	7.5	0.76	10
Pyrene	mg/kg	0.05	MCERTS	7.6	0.75	8.9
Benzo(a)anthracene	mg/kg	0.05	MCERTS	4.1	0.34	4.5
Chrysene	mg/kg	0.05	MCERTS	3	0.31	3.5
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	3.9	0.29	4.1
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	1.4	0.12	2
Benzo(a)pyrene	mg/kg	0.05	MCERTS	3.3	0.26	3.8
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.8	0.12	2.1
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.39	< 0.05	0.47
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	2	0.15	2.4
Total PAH						
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	43.4	5.38	55.8

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Analytical Report Number: 22-10969
Project / Site name: Etihad Ground Investigation - 014
Your Order No: 37349-RH

Lab Sample Number				2519482	2519483	2519484
Sample Reference				TP22/02	TP22/02	TP22/02
Sample Number				3	5	6
Depth (m)				1.00-1.10	2.50-2.60	3.00
Date Sampled				29/11/2022	29/11/2022	29/11/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Heavy Metals / Metalloids						
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	48	17	14
Boron (water soluble)	mg/kg	0.2	MCERTS	1.1	1.7	1.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	12	< 0.2	1.1
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	-	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	59	46	34
Copper (aqua regia extractable)	mg/kg	1	MCERTS	410	51	110
Lead (aqua regia extractable)	mg/kg	1	MCERTS	480	63	330
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	35	30	22
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	1800	280	400
Monoaromatics & Oxygenates						
Benzene	µg/kg	5	MCERTS	< 1.0	< 1.0	-
Toluene	µg/kg	5	MCERTS	< 1.0	< 1.0	-
Ethylbenzene	µg/kg	5	MCERTS	< 1.0	< 1.0	-
p & m-xylene	µg/kg	5	MCERTS	< 1.0	< 1.0	-
o-xylene	µg/kg	5	MCERTS	< 1.0	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 1.0	< 1.0	-
Petroleum Hydrocarbons						
TPH C10 - C40 $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	MCERTS	1300	48	150
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001	< 0.001	-
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001	< 0.001	-
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001	< 0.001	-
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	9.1	< 1.0	-
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	40	< 2.0	-
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	190	< 8.0	-
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	450	< 8.0	-
TPH-CWG - Aliphatic >EC35 - EC40 $_{EH\_CU\_1D\_AL}$	mg/kg	10	NONE	66	< 10	-
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	NONE	690	10	-
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001	< 0.001	-
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001	< 0.001	-
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001	< 0.001	-
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	< 1.0	< 1.0	-
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	8.3	2.7	-
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	110	< 10	-
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	370	10	-
TPH-CWG - Aromatic >EC35 - EC40 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	31	14	-
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	NONE	490	19	-
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	NONE	730	29	-

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Analytical Report Number: 22-10969
Project / Site name: Etihad Ground Investigation - 014
Your Order No: 37349-RH

Lab Sample Number				2519482	2519483	2519484
Sample Reference				TP22/02	TP22/02	TP22/02
Sample Number				3	5	6
Depth (m)				1.00-1.10	2.50-2.60	3.00
Date Sampled				29/11/2022	29/11/2022	29/11/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
VOCs						
Chloromethane	µg/kg	5	ISO 17025	-	< 1.0	-
Chloroethane	µg/kg	5	NONE	-	< 1.0	-
Bromomethane	µg/kg	5	ISO 17025	-	< 1.0	-
Vinyl Chloride	µg/kg	5	NONE	-	< 1.0	-
Trichlorofluoromethane	µg/kg	5	NONE	-	< 1.0	-
1,1-Dichloroethene	µg/kg	5	NONE	-	< 1.0	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	5	NONE	-	< 1.0	-
Cis-1,2-dichloroethene	µg/kg	5	ISO 17025	-	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	-	< 1.0	-
1,1-Dichloroethane	µg/kg	5	ISO 17025	-	< 1.0	-
2,2-Dichloropropane	µg/kg	5	ISO 17025	-	< 1.0	-
Trichloromethane	µg/kg	5	ISO 17025	-	< 1.0	-
1,1,1-Trichloroethane	µg/kg	5	ISO 17025	-	< 1.0	-
1,2-Dichloroethane	µg/kg	5	ISO 17025	-	< 1.0	-
1,1-Dichloropropene	µg/kg	5	ISO 17025	-	< 1.0	-
Trans-1,2-dichloroethene	µg/kg	5	NONE	-	< 1.0	-
Benzene	µg/kg	5	MCERTS	-	< 1.0	-
Tetrachloromethane	µg/kg	5	NONE	-	< 1.0	-
1,2-Dichloropropane	µg/kg	5	ISO 17025	-	< 1.0	-
Trichloroethene	µg/kg	5	ISO 17025	-	< 1.0	-
Dibromomethane	µg/kg	5	ISO 17025	-	< 1.0	-
Bromodichloromethane	µg/kg	5	ISO 17025	-	< 1.0	-
Cis-1,3-dichloropropene	µg/kg	5	ISO 17025	-	< 1.0	-
Trans-1,3-dichloropropene	µg/kg	5	ISO 17025	-	< 1.0	-
Toluene	µg/kg	5	MCERTS	-	< 1.0	-
1,1,2-Trichloroethane	µg/kg	5	ISO 17025	-	< 1.0	-
1,3-Dichloropropane	µg/kg	5	ISO 17025	-	< 1.0	-
Dibromochloromethane	µg/kg	5	ISO 17025	-	< 1.0	-
Tetrachloroethene	µg/kg	5	NONE	-	< 1.0	-
1,2-Dibromoethane	µg/kg	5	ISO 17025	-	< 1.0	-
Chlorobenzene	µg/kg	5	ISO 17025	-	< 1.0	-
1,1,1,2-Tetrachloroethane	µg/kg	5	ISO 17025	-	< 1.0	-
Ethylbenzene	µg/kg	5	MCERTS	-	< 1.0	-
p & m-Xylene	µg/kg	5	MCERTS	-	< 1.0	-
Styrene	µg/kg	5	ISO 17025	-	< 1.0	-
Tribromomethane	µg/kg	5	NONE	-	< 1.0	-
o-Xylene	µg/kg	5	MCERTS	-	< 1.0	-
1,1,2,2-Tetrachloroethane	µg/kg	5	ISO 17025	-	< 1.0	-
Isopropylbenzene	µg/kg	5	ISO 17025	-	< 1.0	-
Bromobenzene	µg/kg	5	ISO 17025	-	< 1.0	-
n-Propylbenzene	µg/kg	5	ISO 17025	-	< 1.0	-
2-Chlorotoluene	µg/kg	5	ISO 17025	-	< 1.0	-
4-Chlorotoluene	µg/kg	5	ISO 17025	-	< 1.0	-
1,3,5-Trimethylbenzene	µg/kg	5	ISO 17025	-	< 1.0	-
tert-Butylbenzene	µg/kg	5	ISO 17025	-	< 1.0	-
1,2,4-Trimethylbenzene	µg/kg	5	ISO 17025	-	< 1.0	-
sec-Butylbenzene	µg/kg	5	ISO 17025	-	< 1.0	-
1,3-Dichlorobenzene	µg/kg	5	ISO 17025	-	< 1.0	-
p-Isopropyltoluene	µg/kg	5	ISO 17025	-	< 1.0	-
1,2-Dichlorobenzene	µg/kg	5	ISO 17025	-	< 1.0	-
1,4-Dichlorobenzene	µg/kg	5	ISO 17025	-	< 1.0	-
Butylbenzene	µg/kg	5	NONE	-	< 1.0	-
1,2-Dibromo-3-chloropropane	µg/kg	5	ISO 17025	-	< 1.0	-
1,2,4-Trichlorobenzene	µg/kg	5	ISO 17025	-	< 1.0	-
Hexachlorobutadiene	µg/kg	5	NONE	-	< 1.0	-

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Analytical Report Number: 22-10969
Project / Site name: Etihad Ground Investigation - 014
Your Order No: 37349-RH

Lab Sample Number				2519482	2519483	2519484
Sample Reference				TP22/02	TP22/02	TP22/02
Sample Number				3	5	6
Depth (m)				1.00-1.10	2.50-2.60	3.00
Date Sampled				29/11/2022	29/11/2022	29/11/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
1,2,3-Trichlorobenzene	µg/kg	5	ISO 17025	-	< 1.0	-
SVOCs						
Aniline	mg/kg	0.1	NONE	-	0.1	-
Phenol	mg/kg	0.2	ISO 17025	-	< 0.2	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	< 0.2	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	< 0.1	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	< 0.1	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-
Hexachloroethane	mg/kg	0.05	ISO 17025	-	< 0.05	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-
4-Methylphenol	mg/kg	0.2	NONE	-	< 0.2	-
Isophorone	mg/kg	0.2	MCERTS	-	< 0.2	-
2-Nitrophenol	mg/kg	0.3	NONE	-	< 0.3	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	< 0.3	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-
Naphthalene	mg/kg	0.05	MCERTS	-	0.44	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	< 0.3	-
4-Chloroaniline	mg/kg	0.1	NONE	-	< 0.1	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	< 0.1	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	< 0.1	-
2,4,6-Trichlorophenol	mg/kg	0.1	NONE	-	< 0.1	-
2,4,5-Trichlorophenol	mg/kg	0.2	NONE	-	< 0.2	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	0.4	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	< 0.1	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	< 0.1	-
2,6-Dinitrotoluene	mg/kg	0.1	NONE	-	< 0.1	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	< 0.05	-
Acenaphthene	mg/kg	0.05	MCERTS	-	0.28	-
2,4-Dinitrotoluene	mg/kg	0.2	NONE	-	< 0.2	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	0.2	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	MCERTS	-	< 0.3	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-
4-Nitroaniline	mg/kg	0.2	NONE	-	< 0.2	-
Fluorene	mg/kg	0.05	MCERTS	-	0.22	-
Azobenzene	mg/kg	0.3	NONE	-	< 0.3	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	< 0.2	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-
Phenanthrene	mg/kg	0.05	MCERTS	-	1.2	-
Anthracene	mg/kg	0.05	MCERTS	-	0.14	-
Carbazole	mg/kg	0.3	MCERTS	-	< 0.3	-
Dibutyl phthalate	mg/kg	0.2	NONE	-	< 0.2	-
Anthraquinone	mg/kg	0.3	NONE	-	< 0.3	-
Fluoranthene	mg/kg	0.05	MCERTS	-	0.76	-
Pyrene	mg/kg	0.05	MCERTS	-	0.75	-
Butyl benzyl phthalate	mg/kg	0.3	NONE	-	< 0.3	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	0.34	-
Chrysene	mg/kg	0.05	MCERTS	-	0.31	-
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	-	0.29	-
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	-	0.12	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	0.26	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	0.12	-

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Analytical Report Number: 22-10969
Project / Site name: Etihad Ground Investigation - 014
Your Order No: 37349-RH

Lab Sample Number				2519482	2519483	2519484
Sample Reference				TP22/02	TP22/02	TP22/02
Sample Number				3	5	6
Depth (m)				1.00-1.10	2.50-2.60	3.00
Date Sampled				29/11/2022	29/11/2022	29/11/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	< 0.05	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	0.15	-

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number: 22-10969
Project / Site name: Etihad Ground Investigation - 014
Your Order No: 37349-RH

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006-PL based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
2519484	TP22/02	3.00	156	Sheeting/Board Debris	**Amosite**	0.007	**0.007**

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

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Analytical Report Number : 22-10969
Project / Site name: Etihad Ground Investigation - 014

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2519482	TP22/02	3	1.00-1.10	Brown loam and sand with gravel and stones.
2519483	TP22/02	5	2.50-2.60	Brown clay with gravel and stones.
2519484	TP22/02	6	3	Brown loam and sand with gravel and brick.

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Analytical Report Number : 22-10969
Project / Site name: Etihad Ground Investigation - 014

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE

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Analytical Report Number : 22-10969
Project / Site name: Etihad Ground Investigation - 014

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-10974

Project / Site name:	Etihad Ground Investigation - 014	**Samples received on:**	01/12/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	01/12/2022
Your order number:	37349-RH	**Analysis completed by:**	12/12/2022
Report Issue Number:	1	**Report issued on:**	12/12/2022
Samples Analysed:	1 10:1 WAC Samples		

Signed: Izabela Wójcik

Izabela Wójcik
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Waste Acceptance Criteria Analytical Results

Report No:	**22-10974**						
					Client:	**GEOENG**	
Location	**Etihad Ground Investigation - 014**						
Lab Reference (Sample Number)	2519542 / 2520288				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	29/11/2022				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TP22/02 3						
Depth (m)	1.00-1.10						
Solid Waste Analysis							
TOC (%)**	1.9				3%	5%	6%
Loss on Ignition (%) **	5.8				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) ***	0.082				1	--	--
Mineral Oil (mg/kg) $_{EH\_1D\_CU\_AL}$	440				500	--	--
Total PAH (WAC-17) (mg/kg)	44.9				100	--	--
pH (units)**	10.6				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	63				--	To be evaluated	To be evaluated
Eluate Analysis (BS EN 12457 - 2 preparation utilising end over end leaching procedure)	10:1 mg/l			10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.0142			0.123	0.5	2	25
Barium *	0.0100			0.0856	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0008			0.0065	0.5	10	70
Copper *	0.033			0.28	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0042			0.0357	0.5	10	30
Nickel *	0.0014			0.012	0.4	10	40
Lead *	0.0028			0.024	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.017			0.14	4	50	200
Chloride *	3.0			26	800	15000	25000
Fluoride*	0.36			3.1	10	150	500
Sulphate *	55			470	1000	20000	50000
TDS*	150			1300	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	6.08			52.3	500	800	1000
Leach Test Information							
Stone Content (%)	8.7						
Sample Mass (kg)	1.4						
Dry Matter (%)	90						
Moisture (%)	10						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.

*= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepencies with current legislation

** = MCERTS accredited

***Data reported unaccredited due to quality control parameter failure associated with this result; other checks applied prior to reporting the data have been accepted and the failure justified as having no significant impact on sample data reported.

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 22-10974
Project / Site name: Etihad Ground Investigation - 014

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2519542	TP22/02	3	1.00-1.10	Brown loam and sand with gravel and stones.

Analytical Report Number : 22-10974
Project / Site name: Etihad Ground Investigation - 014

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270.	L064-PL	D	MCERTS
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	NONE
pH at 20oC in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Total BTEX in soil (Poland)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073-PL	W	MCERTS
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025

Analytical Report Number : 22-10974
Project / Site name: Etihad Ground Investigation - 014

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by EC probe using a factor of 0.6.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L031	W	ISO 17025
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-11022

Project / Site name:	Etihad Ground Investigation 015	**Samples received on:**	01/12/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	01/12/2022
Your order number:	37349 RH	**Analysis completed by:**	09/12/2022
Report Issue Number:	1	**Report issued on:**	09/12/2022
Samples Analysed:	3 soil samples		

Signed:

Adam Fenwick
Technical Reviewer
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-11022
Project / Site name: Etihad Ground Investigation 015
Your Order No: 37349 RH

Lab Sample Number				2519744	2519745	2519746
Sample Reference				BH22/08	BH22/08	BH22/08
Sample Number				5	5	5
Depth (m)				1.50	2.50	4.50
Date Sampled				30/11/2022	30/11/2022	30/11/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	20	19	17
Total mass of sample received	kg	0.001	NONE	1.4	1.5	1.5
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile	Chrysotile	Chrysotile
Asbestos in Soil	Type	N/A	ISO 17025	Detected	Detected	Detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	0.027	0.025	< 0.001
Asbestos Quantification Total	%	0.001	ISO 17025	0.027	0.025	< 0.001
Asbestos Analyst ID	N/A	N/A	N/A	SPU	SPU	SPU
General Inorganics						
pH - Automated	pH Units	N/A	MCERTS	10.2	10.4	8.9
Total Cyanide	mg/kg	1	MCERTS	1.5	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.36	0.36	0.048
Organic Matter (automated)	%	0.1	MCERTS	2.7	2.4	1.5
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	-	1.4	0.9
Loss on Ignition @ 450oC	%	0.2	MCERTS	-	4	3.1
Total Phenols						
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Speciated PAHs						
Naphthalene	mg/kg	0.05	NONE	3.8	1.3	0.23
Acenaphthylene	mg/kg	0.05	NONE	0.23	0.11	< 0.05
Acenaphthene	mg/kg	0.05	NONE	2.4	0.72	0.15
Fluorene	mg/kg	0.05	NONE	2.7	0.63	0.15
Phenanthrene	mg/kg	0.05	NONE	15	3.5	0.69
Anthracene	mg/kg	0.05	NONE	4.3	0.79	0.14
Fluoranthene	mg/kg	0.05	NONE	16	3.4	0.75
Pyrene	mg/kg	0.05	NONE	15	3.2	0.69
Benzo(a)anthracene	mg/kg	0.05	NONE	8	1.6	0.35
Chrysene	mg/kg	0.05	NONE	5.3	1.4	0.34
Benzo(b)fluoranthene	mg/kg	0.05	NONE	5.2	1.3	0.29
Benzo(k)fluoranthene	mg/kg	0.05	NONE	3.3	0.71	0.15
Benzo(a)pyrene	mg/kg	0.05	NONE	5.2	1.1	0.25
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	2.2	0.59	0.11
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	0.54	0.14	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	NONE	2.9	0.71	0.17
Total PAH						
Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	92.3	21.1	4.46
Heavy Metals / Metalloids						
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	20	11	7.6
Boron (water soluble)	mg/kg	0.2	MCERTS	4.6	3	0.7
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1.2	0.6	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	-	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	64	36	26
Copper (aqua regia extractable)	mg/kg	1	MCERTS	71	44	23
Lead (aqua regia extractable)	mg/kg	1	MCERTS	160	110	16
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3

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Analytical Report Number: 22-11022
Project / Site name: Etihad Ground Investigation 015
Your Order No: 37349 RH

Lab Sample Number				2519744	2519745	2519746
Sample Reference				BH22/08	BH22/08	BH22/08
Sample Number				5	5	5
Depth (m)				1.50	2.50	4.50
Date Sampled				30/11/2022	30/11/2022	30/11/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	32	29	32
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	350	160	60
Monoaromatics & Oxygenates						
Benzene	µg/kg	1	NONE	52	-	< 1.0
Toluene	µg/kg	1	NONE	< 1.0	-	< 1.0
Ethylbenzene	µg/kg	1	NONE	< 1.0	-	< 1.0
p & m-xylene	µg/kg	1	NONE	< 1.0	-	< 1.0
o-xylene	µg/kg	1	NONE	< 1.0	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	< 1.0	-	< 1.0
Petroleum Hydrocarbons						
TPH C10 - C40 $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	NONE	770	670	80
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	NONE	1.2	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	NONE	7.2	-	3.3
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	NONE	28	-	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	NONE	180	-	43
TPH-CWG - Aliphatic >EC35 - EC40 $_{EH\_CU\_1D\_AL}$	mg/kg	10	NONE	93	-	29
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	0.046	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	NONE	3.5	-	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	NONE	19	-	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	94	-	< 10
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	270	-	< 10
TPH-CWG - Aromatic >EC35 - EC40 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	83	-	< 10
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	NONE	770	-	80

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number: 22-11022
Project / Site name: Etihad Ground Investigation 015
Your Order No: 37349 RH

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006-PL based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
2519744	BH22/08	1.50	140	Rope	**Chrysotile**	0.027	**0.027**
2519745	BH22/08	2.50	146	Sheeting/Board Debris	**Chrysotile**	0.025	**0.025**
2519746	BH22/08	4.50	142	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**

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

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Analytical Report Number : 22-11022
Project / Site name: Etihad Ground Investigation 015

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2519744	BH22/08	5	1.5	Brown clay with gravel and vegetation.
2519745	BH22/08	5	2.5	Brown clay and loam with gravel and vegetation.
2519746	BH22/08	5	4.5	Brown clay.

Analytical Report Number : 22-11022
Project / Site name: Etihad Ground Investigation 015

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	NONE
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	NONE

Analytical Report Number : 22-11022
Project / Site name: Etihad Ground Investigation 015

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-11025

Project / Site name:	Etihad Ground Investigation 015	**Samples received on:**	01/12/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	01/12/2022
Your order number:	37349 RH	**Analysis completed by:**	09/12/2022
Report Issue Number:	1	**Report issued on:**	09/12/2022
Samples Analysed:	1 leachate sample - 1 soil sample		

Signed: _____

Karolina Marek
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing

Analytical Report Number: 22-11025
Project / Site name: Etihad Ground Investigation 015
Your Order No: 37349 RH

Lab Sample Number				2519784
Sample Reference				BH22/08
Sample Number				5
Depth (m)				1.50
Date Sampled				30/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	20
Total mass of sample received	kg	0.001	NONE	1.4

General Inorganics

pH - Manual	pH Units	N/A	MCERTS	10.6
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	1.6
Loss on Ignition @ 450oC	%	0.2	MCERTS	4.8
Acid Neutralisation Capacity	+/- mmol/kg	-999	NONE	120

Speciated PAHs

Naphthalene	mg/kg	0.05	NONE	3.8
Acenaphthylene	mg/kg	0.05	NONE	0.23
Acenaphthene	mg/kg	0.05	NONE	2.4
Fluorene	mg/kg	0.05	NONE	2.6
Phenanthrene	mg/kg	0.05	NONE	15
Anthracene	mg/kg	0.05	NONE	4.3
Fluoranthene	mg/kg	0.05	NONE	16
Pyrene	mg/kg	0.05	NONE	14
Benzo(a)anthracene	mg/kg	0.05	NONE	7
Chrysene	mg/kg	0.05	NONE	6.3
Benzo(b)fluoranthene	mg/kg	0.05	NONE	5.2
Benzo(k)fluoranthene	mg/kg	0.05	NONE	3.4
Benzo(a)pyrene	mg/kg	0.05	NONE	5.4
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	2.3
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	0.63
Benzo(ghi)perylene	mg/kg	0.05	NONE	3
Coronene	mg/kg	0.05	NONE	< 0.05

Total PAH

Total WAC-17 PAHs	mg/kg	0.85	NONE	92.2

Monoaromatics & Oxygenates

Benzene	µg/kg	1	NONE	27
Toluene	µg/kg	1	NONE	< 1.0
Ethylbenzene	µg/kg	1	NONE	< 1.0
p & m-xylene	µg/kg	1	NONE	< 1.0
o-xylene	µg/kg	1	NONE	< 1.0

Total BTEX	µg/kg	10	NONE	27

Petroleum Hydrocarbons

Mineral Oil (C10 - C40) EH_CU_1D_AL	mg/kg	10	NONE	350

PCBs by GC-MS

PCB Congener 28	mg/kg	0.001	NONE	< 0.001
PCB Congener 52	mg/kg	0.001	NONE	< 0.001
PCB Congener 101	mg/kg	0.001	NONE	0.006
PCB Congener 118	mg/kg	0.001	NONE	0.007
PCB Congener 138	mg/kg	0.001	NONE	0.006
PCB Congener 153	mg/kg	0.001	NONE	0.005
PCB Congener 180	mg/kg	0.001	NONE	< 0.001

Total PCBs by GC-MS

Analytical Report Number: 22-11025
Project / Site name: Etihad Ground Investigation 015
Your Order No: 37349 RH

Lab Sample Number				2519784
Sample Reference				BH22/08
Sample Number				5
Depth (m)				1.50
Date Sampled				30/11/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Total PCBs	mg/kg	0.007	NONE	0.025

U/S = Unsuitable Sample I/S = Insufficient Sample

4041

Analytical Report Number: 22-11025
Project / Site name: Etihad Ground Investigation 015

Your Order No: 37349 RH

Lab Sample Number				2519785
Sample Reference				BH22/08
Sample Number				5
Depth (m)				1.50
Date Sampled				30/11/2022
Time Taken				None Supplied
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
10:1 WAC Leachate				
Arsenic	mg/l	0.001	ISO 17025	0.0187
Barium	mg/l	0.00005	ISO 17025	0.0241
Cadmium	mg/l	0.0001	ISO 17025	< 0.0001
Chromium	mg/l	0.0004	ISO 17025	0.0045
Copper	mg/l	0.0007	ISO 17025	0.036
Mercury	mg/l	0.0005	ISO 17025	< 0.0005
Molybdenum	mg/l	0.0004	ISO 17025	0.0073
Nickel	mg/l	0.0003	ISO 17025	0.011
Lead	mg/l	0.001	ISO 17025	< 0.0010
Antimony	mg/l	0.0017	ISO 17025	< 0.0017
Selenium	mg/l	0.004	ISO 17025	< 0.0040
Zinc	mg/l	0.0004	ISO 17025	0.01
Chloride	mg/l	0.15	ISO 17025	18
Fluoride	mg/l	0.05	ISO 17025	0.25
Sulphate	mg/l	0.1	ISO 17025	42
Total dissolved solids	mg/l	4	ISO 17025	190
Total monohydric phenols	mg/l	0.01	ISO 17025	0.016
Dissolved organic carbon	mg/l	0.1	NONE	12.5
10:1 WAC Leachate				
Arsenic	mg/kg	0.01	NONE	0.149
Barium	mg/kg	0.0005	NONE	0.191
Cadmium	mg/kg	0.0008	NONE	< 0.0008
Chromium	mg/kg	0.004	NONE	0.035
Copper	mg/kg	0.007	NONE	0.28
Mercury	mg/kg	0.005	NONE	< 0.0050
Molybdenum	mg/kg	0.004	NONE	0.0579
Nickel	mg/kg	0.003	NONE	0.087
Lead	mg/kg	0.01	NONE	< 0.010
Antimony	mg/kg	0.017	NONE	< 0.017
Selenium	mg/kg	0.04	NONE	< 0.040
Zinc	mg/kg	0.004	NONE	0.082
Chloride	mg/kg	1.5	NONE	150
Fluoride	mg/kg	0.5	NONE	1.9
Sulphate	mg/kg	1	NONE	330
Total dissolved solids	mg/kg	40	ISO 17025	1500
Total monohydric phenols	mg/kg	0.1	NONE	0.13
Dissolved organic carbon	mg/kg	1	NONE	99

U/S = Unsuitable Sample I/S = Insufficient Sample

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Waste Acceptance Criteria Analytical Results

Report No:	**22-11025**						
					Client:	**GEOENG**	
Location	**Etihad Ground Investigation 015**						
Lab Reference (Sample Number)	2519784 / 2519785				**Landfill Waste Acceptance Criteria**		
					Limits		
Sampling Date	30/11/2022				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	BH22/08 5						
Depth (m)	1.50						
Solid Waste Analysis							
TOC (%)**	1.6				3%	5%	6%
Loss on Ignition (%) **	4.8				--	--	10%
BTEX (µg/kg)	27				6000	--	--
Sum of PCBs (mg/kg)	0.025				1	--	--
Mineral Oil (mg/kg) EH_1D_CU_AL	350				500	--	--
Total PAH (WAC-17) (mg/kg)	92.2				100	--	--
pH (units)**	10.6				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	120				--	To be evaluated	To be evaluated
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.0187			0.149	0.5	2	25
Barium *	0.0241			0.191	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0045			0.035	0.5	10	70
Copper *	0.036			0.28	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0073			0.0579	0.5	10	30
Nickel *	0.011			0.087	0.4	10	40
Lead *	< 0.0010			< 0.010	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.010			0.082	4	50	200
Chloride *	18			150	800	15000	25000
Fluoride*	0.25			1.9	10	150	500
Sulphate *	42			330	1000	20000	50000
TDS*	190			1500	4000	60000	100000
Phenol Index (Monohydric Phenols) *	0.016			0.13	1	-	-
DOC	12.5			99.0	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.4						
Dry Matter (%)	80						
Moisture (%)	20						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.

*= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepencies with current legislation

** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Analytical Report Number : 22-11025
Project / Site name: Etihad Ground Investigation 015

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2519784	BH22/08	5	1.5	Brown clay with gravel and vegetation.

Analytical Report Number : 22-11025
Project / Site name: Etihad Ground Investigation 015

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270.	L064-PL	D	NONE
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	NONE
pH at 20oC in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	NONE
Total BTEX in soil (Poland)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073-PL	W	NONE
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by EC probe using a factor of 0.6.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L031	W	ISO 17025

Analytical Report Number : 22-11025
Project / Site name: Etihad Ground Investigation 015

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-11455

Replaces Analytical Report Number: 22-11455, issue no. 1
Result correction by laboratory.

Project / Site name:	Etihad Ground Investigation 016	**Samples received on:**	01/12/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	05/12/2022
Your order number:	37349 RH	**Analysis completed by:**	23/02/2023
Report Issue Number:	2	**Report issued on:**	02/03/2023
Samples Analysed:	4 soil samples		

Signed:

Dominika Warjan
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Analytical Report Number: 22-11455
Project / Site name: Etihad Ground Investigation 016
Your Order No: 37349 RH

Lab Sample Number				2522267	2522268	2522269	2522270
Sample Reference				TP22/03	TP22/03	TP22/03	OT22/01
Sample Number				2	4	6	3
Depth (m)				0.40-1.25	1.25-1.80	2.00-2.25	1.30-1.50
Date Sampled				30/11/2022	30/11/2022	30/11/2022	30/11/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	34	< 0.1
Moisture Content	%	0.01	NONE	8.1	11	9.3	15
Total mass of sample received	kg	0.001	NONE	1.2	1.2	1.2	1.2
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	SFS	SFS	SFS	SFS
General Inorganics							
pH - Automated	pH Units	N/A	MCERTS	12.2	10.8	11.2	9
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.038	0.52	0.45	0.068
Organic Matter (automated)	%	0.1	MCERTS	1.6	2.2	1.5	1.5
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.9	1.3	-	-
Loss on Ignition @ 450oC	%	0.2	MCERTS	3.5	3.8	-	-
Total Phenols							
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs							
Naphthalene	mg/kg	0.05	MCERTS	0.56	0.68	0.75	0.41
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	0.07	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.76	0.72	1.6	0.18
Fluorene	mg/kg	0.05	MCERTS	0.66	0.51	1.3	0.11
Phenanthrene	mg/kg	0.05	MCERTS	6.6	5.2	11	0.88
Anthracene	mg/kg	0.05	MCERTS	1.4	1.4	2.5	0.15
Fluoranthene	mg/kg	0.05	MCERTS	8.1	7.6	15	0.81
Pyrene	mg/kg	0.05	MCERTS	7.3	7.1	13	0.81
Benzo(a)anthracene	mg/kg	0.05	MCERTS	3.7	3.7	6.1	0.36
Chrysene	mg/kg	0.05	MCERTS	2.8	2.7	5	0.37
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	3.2	3.8	6.6	0.35
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	1.7	1.3	1.6	0.11
Benzo(a)pyrene	mg/kg	0.05	MCERTS	3.3	3.3	5.5	0.3
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.5	1.7	2.7	0.15
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.43	0.4	0.59	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	2	2	3.1	0.18
Total PAH							
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	43.9	42.1	76.1	5.17
Heavy Metals / Metalloids							
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	8	11	9	11
Boron (water soluble)	mg/kg	0.2	MCERTS	0.6	3.7	2.9	0.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.8	0.8	0.7	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	-	-	< 1.8	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	22	49	35	25
Copper (aqua regia extractable)	mg/kg	1	MCERTS	65	69	52	25
Lead (aqua regia extractable)	mg/kg	1	MCERTS	100	180	110	21
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	15	23	21	29
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	140	240	160	71
Monoaromatics & Oxygenates							
Benzene	µg/kg	5	MCERTS	-	< 5.0	-	< 5.0
Toluene	µg/kg	5	MCERTS	-	< 5.0	-	< 5.0

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Analytical Report Number: 22-11455
Project / Site name: Etihad Ground Investigation 016
Your Order No: 37349 RH

Lab Sample Number				2522267	2522268	2522269	2522270
Sample Reference				TP22/03	TP22/03	TP22/03	OT22/01
Sample Number				2	4	6	3
Depth (m)				0.40-1.25	1.25-1.80	2.00-2.25	1.30-1.50
Date Sampled				30/11/2022	30/11/2022	30/11/2022	30/11/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Ethylbenzene	µg/kg	5	MCERTS	-	< 5.0	-	< 5.0
p & m-xylene	µg/kg	5	MCERTS	-	< 5.0	-	< 5.0
o-xylene	µg/kg	5	MCERTS	-	< 5.0	-	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	-	< 5.0	-	< 5.0
Petroleum Hydrocarbons							
TPH C10 - C40 $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	MCERTS	270	370	130	< 10
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	< 0.001	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	-	< 1.0	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	-	2.6	-	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	21	-	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	110	-	< 8.0
TPH-CWG - Aliphatic >EC35 - EC40 $_{EH\_CU\_1D\_AL}$	mg/kg	10	NONE	-	28	-	< 10
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	< 0.001	-	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	-	1.6	-	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	-	19	-	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	56	-	< 10
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	130	-	< 10
TPH-CWG - Aromatic >EC35 - EC40 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	-	13	-	< 10
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	NONE	-	370	-	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number : 22-11455
Project / Site name: Etihad Ground Investigation 016

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2522267	TP22/03	2	0.40-1.25	Brown sandy loam with gravel.
2522268	TP22/03	4	1.25-1.80	Brown sandy loam with gravel and rubble.
2522269	TP22/03	6	2.00-2.25	Brown clay and sand with gravel and stones.
2522270	OT22/01	3	1.30-1.50	Brown clay.

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Analytical Report Number : 22-11455
Project / Site name: Etihad Ground Investigation 016

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS

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Analytical Report Number : 22-11455
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Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-11455

Project / Site name: Etihad Ground Investigation 016

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis.Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
TP22/03	6	S	2522269	b	Monohydric phenols in soil	L080-PL	b
TP22/03	6	S	2522269	b	Speciated EPA-16 PAHs in soil	L064-PL	b

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Analytical Report Number : 22-11461

Project / Site name:	Etihad Ground Investigation 016	**Samples received on:**	01/12/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	05/12/2022
Your order number:	37349 RH	**Analysis completed by:**	13/12/2022
Report Issue Number:	1	**Report issued on:**	13/12/2022
Samples Analysed:	2 10:1 WAC Samples		

Signed:

Adam Fenwick
Technical Reviewer
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Waste Acceptance Criteria Analytical Results

Report No:	**22-11461**						
					Client:	**GEOENG**	
Location	**Etihad Ground Investigation 016**						
Lab Reference (Sample Number)	2522338 / 2522339				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	30/11/2022				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TP22/03 6						
Depth (m)	2.00-2.25						
Solid Waste Analysis							
TOC (%)**	0.9				3%	5%	6%
Loss on Ignition (%) **	3.6				--	--	10%
BTEX (µg/kg) **	< 5.0				6000	--	--
Sum of PCBs (mg/kg) **	0.022				1	--	--
Mineral Oil (mg/kg) EH_1D_CU_AL	25				500	--	--
Total PAH (WAC-17) (mg/kg)	81.4				100	--	--
pH (units)**	11.1				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	98				--	To be evaluated	To be evaluated
Eluate Analysis (BS EN 12457 - 2 preparation utilising end over end leaching procedure)	10:1 mg/l			10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.0067			0.0584	0.5	2	25
Barium *	0.0155			0.134	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0039			0.034	0.5	10	70
Copper *	0.026			0.22	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0059			0.0512	0.5	10	30
Nickel *	0.0050			0.043	0.4	10	40
Lead *	0.0064			0.056	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.016			0.14	4	50	200
Chloride *	2.4			21	800	15000	25000
Fluoride*	0.24			2.1	10	150	500
Sulphate *	18			160	1000	20000	50000
TDS*	72			630	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	11.4			99.3	500	800	1000
Leach Test Information							
Stone Content (%)	34						
Sample Mass (kg)	0.60						
Dry Matter (%)	91						
Moisture (%)	9.3						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.
*= UKAS accredited (liquid eluate analysis only)
Stated limits are for guidance only and i2 cannot be held responsible for any discrepencies with current legislation
** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Waste Acceptance Criteria Analytical Results

Report No:	**22-11461**						
					Client:	**GEOENG**	
Location	**Etihad Ground Investigation 016**						
Lab Reference (Sample Number)	2522340 / 2522341				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	30/11/2022				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	OT22/01 3						
Depth (m)	1.30-1.50						
Solid Waste Analysis							
TOC (%)**	0.9				3%	5%	6%
Loss on Ignition (%) **	2.9				--	--	10%
BTEX (µg/kg) **	< 5.0				6000	--	--
Sum of PCBs (mg/kg) **	< 0.007				1	--	--
Mineral Oil (mg/kg) EH_1D_CU_AL	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	5.60				100	--	--
pH (units)**	8.7				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	15				--	To be evaluated	To be evaluated
Eluate Analysis (BS EN 12457 - 2 preparation utilising end over end leaching procedure)	10:1 mg/l			10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.0018			0.0162	0.5	2	25
Barium *	0.0090			0.0791	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0007			0.0062	0.5	10	70
Copper *	0.0033			0.029	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0078			0.0685	0.5	10	30
Nickel *	< 0.0003			< 0.0030	0.4	10	40
Lead *	< 0.0010			< 0.010	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.0026			0.023	4	50	200
Chloride *	54			470	800	15000	25000
Fluoride*	0.29			2.6	10	150	500
Sulphate *	8.8			77	1000	20000	50000
TDS*	150			1300	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	13.1			115	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.2						
Dry Matter (%)	85						
Moisture (%)	15						

Results are expressed on a dry weight basis, after correction for moisture content where applicable. *= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepencies with current legislation ** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
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Analytical Report Number : 22-11461
Project / Site name: Etihad Ground Investigation 016

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Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2522338	TP22/03	6	2.00-2.25	Brown clay and sand with gravel and stones.
2522340	OT22/01	3	1.30-1.50	Brown clay.

Analytical Report Number : 22-11461
Project / Site name: Etihad Ground Investigation 016

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270.	L064-PL	D	MCERTS
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH at 20oC in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Total BTEX in soil (Poland)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073-PL	W	MCERTS
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by EC probe using a factor of 0.6.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L031	W	ISO 17025

Analytical Report Number : 22-11461
Project / Site name: Etihad Ground Investigation 016

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Analytical Report Number : 22-11461
Project / Site name: Etihad Ground Investigation 016

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis.Please note that the associated result(s) may be unreliable and should be interpreted with care.

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
TP22/03	6	S	2522338	b	BTEX in soil (Monoaromatics)	L073B-PL	b
TP22/03	6	S	2522338	b	Mineral Oil (Soil) C10 - C40	L076-PL	b
TP22/03	6	S	2522338	b	PCB's By GC-MS in soil	L027-PL	b
TP22/03	6	S	2522338	b	Speciated WAC-17 PAHs in soil	L064-PL	b
TP22/03	6	S	2522338	b	Total BTEX in soil (Poland)	L073-PL	b

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Analytical Report Number : 22-11604

Replaces Analytical Report Number: 22-11604, issue no. 1
Result correction by laboratory.

Project / Site name:	Etihad Ground Investigation - 017	**Samples received on:**	05/12/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	05/12/2022
Your order number:	37349 RH	**Analysis completed by:**	23/02/2023
Report Issue Number:	2	**Report issued on:**	02/03/2023
Samples Analysed:	8 soil samples		

Signed:

Dominika Warjan
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 22-11604
Project / Site name: Etihad Ground Investigation - 017
Your Order No: 37349 RH

Lab Sample Number				2523125	2523126	2523127	2523128	2523129
Sample Reference				OT22/02	TP22/06	TP22/06	TP22/06	TP22/07
Sample Number				3	1	3	4	1
Depth (m)				0.90	0.00-0.20	1.30-1.50	2.00-2.20	0.20-0.40
Date Sampled				01/12/2022	01/12/2022	01/12/2022	01/12/2022	01/12/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	23	< 0.1	< 0.1	< 0.1	32
Moisture Content	%	0.01	NONE	7.7	15	13	13	8.2
Total mass of sample received	kg	0.001	NONE	1.2	1.2	1	1	1
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	Amosite
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	< 0.001
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	< 0.001
Asbestos Analyst ID	N/A	N/A	N/A	SCA	SCA	SCA	SCA	SCA
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	9.3	9.7	11.2	11.3	11.5
Total Cyanide	mg/kg	1	MCERTS	2.3	< 1.0	< 1.0	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.29	0.58	0.28	0.22	0.15
Organic Matter (automated)	%	0.1	MCERTS	2	2.5	2.4	2.7	3.2
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	1.2	1.5	-	1.5	1.8
Loss on Ignition @ 450oC	%	0.2	MCERTS	3.4	4.1	-	4.3	4.2
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	0.32	0.78	0.95	1.5	5.3
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	0.16	0.11	0.15	1
Acenaphthene	mg/kg	0.05	MCERTS	0.33	0.61	0.71	1	3.7
Fluorene	mg/kg	0.05	MCERTS	0.25	0.63	0.62	0.91	2.7
Phenanthrene	mg/kg	0.05	MCERTS	2.5	5.2	3.7	5.5	17
Anthracene	mg/kg	0.05	MCERTS	0.54	1.2	0.85	1.5	4.3
Fluoranthene	mg/kg	0.05	MCERTS	3.9	5.3	3.9	5.2	19
Pyrene	mg/kg	0.05	MCERTS	3.8	5.6	3.8	5.2	21
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2	2.5	1.7	2.5	9.3
Chrysene	mg/kg	0.05	MCERTS	1.9	1.6	1.9	2.5	7.5
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	2	1.8	2	2.5	10
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	1.1	1.2	0.85	1.2	4.2
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.9	2.2	1.5	2.1	7.7
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.97	1	0.79	1	3.5
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.25	< 0.05	0.29	0.29	1
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.1	1.3	0.97	1.3	4
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	22.8	31.1	24.5	34.3	121

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Analytical Report Number: 22-11604
Project / Site name: Etihad Ground Investigation - 017
Your Order No: 37349 RH

Lab Sample Number				2523125	2523126	2523127	2523128	2523129
Sample Reference				OT22/02	TP22/06	TP22/06	TP22/06	TP22/07
Sample Number				3	1	3	4	1
Depth (m)				0.90	0.00-0.20	1.30-1.50	2.00-2.20	0.20-0.40
Date Sampled				01/12/2022	01/12/2022	01/12/2022	01/12/2022	01/12/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	27	14	11	12	11
Boron (water soluble)	mg/kg	0.2	MCERTS	0.5	1.1	4.9	0.9	1.8
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1.9	0.7	0.6	0.5	0.9
Chromium (hexavalent)	mg/kg	1.8	MCERTS	-	-	< 1.8	-	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	85	37	33	31	30
Copper (aqua regia extractable)	mg/kg	1	MCERTS	100	54	63	46	61
Lead (aqua regia extractable)	mg/kg	1	MCERTS	170	120	150	110	84
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	22	28	26	25	22
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	480	200	170	170	190
Monoaromatics & Oxygenates								
Benzene	µg/kg	5	MCERTS	-	-	< 5.0	-	-
Toluene	µg/kg	5	MCERTS	-	-	< 5.0	-	-
Ethylbenzene	µg/kg	5	MCERTS	-	-	< 5.0	-	-
p & m-xylene	µg/kg	5	MCERTS	-	-	< 5.0	-	-
o-xylene	µg/kg	5	MCERTS	-	-	< 5.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	-	-	< 5.0	-	-
Petroleum Hydrocarbons								
TPH C10 - C40 $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	MCERTS	79	210	440	350	1300
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	-	< 0.001	-	-
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	-	< 0.001	-	-
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	-	< 0.001	-	-
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	-	-	3.1	-	-
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	-	-	9.5	-	-
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	-	26	-	-
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	-	120	-	-
TPH-CWG - Aliphatic >EC35 - EC40 $_{EH\_CU\_1D\_AL}$	mg/kg	10	NONE	-	-	53	-	-
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	-	< 0.001	-	-
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	-	< 0.001	-	-
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	-	< 0.001	-	-
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	-	-	3.6	-	-
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	-	-	6.6	-	-
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	-	30	-	-
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	-	140	-	-
TPH-CWG - Aromatic >EC35 - EC40 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	-	-	47	-	-
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	NONE	-	-	440	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number: 22-11604
Project / Site name: Etihad Ground Investigation - 017
Your Order No: 37349 RH

Lab Sample Number				2523130	2523131	2523132
Sample Reference				TP22/07	TP22/07	TP22/07
Sample Number				2	3	5
Depth (m)				1.00-1.20	2.20-2.40	3.70-3.90
Date Sampled				01/12/2022	01/12/2022	01/12/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Stone Content	%	0.1	NONE	< 0.1	31	< 0.1
Moisture Content	%	0.01	NONE	8.5	11	13
Total mass of sample received	kg	0.001	NONE	1.2	1.2	1.2
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-
Asbestos Analyst ID	N/A	N/A	N/A	SCA	SCA	SCA
General Inorganics						
pH - Automated	pH Units	N/A	MCERTS	10.4	11	10.2
Total Cyanide	mg/kg	1	MCERTS	< 1.0	3.3	2.3
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.23	0.31	0.39
Organic Matter (automated)	%	0.1	MCERTS	3.3	3	3.3
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	1.9	-	1.9
Loss on Ignition @ 450oC	%	0.2	MCERTS	4.1	-	5.2
Total Phenols						
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Speciated PAHs						
Naphthalene	mg/kg	0.05	MCERTS	13	1.7	2.8
Acenaphthylene	mg/kg	0.05	MCERTS	2	0.15	0.18
Acenaphthene	mg/kg	0.05	MCERTS	8.1	0.98	1.4
Fluorene	mg/kg	0.05	MCERTS	5.2	0.78	1.1
Phenanthrene	mg/kg	0.05	MCERTS	21	5.4	7.1
Anthracene	mg/kg	0.05	MCERTS	6.5	1.3	1.7
Fluoranthene	mg/kg	0.05	MCERTS	16	6.2	6.7
Pyrene	mg/kg	0.05	MCERTS	19	6	6.6
Benzo(a)anthracene	mg/kg	0.05	MCERTS	9.1	3	3.3
Chrysene	mg/kg	0.05	MCERTS	7.3	1.7	2.7
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	8.8	2.4	3.3
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	2.2	1.3	1.4
Benzo(a)pyrene	mg/kg	0.05	MCERTS	8	2.6	2.8
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	3.5	1.3	1.2
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.9	0.27	0.39
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	3.9	1.6	1.6
Total PAH						
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	135	36.6	44.2

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Analytical Report Number: 22-11604
Project / Site name: Etihad Ground Investigation - 017
Your Order No: 37349 RH

Lab Sample Number				2523130	2523131	2523132
Sample Reference				TP22/07	TP22/07	TP22/07
Sample Number				2	3	5
Depth (m)				1.00-1.20	2.20-2.40	3.70-3.90
Date Sampled				01/12/2022	01/12/2022	01/12/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Heavy Metals / Metalloids						
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	14	22	17
Boron (water soluble)	mg/kg	0.2	MCERTS	2.2	1.1	3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.7	1.2	1
Chromium (hexavalent)	mg/kg	1.8	MCERTS	-	-	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	34	50	59
Copper (aqua regia extractable)	mg/kg	1	MCERTS	57	62	61
Lead (aqua regia extractable)	mg/kg	1	MCERTS	94	130	120
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	26	29	32
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	190	370	290
Monoaromatics & Oxygenates						
Benzene	µg/kg	5	MCERTS	-	< 5.0	-
Toluene	µg/kg	5	MCERTS	-	< 5.0	-
Ethylbenzene	µg/kg	5	MCERTS	-	< 5.0	-
p & m-xylene	µg/kg	5	MCERTS	-	< 5.0	-
o-xylene	µg/kg	5	MCERTS	-	< 5.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	-	< 5.0	-
Petroleum Hydrocarbons						
TPH C10 - C40 $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	MCERTS	1300	150	290
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	< 0.001	-
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	< 0.001	-
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	< 0.001	-
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	-	< 1.0	-
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	-	< 2.0	-
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	< 8.0	-
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	21	-
TPH-CWG - Aliphatic >EC35 - EC40 $_{EH\_CU\_1D\_AL}$	mg/kg	10	NONE	-	< 10	-
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	< 0.001	-
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	< 0.001	-
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	< 0.001	-
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	-	1.9	-
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	-	4.5	-
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	17	-
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	65	-
TPH-CWG - Aromatic >EC35 - EC40 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	-	38	-
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	NONE	-	150	-

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number: 22-11604
Project / Site name: Etihad Ground Investigation - 017
Your Order No: 37349 RH

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006-PL based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
2523129	TP22/07	0.20-0.40	134	Loose Fibres	**Amosite**	< 0.001	**< 0.001**

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

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Analytical Report Number : 22-11604
Project / Site name: Etihad Ground Investigation - 017

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2523125	OT22/02	3	0.9	Brown clay and sand with stones and gravel
2523126	TP22/06	1	0.00-0.20	Brown loam and clay with gravel and vegetation.
2523127	TP22/06	3	1.30-1.50	Brown clay and sand with gravel and vegetation.
2523128	TP22/06	4	2.00-2.20	Brown clay and sand with gravel and vegetation.
2523129	TP22/07	1	0.20-0.40	Brown clay and sand with stones and gravel
2523130	TP22/07	2	1.00-1.20	Brown clay and sand with gravel.
2523131	TP22/07	3	2.20-2.40	Brown clay and sand with stones.
2523132	TP22/07	5	3.70-3.90	Brown clay and sand with gravel.

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Analytical Report Number : 22-11604
Project / Site name: Etihad Ground Investigation - 017

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number : 22-11604
Project / Site name: Etihad Ground Investigation - 017

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-11612

Project / Site name:	Etihad Ground Investigation - 017	**Samples received on:**	05/12/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	05/12/2022
Your order number:	37349 RH	**Analysis completed by:**	14/12/2022
Report Issue Number:	1	**Report issued on:**	14/12/2022
Samples Analysed:	2 leachate samples - 2 soil samples		

Signed:

Adam Fenwick
Technical Reviewer
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Waste Acceptance Criteria Analytical Results

Report No:	**22-11612**						
					Client:	**GEOENG**	
Location	**Etihard Ground Investiagtion - 017**						
Lab Reference (Sample Number)	2523201 / 2523202				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	01/12/2022						
Sample ID	TP22/06 3				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Depth (m)	1.30-1.50						
Solid Waste Analysis							
TOC (%)**	1.4				3%	5%	6%
Loss on Ignition (%) **	4.4				--	--	10%
BTEX (µg/kg) **	< 5.0				6000	--	--
Sum of PCBs (mg/kg) **	0.034				1	--	--
Mineral Oil (mg/kg) EH_1D_CU_AL	230				500	--	--
Total PAH (WAC-17) (mg/kg)	42.8				100	--	--
pH (units)**	12.0				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	100				--	To be evaluated	To be evaluated
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.0021			0.0180	0.5	2	25
Barium *	0.0846			0.709	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0024			0.020	0.5	10	70
Copper *	0.087			0.73	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0128			0.108	0.5	10	30
Nickel *	0.024			0.20	0.4	10	40
Lead *	< 0.0010			< 0.010	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	0.0044			< 0.040	0.1	0.5	7
Zinc *	0.0076			0.064	4	50	200
Chloride *	11			95	800	15000	25000
Fluoride*	0.30			2.5	10	150	500
Sulphate *	49			410	1000	20000	50000
TDS*	400			3300	4000	60000	100000
Phenol Index (Monohydric Phenols) *	0.024			0.20	1	-	-
DOC	16.4			137	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.0						
Dry Matter (%)	87						
Moisture (%)	13						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.

*= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepencies with current legislation

** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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The results included within the report are representative of the samples submitted for analysis.

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Waste Acceptance Criteria Analytical Results

Report No:	**22-11612**							
					Client:	**GEOENG**		
Location	**Etihard Ground Investiagtion - 017**							
Lab Reference (Sample Number)	2523203 / 2523204				**Landfill Waste Acceptance Criteria Limits**			
Sampling Date	01/12/2022				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID	TP22/07 3							
Depth (m)	2.20-2.40							
Solid Waste Analysis								
TOC (%)**	1.7				3%	5%	6%	
Loss on Ignition (%) **	4.9				--	--	10%	
BTEX (µg/kg) **	< 5.0				6000	--	--	
Sum of PCBs (mg/kg) **	0.025				1	--	--	
Mineral Oil (mg/kg) EH_1D_CU_AL	27				500	--	--	
Total PAH (WAC-17) (mg/kg)	38.2				100	--	--	
pH (units)**	10.6				--	>6	--	
Acid Neutralisation Capacity (mmol / kg)	46				--	To be evaluated	To be evaluated	
Eluate Analysis (BS EN 12457 - 2 preparation utilising end over end leaching procedure)	10:1 mg/l			10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg (mg/kg)			
Arsenic *	0.0221			0.192	0.5	2	25	
Barium *	0.0264			0.230	20	100	300	
Cadmium *	< 0.0001			< 0.0008	0.04	1	5	
Chromium *	0.0072			0.062	0.5	10	70	
Copper *	0.045			0.39	2	50	100	
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2	
Molybdenum *	0.0133			0.116	0.5	10	30	
Nickel *	0.012			0.11	0.4	10	40	
Lead *	< 0.0010			< 0.010	0.5	10	50	
Antimony *	< 0.0017			< 0.017	0.06	0.7	5	
Selenium *	< 0.0040			< 0.040	0.1	0.5	7	
Zinc *	0.0064			0.056	4	50	200	
Chloride *	13			110	800	15000	25000	
Fluoride*	0.24			2.1	10	150	500	
Sulphate *	84			730	1000	20000	50000	
TDS*	210			1800	4000	60000	100000	
Phenol Index (Monohydric Phenols) *	0.012			0.11	1	-	-	
DOC	11.2			97.7	500	800	1000	
Leach Test Information								
Stone Content (%)	31							
Sample Mass (kg)	1.2							
Dry Matter (%)	89							
Moisture (%)	11							

Results are expressed on a dry weight basis, after correction for moisture content where applicable.

*= UKAS accredited (liquid eluate analysis only)

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** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Analytical Report Number : 22-11612
Project / Site name: Etihard Ground Investiagtion - 017

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2523201	TP22/06	3	1.30-1.50	Brown clay and sand with gravel and vegetation.
2523203	TP22/07	3	2.20-2.40	Brown clay and sand with stones.

Analytical Report Number : 22-11612
Project / Site name: Etihard Ground Investiagtion - 017

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270.	L064-PL	D	MCERTS
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH at 20oC in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Total BTEX in soil (Poland)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073-PL	W	MCERTS
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025

Analytical Report Number : 22-11612
Project / Site name: Etihard Ground Investiagtion - 017

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by EC probe using a factor of 0.6.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L031	W	ISO 17025
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-12097

Project / Site name:	Eithad Ground Investigation - 018	**Samples received on:**	05/12/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	08/12/2022
Your order number:	37349 RH	**Analysis completed by:**	15/12/2022
Report Issue Number:	1	**Report issued on:**	15/12/2022
Samples Analysed:	4 soil samples		

Signed:

Anna Goc
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 22-12097
Project / Site name: Eithad Ground Investigation - 018
Your Order No: 37349 RH

Lab Sample Number				2525956	2525957	2525958	2525959
Sample Reference				BH22/06A	BH22/06A	(WS)TP22/08	(WS)TP22/08
Sample Number				3	4	3	5
Depth (m)				3.70-3.90	4.20-4.40	0.50	2.00
Date Sampled				02/12/2022	02/12/2022	02/12/2022	02/12/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Stone Content	%	0.1	NONE	15	< 0.1	22	< 0.1
Moisture Content	%	0.01	NONE	10	15	8.4	16
Total mass of sample received	kg	0.001	NONE	1.5	1.5	1.4	1.4
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	PDO	PDO	PDO	PDO
General Inorganics							
pH - Automated	pH Units	N/A	MCERTS	10.6	9	10	10.3
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	1.2	2.8
Free Cyanide	mg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.34	0.14	0.53	0.61
Organic Matter (automated)	%	0.1	MCERTS	1.9	1.3	2.3	2.1
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	-	-	-	1.2
Loss on Ignition @ 450oC	%	0.2	MCERTS	-	-	-	3.9
Total Phenols							
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs							
Naphthalene	mg/kg	0.05	MCERTS	1.4	0.17	2.5	1.5
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.27	0.12
Acenaphthene	mg/kg	0.05	MCERTS	2.8	0.17	1.3	0.65
Fluorene	mg/kg	0.05	MCERTS	2.2	0.15	1	0.51
Phenanthrene	mg/kg	0.05	MCERTS	20	1	8.5	3
Anthracene	mg/kg	0.05	MCERTS	5.5	0.22	1.9	0.67
Fluoranthene	mg/kg	0.05	MCERTS	34	0.85	8.3	3.2
Pyrene	mg/kg	0.05	MCERTS	34	0.72	8.1	3.2
Benzo(a)anthracene	mg/kg	0.05	MCERTS	15	0.36	4.2	1.8
Chrysene	mg/kg	0.05	MCERTS	13	0.22	3.2	1.3
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	14	0.29	3.8	1.4
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	7.6	0.09	1.8	0.73
Benzo(a)pyrene	mg/kg	0.05	MCERTS	14	0.23	3.6	1.3
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	6.2	< 0.05	1.8	0.58
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	1.3	< 0.05	0.31	0.12
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	7	< 0.05	2	0.68
Total PAH							
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	177	4.47	52.5	20.7
Heavy Metals / Metalloids							
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	8.2	7.7	12	12
Boron (water soluble)	mg/kg	0.2	MCERTS	1.4	0.3	1.9	1.1
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.5	0.3	1.3	0.6
Chromium (hexavalent)	mg/kg	1.8	MCERTS	-	-	< 1.8	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	17	29	30	34
Copper (aqua regia extractable)	mg/kg	1	MCERTS	48	30	63	93
Lead (aqua regia extractable)	mg/kg	1	MCERTS	67	18	120	90
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	16	32	18	26
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	97	73	180	150
Monoaromatics & Oxygenates							
Benzene	µg/kg	5	MCERTS	-	-	-	< 5.0
Toluene	µg/kg	5	MCERTS	-	-	-	< 5.0

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 22-12097
Project / Site name: Eithad Ground Investigation - 018
Your Order No: 37349 RH

Lab Sample Number				2525956	2525957	2525958	2525959
Sample Reference				BH22/06A	BH22/06A	(WS)TP22/08	(WS)TP22/08
Sample Number				3	4	3	5
Depth (m)				3.70-3.90	4.20-4.40	0.50	2.00
Date Sampled				02/12/2022	02/12/2022	02/12/2022	02/12/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Ethylbenzene	µg/kg	5	MCERTS	-	-	-	< 5.0
p & m-xylene	µg/kg	5	MCERTS	-	-	-	< 5.0
o-xylene	µg/kg	5	MCERTS	-	-	-	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	-	-	-	< 5.0
Petroleum Hydrocarbons							
TPH C10 - C40 EH_CU_1D_TOTAL	mg/kg	10	MCERTS	500	< 10	350	280
TPH-CWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.001	NONE	-	-	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.001	NONE	-	-	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.001	NONE	-	-	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	MCERTS	-	-	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	MCERTS	-	-	-	12
TPH-CWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	MCERTS	-	-	-	77
TPH-CWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	MCERTS	-	-	-	92
TPH-CWG - Aliphatic >EC35 - EC40 EH_CU_1D_AL	mg/kg	10	MCERTS	-	-	-	< 10
TPH-CWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.001	NONE	-	-	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.001	NONE	-	-	-	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.001	NONE	-	-	-	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	-	-	-	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	-	-	-	4.2
TPH-CWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	-	-	-	31
TPH-CWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	-	-	-	54
TPH-CWG - Aromatic >EC35 - EC40 EH_CU_1D_AR	mg/kg	10	NONE	-	-	-	< 10
TPH Total C5 - C40 EH_CU+HS_1D_TOTAL	mg/kg	10	NONE	-	-	-	280

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number : 22-12097
Project / Site name: Eithad Ground Investigation - 018

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2525956	BH22/06A	3	3.70-3.90	Brown clay and sand with gravel and stones.
2525957	BH22/06A	4	4.20-4.40	Brown clay.
2525958	(WS)TP22/08	3	0.5	Brown loam and sand with vegetation and stones.
2525959	(WS)TP22/08	5	2	Brown clay and loam with gravel and vegetation.

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Analytical Report Number : 22-12097
Project / Site name: Eithad Ground Investigation - 018

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS

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Analytical Report Number : 22-12097
Project / Site name: Eithad Ground Investigation - 018

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-12099

Project / Site name:	Etihad Ground Investigation - 018	**Samples received on:**	05/12/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	08/12/2022
Your order number:	37349 RH	**Analysis completed by:**	15/12/2022
Report Issue Number:	1	**Report issued on:**	15/12/2022
Samples Analysed:	10:1 WAC sample		

Signed:

Anna Goc
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Waste Acceptance Criteria Analytical Results

Report No:	**22-12099**						
					Client:	**GEOENG**	
Location	**Etihad Ground Investigation - 018**						
Lab Reference (Sample Number)	2525961 / 2525962				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	02/12/2022				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	(WS)TP22/08 3						
Depth (m)	0.50						
Solid Waste Analysis							
TOC (%)**	1.3				3%	5%	6%
Loss on Ignition (%) **	3.6				--	--	10%
BTEX (µg/kg) **	< 5.0				6000	--	--
Sum of PCBs (mg/kg) **	0.030				1	--	--
Mineral Oil (mg/kg) EH_1D_CU_AL	140				500	--	--
Total PAH (WAC-17) (mg/kg)	53.5				100	--	--
pH (units)**	9.8				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	58				--	To be evaluated	To be evaluated
Eluate Analysis (BS EN 12457 - 2 preparation utilising end over end leaching procedure)	10:1 mg/l			10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.0110			0.0942	0.5	2	25
Barium *	0.0300			0.257	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0026			0.023	0.5	10	70
Copper *	0.050			0.43	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0111			0.0952	0.5	10	30
Nickel *	0.012			0.11	0.4	10	40
Lead *	< 0.0010			< 0.010	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.011			0.095	4	50	200
Chloride *	9.7			83	800	15000	25000
Fluoride*	0.18			1.5	10	150	500
Sulphate *	50			430	1000	20000	50000
TDS*	190			1600	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	14.3			122	500	800	1000
Leach Test Information							
Stone Content (%)	22						
Sample Mass (kg)	1.4						
Dry Matter (%)	92						
Moisture (%)	8.4						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.

*= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepencies with current legislation

** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Analytical Report Number : 22-12099
Project / Site name: Etihad Ground Investigation - 018

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2525961	(WS)TP22/08	3	0.5	Brown loam and sand with vegetation and stones.

Analytical Report Number : 22-12099
Project / Site name: Etihad Ground Investigation - 018

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270.	L064-PL	D	MCERTS
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH at 20oC in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Total BTEX in soil (Poland)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073-PL	W	MCERTS
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by EC probe using a factor of 0.6.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L031	W	ISO 17025

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Analytical Report Number : 22-12099
Project / Site name: Etihad Ground Investigation - 018

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-12746

Replaces Analytical Report Number: 22-12746, issue no. 1
Result correction by laboratory.

Project / Site name:	Etihad Ground Investigation - 020	**Samples received on:**	09/12/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	09/12/2022
Your order number:	37349 RH	**Analysis completed by:**	23/02/2023
Report Issue Number:	2	**Report issued on:**	02/03/2023
Samples Analysed:	3 soil samples		

Signed:

Dominika Warjan
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Analytical Report Number: 22-12746
Project / Site name: Etihad Ground Investigation - 020
Your Order No: 37349 RH

Lab Sample Number				2529891	2529892	2529893
Sample Reference				(WS)TP22/01	(WS)TP22/01	(WS)TP22/01
Sample Number				3	4	6
Depth (m)				0.50	1.00	1.80
Date Sampled				05/12/2022	05/12/2022	07/12/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Stone Content	%	0.1	NONE	< 0.1	< 0.1	34
Moisture Content	%	0.01	NONE	12	10	8.7
Total mass of sample received	kg	0.001	NONE	1.3	1.3	1.3
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	MWI	MWI	MWI
General Inorganics						
pH - Automated	pH Units	N/A	MCERTS	9.4	9.2	8.2
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.21	0.15	0.34
Organic Matter (automated)	%	0.1	MCERTS	0.9	0.7	3.7
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.5	0.4	-
Loss on Ignition @ 450oC	%	0.2	MCERTS	2.2	1.9	-
Total Phenols						
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Speciated PAHs						
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.1	0.14	0.09
Fluorene	mg/kg	0.05	MCERTS	0.07	0.08	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.55	0.79	0.7
Anthracene	mg/kg	0.05	MCERTS	0.14	0.17	0.15
Fluoranthene	mg/kg	0.05	MCERTS	0.85	1.1	0.9
Pyrene	mg/kg	0.05	MCERTS	1	1.3	0.86
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.61	0.63	0.43
Chrysene	mg/kg	0.05	MCERTS	0.45	0.6	0.49
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.7	0.46	0.44
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.25	0.23	0.17
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.55	0.58	0.45
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.24	0.33	0.23
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.07	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.34	0.32	0.27
Total PAH						
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	5.96	6.69	5.18
Heavy Metals / Metalloids						
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	6.5	4.8	96
Boron (water soluble)	mg/kg	0.2	MCERTS	1.1	0.6	3.1
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.6	0.4	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	16	13	120
Copper (aqua regia extractable)	mg/kg	1	MCERTS	11	7.7	310
Lead (aqua regia extractable)	mg/kg	1	MCERTS	36	29	340
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	15	14	51
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	110	82	1300

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Analytical Report Number: 22-12746
Project / Site name: Etihad Ground Investigation - 020
Your Order No: 37349 RH

Lab Sample Number				2529891	2529892	2529893
Sample Reference				(WS)TP22/01	(WS)TP22/01	(WS)TP22/01
Sample Number				3	4	6
Depth (m)				0.50	1.00	1.80
Date Sampled				05/12/2022	05/12/2022	07/12/2022
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Monoaromatics & Oxygenates						
Benzene	µg/kg	5	MCERTS	-	-	< 5.0
Toluene	µg/kg	5	MCERTS	-	-	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	-	-	< 5.0
p & m-xylene	µg/kg	5	MCERTS	-	-	< 5.0
o-xylene	µg/kg	5	NONE	-	-	< 5.0*
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	-	-	< 5.0
Petroleum Hydrocarbons						
TPH C10 - C40 $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	MCERTS	28	27	39
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	-	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	-	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	-	-	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	-	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	-	-	< 8.0
TPH-CWG - Aliphatic >EC35 - EC40 $_{EH\_CU\_1D\_AL}$	mg/kg	10	NONE	-	-	< 10
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	-	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	-	-	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	-	-	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	-	-	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	-	16
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	-	22
TPH-CWG - Aromatic >EC35 - EC40 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	-	-	< 10
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	NONE	-	-	39

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

*Data reported unaccredited due to quality control parameter failure associated with this result; other checks applied prior to reporting the data have been accepted and the failure justified as having no significant impact on sample data reported.

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Analytical Report Number : 22-12746
Project / Site name: Etihad Ground Investigation - 020

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2529891	(WS)TP22/01	3	0.5	Brown clay and sand with gravel.
2529892	(WS)TP22/01	4	1	Brown clay and sand with gravel.
2529893	(WS)TP22/01	6	1.8	Brown sand with chalk and stones.

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Analytical Report Number : 22-12746
Project / Site name: Etihad Ground Investigation - 020

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS

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Analytical Report Number : 22-12746
Project / Site name: Etihad Ground Investigation - 020

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-12746

Project / Site name: Etihad Ground Investigation - 020

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis.Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
(WS)TP22/01	3	S	2529891	c	Free cyanide in soil	L080-PL	c
(WS)TP22/01	3	S	2529891	c	Total cyanide in soil	L080-PL	c
(WS)TP22/01	4	S	2529892	c	Free cyanide in soil	L080-PL	c
(WS)TP22/01	4	S	2529892	c	Total cyanide in soil	L080-PL	c

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Analytical Report Number : 22-12757

Replaces Analytical Report Number: 22-12757, issue no. 1
Result correction by laboratory.

Project / Site name:	Etihad Ground Investigation - 020	**Samples received on:**	09/12/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	09/12/2022
Your order number:	37349/RH	**Analysis completed by:**	16/12/2022
Report Issue Number:	2	**Report issued on:**	02/03/2023
Samples Analysed:	1 leachate sample - 1 soil sample		

Signed:

Dominika Warjan
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Analytical Report Number: 22-12757
Project / Site name: Etihad Ground Investigation - 020
Your Order No: 37349/RH

Lab Sample Number				2529913
Sample Reference				(WS)TP22/01
Sample Number				6
Depth (m)				1.80
Date Sampled				07/12/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	34
Moisture Content	%	0.01	NONE	8.7
Total mass of sample received	kg	0.001	NONE	1.3

General Inorganics

pH - Manual	pH Units	N/A	MCERTS	7.7
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	2.1
Loss on Ignition @ 450oC	%	0.2	MCERTS	6.9
Acid Neutralisation Capacity	+/- mmol/kg	-999	NONE	5.3

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.24
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.1
Fluorene	mg/kg	0.05	MCERTS	0.08
Phenanthrene	mg/kg	0.05	MCERTS	0.66
Anthracene	mg/kg	0.05	MCERTS	0.14
Fluoranthene	mg/kg	0.05	MCERTS	0.87
Pyrene	mg/kg	0.05	MCERTS	0.86
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.53
Chrysene	mg/kg	0.05	MCERTS	0.41
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.68
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.32
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.38
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.23
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.29
Coronene	mg/kg	0.05	NONE	< 0.05

Total PAH

Total WAC-17 PAHs	mg/kg	0.85	NONE	5.72

Monoaromatics & Oxygenates

Benzene	µg/kg	5	MCERTS	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0
p & m-xylene	µg/kg	5	MCERTS	< 5.0
o-xylene	µg/kg	5	NONE	< 5.0*

Total BTEX	µg/kg	5	MCERTS	< 5.0*

Petroleum Hydrocarbons

Mineral Oil (C10 - C40) EH_CU_1D_AL	mg/kg	10	NONE	< 10

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Analytical Report Number: 22-12757
Project / Site name: Etihad Ground Investigation - 020
Your Order No: 37349/RH

Lab Sample Number				2529913
Sample Reference				(WS)TP22/01
Sample Number				6
Depth (m)				1.80
Date Sampled				07/12/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
PCBs by GC-MS				
PCB Congener 28	mg/kg	0.001	MCERTS	< 0.001
PCB Congener 52	mg/kg	0.001	MCERTS	< 0.001
PCB Congener 101	mg/kg	0.001	MCERTS	< 0.001
PCB Congener 118	mg/kg	0.001	MCERTS	< 0.001
PCB Congener 138	mg/kg	0.001	MCERTS	< 0.001
PCB Congener 153	mg/kg	0.001	MCERTS	< 0.001
PCB Congener 180	mg/kg	0.001	MCERTS	< 0.001
Total PCBs by GC-MS				
Total PCBs	mg/kg	0.007	MCERTS	< 0.007

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected
*Data reported unaccredited due to quality control parameter failure associated with this result; other checks applied prior to reporting the data have been accepted and the failure justified as having no significant impact on sample data reported.

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Analytical Report Number: 22-12757
Project / Site name: Etihad Ground Investigation - 020

Your Order No: 37349/RH

Lab Sample Number				2529914
Sample Reference				(WS)TP22/01
Sample Number				6
Depth (m)				1.80
Date Sampled				07/12/2022
Time Taken				None Supplied
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
10:1 WAC Leachate				
Arsenic	mg/l	0.001	ISO 17025	0.0049
Barium	mg/l	0.00005	ISO 17025	0.0273
Cadmium	mg/l	0.0001	ISO 17025	< 0.0001
Chromium	mg/l	0.0004	ISO 17025	< 0.0004
Copper	mg/l	0.0007	ISO 17025	0.0044
Mercury	mg/l	0.0005	ISO 17025	< 0.0005
Molybdenum	mg/l	0.0004	ISO 17025	0.0091
Nickel	mg/l	0.0003	ISO 17025	0.0078
Lead	mg/l	0.001	ISO 17025	0.0017
Antimony	mg/l	0.0017	ISO 17025	< 0.0017
Selenium	mg/l	0.004	ISO 17025	< 0.0040
Zinc	mg/l	0.0004	ISO 17025	0.019
Chloride	mg/l	0.15	ISO 17025	4.7
Fluoride	mg/l	0.05	ISO 17025	0.31
Sulphate	mg/l	0.1	ISO 17025	44
Total dissolved solids	mg/l	4	ISO 17025	110
Total monohydric phenols	mg/l	0.01	ISO 17025	< 0.010
Dissolved organic carbon	mg/l	0.1	NONE	3.65
10:1 WAC Leachate				
Arsenic	mg/kg	0.01	NONE	0.0426
Barium	mg/kg	0.0005	NONE	0.236
Cadmium	mg/kg	0.0008	NONE	< 0.0008
Chromium	mg/kg	0.004	NONE	< 0.0040
Copper	mg/kg	0.007	NONE	0.038
Mercury	mg/kg	0.005	NONE	< 0.0050
Molybdenum	mg/kg	0.004	NONE	0.0786
Nickel	mg/kg	0.003	NONE	0.067
Lead	mg/kg	0.01	NONE	0.014
Antimony	mg/kg	0.017	NONE	< 0.017
Selenium	mg/kg	0.04	NONE	< 0.040
Zinc	mg/kg	0.004	NONE	0.16
Chloride	mg/kg	1.5	NONE	40
Fluoride	mg/kg	0.5	NONE	2.7
Sulphate	mg/kg	1	NONE	380
Total dissolved solids	mg/kg	40	ISO 17025	940
Total monohydric phenols	mg/kg	0.1	NONE	< 0.10
Dissolved organic carbon	mg/kg	1	NONE	31.5

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Waste Acceptance Criteria Analytical Results

Report No:	**22-12757**						
					Client:	**GEOENG**	
Location	**Etihad Ground Investigation - 020**						
Lab Reference (Sample Number)	2529913 / 2529914				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	07/12/2022				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	(WS)TP22/01 6						
Depth (m)	1.80						
Solid Waste Analysis							
TOC (%)**	2.1				3%	5%	6%
Loss on Ignition (%) **	6.9				--	--	10%
BTEX (µg/kg) **	< 5.0				6000	--	--
Sum of PCBs (mg/kg) **	< 0.007				1	--	--
Mineral Oil (mg/kg) EH_1D_CU_AL	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	5.72				100	--	--
pH (units)**	7.7				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	5.3				--	To be evaluated	To be evaluated
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.0049			0.0426	0.5	2	25
Barium *	0.0273			0.236	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	< 0.0004			< 0.0040	0.5	10	70
Copper *	0.0044			0.038	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0091			0.0786	0.5	10	30
Nickel *	0.0078			0.067	0.4	10	40
Lead *	0.0017			0.014	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.019			0.16	4	50	200
Chloride *	4.7			40	800	15000	25000
Fluoride*	0.31			2.7	10	150	500
Sulphate *	44			380	1000	20000	50000
TDS*	110			940	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	3.65			31.5	500	800	1000
Leach Test Information							
Stone Content (%)	34						
Sample Mass (kg)	1.3						
Dry Matter (%)	91						
Moisture (%)	8.7						

Results are expressed on a dry weight basis, after correction for moisture content where applicable. *= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepencies with current legislation ** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number : 22-12757
Project / Site name: Etihad Ground Investigation - 020

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2529913	(WS)TP22/01	6	1.8	Brown sand with chalk and stones.

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Analytical Report Number : 22-12757
Project / Site name: Etihad Ground Investigation - 020

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270.	L064-PL	D	MCERTS
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH at 20oC in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	ISO 17025
Total BTEX in soil (Poland)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073-PL	W	MCERTS
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025

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Analytical Report Number : 22-12757
Project / Site name: Etihad Ground Investigation - 020

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by EC probe using a factor of 0.6.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L031	W	ISO 17025
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-12737

Replaces Analytical Report Number: 22-12737, issue no. 1
Result correction by laboratory.

Project / Site name:	Eihad Ground Investigation - 021	**Samples received on:**	09/12/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	09/12/2022
Your order number:	37349-RH	**Analysis completed by:**	23/02/2023
Report Issue Number:	2	**Report issued on:**	02/03/2023
Samples Analysed:	1 soil sample		

Signed:

Dominika Warjan
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Analytical Report Number: 22-12737
Project / Site name: Eihad Ground Investigation - 021
Your Order No: 37349-RH

Lab Sample Number				2529860
Sample Reference				(WS) TP22-05
Sample Number				3
Depth (m)				0.50
Date Sampled				08/12/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	2.6
Total mass of sample received	kg	0.001	NONE	1.3

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	ASE

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	11.4
Total Cyanide	mg/kg	1	MCERTS	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.091
Organic Matter (automated)	%	0.1	MCERTS	0.6
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.4

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.15
Anthracene	mg/kg	0.05	MCERTS	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.25
Pyrene	mg/kg	0.05	MCERTS	0.28
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.12
Chrysene	mg/kg	0.05	MCERTS	0.12
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.13
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.08
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.13
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.09
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.09

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	1.44

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	2.3
Boron (water soluble)	mg/kg	0.2	MCERTS	0.9
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.4
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	6.6
Copper (aqua regia extractable)	mg/kg	1	MCERTS	15
Lead (aqua regia extractable)	mg/kg	1	MCERTS	12
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	3.7
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	21

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Analytical Report Number: 22-12737
Project / Site name: Eihad Ground Investigation - 021
Your Order No: 37349-RH

Lab Sample Number				2529860
Sample Reference				(WS) TP22-05
Sample Number				3
Depth (m)				0.50
Date Sampled				08/12/2022
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Monoaromatics & Oxygenates				
Benzene	µg/kg	5	MCERTS	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0
p & m-xylene	µg/kg	5	MCERTS	< 5.0
o-xylene	µg/kg	5	MCERTS	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0
Petroleum Hydrocarbons				
TPH C10 - C40 $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	MCERTS	37
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	28
TPH-CWG - Aliphatic >EC35 - EC40 $_{EH\_CU\_1D\_AL}$	mg/kg	10	NONE	< 10
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10
TPH-CWG - Aromatic >EC35 - EC40 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	< 10
TPH Total C5 - C40 $_{EH\_CU+HS\_1D\_TOTAL}$	mg/kg	10	NONE	37

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number : 22-12737
Project / Site name: Eihad Ground Investigation - 021

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2529860	(WS) TP22-05	3	0.5	Grey sand with rubble and gravel

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Analytical Report Number : 22-12737
Project / Site name: Eihad Ground Investigation - 021

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
TPH Chromatogram in Soil	TPH Chromatogram in Soil.	In-house method	L064-PL	D	NONE
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS

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Analytical Report Number : 22-12737
Project / Site name: Eihad Ground Investigation - 021

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

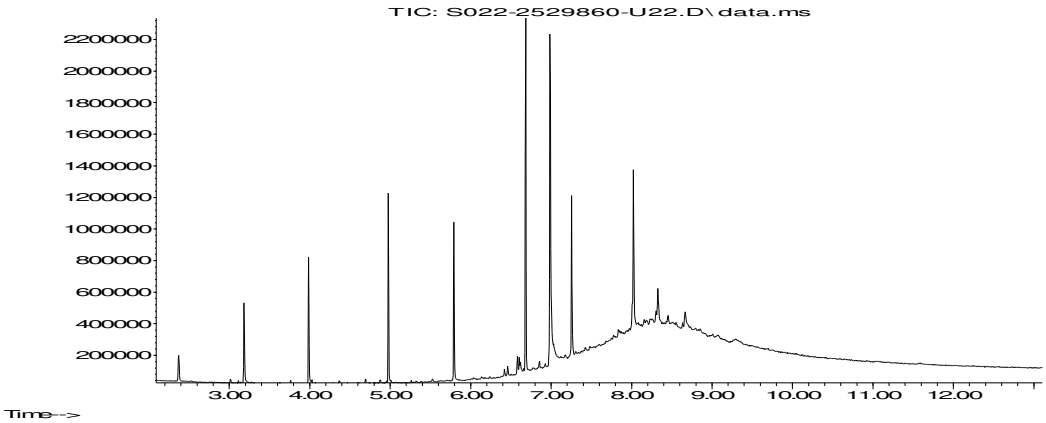
For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-12740

Project / Site name:	Etihad Ground Investigation - 021	**Samples received on:**	09/12/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	09/12/2022
Your order number:	37349-RH	**Analysis completed by:**	19/12/2022
Report Issue Number:	1	**Report issued on:**	19/12/2022
Samples Analysed:	1 10:1 WAC sample		

Signed:

Dominika Warjan
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Waste Acceptance Criteria Analytical Results

Report No:	**22-12740**						
					Client:	**GEOENG**	
Location	**Etihad Ground Investigation - 021**						
Lab Reference (Sample Number)	2529864 / 2529865				**Landfill Waste Acceptance Criteria**		
					Limits		
Sampling Date	08/12/2022				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	(WS) TP22-05 3						
Depth (m)	0.50						
Solid Waste Analysis							
TOC (%)**	0.4				3%	5%	6%
Loss on Ignition (%) **	1.2				--	--	10%
BTEX (µg/kg) **	< 5.0				6000	--	--
Sum of PCBs (mg/kg) **	< 0.007				1	--	--
Mineral Oil (mg/kg) EH_1D_CU_AL	52				500	--	--
Total PAH (WAC-17) (mg/kg) ***	1.86				100	--	--
pH (units)**	9.8				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	17				--	To be evaluated	To be evaluated
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	< 0.0010			< 0.0100	0.5	2	25
Barium *	0.0195			0.186	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0007			0.0071	0.5	10	70
Copper *	0.0083			0.079	2	50	100
Mercury *	0.0039			0.0373	0.01	0.2	2
Molybdenum *	0.0009			0.0088	0.5	10	30
Nickel *	< 0.0003			< 0.0030	0.4	10	40
Lead *	< 0.0010			< 0.010	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.0057			0.055	4	50	200
Chloride *	7.0			67	800	15000	25000
Fluoride*	0.27			2.6	10	150	500
Sulphate *	15			140	1000	20000	50000
TDS*	130			1200	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	3.92			37.4	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.3						
Dry Matter (%)	97						
Moisture (%)	2.6						

Results are expressed on a dry weight basis, after correction for moisture content where applicable. *= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepencies with current legislation ** = MCERTS accredited

***Data reported unaccredited due to quality control parameter failure associated with this result; other checks applied prior to reporting the data have been accepted and the failure justified as having no significant impact on sample data reported.

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number : 22-12740
Project / Site name: Etihad Ground Investigation - 021

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2529864	(WS) TP22-05	3	0.5	Grey sand with rubble and gravel

Analytical Report Number : 22-12740
Project / Site name: Etihad Ground Investigation - 021

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270.	L064-PL	D	NONE
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH at 20oC in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Total BTEX in soil (Poland)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073-PL	W	MCERTS
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by EC probe using a factor of 0.6.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L031	W	ISO 17025

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Analytical Report Number : 22-12740
Project / Site name: Etihad Ground Investigation - 021

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-12739

Replaces Analytical Report Number: 22-12739, issue no. 1
Result correction by laboratory.

Project / Site name:	Etihad Ground Investigation - 022	**Samples received on:**	12/12/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	12/12/2022
Your order number:	37349 RH	**Analysis completed by:**	23/02/2023
Report Issue Number:	2	**Report issued on:**	02/03/2023
Samples Analysed:	2 soil samples		

Signed:

Dominika Warjan
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Analytical Report Number: 22-12739
Project / Site name: Etihad Ground Investigation - 022
Your Order No: 37349 RH

Lab Sample Number				2529862	2529863
Sample Reference				BH22/04	BH22/04
Sample Number				6	8
Depth (m)				3.20-3.40	4.50-4.70
Date Sampled				09/12/2022	09/12/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	16	15
Total mass of sample received	kg	0.001	NONE	1	1

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	ASE	ASE

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8	8.7
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.55	0.34
Organic Matter (automated)	%	0.1	MCERTS	4.9	1.4
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	2.9	0.8
Loss on Ignition @ 450oC	%	0.2	MCERTS	7	2.8

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.68	0.81
Acenaphthylene	mg/kg	0.05	MCERTS	0.21	0.11
Acenaphthene	mg/kg	0.05	MCERTS	2.7	3.8
Fluorene	mg/kg	0.05	MCERTS	2.1	3
Phenanthrene	mg/kg	0.05	MCERTS	19	17
Anthracene	mg/kg	0.05	MCERTS	5	4.6
Fluoranthene	mg/kg	0.05	MCERTS	31	19
Pyrene	mg/kg	0.05	MCERTS	36	17
Benzo(a)anthracene	mg/kg	0.05	MCERTS	14	8.3
Chrysene	mg/kg	0.05	MCERTS	14	6.3
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	18	8.9
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	4.5	3.1
Benzo(a)pyrene	mg/kg	0.05	MCERTS	15	7.2
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	7.7	3.2
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	1.8	0.72
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	8.8	3.4

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	182	105

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Analytical Report Number: 22-12739
Project / Site name: Etihad Ground Investigation - 022
Your Order No: 37349 RH

Lab Sample Number				2529862	2529863
Sample Reference				BH22/04	BH22/04
Sample Number				6	8
Depth (m)				3.20-3.40	4.50-4.70
Date Sampled				09/12/2022	09/12/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Heavy Metals / Metalloids					
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	84	25
Boron (water soluble)	mg/kg	0.2	MCERTS	2.8	1.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	11	1.4
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	61	86
Copper (aqua regia extractable)	mg/kg	1	MCERTS	610	160
Lead (aqua regia extractable)	mg/kg	1	MCERTS	400	75
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	56	21
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	3800	400
Petroleum Hydrocarbons					
TPH C10 - C40 EH_CU_1D_TOTAL	mg/kg	10	MCERTS	560	390

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number : 22-12739
Project / Site name: Etihad Ground Investigation - 022

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Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2529862	BH22/04	6	3.20-3.40	Brown clay and sand with gravel.
2529863	BH22/04	8	4.50-4.70	Brown clay and sand with gravel.

Analytical Report Number : 22-12739
Project / Site name: Etihad Ground Investigation - 022

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270.	L064-PL	D	ISO 17025
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS

Analytical Report Number : 22-12739
Project / Site name: Etihad Ground Investigation - 022

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 22-13337

Project / Site name:	Etihad Ground Investigation - 023	**Samples received on:**	14/12/2022
Your job number:	37349	**Samples instructed on/ Analysis started on:**	14/12/2022
Your order number:	37349 RH	**Analysis completed by:**	23/12/2022
Report Issue Number:	1	**Report issued on:**	23/12/2022
Samples Analysed:	2 soil samples		

Signed:

Dominika Warjan
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Analytical Report Number: 22-13337
Project / Site name: Etihad Ground Investigation - 023
Your Order No: 37349 RH

Lab Sample Number				2533902	2533903
Sample Reference				BH22/07	BH22/07
Sample Number				6	7
Depth (m)				2.80-3.00	3.70-3.90
Date Sampled				13/12/2022	13/12/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	13	11
Total mass of sample received	kg	0.001	NONE	1.3	1.3

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	SFS	SFS

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	9.6	9.1
Total Cyanide	mg/kg	1	MCERTS	2.1	1
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.53	0.28
Organic Matter (automated)	%	0.1	MCERTS	3.9	2.9
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	2.3	1.7
Loss on Ignition @ 450oC	%	0.2	MCERTS	4.8	4.2

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	5.4	2.1
Acenaphthylene	mg/kg	0.05	MCERTS	0.48	0.14
Acenaphthene	mg/kg	0.05	MCERTS	6.3	1.5
Fluorene	mg/kg	0.05	MCERTS	6.4	1
Phenanthrene	mg/kg	0.05	MCERTS	31	8.8
Anthracene	mg/kg	0.05	MCERTS	10	2.1
Fluoranthene	mg/kg	0.05	MCERTS	41	13
Pyrene	mg/kg	0.05	MCERTS	34	12
Benzo(a)anthracene	mg/kg	0.05	MCERTS	19	5.7
Chrysene	mg/kg	0.05	MCERTS	19	5.2
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	21	6.6
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	8.4	2.3
Benzo(a)pyrene	mg/kg	0.05	MCERTS	16	5.6
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	7.8	2.8
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	1.8	0.68
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	9	3.5

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	236	72.7

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Analytical Report Number: 22-13337
Project / Site name: Etihad Ground Investigation - 023
Your Order No: 37349 RH

Lab Sample Number				2533902	2533903
Sample Reference				BH22/07	BH22/07
Sample Number				6	7
Depth (m)				2.80-3.00	3.70-3.90
Date Sampled				13/12/2022	13/12/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Heavy Metals / Metalloids					
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	18	14
Boron (water soluble)	mg/kg	0.2	MCERTS	2.6	1.8
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	32	22
Copper (aqua regia extractable)	mg/kg	1	MCERTS	94	50
Lead (aqua regia extractable)	mg/kg	1	MCERTS	190	110
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.4	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	29	19
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	150	170
Petroleum Hydrocarbons					
TPH C10 - C40 $_{EH\_CU\_1D\_TOTAL}$	mg/kg	10	MCERTS	720	280

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number : 22-13337
Project / Site name: Etihad Ground Investigation - 023

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2533902	BH22/07	6	2.80-3.00	Brown clay and loam with gravel and brick.
2533903	BH22/07	7	3.70-3.90	Brown clay and loam with gravel and vegetation.

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Analytical Report Number : 22-13337
Project / Site name: Etihad Ground Investigation - 023

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
TPH Banding in Soil by FID	Determination of hexane extractable hydrocarbons in soil by GC-FID.	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS

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Analytical Report Number : 22-13337
Project / Site name: Etihad Ground Investigation - 023

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Environmental Science

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Analytical Report Number : 23-10821

Project / Site name:	Etihad Ground Investigation - 024	**Samples received on:**	06/01/2023
Your job number:	37349	**Samples instructed on/ Analysis started on:**	06/01/2023
Your order number:	37349 RH	**Analysis completed by:**	13/01/2023
Report Issue Number:	1	**Report issued on:**	16/01/2023
Samples Analysed:	8 water samples		

Signed:

Joanna Wawrzeczko
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Analytical i2 Environmental Science

Analytical Report Number: 23-10821
Project / Site name: Etihad Ground Investigation - 024

Your Order No: 37349 RH

Lab Sample Number				2548570	2548571	2548572	2548573	2548574
Sample Reference				BH22/01 Deep	BH22/02 Deep	BH22/03 Deep	BH22/05 Deep	BH22/07 Deep
Sample Number				1	1	1	1	1
Depth (m)				19.30	19.33	22.55	19.72	21.30
Date Sampled				04/01/2023	04/01/2023	04/01/2023	04/01/2023	05/01/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH	pH Units	N/A	ISO 17025	7.7	7.6	8.1	7.6	7.4
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	49
Sulphate as SO4	mg/l	0.045	ISO 17025	15.2	205	120	122	465
Chloride	mg/l	0.15	ISO 17025	42	70	47	41	390
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	17.5	113	64.5	11	126
Nitrate as N	mg/l	0.01	ISO 17025	0.16	0.14	0.2	0.25	0.21
Nitrate as NO3	mg/l	0.05	ISO 17025	0.73	0.62	0.88	1.09	0.94
Hardness - Total	mgCaCO3/l	1	ISO 17025	426	598	271	331	850
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	21
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025	389	474	< 0.01	262	58.5
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	2.49	2.53	< 0.01	2.14	0.36
Fluorene	µg/l	0.01	ISO 17025	0.84	0.53	< 0.01	0.42	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	0.66	0.33	< 0.01	0.28	< 0.01
Anthracene	µg/l	0.01	ISO 17025	0.23	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Total PAH								
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	393	478	< 0.16	265	58.9
Heavy Metals / Metalloids								
Boron (dissolved)	µg/l	10	ISO 17025	77	590	120	130	430
Calcium (dissolved)	mg/l	0.012	ISO 17025	110	160	73	96	230
Magnesium (dissolved)	mg/l	0.005	ISO 17025	37	50	22	22	69
Arsenic (dissolved)	µg/l	0.15	ISO 17025	1.21	7.94	19.2	56.7	10.3
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.14	0.07	0.06	0.04	0.03
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	1.2	1.5	1.9	0.6	0.9
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	2.4	12	29	11	27
Selenium (dissolved)	µg/l	0.6	ISO 17025	0.7	1.2	2.2	0.8	1.5
Zinc (dissolved)	µg/l	0.5	ISO 17025	4.9	16	88	2.4	16
Monoaromatics & Oxygenates								
Benzene	µg/l	1	ISO 17025	-	-	-	-	-
Toluene	µg/l	1	ISO 17025	-	-	-	-	-

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Analytical Report Number: 23-10821
Project / Site name: Etihad Ground Investigation - 024

Your Order No: 37349 RH

Lab Sample Number				2548570	2548571	2548572	2548573	2548574
Sample Reference				BH22/01 Deep	BH22/02 Deep	BH22/03 Deep	BH22/05 Deep	BH22/07 Deep
Sample Number				1	1	1	1	1
Depth (m)				19.30	19.33	22.55	19.72	21.30
Date Sampled				04/01/2023	04/01/2023	04/01/2023	04/01/2023	05/01/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Ethylbenzene	µg/l	1	ISO 17025	-	-	-	-	-
p & m-xylene	µg/l	1	ISO 17025	-	-	-	-	-
o-xylene	µg/l	1	ISO 17025	-	-	-	-	-
Petroleum Hydrocarbons								
TPH1 (C10 - C40) EH_1D_TOTAL_MS	µg/l	10	ISO 17025	730	590	< 10	350	240

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical i2 Environmental Science

Analytical Report Number: 23-10821
Project / Site name: Etihad Ground Investigation - 024

Your Order No: 37349 RH

Lab Sample Number				2548575	2548576	2548577
Sample Reference				BH22/04 Shallow	BH22/06A Shallow	BH22/01 Shallow
Sample Number				1	1	1
Depth (m)				2.02	2.14	2.20
Date Sampled				05/01/2023	05/01/2023	06/01/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
General Inorganics						
pH	pH Units	N/A	ISO 17025	7.8	11.1	8
Total Cyanide	µg/l	10	ISO 17025	11	49	11
Sulphate as SO4	mg/l	0.045	ISO 17025	173	448	161
Chloride	mg/l	0.15	ISO 17025	2000	1600	250
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	416	101	65.2
Nitrate as N	mg/l	0.01	ISO 17025	0.19	0.13	0.08
Nitrate as NO3	mg/l	0.05	ISO 17025	0.83	0.57	0.36
Hardness - Total	mgCaCO3/l	1	ISO 17025	601	421	165
Total Phenols						
Total Phenols (monohydric)	µg/l	10	ISO 17025	23	68	73
Speciated PAHs						
Naphthalene	µg/l	0.01	ISO 17025	9.9	24.6	3.81
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	2.95	4.44	0.41
Fluorene	µg/l	0.01	ISO 17025	1.34	1.79	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	3.86	3.74	< 0.01
Anthracene	µg/l	0.01	ISO 17025	0.93	0.92	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	2.66	2.77	< 0.01
Pyrene	µg/l	0.01	ISO 17025	2.28	2.52	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	0.56	0.81	< 0.01
Chrysene	µg/l	0.01	ISO 17025	0.54	0.81	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	1.46	0.42	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	0.4	0.19	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	0.39	0.69	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	0.26	0.41	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	0.31	0.55	< 0.01
Total PAH						
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	27.8	44.7	4.22
Heavy Metals / Metalloids						
Boron (dissolved)	µg/l	10	ISO 17025	1700	140	120
Calcium (dissolved)	mg/l	0.012	ISO 17025	240	170	53
Magnesium (dissolved)	mg/l	0.005	ISO 17025	3.4	0.27	7.7
Arsenic (dissolved)	µg/l	0.15	ISO 17025	11.9	16.3	8.65
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.04	0.03	0.02
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	1.8	1.2	< 0.5
Lead (dissolved)	µg/l	0.2	ISO 17025	0.6	0.2	< 0.2
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	0.4	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	8.8	20	8.6
Selenium (dissolved)	µg/l	0.6	ISO 17025	12	6.8	1.6
Zinc (dissolved)	µg/l	0.5	ISO 17025	9.5	1.4	2.3
Monoaromatics & Oxygenates						
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0

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Analytical Report Number: 23-10821
Project / Site name: Etihad Ground Investigation - 024

Your Order No: 37349 RH

Lab Sample Number				2548575	2548576	2548577
Sample Reference				BH22/04 Shallow	BH22/06A Shallow	BH22/01 Shallow
Sample Number				1	1	1
Depth (m)				2.02	2.14	2.20
Date Sampled				05/01/2023	05/01/2023	06/01/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons						
TPH1 (C10 - C40) EH_1D_TOTAL_MS	µg/l	10	ISO 17025	240	540	120

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number : 23-10821
Project / Site name: Etihad Ground Investigation - 024

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Monohydric phenols in water	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water after filtration by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total organic carbon in water	Determination of dissolved organic carbon in water by TOC/DOC NDIR analyser. Accredited matrices: SW PW GW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	ISO 17025
BTEX in water (Monoaromatics)	Determination of BTEX in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	ISO 17025

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Analytical Report Number : 23-10821
Project / Site name: Etihad Ground Investigation - 024

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Chloride in water	Determination of Chloride (diissolved) colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 23-10821
Project / Site name: Etihad Ground Investigation - 024

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis.Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
BH22/01 Deep	1	W	2548570	c	Nitrate as N in water	L078-PL	c
BH22/01 Deep	1	W	2548570	c	Nitrate in water	L078-PL	c
BH22/01 Deep	1	W	2548570	c	pH at 20oC in water (automated)	L099-PL	c
BH22/01 Shallow	1	W	2548577	c	pH at 20oC in water (automated)	L099-PL	c
BH22/02 Deep	1	W	2548571	c	Nitrate as N in water	L078-PL	c
BH22/02 Deep	1	W	2548571	c	Nitrate in water	L078-PL	c
BH22/02 Deep	1	W	2548571	c	pH at 20oC in water (automated)	L099-PL	c
BH22/03 Deep	1	W	2548572	c	Nitrate as N in water	L078-PL	c
BH22/03 Deep	1	W	2548572	c	Nitrate in water	L078-PL	c
BH22/03 Deep	1	W	2548572	c	pH at 20oC in water (automated)	L099-PL	c
BH22/04 Shallow	1	W	2548575	c	pH at 20oC in water (automated)	L099-PL	c
BH22/05 Deep	1	W	2548573	c	Nitrate as N in water	L078-PL	c
BH22/05 Deep	1	W	2548573	c	Nitrate in water	L078-PL	c
BH22/05 Deep	1	W	2548573	c	pH at 20oC in water (automated)	L099-PL	c
BH22/06A Shallow	1	W	2548576	c	pH at 20oC in water (automated)	L099-PL	c
BH22/07 Deep	1	W	2548574	c	pH at 20oC in water (automated)	L099-PL	c

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UKAS TESTING
4041

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Analytical Report Number : 23-14457

Project / Site name:	Etihad Ground Investigation - 026	**Samples received on:**	25/01/2023
Your job number:	37349	**Samples instructed on/ Analysis started on:**	27/01/2023
Your order number:	37349 RH	**Analysis completed by:**	03/02/2023
Report Issue Number:	1	**Report issued on:**	03/02/2023
Samples Analysed:	6 water samples		

Signed:

Adam Fenwick
Technical Reviewer
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Analytical Report Number: 23-14457
Project / Site name: Etihad Ground Investigation - 026

Your Order No: 37349 RH

Lab Sample Number				2567727	2567728	2567729	2567730	2567731	2567732
Sample Reference				BH22/01 Deep	BH22/02 Deep	BH22/03 Deep	BH22/05 Deep	BH22/07 Deep	BH22/01 Shallow
Sample Number				3	2	2	2	2	4
Depth (m)				19.70	19.70	22.47	19.77	21.31	2.43
Date Sampled				24/01/2023	24/01/2023	24/01/2023	24/01/2023	24/01/2023	24/01/2023
Time Taken				1351	1437	1523	1045	1127	1231
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**						
General Inorganics									
pH (L005B)	pH Units	N/A	ISO 17025	7.3	6.9	7.4	7.3	8.4	8.0
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	140	30
Sulphate as SO4	µg/l	45	ISO 17025	20700	251000	134000	195000	174000	132000
Sulphate as SO4	mg/l	0.045	ISO 17025	20.7	251	134	195	174	132
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	13.6	157	147	39.4	367	80
Hardness - Total	mgCaCO3/l	1	ISO 17025	489	703	399	513	240	232
Total Phenols									
Total Phenols (monohydric)	µg/l	10	ISO 17025	15	< 10	< 10	< 10	400	88
Speciated PAHs									
Naphthalene	µg/l	0.01	ISO 17025	976	487	376	59	1.14	4.48
Acenaphthylene	µg/l	0.01	ISO 17025	1.57	0.21	0.2	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	30.1	3.93	3.5	0.95	0.9	0.21
Fluorene	µg/l	0.01	ISO 17025	12.1	1.02	0.83	0.23	0.29	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	6.06	0.33	0.25	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Total PAH									
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	1030	493	381	60.2	2.33	4.69
Heavy Metals / Metalloids									
Boron (dissolved)	µg/l	10	ISO 17025	92	710	240	190	1500	160
Calcium (dissolved)	mg/l	0.012	ISO 17025	130	190	93	140	86	79
Magnesium (dissolved)	mg/l	0.005	ISO 17025	39	56	40	41	5.9	8.4
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.26	8.03	10.9	13.5	34	20.4
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02	< 0.02	< 0.02	0.1	0.04
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.2	0.2	< 0.2	0.3	< 0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	0.8	< 0.5	3	0.9
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	0.84	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	2.8	18	23	10	93	28
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6	1	1.3	1.1	15	4.2
Zinc (dissolved)	µg/l	0.5	ISO 17025	4.2	8.1	7.8	2	2.9	1.6
Petroleum Hydrocarbons									
TPH1 (C10 - C40) EH_1D_TOTAL_MS	µg/l	10	ISO 17025	2300	790	620	190	870	260

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number : 23-14457
Project / Site name: Etihad Ground Investigation - 026

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Monohydric phenols in water	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water after filtration by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total organic carbon in water	Determination of dissolved organic carbon in water by TOC/DOC NDIR analyser. Accredited matrices: SW PW GW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	ISO 17025

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted

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Analytical Report Number : 23-14457
Project / Site name: Etihad Ground Investigation - 026

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
_	Operator - understore to separate acronyms (exception for +)				
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total				

Analytical Report Number : 23-14457

Project / Site name: Etihad Ground Investigation - 026

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis.Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
BH22/01 Deep	3	W	2567727	c	pH at 20oC in water (automated)	L099-PL	c
BH22/01 Shallow	4	W	2567732	c	pH at 20oC in water (automated)	L099-PL	c
BH22/02 Deep	2	W	2567728	c	pH at 20oC in water (automated)	L099-PL	c
BH22/03 Deep	2	W	2567729	c	pH at 20oC in water (automated)	L099-PL	c
BH22/05 Deep	2	W	2567730	c	pH at 20oC in water (automated)	L099-PL	c
BH22/07 Deep	2	W	2567731	c	pH at 20oC in water (automated)	L099-PL	c

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Analytical Report Number : 23-14460

Project / Site name:	Etihad Ground Investigation - 027	**Samples received on:**	26/01/2023
Your job number:	37349	**Samples instructed on/ Analysis started on:**	27/01/2023
Your order number:	37349-RH	**Analysis completed by:**	03/02/2023
Report Issue Number:	1	**Report issued on:**	03/02/2023
Samples Analysed:	2 water samples		

Signed:

Adam Fenwick
Technical Reviewer
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Analytical Report Number: 23-14460
Project / Site name: Etihad Ground Investigation - 027

Your Order No: 37349-RH

Lab Sample Number				2567746	2567747
Sample Reference				BH22-04 Shallow	BH22-06A Shallow
Sample Number				2	2
Depth (m)				1.73	2.30
Date Sampled				25/01/2023	25/01/2023
Time Taken				1309	1349
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
General Inorganics					
pH (L005B)	pH Units	N/A	ISO 17025	7.1	10.3
Total Cyanide	µg/l	10	ISO 17025	< 10	44
Sulphate as SO4	µg/l	45	ISO 17025	207000	367000
Sulphate as SO4	mg/l	0.045	ISO 17025	207	367
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	428	64.4
Hardness - Total	mgCaCO3/l	1	ISO 17025	1220	403
Total Phenols					
Total Phenols (monohydric)	µg/l	10	ISO 17025	57	87
Speciated PAHs					
Naphthalene	µg/l	0.01	ISO 17025	4.4	15
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	1.35	2.66
Fluorene	µg/l	0.01	ISO 17025	0.6	0.9
Phenanthrene	µg/l	0.01	ISO 17025	1.59	1.14
Anthracene	µg/l	0.01	ISO 17025	0.45	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	0.92	0.29
Pyrene	µg/l	0.01	ISO 17025	0.8	0.2
Benzo(a)anthracene	µg/l	0.01	ISO 17025	0.27	< 0.01
Chrysene	µg/l	0.01	ISO 17025	0.26	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	0.28	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	0.1	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	0.22	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Total PAH					
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	11.2	20.2
Heavy Metals / Metalloids					
Boron (dissolved)	µg/l	10	ISO 17025	1500	110
Calcium (dissolved)	mg/l	0.012	ISO 17025	480	160
Calcium (dissolved)	µg/l	12	ISO 17025	480000	160000
Magnesium (dissolved)	mg/l	0.005	ISO 17025	6.5	0.72
Magnesium (dissolved)	µg/l	5	ISO 17025	6500	720
Arsenic (dissolved)	µg/l	0.15	ISO 17025	20.1	22.8
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.03	0.03
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.5	0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	1.4	0.9
Lead (dissolved)	µg/l	0.2	ISO 17025	0.8	< 0.2
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	0.41
Nickel (dissolved)	µg/l	0.5	ISO 17025	9.1	24
Selenium (dissolved)	µg/l	0.6	ISO 17025	5	5.8
Zinc (dissolved)	µg/l	0.5	ISO 17025	28	2.6
Petroleum Hydrocarbons					
TPH1 (C10 - C40) EH_1D_TOTAL_MS	µg/l	10	ISO 17025	290	880

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4041

Analytical Report Number: 23-14460
Project / Site name: Etihad Ground Investigation - 027

Your Order No: 37349-RH

Lab Sample Number				2567746	2567747
Sample Reference				BH22-04 Shallow	BH22-06A Shallow
Sample Number				2	2
Depth (m)				1.73	2.30
Date Sampled				25/01/2023	25/01/2023
Time Taken				1309	1349
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number : 23-14460
Project / Site name: Etihad Ground Investigation - 027

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Monohydric phenols in water	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water after filtration by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total organic carbon in water	Determination of dissolved organic carbon in water by TOC/DOC NDIR analyser. Accredited matrices: SW PW GW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
TPH1 (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS.	In-house method	L070-PL	W	ISO 17025

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

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4041

Analytical Report Number : 23-14460
Project / Site name: Etihad Ground Investigation - 027

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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Analytical Report Number : 23-14460
Project / Site name: Etihad Ground Investigation - 027

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis.Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
BH22-04 Shallow	2	W	2567746	c	pH at 20oC in water (automated)	L099-PL	c
BH22-06A Shallow	2	W	2567747	c	pH at 20oC in water (automated)	L099-PL	c

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The results included within the report relate only to the sample(s) submitted for testing.

CERTIFICATE OF ANALYSIS

MULTI-SAMPLE REPORT REFERENCE	REGISTERED DATE	RECEIVED DATE	ANALYSIS STARTED	ANALYSIS COMPLETE
2023-31-08-10:08:19	10/01/2023	25/01/2023	26/01/2023	27/01/2023

LABORATORY
i2 Analytical
Croxley Green Business Park
7 Woodshots Meadow
Watford
WD18 8YS

CUSTOMER
Geotechnical Engineering Ltd
Centurion House
Olympus Park
Quedgeley
Gloucestershire
GL2 4NF

CLIENT CODE	37349	DATE SAMPLED (DD/MM/YY)	23/01/2023
CLIENT SITE	Etihad Ground Investigation -025	PO NUMBER	37349/RH

Matrix: Gas Bag

				i2 Sample Number	512771	512772	512773
				Pre Printed Barcode	PP89806	PP89801	PP897F5
				Sample Reference	BH22/05	BH22/06A	BH22/07
Determinand	Technique	LOD	Accreditation				
1,3-butadiene	T385	5.0 ppmv	UKAS		< 5.0	< 5.0	< 5.0
1-Butene	T385	5.0 ppmv	UKAS		< 5.0	< 5.0	< 5.0
1-Pentene	T385	5.0 ppmv	UKAS		< 5.0	< 5.0	< 5.0
2-Methyl-2-Butene	T385	5.0 ppmv	UKAS		< 5.0	< 5.0	< 5.0
Acetylene	T385	10.0 ppmv	UKAS		< 10.0	< 10.0	< 10.0
C-2-Butene	T385	5.0 ppmv	UKAS		< 5.0	< 5.0	< 5.0
C-2-Pentene	T385	5.0 ppmv	UKAS		< 5.0	< 5.0	< 5.0
C6+	T385	5.0 ppmv	None		< 5.0	< 5.0	< 5.0
Carbon Dioxide	T385	125.0 ppmv	None		44000	1300	710
Carbon Monoxide	T385	125.0 ppmv	UKAS		< 125.0	< 125.0	< 125.0
Ethane	T385	5.0 ppmv	UKAS		< 5.0	< 5.0	13
Ethylene	T385	10.0 ppmv	UKAS		< 10.0	< 10.0	< 10.0
Hydrogen	T385	32.0 ppmv	UKAS		< 32.0	< 32.0	< 32.0
I-Butane	T385	5.0 ppmv	UKAS		< 5.0	< 5.0	< 5.0
I-Butylene	T385	5.0 ppmv	UKAS		< 5.0	< 5.0	< 5.0
I-Pentane	T385	5.0 ppmv	UKAS		< 5.0	< 5.0	< 5.0
Media Charge	T385	0.0	None		Unreportable	Unreportable	Unreportable
Methane	T385	5.0 ppmv	UKAS		44	43	4400
Methyl Acetylene	T385	5.0 ppmv	UKAS		< 5.0	< 5.0	< 5.0
N-Butane	T385	5.0 ppmv	UKAS		< 5.0	< 5.0	< 5.0
N-Pentane	T385	5.0 ppmv	UKAS		< 5.0	< 5.0	< 5.0
Nitrogen	T385	5.0 %	None		85	92	87
Oxygen / Argon	T385	5.0 %	None		9.7	6.0	7.8
Propadiene	T385	10.0 ppmv	UKAS		< 10.0	< 10.0	< 10.0
Propane	T385	5.0 ppmv	UKAS		< 5.0	< 5.0	7.5
Propylene	T385	5.0 ppmv	UKAS		< 5.0	< 5.0	< 5.0
T-2-Butene	T385	5.0 ppmv	UKAS		< 5.0	< 5.0	< 5.0
T-2-Pentene	T385	5.0 ppmv	UKAS		< 5.0	< 5.0	< 5.0

Technical Reviewer	Role
Mrs Jeanette Abbott	Customer Service Manager

UKAS TESTING

4041

i2 Analytical Limited.
Registered in England No.
4750390 VAT Reg. No. 821
0972 49

Extra Testing Information

Technique Code	Technique Name	Samples
T385	L108B-RGA	512771, 512772, 512773

Testing Location	Samples
All analysis was carried out at i2 Analytical (Poland), i2 Analytical Limited Sp z.o.o, Oddziat w Polsce, ul.Pionierow 39, 41-711 Ruda Slaska, Poland	512771, 512772, 512773

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.
Tests covered by this certificate were conducted in accordance with i2 Analytical's SOPs.
Note: All assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement of uncertainty can be provided on request.
This is a simplified test report
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Results in black are positive/detected results. Results in gray are below the LOD or have not been found.
LOD = Limit of Determination. This is the lowest reportable limit of the test.

CERTIFICATE OF ANALYSIS

MULTI-SAMPLE REPORT REFERENCE	REGISTERED DATE	RECEIVED DATE	ANALYSIS STARTED	ANALYSIS COMPLETE
2023-13-37-08:37:35	10/01/2023	25/01/2023	26/01/2023	10/02/2023

LABORATORY
i2 Analytical
Croxley Green Business Park
7 Woodshots Meadow
Watford
WD18 8YS

CUSTOMER
Geotechnical Engineering Ltd
Centurion House
Olympus Park
Quedgeley
Gloucestershire
GL2 4NF

CLIENT CODE	37349	DATE SAMPLED (DD/MM/YY)	23/01/2023
CLIENT SITE	Etihad Ground Investigation -025	PO NUMBER	37349/RH

Matrix: Gas Bag

				i2 Sample Number	512780	512786	512787
				Pre Printed Barcode	PP897FD	PP897F6	PP89805
				Sample Reference	BH22/05	BH22/06A	BH22/07
Determinand	Technique	LOD	Accreditation				
Hydrogen Sulphide	T437	0.01 %	None		< 0.001 [844]	< 0.001 [844]	< 0.001 [844]
Media Charge	T385	0.0	None		Not Applicable	Not Applicable	Not Applicable

Technical Reviewer	Role
Mrs Jeanette Abbott	Customer Service Manager

Extra Testing Information

Technique Code	Technique Name	Samples
T385	L108B-RGA	512780, 512786, 512787
T437	GC/TCD/FID-Subcon	512780, 512786, 512787

Testing Location	Samples
Analysis using techniques L108B-RGA was carried out at i2 Analytical (Poland), i2 Analytical Limited Sp z.o.o, Oddziat w Polsce, ul.Pionierow 39, 41-711 Ruda Slaska, Poland	512780, 512786, 512787
Analysis using techniques GC/TCD/FID-Subcon was carried out at Marchwood Scientific Services, Unit 5 Smithfold Lane, Worsley, Manchester, M28 0GP	

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.
Tests covered by this certificate were conducted in accordance with i2 Analytical's SOPs.
Note: All assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement of uncertainty can be provided on request.
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LOD = Limit of Determination. This is the lowest reportable limit of the test.
844 - LOD updated by subcontractor lab

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