Phase 2 Site Investigation

E Plots & Mini Masterplan, Airport City North

for

Airport City Ltd Partnership



05 / 04 / 2019

COMPLEX CHALLENGES ...
MADE SIMPLE

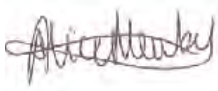
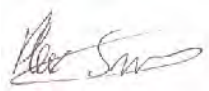
Phase 2 Site Investigation

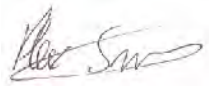
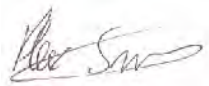
E Plots & Mini Masterplan, Airport City North

for

Airport City Ltd Partnership

5th April 2019

DESCRIPTION	DATE	AUTHOR	AUTHOR	APPROVED BY
Phase 2 Site Investigation Report FINAL	05/04/19	Mabel Newby 	Elizabeth Stewart 	Alex Smiles 

REVISION	DESCRIPTION	DATE	AUTHOR	APPROVED BY
R1	Revised CBR results, ground gas RA and borehole logs	09/04/2019	Elizabeth Stewart 	Alex Smiles 
R2	Updated ground gas RA	22/11/2019	Elizabeth Stewart 	Alex Smiles 

COMPLEX CHALLENGES ...
MADE SIMPLE

CONTENTS

1.0 INTRODUCTION 3
1.1 Background 3
1.2 Terms of Reference 3
1.3 Objectives 4
2.0 LIMITATIONS OF STUDY ASSESSMENT 5
3.0 BACKGROUND INFORMATION 6
3.1 Site Description 6
3.2 Geological Characteristics 6
3.3 Site History and Environmental Characteristics 7
3.4 Previous Site Investigation Information 8
3.5 Redevelopment Proposals 12
4.0 SITE INVESTIGATION DESIGN 13
5.0 SITE INVESTIGATION FIELDWORKS 14
6.0 ENCOUNTERED GROUND CONDITIONS 15
6.1 Ground Conditions Overview 15
6.2 Groundwater & Contamination Observations 18
6.3 Below Ground Obstructions 19
6.4 DCP Testing 19
7.0 LABORATORY TESTING 22
8.0 GEO-ENVIRONMENTAL ASSESSMENT 29
8.1 Assessment of Soil Contamination 33
8.2 Ground Gas Risk Assessment 34
8.3 Controlled Waters 36
8.4 Below Ground Concrete Construction 36
8.5 Below Ground Utilities and Service Runs 36
9.0 REFINED CONCEPTUAL SITE MODEL 22
10.0 GEOTECHNICAL & FOUNDATION DESIGN ASSESSMENT 28
10.1 New Building Foundation Design (E Plots) 28
10.2 New Building Foundation Design (Mini Masterplan) 31
10.3 Road Design 32
10.4 Culvert Design 33
10.5 General Comments 33
11.0 CONCLUSIONS & RECOMMENDATIONS 34
APPENDIX A – SITE DRAWINGS 35
APPENDIX B – EXPLORATORY HOLE LOGSHEETS 36
APPENDIX C – CHEMICAL TESTING RESULTS 37
APPENDIX D – GEOTECHNICAL TESTING RESULTS 38
APPENDIX E – GROUND GAS / WATER MONITORING RESULTS 39
APPENDIX F – PREVIOUS SITE INVESTIGATION INFORMATION 40
APPENDIX G – PRELIMINARY EARTHWORKS PROPOSALS 41

1.0 Introduction

1.1 Background

1.1.1 RoC Consulting has been appointed by Airport City Ltd Partnership to conduct a Phase 2 Site Investigation across the Mini Masterplan area as part of the Airport City North Masterplan (the site). In addition, supplementary site investigation works has been completed within the E plots development parcel (forming the southern boundary of the wider Mini Masterplan site) to support detailed building and foundation design requirements.

1.1.2 It is understood that the site is to be redeveloped for commercial office use in accordance with 5 Plus architect's drawings (ref: MP_00_0200 rev B and MP_00-0220 rev O) provided within Appendix A.

1.1.3 The following assessment has been completed to support design and planning requirements for the site's redevelopment and follows on from a number of site investigations relating to the development site, specifically:

1) RoC Consulting 2018 Plot E1, E2 and E3 Phase 1 Desktop Study (report ref: MN/AS/p1 3733);
2) RoC Consulting 2016 Airport City North (ACN) Phase 2 Site Investigation (report ref: JB/AS/p2 3407); and
3) RoC Consulting 2017 Airport City Bridge Phase 2 Site Investigation (MN/AS/p2 3590)

1.1.4 It is recommended reference be made to the abovementioned report(s) when reviewing the current assessment.

1.1.5 The scope of the report and its assessment has been based around the site's redevelopment proposals as outlined in the aforementioned 5 Plus architect's plans. It should be noted that any subsequent revision of the proposed redevelopment or site boundary away from the above-mentioned drawing may result in the full or partial re-interpretation of this report and assessment.

1.2 Terms of Reference

1.2.1 The Phase 2 Site Investigation was carried out following receipt of an instruction from Natasha Dayes of Faithful & Gould.

1.3 Objectives

1.3.1 The scope of works has been tailored to meet both planning and design requirements to assist with the site's redevelopment. These considerations include:

1) Completion of a comprehensive review of all site investigations completed across the Mini Masterplan site (inc E Plots development parcel).

2) Design a programme of site investigation works to complement works already undertaken and provide detailed information on ground conditions and quality, particularly within the area of the proposed E Plot buildings.

3) Completion of site investigation field works including the formation of x10 cable percussion with rotary follow-on boreholes, x14 window sampler boreholes to establish the site's geology and x10 TRL DCP tests to inform road and pavement design.

4) Completion of geo-environmental and geotechnical laboratory analysis of soil / rock samples to determine physical and chemical characteristics.

5) Completion of a detailed geotechnical assessment of site conditions to inform new building foundation and retaining wall design. The scope of this assessment will also include reference to the findings and result of previous site investigation works.

6) Completion of a geo-environmental assessment utilising information provided by both the current and previous phases of site investigation works sufficient in its scope to assist with the discharge of contaminated land related planning conditions.

2.0 Limitations of Study Assessment

2.0.1 The report has been produced by RoC Consulting for the client solely for the purposes of a review of information for the above-mentioned site. It may not be used by any person for any other purpose other than that specified without the express written permission of RoC Consulting. Any liability arising out of its use by a third party for purposes not wholly connected with the above shall be the responsibility of that party who shall indemnify RoC Consulting against all claims, costs, damages and losses arising out of such use.

2.0.2 This report is written in the context of an agreed scope of work and should not be used in a different context. The report should be read in its entirety. Furthermore, new information, improved practices and changes in legislation may require re-interpretation of this report in whole or in part after its original issue. RoC Consulting reserve the right to alter their conclusions and recommendations in the light of further information that may become available.

2.0.3 Ground conditions can change rapidly, especially in areas of Made Ground, however, it is assumed that the ground conditions observed are typical and representative of the site as a whole. The ground conditions have been determined from a limited number of exploratory holes formed across the property, therefore, only a small percentage of the total area of the property has been investigated. Interpolation between exploratory holes has enabled a general picture of the subsurface conditions to be produced.

2.0.4 Conclusions drawn from the ground investigation should be read in this context. RoC Consulting cannot accept responsibility for any situations resulting from locally unforeseen ground conditions occurring between exploratory holes.

3.0 Background Information

3.0.1 The overview below outlines the most salient points and considerations. It is recommended reference be made to the complete findings of previous site investigation reports for additional information and/or clarification.

3.1 Site Description

3.1.1 The site is located approximately 400m north of Manchester Airport and covers an area approximately 7.1ha. The site is bordered by Enterprise Way to the north west, west and north east and the Airport Spur road to the south. The Terminal 2 Roundabout borders the south west corner of the site.

3.1.2 The site comprises a gravel long stay car park across the north eastern extent and an area of disused land across the western extent. A road providing access to the long stay car park stems from the Terminal 2 roundabout crossing the centre of the site in a north west to south east direction.

3.1.3 The E-plots portion of the site is located at the southern extent of the wider Mini Masterplan site. The site covers an area of approximately 3.48Ha. The site consists of cleared woodland with a pond feature on the southern boundary. Levels decrease from the central reservation to both the north and south. The eastern area of the site is noted to comprise reworked ground which appears to have been laid following the construction of Enterprise Way.

3.2 Geological Characteristics

3.2.1 Review of publicly available BGS geological map records indicate the site is underlain by the following:

Drift Geology: Till, Devensian - Diamicton

Solid Geology: Bollin Mudstone Member - Mudstone

3.2.2 The Envirocheck report (Appendix C) indicates that the site is not located in an area which may be affected by historic Coal Mining or Brine extraction and a Coal Authority report is not required.

3.3 Site History and Environmental Characteristics

3.3.1 Historical records from 1882 indicate the site to have comprised open fields and farmland with Outwood Lane intersecting the site from the south eastern corner to the north western corner. Small residential buildings (Mayfield & Brookside Cottages) are noted on-site as well as a pond feature at the south eastern extent (within the E-Plots boundary) and at the central northern border.

3.3.2 With the exception of the above mentioned buildings or farmsteads the site remains largely undeveloped until the 1970s when a roundabout is constructed on the eastern extent associated with the M56 Junction 5 Airport Spur Road. In the 1990s Outwood Lane is realigned, becoming Outwood Lane West and Thorley Lane. Car parks are indicated on 1996 mapping records. The buildings remain onsite until 1990 and the pond remains on site until present day. No further significant development is noted.

3.3.3 The Envirocheck Groundwater Vulnerability Map indicates the drift geology is classified a Secondary Undifferentiated Aquifer with the underlying Mudstone bedrock classed as a Secondary B Aquifer. The site is not located within an Environment Agency Source Protection Zone and is not located in close proximity to any sensitive water abstraction points (e.g. potable water supply well).

3.3.4 The nearest surface water feature is indicated on site in the form of a pond located within the central area of the E-Plots site. In addition, a brook is located at the western extent of the site. No measurable water quality or flow rates are available for this feature. The nearest active discharge consent is indicated 358m to the north west of the site held by Manchester Airport Plc. for the discharge of Sewage Discharges (Final / Treated Effluent into Freshwater Stream/River), with the receiving water, Lower Mersey, being fed via a surface water drain.

3.3.5 There are no active Control of Major Accident Hazards sites (COMAHs), Explosive Sites, Notification of Installations Handling Hazardous Substances (NIHHS), Planning Hazardous Substance Consents, Radioactive Substance, Planning Hazardous Substance Enforcements or COMAH sites within 500m of site. However, four COMAH sites and three Planning Hazardous Substance Consents are noted within 1000m of the site.

3.3.6 The Envirocheck Report indicates that the site is located within an area with potential for groundwater flooding of property situated below ground level, and for groundwater flooding to occur at surface level.

3.4 Previous Site Investigation Information

3.4.1 As previously noted a number of site investigation works have taken place across the ACN site including:

1) RoC Consulting 2016 Airport City North Phase 2 Site Investigation (report ref: JB/AS/p2 3407)
2) RoC Consulting 2017 Airport City Bridge Phase 2 Site Investigation (MN/AS/p2 3590)
3) Lucion Environmental 2018 Asbestos Contamination Investigations

3.4.2 The following appraise has been collated with reference to the findings of the above ground investigations. In addition ground investigation information from previous studies have been included as part of the ground conditions summary for the site (further details of which are provided within Section 6.0).

RoC Consulting 2016 Airport City North Phase 2

3.4.3 Site Investigations were undertaken between the 11th and 22nd of March 2016. A number of exploratory holes were formed on the current site as part of a wider program of works. Exploratory holes formed onsite included x12 CPT probe holes, x4 California Bearing Ratio tests and 2 rotary cored boreholes (following on from Cable Tool holes).

3.4.4 Reported ground conditions comprised Made Ground to depths of 2.00mbgl (BH102) and 0.30mbgl (BH202). At BH102, Made Ground was described as “large stone fill”; at BH202 Made Ground comprised “road stone”/ granular fill.

3.4.5 Natural strata was reported beneath Made Ground deposits. “Brown clay” was reported underlying Made Ground deposits at BH102 to depths of 3.50mbgl. “Weathered grey mudstone” was reported directly beneath Made Ground deposits at BH202.

3.4.6 Bedrock was encountered between 3.50mbgl (66.90mAoD) at BH102 and 0.30mbgl (69.57mAoD) at BH202. Bedrock was generally described as either reddish brown or greenish grey thinly bedded silty or fine sandy partially weathered mudstone with low angle bedding.

3.4.7 Ground conditions were also interpreted from the results of CPTu testing results (an overview to which is provided within Table 3.0 overleaf).

Table 3.0: Results of 2016 CPT Testing

CPT Probe ID	Interpreted Ground Conditions	Strength Testing Result*	Depth to Weathered Bedrock
PB107	Medium dense sand mixtures to 1.2m overlying loose sand to 1.9m.	2.0m Undrained Cohesion of 150-350kPa	2.8mbgl 67.69mAOD
PB108	Loose sand mixes to 0.9 over firm clay mixes to 1.5m.	1.5m Undrained Cohesion of 150kPa	2.4mbgl 67.93mAOD
PB207	Stiff clay mixtures from a shallow depth.	1.0m Undrained Cohesion of 125-185kPa	1.8mbgl 67.62mAOD
PB208	Stiff clay mixtures from a shallow depth.	1.0m Undrained Cohesion of 135 -175kPa	1.8mbgl 67.43mAOD
PB210	Medium dense sand/clay mix over stiff and very stiff clay mixtures from shallow depth.	1.0m Undrained Cohesion of 75kPa	2.6mbgl 67.23mAOD
PB212	Stiff clay mixtures from a shallow depth, becoming locally variable in strength below 3.0m.	1.0m Undrained Cohesion of 65-70kPa 3.2m Undrained Cohesion of 30kPa	3.7mbgl 64.60mAOD
PB213	Stiff and very stiff clay mixtures from a shallow depth.	1.0m Undrained Cohesion of 130kPa	1.5mbgl 68.37mAOD
PB214	Stiff clay mixtures from shallow depth, with a thin band of soft clay mixtures 1.3-1.8m.	1.3m Undrained Cohesion of 35-45kPa 2.2m Undrained Cohesion of 120-200kPa	5.0mbgl 63.59mAOD
PB215	Stiff clay mixtures and very stiff clay from shallow depth.	1.4m Undrained Cohesion of 180kPa	5.0mbgl 64.17mAOD
PB220	Stiff clay mixtures from shallow depth, with a thin band of soft clay mixtures 1.7-1.8m.	1.0m Undrained Cohesion of 60-90kPa	3.35mbgl 66.25mAOD
PB221	Initially stiff, locally weakened to firm, clay mixtures.	1.0m Undrained Cohesion of 200-250kPa 1.2m Undrained Cohesion of 60kPa	4.8mbgl 63.99mAOD
PB222	Initially stiff, locally weakened to firm, clay mixtures.	1.9m Undrained Cohesion of 110kPa	2.3mbgl 67.74mAOD

*Undrained cohesion estimated from CPT testing results

3.4.8 A program of DCP testing was undertaken along the proposed road alignment. A total of four test were located on the current study site. TRL DCP tests gave CBR values between 6 and 50%. The high CBR values are attributed to the existing car park while lower values between 5 and 22% are considered to be representative of underlying natural clays.

3.4.9 A single monitoring well was installed on-site within BH202 with a response zone between 0.50 – 6.0mbgl. With reference to guidance provided in CIRIA C665 "*Assessing risks posed by hazardous ground gases to buildings*"; the worst-case gas levels and borehole flow rates equate to a gas screening value of 0.001/hr. This value equates to a Characteristic 1 Situation with no remedial measures envisaged to control ground gas ingress.

3.4.10 Groundwater was encountered as water strikes during the SI within both BH102 and BH202 at depths of 64.40mAoD and 63.78mAoD respectively. Resting water levels were recorded at the same depth as the water strikes. Groundwater levels as indicated from monitoring wells indicate a groundwater table between 3.70 and 4.60mbgl (66.17 and 65.27mAoD) in BH202.

3.4.11 Assessment of soil contamination did not identify any exceedances of screening values when compared to a "commercial" end use scenario.

RoC Consulting 2017 Airport City Bridge Phase 2

3.4.12 Site investigations were undertaken between the 27th of June and 16th of August. Boreholes formed on site included 1 rotary cored borehole (BH202) and 2 cable tool boreholes (BH203 and BH204). BH202 was extended to a depth of 19.50mbgl and BH203 and BH204 were extended to depths of 5.32mbgl and 8.31mbgl respectively. Locations of these boreholes are shown on drawing ES101 presented in Appendix A.

3.4.13 Ground conditions encountered within the above boreholes generally comprised Made Ground overlying clay and weathered mudstone. Depth of Made Ground varied across the site from depths of 0.60m (BH202) to 3.50m (BH203) and 6.00m (BH204). Made ground at BH202 comprised brown slightly sandy reworked clay to 0.60m. BH203 and BH204 comprised a slightly gravelly silty sand topsoil to 0.02m overlying a brown sandy clayey gravel of brick, tile, concrete and mixed lithology with rare plastic and wood to a depth between 1.00m and 1.20m. Below the gravel a brown sandy gravelly clay was reported with gravels of brick, concrete and mix lithology extending to depths between 3.50m and 6.00m.

3.4.14 Natural strata comprised a brown to reddish brown clay to depths between 1.50mbgl to 7.10mbgl. At BH203 and BH204 the clay was reported as being mottled bluish grey, yellowish brown and orange. At BH204, the clay was reported as being very sandy and slightly gravelly.

3.4.15 Weathered bedrock was encountered between 3.00mbgl (66.41mAoD), 4.20mbgl (68.67mAoD) and 7.10m (68.52mAoD). Highly weathered bedrock was generally recovered as light grey mottled brown silty gravelly clay and very clayey gravel. At greater depths, bedrock was described as dark grey becoming reddish brown thinly bedded mudstone with numerous highly / completely weathered bands. Highly weathered bands were noted to depths of 8.50mbgl.

3.4.16 A monitoring well was installed within BH203 with a response zone between 1.0 and 4.0m (Made Ground and natural strata). No groundwater was noted within the monitoring well standpipe or during ground investigation works.

3.4.17 A number of obstructions were noted including a section of brick wall in BH204 at 0.50mbgl, whole bricks in BH203 and BH204 at 1.5m and 0.7mbgl respectively and a large concrete boulder in BH203 at 0.40mbgl.

3.4.18 Plasticity Index for a single sample of clay from BH204 at 6.00 – 6.45mbgl was reported as 22%. The undrained shear strength for the same sample was reported as 116kPa. Point load strength index for rock core samples from BH202 were in the range 0.30 – 3.02MPa. Values were corrected to UCS using a conversion factor of 24 resulting in values between 7.20 and 72.48mPa (Weak to strong).

3.4.19 No exceedances of generic assessment criteria was identified when results of chemical testing analysis were screened against a “Public Open Space (Park)” end use scenario. No evidence of asbestos containing material was reported in all samples tested.

3.4.20 It is considered that well compacted buried concrete should be designed in accordance with Class DS-1 AC-1s requirements as specified in BRE Digest Special Digest 1:2005 *Concrete in aggressive ground: Version 3.*

Lucion Environmental 2018 Asbestos Contamination Investigations

3.4.21 During works being undertaken by contractors BCEGI an area of suspected Asbestos Containing Materials (ACMs) was noted on the Outwood Lane island. Samples of this material were tested and the presence of asbestos was confirmed. As such, investigation of the surrounding area soils was completed to determine the extent of asbestos contamination and waste classification for disposal.

3.4.22 During recent investigations undertaken by Lucion Environmental on the 25th October 2018 a total of 36 samples were taken from 12 trial pit locations across the area shown in Figure 3.0 overleaf between depths of 300mm and 1.2m. Of the 36 samples tested, asbestos was identified in 4 locations:

- TP03 at 800mm identified as cement, 0.80% total asbestos
- TP03 at 300mm identified as cement, 0.41% total asbestos
- TP04 at 1.2m identified as cement, 0.90% total asbestos
- TP11 at 1.2m identified as cement, 1.20% total asbestos

3.4.23 It is noted that it is not uncommon to encounter trace levels of asbestos within Made Ground deposits on brownfield sites. BCEGI have stated that soil concentrations were sufficient to classify the soil as a hazardous material, however, due to the asbestos being buried it does not present a hazard to anyone walking in the area. It is understood that any ACMs identified were removed and disposed of from site. However, the presence of further asbestos within site soils cannot be precluded.

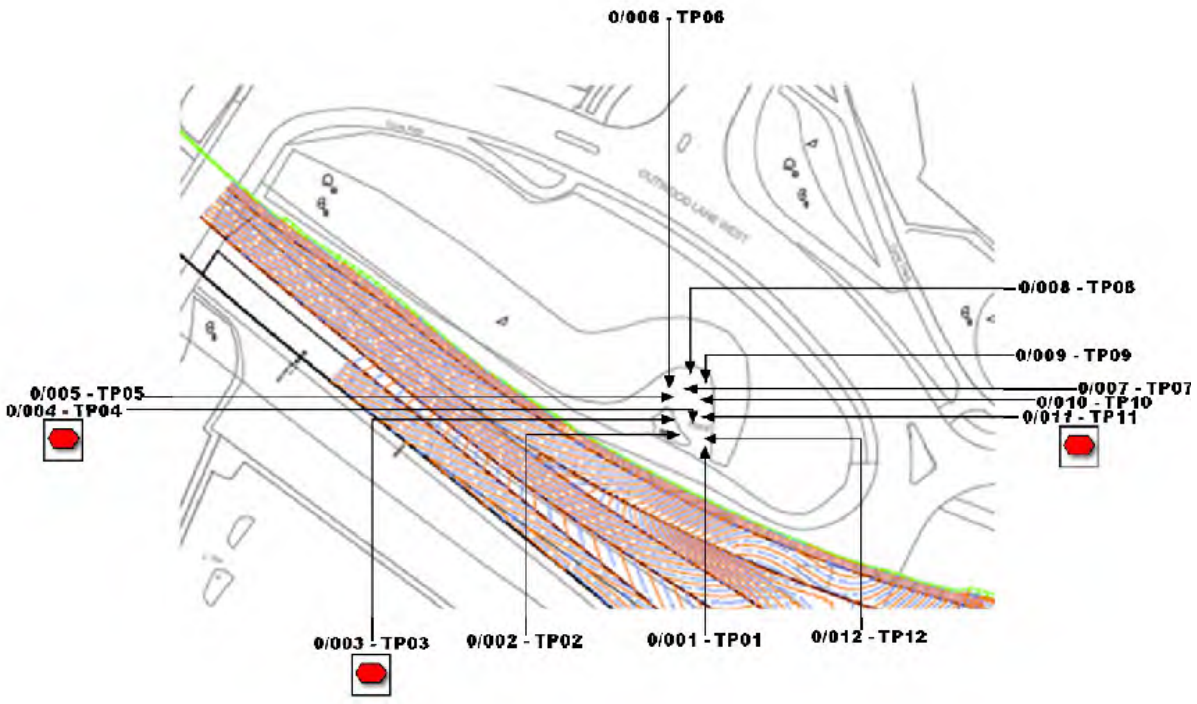


Figure 3.0: Trial Pit Locations

3.4.24 The results from each of the above investigations have formed the basis from which the current investigation has been designed and (where available) information relating to ground conditions and quality have been included within this report.

3.5 Redevelopment Proposals

3.5.1 The Mini Masterplan falls within Airport City North which was approved for outline planning consent in 2013 (planning ref: 100831/OO/2012/S2), though it is not known whether this outline consent is still active.

3.5.2 E Plots which are located on the southern extent of the Mini Masterplan were approved for full planning permission in 2018 (planning ref: 121323/FO/2018). The planning proposal includes the erection of two 6 storey office buildings (Plot E2 and Plot E3) and a 9 storey car park (Plot E1) with associated infrastructure works including the brook diversion within the wider Mini Masterplan area.

3.5.3 Current redevelopment proposals across the Mini Masterplan area comprise multi-storey car parks, offices and hotels with a number of open green spaces. As previously noted, the brook currently noted on site has been approved for full planning permission to be diverted and it is understood that it is to be culverted.

3.5.4 A program of bulk “Cut / Fill” earthworks will be required to facilitate the creation of suitable development plots. An earthworks assessment has been completed by RoC Consulting (further details of which are provided on drawings 3733-CIV-200 and 201 provided within Appendix G).

3.5.5 With reference to these proposals it is noted levels within the E Plots area are likely to be reduced (by up to 3m in the area of Plot E1) with soils redistributed across to the north and west both to level land across the Mini Masterplan site and also infill and divert an existing watercourse to the central and north western extent.

4.0 Site Investigation Design

General

4.0.1 The RoC intrusive investigation was designed and completed to further investigate geo-environmental issues identified during previous site investigations as well as provide geotechnical information to facilitate new building design.

4.0.2 The site investigation works comprised the formation of 10 window sampler boreholes, 10 cable tool with rotary follow-on boreholes and 10 DCP test locations. Window sampler boreholes were advanced to depths between 0.50 and 6.45mbgl while rotary follow-on boreholes were advanced to depths between 14.53 and 15.00mbgl. DCP testing was performed to a maximum depth of 1.00mbgl.

4.0.3 Exploratory hole placement was dictated by the findings of the Phase 1 Desktop Study to target areas where current and previous industrial activity may have impacted soil quality. In addition, boreholes were located within the footprint of the proposed new development to establish ground conditions and support foundation design.

4.0.4 Samples of soil collected during the investigation works are to be analysed for a variety of determinants associated with the pattern of current and historic industrial activity across the site as outlined within the preliminary conceptual site model.

4.0.5 Table 4.0 provided below provides location justification for each exploratory hole formed during the site investigation fieldworks. The purposes of this table are to illustrate the targeting of potential sources of contamination during the Phase 2 site investigation works.

Table 4.0: Borehole Locations & Justification

BH/WS ID.	Reason for selection
BH301 – BH307	Located within footprint of E-Plots buildings to investigate both shallow ground and bedrock conditions and to investigate potential presence of contamination.
WS301 – WS304	Located to investigate extent of possible asbestos contamination across area of site known to be impacted by asbestos.
BH401 – BH403	Located within footprint of buildings across the Mini Masterplan area to investigate both shallow ground and bedrock conditions and to investigate potential presence of contamination. Boreholes were located to supplement previous site investigations.
WS401 – WS404	Placed to investigate shallow ground conditions and aid design of proposed brook diversion.
WS405 – WS410	Located to investigate shallow ground conditions and investigate the possible presence of contamination. Boreholes were placed to supplement previous site investigations.

4.0.6 Exploratory hole locations are shown on RoC Consulting drawing ES101 (Current Site) and ES102 (Proposed Development Layout) provided within Appendix A.

5.0 Site Investigation Fieldworks

5.0.1 Site investigation fieldworks were completed between the 25th February and 6th of March 2019 by drilling contractors Taylor Drilling Services Ltd. Boreholes were formed using a Dando 150 rig (Cable Tool Boreholes), Competitor 150 (Window Sampler Boreholes) or a Beretta T41 (Rotary Boreholes).

5.0.2 Information with respect to buried services was obtained from relevant providers prior to commencement of the investigation works. However, as a precautionary measure all exploratory hole locations were scanned with a Cable Avoidance Tool prior to the commencement of works. In addition, hand dug service pits were completed to a depth of 1.2mbgl at all borehole locations deemed to fall in close proximity to the suspected location of any buried service runs / infrastructure.

5.0.3 To ensure no new sources of contamination were introduced to underlying soils / bedrock during the formation of each borehole, steel casing was used throughout as well as vegetable oil as a lubrication medium for all drilling apparatus. Sampling equipment was also cleaned between sampling to reduce cross-contamination risks.

5.0.4 Soil and rock core samples were collected for subsequent chemical and geotechnical laboratory analysis. Soil samples used for geotechnical analysis were collected in 500g plastic sample tubs and U100 wax sealed sample tubes. Samples collected for chemical testing were collected in 300g glass jars and 500g plastic sample tubs. Samples were obtained from both Made Ground and natural strata to assess the overall quality of underlying soils. In situ soil strength was investigated using Standard Penetration Tests (SPT) within superficial deposits as well as to confirm rock head had been reached.

5.0.5 The shallow soils encountered during construction of the boreholes were described and logged by a suitably qualified engineer in accordance with BS 5930: Code of Practice for Site Investigations (the log sheets for which have been provided within Appendix B).

5.0.6 A total of 6 ground gas and ground water monitoring wells were installed within rotary follow-on or window sampler boreholes. Installation details are provided within Table 5.0 below, copies of ground water and gas monitoring records are provided within Appendix E.

Table 5.0: Monitoring Well Installations

BH ID	Well depth (mbgl)	Response zone (mbgl)	Response zone strata
BH302	3.00	1.00 – 3.00	Made Ground
BH303	1.50	0.50 – 1.50	Made Ground
BH306A	5.00	1.00 – 5.00	Made Ground, glacial clay and weathered mudstone
BH403	5.00	1.00 – 5.00	Made Ground, glacial clay and weathered mudstone
WS403	2.70	0.70 – 2.70	Made Ground, glacial clay and weathered mudstone
WS409	5.00	1.00 – 5.00	Glacial clay

6.0 Encountered Ground Conditions

6.0.1 The following ground conditions are summarised from the exploratory holes formed during the RoC Consulting site investigation. The following represents an overview of encountered ground conditions and it is recommended reference be made to the borehole log sheets provided within Appendix B for a detailed strata description; all depths shown are given in metres below ground level (mbgl) unless otherwise stated.

6.1 Ground Conditions Overview

E Plots

6.1.1 The following conditions are summarised from x7 Rotary Cored boreholes (BH301-BH304, BH305A, BH306A & BH307), x2 Cable Percussion boreholes (BH305 & BH306) and x5 Window Sampler boreholes (WS301-WS303, WS303A & WS304) completed by ROC Consulting in 2019. In addition, reference has been made to the results from x1 Rotary Cored borehole (BH202) and x2 Cable Percussion boreholes (BH203 & BH204) completed by ROC Consulting during their 2017 investigation.

Topsoil

6.1.2 Topsoil was encountered at 8 of 17 exploratory hole locations (BH301, BH303, BH305, BH305A, BH307, WS303A, BH203 & BH204) to depths ranging between 0.02m and 0.40mbgl as generally brown slightly gravelly silty sand or clay with numerous roots, rootlets and organic matter. It is noted that site clearance works across the central reservation are likely to have led to the complete or partial removal of topsoil deposits.

Made Ground

6.1.3 Made Ground was reported at 16 of 17 exploratory hole locations at surface level or underlying topsoil deposits to depths ranging between 1.00m and 6.10mbgl. The deepest Made Ground deposits were encountered in BH302 located at the highest elevation (on top of the embankment structure suspected to be related to the M56 spur construction works).

6.1.4 Made Ground was encountered as generally three types: demolition type material and reworked clay (predominantly in areas of embankment construction), as well as road construction material.

6.1.5 Demolition type material was noted at 15 exploratory hole locations to depths ranging between 0.40m and 6.00mbgl comprising generally brown very gravelly clay with fine to coarse subangular to angular gravel of brick, ceramic tile, concrete, coal, mudstone, sandstone, asphalt and slate.

6.1.6 Road construction material was noted at 6 exploratory hole locations to depths ranging between 1.00m and 3.10mbgl comprising generally asphalt overlying sandy gravel of limestone.

6.1.7 Reworked clay was noted at 3 exploratory hole locations to depths ranging between 2.50m and 6.10mbgl comprising generally brown gravelly clay with fine to coarse subangular to angular gravel of mudstone and sandstone and occasional cobbles of mudstone.

Glacial Till

6.1.8 Glacial clay was encountered underlying Made Ground deposits at 12 of 17 exploratory hole locations (all except one of the boreholes [BH307] extended beyond Made Ground deposits) to depths ranging between 1.10m (68.78mAOD) and 8.60mbgl (67.40mAOD). Clay generally comprised firm to stiff reddish brown mottled grey or grey mottled reddish brown sandy or silty slightly gravelly clay with fine to medium subangular to angular gravel of mudstone.

6.1.9 Sand was noted interbedded with glacial clay deposits at two borehole locations (WS301 and WS304) generally comprising brown medium to coarse slightly gravelly sand. Gravel was fine subangular to rounded of mixed lithologies.

Bollin Mudstone Bedrock

6.1.10 The weathered fraction of mudstone bedrock was encountered underlying glacial till deposits at 12 of 17 exploratory hole locations as reddish brown or grey residual mudstone recovered as silt / clay and fine to medium subangular to angular gravel or destructured mudstone recovered as fine to coarse subangular to angular clayey gravel.

6.1.11 Bollin Mudstone bedrock was encountered and cored at 7 exploratory hole locations during ROC Consulting 2019 investigations to depths ranging between 15.00m (BH307) and 21.16mbgl (BH302). The depth to the top of solid bedrock (below initial weathered fraction) was reported ranging between 3.48m (BH307) and 9.38mbgl (BH302) or 66.02mAOD (BH301) and 67.84mAOD (BH306A).

6.1.12 Mudstone bedrock was generally reported as grey banded dark grey and white or reddish brown extremely weak to weak thinly bedded distinctly weathered to unweathered with extremely closely to medium spaced fractures. For further information refer to rock coring borehole logs and photographic evidence (provided within Appendix B).

Mini Masterplan Wider Area

6.1.13 The following ground conditions are summarised from the x3 rotary cored boreholes (BH401, BH402 and BH402) and x10 window sampler holes (WS401 – WS410) completed by RoC Consulting as part of the current phase of works. In addition, exploratory holes formed by RoC consulting in 2016 (BH102 and ACN BH202) have been included as part of the assessment.

Topsoil

6.1.14 Topsoil was reported at a total of three exploratory holes. Topsoil was reported as blackish brown sandy clay at WS404, dark brown slightly sandy slightly gravelly clay at WS406A and brown slightly clayey sand at BH403. Frequent rootlets and organic matter was present at all locations.

6.1.15 A relic topsoil was reported at WS401 between 1.60 and 2.00mbgl as a dark greyish brown slightly sandy clay with frequent rootlets.

Made Ground

Long Stay Car Park

6.1.16 As indicated from exploratory holes BH401, BH402, ACNBH202, WS406 and WS408 – 410, Made Ground across the long stay car park generally comprised a grey medium to coarse subangular to sub-rounded gravel of limestone overlying a yellowish brown to brown sand and / or gravel of limestone. At BH401, BH402 and WS408, blackish brown to brown gravelly slightly sandy to sandy clay was reported beneath granular fill. Gravels comprised limestone, brick and mudstone. Occasional glass was noted within this stratum. Made Ground ranged in depth from 0.15 – 0.50mbgl with an average of 0.36mbgl.

Brook Diversion

6.1.17 Across the area of the brook diversion, exploratory holes WS401 – 404, Made Ground was generally variable. Depth of Made Ground ranged from 1.00 – 2.00mbgl with an average of 1.48mbgl. At WS401 Made Ground comprised of a brown mottled black gravelly clay to 0.30mbgl. Gravel comprised limestone, sandstone and brick. Beneath this surface layer a reddish brown, greyish brown and brown sandy gravelly clay was reported to 1.60mblg. Gravels comprised limestone, coal, mudstone, brick, and rare quartz. At 1.60 – 2.00mbgl a relic topsoil was reported comprising greyish brown slightly sandy slightly gravelly clay with frequent rootlets.

6.1.18 At WS402 and WS403, Made Ground at the surface comprised a yellowish brown to greyish brown sandy gravel of limestone, sandstone and mudstone. At WS402, black to greyish brown gravelly sand was reported beneath the surface layer. At WS403, a black mottled grey and yellowish brown sandy gravelly clay with frequent rootlets was reported beneath the surface layer.

6.1.19 At WS404, a topsoil was reported to a depth of 0.70mbgl comprising a blackish brown sandy clay with frequent organic matter. A layer of brown mottled orangish brown very sandy reworked clay was reported beneath this stratum. Fine to coarse gravels of brick were reported between 1.00 and 1.20mbgl.

Remainder of Site

6.1.20 Made Ground within WS405 and BH403 comprised reworked clay. Made Ground within WS405, located within the disused area of land to the west of the site, extended to a depth of 4.00mbgl. Made Ground comprised brown, blackish brown and dark grey slightly sandy gravelly clay. Gravels comprised mudstone, limestone, brick and coal with occasional glass. Made Ground within BH403 underlay a slightly clayey sand topsoil and comprised a brown sandy clay with pockets of orangish brown sand with gravels of mudstone and brick to a depth of 2.40mbgl.

Glacial Clay / Sand / Silt

6.1.21 Natural soils were reported at the base of Made Ground deposits at all exploratory hole locations. Natural strata encountered comprised either clay, silt or sand.

6.1.22 Clay was reported at all exploratory hole locations and was generally reported as reddish brown mottled grey clay with rare fine sub-rounded to subangular gravels of mudstone and coal. SPT derived strength values for clays ranged from 24 – 100kPa (soft to stiff) with an average of 61kPa (firm).

6.1.23 Sand was reported as bands and / or pockets within WS401, WS403, WS404, WS406A and BH403. Sand consisted of either dark grey silty clayey fine sand, brown and cream slightly clayey medium to coarse sand or reddish brown fine to coarse slightly gravelly slightly clayey sand.

6.1.24 Silt was reported at WS408 between 0.40 and 0.90mbgl. The stratum was described as greyish brown mottled reddish brown slightly gravelly slightly clayey silt.

Weathered Bedrock

6.1.25 Weathered bedrock was reported at all exploratory hole locations with the exceptions of WS406 and WS409. It is noted that WS406 was terminated within Made Ground deposits.

6.1.26 Weathered bedrock was reported between 69.57mAOD (BH202) and 65.66mAOD (WS410). Weathered mudstone was generally recovered as reddish brown mottled grey clayey silty residual mudstone becoming distinctly weathered and partially weathered with depth. WS409 was terminated before reaching bedrock, it is considered that depth to bedrock in this location is in excess of 62.14mAOD.

6.1.27 Fracture spacing was generally extremely to closely spaced with multiple drilling induced fractures present. Fractures generally dipped between 80 - 110° with occasional sub vertical fractures present throughout. Bedding was described as thinly bedded.

6.1.28 Frequent bands of destructured / residual mudstone was noted throughout the rock cores recovered as gravel and / or clay.

6.1.29 A programme of geotechnical testing was completed on rock samples obtained from site investigation works copies of which are provided within Appendix D.

6.2 Groundwater & Contamination Observations

6.2.1 No visual evidence of contamination was reported during the site investigation works. A hydrocarbon odour was noted in BH306A within Made Ground beneath road type material at a depth between 2.30 and 3.00mbgl and in WS410 at a depth of 0.40m and BH401 at a depth of 0.20 to 0.40m at the base of the road type material. Hydrocarbons are likely to have permeated through road type material following petrol spills from cars on the historic road and within the active car park.

6.2.2 Groundwater strikes were reported within BH403 at 3.30mbgl, WS401 at 4.00mbgl, WS403 at 2.80mbgl, WS404 at 1.20mbgl and WS410 at 0.40mbgl.

6.2.3 Resting groundwater monitoring results (as revealed from borehole stand pipes) indicate a groundwater table within the Made Ground and weathered bedrock deposits at depths ranging between 1.05m and 4.89mbgl. Full details of monitoring results have been provided within Appendix E.

6.3 Below Ground Obstructions

6.3.1 Below ground obstructions were encountered in BH305 at 1.5m comprising brick / concrete fill, the borehole was relocated to BH305A and concrete fill obstruction was also encountered at this location at a depth of 1.00 to 1.80m, though it was broken through with chiselling. An obstruction was also encountered in BH306 at 1.10 to 1.50m comprising asphalt within the area of historic road. BH306 was relocated to BH306A, within which an obstruction was encountered in the form of asphalt / concrete fill at 1.30 to 2.30m which was broken through with chiselling.

6.3.2 An obstruction was encountered in WS303 and WS406 within the hand dug exposure pit at depths of 1.0m and 0.50mbgl respectively. The obstruction in WS303 was noted as asphalt and the borehole was relocated to WS303A, within which the same obstruction was noted at 1.0mbgl, the asphalt was impenetrable with hand digging tools. The obstruction in WS406 comprised compact Made Ground which was not penetrable with hand digging tools. The borehole was therefore relocated to WS406A and advanced.

6.4 DCP Testing

6.4.1 A total of 10 Dynamic Cone Penetrometer test were performed across the proposed road development layout to inform road design. Test locations are shown on drawings ES101 and ES102 provided in Appendix A.

6.4.2 DCP testing was conducted through the dropping of an 8kg hammer from a height of 575mm and recording the resulting penetration of a 20mm cone through the ground to a maximum of 1155mm bgl. CBR values have been calculated from the number of blows per millimetre. An overview to minimum and maximum CBR values recorded at each location is provided overleaf.

Location	Depth (mm)	CBR Value (%)	Comments
CBR401	0 - 416	8	Topsoil type material
	416 - 461	>50	Possible relic road or compacted Made Ground
	461 - 734	14	Likely natural clay strata
CBR402	0 - 201	7	Loose embankment type fill
	201 - 272	>50	Possible compact Made Ground / cobbles
	272 - 710	18	Likely natural clay strata
CBR403*	120 - 508	18	Topsoil / embankment fill type material
	508 - 836	>50	Possible relic road or compacted Made Ground
	836 - 1155	46	Possible natural clay / highly weathered mudstone
CBR404	0 - 636	6	Topsoil type material / loose embankment fill
	636 - 887	13	Likely natural clay strata
CBR405	0 - 143	27	Granular car park surfacing
	143 - 304	>50	Compact carpark sub base
	304 - 922	8	Natural clay strata
CBR406	0 - 226	>50	Granular car park surfacing
	226 - 449	>50	Compact carpark sub base
	449 - 912	13	Natural clay strata
CBR407	0 - 324	>50	Compact carpark material
	324 - 916	10	Natural clay strata
CBR408	0 - 219	18	Granular car park surfacing
	219 - 360	37	Compact carpark sub base
	360 - 671	10	Natural clay strata
	671 - 886	22	Natural clay strata
CBR409A	0 - 33	>50	Compact Made Ground
	33 - 101	>50	Compact Made Ground
CBR410*	70 - 428	7	Loose embankment type fill
	428 - 504	27	Made Ground
	504 - 985	8	Natural clay strata

**The surface topsoil layer was removed before commencing testing at this location.*

6.4.3 CBR values are in the range of 6 – >50%. CBR values derived from tests taken in areas of embankment type fill or topsoil present at the surface are low and in the range of 6 – 8% indicating this material to be poorly compacted. CBR values of surface materials taken across the current long stay car park are generally much greater and in the range of 18 - >50%.

6.4.4 Beneath surface materials, CBR values generally significantly increase. This is likely due to the presence of compact Made Ground deposits associated with either the current car park construction or historic use as areas of carparking at the site and relic roads.

6.4.5 CBR values are observed to decrease significantly at approximately 300 – 400mm bgl. These CBR values are considered to be taken within the upper portion of the natural clay strata. CBR values are in the range of 8 – 18% and increasing to between 22 and 46% with greater depth.

6.4.6 Full copies of testing data can be provided on request.

7.0 Laboratory Testing

7.0.1 To establish the physical and chemical properties of underlying soils, a programme of laboratory analysis was completed utilising samples obtained during site investigation works. This analysis comprised the testing of soil samples to assist with the estimation of risks posed by contaminated land related concerns.

Chemical Testing

7.0.2 RoC Consulting submitted a total of 33 soil samples as part of the current phase of works and 3 soil samples as part of previous phases of work to a UKAS accredited testing facility for analysis against a range of determinands synonymous with the site's former industrial activity.

Determinands	No. of Tests
Toxic and phytotoxic metals and metalloids	28
Total & Speciated Polycyclic Aromatic Hydrocarbons (PAH),	28
Other inorganic substances (e.g. Sulphate, Cyanide etc)	28
Asbestos ID	30
SVOC's	4
Water Soluble Sulfate & pH	28
Waste Acceptance Criteria	6

7.0.3 Copies of chemical testing results have been provided within Appendix C.

Geotechnical Testing

7.0.4 A programme of geotechnical laboratory analysis was also completed on tub and undisturbed soil samples obtained during site investigation works.

E Plots

Plasticity Index

7.0.5 A total of 10 soil samples were tested for the determination of the glacial clays plasticity index during the RoC Consulting 2019 works and an additional sample was tested during the RoC Consulting 2017 bridge investigation. The depth range of samples tested varied from 1.2 to 6.0mbgl with a mean depth of 3.8mbgl. The plasticity index range varied between 9 and 22% with a mean value of 14.3%. These results indicate clays to be of a low to intermediate plastic nature. A plasticity chart detailing the results is provided overleaf (Figure 7.0).

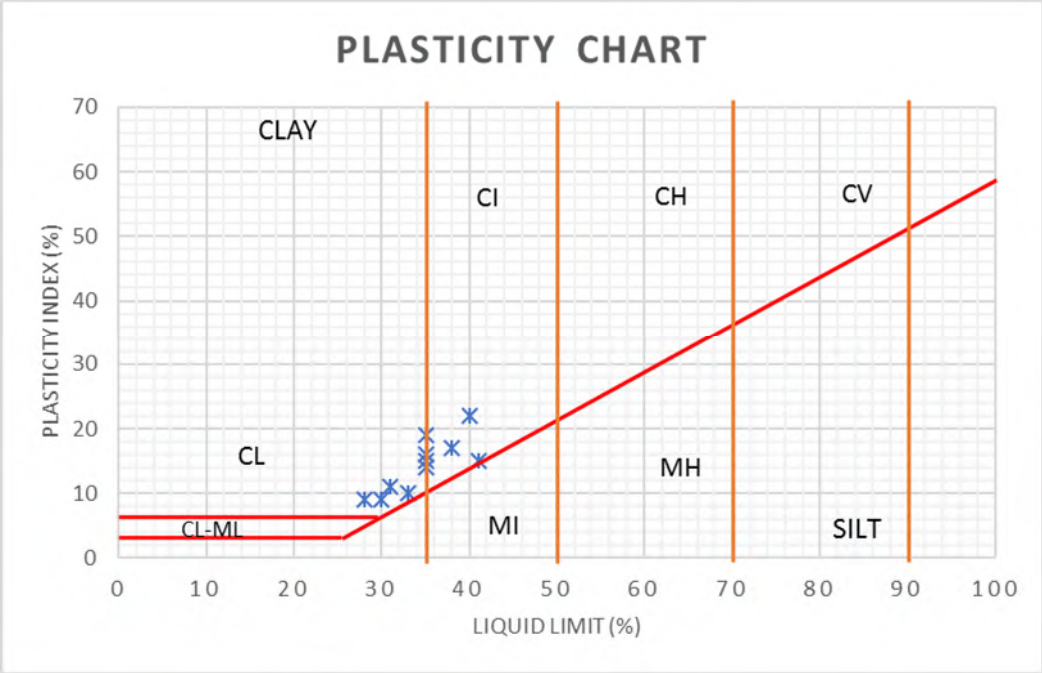


Figure 7.0: Plasticity of site soils for E Plots

Undrained Shear Strength

7.0.6 A total of 4 glacial clay samples were tested for the determination of undrained shear strength from RoC Consulting 2019 works, with an additional sample tested from RoC Consulting 2017 works. Test depths range between 3.0m and 7.5mbgl with a mean depth of 4.9mbgl. Shear strength results vary between 36 and 116kPa with a mean value of 66.2kPa. These results indicate shallow clay strengths vary between low to high strength.

One Dimensional Consolidation

7.0.7 A total of 3 glacial clay samples were tested for the determination of One Dimensional Consolidation during RoC Consulting 2019 works. Tests were completed on undisturbed "U100" samples obtained from cable tool boreholes at depths ranging between 3.0m and 5.0mbgl. A range of applied pressures were used (12 to 200kPa). Resulting Mv values were found to range between 0.09 and 1.2m^2/MN.

Point Load Testing

7.0.8 A total of 84 axial (load applied along the core axis, normal to the observed bedding) point load tests were completed on rock core samples obtained from rotary boreholes during RoC Consulting 2019 works from depths ranging between 4.45 and 20.76mbgl. In addition, a total of 5 axial point load tests were completed on rock core samples obtained from rotary boreholes during RoC Consulting 2017 works from depths ranging between 5.9m and 15.25mbgl.

7.0.9 Measured Is50 values from axial point load index tests have been converted using a factor of 24 (Hoek and Bray 1981) for mudstone to obtain estimated UCS values. These results are presented in Table 7.0 overleaf.

Table 7.0: Overview to Point Load Testing Results

Borehole ID	Orientation	Is_{50}		Estimated UCS		
		Min (MPa)	Max (MPa)	Min (MPa)	Max (MPa)	Average (MPa)
BH301	Axial	0.14	1.23	3.36	29.52	12.74
BH302		0.05	2.98	1.2	71.52	14.14
BH303		0.13	3.82	3.12	91.68	31.14
BH304		0.10	1.98	2.4	47.52	19.17
BH305A		0.22	2.46	5.28	59.04	21.20
BH306A		0.03	2.67	0.72	64.08	23.57
BH307		0.04	2.27	0.96	54.48	18.94
BH202		0.30	3.02	7.2	72.48	44.26

UCS Testing

7.0.10 Due to the very weak nature of the rock, numerous restrictions were encountered when selecting samples for Unconfined Compressive Strength (UCS) tests. One UCS test was completed from rock core samples obtained from rotary boreholes during RoC Consulting 2019 works. In addition, three UCS tests were completed on rock core samples obtained from rotary boreholes during RoC Consulting 2017 works. UCS tests were completed at depths ranging between 7.52m and 10.75mbgl. The results are presented in Table 7.1 below.

Table 7.1: Overview to UCS Strength Testing Results

Borehole ID	Min (MPa)	Max (MPa)	Average (MPa)
BH303	22.00	22.00	22.00
BH202	1.70	9.40	6.60

7.0.11 Figure 7.2 (provided overleaf) indicates the Unconfined Compressive Strength and Point Load Axial Index (Is50) derived estimated Uniaxial Compressive Strength values plotted versus depth. The results indicate that the compressive strength of the mudstone ranges between 0.72 and 91.68MPa (extremely weak to strong). No correlation between rock depth and strength is noted. The strength of the rock is extremely variable with weak sections of rock present throughout the rock core.

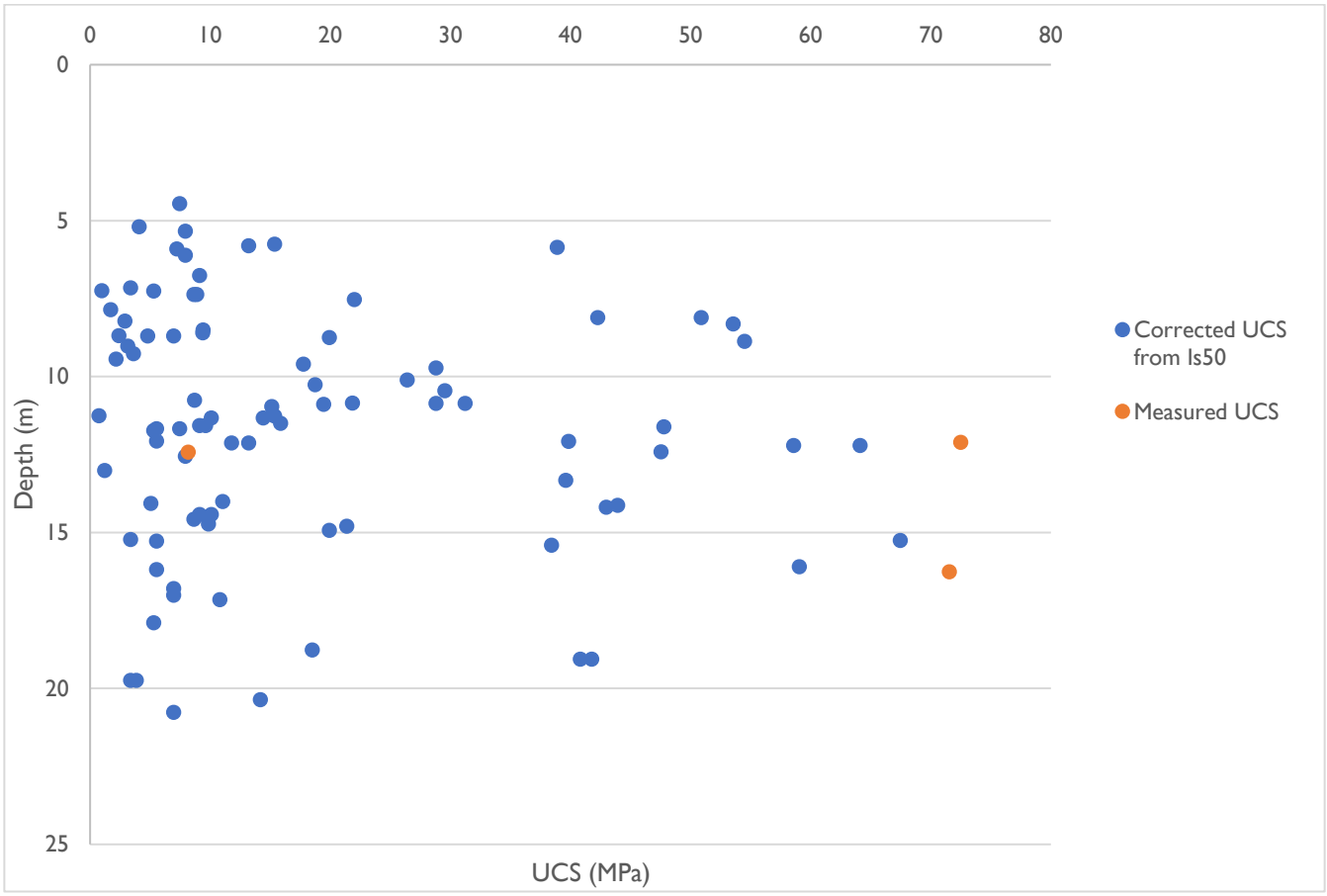


Figure 7.1: Depth vs UCS determined from both corrected and measured values for E Plots

7.0.12 SPTs tests were taken during rotary core drilling where recovery of rock core was poor. Table 7.2 provided below details the results of these tests.

Table 7.2: Overview to SPT During Rotary Drilling Results

Borehole ID	Test Depth (mbgl)	Main Drive Blows	Reported N Value
BH301	6.00	50 over 75mm	50/75mm
	12.00	50 over 70mm	50/70mm
BH304	9.50	50 over 50mm	50/50mm
	15.50	25 over 20mm, 50 over 50mm	75/70mm
BH306A	9.00	42, 50 over 50mm	92/125mm
	15.50	50 over 65mm	50/65mm

Mini Masterplan Wider Area

Plasticity Index

7.0.13 A total of 8 soil samples were tested for the determination of the glacial clays plasticity index. The depth range of samples tested varied from 1.20 to 7.50m with a mean depth of 3.49mbgl. The plasticity index range varied between 10 and 19% with associated liquid limits of 28 and 43%. These results indicate clays to be of a low to intermediate plastic nature.

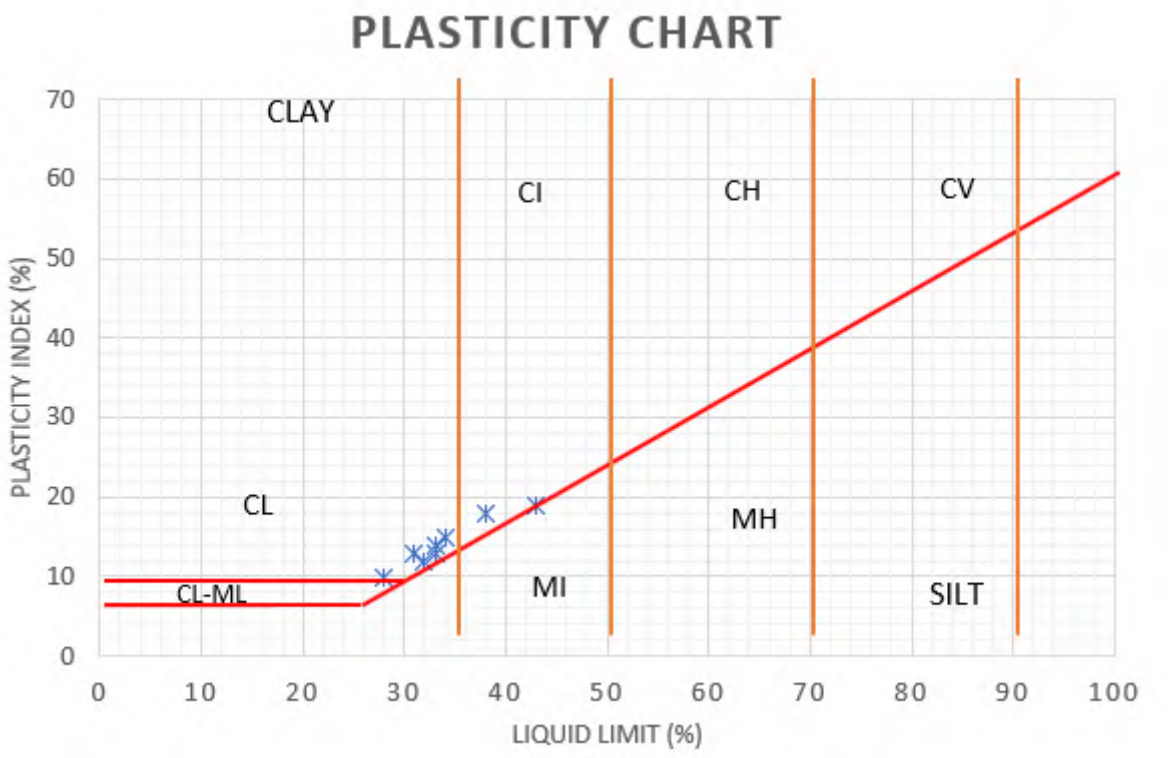


Figure 7.2: Plasticity of site soils for the wider mini masterplan area

Undrained Shear Strength

7.0.14 A total of 2 glacial clay samples were tested for the determination of undrained shear strength from depths ranging between 1.20 and 2.00mbgl. Shear strength results vary between 27 and 62kPa with a mean value of 44.5kPa. These results indicate shallow clay strengths vary between soft to firm.

One Dimensional Consolidation

7.0.15 A total of 2 glacial clay samples were tested for the determination of One Dimensional Consolidation. Tests were completed on undisturbed "U100" samples obtained from cable tool boreholes using a range of applied pressures (0 to 50kPa). Resulting Mv values were found to range between 0.18 and 1.6m^2/MN.

Point Load Testing

7.0.16 A total of 32 axial (load applied along the core axis, normal to the observed bedding) point load tests were completed on rock core samples obtained from rotary boreholes from depths

ranging between 4.80 and 14.87mbgl. Geotechnical testing results from BH102 and BH202 formed as part of previous site investigations have been included as part of the assessment.

7.0.17 Measured Is50 values from Point Load index tests have been converted using a factor of 24 (Hoek and Bray 1981) for mudstone to obtain estimated UCS values. These results are presented in Table 7.3 below.

Table 7.3 Overview to Point Load Testing Results

Borehole ID	Orientation	Is_{50}		Estimated UCS		
		Min (MPa)	Max (MPa)	Min (MPa)	Max (MPa)	Average (MPa)
BH401	Axial	0.05	0.09	1.2	2.16	1.73
BH402		0.13	3.46	3.12	83.04	21.67
BH403		0.06	0.41	1.44	9.84	4.74
BH102		0.04	1.42	0.96	34.08	7.63
BH202		0.06	0.93	1.44	22.32	8.52

UCS Testing

7.0.18 A total of 5 Unconfined Compressive Strength Tests were completed on rock core samples obtained from rotary boreholes at depths ranging between 9.49 and 13.70mbgl. The results are presented in Table 7.4 below.

Table 7.4: Overview to UCS Strength Testing Results

Borehole ID	Min (MPa)	Max (MPa)	Average (MPa)
BH401	0.26	0.29	0.28
BH402	1.6	23.5	12.55
BH403	7.06	7.06	7.06
BH102	1.3	4.70	3.00
BH202	0.9	3.9	1.92

7.0.19 Figure 7.3 (provided overleaf) indicates the Unconfined Compressive Strength and Point Load Axial Index (Is50) derived estimated Uniaxial Compressive Strength values plotted versus depth. The results indicate that the compressive strength of the mudstone ranges between 1.2 and 83.04MPa (very weak to strong). Some increase in strength with increasing depth is noted however, testing results indicate very weak sections of rock throughout the full depth of the rock cores.

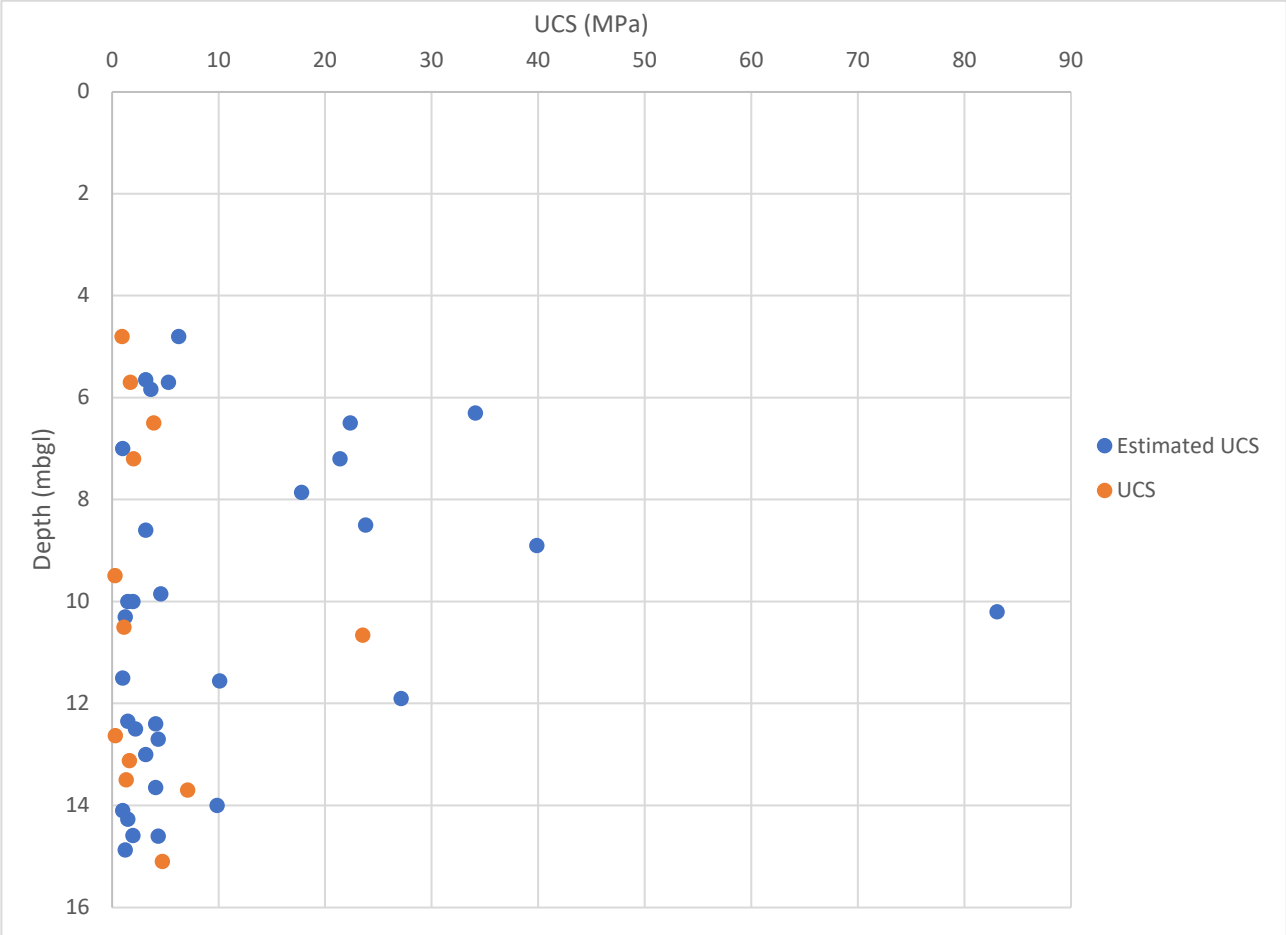


Figure 7.3: Depth vs UCS determined from both corrected and measured values for the wider mini masterplan area

7.0.20 SPTs tests were taken during rotary core drilling where recovery of rock core was poor. Table 7.5 provided below details the results of these tests.

Table 7.5: Overview to SPT During Rotary Drilling Results

Borehole ID	Test Depth (mbgl)	Main Drive Blows	Reported N Value
BH401	9.00	23, 25, 50 over 50mm	98/200mm
	11.50	50 over 70mm	50/70mm
BH402	6.00	50 over 20mm	50/20mm
	12.00	50 over 40mm	50/40mm
BH403	9.00	23, 25, 75 over 50mm	123/275mm
	11.50	50 over 70mm	50/70mm

8.0 Geo-Environmental Assessment

8.0.1 The information obtained during the desk-based study has been reviewed to establish the Preliminary Conceptual Model for the site. This model is based around the Source / Pathway / Receptor methodology as outlined in Figure 8.0.

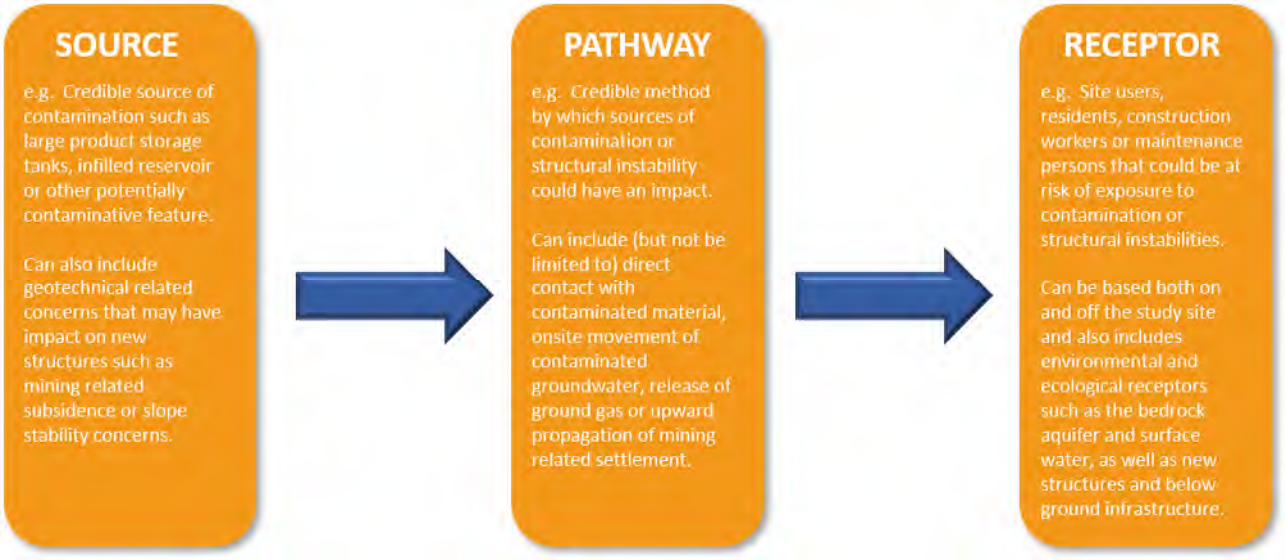


Figure 8.0 Source Pathway Receptor Diagram

8.0.2 Risk assessment is the process of collating known information on a hazard or set hazards in order to establish actual or potential risks to receptors. The receptor may be human health, controlled waters, a sensitive local ecosystem or even construction materials. Receptors can be connected with the hazard under consideration via one or several exposure pathways (e.g. the pathway of direct skin contact and oral exposure).

8.0.3 Risks are generally managed by isolating or removing the hazard, isolating the receptor, or by intercepting the exposure pathway. Without the three essential components of a source (hazard), pathway and receptor, there is deemed to be no risk. In other words, the mere presence of a hazard at a site does not mean that there will necessarily be risks.

8.0.4 A CLEA CLR 8 provides a selection of contaminants that may be relevant for the assessment of contaminated land, based on site usage, because they are likely to be found on a large number of industrial sites in the UK and have the potential to affect human health and the environment. The CLEA CLR 8 documentation, along with other relevant guidance, forms the basis against which the site has been assessed.

8.0.5 A Preliminary desk-based risk assessment has been completed for the site utilising the current and historical environmental information available (refer to RoC Consulting report ref: MN/AS/p1 3733). This report formed the basis from which the current program of ground investigations was designed and undertaken.

8.0.6 The results from these intrusive site investigations have allowed a geo-environmental risk assessment to be completed in accordance with the guidelines and principals of the Environment Agency CLEA Methodology and with reference to the guidance outlined within CIRIA 552 "Contaminated land risk assessment. A good practice guide". This risk assessment methodology considers the potential consequence and severity of risks that may be present within soils in comparison with the likelihood of exposure to and occurrence of said risk.

8.0.7 A range of risk classifications are provided within CIRIA 552 further details of which are provided in Table 8.0 below.

Table 8.0: Definition of Risk Class and Consequence.

Risk Class	Definition	Example
Minor	Potential for harm, although not significant, which may result in financial loss to resolve. Ground conditions where the use of PPE would readily mitigate risks posed to human health.	Low level contamination hotspots within Made Ground / demolition fill materials. Stunted or impeded plant growth due to poor soil quality.
Mild	Pollution of non-sensitive water resources or damage to crops, plant growth, below ground utilities or structures.	Perched groundwater contamination overlying low permeability aquifer or aggressive sulphate concentrations in soils.
Medium	Sources of contamination identified on site have the potential to cause both long and short term health effects on site residents / users. Alternatively (or in conjunction with) sources of contamination may have the potential to impact surface or groundwater quality or impede vegetation growth	Elevated concentrations of hydrocarbon contamination reported within topsoil tested within residential gardens as a result of inadequate or incomplete previous remediation works. Movement of contaminated groundwater from leaking below ground storage tank into adjacent surface water course.
Severe	Sources of contamination pose a credible and acute risk to human health with potential for "Significant Harm" occurring as defined by the Part IIA of the Environmental Protection Act (1990). Alternatively (or in conjunction with risks posed to human health) sources of contamination may pose an immediate risk to controlled water resources or ecosystems.	Grossly contaminated soils are encountered or disturbed during excavation works, causing an immediate release of toxic soil vapour and leachate / contaminated groundwater flow across adjacent land.

8.0.8 As previously discussed the contaminated land risk assessment model evaluates both the severity of risks that may be present within soils and groundwater in the context of threats posed to identified receptors before deriving the actual risk rating based on the probability of occurrence. Table 8.1 (provided overleaf) outlines the range of risk likelihood.

Table 8.1: Probability Assessment

Classification	Definition
High likelihood	A credible pollutant linkage has been identified and it is very likely contaminants will impact identified receptors in both the short or long term (or is already actively doing so). The potential for harm to be caused is thus highly likely.
Likely	Pollutant linkages between the sources of contamination and identified receptors are present and it is considered likely they will become active given the right set of circumstances (e.g. contaminants currently buried below ground that are likely to be exposed or disturbed during construction and excavation works. The circumstances are such that an event is not inevitable, however, it is possible in the short term and likely over the longer term.
Low likelihood	A theoretical pollutant linkage has been identified that has the potential to expose receptors to contaminants under the correct circumstances. However, the likelihood of such an event occurring is not a certainty, even in the long term
Unlikely	There is no / minimal likelihood a pollutant linkage would occur, even over the long term.

8.0.9 The risk assessment process is a combination of probability and consequence, recognising that it may be possible to have a significant source of contamination beneath a site (such as a large below ground chemical storage tank) that may only present a relatively moderate to low risk (owing to the fact it may be contained within a secure concrete bund). Table 8.2 indicates how the actual nature of risk is established with Table 8.3 illustrating how the risk is interpreted in the context of contaminated land risk assessment.

Table 8.2: Risk Definition

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate / Low Risk
	Likely	High Risk	Moderate Risk	Moderate / Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate / Low Risk	Low Risk	Very Low Risk	

Table 8.3: Description of risks posed

Risk Definition	Description
Very High	Active pollutant linkages between a significant source of contamination and identified receptors have been establish and there is a high likelihood of severe harm occurring to said receptors unless immediate investigation and remediation action is not taken.
High Risk	Harm is likely to arise to receptors from an identified hazard in the short and long term. Urgent investigation of the contaminant issue will be required, and remedial treatment is likely.
Moderate Risk	The possibility of harm has been identified toward receptors under the right circumstances, although the severity of harm would be relatively mild. Further investigation of identified issues would be prudent and possible need for remedial measures in the long term.
Low Risk	It is possible harm could arise to a designated receptor from identified hazard, but it is likely (if realised) any harm would be (at worst) mild.
Very Low Risk	No significant pollutant linkages have been identified and the possibly of harm occurring to receptors is low.

8.0.10 A geo-environmental risk assessment has been completed to quantify the risks posed to identified receptors (as outlined in the preliminary site conceptual model) using the information obtained during site investigation fieldworks. Broadly speaking, this risk assessment process can be divided based on the receptor group in question between:

1) Risks posed to human health by soil contamination (both construction persons and future site users).

2) Risks posed to human health by hazardous ground gas ingress (both construction persons and future site users).

3) Risks posed to controlled waters by soil or groundwater contamination (both surface water features and bedrock aquifers).

4) Risks posed to new building construction by aggressive ground conditions (namely elevated sulphate concentrations).

8.0.11 It is noted the site is being developed for commercial end uses comprising car parks, multi storey office buildings, hotels, open green spaces and associated infrastructure works.

8.0.12 Appropriate assessment have been completed for each of the above utilising the latest statutory and non-statutory guidance documents; for details of risks posed to human health refer to Section 8.1 (soils) and Section 8.2 (ground gas), for details of risks posed to controlled waters refer to Section 8.3 and risks posed to new structures refer to Section 8.4.

8.1 Assessment of Soil Contamination

8.1.1 In order to estimate the risks posed to human health from soil contamination, a quantitative risk assessment has been completed utilising the latest Environment Agency CLEA methodology. The assessment utilises the chemical testing results obtained during the site investigation fieldworks to characterise site conditions and facilitate the completion of the risk assessment process.

8.1.2 The assessment is based on the comparison of soil chemical testing results with published Environment Agency Category Four Screening Levels (C4SL's) under the proposed end use scenario to determine the sites suitability for use. C4SL values represent the highest acceptable values for contaminants within site soils under the proposed end use and are derived using the Environment Agency CLEA risk assessment methodology. A result in exceedance of a C4SL level may indicate the presence of contaminants within site soils and require further assessment.

8.1.3 It is noted only a limited number of C4SL values have been derived by the Environment Agency for use and reference has been made to LQM/CIEH Suitable For Use Values (S4UL's) for a wider range of other contaminants (Heavy Metals, Poly Aromatic Hydrocarbons, TPH, SVOC and VOC's) to increase the depth and robustness of our assessment.

8.1.4 Chemical testing results are compared against C4SL and S4UL values for each determinant with any results reported in exceedance of screening criteria identified and their significance reviewed. When determining the significance of any exceedances within the dataset the magnitude and frequency of the exceedance need to be taken into account, for example, a single exceedance of a screening value may be considered a localised hotspot whereas consistently elevated levels of a substance at multiple locations across the site may indicate a more prevalent contamination issue.

8.1.5 In addition to this assessment, an Asbestos Identification test (via the visual inspection method) has been completed on all samples of Made Ground obtained during the investigation to determine risks posed. Any positive occurrences of Asbestos will be subject to quantification analysis to further assess the extent and significance of risks posed.

8.1.6 As required, for each exceedance reference will be made to the Conceptual Site Model to establish the most likely source of contaminants and initial commentary given as to the likely scope of remedial measures. In addition, reference will also be made to the assumptions used to derive generic assessment criteria (C4SL and S4UL values) to determine their comparability with the proposed end use.

8.1.7 For the purposes of this assessment we have assumed a "Commercial" end use scenario when reviewing chemical testing data against C4SL / S4UL values; a "worst case" Soil Organic Matter content value of 1% has been assumed for the initial assessment.

Summary and Assessment of Risks Posed by Soil Contamination

8.1.8 Results from chemical testing analysis indicate the following:

1) No exceedances of CLA SGV or CIEH LQM generic assessment criteria when reviewed under a "Commercial" end use scenario.

2) Loose chrysotile fibres noted in Made Ground deposits in BH305 at a depth of 1.00 – 1.10mbgl. Further testing indicates quantity of asbestos within the sample to be <0.001%.

8.1.9 Asbestos contamination was encountered within the central reservation embankment feature across which the E Plot buildings are to be constructed, on the southern extent of the wider Mini Masterplan area. The chrysotile fibres were noted within demolition type material used in the construction of the embankment. Previous works by contractors BCEGI have identified asbestos within this area and it is noted that it is not uncommon to encounter trace levels of asbestos within demolition type Made Ground deposits on brownfield sites. Precautionary measures should be taken during the removal of Made Ground deposits within this area.

Waste Acceptance Criteria Testing

8.1.10 A total of 3 Waste Acceptance Criteria (WAC) tests were completed within embankment fill material on the E Plots site and an additional WAC test was completed within road construction material within the area of the proposed brook diversion on the wider mini masterplan area as it is understood that these are likely to be areas of cut.

8.1.11 In terms of waste disposal implications, WAC results indicate that generally the material would be classed as Inert Waste. Although, it is noted that there was an exceedance of Mineral Oil concentration in BH307 placing the material under the Non-Hazardous waste category.

8.1.12 It should be noted that the WAC testing only provides an initial indication of the materials actual classification and discussions should be held with suitably qualified waste disposal contractors to confirm classification and associated disposal costs.

8.1.13 The findings of the above have been used to update the Refined Conceptual Site Model (provided within Section 9.0) as well as inform the scope of any further investigation or remedial works deemed necessary to support the sites development.

8.2 Ground Gas Risk Assessment

8.2.1 The Preliminary Conceptual Site model identified the Made Ground deposits as being a potential source of ground gas generation (via the decay of any organic matter or buried topsoil contained therein). The site is not said to be located within in an area at risk from Radon gas ingress.

8.2.2 It is considered the most probable exposure pathways are likely to be limited to construction workers during the sites redevelopment and future site users occupying buildings across the site.

8.2.3 To estimate the risks posed by ground gas generation a total of six boreholes were installed with gas monitoring wells (BH302, BH303, BH306A, BH403, WS403 and WS409). The purpose of these standpipes is to investigate ground gas generation potential of shallow and at depth soils and the associated implications this may have for new building design.

8.2.4 At the time of writing, a total of four ground gas monitoring visits have been completed on site during varying weather conditions and atmospheric pressure (refer to Appendix E for further information). The results from these monitoring works revealed a maximum Carbon Dioxide concentration of 15.50% with gas flow rates ranging from negligible to 1.30 l/hr. The results also indicated depleted oxygen levels ranging between 20.20 and 2.00% within monitoring wells and an absence of methane and hydrogen sulphide gases.

8.2.5 Attempts to complete further gas monitoring works were attempted during November 2019 period but were unsuccessful due to the earth works undertaken at the time. The majority of monitoring wells had been either removed / destroyed as part of earthworks or were inaccessible due to stock piling of materials. Photographic evidence has been provided within Appendix E.

8.2.6 Based on monitoring works completed to date, and with reference to guidance provided in CIRIA C665 “Assessing risks posed by hazardous ground gases to buildings”; the above-mentioned worst-case gas levels and borehole flow rates equate to a gas screening value of 0.2015 l/hr (assuming the development comprises offices, green space, hotels and associated infrastructure). This value equates to a Characteristic 2 Situation with possible remedial measures envisaged to control ground gas ingress.

8.2.7 It is noted that concentrations of CO2 are consistently greatest within BH403 only with concentrations ranging between 13.20 and 15.80% (which correlates to a Characteristic Situation 2) while gas concentrations from the remaining monitoring wells across the wider site equate to a Characteristic Situation 1 (concentrations within remaining wells are in the range 0.50 – 3.90%). It is also noted that BH403 is located outside of the development area for the current phase of works and is not representative of the current development site.

8.2.8 It is considered likely the gas levels in and around BH403 are relating to recent vegetation clearance operations and the subsequent placement of mulch and organic matter across site soils. It is likely any organic rich soils surrounding BH403 will be removed from site prior to site development and floor slab construction (as they are not a suitable founding stratum) which would reduce the source and severity of gas risk in this zone. No other significant sources of ground gas ingress have been noted on or adjacent either BH403 or the wider site (e.g. infilled large pond or reservoirs, landfill sites etc)

8.2.9 It is considered that ground gas readings within BH403 are not representative of the wider site and application of a Situation 2 gas risk (and associated remedial measures) across the wider site is considered potentially unnecessary. It is recommended that a Characteristic 1 Situation is representative of the current development area and that no remedial measures are required. With respect to development in the area of BH403, it is recommended attempts are made to relocate this well following site strip operations and additional monitoring works completed to establish any alterations that have occurred in the gas regime (and associated remedial measures in this zone).

8.3 Controlled Waters

8.3.1 It is understood the site is underlain by a Secondary Aquifer and is not said to be located within any Environment Agency Zone source protection zones or in close proximity to sensitive groundwater abstraction boreholes. The nearest surface water features are noted on site in the form of a brook on the western extent and pond in the area of E Plots. These features are not considered to be at risk of contaminant migration from the study site.

8.3.2 Ground conditions were found to comprise predominantly clay deposits and therefore it is likely that any contaminant migration would be impeded due to the impermeable nature of these deposits. In addition, no significant sources of contamination were identified within site soils further reducing the risk to controlled waters.

8.4 Below Ground Concrete Construction

8.4.1 Peak potential sulphate concentrations range between <10 and 207 mg/l with soil pH values ranging between 6.96 and 11.18. Based on these results, it is considered that well compacted buried concrete should be designed in accordance with Class DS-1 AC-1s requirements as specified in BRE Digest Special Digest 1:2005 *Concrete in aggressive ground: Version 3*.

8.5 Below Ground Utilities and Service Runs

8.5.1 No evidence of significant contamination was identified during site works and protective water supply pipes are unlikely to be required.

9.0 Refined Conceptual Site Model

9.0.1 The Environmental Protection Act Part IIA: 1990, defines contamination as land containing levels of contamination which form a risk to human health, controlled waters or other ecosystems. Therefore, contamination in exceedance of the relevant screening values is considered a source. Table 9.0 assesses and summarises the sources, pathways and receptors that may exist at the site;

Table 9.0: Refined Conceptual Site Model

Table 3.0		Preliminary Conceptual Site Model					
Source		Pathway	Receptor	Severity	Probability	Risk definition	Comments
On Site	Contaminants within site soils / Made Ground	Dermal contact and / or ingestion; inhalation of vapours / dusts	Current Site Users	Mild	Unlikely	Very Low	Current site users comprise members of the public, employees at the long stay car park and members of the public crossing the site. A review of historical information has identified that the site comprised green fields with a small number of residential houses. The area to the west of the site was previously in use as a long stay car park however, it is now disused land and no access is available to the public. No evidence of significant levels of contaminants have been identified that may have resulted from historical or current site usage. It is not considered that current site users are at risk of harm by any contaminants present within site soils due to the low levels of contaminants identified in site soils and the nature of current site use.
			Construction workers	Medium	Low	Moderate / Low Risk	It is considered the risks posed to construction personnel, by sources of contamination, can be adequately mitigated against via the use of full PPE and the adoption of good hygiene and site practices. * Appropriate personal ground gas detection equipment should be deployed by all site operatives when working in below ground or confined spaces.
			Future Site Users	Mild	Unlikely	Low	The site is to be developed to comprise commercial office space and car parking with areas of public open space. It is assumed that areas of soft landscaping will include a suitable clean soil capping layer. Given the relatively low levels of contaminants identified and the presence of hardstanding / soil capping layer it is not considered that future site users will come into direct contact with site soils.

Table 3.0		Preliminary Conceptual Site Model					
Source		Pathway	Receptor	Severity	Probability	Risk definition	Comments
			Ecological	Minor	Unlikely	Low	There is no evidence of phytotoxic chemicals present within site soils. The site is not located within an area of ecological importance. It is recommended that suitable soil capping layers are used in areas of soft landscaping.
On site	Leachable contaminants within site soils / Made Ground	Leaching of contaminated soil & impact beneath site	Controlled Waters: Aquifer	Minor	Unlikely	Very Low	The underlying aquifers are classified as an Undifferentiated Secondary Aquifer and a Secondary B Aquifer. These aquifers are not considered to be especially sensitive receptors. Additionally, the low level of contaminants present and low permeability clay across the site will inhibit the leaching of any contaminants to the aquifer.
			Adjacent Sites	Minor	Unlikely	Very Low	Adjacent land use comprises commercial offices and does not represent especially sensitive receptors. Additionally, the absence of highly elevated concentrations of contaminants within site soils and widespread presence of low permeability clays significantly reduces the risk of off-site contaminant transport.
		Below ground service runs	Below ground infrastructure & construction	Medium	Unlikely	Low	All below ground concrete structures to be designed in accordance with a Class DS-1 AC-1s requirements as specified in BRE Digest Special Digest 1:2005 Concrete in aggressive ground: Version 3. No significant evidence of contamination was identified during site works and protective water supply pipes are unlikely to be required.
	Ground Gas Generation	Migration / Accumulation	Current Site Users Construction workers Future Site Users Current Site Users	Medium	Low Likelihood	Low - Moderate	Ground gas monitoring has revealed a maximum carbon dioxide concentration of 15.50% with a peak flow rate of 1.30 l/hr. This equates to a Characteristic 2 Situation with potential remedial measures comprising a reinforced concrete slab or gas membrane / underfloor venting. It is noted that the elevated levels of gas readings are limited to BH403 only and as such application of Characteristic 2 Situation and associated remedial measures across the site is considered potentially unnecessary. It is recommended that a Characteristic 1 Situation is applicable for the current development site and that attempts are made to relocate BH403 following a site strip to assess any alterations in the gas regime.

Table 3.0		Preliminary Conceptual Site Model					
Source		Pathway	Receptor	Severity	Probability	Risk definition	Comments
Off site	Potentially Contaminative Sources; Controlled waters and ground gas generation [adjacent landfills, peat bogs etc]	Leaching of contaminated soil onto site	Controlled Waters: Aquifer	Mild	Unlikely	Very Low	No significant sources of contamination from off-site sources have been identified during the site investigation and as such the risks posed to controlled waters is considered to be low.
			Controlled Waters: Surface Water	Mild	Unlikely	Very Low	
		Ground gas Migration / Accumulation	Construction workers	Severe	Unlikely	Low - Moderate	No significant sources of ground gas generation have been identified off-site. It is considered the risks posed to construction personnel, be it sources of contamination, can be adequately mitigated against via the use of full PPE and the adoption of good hygiene and site practises. Appropriate personal ground gas detection equipment should be deployed by all site operatives when working in below ground or confined spaces.
			Future Site Users	Severe	Unlikely	Low - Moderate	No significant sources of ground gas generation have been identified off-site. As such the risk to future site users and the proposed development is considered to be low with no remedial measures required.
			Proposed development	Severe	Unlikely	Low - Moderate	

*Any sources of contamination uncovered during site development works should be brought to the immediate attention of RoC Consulting for consideration and comment.

9.0.2 Re-appraisal and reassessment of the conceptual site model (following completion of investigation works) has failed to reveal any specific sources of contamination that could require specific remedial measures.

9.0.3 It is recommended all construction contractors take reasonable precautions to control environmental impacts that may occur as a result of redevelopment works with respect of soil and groundwater quality. These measures should include (and not be limited to):

1) Any sources of contamination uncovered during site development works should be brought to the immediate attention of RoC Consulting for consideration and comment. As required, the findings and recommendations of the current assessment may require amendment to reflect changes in site condition.

2) The operation of plant, refuelling facilities and general basement excavation works should include appropriate provision to reduce the risk of leakage and spillage, particularly into the site's groundwater table or exposed natural soils.

3) Appropriate dust mitigation measures should be deployed during basement excavation works, particularly when handling and excavating Made Ground deposits.

4) All excavated materials stockpiled should be periodically dampened down to control dust release. Similarly, the disposal of any material from site should be completed using covered wagons.

5) Re-assessment of sites ground gas regime post completion of bulk earthworks operations.

10.0 Geotechnical & Foundation Design Assessment

Background Information

10.0.1 A geotechnical assessment of site conditions have been collated for the proposed E Plots and Mini Master Plan developments. In addition, advice on future road construction and culvert diversion works has also been provided to support on-going design requirements. The assessment includes reference to the results of both current and previous site investigations in the context of the development masterplan and site layout at the time of writing.

10.0.2 It should be noted any alteration of development or site layout may require the full or partial re-assessment of this review.

10.1 New Building Foundation Design (E Plots)

10.1.1 It is understood the E Plots site is to be redeveloped to comprise two 6 storey office buildings and a 9 storey car park with associated infrastructure works. The safe working column loadings associated with this development are said to be of the order of 3200 - 3500kN.

10.1.3 Site investigations indicate ground conditions to comprise topsoil at approximately half of the exploratory hole locations to a maximum depth of 0.40mbgl. Made Ground was reported at 16 of 17 exploratory hole locations ranging in depth from 1.00mbgl to 6.10mbgl. Made Ground comprised either demolition fill type material, road type material and reworked natural clay.

10.1.4 Natural strata encountered underlying Made Ground deposits was reported as glacial till comprising either clay or sand interbedded with clay. Clay was generally reported as firm to stiff reddish brown, brown or orangish brown mottled grey slightly sandy clay. SPT derived strength values were in the range 24 – 64kPa with an average of 12kPa.

10.1.5 Bands of sand within natural strata were generally reported as brown medium to coarse slightly gravelly sand.

10.1.6 The weathered bedrock fraction was encountered within 12 of 17 exploratory hole locations between depths of 67.40 and 69.91mAOD with an average depth of 68.73mAOD. Weathered bedrock was generally recovered as residual mudstone comprising silt / clay and destructured mudstone comprising fine to medium subangular to angular gravel.

10.1.7 Groundwater strikes were reported between 0.40 and 4.00mbgl. Resting groundwater monitoring results indicate a groundwater table between 0.31 and 4.13mbgl.

10.1.8 It is not recommended new building foundations be constructed on top of Made Ground deposits. The variable composition and in situ strength of these materials is such that unacceptable levels of total and differential settlement will occur as a result.

10.1.9 The nature of the development and the variability of the shallow ground conditions will preclude the adoption of simple spread foundations. It should be noted that along the southern boundary is the highway embankment. This will require local cut and some areas will be filled to produce a consistent development platform.

10.1.10 For low rise development it may be possible to adopt a pad foundation solution with foundations placed on the competent Glacial Till or competent weathered mudstone. However, this assessment is outside of the remit of this report.

10.1.11 It is suggested that the structural foundations will be carried on a piled foundation. It is anticipated that a Continuous Flight Auger pile methods would be adopted to ensure penetration in to the weathered mudstone to a suitable termination depth.

10.1.12 As discussed above the weathered Mudstone has been encountered at an elevation in the range: 67.40mAOD to 69.91mAOD with the penetration by light cable percussion in the range 0.4-3.3m. The light cable percussion borehole was terminated with an SPTN of 50 for incomplete penetration.

10.1.13 The borehole record sheets for the rotary cored boreholes show the rock mass to comprise the Bollin Mudstone, is variably weathered from destructed to partially weathered. The rock strength has been measured from Point Load Index (Is50) 0.72-91.68MN/m² with the average circa 23MN/m². The Uniaxial Compressive Strength test is and the range 1.7-22MN/².

10.1.14 The rock mass is shown by the mechanical logging to have highly variable discontinuities. Principally the discontinuities are related to bedding in the mudstone. The bedding seems to be at low angle (across the core axis) indicating horizontal and sub-horizontal bedding. There are areas of the core where there a high angle (across the core axis) open but rough joints.

10.1.15 The discontinuities form in two groups: (1) geological origin and (2) drilling induced. Drilling induced discontinuities result from the separation of the weakly bonded bedding surfaces resulting in frequent disc like core. High angle drilling induced discontinuities can form by flexing of the core either during drilling or in the core liner at time of the core extraction.

10.1.16 Site investigation works to date have identified localised weaker and highly weathered bands depth within the Mudstone formation that will require due consideration as part of the pile design process.

10.1.17 Of particular concern in this regard is the potential for piles to be terminated in what appears to be more competent bedrock that is underlain by weaker zones, and the potential for pile failure once loading is applied as a result. Any pile contractor reviewing this (and supplementary plot specific site investigations) should be mindful of this issue within the Bolin Mudstone and ensure appropriate provision is made. A specialist contractor will provide a conforming design for suitable diameter and depth piles to carry the indicated foundations loads

10.1.18 As discussed above the road embankment at the southern end of the site will be cut to produce the development area. The resulting spoil, where suitable, will be used as engineered fill. The ROC ground investigation report 3590 2017 has BH203 (gl 72.87mAOD) and BH204 (gl 75.62mAOD) at the top of the embankment they both show Made Ground to 3.50m and 6.0m respectively.

10.1.19 The Made Ground is composed of a near surface layer of general mixed granular fill with inclusions of brick tile and concrete with rare inclusions of wood and plastic. Below circa 1.0m the Made Ground is generally cohesive fill with inclusions of brick and concrete and natural gravel. The road embankment fill had been engineered as shown by the Standard Penetration Test N values that are in the range 24 to 10.

10.1.20 It is considered that the embankment fill can be considered as general fill with the end performance being determined by appropriate testing. The placement of the reworked embankment fill, to form structural fill, dependent of test results, can be undertaken using the following:

- Conventional earthworks, placed in thin layers and compacted
- Heavy Impact Compaction
- Lime /cement modification

10.1.21 The reuse of materials should be completed in accordance with a performance specification with appropriate treatment using some of the abovementioned methods as required. Due care and attention should also be taken when excavating and handling site soils to ensure their physical composition is not affected by plant vehicle movements or periods of sustained poor weather.

10.1.22 The use of ground improvement as part of the overall earthworks across both the E Plot and Mini Masterplan development sites may also be prudent to stabilise soils to allow construction of a piling mat and as a possible support for ground bearing floor slabs / external areas.

10.2 New Building Foundation Design (Mini Masterplan)

Background Information

10.2.1 It is understood the Mini Masterplan site is to be redeveloped for use as multi-storey car parks, offices and hotels with a number of green open spaces. No further information regarding column loadings are available for the development and as such the below comprises a preliminary assessment only. This assessment should be read in conjunction with the RoC Report 3407 2017.

10.2.2 The 2019 ground investigations indicate ground conditions to generally comprise Made Ground over natural deposits. Topsoil was reported at 3 exploratory hole locations. Made Ground was variable across the site and comprised either demolition type fill, granular fill associated with the gravel car park and reworked clay. Made Ground was reported to depths between 0.15 – 4.00mbg at WS405 located on an embankment.

10.2.3 The embankment fill at WS405 was composed generally of cohesive fill, soft-firm with SPTN values 9-11, with inclusions of gravel of mudstone limestone brick fragments and coal. The Made Ground of the car park construction is generally granular surfacing over cohesive fill with inclusions of gravel sized concrete mudstone brick coal.

10.2.4 At BH403, in the north west corner of the development area, adjacent to the recently constructed Enterprise way, shows Made Ground of reworked soft sandy slightly gravelly CLAY (SPTN 7).

10.2.5 Natural strata underlying the Made Ground deposits generally comprised clay reported as reddish brown mottled grey clay with rare gravels of mudstone and coal. SPT derived strength values for clays ranged from 24 – 100kPa (soft to stiff) with an average of 61kPa (firm). Bands and / or pockets of sand were reported at 5 exploratory hole locations.

10.2.6 The Unconsolidated Undrained Triaxial (QUT) shear strength at BH403 1.2m 27kPa and 2.0m 62kPa.

10.2.7 Weathered bedrock was recorded between 69.57 and 65.66mAOD recovered as reddish brown mottled grey clayey silty residual mudstone becoming distinctly weathered and partially weathered with depth. It is noted that WS409 was terminated before reaching bedrock and it is considered that depth to bedrock in this location is in excess of 62.14mAOD.

10.2.8 The mudstone was penetrated, by light cable percussion methods, over a distance of 1.0m (BH402) and 1.7m (BH403) confirmed by an SPTN of 50blows with incomplete penetration.

10.2.9 It is not recommended new building foundations be constructed on top of Made Ground deposits. The variable composition and in situ strength of these materials is such that unacceptable levels of total and differential settlement will occur as a result.

10.2.10 It is not recommended new building foundations be constructed on top of Made Ground deposits. The variable composition and in situ strength of these materials is such that unacceptable levels of total and differential settlement will occur as a result.

10.2.11 For low rise development it may be possible to adopt a pad foundation solution with foundations placed on the competent Glacial Till or competent weathered mudstone. The variability of the shallow soils will require a plot specific foundation assessment.

10.2.12 It is suggested that the structural foundations will be carried on a piled foundation. It is anticipated that a Continuous Flight Auger pile methods would be adopted to ensure penetration in to the weathered mudstone to a suitable termination depth. For lower structural loads a driven pile option may be applicable

10.2.13 As discussed above the weathered Mudstone has been encountered in the 400 Series Boreholes at an elevation in the range: 66.39mAOD to 68.70mAOD with the penetration by light cable percussion in the range 1.0-1.7m. The light cable percussion borehole was terminated with an SPTN of 50 for incomplete penetration.

10.2.14 A specialist contractor will provide a conforming design for suitable diameter and depth piles to carry the indicated foundations loads.

10.2.15 The importation and placement of fill material across the Mini Masterplan should be completed in accordance with the aforementioned RoC Consulting earthworks strategy and in compliance with any performance criteria. The use of ground improvement techniques may be required to stabilise soils being brought into the Mini Masterplan plot from the adjacent E Plots development (further details of which is provided in Section 10.1).

10.3 Road Design

10.3.1 The California Bearing Ratio was determined using the TRL-Transport Research Dynamic Cone Penetration method with tests undertaken from surface. The full results are presented in Table 6.4, in summary the DCP confirms the strong near surface granular layer of the car park with California Bearing Ratio greater than 50%.

10.3.2 From RoC Report 3407, the natural ground CBR values are in the range 3-7%, these values would be commensurate with the typical Plasticity Indices and the values of Equilibrium Subgrade CBR given in table 5.1 of IAN73/06 Revision 1 (formerly HD25).

10.4 Culvert Design

10.4.1 The existing culvert, ordinary watercourse and culvert head wall is to be grubbed out and infilled. The proposed alignment of culvert diversion spans the western extent bordering Enterprise Way before turning to follow the northern border of plots E1 and E2. The proposed culvert then borders the western and southern edges of E3.

10.4.2 The surface level, at the boreholes, is in the range (from south to north); 71.2mAOD, 70.2mAOD, 70.1mAOD and 69.9mAOD.

10.4.3 The borehole at the south (WS401) shows Made Ground composed of Embankment Fill of reworked sandy gravelly Clay with inclusions of brick mudstone limestone, to 1.60m The SPTN at 1.0m was 13. There is a relict Topsoil (sandy clay) 1.6-2.0m which overlies soft becoming firm slightly sandy Clay (SPTN at 2.0m N9, at 3.0m N16).

10.4.4 Borehole WS402 shows Made Ground composed of reworked soils from the car park composed of slightly clayey silty gravelly sand to 1.0m then firm slightly sandy slightly gravelly Clay (SPTN at 1.0m N9). From 1.7m is a thin band (100mm) of clay which overlies weathered Mudstone.

10.4.5 Borehole WS403, shows Made Ground to 1.6m of reworked soils from the car park and comprises sandy gravelly clay fill. Below 1.0m is firm clay (SPTN 11/18) to 2.40m.

10.4.6 The borehole at the north (WS404) shows Clay Topsoil to 0.7m over Made Ground of reworked very sandy slightly gravelly Clay. From 1.0-2.40m is medium dense brown and very light brown slightly clay medium-coarse Sand.

10.4.7 As noted above the soils are variable along the course of the proposed diversion. Appropriate construction will be undertaken. Suitable lateral support will be required to form the excavation. This could be achieved using driven sheet piles or a drag box.

10.4.8 At the northern end of the diversion the subgrade will change from Cohesive Glacial Till to Granular Glacial Till. The formation at the foundation shall be designed to ensure that there is no unacceptable differential settlement.

10.5 General Comments

10.5.1 No entry should be permitted into excavations exceeding 1.2m depth without appropriate risk assessments, shoring and support. Whilst groundwater was not encountered in significant volumes during site investigation works the presence of a perched water table cannot be precluded. Appropriate provisions should be made to dewater excavations as and when required.

10.5.2 Similarly it is not recommended foundation excavations to underlying clay be left open and exposed to the elements as rainwater ingress will damage and reduce its strength (and subsequent bearing capacity). Similarly, no vehicular movements should be permitted within exposed foundation locations.

11.0 Conclusions & Recommendations

11.0.1 The Mini Masterplan site is to be developed for a range of commercial uses including offices, hotels, multi storey car parks and green open spaces. The E Plots site is to be redeveloped for two 6 storey buildings and a single 9 storey car park. The E Plots development programme also includes the diversion of an on-site watercourse.

11.0.2 Site investigations have revealed ground conditions to comprise Made Ground deposits overlying natural strata and weathered bedrock. Made Ground deposits varied across the site generally comprising demolition type material and reworked clay in areas of embankment construction and road type material across areas of car parking and former roads. Natural strata generally comprised reddish brown slightly sandy clay while weathered bedrock was reported either reddish brown or grey residual / destructed mudstone. The core fraction of bedrock was generally reported as extremely weak to weak reddish brown or grey thinly bedded distinctly to partially weathered mudstone.

11.0.3 Chemical assessment of site soils has failed to reveal any sources of soil contamination when compared against a *"commercial"* end use scenario across both sites. A single occurrence of asbestos within soils was identified however quantification of the sample indicates this to be <0.001%. Due care and attention should be taken at all times when excavating site soils and any suspected sources of contamination identified brought to the immediate attention of RoC Consulting.

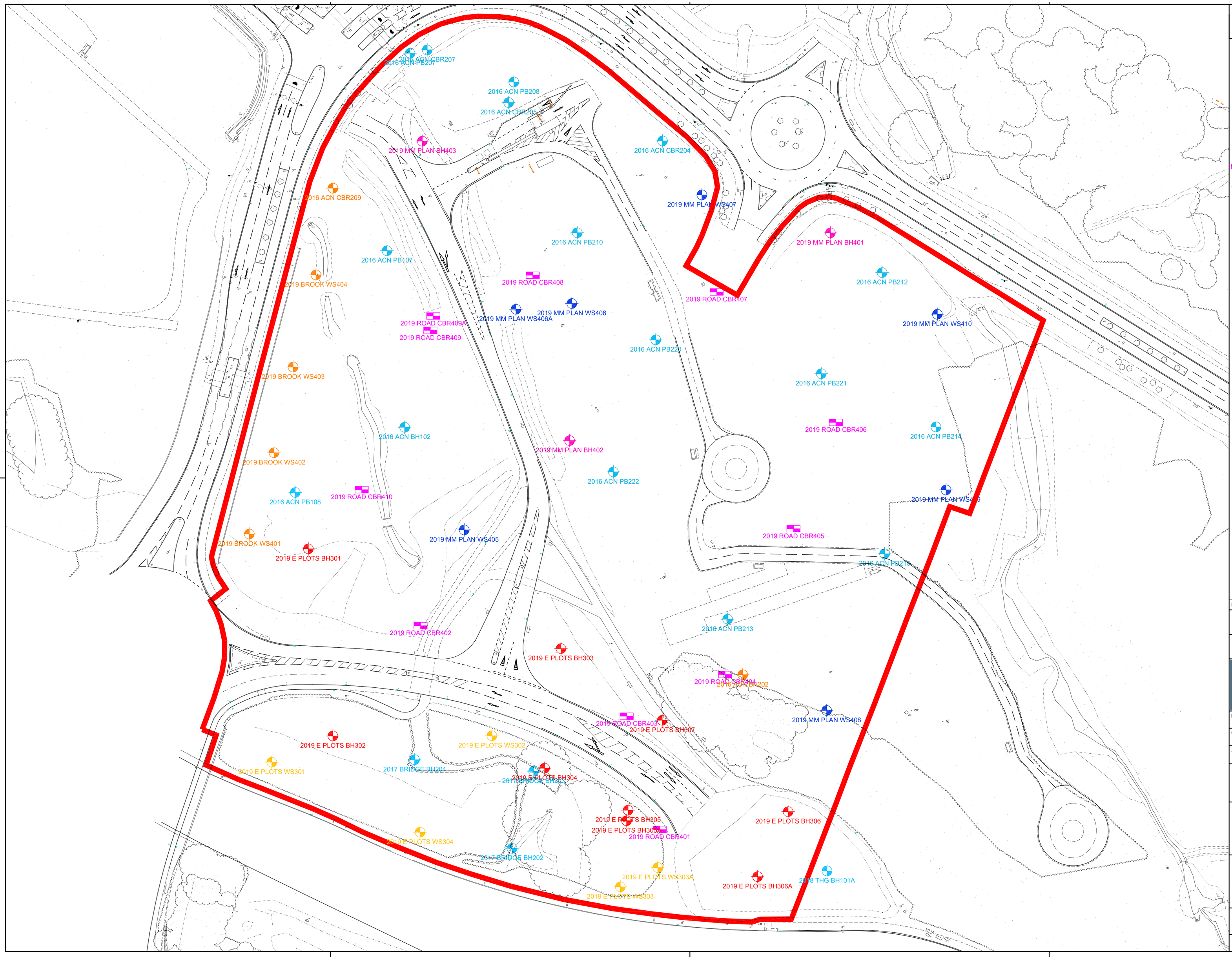
11.0.4 The adoption of a piled foundation solution will be required for all new structures across both the E Plots and Mini Masterplan portions of the development. As noted in Section 3.5 (and within Appendix G) a program of bulk earthworks will be required to facilitate development with materials moved from the area of E Plots to the north across the Mini Masterplan site to both correct site levels and infill and existing water course.

11.0.5 The re-use of site won natural and reworked clays is considered possible for these works subject to compliance with a performance specification and removal of all unsuitable / organic / deleterious materials. The use of ground improvement techniques (such as vibro compaction or lime / cement modification) may be required to facilitate reuse of these soils, particularly embankment fill in the area around E Plots. The use of ground improvement as part of the overall earthworks across both the E Plot and Mini Masterplan development sites may also be prudent to stabilise soils to allow construction of a piling mat and as a possible support for ground bearing floor slabs / external areas.

11.0.6 As required, any suspected sources of contamination discovered during the site development (outside those discussed in this report) should be brought to the attention of RoC Consulting and their implications assessed. Depending on the extent and severity, the findings and assessment of the current study may require re-interpretation and a remediation strategy proposed to support the sites development.

11.0.7 Copies of the current report, along with the Phase 1 Desktop Study, should be submitted to the local planning authority for consideration and comment. As required, any feedback received from the local authority should be passed back to RoC Consulting for review.

APPENDIX A – Site Drawings



THIS DRAWING IS THE PROPERTY OF RoCp. COPYRIGHT IS RESERVED BY THEM AND THE DRAWING IS ISSUED ON THE CONDITION THAT IT IS NOT COPIED, REPRODUCED, RETAINED OR DISCLOSED TO ANY UNAUTHORISED PERSON EITHER WHOLLY OR IN PART WITHOUT THE WRITTEN CONSENT OF RoCp

NOTES

- ROC E PLOTS ROTARY FOLLOW ON BOREHOLE
- ROC E PLOTS WINDOW SAMPLING BOREHOLE
- ROC MINI MASTERPLAN ROTARY FOLLOW ON BOREHOLE
- ROC MINI MASTERPLAN WINDOW SAMPLING BOREHOLE
- ROC BROOK WINDOW SAMPLING BOREHOLE
- ROC ROAD CBR LOCATIONS
- ROC PREVIOUS EXPLORATORY HOLE LOCATIONS
- MINI MASTERPLAN SITE BOUNDARY

DRAWING NOTES

1) EXPLORATORY HOLE LOCATIONS SHOWN AT APPROXIMATE EXTENTS.

2) PROPOSED DEVELOPMENT ARRANGEMENT TAKEN FROM 5-PLUS PLANS (REF: 05042_mp00_1201) AND MAY BE SUBJECT TO AMENDMENT OR REVIEW.

3) REFER TO ROC CONSULTING PHASE 2 SITE INVESTIGATION REPORT (REF: LS/MN/AS/p2 3733) FOR A DETAILED DESCRIPTION OF GROUND CONDITIONS.

4) ROC CONSULTING ACCEPTS NO RESPONSIBILITY FOR ANY DAMAGES OR LOSS ARISING AS A RESULT OF THE USE OF THIS DRAWING

REV.	DATE	DETAILS	DRN.	CHK.

DRAWING STATUS
PRELIMINARY

RIBA STAGE
N/A

RoC CONSULTING
Commercial Wharf
6 Commercial Street
Manchester M15 4PZ
T 0161 214 5390
W rocconsulting.com

DRAWN MN	DATE MAR 19	SCALES SCALE
CHECKED AS	DATE MAR 19	THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE ~~DO NOT SCALE~~
APPRVD. AS	DATE MAR 19	EMAIL FOR DRAWINGS info@rocconsulting.com

CLIENT
AIRPORT CITY LTD PARTNERSHIP

PROJECT TITLE
MINI MASTERPLAN & E PLOTS AIRPORT CITY

DRAWING TITLE
AIRPORT CITY NORTH EXPLORATORY HOLE LOCATIONS

PROJECT No.	DRAWING No.	REV.
3733	ES101	R1

© RoCp Ltd.



THIS DRAWING IS THE PROPERTY OF RoCp. COPYRIGHT IS RESERVED BY THEM AND THE DRAWING IS ISSUED ON THE CONDITION THAT IT IS NOT COPIED, REPRODUCED, RETAINED OR DISCLOSED TO ANY UNAUTHORISED PERSON EITHER WHOLLY OR IN PART WITHOUT THE WRITTEN CONSENT OF RoCp

NOTES

- ROC E PLOTS ROTARY FOLLOW ON BOREHOLE
- ROC E PLOTS WINDOW SAMPLING BOREHOLE
- ROC MINI MASTERPLAN ROTARY FOLLOW ON BOREHOLE
- ROC MINI MASTERPLAN WINDOW SAMPLING BOREHOLE
- ROC BROOK WINDOW SAMPLING BOREHOLE
- ROC ROAD CBR LOCATIONS
- ROC PREVIOUS EXPLORATORY HOLE LOCATIONS
- MINI MASTERPLAN SITE BOUNDARY
- E PLOTS PROPOSED BUILDING LAYOUT
- MINI MASTERPLAN PROPOSED BUILDING LAYOUT
- MINI MASTERPLAN PROPOSED AREA OF GREEN SPACE

DRAWING NOTES

1) EXPLORATORY HOLE LOCATIONS SHOWN AT APPROXIMATE EXTENTS.

2) PROPOSED DEVELOPMENT ARRANGEMENT TAKEN FROM S-PLUS PLANS (REF: 05042_mp00_1201) AND MAY BE SUBJECT TO AMENDMENT OR REVIEW.

3) REFER TO ROC CONSULTING PHASE 2 SITE INVESTIGATION REPORT (REF: LS/MN/AS/p2 3733) FOR A DETAILED DESCRIPTION OF GROUND CONDITIONS.

4) ROC CONSULTING ACCEPTS NO RESPONSIBILITY FOR ANY DAMAGES OR LOSS ARISING AS A RESULT OF THE USE OF THIS DRAWING

REV.	DATE	DETAILS	DRN.	CHK.

DRAWING STATUS
PRELIMINARY

RIBA STAGE
N/A

RoC CONSULTING
Commercial Wharf
6 Commercial Street
Manchester M15 4PZ
T 0161 214 5390
W rocconsulting.com

DRAWN LS	DATE 25/01/19	SCALES SCALE
CHECKED AS	DATE 25/01/19	THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE ~~DO NOT SCALE~~
APPRVD. AS	DATE 25/01/19	EMAIL FOR DRAWINGS info@rocconsulting.com

CLIENT
AIRPORT CITY LTD PARTNERSHIP

PROJECT TITLE
MINI MASTERPLAN & E PLOTS AIRPORT CITY

DRAWING TITLE
AIRPORT CITY NORTH PROPOSED BUILDING & POS LAYOUT

PROJECT No.	DRAWING No.	REV.
3733	ES102	R1

© RoCp Ltd.

Copyright of this drawing is vested in 5plus Architects and it must not be copied or reproduced without written consent.
Figured dimensions only are to be taken from this drawing. Do not scale from this drawing.

All Contractors must visit the site and are responsible for taking and checking all dimensions relative to their work. 5plus Architects are to be advised of any variation between drawings and site conditions.

Electronic data/ drawings issued as 'read only' and should not be interrogated for measurement.
All dimensions and levels should be 'read only' from those values stated in text, on the drawings

⚠ CONSTRUCTION - It is considered that the proposed works are within the scope of a competent Contractor and as such no unusual hazards have been identified, refer to relevant Key/ Scheduled Designers Risk Assessment

KEY PLAN:

E Plots Redline Planning Boundary

REV:	DATE:	DETAILS:
B	15/03/18	Revised to Stage 2
A	23/01/18	Scale and format amended.

5plus architects

4th Floor
The Hive
47 Lever Street
Manchester
M1 1FN

+44 (0)161 228 0211

www.5plusarchitects.com

PROJECT:
Airport City
Manchester

TITLE:
Ground Level Site Plan
Proposed Site Plan - Illustrative Masterplan

SCALE:	ORIGIN DATE:	DRAWN:	CHECKED:
1:1250 @ A1	22.09.2017	HF	JB

STATUS:
Stage 2

PROJECT	DRAWING NO:	REV:
05042	MP_00_0200	B

Architecture I MasterPlanning I Interiors I Graphics I Branding

Copyright of this drawing is vested in 5plus Architects and it must not be copied or reproduced without written consent.
Figured dimensions only are to be taken from this drawing. Do not scale from this drawing.

All Contractors must visit the site and are responsible for taking and checking all dimensions relative to their work. 5plus Architects are to be advised of any variation between drawings and site conditions.

Electronic data/ drawings issued as 'read only' and should not be interrogated for measurement.
All dimensions and levels should be 'read only' from those values stated in text, on the drawings

⚠ CONSTRUCTION - It is considered that the proposed works are within the scope of a competent Contractor and as such no unusual hazards have been identified, refer to relevant Keyr Scheduled Designers Risk Assessment

KEY PLAN:

REV:	DATE:	DETAILS:

5plus architects

4th Floor
The Hive
47 Lever Street
Manchester
M1 1FN

+44 (0)161 228 0211

www.5plusarchitects.com

PROJECT:
Airport City
Manchester

TITLE:
Ground Level Site Plan
Proposed Site Plan

SCALE:	ORIGIN DATE:	DRAWN:	CHECKED:
1:1250 @ A1	08.08.18	HF	JB

STATUS:
Information

PROJECT	DRAWING NO:	REV:
05042	MP_00_0220	0

Architecture I Masterplanning I Interiors I Graphics I Branding

APPENDIX B – Exploratory Hole Logsheets

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 20/02/2019 - 28/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381812.60 N385794.00
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH301	CP+RC	69.88m AoD	MN	1:27	Sheet 1 of 4

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.20 - 0.30	ES					Dark brown CLAY with numerous roots, rootlets and organic matter (TOPSOIL)
					0.40	69.48		Firm to stiff orangish brown mottled light grey slightly sandy slightly gravelly CLAY. Gravel is fine to medium subangular to rounded of mixed lithologies (GLACIAL TILL)
		1.20 - 1.65 1.20	D SPT	N=23 (1,2/4,5,6,8)	1.10	68.78		Brown mottled grey residual MUDSTONE recovered as slightly silty clay (BOLLIN MUDSTONE)
		2.00 - 2.45 2.00	D SPT	N=50 (3,7/50 for 235mm)				
					2.60	67.28		Reddish brown residual MUDSTONE recovered as silt and fine to medium subangular to angular gravel (BOLLIN MUDSTONE)
		3.00 - 3.45 3.00	D SPT	50 (25 for 85mm/50 for 90mm 50mm)	3.00	66.88		Zone of core loss assumed destructured / residual MUDSTONE (BOLLIN MUDSTONE)
					3.64	66.24		Reddish brown destructured MUDSTONE recovered as fine to coarse subangular to angular clayey gravel (BOLLIN MUDSTONE)
					3.86	66.02		Very weak reddish brown thinly bedded distinctly weathered MUDSTONE (BOLLIN MUDSTONE)
		3.00 - 6.00	2 6 12	80 68 15	3.98	65.90		Reddish brown residual MUDSTONE recovered as marl and fine to medium subangular to angular clayey gravel (BOLLIN MUDSTONE)
					4.21	65.67		Very weak reddish brown banded grey and reddish grey thinly bedded distinctly weathered MUDSTONE. Fractures extremely closely to very closely spaced dipping 50° - 92° (BOLLIN MUDSTONE)
								… 4.54 - 4.60m vertical stepped fracture dipping 13°
								… 4.90 - 4.98m vertical stepped fracture dipping 37°
			Type/Fl	TCR SCR RQD				

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	15.10	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with bentonite.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 20/02/2019 - 28/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381812.60 N385794.00
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH301	CP+RC	69.88m AoD	MN	1:27	Sheet 2 of 4

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
											Very weak reddish brown banded grey and reddish grey thinly bedded distinctly weathered MUDSTONE. Fractures extremely closely to very closely spaced dipping 50° - 92° (BOLLIN MUDSTONE)
											… 5.17 - 5.33m vertical wavy fracture dipping 171°
											… 5.60 - 5.71m gravel filled vertical wavy fracture dipping 18° - 155°
											… 5.73 - 5.79m zone of residual mudstone recovered as marl
								5.90	63.98		
							90mm				Very weak reddish brown becoming grey thinly bedded partially weathered MUDSTONE (BOLLIN MUDSTONE)
								6.08	63.80		
											Zone of core loss assumed destructured / residual MUDSTONE (BOLLIN MUDSTONE)
								6.30	63.58		
											Grey destructured MUDSTONE recovered as fine to coarse subangular to angular gravel and clay (BOLLIN MUDSTONE)
								6.53	63.35		
											Extremely weak to very weak reddish brown thinly bedded distinctly weathered MUDSTONE. Fractures extremely closely to closely spaced dipping 51° - 107° (BOLLIN MUDSTONE)
		6.00 - 9.00	1 5 17	92	73	19					*… 7.11 - 7.16m zone of destructured mudstone recovered as fine to coarse subangular to angular gravel*
											… 7.34 - 7.45m zone of destructured mudstone recovered as fine to medium subangular to angular clayey gravel
											… 7.65 - 7.74m zone of destructured mudstone recovered as fine to medium subangular to angular clayey gravel
								8.29	61.59		
											Very weak to weak grey banded dark grey thinly bedded partially weathered MUDSTONE. Fractures extremely closely to very closely spaced dipping 78° - 91° (BOLLIN MUDSTONE)
											… 8.58 - 8.68m vertical planar fracture dipping 17°
							90mm				
								9.10	60.78		Grey destructured MUDSTONE recovered as fine to coarse subangular to angular gravel (BOLLIN MUDSTONE)
								9.35	60.53		Very weak to weak grey banded reddish grey thinly bedded distinctly weathered MUDSTONE. Fractures extremely closely to very closely spaced dipping 81° - 106° (BOLLIN MUDSTONE)

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	15.10	0							

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with bentonite.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 20/02/2019 - 28/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381812.60 N385794.00
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH301	CP+RC	69.88m AoD	MN	1:27	Sheet 3 of 4

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		9.00 - 12.00	1 7 39	98	83	27	90mm	10.42	59.46		Very weak to weak grey banded reddish grey thinly bedded distinctly weathered MUDSTONE. Fractures extremely closely to very closely spaced dipping 81° - 106° (BOLLIN MUDSTONE)
											... 10.15 - 10.24m vertical stepped fracture dipping 164°
											... 10.24 - 10.31m zone of destructured mudstone recovered as medium to coarse subangular to angular gravel
											... 10.40 - 10.44m zone of destructured mudstone recovered as gravelly marl
								11.04	58.84		Very weak to weak reddish brown and grey thinly bedded partially weathered MUDSTONE. Fractures extremely closely to closely spaced dipping 52° - 105° (BOLLIN MUDSTONE)
											Very weak to weak reddish brown thinly bedded distinctly weathered MUDSTONE. Fractures extremely closely to very closely spaced dipping 88° - 105° (BOLLIN MUDSTONE)
								11.72	58.16		*... 11.22 - 11.44m vertical wavy fracture dipping 177°*
											... 11.44 - 11.50m zone of destructured mudstone recovered as fine to medium subangular to angular silty gravel
								12.26	57.62		Weak reddish brown thinly bedded unweathered MUDSTONE. Fractures very closely to closely spaced dipping 86° - 93° (BOLLIN MUDSTONE)
											... 11.99 - 12.11m zone of destructured mudstone recovered as fine to coarse subangular to angular gravel
											Very weak to weak reddish brown thinly bedded distinctly weathered MUDSTONE. Fractures extremely closely to very closely spaced dipping 79° - 102° (BOLLIN MUDSTONE)
											... 12.87 - 12.96m zone of destructured mudstone recovered as marl and fine to medium subangular to angular gravel
		12.00 - 15.00	1 6 22	104	78	30		13.49	56.39		Weak grey banded reddish brown and dark grey thinly bedded partially weathered MUDSTONE. Fractures extremely closely to closely spaced dipping 72° - 112° (BOLLIN MUDSTONE)
											... 13.77 - 13.82m zone of destructured mudstone recovered as fine to coarse subangular to angular gravel
											... 13.98 - 14.10m reddish brown band
											... 14.18 - 14.25m vertical stepped fracture dipping 8°
											... 14.56 - 14.62m zone of redisual mudstone receovered as marl
											... 14.77 - 14.83m zone of destructured mudstone recovered as marl and fine to coarse subangular to

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	15.10	0							

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with bentonite.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 20/02/2019 - 28/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381812.60 N385794.00
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH301	CP+RC	69.88m AoD	MN	1:27	Sheet 4 of 4

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
								15.10	54.78		Weak grey banded reddish brown and dark grey thinly bedded partially weathered MUDSTONE. Fractures extremely closely to closely spaced dipping 72° - 112° (BOLLIN MUDSTONE) *… 14.77 - 14.83m zone of destructured mudstone recovered as marl and fine to coarse subangular to angular gravel* End of Borehole at 15.100m

16 17 18 19 20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	15.10	0							

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with bentonite.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 20/02/2019 - 22/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381821.80 N385723.68
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH302	CP+RC	76.00m AoD	MN	1:27	Sheet 1 of 5

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
								Firm brown mottled reddish brown and grey slightly silty gravelly CLAY. Gravel is fine to medium subangular to angular of brick, concrete, coal and mudstone (EMBANKMENT FILL - DEMOLITION TYPE MATERIAL)	
		1.00 - 1.10	ES						1
		1.20	SPT	N=14 (1,2/2,3,4,5)					
		2.00 - 2.45	D						2
		2.00	SPT	N=14 (2,3/3,4,4,3)					
		3.00 - 3.45	U	Ublow=14					3
		4.00	SPT	N=11 (2,2/3,2,3,3)					4
		5.00 - 5.45	U	Ublow=12	5.00	71.00			5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	21.16	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was installed with 50mm diameter standpipe to a depth of 3.0m, with a response zone between 1.0m and 3.0m.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 20/02/2019 - 22/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381821.80 N385723.68
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH302	CP+RC	76.00m AoD	MN	1:27	Sheet 2 of 5

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		6.00 - 6.45 6.00	D SPT	N=13 (1,2/2,3,4,4)	6.10	69.90		Firm to stiff brown slightly gravelly CLAY. Gravel is fine to coarse subangular to angular of mudstone (EMBANKMENT FILL - REWORKED CLAY)
		7.50 - 7.95	U	Ublow=28				Firm reddish brown mottled grey slightly silty slightly gravelly CLAY. Gravel is fine of mudstone (GLACIAL TILL) *... 7.50m becoming stiff*
		9.00 - 9.45 9.00	D SPT	50 (25 for 145mm/50 for 105mm)	8.60	67.40		Grey destructured MUDSTONE recovered as fine to coarse subangular to angular clayey gravel (BOLLIN MUDSTONE)
					9.38	66.62		Very weak grey banded white thinly bedded partially weathered MUDSTONE. Fractures very closely spaced dipping 90° - 108° (BOLLIN MUDSTONE) *... 9.58 - 9.66m vertical stepped fracture dipping 167°*
					9.84	66.16		Extremely weak to very weak grey banded

Type/FI TCR SCR RQD 90mm

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	21.16	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was installed with 50mm diameter standpipe to a depth of 3.0m, with a response zone between 1.0m and 3.0m.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 20/02/2019 - 22/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381821.80 N385723.68
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH302	CP+RC	76.00m AoD	MN	1:27	Sheet 3 of 5

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		9.00 - 12.00	2 7 18	91	78	28					Extremely weak to very weak grey banded white and dark grey thinly bedded distinctly weathered MUDSTONE. Fractures extremely closely spaced dipping 83° - 113° (BOLLIN MUDSTONE)
											... 10.53 - 10.71m vertical wavy fracture dipping 7°
								11.44	64.56		*... 11.35 - 11.42m zone of destructured mudstone recovered as fine to medium subangular to angular clayey gravel*
							90mm				Weak reddish brown banded grey and dark reddish brown unweathered MUDSTONE. Fractures closely spaced dipping 64° - 106° (BOLLIN MUDSTONE)
											... 12.10 - 12.28m zone of core loss assumed residual / destructured mudstone
											... 12.67 - 12.85m zone of extremely weak destructured mudstone recovered as fine to medium subangular to angular gravel
		12.00 - 15.00	3 8 29	87	80	39					
											... 14.27 - 14.33m vertical stepped fracture dipping 180°
								14.70	61.30		Weak grey banded dark grey and white thinly bedded partially weathered MUDSTONE. Fractures very closely spaced dipping 78° - 98°
							90mm				

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	21.16	0							

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was installed with 50mm diameter standpipe to a depth of 3.0m, with a response zone between 1.0m and 3.0m.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 20/02/2019 - 22/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381821.80 N385723.68
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH302	CP+RC	76.00m AoD	MN	1:27	Sheet 4 of 5

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		15.00 - 18.00	1 8 29	100	93	36	90mm	15.97	60.03		Weak grey banded dark grey and white thinly bedded partially weathered MUDSTONE. Fractures very closely spaced dipping 78° - 98° (BOLLIN MUDSTONE) *… 14.74 - 14.87m zone of destructured mudstone recovered as fine to medium subangular to angular clayey gravel* *… 14.89 - 14.95m vertical undulating fracture dipping 145°*
											Weak reddish brown banded grey, white and dark reddish brown thinly bedded partially weathered MUDSTONE. Fractures very closely to closely spaced dipping 47° - 133° (BOLLIN MUDSTONE) *… 16.71 - 16.80m vertical undulating fracture dipping 25°*
		18.00 - 21.00	2 8 26	101	86	30		18.11 18.38 19.42	57.89 57.62 56.58		Very weak to weak grey banded reddish brown thinly bedded distinctly weathered MUDSTONE. Fractures very closely spaced dipping 74° - 94° (BOLLIN MUDSTONE) Weak grey banded reddish brown thinly bedded partially weathered MUDSTONE. Fractures closely spaced dipping 50° - 100° (BOLLIN MUDSTONE) Very weak to weak grey banded reddish brown becoming reddish brown thinly bedded distinctly weathered MUDSTONE. Fractures very closely to closely spaced dipping 90° - 99° (BOLLIN MUDSTONE) *… 19.46 - 19.56m vertical stepped fracture dipping*

16 17 18 19 20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	21.16	0							

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was installed with 50mm diameter standpipe to a depth of 3.0m, with a response zone between 1.0m and 3.0m.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 20/02/2019 - 22/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381821.80 N385723.68
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH302	CP+RC	76.00m AoD	MN	1:27	Sheet 5 of 5

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
								20.36	55.64		Very weak to weak grey banded reddish brown becoming reddish brown thinly bedded distinctly weathered MUDSTONE. Fractures very closely to closely spaced dipping 90° - 99° (BOLLIN MUDSTONE) *... 19.46 - 19.56m vertical stepped fracture dipping 164°* *... 19.61 - 19.72m vertical curved fracture dipping 36°* *... 20.29 - 20.36m zone of destructured mudstone recovered as fine to medium subangular to angular clayey gravel*
								21.16	54.84		Weak reddish brown banded cream and grey thinly bedded partially weathered MUDSTONE. Fractures very closely to closely spaced dipping 82° - 117° (BOLLIN MUDSTONE) End of Borehole at 21.160m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	21.16	0							

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was installed with 50mm diameter standpipe to a depth of 3.0m, with a response zone between 1.0m and 3.0m.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 19/02/2019 - 21/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381907.55 N385756.53
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH303	CP+RC	72.98m AoD	MN	1:27	Sheet 1 of 4

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	72.78		Black slightly gravelly slightly silty CLAY with numerous roots, rootlets and organic matter (TOPSOIL)
								Dark reddish brown mottled orangish brown, grey and cream very gravelly slightly sandy CLAY. Gravel is fine to medium subangular to angular of concrete, brick and sandstone (EMBANKMENT FILL - DEMOLITION TYPE MATERIAL)
		0.80 - 0.90	ES					
		1.20 - 1.65	U	Ublow=21	1.30	71.68		Soft greyish brown mottled black and orangish brown slightly sandy CLAY (GLACIAL TILL)
								... 1.30 - 1.50m organic matter and detritus
		2.00 - 2.45 2.00	D SPT	N=6 (1,1/1,1,2,2)				
		3.00 - 3.45	U	Ublow=14				*... 3.00m becoming firm*
					3.30	69.68		Light grey speckled yellow residual MUDSTONE recovered as silty clay and fine to medium gravel (BOLLIN MUDSTONE)
		4.00 - 4.45 4.00	D SPT	N=35 (1,2/4,4,9,18)				
		5.00 - 5.45	D		5.00	67.98		

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	15.03	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was installed with 50mm diameter standpipe to a depth of 1.5m, with a response zone between 0.5m and 1.5m.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 19/02/2019 - 21/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381907.55 N385756.53
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH303	CP+RC	72.98m AoD	MN	1:27	Sheet 2 of 4

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		5.00 - 5.45	D				90mm	5.20	67.78		Grey destructured mudstone recovered as fine to coarse subangular to angular gravel (BOLLIN MUDSTONE)
		5.00 - 6.00	1 8 24	81	69	23					Weak grey banded dark grey and white thinly bedded partially weathered MUDSTONE. Fractures very closely to closely spaced dipping 76° - 101° (BOLLIN MUDSTONE)
		6.00 - 7.00	1 4 10	96	87	10	90mm				
		7.00 - 10.00	1 7 17	96	76	27	90mm	8.43	64.55		*… 7.37 - 7.43m zone of destructured mudstone recovered as fine to coarse subangular to angular gravel* *… 7.60 - 7.69m zone of destructured mudstone recovered as marl and fine to coarse subangular to angular gravel* *… 8.18 - 8.23m zone of destructured mudstone recovered as fine to medium subangular to angular gravel* Very weak reddish brown thinly bedded distinctly weathered MUDSTONE. Fractures extremely closely to very closely spaced dipping 81° - 103° (BOLLIN MUDSTONE) *… 8.50 - 8.55m zone of residual mudstone recovered as gravelly clay* *… 8.70 - 8.82m vertical wavy fracture dipping 29°* *… 8.92 - 9.00m zone of destructured mudstone recovered as fine to coarse subangular to angular clayey gravel* *… 9.43 - 9.51m zone of destructured mudstone recovered as fine to coarse subangular to angular gravel* *… 9.80 - 9.88m zone of destructured mudstone recovered as fine to medium subangular to angular*

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	15.03	0							

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was installed with 50mm diameter standpipe to a depth of 1.5m, with a response zone between 0.5m and 1.5m.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 19/02/2019 - 21/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381907.55 N385756.53
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH303	CP+RC	72.98m AoD	MN	1:27	Sheet 3 of 4

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
											Very weak reddish brown thinly bedded distinctly weathered MUDSTONE. Fractures extremely closely to very closely spaced dipping 81° - 103° (BOLLIN MUDSTONE)
											… 9.80 - 9.88m zone of destructured mudstone recovered as fine to medium subangular to angular clayey gravel
											… 10.00 - 10.19m zone of destructured mudstone recovered as fine to coarse subangular to angular gravel
											… 10.56 - 10.64m zone of destructured mudstone recovered as fine to medium subangular to angular clayey gravel
											… 10.95 - 11.03m zone of residual mudstone recovered as gravelly clay
								11.30	61.68		
		10.00 - 13.00	2 8 42	77	63	15					Very weak grey banded dark grey, white and reddish brown thinly bedded partially weathered MUDSTONE. Fractures closely spaced dipping 90° - 98° (BOLLIN MUDSTONE)
								11.99	60.99		
											Zone of core loss assumed destructured / residual MUDSTONE (BOLLIN MUDSTONE)
								12.60	60.38		
							90mm				Very weak to weak grey banded white and dark grey thinly bedded distinctly weathered MUDSTONE. Fractures extremely closely to very closely spaced dipping 48° - 106° (BOLLIN MUDSTONE)
											… 13.00 - 13.21m zone of residual mudstone recovered as marl
											… 13.59 - 13.66m vertical stepped fracture dipping 149°
		13.00 - 15.00	2 5 11	95	70	16					
											… 14.50 - 14.71m gravel filled vertical curved fracture dipping 12°
											… 14.71 - 14.77m zone of destructured mudstone recovered as fine to coarse subangular to angular gravel

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	15.03	0							

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was installed with 50mm diameter standpipe to a depth of 1.5m, with a response zone between 0.5m and 1.5m.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 19/02/2019 - 21/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381907.55 N385756.53
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH303	CP+RC	72.98m AoD	MN	1:27	Sheet 4 of 4

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
								15.03	57.95		Very weak to weak grey banded white and dark grey thinly bedded distinctly weathered MUDSTONE. Fractures extremely closely to very closely spaced dipping 48° - 106° (BOLLIN MUDSTONE) *... 15.00 - 15.03m zone of residual mudstone recovered as silt and marl* End of Borehole at 15.030m

16

17

18

19

20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	15.03	0							

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was installed with 50mm diameter standpipe to a depth of 1.5m, with a response zone between 0.5m and 1.5m.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 21/02/2019 - 27/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381901.42 N385711.56
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH304	CP+RC	73.25m AoD	MN	1:27	Sheet 1 of 4

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.40 - 0.50	ES					Dark brown slightly sandy very gravelly CLAY. Gravel is fine to coarse subangular to angular of brick, concrete, asphalt, sandstone and mudstone (EMBANKMENT FILL - DEMOLITION TYPE MATERIAL) *… 0.20m whole brick and sandstone cobble*	
					1.00	72.25			1
		1.20 - 1.65 1.20	D SPT	N=12 (2,2/3,3,3,3)				Firm brown sandy very gravelly CLAY. Gravel is fine to medium subangular to angular of sandstone and mudstone with occasional cobbles of sandstone (EMBANKMENT FILL - REWORKED CLAY)	
		2.00 - 2.45 2.00	D SPT	N=14 (1,2/3,3,4,4)					2
					2.50	70.75		Brown very sandy gravelly CLAY. Gravel is fine to medium subangular to angular of asphalt and limestone (ROAD CONSTRUCTION MATERIAL)	
		3.00 - 3.45 3.00	D SPT	N=16 (2,2/3,3,5,5)					3
					3.10	70.15		Firm grey mottled brown slightly sandy silty CLAY (GLACIAL TILL)	
		4.00 - 4.45 4.00	D SPT	50 (9,10/50 for 160mm)	4.00	69.25		Reddish brown and grey residual MUDSTONE recovered as very silty gravelly clay (BOLLIN MUDSTONE)	4
		5.00 - 5.45	D						5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	15.50	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with bentonite.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 21/02/2019 - 27/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381901.42 N385711.56
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH304	CP+RC	73.25m AoD	MN	1:27	Sheet 2 of 4

Well	Water Strikes	Sample and In Situ Testing						Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results							
		5.00	SPT	50 (10,10/50 for 160mm)							Reddish brown and grey residual MUDSTONE recovered as very silty gravelly clay (BOLLIN MUDSTONE)
											… 5.00m becoming dark reddish brown
		6.00 - 6.45	D								
		6.00	SPT	50 (25 for 105mm/50 for 105mm)							
							90mm	6.50	66.75		Reddish grey destructured MUDSTONE recovered as fine to coarse subangular to angular clayey gravel (BOLLIN MUDSTONE)
								6.78	66.47		Reddish brown residual MUDSTONE recovered as slightly gravelly silty clay (BOLLIN MUDSTONE)
								7.04	66.21		Very weak to weak reddish brown and grey banded white thinly bedded partially weathered MUDSTONE. Fractures extremely closely to very closely spaced dipping 78° - 103° (BOLLIN MUDSTONE)
											… 7.25 - 7.32m zone of residual mudstone recovered as gravelly silty clay
								7.84	65.41		Weak grey banded dark grey and white thinly bedded unweathered MUDSTONE. Fractures extremely closely to closely spaced dipping 79° - 112° (BOLLIN MUDSTONE)
		6.50 - 9.50	1 4 49	97	77	35					
							90mm	9.50	63.75		Weak grey banded dark grey, reddish brown and white thinly bedded partially weathered MUDSTONE. Fractures extremely closely to closely spaced dipping 77° - 110° (BOLLIN MUDSTONE)
			Type/FI	TCR	SCR	RQD					

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	15.50	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with bentonite.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 21/02/2019 - 27/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381901.42 N385711.56
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH304	CP+RC	73.25m AoD	MN	1:27	Sheet 3 of 4

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		9.50 - 12.50	1 8 24	99	88	41					Weak grey banded dark grey, reddish brown and white thinly bedded partially weathered MUDSTONE. Fractures extremely closely to closely spaced dipping 77° - 110° (BOLLIN MUDSTONE)
											… 9.50 - 9.57m zone of extremely weak destructured mudstone recovered as fine to coarse subangular to angular gravel
							90mm	12.50	60.75		Zone of core loss assumed destructured / residual MUDSTONE (BOLLIN MUDSTONE)
								12.67	60.58		Very weak to weak reddish brown thinly bedded distinctly weathered MUDSTONE. Fractures extremely closely to closely spaced dipping 73° - 96° (BOLLIN MUDSTONE)
		12.50 - 15.50	1 6 20	94	74	22					*… 13.77 - 13.82m zone of destructured mudstone recovered as fine to medium subangular to angular clayey gravel*
											… 14.15 - 14.27m zone of destructured mudstone recovered as fine to medium subangular to angular clayey gravel
											… 14.83 - 14.95m zone of destructured mudstone recovered as fine to coarse subangular to angular

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	15.50	0							

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with bentonite.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 21/02/2019 - 27/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381901.42 N385711.56
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH304	CP+RC	73.25m AoD	MN	1:27	Sheet 4 of 4

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
								15.41	57.84		Very weak to weak reddish brown thinly bedded distinctly weathered MUDSTONE. Fractures extremely closely to closely spaced dipping 73° - 96° (BOLLIN MUDSTONE)
								15.50	57.75		*... 14.83 - 14.95m zone of destructured mudstone recovered as fine to coarse subangular to angular gravel*
											... 15.07 - 15.13m zone of destructured mudstone recovered as marl
											... 15.13 - 15.22m zone of destructured mudstone recovered as fine to coarse subangular to angular gravel
											... 15.36 - 15.40m zone of destructured mudstone recovered as medium to coarse subangular to angular gravel
											Weak grey banded white thinly bedded unweathered MUDSTONE (BOLLIN MUDSTONE)
											End of Borehole at 15.500m

16 17 18 19 20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	15.50	0							

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with bentonite.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 18/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381932.80 N385695.79
Project No. : 3733	Crew Name: N. Topping	Drilling Equipment: Dando 150

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH305	CP	71.99m AoD	MN	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	71.89		Black slightly silty CLAY with numerous roots, rootlets and organic matter (TOPSOIL)
		0.50 - 0.60	ES					Brown mottled orangish brown and black gravelly CLAY. Gravel is fine to medium subangular to angular of brick, sandstone, asphalt, concrete and mudstone (EMBANKMENT FILL - DEMOLITION TYPE MATERIAL)
		1.00 - 1.10	ES					
		1.20	SPT	50 (25 for 80mm/50 for 80mm)				
					1.50	70.49		End of Borehole at 1.500m

1
2
3
4
5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	1.50	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Obstruction was encountered at 1.5m and borehole was relocated. 4. Upon completion exploratory hole was backfilled with arisings.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 19/02/2019 - 20/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381932.23 N385691.82
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH305A	CP+RC	72.35m AoD	MN	1:27	Sheet 1 of 4

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10	72.25		Black slightly silty CLAY with numerous roots, rootlets and organic matter (TOPSOIL)	
								Dark brown mottled yellowish brown, grey and black slightly sandy gravelly CLAY. Gravel is fine to coarse subangular to angular of concrete, brick, sandstone and mudstone (EMBANKMENT FILL - DEMOLITION TYPE MATERIAL)	
		0.80 - 0.90	ES						
								... 1.00 - 1.80m concrete boulder	1
		1.20	SPT	N=23 (7,9/7,5,4,7)					
					1.80	70.55		Firm brown mottled grey and black slightly ashy slightly gravelly silty CLAY with occasional pockets of silt and sand. Gravel is fine to medium subangular to angular of brick, concrete and sandstone (EMBANKMENT FILL - DEMOLITION TYPE MATERIAL)	
		2.00	SPT	N=16 (7,7/5,5,3,3)					2
		3.00 - 3.45	D		3.00	69.35		Firm brown mottled grey very silty CLAY with occasional rootlets and organic matter (GLACIAL TILL)	3
		3.00	SPT	N=12 (3,3/2,3,3,4)					
					3.50	68.85		Reddish brown residual MUDSTONE recovered as silty friable clay and fine to medium subangular to angular gravel (BOLLIN MUDSTONE)	
		4.00 - 4.45	D						4
		4.00	SPT	50 (8,12/50 for 160mm)					
					4.50	67.85		Grey destructured MUDSTONE recovered as fine to coarse subangular to angular clayey gravel (BOLLIN MUDSTONE)	
		5.00 - 5.45	D						5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	18.00	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with bentonite.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 19/02/2019 - 20/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381932.23 N385691.82
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH305A	CP+RC	72.35m AoD	MN	1:27	Sheet 2 of 4

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		5.00	SPT	50 (25 for 145mm/50 for 160mm)				Grey destructured MUDSTONE recovered as fine to coarse subangular to angular clayey gravel (BOLLIN MUDSTONE)
		6.00 - 6.45	D					
		6.00 - 6.45	D					
		6.00	SPT	50 (25 for 125mm/50 for 95mm) 90mm	6.25	66.10		Very weak grey banded white, cream and dark grey thinly bedded partially weathered MUDSTONE. Fractures very closely spaced dipping 82° - 102° (BOLLIN MUDSTONE)
								… 6.43 - 6.52m zone of destructured mudstone recovered as fine to medium subangular to angular gravel
								… 7.15 - 7.20m zone of destructured mudstone recovered as fine to medium subangular to angular gravel
		6.00 - 9.00	1 10 33	95 84 62				
				90mm	9.00	63.35		Zone of core loss assumed destructured / residual MUDSTONE (BOLLIN MUDSTONE)
					9.20	63.15		Reddish brown destructured MUDSTONE recovered as clay and fine to coarse subangular to angular gravel (BOLLIN MUDSTONE)
					9.58	62.77		Weak grey banded white, dark grey and reddish brown thinly bedded partially weathered MUDSTONE. Fractures extremely closely to closely spaced dipping 74° - 105° (BOLLIN MUDSTONE)
			Type/FI	TCR SCR RQD				

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	18.00	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with bentonite.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 19/02/2019 - 20/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381932.23 N385691.82
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH305A	CP+RC	72.35m AoD	MN	1:27	Sheet 3 of 4

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		9.00 - 12.00	2 9 26	88	61	27					Weak grey banded white, dark grey and reddish brown thinly bedded partially weathered MUDSTONE. Fractures extremely closely to closely spaced dipping 74° - 105° (BOLLIN MUDSTONE) *… 11.00 - 11.09m zone of destructured mudstone recovered as gravelly marl*
								11.65	60.70		Very weak reddish brown thinly bedded distinctly weathered MUDSTONE. Fractures extremely closely to closely spaced dipping 65° - 103° (BOLLIN MUDSTONE)
							90mm				*… 11.74 - 11.98m vertical wavy fracture dipping 6°* *… 12.40 - 12.52m vertical curved fracture dipping 9°*
		12.00 - 15.00	2 6 11	74	44	10					*… 12.84 - 13.00m zone of destructured mudstone recovered as fine to coarse subangular to angular clayey gravel* *… 13.09 - 13.15m zone of destructured mudstone recovered as fine to coarse subangular to angular clayey gravel* *… 13.49 - 13.59m zone of destructured mudstone recovered as fine to coarse subangular to angular gravel* *… 13.73 - 13.93m zone of destructured mudstone recovered as fine to coarse subangular to angular clayey gravel* *… 14.00 - 14.60m zone of core loss assumed destructured / residual mudstone* *… 14.60 - 14.87m zone of residual mudstone recovered as gravelly marl*
							90mm	15.00	57.35		

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	18.00	0							

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with bentonite.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 19/02/2019 - 20/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381932.23 N385691.82
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH305A	CP+RC	72.35m AoD	MN	1:27	Sheet 4 of 4

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
											Very weak grey banded dark grey and white thinly bedded partially weathered MUDSTONE. Fractures extremely closely to very closely spaced dipping 76° - 92° (BOLLIN MUDSTONE)
											… 15.05 - 15.30m zone of destructured mudstone recovered as fine to coarse subangular gravel
		15.00 - 18.00	2 7 51	98	76	28		16.53	55.82		Weak grey banded dark grey thinly bedded unweathered MUDSTONE. Fractures closely spaced dipping 94° - 111° (BOLLIN MUDSTONE)
								17.75	54.60		Extremely weak to very weak reddish brown thinly bedded distinctly weathered MUDSTONE. Fractures very closely spaced dipping 97° - 99° (BOLLIN MUDSTONE)
								18.00	54.35		End of Borehole at 18.000m

16 17 18 19 20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	18.00	0							

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with bentonite.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 18/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381992.97 N385695.25
Project No. : 3733	Crew Name: N. Topping	Drilling Equipment: Dando 150

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH306	CP	73.22m AoD	MN	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50 - 0.60	ES					Brown and reddish brown very gravelly friable CLAY. Gravel is fine to coarse subangular to angular of concrete, asphalt, slate, brick and mudstone (FILL ASSOCIATED WITH RECENT ENTERPRISE WAY CONSTRUCTION)
		1.20	SPT	50 (25 for 30mm/50 for 50mm)	1.10	72.12		Grey asphalt (ROAD CONSTRUCTION MATERIAL)
					1.50	71.72		End of Borehole at 1.500m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	1.50	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Obstruction was encountered at 1.1 - 1.5m and borehole was relocated. 4. Upon completion exploratory hole was backfilled with arisings.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 22/02/2019 - 26/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381981.47 N385670.82
Project No. : 3733	Crew Name: M. Williams+N. Topping	Drilling Equipment: Comacchio 205+Dando 150

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH306A	CP+RC	73.04m AoD	MN	1:27	Sheet 1 of 4

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Brown and reddish brown very gravelly friable CLAY. Gravel is fine to coarse subangular to angular of concrete, asphalt, slate, brick and mudstone (FILL ASSOCIATED WITH RECENT ENTERPRISE WAY CONSTRUCTION - DEMOLITION TYPE MATERIAL)
		1.20 - 1.65 1.20	D SPT	N=38 (3,4/9,9,10,10)	1.30	71.74		
								Medium dense grey asphalt and concrete fill (ROAD CONSTRUCTION MATERIAL)
		2.00	SPT	N=14 (6,9/5,3,3,3)				
					2.30	70.74		
		2.50 - 3.00	ES					Dark brown very sandy very gravelly CLAY. Gravel is fine to medium subangular to angular of asphalt, brick, mudstone and sandstone (FORMER ROUNDABOUT CONSTRUCTION MATERIAL - DEMOLITION TYPE MATERIAL)
								.. 2.30 - 3.00m slight hydrocarbon odour
		3.00 - 3.45	U	Ublow=28	3.00	70.04		Stiff dark grey mottled grey slightly gravelly CLAY with occasional pockets of silt, rootlets and organic matter. Gravel is fine subrounded to angular of mudstone (GLACIAL TILL)
								... 3.50m sand lenses
		4.00 - 4.45 4.00	D SPT	50 (6,9/50 for 200mm)	4.00	69.04		Grey residual MUDSTONE recovered as silt, slightly silty clay and fine to medium subangular to angular gravel (BOLLIN MUDSTONE)
		4.50	SPT	50 (25 for 75mm/50 for 75mm)				
		5.00 - 5.45	D		5.00	68.04		

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	16.50	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was installed with 50mm diameter standpipe to a depth of 5.0m, with a response zone between 1.0m and 5.0m.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 22/02/2019 - 26/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381981.47 N385670.82
Project No. : 3733	Crew Name: M. Williams+N. Topping	Drilling Equipment: Comacchio 205+Dando 150

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH306A	CP+RC	73.04m AoD	MN	1:27	Sheet 2 of 4

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		5.00 - 5.45	D				90mm				Very weak grey destructured MUDSTONE recovered as fine to coarse subangular to angular gravel (BOLLIN MUDSTONE)
								5.20	67.84		Very weak grey banded dark grey thinly bedded distinctly weathered MUDSTONE. Fractures very closely spaced dipping 63° - 94° (BOLLIN MUDSTONE)
								5.70	67.34		Very weak grey banded white and dark grey partially weathered MUDSTONE. Fractures very closely spaced dipping 68° - 100° (BOLLIN MUDSTONE)
								6.08	66.96		Very weak reddish brown thinly bedded distinctly weathered MUDSTONE (BOLLIN MUDSTONE)
								6.34	66.70		*... 6.10 - 6.14m marl and gravel filled fracture*
		5.00 - 8.00	1 5 17	59	39	6					*... 6.21 - 6.36m vertical wavy fracture dipping 21°* Reddish brown residual MUDSTONE recovered as gravelly clay and marl. Gravel is fine to coarse subangular to angular (BOLLIN MUDSTONE)
							90mm	8.05	64.99		Reddish brown destructured MUDSTONE recovered as fine to coarse angular gravel (BOLLIN MUDSTONE)
								8.25	64.79		Very weak to weak reddish brown distinctly weathered MUDSTONE. Fractures very closely spaced dipping 62° - 101° (BOLLIN MUDSTONE)
		8.00 - 9.50	1 5 8	63	13	0		8.71	64.33		Reddish brown residual MUDSTONE recovered as silty gravelly clay (BOLLIN MUDSTONE)
							90mm				
								9.85	63.19		Very weak to weak reddish brown and grey

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	16.50	0							

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was installed with 50mm diameter standpipe to a depth of 5.0m, with a response zone between 1.0m and 5.0m.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 22/02/2019 - 26/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381981.47 N385670.82
Project No. : 3733	Crew Name: M. Williams+N. Topping	Drilling Equipment: Comacchio 205+Dando 150

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH306A	CP+RC	73.04m AoD	MN	1:27	Sheet 3 of 4

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		9.50 - 12.50	1 5 19	94	76	14	90mm	11.02	62.02		Very weak to weak reddish brown and grey thinly bedded distinctly weathered MUDSTONE. Fractures extremely closely to closely spaced dipping 83° - 98° (BOLLIN MUDSTONE) *... 9.96 - 10.02m zone of destructured mudstone recovered as fine to medium subangular to angular clayey gravel* *... 10.07 - 10.11m zone of residual mudstone recovered as clay* *... 10.31 - 10.45m zone of destructured mudstone recovered as fine to medium subangular to angular clayey gravel* *... 10.81 - 10.92m zone of destructured mudstone recovered as fine to coarse subangular to angular gravel* *... 11.01 - 11.05m zone of destructured mudstone recovered as fine to coarse subangular to angular gravel*
								11.87	61.17		Weak grey banded dark grey and greyish brown partially weathered MUDSTONE. Fractures very closely spaced dipping 76° - 114° (BOLLIN MUDSTONE) *... 11.46 - 11.57m zone of residual mudstone recovered as marl*
								12.47	60.57		Weak grey banded dark grey and white unweathered MUDSTONE. Fractures medium spaced dipping 86° - 102° (BOLLIN MUDSTONE)
		12.50 - 15.50	2 7 15	93	83	16		12.99	60.05		Weak grey banded reddish brown and white thinly bedded distinctly weathered MUDSTONE. Fractures very closely spaced dipping 87° - 102° (BOLLIN MUDSTONE)
								14.26	58.78		Extremely weak to very weak reddish brown distinctly weathered MUDSTONE. Fractures extremely closely to very closely spaced dipping 76° - 106° (BOLLIN MUDSTONE)
											Very weak to weak reddish brown thinly bedded partially weathered MUDSTONE. Fractures closely spaced dipping 59° - 92° (BOLLIN MUDSTONE)

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	16.50	0							

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was installed with 50mm diameter standpipe to a depth of 5.0m, with a response zone between 1.0m and 5.0m.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 22/02/2019 - 26/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381981.47 N385670.82
Project No. : 3733	Crew Name: M. Williams+N. Topping	Drilling Equipment: Comacchio 205+Dando 150

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH306A	CP+RC	73.04m AoD	MN	1:27	Sheet 4 of 4

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
								15.14	57.90		Very weak to weak reddish brown thinly bedded partially weathered MUDSTONE. Fractures closely spaced dipping 59° - 92° (BOLLIN MUDSTONE)
							90mm	15.48	57.56		Extremely weak reddish brown destructured MUDSTONE recovered as fine to coarse subangular to angular clayey gravel (BOLLIN MUDSTONE)
								15.75	57.29		Extremely weak grey destructured MUDSTONE recovered as fine to coarse subangular to angular clayey gravel (BOLLIN MUDSTONE)
		15.50 - 16.50	1 6 12	104	74	11					Weak grey banded white and dark grey thinly bedded partially weathered MUDSTONE. Fractures closely spaced dipping 80° - 95° (BOLLIN MUDSTONE)
											… 16.30 - 16.39m zone of destructured mudstone recovered as fine to medium subangular to angular gravel
								16.57	56.47		End of Borehole at 16.500m

16
17
18
19
20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	16.50	0							

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was installed with 50mm diameter standpipe to a depth of 5.0m, with a response zone between 1.0m and 5.0m.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 18/02/2019 - 19/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381945.63 N385729.58
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH307	CP+RC	70.91m AoD	MN	1:27	Sheet 1 of 4

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.20 - 0.40	ES		0.15	70.76		Dark brown slightly gravelly CLAY with numerous roots, rootlets and organic matter. Gravel is fine to medium subangular to rounded of mixed lithologies (TOPSOIL)
					0.40	70.51		Dark brown gravelly CLAY. Gravel is fine to coarse subangular to angular of coal, ceramic tile, brick and concrete (EMBANKMENT FILL - DEMOLITION TYPE MATERIAL)
					0.60	70.31		Black asphalt (ROAD CONSTRUCTION MATERIAL)
					1.00	69.91		Greyish brown clayey gravelly SAND. Gravel is fine subangular to angular of concrete (ROAD CONSTRUCTION MATERIAL)
		1.20 - 1.65 1.20	D SPT	N=17 (3,4/4,5,4,4)				Grey mottled orangish and reddish brown residual MUDSTONE recovered as firm silty slightly sandy friable CLAY (BOLLIN MUDSTONE)
		2.00 - 2.45 2.00	D SPT	50 (25 for 80mm/50 for 95mm)				*... 2.0m becoming very stiff*
		3.00	SPT	50 (25 for 40mm/50 for 30mm) 90mm	3.00	67.91		Grey destructured MUDSTONE recovered as medium to coarse subangular to angular gravel (BOLLIN MUDSTONE)
					3.48	67.43		Weak grey banded dark grey thinly bedded partially weathered MUDSTONE (BOLLIN MUDSTONE)
		3.00 - 6.00	2 8 30	84 54 15	3.57	67.34		Extremely weak reddish brown thinly bedded distinctly weathered MUDSTONE. Fractures extremely closely to closely spaced dipping 65° - 105° (BOLLIN MUDSTONE) *... 3.64 - 3.72m zone of residual mudstone recovered as slightly gravelly clay* *... 3.82 - 3.92m zone of destructured mudstone recovered as fine to medium subangular clayey gravel* *... 4.15 - 4.31m zone of destructured mudstone recovered as clay and fine to coarse subangular to angular gravel* *... 4.64 - 4.76m zone of destructured mudstone recovered as clay and fine to medium subangular to angular gravel*
			Type/FI	TCR SCR RQD				

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	15.00	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with bentonite.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 18/02/2019 - 19/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381945.63 N385729.58
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH307	CP+RC	70.91m AoD	MN	1:27	Sheet 2 of 4

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
											Extremely weak reddish brown thinly bedded distinctly weathered MUDSTONE. Fractures extremely closely to closely spaced dipping 65° - 105° (BOLLIN MUDSTONE)
											… 4.86 - 5.00m zone of destructured mudstone recovered as clay and fine to medium subangular to angular gravel
											… 5.71 - 5.81m vertical undulating fracture dipping 160°
							90mm				*… 6.00 - 6.20m zone of core loss assumed destructured / residual mudstone*
											… 6.20 - 6.53m zone of destructured mudstone recovered as clay and fine to coarse subangular to angular gravel
											… 6.64 - 7.00m zone of destructured mudstone recovered as fine to coarse subangular to angular gravel
		6.00 - 9.00	2 7 22	83	62	29		7.00	63.91		Very weak grey banded dark grey and white thinly bedded partially weathered MUDSTONE. Fractures extremely closely to closely spaced dipping 75° - 97° (BOLLIN MUDSTONE)
											… 7.98 - 8.07m zone of destructured mudstone recovered as fine to coarse subangular to angular gravel
											… 8.53 - 8.66m zone of destructured mudstone recovered as fine to coarse subangular to angular clayey gravel
							90mm				
								9.60	61.31		Extremely weak reddish brown thinly bedded distinctly weathered MUDSTONE. Fractures very closely to closely spaced dipping 82° - 114° (BOLLIN MUDSTONE)

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	15.00	0							

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with bentonite.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 18/02/2019 - 19/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381945.63 N385729.58
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH307	CP+RC	70.91m AoD	MN	1:27	Sheet 3 of 4

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		9.00 - 12.00	2 11 87	100	80	46	90mm	10.71	60.20		Extremely weak reddish brown thinly bedded distinctly weathered MUDSTONE. Fractures very closely to closely spaced dipping 82° - 114° (BOLLIN MUDSTONE) *… 9.75 - 9.97m zone of destructured mudstone recovered as clay and fine to coarse subangular to angular gravel* *… 10.14 - 10.22m zone of destructured mudstone recovered as fine to medium subangular to angular sandy clayey gravel* Weak reddish brown thinly bedded unweathered MUDSTONE. Fractures medium spaced dipping 70° - 98° (BOLLIN MUDSTONE)
		12.00 - 15.00	1 6 15	72	50	17		13.00	57.91		*… 12.00 - 12.74m zone of core loss assumed destructured / residual mudstone* Weak grey banded dark grey and white thinly bedded partially weathered MUDSTONE. Fractures extremely closely to closely spaced dipping 88° - 100° (BOLLIN MUDSTONE) *… 13.09 - 13.13m zone of destructured mudstone recovered as fine to medium subangular to angular gravel*
								15.00	55.91		

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	15.00	0							

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with bentonite.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 18/02/2019 - 19/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381945.63 N385729.58
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots BH307	CP+RC	70.91m AoD	MN	1:27	Sheet 4 of 4

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
											Weak grey banded dark grey and white thinly bedded partially weathered MUDSTONE. Fractures extremely closely to closely spaced dipping 88° - 100° (BOLLIN MUDSTONE) *... 14.93 - 15.00m zone of destructured mudstone recovered as very gravelly clay* End of Borehole at 15.000m

16 17 18 19 20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
								0.00	15.00	0							

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with bentonite.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 26/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E382008.84 N385912.72
Project No. : 3733	Crew Name: M. Williams+N. Topping	Drilling Equipment: Comacchio 205+Dando 150

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
MM Plan BH401	CP+RC	68.39m AoD	ES	1:27	Sheet 1 of 4

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.03	ES		0.03	68.36		Grey, light grey and dark grey slightly sandy fine to medium subangular to angular GRAVEL of limestone (ROAD CONSTRUCTION MATERIAL - CURRENT CARPARK)	
		0.10 - 0.20	ES						
		0.20 - 0.30	ES		0.20	68.19			
					0.40	67.99		Brown sandy slightly clayey fine to coarse subangular GRAVEL of limestone, mudstone, coal, brick and occasional glass (ROAD CONSTRUCTION MATERIAL - CURRENT CARPARK)	
					0.50	67.89			
								Firm brown and black slightly gravelly slightly sandy CLAY. Gravel is subangular to angular of limestone, brick and coal (EMBANKMENT FILL)	
								Firm brown mottled yellowish brown reworked CLAY with pockets of yellowish brown fine silty sand. Occasional roots and organic matter (MADE GROUND - REWORKED CLAY)	1
		1.20 - 1.65	D					Firm reddish brown CLAY with rare fine angular gravel of mudstone (GLACIAL TILL)	
		1.20	SPT	N=12 (1,2/2,2,4,4)					
		2.00 - 2.45	D		2.00	66.39		Extremely weak reddish brown mottled grey residual weathered MUDSTONE (BOLLIN MUDSTONE MEMBER)	2
		2.00	SPT	N=15 (2,2/2,4,5,4)					
		3.00 - 3.45	D						3
		3.00	SPT	N=27 (2,3/4,4,9,10)					
		4.00 - 4.45	D						4
		4.00	SPT	N=50 (7,7/50 for 295mm)					
		5.00 - 5.45	D						5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
				7.00	7.50	01:00		0.00	15.00	0	

Remarks

1. Inspection pit hand excavated to 1.2m bgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole backfilled with bentonite.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 26/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E382008.84 N385912.72
Project No. : 3733	Crew Name: M. Williams+N. Topping	Drilling Equipment: Comacchio 205+Dando 150

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
MM Plan BH401	CP+RC	68.39m AoD	ES	1:27	Sheet 2 of 4

Well	Water Strikes	Sample and In Situ Testing						Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results							
		5.00	SPT	N=37 (4,7/8,9,10,10)							Extremely weak reddish brown mottled grey residual weathered MUDSTONE (BOLLIN MUDSTONE MEMBER)
		6.00 - 6.45 6.00	D SPT	N=42 (5,10/10,10,10,12)							
		7.50 - 7.75 7.50	D SPT	50 (25 for 145mm/50 for 105mm)							
		8.00 - 9.00	14 14 14	91	44	26	90mm 90mm	8.00 8.19	60.39 60.20		Greyish brown residual MUDSTONE recovered as soft slightly gravelly clay. Gravel is fine to medium subangular of mudstone (BOLLIN MUDSTONE MEMBER) Extremely weak reddish brown and grey distinctly weathered MUDSTONE. Fractures closely spaced dipping 62 - 92° (BOLLIN MUDSTONE MEMBER) *… at 8.36 - 8.49m destructured zone recovered as clayey fine to medium subangular gravel of mudstone.* *… at 8.60 - 9.22m destructured zone recovered as clayey fine to medium subangular gravel of mudstone.*
			Type/FI	TCR	SCR	RQD					

6 7 8 9 10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
				7.00	7.50	01:00		0.00	15.00	0	

Remarks

1. Inspection pit hand excavated to 1.2m bgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole backfilled with bentonite.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 26/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E382008.84 N385912.72
Project No. : 3733	Crew Name: M. Williams+N. Topping	Drilling Equipment: Comacchio 205+Dando 150

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
MM Plan BH401	CP+RC	68.39m AoD	ES	1:27	Sheet 3 of 4

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		9.00 - 11.50	2 9 19	72	49	16	90mm	11.50	56.89		Extremely weak reddish brown and grey distinctly weathered MUDSTONE. Fractures closely spaced dipping 62 - 92° (BOLLIN MUDSTONE MEMBER) *… at 10.20 - 10.36m resdiual zone recovered as firm clay.* *… at 10.52 - 10.64m residual zone recovered a firm clay.* *… at 10.64 - 11.50m zone of core loss.*
		11.50 - 14.50	5 12 25	85	75	20	90mm				Very weak reddish brown partially weathered MUDSTONE. Fractures medium spaced dipping 9 - 151° (BOLLIN MUDSTONE MEMBER) *… at 11.72 - 12.18m verticle fracture dipping 10°.* *… 12.76 - 13.17m verticle fracture dipping 9°.* *… 13.50 - 14.00m distinctly weathered zone recovered as extremely weak reddish brown destructured mudstone.* *… at 14.00 - 14.50 zone of core loss.*
			3 9 17								*… at 14.67m becoming banded grey.*

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
				7.00	7.50	01:00		0.00	15.00	0							

Remarks

1. Inspection pit hand excavated to 1.2m bgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole backfilled with bentonite.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 26/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E382008.84 N385912.72
Project No. : 3733	Crew Name: M. Williams+N. Topping	Drilling Equipment: Comacchio 205+Dando 150

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
MM Plan BH401	CP+RC	68.39m AoD	ES	1:27	Sheet 4 of 4

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		14.50 - 15.50		51	46	27		15.50	52.89		Very weak reddish brown partially weathered MUDSTONE. Fractures medium spaced dipping 9 - 151° (BOLLIN MUDSTONE MEMBER)
											End of Borehole at 15.000m

16 17 18 19 20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
				7.00	7.50	01:00		0.00	15.00	0							

Remarks

1. Inspection pit hand excavated to 1.2m bgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole backfilled with bentonite.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 25/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381910.81 N385834.70
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
MM Plan BH402	CP+RC	70.07m AoD	ES	1:27	Sheet 1 of 3

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.01	70.06		Grey, light grey and dark grey slightly sandy fine to medium subangular to angular GRAVEL of limestone (ROAD CONSTRUCTION MATERIAL - CURRENT CARPARK)
					0.04	70.03		
		0.30 - 0.40	ES					
					0.40	69.67		Yellowish brown sandy fine to medium subangular GRAVEL of limestone (ROAD CONSTRUCTION MATERIAL - CURRENT CARPARK)
					0.50	69.57		Brown clayey SAND & GRAVEL. Gravel is fine to medium subangular of limestone (ROAD CONSTRUCTION MATERIAL - CURRENT CARPARK)
								Firm reddish brown mottled grey and orangish brown sandy slightly silty reworked CLAY. Rare fine subangular gravel of mudstone (MADE GROUND - REWORKED CLAY)
								Soft to firm reddish brown mottled grey slightly sandy CLAY with rare subrounded cobbles of mudstone (GLACIAL TILL)
		2.00 - 2.45	D		2.00	68.07		Grey destructured weathered MUDSTONE recovered as silty fine to medium subangular gravel of mudstone (BOLLIN MUDSTONE MEMBER)
		2.00	SPT	50 (25 for 115mm/50 for 85mm)				
		3.00 - 3.29	D		3.00	67.07		Residual weathered MUDSTONE recovered as greyish brown gravelly clay. Gravel is fine to medium subangular to angular of mudstone (BOLLIN MUDSTONE MEMBER)
		3.00	SPT	50 (7,12/50 for 135mm/90mm)				
					3.63	66.44		Very weak grey banded reddish brown becoming reddish brown thinly bedded partially weathered MUDSTONE. Fracture very closely spaced dipping 77 - 93° (BOLLIN MUDSTONE MEMBER)
		3.00 - 6.00	4, 10, 62	81 / 62 / 26				*… 3.73 - 3.87m destructured / residual zone recovered as gravelly clay. Gravel is fine subangular to angular of mudstone.*
								… at 4.13 - 4.16m gravel filled fracture.
								… 4.19 - 4.24m destructured zone recovered as fine to coarse angular gravel.
								… at 4.42 - 4.57m destructured zone recovered as fine to coarse angular gravel of mudstone.
					4.92	65.15		
			Type/FI	TCR / SCR / RQD				

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
				2.00	3.00	01:00		0.00	14.56	0	

Remarks

1. Inspection pit hand excavated to 1.2m bgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole backfilled with bentonite.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 25/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381910.81 N385834.70
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
MM Plan BH402	CP+RC	70.07m AoD	ES	1:27	Sheet 2 of 3

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
								5.87	64.20		Weak reddish brown thinly bedded partially weathered MUDSTONE. Fractures widely spaced dipping 90 - 110° (BOLLIN MUDSTONE MEMBER) *… at 5.00 - 5.12m curved fracture dipping 21 - 73°.*
							90mm				Very weak reddish brown banded grey becoming grey thinly bedded distinctly weathered MUDSTONE. Fractures extremely closely to very closely spaced dipping 76 - 152° (BOLLIN MUDSTONE MEMBER) *… at 5.88 - 6.04m destructured / residual zone recovered as fine to coarse angular gravel and clay.* *… at 6.21 - 6.42m destructured zone recovered as fine to medium subangular to angular gravel of mudstone.* *… at 6.51 - 6.62m destructured zone recovered as fine to medium subangular to angular gravel of mudstone.* *… at 6.72 - 6.79m destructured zone recovered as fine to medium subangular to angular gravel of mudstone.*
		6.00 - 9.00	1 10 41	96	81	41		6.79	63.28		Weak grey banded dark grey and light grey partially weathered MUDSTONE. Fractures extremely closely to very closely spaced dipping 68 - 106° (BOLLIN MUDSTONE MEMBER)
							90mm				*… 9.24 - 9.49m zone of extremely closely spaced fractures dipping 76 - 101°.* *… at 9.67 - 9.86m residual zone recovered as reddish brown gravelly clay. Gravel is fine to coarse subangular to angular.*

6 7 8 9 10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
				2.00	3.00	01:00		0.00	14.56	0							

Remarks

1. Inspection pit hand excavated to 1.2m bgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole backfilled with bentonite.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 25/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381910.81 N385834.70
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
MM Plan BH402	CP+RC	70.07m AoD	ES	1:27	Sheet 3 of 3

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		9.00 - 12.00	1 10 31	96	81	50	90mm	12.11	57.96		Weak grey banded dark grey and light grey partially weathered MUDSTONE. Fractures extremely closely to very closely spaced dipping 68 - 106° (BOLLIN MUDSTONE MEMBER) *… 10.63 - 10.70m destructured zone recovered as clayey fine to coarse subangular to angular gravel.* *… at 10.79 - 10.93m destructured zone recovered as silty fine subangular gravel of mudstone.* *… at 10.93 - 11.00m zone of extremely closely spaced fractures dipping 80 - 95°.* *… 11.36 - 11.41m destructured / residual zone recovered as gravelly clay. Gravel is fine subangular to angular of mudstone.* *… at 11.58 - 12.11m Zone of no recovery.*
		12.00 - 15.00	2 9 29	95	78	31		14.56	55.51		Reddish brown partially weathered MUDSTONE. Fractures very closely to medium spaced dipping 83 - 112° (BOLLIN MUDSTONE MEMBER) *… at 12.11 - 12.26m grey band.* *… at 12.41 - 12.45m destructured zone recovered as fine to medium subangular to angular gravel of mudstone.* *… 12.53 - 12.62m residual zone recovered as clayey fine to medium subangular to angular gravel of mudstone.* *… 12.96 - 13.09m residual zone recovered as fine subangular to angular gravel and clay.* *… 13.31 - 13.40m residual zone recovered as gravelly clay. Gravel is fine to medium subangular.* *… 13.72 - 13.90m residual zone recovered as gravelly clay. Gravel is fine to medium subangular of mudstone.* *… 14.48 - 14.56m residual zone recovered gravelly clay. Gravel is fine to medium subangular to angular.* End of Borehole at 14.560m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
				2.00	3.00	01:00		0.00	14.56	0							

Remarks

1. Inspection pit hand excavated to 1.2m bgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole backfilled with bentonite.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 25/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381855.44 N385947.20
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
MM Plan BH403	CP+RC	70.45m AoD	ES	1:27	Sheet 1 of 3

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.80	69.65		Grass over brown slightly clayey SAND. Rare fine to medium subangular to subrounded gravel of mixed. Occasional rootlets and organic matter (TOPSOIL)	
		1.00 - 1.45	D					Soft brown slightly gravelly sandy reworked CLAY with pockets of orangish brown medium sand. Gravel is medium subrounded of mudstone. Rare fine subangular gravels of brick (MADE GROUND)	1
		1.20	SPT	N=7 (1,1/1,2,2,2)					
					2.40	68.05		Firm brown mottled grey gravelly very sandy CLAY. Gravel is fine to medium subangular to angular of mudstone (GLACIAL CLAY)	2
		3.00 - 3.45	D						
	▼	3.00	SPT	N=17 (1,1/3,4,5,5)				*… at 3.20 - 3.30m band of dark brown medium sand.*	3
					3.30	67.15		Grey destructured weathered MUDSTONE (BOLLIN MUDSTONE MEMBER)	
		4.00 - 4.45	D						
		4.00	SPT	50 (5,9/50 for 180mm)					4
								… at 4.50 - 5.00m becoming greyish brown mottled grey.	
		5.00 - 5.27	D		5.00	65.45			5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
				4.00	5.00	01:00		0.00	14.53	0	

Remarks

1. Inspection pit hand excavated to 1.2m bgl prior to drilling. 2. Groundwater was encountered at 3.30mbgl. 3. Upon completion exploratory hole installed with 50mm diameter standpipe to a depth of 5.00mbgl, with a response zone between 1.00 and 5.00mbgl.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 25/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381855.44 N385947.20
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
MM Plan BH403	CP+RC	70.45m AoD	ES	1:27	Sheet 2 of 3

Well	Water	Depth (m)	Type /FI	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
		5.00 - 5.27	D				90mm	5.24	65.21		Residual mudstone recovered as reddish brown soft slightly sandy gravelly CLAY. Gravel is fine to medium subangular to angular of mudstone (BOLLIN MUDSTONE MEMBER)
											… at 5.00m becoming reddish brown.
											Very weak reddish brown and grey distinctly weathered MUDSTONE. Fractures extremely closely spaced dipping 13 - 107° (BOLLIN MUDSTONE MEMBER)
											… at 5.38 - 5.79m destructured zone recovered as reddish brown and grey clayey fine to medium subangular gravel.
											… at 6.00 - 8.00m zone of core loss.
		5.00 - 8.00	2 8 21	38	22	7					
							90mm				*… at 8.00 - 8.10m residual / destructured zone recovered as silt and fine to coarse subangular to angular gravel of mudstone.*
											… at 8.00 - 8.62 becoming grey.
											… at 8.10 - 8.25m residual zone recovered as grey slightly gravelly silt. Gravel is fine subangular of mudstone.
											… at 8.62 - 8.81m verticle fracture dipping 35°.
		8.00 - 11.00	2 6 16	73	48	13					*… at 8.80 - 8.88m destructured zone recovered as reddish brown fine to coarse subangular gravel of mudstone.*
											… at 9.22 - 9.31 residual zone recovered as fine to coarse subrounded gravel of mudstone and clay.
											… at 9.37 - 9.54m verticle fracture dipping 13°.
											… at 9.59 - 9.69m zone of core loss.
								9.69	60.76		Weak reddish brown thinly bedded distinctly weathered MUDSTONE. Fractures very closely spaced dipping 92 - 97° (BOLLIN MUDSTONE

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
				4.00	5.00	01:00		0.00	14.53	0							

Remarks

1. Inspection pit hand excavated to 1.2m bgl prior to drilling. 2. Groundwater was encountered at 3.30mbgl. 3. Upon completion exploratory hole installed with 50mm diameter standpipe to a depth of 5.00mbgl, with a response zone between 1.00 and 5.00mbgl.

Rotary Core Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 25/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381855.44 N385947.20
Project No. : 3733	Crew Name: N. Topping+M. Williams	Drilling Equipment: Dando 150 +Comacchio 205

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
MM Plan BH403	CP+RC	70.45m AoD	ES	1:27	Sheet 3 of 3

Well	Water	Depth (m)	Type /Fl	Coring TCR	Coring SCR	Coring RQD	Diameter Recovery (SPT)	Depth (m)	Level (m)	Legend	Stratum Description
											Weak reddish brown thinly bedded distinctly weathered MUDSTONE. Fractures very closely spaced dipping 92 - 97° (BOLLIN MUDSTONE MEMBER)
											… at 9.93 - 10.01m destructured / residual zone recovered as fine - coarse subangular gravel and clay.
											… at 10.12 - 12.00m zone of core loss.
		11.00 - 13.00	15 15 15	42	11	8	90mm				*… at 12.00 - 12.17m residual zone recovered as soft reddish brown gravelly clay and medium to coarse angular gravel of mudstone.*
											… at 12.31 - 12.87m residual zone recovered as soft reddish brown gravelly clay. Gravel is fine to medium subangular of mudstone.
							90mm				*… at 12.97 - 13.02m destructured zone recovered as fine to medium angular gravel of mudstone.*
											… at 13.15 - 13.21m destructured zone recovered as fine to medium angular clayey gravel of mudstone.
											… at 13.29 - 13.47m destructured zone recovered as fine to coarse angular gravel of mudstone.
								13.59	56.86		
		13.00 - 15.00	3 14 26	98	78	39					Weak reddish brown and grey thinly bedded partially weathered MUDSTONE. Fractures very closely to closely spaced dipping 91 - 97° (BOLLIN MUDSTONE MEMBER)
											… at 13.77 - 13.80m silt filled fracture.
								14.53	55.92		End of Borehole at 14.530m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation				Drilling Flush					
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation	Depth Top	Depth Base	Type	Colour	Min (%)	Max (%)
				4.00	5.00	01:00		0.00	14.53	0							

Remarks

1. Inspection pit hand excavated to 1.2m bgl prior to drilling. 2. Groundwater was encountered at 3.30mbgl. 3. Upon completion exploratory hole installed with 50mm diameter standpipe to a depth of 5.00mbgl, with a response zone between 1.00 and 5.00mbgl.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 28/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381798.85 N385713.81
Project No. : 3733	Crew Name: N. Topping	Drilling Equipment: Competitor Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots WS301	WS	73.33m AoD	MN	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES					Brown slightly sandy gravelly CLAY with occasional whole brick and wood fragments. Gravel is fine to coarse subangular to angular of brick, sandstone, concrete, mudstone and asphalt (EMBANKMENT FILL - DEMOLITION TYPE MATERIAL)
		1.20	SPT	N=9 (1,2/1,2,3,3)				
		2.00	SPT	N=19 (3,3/3,4,6,6)				
					2.80	70.53		
		3.00	SPT	N=23 (3,3/3,6,6,8)	3.00	70.33		Dark brown and black slightly sandy slightly gravelly CLAY with numerous rootlets. Gravel is fine subangular to subrounded of sandstone and mudstone (RELIC TOPSOIL)
		4.00	SPT	N=31 (3,3/4,8,9,10)				Stiff orangish / reddish brown mottled grey slightly gravelly slightly sandy CLAY with occasional pockets of sand. Gravel is fine to medium angular to subrounded of mudstone and coal (GLACIAL TILL)
								… 3.00 - 3.10m band of greyish brown fine silty sand
					4.40	68.93		Medium dense brown medium slightly gravelly SAND. Gravel is fine subangular to rounded of mixed lithologies (GLACIAL TILL)
		5.00	SPT	N=26 (3,4/4,6,8,8)				
					5.20	68.13		Stiff brown silty slightly sandy CLAY (GLACIAL TILL)
					5.45	67.88		End of Borehole at 5.450m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	5.45	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with arisings.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 28/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381881.60 N385723.75
Project No. : 3733	Crew Name: N. Topping	Drilling Equipment: Competitor Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots WS302	WS	72.94m AoD	MN	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50 - 0.60	ES					Dark brown gravelly clayey SAND. Gravel is fine to medium subangular to angular of asphalt, brick, concrete, mudstone and sandstone (EMBANKMENT FILL - DEMOLITION TYPE MATERIAL)
		1.20	SPT	N=15 (4,4/4,3,4,4)				
					1.80	71.14		
		2.00	SPT	N=4 (2,1/1,1,1,1)				Grey and black fine to coarse subangular to angular sandy GRAVEL of limestone and asphalt (TEMPORARY ROAD CONSTRUCTION MATERIAL)
					2.10	70.84		Brown mottled grey slightly gravelly CLAY. Gravel is fine to medium subangular to angular of mudstone (EMBANKMENT FILL - REWORKED CLAY)
		3.00	SPT	N=18 (2,2/3,2,6,7)	3.00	69.94		Firm yellowish brown mottled orangish brown and grey gravelly CLAY. Gravel is fine to medium subangular to angular of limestone, brick and sandstone (EMBANKMENT FILL - REWORKED CLAY)
					3.75	69.19		Grey mottled orangish brown silty CLAY (GLACIAL TILL)
		4.00	SPT	N=25 (3,3/5,6,6,8)	3.90	69.04		Grey mottled orangish brown residual MUDSTONE recovered as marl (BOLLIN MUDSTONE)
					4.30	68.64		Reddish brown mottled grey residual MUDSTONE recovered as marl (BOLLIN MUDSTONE)
		5.00	SPT	N=50 (5,9/50 for 295mm)				
					5.40	67.54		Very weak grey weathered MUDSTONE (BOLLIN MUDSTONE)
					5.45	67.49		End of Borehole at 5.450m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	5.45	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with arisings.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 28/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381929.88 N385666.98
Project No. : 3733	Crew Name: N. Topping	Drilling Equipment: Competitor Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots WS303	WS	71.37m AoD	MN	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50 - 0.60	ES		1.00	70.37		Brown sandy gravelly CLAY with occasional whole bricks. Gravel is fine to medium subangular to angular of concrete, brick, mudstone, sandstone and ceramic tile (EMBANKMENT FILL - DEMOLITION TYPE MATERIAL) End of Borehole at 1.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	1.00	0	

Remarks

1. Inspection pit hand excavated to 1.0mbgl at which depth an obstruction was encountered and borehole relocated. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with arisings.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 28/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381943.96 N385674.23
Project No. : 3733	Crew Name: N. Topping	Drilling Equipment: Competitor Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots WS303A	WS	70.60m AoD	MN	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.40 - 0.50	ES		0.20	70.40		Black slightly silty CLAY with numerous roots, rootlets and organic matter (TOPSOIL)
		0.80 - 0.90	ES		0.50	70.10		Brown slightly sandy gravelly CLAY. Gravel is fine to medium subangular to angular of brick, sandstone and concrete (EMBANKMENT FILL - DEMOLITION TYPE MATERIAL)
					1.00	69.60		Brown very gravelly clayey SAND. Gravel is fine to medium subangular to angular of brick, concrete, mudstone and sandstone (EMBANKMENT FILL - DEMOLITION TYPE MATERIAL)
								End of Borehole at 1.000m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	1.00	0	

Remarks

1. Inspection pit hand excavated to 1.0mbgl at which depth an obstruction was encountered. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with arisings.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 28/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381854.56 N385687.49
Project No. : 3733	Crew Name: N. Topping	Drilling Equipment: Competitor Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
E Plots WS304	WS	70.59m AoD	MN	1:50	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES					Firm to stiff brown mottled reddish brown and blackish brown slightly gravelly CLAY with occasional roots and organic matter. Gravel is fine to coarse subangular to rounded of mudstone and limestone (EMBANKMENT FILL - REWORKED CLAY)
					0.40	70.19		
		0.60	ES		0.50	70.09		Yellowish brown slightly clayey sandy fine to coarse angular gravel of limestone (ROAD CONSTRUCTION MATERIAL)
					1.00	69.59		Brown sandy fine to coarse subangular to subrounded GRAVEL of limestone (ROAD CONSTRUCTION MATERIAL)
		1.20	SPT	N=9 (3,2/3,2,2,2)				Soft reddish brown mottled orangish brown slightly sandy CLAY with occasional pockets of yellowish brown sand (GLACIAL TILL)
		2.00	SPT	N=12 (3,3/3,3,3,3)	2.00	68.59		*... 1.20 - 1.30m band of greyish brown fine silty sand*
					2.50	68.09		Medium dense reddish brown slightly clayey slightly gravelly medium to coarse SAND. Gravel is fine subangular to rounded of mudstone and coal (GLACIAL TILL)
		3.00	SPT	N=50 (5,9/50 for 255mm)	2.90	67.69		*... 2.30m becoming clayey*
					3.41	67.18		Firm to stiff reddish brown sandy slightly gravelly CLAY. Gravel is fine to medium subangular of mudstone and coal (GLACIAL TILL)
								Very weak reddish brown silty weathered MUDSTONE (BOLLIN MUDSTONE)
								End of Borehole at 3.410m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	3.41	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. No groundwater was observed. 3. Upon completion exploratory hole was backfilled with arisings.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 28/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381871.20 N385801.11
Project No. : 3733	Crew Name: N. Topping	Drilling Equipment: Competitor Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
MM Plan WS405	WS	72.41m AoD	ES	1:25	Sheet 1 of 2

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	ES					Soft to firm brown sandy gravelly CLAY. Gravel is fine to coarse angular to rounded of mudstone limestone, brick and coal (EMBANKMENT FILL)	
		1.00 - 1.45 1.00	D SPT	N=9 (2,2/2,2,2,3)				*… at 1.00m becoming firm to stiff and slightly gravelly.*	1
		2.00 - 2.45 2.00	D SPT	N=11 (4,3/3,2,3,3)	2.10	70.31		Firm brown mottled grey slightly gravelly slightly sandy reworked CLAY. Gravel is fine to medium subangular to subrounded of mudstone (EMBANKMENT FILL)	2
								… at 2.80m becoming soft to firm.	
		3.00 - 3.45 3.00	D SPT	N=11 (2,2/2,3,3,3)	3.10	69.31		Firm blackish brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is medium to fine subangular to subrounded of brick, coal and mudstone (EMBANKMENT FILL)	3
		3.70	ES		3.70	68.71		Firm dark grey slightly sandy slightly gravelly clay with frequent organic matter. Gravel is fine subangular to subrounded of brick, coal and glass (EMBANKMENT FILL)	
		4.00 - 4.45 4.00	D SPT	N=9 (2,2/2,2,2,3)	4.00	68.41		Soft grey and reddish brown mottled grey silty CLAY (GLACIAL TILL)	4
								… at 4.50m becoming grey.	
		5.00 - 5.40	D		4.80	67.61		Extremely weak grey silty weathered residual MUDSTONE (BOLLIN MUDSTONE MEMBER)	5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	5.40	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole backfilled with arisings.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 28/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381871.20 N385801.11
Project No. : 3733	Crew Name: N. Topping	Drilling Equipment: Competitor Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
MM Plan WS405	WS	72.41m AoD	ES	1:25	Sheet 2 of 2

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		5.00	SPT	N=59 (4,5/59 for 245mm)				Extremely weak grey silty weathered residual MUDSTONE (BOLLIN MUDSTONE MEMBER)
					5.40	67.01		End of Borehole at 5.400m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	5.40	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole backfilled with arisings.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 05/03/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381911.65 N385886.20
Project No. : 3733	Crew Name: D. Taylor	Drilling Equipment: Competitor Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
MM Plan WS406	WS	70.86m AoD	ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15	70.71		Yellowish brown very gravelly fine to coarse SAND. Gravel is fine to coarse subrounded to rounded of limestone (ROAD CONSTRUCTION MATERIAL - CURRENT CARPARK)
					0.50	70.36		Brown slightly clayey very gravelly fine to medium SAND. Gravel is fine to coarse subangular to subrounded of limestone. Occasional subrounded limestone cobbles (ROAD CONSTRUCTION MATERIAL - CURRENT CARPARK)
								End of Borehole at 0.500m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	0.50	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole backfilled with arisings. 4. Borehole terminated due to every compacted granular material.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 05/03/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381890.63 N385884.04
Project No. : 3733	Crew Name: D. Taylor	Drilling Equipment: Competitor Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
MM Plan WS406A	WS	70.15m AoD	ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20 - 0.60	ES		0.20	69.95		Dark brown slightly sandy slightly gravelly CLAY. Gravel is medium to coarse subangular to subrounded of limestone. Frequent roots, rootlets and organic matter. (TOPSOIL)
								Brown slightly clayey slightly gravelly fine to medium SAND. Gravel is fine to coarse subrounded of mudstone. Occasional subrounded cobble of mudstone and rare brick fragments (EMBANKMENT FILL)
					0.80	69.35		Soft to firm orangish brown mottled reddish brown, yellowish brown and grey sandy CLAY (GLACIAL TILL)
		1.00 - 1.45 1.00	D SPT	N=10 (3,2/2,3,3,2)				*… at 1.00 - 1.10m very sandy.*
					1.20	68.95		Reddish brown fine to coarse slightly gravelly slightly clayey SAND. Gravel is fine to medium subrounded of mudstone (GLACIAL TILL)
					1.50	68.65		Soft brown sandy CLAY. Rare fine subrounded gravel of coal and mudstone (GLACIAL TILL)
								… at 1.80m becoming very gravelly. Gravel is fine to medium angular of mudstone.
		2.00 - 2.45 2.00	D SPT	N=21 (3,4/5,5,6,5)	2.00	68.15		Extremely weak grey silty weathered residual MUDSTONE (BOLLIN MUDSTONE MEMBER)
		3.00 - 3.44 3.00	D SPT	N=50 (7,9/50 for 288mm)				
					3.44	66.71		End of Borehole at 3.440m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	3.44	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole backfilled with arisings.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 01/03/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381960.55 N385926.99
Project No. : 3733	Crew Name: N. Topping	Drilling Equipment: Competitor Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
MM Plan WS407	WS	69.04m AoD	ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.03	69.01		Grey coarse subangular to angular gravel of limestone (ROAD CONSTRUCTION MATERIAL - CURRENT CARPARK)
					0.30	68.74		Light grey sandy fine to coarse subangular to angular GRAVEL of limestone (ROAD CONSTRUCTION MATERIAL - CURRENT CARPARK)
		0.40	ES					Dark brown slightly gravelly slightly sandy CLAY. Gravel is fine to medium subangular to angular of coal, concrete, mudstone, brick and other (MADE GROUND)
		1.00 - 1.45 1.00	D SPT	N=6 (2,2/2,1,2,1)	1.00	68.04		Soft light greyish brown gravelly silty friable CLAY. Gravel is fine to medium angular to subangular of mudstone (GLACIAL TILL)
					1.50	67.54		Reddish brown silty residual weathered MUDSTONE (BOLLIN MUDSTONE MEMBER)
		2.00 - 2.39 2.00	D SPT	N=25 (8,8/25 for 235mm)				
								End of Borehole at 2.390m
		3.00	SPT	N=50 (7,9/50 for 288mm)				
					3.28	65.76		

1
2
3
4
5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	2.39	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole backfilled with arisings.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 05/03/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E382007.44 N385733.26
Project No. : 3733	Crew Name: D. Taylor	Drilling Equipment: Competitor Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
MM Plan WS408	WS	69.68m AoD	ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.03	69.65		Grey coarse subangular to angular gravel of limestone (ROAD CONSTRUCTION MATERIAL - CURRENT CARPARK)
		0.20 - 0.40	ES		0.20	69.48		Greyish brown sandy slightly clayey fine to coarse subangular to subrounded GRAVEL of limestone (ROAD CONSTRUCTION MATERIAL - CURRENT CARPARK)
					0.40	69.28		Blackish brown slightly sandy gravelly CLAY. Gravel is fine to coarse subangular to angular of mixed (ROAD CONSTRUCTION MATERIAL - CURRENT CARPARK)
					0.90	68.78		Greyish brown mottled reddish brown slightly gravelly slightly clayey SILT. Gravel is medium to coarse subangular of mudstone (GLACIAL TILL)
		1.00 - 1.45 1.00	D SPT	N=30 (4,4/5,5,10,10)				Extremely weak reddish brown silty residual weathered MUDSTONE (BOLLIN MUDSTONE MEMBER)
		2.00 - 2.32 2.00	D SPT	38 (10,12/38 for 170mm)				
					2.32	67.36		End of Borehole at 2.320m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	2.32	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole backfilled with arisings.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 05/03/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E382052.32 N385816.14
Project No. : 3733	Crew Name: D. Taylor	Drilling Equipment: Competitor Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
MM Plan WS409	WS	68.59m AoD	ES	1:25	Sheet 1 of 2

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.30	ES		0.10	68.49		Moss and leaves over light greyish brown slightly clayey very sandy fine to medium angular to subangular GRAVEL of limestone (ROAD CONSTRUCTION MATERIAL - CURRENT CARPARK)	
					0.30	68.29		Yellowish brown gravelly clayey SAND. Gravel is fine to coarse subangular of limestone (ROAD CONSTRUCTION MATERIAL - CURRENT CARPARK)	
								Firm becoming stiff reddish brown mottled grey CLAY with rare fine subrounded gravels of mudstone (GLACIAL TILL)	
								… at 0.30m membrane.	
		1.00 - 1.45 1.00	D SPT	N=11 (2,2/3,2,3,3)				*… at 0.80m becoming silty and friable.* *… at 1.00 - 1.10m becoming soft and slightly gravelly. Gravel is fine to medium subangular of mudstone. Ocassional organic matter comprising moss and rootlets.*	1
		2.00 - 2.45 2.00	D SPT	N=16 (3,3/4,4,4,4)					2
								… at 2.40m absence of grey mottling.	
		3.00 - 3.45 3.00	D SPT	N=22 (4,5/5,5,6,6)					3
		4.00 - 4.45 4.00	D SPT	N=25 (5,4/5,6,7,7)					4
		5.00 - 5.45	D						5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	6.45	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole installed with 50mm diameter standpipe to a depth of 4.00mbgl, with a response zone between 1.00 and 4.00mbgl.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 05/03/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E382052.32 N385816.14
Project No. : 3733	Crew Name: D. Taylor	Drilling Equipment: Competitor Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
MM Plan WS409	WS	68.59m AoD	ES	1:25	Sheet 2 of 2

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		5.00	SPT	N=25 (3,3/5,6,7,7)				Firm becoming stiff reddish brown mottled grey CLAY with rare fine subrounded gravels of mudstone (GLACIAL TILL)
								… at 5.30 - 5.80m becoming soft.
		6.00 - 6.45	D					
		6.00	SPT	N=24 (3,4/5,6,6,7)				*… at 6.00m becoming brown.*
					6.45	62.14		End of Borehole at 6.450m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	6.45	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole installed with 50mm diameter standpipe to a depth of 4.00mbgl, with a response zone between 1.00 and 4.00mbgl.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 05/03/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E382049.06 N385882.15
Project No. : 3733	Crew Name: D. Taylor	Drilling Equipment: Competitor Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
MM Plan WS410	WS	68.06m AoD	ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.03	68.03		Grey coarse subangular to angular gravel of limestone (ROAD CONSTRUCTION MATERIAL - CURRENT CARPARK)
		0.20 - 0.50	ES		0.15	67.91		Grey slightly clayey sandy medium to coarse subangular GRAVEL of limestone (ROAD CONSTRUCTION MATERIAL - CURRENT CARPARK)
					0.50	67.56		Soft greyish brown very sandy slightly gravelly CLAY. Gravel is fine to medium subangular of mudstone. Frequent organic matter (GLACIAL TILL)
					0.80	67.26		Firm to stiff orangish brown slightly sandy CLAY (GLACIAL TILL)
		1.00 - 1.45 1.00	D SPT	N=10 (2,2/2,3,2,3)				Soft to firm reddish brown mottled grey CLAY (GLACIAL TILL)
		2.00 - 2.45 2.00	D SPT	N=17 (2,2/3,4,5,5)				
					2.40	65.66		Extremely weak grey and reddish brown silty residual weathered MUDSTONE (BOLLIN MUDSTONE MEMBER)
		3.00 - 3.44 3.00	D SPT	N=50 (8,9/50 for 290mm)				
					3.44	64.62		End of Borehole at 3.440m

1 2 3 4 5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	3.44	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole backfilled with arisings.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 28/02/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381790.40 N385799.56
Project No. : 3733	Crew Name: N. Topping	Drilling Equipment: Competitor Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
Brook WS401	WS	71.17m AoD	ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.40	ES		0.30	70.87		Firm brown mottled black gravelly CLAY. Gravel is fine to coarse subangular of limestone, sandstone and brick (EMBANKMENT FILL - DEMOLITION TYPE MATERIAL)
		1.00 - 1.45 1.00	D SPT	N=13 (2,1/2,3,4,4)				Soft to firm brown, reddish brown and greyish brown slightly sandy gravelly CLAY. Gravel is fine to coarse subangular to rounded of limestone, coal, mudstone and brick (EMBANKEMENT FILL - DEMOLITION TYPE MATERIAL) *… at 0.30 - 0.35m band of cream sandy fine to coarse subangular to angular gravel of limestone.*
					1.20	69.97		Firm reddish brown slightly gravelly slightly sandy CLAY. Gravel is fine to coarse subangular to rounded of limestone, mudstone and quartz (EMBANKMENT FILL)
					1.60	69.57		Firm dark greyish brown slightly sandy slightly gravelly CLAY. Gravel is fine subangular of coal and mudstone. Frequent rootlets (RELIC TOPSOIL)
		2.00 - 2.45 2.00	D SPT	N=9 (2,1/1,3,2,3)	2.00 2.10	69.17 69.07		Dark grey silty clayey fine SAND (GLACIAL TILL) Soft grey mottled yellowish brown slightly sandy CLAY. Rare fine to medium subangular gravel of mudstone (GLACIAL TILL)
		3.00 - 3.45 3.00	D SPT	N=16 (2,2/3,4,5,4)	2.90	68.27		Firm to stiff reddish brown CLAY (GLACIAL TILL)
		4.00 - 4.41 4.00	D SPT	N=44 (5,6/44 for 255mm)	3.30	67.87		Extremely weak reddish brown residual weathered MUDSTONE (BOLLIN MUDSTONE MEMBER) *… at 4.25 - 4.26m band of reddish brown medium sand.*
					4.45	66.72		End of Borehole at 4.400m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	4.40	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole backfilled with arisings.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 01/03/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381799.67 N385830.10
Project No. : 3733	Crew Name: N. Topping	Drilling Equipment: Competitor Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
Brook WS402	WS	70.21m AoD	ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES					Yellowish brown / greyish brown very sandy GRAVEL. Gravel is fine to coarse subangular to angular of sandstone and limestone (FORMER CARAPRK CONSTRUCTION MATERIAL)
					0.40	69.81		
					0.50	69.71		Black slightly clayey slightly silty gravelly SAND. Gravel is fine to coarse subangular to rounded of mixed. Organic matter and numerous rootlets noted (FORMER CARPARK CONSTRUCTION MATERIAL)
								... at 0.40m membrane
		1.00 - 1.45 1.00	D SPT	N=9 (1,1/1,2,3,3)	1.00	69.21		Greyish brown slightly gravelly silty fine SAND. Gravel is fine to medium subangular to subrounded of mixed (FORMER CARPARK CONSTRUCTION MATERIAL)
								Firm reddish brown mottled orange slightly sandy slightly gravelly CLAY. Gravel is fine subangular to rounded of mixed (MADE GROUND - REWORKED CLAY)
								... at 1.5m subrounded cobble of limestone
					1.70	68.51		
					1.80	68.41		Firm reddish brown mottled grey slightly gravelly very silty CLAY. Gravel is fine subangular to rounded of mudstone (GLACIAL TILL)
		2.00 - 2.45 2.00	D SPT	N=16 (2,3/4,3,4,5)				Reddish brown mottled grey residual weathered MUDSTONE (BOLLIN MUDSTONE MEMBER)
					2.20	68.01		Grey mottled reddish brown residual weathered MUDSTONE (BOLLIN MUDSTONE MEMBER)
		3.00 - 3.10 3.00	D SPT	50 (25 for 85mm/50 for 10mm)	3.10	67.11		End of Borehole at 3.100m

1
2
3
4
5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	3.10	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole backfilled with arisings.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 01/03/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381806.87 N385862.30
Project No. : 3733	Crew Name: N. Topping	Drilling Equipment: Competitor Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
Brook WS403	WS	70.05m AoD	ES	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.40 - 0.50	ES		0.20	69.85		Yellowish brown very sandy fine to coarse subangular to angular gravel of mudstone and limestone (FORMER CARPARK CONSTRUCTION MATERIAL)
								Black mottled grey and yellowish brown sandy gravelly reworked CLAY. Gravel is fine to coarse subangular to rounded of mixed. Occasional rootlets. (FORMER CARPARK CONSTRUCTION MATERIAL)
								… at 0.20m membrane
		1.00 - 1.45 1.00	D SPT	N=11 (2,2/2,3,3,3)	1.00	69.05		Firm reddish brown mottled orange and grey slightly sandy slightly gravelly CLAY. Gravel is fine subangular to rounded of mixed (GLACIAL TILL)
								… at 1.20m pocket of orange fine to medium sand.
					1.70	68.35		Firm reddish brown mottled grey slightly gravelly CLAY. Gravel is fine to medium subangular to angular of mudstone (GLACIAL TILL)
		2.00 - 2.45 2.00	D SPT	N=18 (2,2/3,4,4,7)				
					2.40	67.65		Grey silty residual weathered MUDSTONE (BOLLIN MUDSTONE MEMBER)
					2.60	67.45		Grey destructured weathered MUDSTONE recovered as fine to medium angular gravel of mudstone (BOLLIN MUDSTONE MEMBER)
		3.00 - 3.32 3.00	D SPT	50 (5,6/50 for 170mm)				
					3.32	66.73		End of Borehole at 3.320m

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	3.32	0	

Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole installed with 50mm diameter standpipe to a depth of 2.70mbgl, with a response zone between 0.70 and 2.70mbgl.

Percussion Drilling Log

Project Name: Airport City North	Client: Airport City Ltd Partnership	Date: 01/03/2019
Location: Manchester Airport	Contractor: Taylor Drilling Services Ltd	Co-ords: E381815.44 N385896.95
Project No. : 3733	Crew Name: N. Topping	Drilling Equipment: Competitor Dart

Borehole Number	Hole Type	Level	Logged By	Scale	Page Number
Brook WS404	WS	69.86m AoD	ES	1:25	Sheet 1 of 1

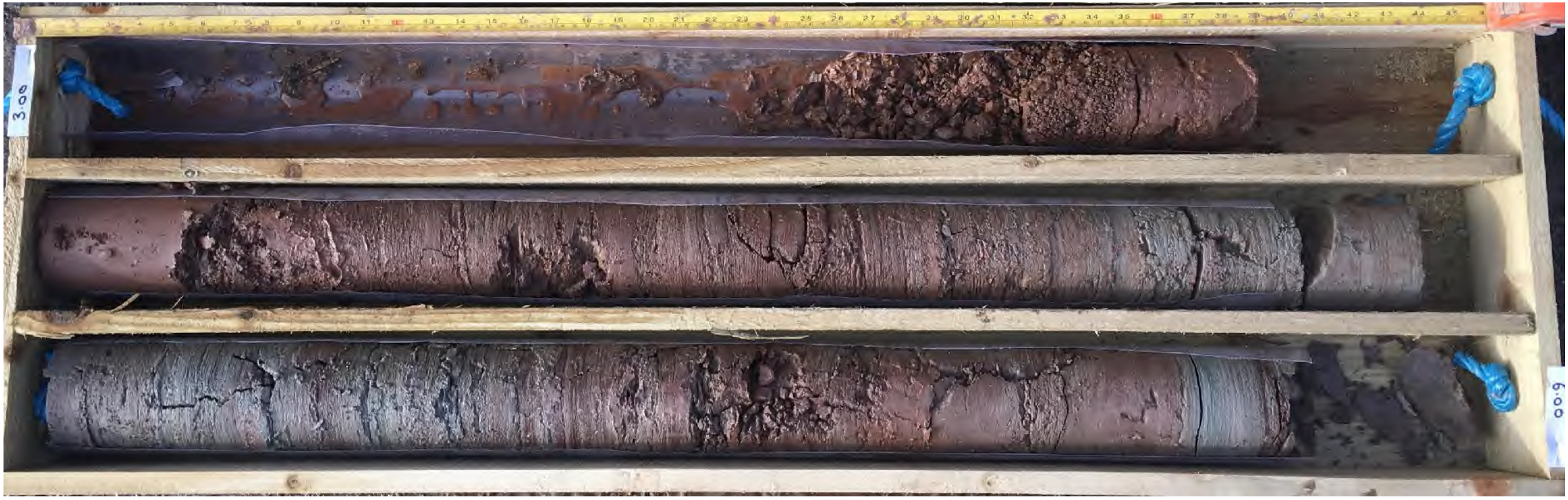
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Blackish brown sandy CLAY with frequent organic matter, roots and rootlets (TOPSOIL)
					0.70	69.16		
		1.00 - 1.20 1.00 - 1.45 1.00	ES D SPT	N=10 (1,2/2,3,2,3)				Brown mottled orangish brown very sandy reworked CLAY. Occasional fine to medium subangular gravel of coal and rare roots (MADE GROUND) *… at 1.00 - 1.20m fine to coarse subangular gravel of brick.*
					1.20	68.66		Brown and cream slightly clayey medium to coarse SAND (GLACIAL TILL)
		2.00 - 2.45 2.00	D SPT	N=16 (1,2/2,4,4,6)				
					2.40	67.46		Firm brown slightly gravelly slightly sandy silty CLAY. Gravel is fine to medium subangular to subrounded of mudstone and coal (GLACIAL TILL)
					2.80	67.06		Grey silty weathered residual MUDSTONE (BOLLIN MUDSTONE MEMBER) *… at 2.80 - 2.90m pocket of reddish brown slightly gravelly medium sand. Gravel is fine subrounded of coal.*
		3.00 - 3.42 3.00	D SPT	N=50 (3,4/50 for 265mm)				
					3.42	66.44		End of Borehole at 3.420m

1 2 3 4 5

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
								0.00	3.42	0	

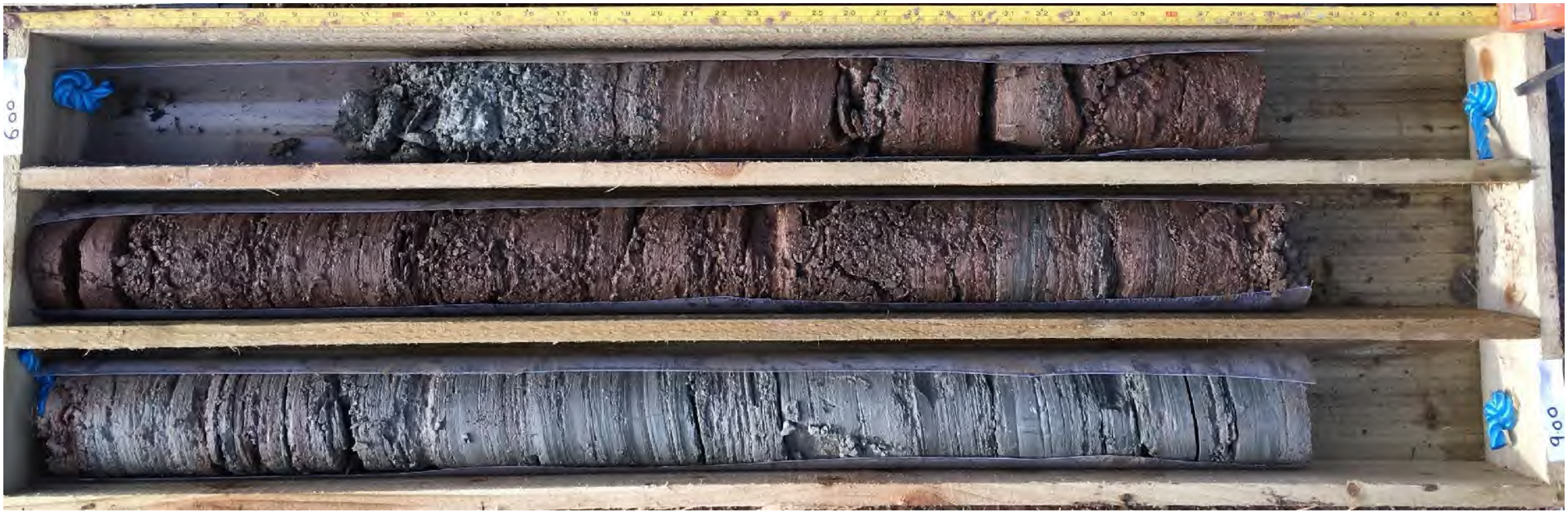
Remarks

1. Inspection pit hand excavated to 1.2mbgl prior to drilling. 2. Groundwater was not observed. 3. Upon completion exploratory hole backfilled with arisings.

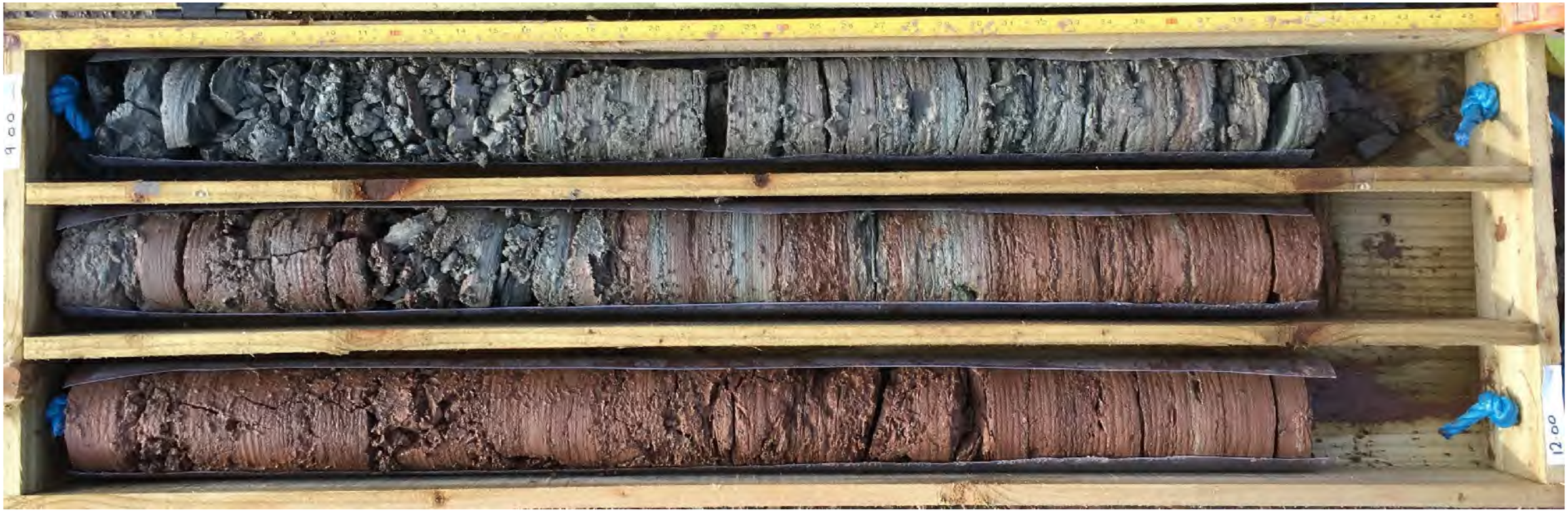


RoC CONSULTING	JOB NO	3733	SKETCH	BH301	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 1 – 3.00 – 6.00m	MN

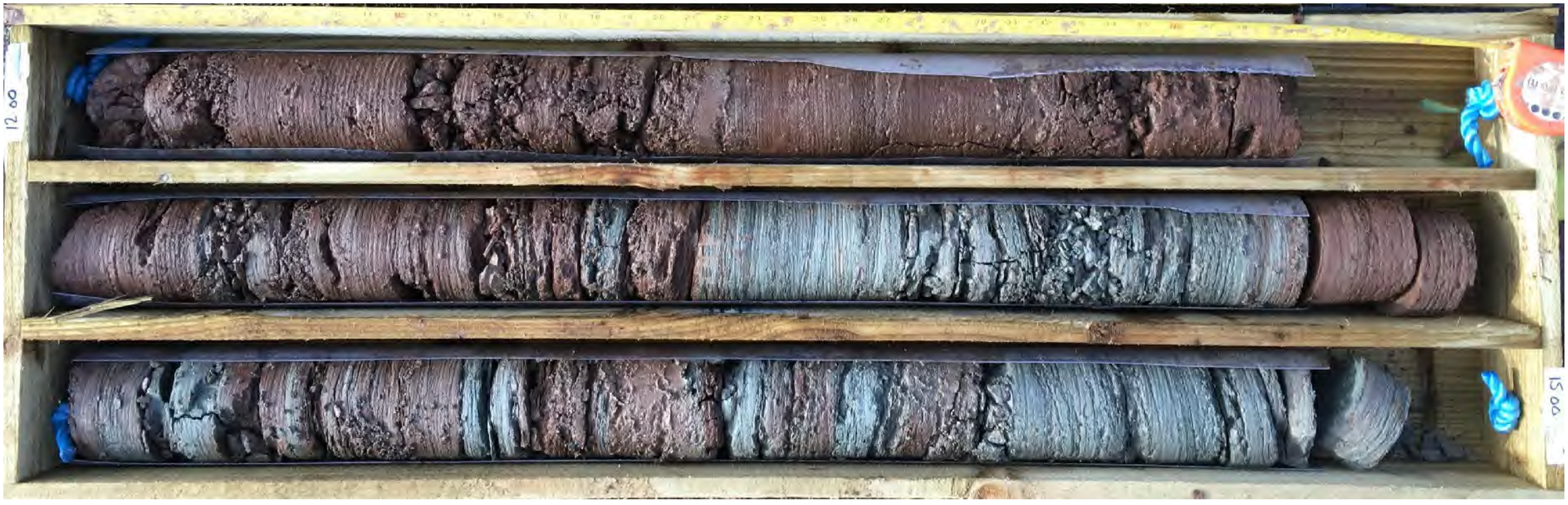
COMPLEX CHALLENGES ... MADE SIMPLE



ROC CONSULTING	JOB NO	3733	SKETCH	BH301	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 2 – 6.00 – 9.00m	MN



RPC CONSULTING	JOB NO	3733	SKETCH	BH301	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 3 – 9.00 – 12.00m	MN



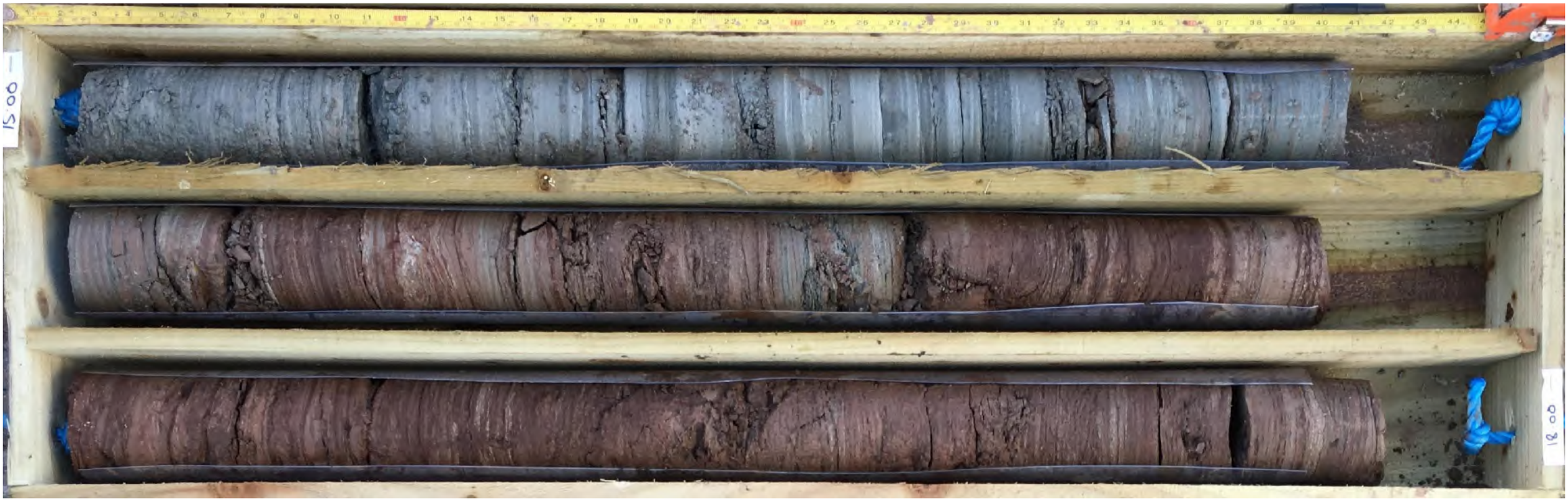
RoC CONSULTING	JOB NO	3733	SKETCH	BH301	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 4 – 12.00 – 15.00m	MN



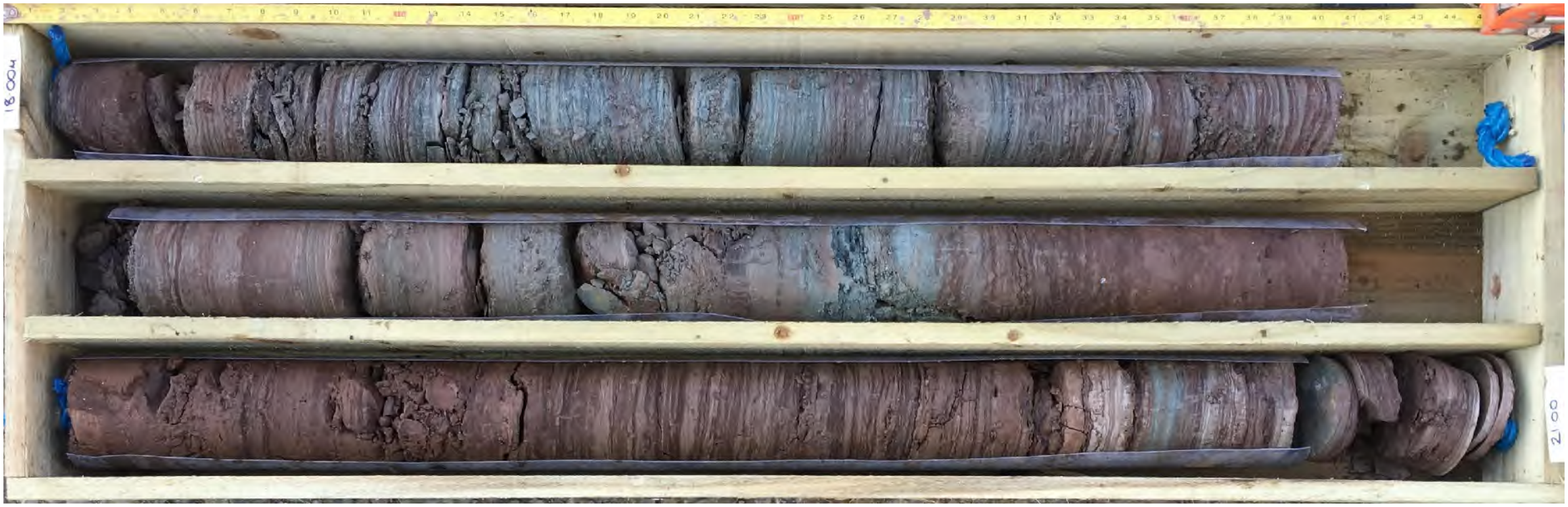
RoC CONSULTING	JOB NO	3733	SKETCH	BH302	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 1 – 9.00 – 12.00m	MN



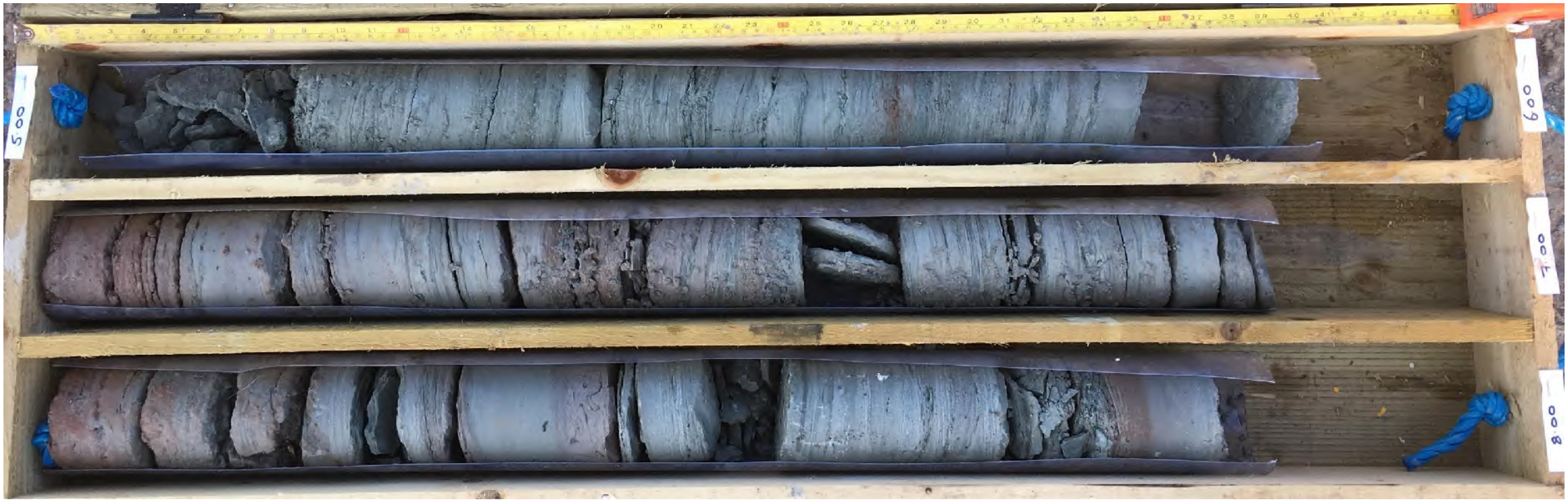
RPC CONSULTING	JOB NO	3733	SKETCH	BH302	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 2 – 12.00 – 15.00m	MN



RPC CONSULTING	JOB NO	3733	SKETCH	BH302	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 3 – 15.00 – 18.00m	MN

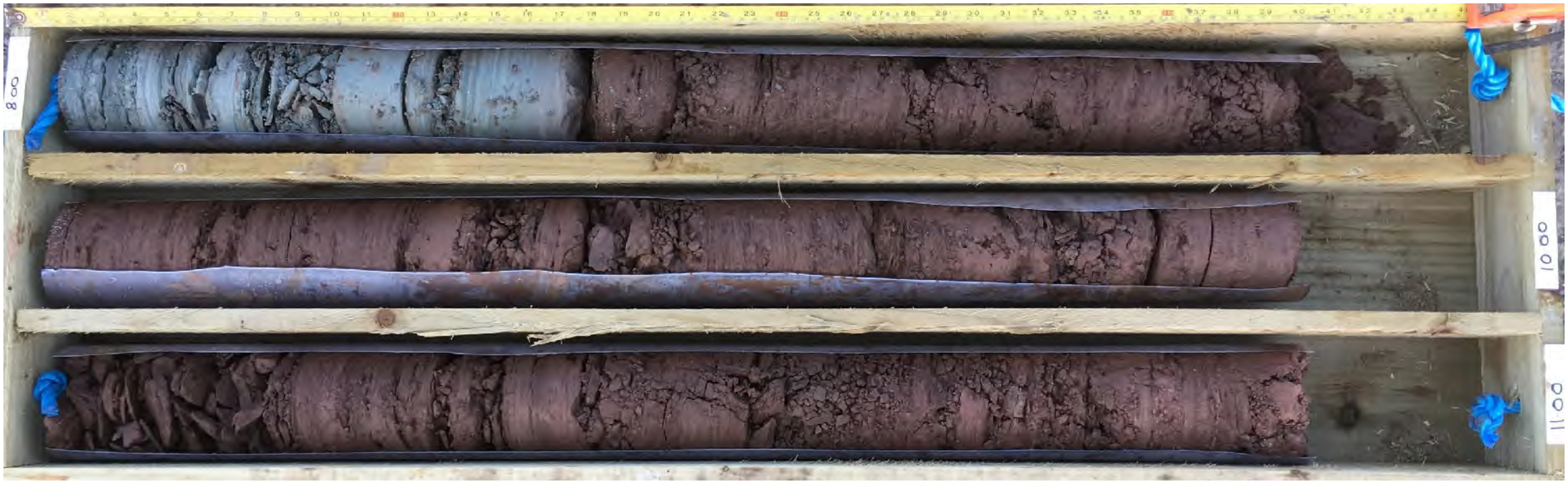


RoC CONSULTING	JOB NO	3733	SKETCH	BH302	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 4 – 18.00 – 21.00m	MN



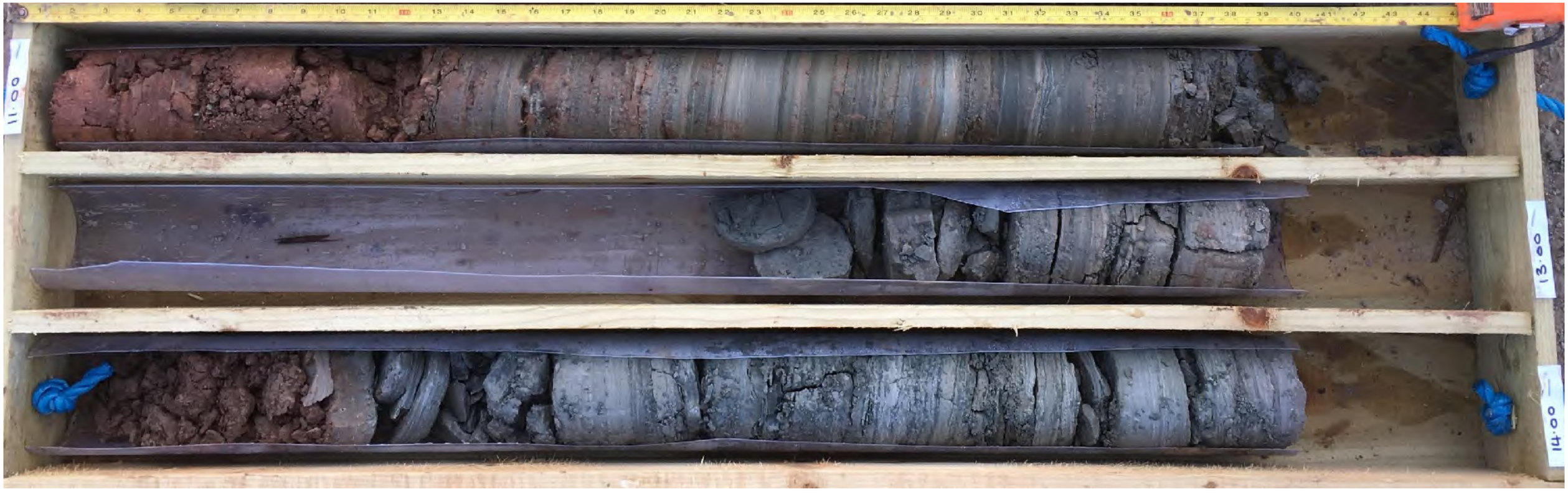
RoC CONSULTING	JOB NO	3733	SKETCH	BH303	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Runs 1, 2 and 3 – 5.00 – 6.00m, 6.00 – 7.00m and 7.00 – 10.00m	MN

COMPLEX CHALLENGES ... MADE SIMPLE



RoC CONSULTING	JOB NO	3733	SKETCH	BH303	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Runs 3 and 4 – 7.00 – 10.00m and 10.00 – 13.00m	MN

COMPLEX CHALLENGES ... MADE SIMPLE



RoC CONSULTING	JOB NO	3733	SKETCH	BH303	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Runs 4 and 5 – 10.00 – 13.00m and 13.00 – 15.00m	MN



RoC CONSULTING	JOB NO	3733	SKETCH	BH303	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 4 – 13.00m – 15.00m	MN

COMPLEX CHALLENGES ... MADE SIMPLE



RPC CONSULTING	JOB NO	3733	SKETCH	BH304	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 1 – 6.50 – 9.50m	MN

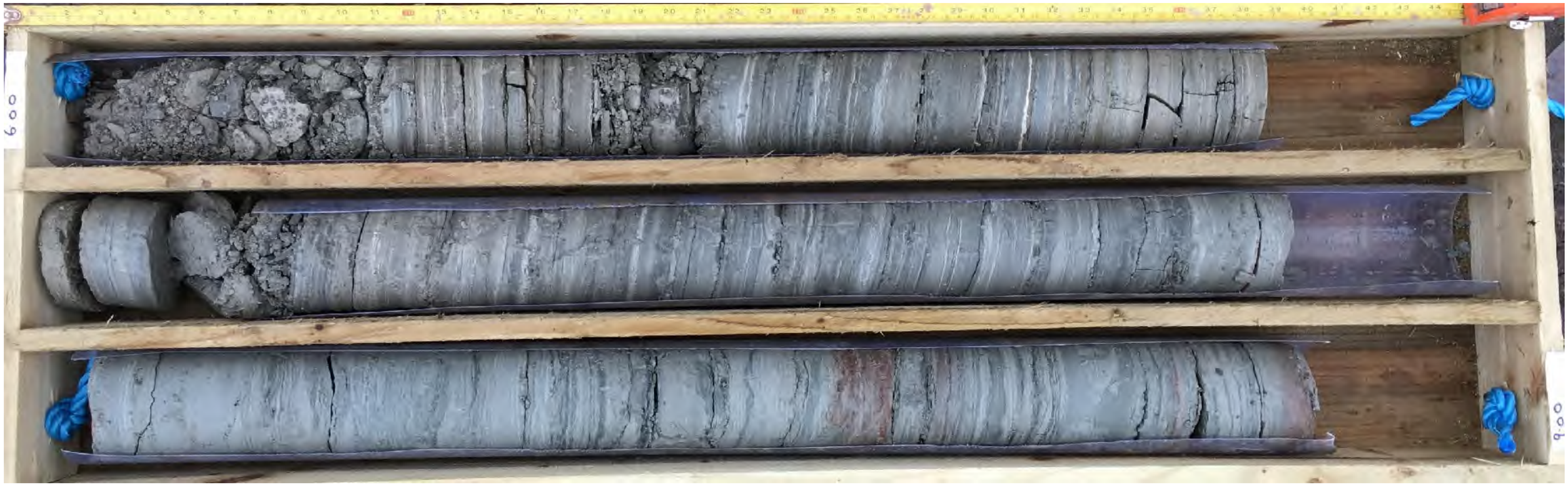


RoC CONSULTING	JOB NO	3733	SKETCH	BH304	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 2 – 9.50 – 12.50m	MN

COMPLEX CHALLENGES ... MADE SIMPLE



RoC CONSULTING	JOB NO	3733	SKETCH	BH304	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 3 – 12.50 – 15.50m	MN



RoC CONSULTING	JOB NO	3733	SKETCH	BH305A	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 1 – 6.00 – 9.00m	MN

COMPLEX CHALLENGES ... MADE SIMPLE



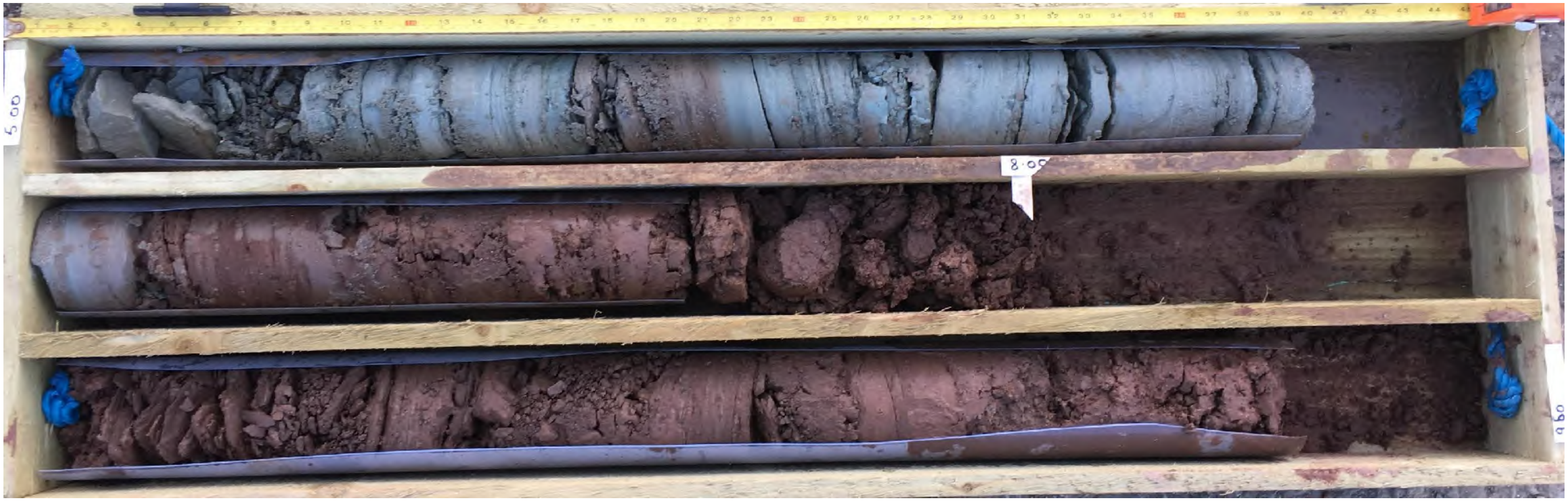
RoC CONSULTING	JOB NO	3733	SKETCH	BH305A	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 2 – 9.00 – 12.00m	MN



RoC CONSULTING	JOB NO	3733	SKETCH	BH305A	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 3 – 12.00 – 15.00m	MN



ROC CONSULTING	JOB NO	3733	SKETCH	BH305A	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 4 – 15.00 – 18.00m	MN

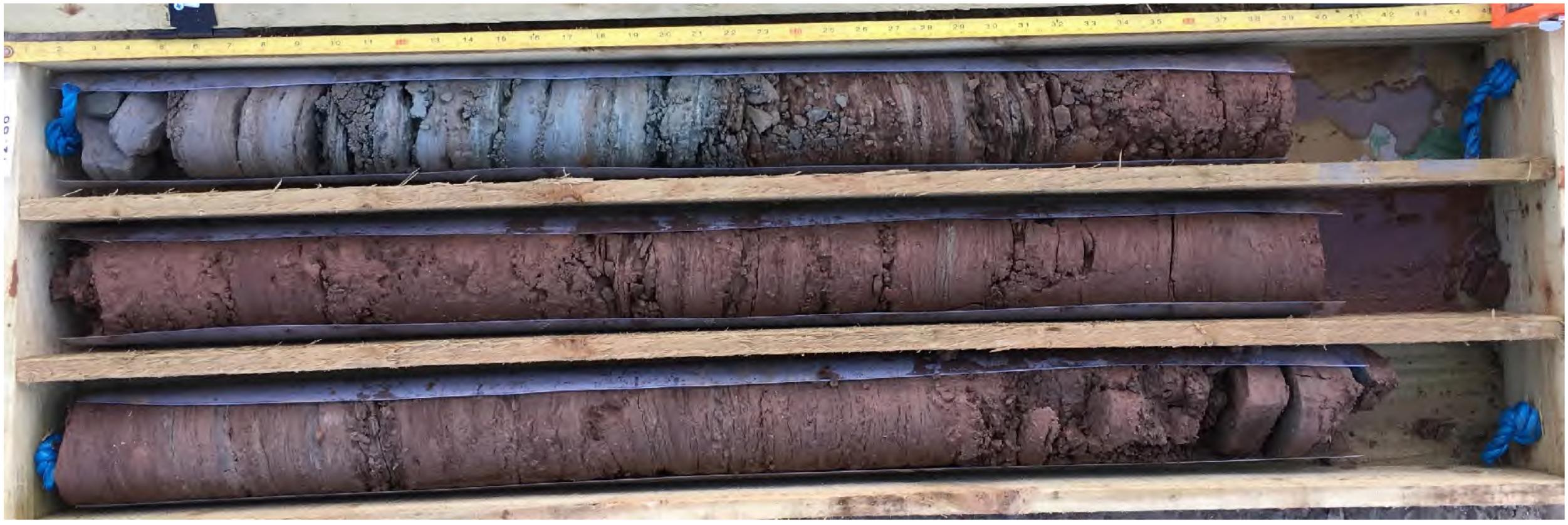


RPC CONSULTING	JOB NO	3733	SKETCH	BH306A	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Runs 1 and 2 – 5.00 – 8.00m and 8.00 – 9.50m	MN

COMPLEX CHALLENGES ... MADE SIMPLE



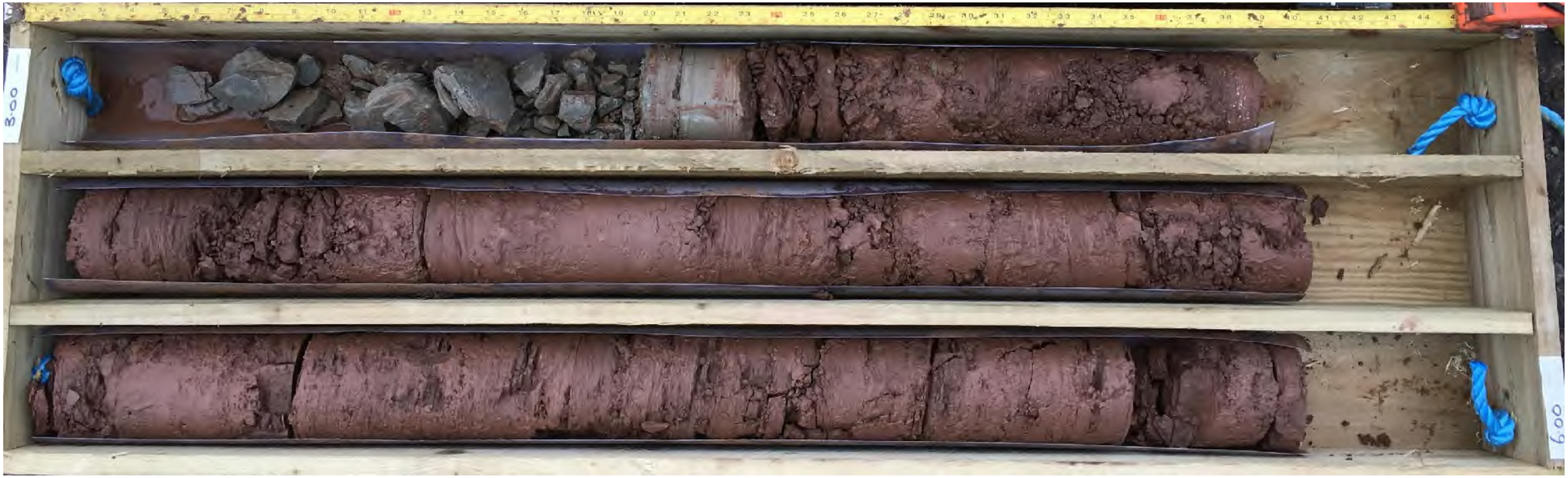
RoC CONSULTING	JOB NO	3733	SKETCH	BH306A	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 3 – 9.50 – 12.50m	MN



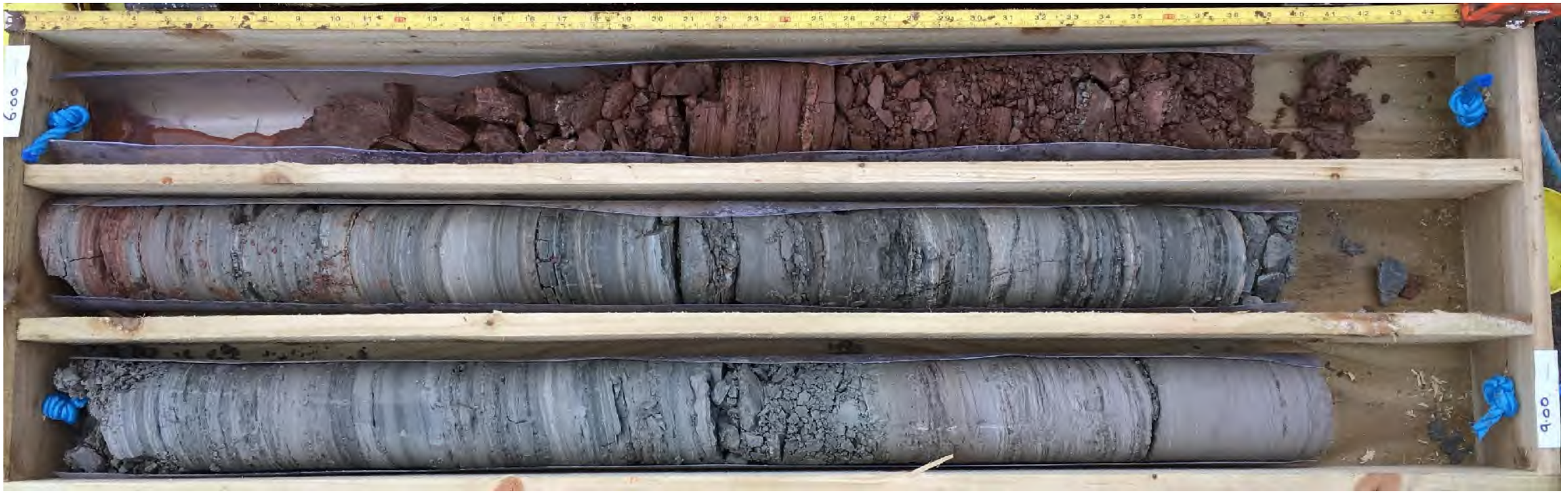
RoC CONSULTING	JOB NO	3733	SKETCH	BH306A	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 4 – 12.50 – 15.50m	MN



RPC CONSULTING	JOB NO	3733	SKETCH	BH306A	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 5 – 15.50 – 16.50m	MN



RPC CONSULTING	JOB NO	3733	SKETCH	BH307	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 1 – 3.00 – 6.00m	MN



RoC CONSULTING	JOB NO	3733	SKETCH	BH307	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 2 – 6.00 – 9.00m	MN



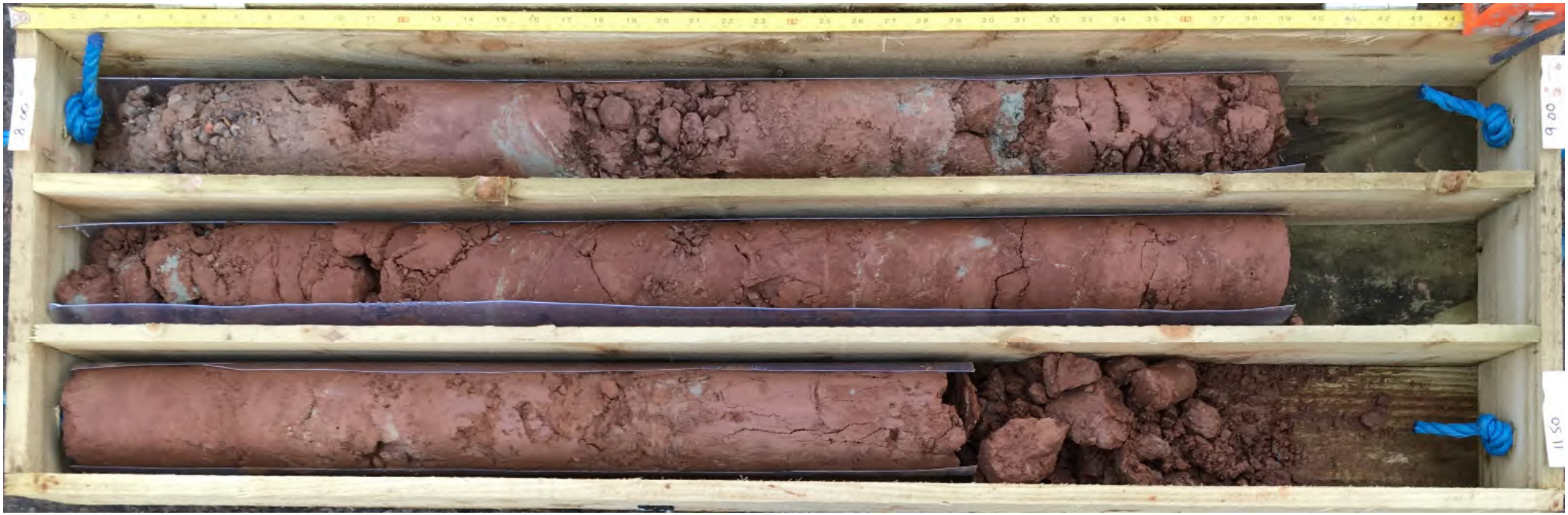
RoC CONSULTING	JOB NO	3733	SKETCH	BH307	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 3 – 9.00 – 12.00m	MN

COMPLEX CHALLENGES ... MADE SIMPLE

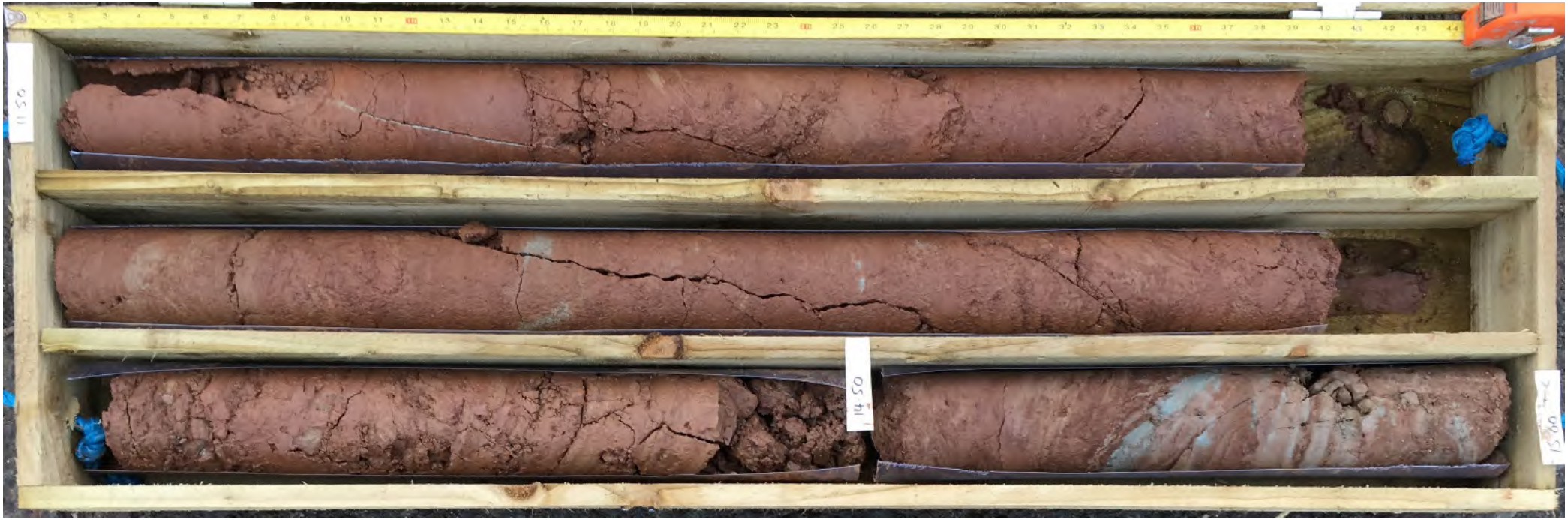


RoC CONSULTING	JOB NO	3733	SKETCH	BH307	DRAWN BY
	PROJECT TITLE	E Plots	SKETCH TITLE	Core Run 4 – 12.00 – 15.00m	MN

COMPLEX CHALLENGES ... MADE SIMPLE

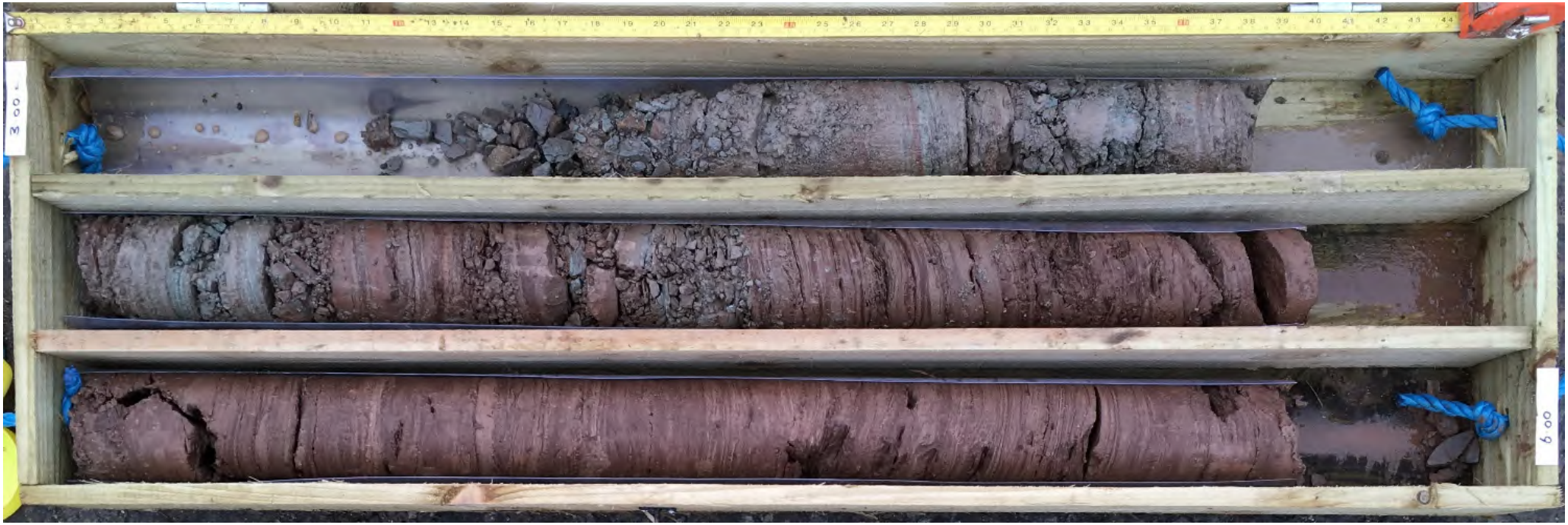


ROC CONSULTING	JOB NO	3733	SKETCH	BH401	DRAWN BY
	PROJECT TITLE	Mini Masterplan	SKETCH TITLE	Core Photos 8.00 – 11.50m	ES

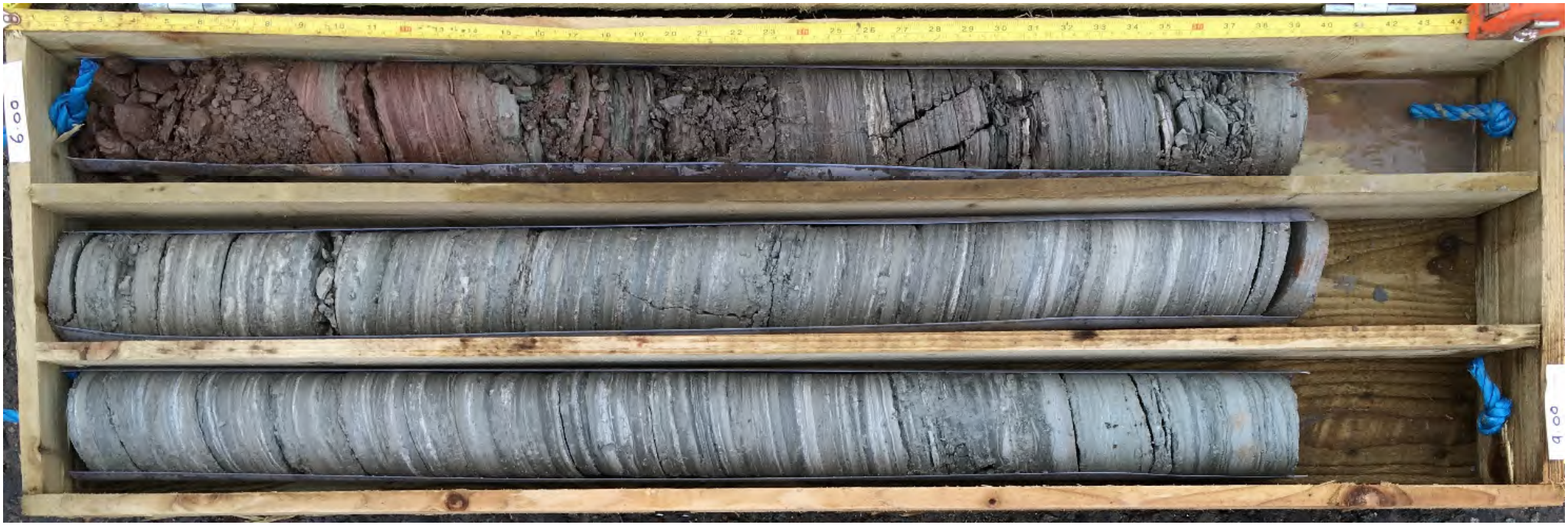


ROC CONSULTING	JOB NO	3733	SKETCH	BH401	DRAWN BY
	PROJECT TITLE	Mini Masterplan	SKETCH TITLE	Core Photos 11.50 – 15.00m	ES

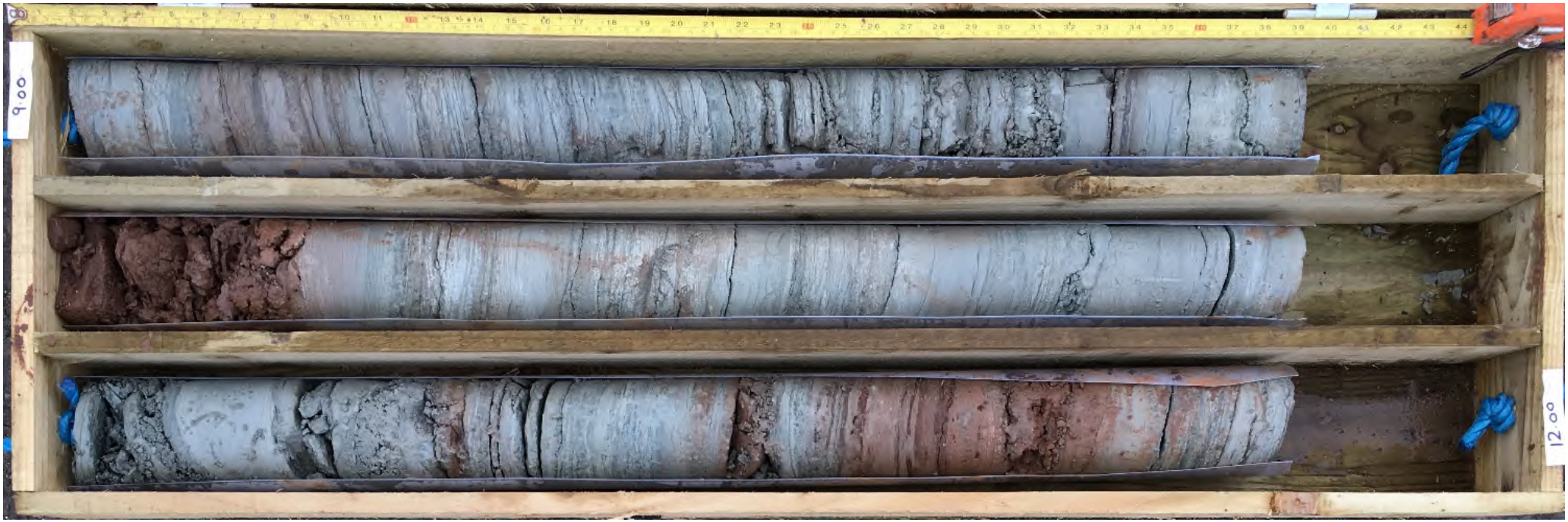
COMPLEX CHALLENGES ... MADE SIMPLE



RoC CONSULTING	JOB NO	3733	SKETCH	BH402	DRAWN BY
	PROJECT TITLE	Mini Masterplan	SKETCH TITLE	Core Photos 3.00 – 6.00m	ES



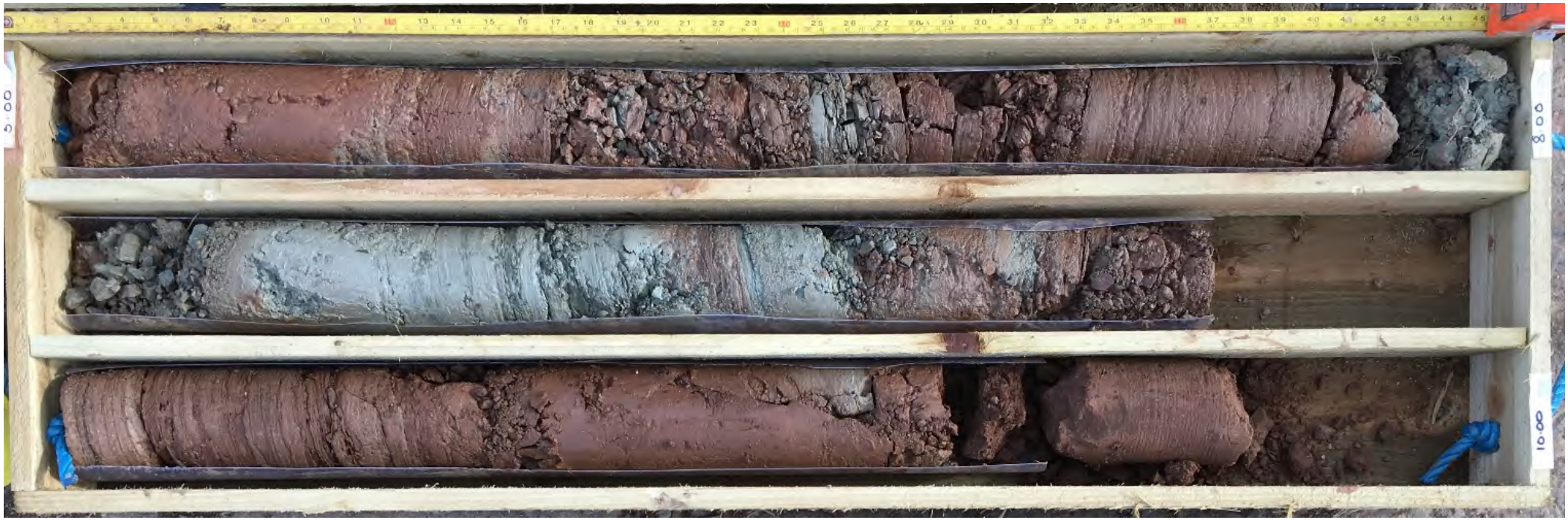
ROC CONSULTING	JOB NO	3733	SKETCH	BH402	DRAWN BY
	PROJECT TITLE	Mini Masterplan	SKETCH TITLE	Core Photos 6.00 – 9.00m	ES



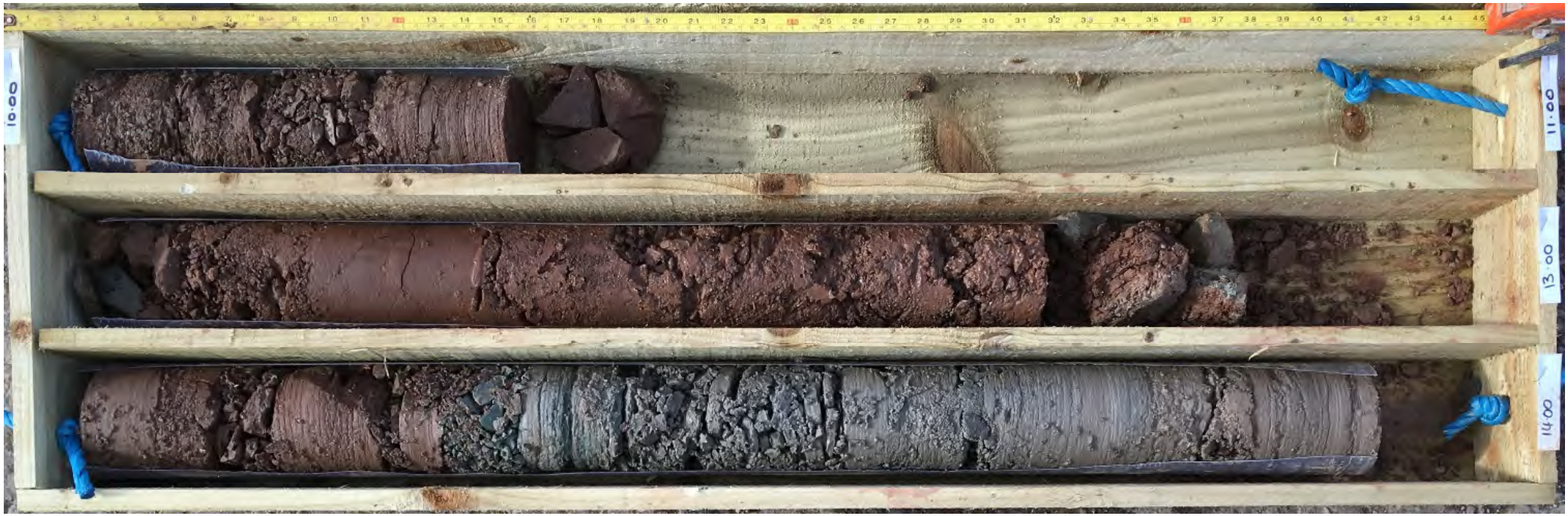
RoC CONSULTING	JOB NO	3733	SKETCH	BH402	DRAWN BY
	PROJECT TITLE	Mini Masterplan	SKETCH TITLE	Core Photos 9.00 – 12.00m	ES



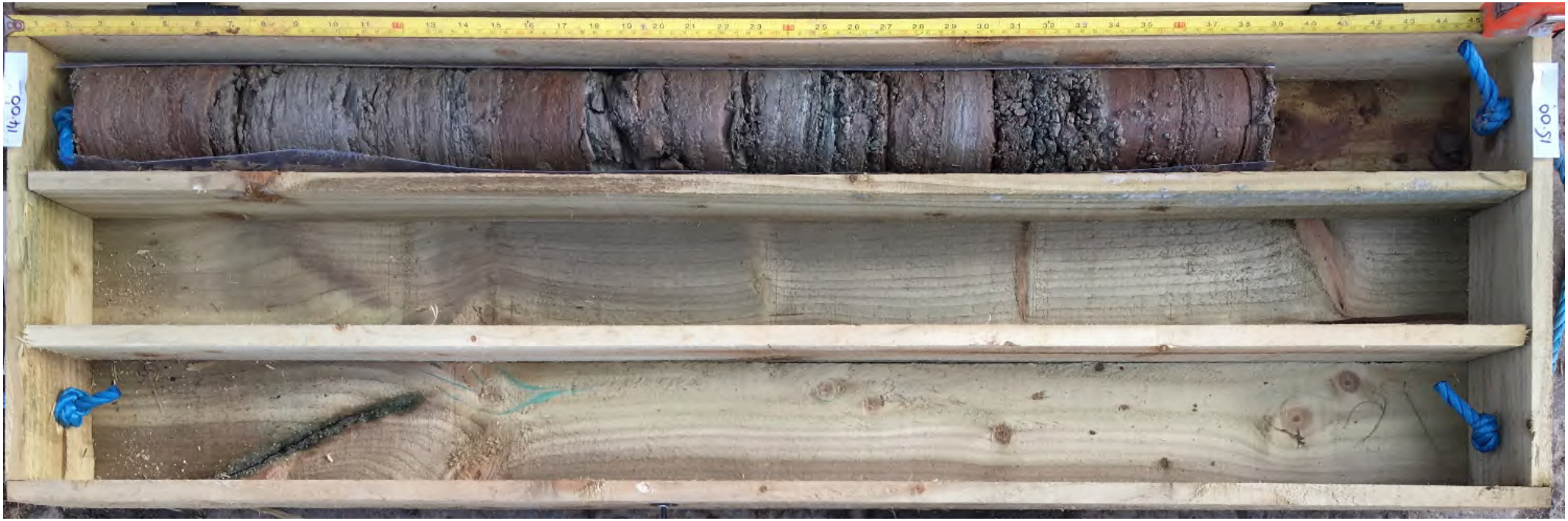
RoC CONSULTING	JOB NO	3733	SKETCH	BH402	DRAWN BY
	PROJECT TITLE	Mini Masterplan	SKETCH TITLE	Core Photos 12.00 – 15.00m	ES



RoC CONSULTING	JOB NO	3733	SKETCH	BH403	DRAWN BY
	PROJECT TITLE	Mini Masterplan	SKETCH TITLE	Core Photos 5.00 – 10.00m	ES



RoC CONSULTING	JOB NO	3733	SKETCH	BH403	DRAWN BY
	PROJECT TITLE	Mini Masterplan	SKETCH TITLE	Core Photos 10.00 – 14.00m	ES



RoC CONSULTING	JOB NO	3733	SKETCH	BH403	DRAWN BY
	PROJECT TITLE	Mini Masterplan	SKETCH TITLE	Core Photos 14.00 – 15.00m	ES

COMPLEX CHALLENGES ... MADE SIMPLE

APPENDIX C – Chemical Testing Results

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 19/01911
Issue Number: 1 **Date:** 13 March, 2019

Client: ROCP LIMITED
Commercial Wharf 6 Commercial Street
Castlefield
Manchester
M15 4PZ

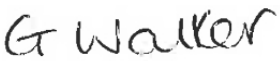
Project Manager: Mabel Newby
Project Name: E Plots
Project Ref: 3733
Order No: 1394
Date Samples Received: 26/02/19
Date Instructions Received: 27/02/19
Date Analysis Completed: 12/03/19

Prepared by:



Elisha Hartley
Admin Assistant

Approved by:



Gill Walker
Director/Laboratory Manager

Envirolab Job Number: 19/01911

Client Project Name: E Plots

Client Project Ref: 3733

Lab Sample ID	19/01911/1								Units	Method ref
Client Sample No										
Client Sample ID	BH306A									
Depth to Top	2.50									
Depth To Bottom	3.00									
Date Sampled	22-Feb-19									
Sample Type	Soil - ES									
Sample Matrix Code	4ABE									
% Stones >10mm$_A$	23.2								% w/w	A-T-044
pH$_D$$^{M\#}$	10.28								pH	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	171								mg/l	A-T-026s
Cyanide (total)$_A$$^{M\#}$	<1								mg/kg	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2								mg/kg	A-T-050s
Fraction of organic carbon$_D$$^{\#}$	0.0123								N/A	A-T-032 FOC
Antimony$_D$	8								mg/kg	A-T-024s
Arsenic$_D$$^{M\#}$	<1								mg/kg	A-T-024s
Barium$_D$	212								mg/kg	A-T-024s
Beryllium$_D$$^{\#}$	0.6								mg/kg	A-T-024s
Boron (water soluble)$_D$$^{M\#}$	1.9								mg/kg	A-T-027s
Cadmium$_D$$^{M\#}$	<0.5								mg/kg	A-T-024s
Copper$_D$$^{M\#}$	25								mg/kg	A-T-024s
Chromium$_D$$^{M\#}$	565								mg/kg	A-T-024s
Chromium (hexavalent)$_D$	<2								mg/kg	A-T-040s
Chromium (trivalent)	565								mg/kg	Calc
Lead$_D$$^{M\#}$	51								mg/kg	A-T-024s
Mercury$_D$	<0.17								mg/kg	A-T-024s
Molybdenum$_D$$^{M\#}$	<1								mg/kg	A-T-024s
Nickel$_D$$^{M\#}$	16								mg/kg	A-T-024s
Selenium$_D$$^{M\#}$	3								mg/kg	A-T-024s
Vanadium$_D$$^{M\#}$	387								mg/kg	A-T-024s
Zinc$_D$$^{M\#}$	98								mg/kg	A-T-024s

Envirolab Job Number: 19/01911

Client Project Name: E Plots

Client Project Ref: 3733

Lab Sample ID	19/01911/1								Units	Method ref
Client Sample No										
Client Sample ID	BH306A									
Depth to Top	2.50									
Depth To Bottom	3.00									
Date Sampled	22-Feb-19									
Sample Type	Soil - ES									
Sample Matrix Code	4ABE									
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{A}^{\#}$	NAD									A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A									

Envirolab Job Number: 19/01911

Client Project Name: E Plots

Client Project Ref: 3733

Lab Sample ID	19/01911/1								Units	Method ref
Client Sample No										
Client Sample ID	BH306A									
Depth to Top	2.50									
Depth To Bottom	3.00									
Date Sampled	22-Feb-19									
Sample Type	Soil - ES									
Sample Matrix Code	4ABE									
PAH-16MS										
Acenaphthene$_A^{M\#}$	0.12								mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	0.02								mg/kg	A-T-019s
Anthracene$_A^{M\#}$	0.24								mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.58								mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.67								mg/kg	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	0.73								mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.57								mg/kg	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	0.25								mg/kg	A-T-019s
Chrysene$_A^{M\#}$	0.63								mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	0.11								mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	1.32								mg/kg	A-T-019s
Fluorene$_A^{M\#}$	0.11								mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	0.56								mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	0.09								mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	0.89								mg/kg	A-T-019s
Pyrene$_A^{M\#}$	1.18								mg/kg	A-T-019s
Total PAH-16MS$_A^{M\#}$	8.07								mg/kg	A-T-019s

Envirolab Job Number: 19/01911

Client Project Name: E Plots

Client Project Ref: 3733

Lab Sample ID	19/01911/1								Units	Method ref
Client Sample No										
Client Sample ID	BH306A									
Depth to Top	2.50									
Depth To Bottom	3.00									
Date Sampled	22-Feb-19									
Sample Type	Soil - ES									
Sample Matrix Code	4ABE									
TPH UKCWG										
Ali >C5-C6$_A^{\#}$	<0.01								mg/kg	A-T-022s
Ali >C6-C8$_A^{\#}$	<0.01								mg/kg	A-T-022s
Ali >C8-C10$_A^{\#}$	<0.01								mg/kg	A-T-022s
Ali >C10-C12$_A^{\#}$	<0.1								mg/kg	A-T-023s
Ali >C12-C16$_A^{\#}$	0.4								mg/kg	A-T-023s
Ali >C16-C21$_A^{\#}$	2.5								mg/kg	A-T-023s
Ali >C21-C35$_A^{\#}$	30.3								mg/kg	A-T-023s
Ali >C35-C44$_A$	2.3								mg/kg	A-T-023s
Total Aliphatics$_A$	35.5								mg/kg	A-T-023s
Aro >C5-C7$_A^{\#}$	<0.01								mg/kg	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01								mg/kg	A-T-022s
Aro >C8-C9$_A^{\#}$	<0.01								mg/kg	A-T-022s
Aro >C9-C10$_A^{\#}$	<0.01								mg/kg	A-T-022s
Aro >C10-C12$_A^{\#}$	0.3								mg/kg	A-T-023s
Aro >C12-C16$_A^{\#}$	1.2								mg/kg	A-T-023s
Aro >C16-C21$_A^{\#}$	2.5								mg/kg	A-T-023s
Aro >C21-C35$_A^{\#}$	32.1								mg/kg	A-T-023s
Aro >C35-C44$_A$	2.1								mg/kg	A-T-023s
Total Aromatics$_A$	38.1								mg/kg	A-T-023s
TPH (Ali & Aro)$_A$	73.5								mg/kg	A-T-023s
BTEX - Benzene$_A^{\#}$	<0.01								mg/kg	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01								mg/kg	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01								mg/kg	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01								mg/kg	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01								mg/kg	A-T-022s
MTBE$_A^{\#}$	<0.01								mg/kg	A-T-022s

REPORT NOTES

General:
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratlry.
All samples contained within this report, and any received with the same delivery, will be disposed of one month after the date of this report.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: ROCP LIMITED, Commercial Wharf 6 Commercial Street, Castlefield, Manchester, M15 4PZ

Project: E Plots

Clients Project No: 3733

Project No: 19/01911

Date Received: 27/02/2019 (am)

Cool Box Temperatures (oC): 16.1

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 19/01913
Issue Number: 1 **Date:** 13 March, 2019

Client: ROCP LIMITED
Commercial Wharf 6 Commercial Street
Castlefield
Manchester
M15 4PZ

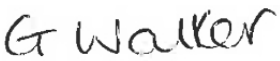
Project Manager: Elizabeth Stewart
Project Name: Mini Masterplan
Project Ref: 3733
Order No: 1395
Date Samples Received: 26/02/19
Date Instructions Received: 27/02/19
Date Analysis Completed: 12/03/19

Prepared by:



Elisha Hartley
Admin Assistant

Approved by:



Gill Walker
Director/Laboratory Manager

Envirolab Job Number: 19/01913

Client Project Name: Mini Masterplan

Client Project Ref: 3733

Lab Sample ID	19/01913/1	19/01913/2	19/01913/3	19/01913/4	19/01913/5				Units	Method ref
Client Sample No										
Client Sample ID	BH401	BH401	BH401	BH402	BH403					
Depth to Top	0.00	0.10	0.20	0.30	1.00					
Depth To Bottom	0.03	0.20	0.30	0.40						
Date Sampled	26-Feb-19	26-Feb-19	26-Feb-19	25-Feb-19	25-Feb-19					
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	7	4A	4AE	4AE	4AE					
% Stones >10mm$_A$	<0.1	14.7	1.5	27.5	1.5				% w/w	A-T-044
pH$_D$$^{M\#}$	9.88	9.96	7.50	7.91	7.93				pH	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	17	207	106	13	94				mg/l	A-T-026s
Cyanide (total)$_A$$^{M\#}$	<1	<1	<1	<1	<1				mg/kg	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2	<0.2	<0.2				mg/kg	A-T-050s
Fraction of organic carbon$_D$$^{\#}$	0.0317	0.0148	0.0243	0.0043	0.0241				N/A	A-T-032 FOC
Antimony$_D$	<5	<5	<5	<5	<5				mg/kg	A-T-024s
Arsenic$_D$$^{M\#}$	<1	<1	2	<1	<1				mg/kg	A-T-024s
Barium$_D$	46	94	108	56	109				mg/kg	A-T-024s
Beryllium$_D$$^{\#}$	<0.5	<0.5	0.9	0.5	1.1				mg/kg	A-T-024s
Boron (water soluble)$_D$$^{M\#}$	<1.0	1.1	<1.0	<1.0	<1.0				mg/kg	A-T-027s
Cadmium$_D$$^{M\#}$	<0.5	<0.5	<0.5	<0.5	<0.5				mg/kg	A-T-024s
Copper$_D$$^{M\#}$	4	11	28	8	14				mg/kg	A-T-024s
Chromium$_D$$^{M\#}$	5	13	23	14	27				mg/kg	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1	<1	<1				mg/kg	A-T-040s
Chromium (trivalent)	5	13	23	14	27				mg/kg	Calc
Lead$_D$$^{M\#}$	4	27	55	12	26				mg/kg	A-T-024s
Mercury$_D$	0.69	0.40	<0.17	<0.17	<0.17				mg/kg	A-T-024s
Molybdenum$_D$$^{M\#}$	<1	<1	<1	<1	<1				mg/kg	A-T-024s
Nickel$_D$$^{M\#}$	3	10	19	17	27				mg/kg	A-T-024s
Selenium$_D$$^{M\#}$	<1	<1	<1	<1	<1				mg/kg	A-T-024s
Vanadium$_D$$^{M\#}$	12	18	31	17	32				mg/kg	A-T-024s
Zinc$_D$$^{M\#}$	13	60	63	38	63				mg/kg	A-T-024s

Envirolab Job Number: 19/01913

Client Project Name: Mini Masterplan

Client Project Ref: 3733

Lab Sample ID	19/01913/1	19/01913/2	19/01913/3	19/01913/4	19/01913/5				Units	Method ref
Client Sample No										
Client Sample ID	BH401	BH401	BH401	BH402	BH403					
Depth to Top	0.00	0.10	0.20	0.30	1.00					
Depth To Bottom	0.03	0.20	0.30	0.40						
Date Sampled	26-Feb-19	26-Feb-19	26-Feb-19	25-Feb-19	25-Feb-19					
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	7	4A	4AE	4AE	4AE					
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_A^{\#}$	-	NAD	NAD	NAD	NAD					A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	-	N/A	N/A	N/A	N/A					

Envirolab Job Number: 19/01913

Client Project Name: Mini Masterplan

Client Project Ref: 3733

Lab Sample ID	19/01913/1	19/01913/2	19/01913/3	19/01913/4	19/01913/5				Units	Method ref
Client Sample No										
Client Sample ID	BH401	BH401	BH401	BH402	BH403					
Depth to Top	0.00	0.10	0.20	0.30	1.00					
Depth To Bottom	0.03	0.20	0.30	0.40						
Date Sampled	26-Feb-19	26-Feb-19	26-Feb-19	25-Feb-19	25-Feb-19					
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	7	4A	4AE	4AE	4AE					
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	1.11	0.02	<0.01	0.34				mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	0.03	<0.01	<0.01	0.04				mg/kg	A-T-019s
Anthracene$_A^{M\#}$	<0.02	5.29	0.04	<0.02	0.87				mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04	7.42	0.13	<0.04	3.66				mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.05	5.28	0.11	<0.04	3.69				mg/kg	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	0.11	4.93	0.14	<0.05	4.46				mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.14	2.53	0.06	<0.05	2.31				mg/kg	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	1.93	<0.07	<0.07	1.45				mg/kg	A-T-019s
Chrysene$_A^{M\#}$	0.27	7.19	0.14	<0.06	3.88				mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	0.73	<0.04	<0.04	0.47				mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08	21.7	0.33	<0.08	8.83				mg/kg	A-T-019s
Fluorene$_A^{M\#}$	0.01	1.32	0.01	<0.01	0.27				mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.03	2.98	0.07	<0.03	2.61				mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	<0.03	<0.03	<0.03	<0.03	<0.03				mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	0.11	8.67	0.19	<0.03	3.66				mg/kg	A-T-019s
Pyrene$_A^{M\#}$	0.09	19.1	0.30	<0.07	7.72				mg/kg	A-T-019s
Total PAH-16MS$_A^{M\#}$	0.78	90.2	1.54	<0.08	44.3				mg/kg	A-T-019s

Envirolab Job Number: 19/01913

Client Project Name: Mini Masterplan

Client Project Ref: 3733

Lab Sample ID	19/01913/1	19/01913/2	19/01913/3	19/01913/4	19/01913/5				Units	Method ref
Client Sample No										
Client Sample ID	BH401	BH401	BH401	BH402	BH403					
Depth to Top	0.00	0.10	0.20	0.30	1.00					
Depth To Bottom	0.03	0.20	0.30	0.40						
Date Sampled	26-Feb-19	26-Feb-19	26-Feb-19	25-Feb-19	25-Feb-19					
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	7	4A	4AE	4AE	4AE					
TPH UKCWG										
Ali >C5-C6$_A^{\#}$	<0.01	-	<0.01	-	-				mg/kg	A-T-022s
Ali >C6-C8$_A^{\#}$	<0.01	-	<0.01	-	-				mg/kg	A-T-022s
Ali >C8-C10$_A^{\#}$	<0.01	-	<0.01	-	-				mg/kg	A-T-022s
Ali >C10-C12$_A^{\#}$	<0.1	-	<0.1	-	-				mg/kg	A-T-023s
Ali >C12-C16$_A^{\#}$	<0.1	-	<0.1	-	-				mg/kg	A-T-023s
Ali >C16-C21$_A^{\#}$	4.8	-	<0.1	-	-				mg/kg	A-T-023s
Ali >C21-C35$_A^{\#}$	417	-	<0.1	-	-				mg/kg	A-T-023s
Ali >C35-C44$_A$	262	-	<0.1	-	-				mg/kg	A-T-023s
Total Aliphatics$_A$	684	-	<0.1	-	-				mg/kg	A-T-023s
Aro >C5-C7$_A^{\#}$	<0.01	-	<0.01	-	-				mg/kg	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	-	<0.01	-	-				mg/kg	A-T-022s
Aro >C8-C9$_A^{\#}$	<0.01	-	<0.01	-	-				mg/kg	A-T-022s
Aro >C9-C10$_A^{\#}$	<0.01	-	<0.01	-	-				mg/kg	A-T-022s
Aro >C10-C12$_A^{\#}$	<0.1	-	<0.1	-	-				mg/kg	A-T-023s
Aro >C12-C16$_A^{\#}$	2.1	-	0.6	-	-				mg/kg	A-T-023s
Aro >C16-C21$_A^{\#}$	10.5	-	5.4	-	-				mg/kg	A-T-023s
Aro >C21-C35$_A^{\#}$	298	-	8.0	-	-				mg/kg	A-T-023s
Aro >C35-C44$_A$	198	-	<0.1	-	-				mg/kg	A-T-023s
Total Aromatics$_A$	508	-	13.8	-	-				mg/kg	A-T-023s
TPH (Ali & Aro)$_A$	1190	-	13.8	-	-				mg/kg	A-T-023s
BTEX - Benzene$_A^{\#}$	<0.01	-	<0.01	-	-				mg/kg	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	-	<0.01	-	-				mg/kg	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	-	<0.01	-	-				mg/kg	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01	-	<0.01	-	-				mg/kg	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	-	<0.01	-	-				mg/kg	A-T-022s
MTBE$_A^{\#}$	<0.01	-	<0.01	-	-				mg/kg	A-T-022s

REPORT NOTES

General:
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratlry.
All samples contained within this report, and any received with the same delivery, will be disposed of one month after the date of this report.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: ROCP LIMITED, Commercial Wharf 6 Commercial Street, Castlefield, Manchester, M15 4PZ

Project: Mini Masterplan

Clients Project No: 3733

Project No: 19/01913

Date Received: 27/02/2019 (am)

Cool Box Temperatures (oC): 16.1

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT
SUPPLEMENT TO TEST REPORT 19/02107/1

Envirolab Job Number: 19/02107
Issue Number: 2 **Date:** 15 March, 2019

Client:
ROCP LIMITED
Commercial Wharf 6 Commercial Street
Castlefield
Manchester
M15 4PZ

Project Manager: Mabel Newby
Project Name: E-plots
Project Ref: 3733
Order No: 1394
Date Samples Received: 04/03/19
Date Instructions Received: 05/03/19
Date Analysis Completed: 13/03/19

Prepared by:



Richard Wong
Client Manager

Approved by:



Iain Haslock
Analytical Consultant

UKAS TESTING
1247

Envirolab Job Number: 19/02107

Client Project Name: E-plots

Client Project Ref: 3733

Lab Sample ID	19/02107/1	19/02107/2	19/02107/3	19/02107/4	19/02107/5	19/02107/6	19/02107/7		Units	Method ref
Client Sample No										
Client Sample ID	WS301	WS302	WS303	WS303A	WS303A	WS304	WS304			
Depth to Top	0.20	0.50	0.50	0.40	0.80	0.10	0.60			
Depth To Bottom		0.60	0.60	0.50	0.90					
Date Sampled	28-Feb-19	28-Feb-19	28-Feb-19	28-Feb-19	28-Feb-19	28-Feb-19	28-Feb-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	4AE	4A	6A	4AE	4AE	6AE	4AE			
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_A^{\#}$	NAD	NAD	NAD	NAD	NAD	NAD	NAD			A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	N/A	N/A	N/A	N/A	N/A	N/A			

REPORT NOTES

General:
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratlry.
All samples contained within this report, and any received with the same delivery, will be disposed of one month after the date of this report.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

Soil chemical analysis:
All results are reported as dry weight (<40℃).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25℃ / 11550µS/cm @ 20℃ fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: ROCP LIMITED, Commercial Wharf 6 Commercial Street, Castlefield, Manchester, M15 4PZ

Project: E-plots

Clients Project No: 3733

Project No: 19/02107

Date Received: 05/03/2019 (am)

Cool Box Temperatures (oC): 9.9

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 19/02148
Issue Number: 1 **Date:** 18 March, 2019

Client: ROCP LIMITED
Commercial Wharf 6 Commercial Street
Castlefield
Manchester
M15 4PZ

Project Manager: Elizabeth Stewart
Project Name: MM-Plan
Project Ref: 3733
Order No: 1395
Date Samples Received: 04/03/19
Date Instructions Received: 05/03/19
Date Analysis Completed: 18/03/19

Prepared by:

G Walker

Gill Walker
Director/Laboratory Manager

Approved by:

Richard Wong
Client Manager

Envirolab Job Number: 19/02148

Client Project Name: MM-Plan

Client Project Ref: 3733

Lab Sample ID	19/02148/1	19/02148/2	19/02148/3	19/02148/4	19/02148/5	19/02148/6	19/02148/7		Units	Method ref
Client Sample No										
Client Sample ID	WS402	WS403	WS404	WS407	WS401	WS405	WS405			
Depth to Top	0.30	0.40	1.00	0.40	0.40	0.50	3.70			
Depth To Bottom		0.50	1.20							
Date Sampled	01-Mar-19	01-Mar-19	01-Mar-19	01-Mar-19	28-Feb-19	28-Feb-19	28-Feb-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	4AE	5A	4BE	4AE	5A	4AE	5			
% Stones >10mm$_A$	34.7	0.9	0.5	7.3	0.8	2.0	<0.1		% w/w	A-T-044
pH$_D^{M\#}$	7.67	7.12	7.29	7.67	8.29	8.61	6.96		pH	A-T-031s
Sulphate BRE (water sol 2:1)$_D^{M\#}$	<10	12	13	<10	15	14	<10		mg/l	A-T-026s
Cyanide (total)$_A^{M\#}$	<1	<1	<1	<1	<1	<1	<1		mg/kg	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		mg/kg	A-T-050s
Fraction of organic carbon$_D^{\#}$	0.0072	0.0115	0.0109	0.0176	0.0087	0.0036	0.0584		N/A	A-T-032 FOC
Antimony$_D$	<5	<5	<5	<5	<5	<5	<5		mg/kg	A-T-024s
Arsenic$_D^{M\#}$	<1	<1	<1	<1	<1	<1	5		mg/kg	A-T-024s
Barium$_D$	51	58	57	69	97	71	93		mg/kg	A-T-024s
Beryllium$_D^{\#}$	<0.5	<0.5	0.6	0.6	0.8	0.6	0.9		mg/kg	A-T-024s
Boron (water soluble)$_D^{M\#}$	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		mg/kg	A-T-027s
Cadmium$_D^{M\#}$	0.7	0.6	<0.5	0.7	1.1	0.7	0.7		mg/kg	A-T-024s
Copper$_D^{M\#}$	9	9	16	19	20	12	40		mg/kg	A-T-024s
Chromium$_D^{M\#}$	13	20	18	20	24	18	23		mg/kg	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1	<1	<1	<1	<1		mg/kg	A-T-040s
Chromium (trivalent)	13	20	18	20	24	18	23		mg/kg	Calc
Lead$_D^{M\#}$	16	9	21	41	29	7	76		mg/kg	A-T-024s
Mercury$_D$	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	0.37		mg/kg	A-T-024s
Molybdenum$_D^{M\#}$	<1	<1	<1	<1	<1	<1	<1		mg/kg	A-T-024s
Nickel$_D^{M\#}$	16	15	16	17	26	20	17		mg/kg	A-T-024s
Selenium$_D^{M\#}$	<1	<1	<1	<1	<1	<1	2		mg/kg	A-T-024s
Vanadium$_D^{M\#}$	13	24	21	25	24	18	30		mg/kg	A-T-024s
Zinc$_D^{M\#}$	35	19	35	50	57	32	58		mg/kg	A-T-024s

Envirolab Job Number: 19/02148

Client Project Name: MM-Plan

Client Project Ref: 3733

Lab Sample ID	19/02148/1	19/02148/2	19/02148/3	19/02148/4	19/02148/5	19/02148/6	19/02148/7		Units	Method ref
Client Sample No										
Client Sample ID	WS402	WS403	WS404	WS407	WS401	WS405	WS405			
Depth to Top	0.30	0.40	1.00	0.40	0.40	0.50	3.70			
Depth To Bottom		0.50	1.20							
Date Sampled	01-Mar-19	01-Mar-19	01-Mar-19	01-Mar-19	28-Feb-19	28-Feb-19	28-Feb-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	4AE	5A	4BE	4AE	5A	4AE	5			
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{A}^{\#}$	-	-	NAD	NAD	NAD	NAD	NAD			A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	-	-	N/A	N/A	N/A	N/A	N/A			

Envirolab Job Number: 19/02148

Client Project Name: MM-Plan

Client Project Ref: 3733

Lab Sample ID	19/02148/1	19/02148/2	19/02148/3	19/02148/4	19/02148/5	19/02148/6	19/02148/7		Units	Method ref
Client Sample No										
Client Sample ID	WS402	WS403	WS404	WS407	WS401	WS405	WS405			
Depth to Top	0.30	0.40	1.00	0.40	0.40	0.50	3.70			
Depth To Bottom		0.50	1.20							
Date Sampled	01-Mar-19	01-Mar-19	01-Mar-19	01-Mar-19	28-Feb-19	28-Feb-19	28-Feb-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	4AE	5A	4BE	4AE	5A	4AE	5			
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	<0.01	0.01	0.08	0.04	<0.01	<0.01		mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01		mg/kg	A-T-019s
Anthracene$_A^{M\#}$	<0.02	<0.02	0.04	0.26	0.05	<0.02	<0.02		mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04	<0.04	0.18	1.20	0.10	<0.04	0.06		mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	<0.04	<0.04	0.21	0.82	0.08	<0.04	0.08		mg/kg	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	<0.05	<0.05	0.25	1.00	0.11	<0.05	0.10		mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05	<0.05	0.16	0.33	<0.05	<0.05	<0.05		mg/kg	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	<0.07	0.09	0.38	<0.07	<0.07	<0.07		mg/kg	A-T-019s
Chrysene$_A^{M\#}$	<0.06	<0.06	0.27	1.22	0.14	<0.06	0.10		mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	<0.04	<0.04	0.09	<0.04	<0.04	<0.04		mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08	<0.08	0.44	3.53	0.24	<0.08	0.10		mg/kg	A-T-019s
Fluorene$_A^{M\#}$	<0.01	<0.01	<0.01	0.08	0.02	<0.01	<0.01		mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.03	<0.03	0.17	0.44	0.05	<0.03	0.05		mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	<0.03	<0.03	0.17	1.16	0.20	<0.03	0.08		mg/kg	A-T-019s
Pyrene$_A^{M\#}$	<0.07	<0.07	0.40	2.89	0.20	<0.07	0.11		mg/kg	A-T-019s
Total PAH-16MS$_A^{M\#}$	<0.08	<0.08	2.39	13.5	1.23	<0.08	0.68		mg/kg	A-T-019s

Envirolab Job Number: 19/02148

Client Project Name: MM-Plan

Client Project Ref: 3733

Lab Sample ID	19/02148/1	19/02148/2	19/02148/3	19/02148/4	19/02148/5	19/02148/6	19/02148/7		Units	Method ref
Client Sample No										
Client Sample ID	WS402	WS403	WS404	WS407	WS401	WS405	WS405			
Depth to Top	0.30	0.40	1.00	0.40	0.40	0.50	3.70			
Depth To Bottom		0.50	1.20							
Date Sampled	01-Mar-19	01-Mar-19	01-Mar-19	01-Mar-19	28-Feb-19	28-Feb-19	28-Feb-19			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	4AE	5A	4BE	4AE	5A	4AE	5			
TPH UKCWG										
Ali >C5-C6$_A^{\#}$	-	-	-	<0.01	-	-	-		mg/kg	A-T-022s
Ali >C6-C8$_A^{\#}$	-	-	-	<0.01	-	-	-		mg/kg	A-T-022s
Ali >C8-C10$_A^{\#}$	-	-	-	<0.01	-	-	-		mg/kg	A-T-022s
Ali >C10-C12$_A^{\#}$	-	-	-	<0.1	-	-	-		mg/kg	A-T-023s
Ali >C12-C16$_A^{\#}$	-	-	-	<0.1	-	-	-		mg/kg	A-T-023s
Ali >C16-C21$_A^{\#}$	-	-	-	<0.1	-	-	-		mg/kg	A-T-023s
Ali >C21-C35$_A^{\#}$	-	-	-	<0.1	-	-	-		mg/kg	A-T-023s
Ali >C35-C44$_A$	-	-	-	<0.1	-	-	-		mg/kg	A-T-023s
Total Aliphatics$_A$	-	-	-	<0.1	-	-	-		mg/kg	A-T-023s
Aro >C5-C7$_A^{\#}$	-	-	-	<0.01	-	-	-		mg/kg	A-T-022s
Aro >C7-C8$_A^{\#}$	-	-	-	<0.01	-	-	-		mg/kg	A-T-022s
Aro >C8-C9$_A^{\#}$	-	-	-	<0.01	-	-	-		mg/kg	A-T-022s
Aro >C9-C10$_A^{\#}$	-	-	-	<0.01	-	-	-		mg/kg	A-T-022s
Aro >C10-C12$_A^{\#}$	-	-	-	<0.1	-	-	-		mg/kg	A-T-023s
Aro >C12-C16$_A^{\#}$	-	-	-	<0.1	-	-	-		mg/kg	A-T-023s
Aro >C16-C21$_A^{\#}$	-	-	-	0.4	-	-	-		mg/kg	A-T-023s
Aro >C21-C35$_A^{\#}$	-	-	-	0.5	-	-	-		mg/kg	A-T-023s
Aro >C35-C44$_A$	-	-	-	<0.1	-	-	-		mg/kg	A-T-023s
Total Aromatics$_A$	-	-	-	1.0	-	-	-		mg/kg	A-T-023s
TPH (Ali & Aro)$_A$	-	-	-	1.0	-	-	-		mg/kg	A-T-023s
BTEX - Benzene$_A^{\#}$	-	-	-	<0.01	-	-	-		mg/kg	A-T-022s
BTEX - Toluene$_A^{\#}$	-	-	-	<0.01	-	-	-		mg/kg	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	-	-	-	<0.01	-	-	-		mg/kg	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	-	-	-	<0.01	-	-	-		mg/kg	A-T-022s
BTEX - o Xylene$_A^{\#}$	-	-	-	<0.01	-	-	-		mg/kg	A-T-022s
MTBE$_A^{\#}$	-	-	-	<0.01	-	-	-		mg/kg	A-T-022s

REPORT NOTES

General
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: ROCP LIMITED, Commercial Wharf 6 Commercial Street, Castlefield, Manchester, M15 4PZ

Project: MM-Plan

Clients Project No: 3733

Project No: 19/02148

Date Received: 05/03/2019 (am)

Cool Box Temperatures (oC): 9.9

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 19/02155
Issue Number: 1 **Date:** 19 March, 2019

Client: ROCP LIMITED
Commercial Wharf 6 Commercial Street
Castlefield
Manchester
M15 4PZ

Project Manager: Elizabeth Stewart
Project Name: Mini Masterplan
Project Ref: 3733
Order No: 1395
Date Samples Received: 05/03/19
Date Instructions Received: 06/03/19
Date Analysis Completed: 19/03/19

Prepared by:

Melanie Marshall
Laboratory Coordinator

Approved by:

Richard Wong
Client Manager

Envirolab Job Number: 19/02155

Client Project Name: Mini Masterplan

Client Project Ref: 3733

Lab Sample ID	19/02155/1	19/02155/2	19/02155/3	19/02155/4					Units	Method ref
Client Sample No										
Client Sample ID	WS409	WS408	WS410	WS406A						
Depth to Top	0.10	0.20	0.20	0.20						
Depth To Bottom	0.30	0.40	0.50	0.60						
Date Sampled	05-Mar-19	05-Mar-19	05-Mar-19	05-Mar-19						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4A	4A	5A	4AE						
% Stones >10mm$_A$	17.8	15.4	<0.1	3.0					% w/w	A-T-044
pH$_D$$^{M\#}$	7.69	7.96	7.84	7.73					pH	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	38	73	32	18					mg/l	A-T-026s
Cyanide (total)$_A$$^{M\#}$	<1	<1	<1	<1					mg/kg	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2	<0.2					mg/kg	A-T-050s
Fraction of organic carbon$_D$$^{\#}$	0.0039	0.0223	0.0057	0.0075					N/A	A-T-032 FOC
Antimony$_D$	<5	<5	<5	<5					mg/kg	A-T-024s
Arsenic$_D$$^{M\#}$	<1	5	<1	<1					mg/kg	A-T-024s
Barium$_D$	83	130	89	37					mg/kg	A-T-024s
Beryllium$_D$$^{\#}$	0.7	0.5	0.6	<0.5					mg/kg	A-T-024s
Boron (water soluble)$_D$$^{M\#}$	<1.0	<1.0	<1.0	<1.0					mg/kg	A-T-027s
Cadmium$_D$$^{M\#}$	0.7	0.7	<0.5	<0.5					mg/kg	A-T-024s
Copper$_D$$^{M\#}$	12	36	4	10					mg/kg	A-T-024s
Chromium$_D$$^{M\#}$	18	16	35	12					mg/kg	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1	<1					mg/kg	A-T-040s
Chromium (trivalent)	18	16	35	12					mg/kg	Calc
Lead$_D$$^{M\#}$	15	100	13	16					mg/kg	A-T-024s
Mercury$_D$	<0.17	<0.17	<0.17	<0.17					mg/kg	A-T-024s
Molybdenum$_D$$^{M\#}$	<1	<1	<1	<1					mg/kg	A-T-024s
Nickel$_D$$^{M\#}$	25	16	26	13					mg/kg	A-T-024s
Selenium$_D$$^{M\#}$	<1	<1	<1	<1					mg/kg	A-T-024s
Vanadium$_D$$^{M\#}$	18	19	29	13					mg/kg	A-T-024s
Zinc$_D$$^{M\#}$	41	72	36	13					mg/kg	A-T-024s

Envirolab Job Number: 19/02155

Client Project Name: Mini Masterplan

Client Project Ref: 3733

Lab Sample ID	19/02155/1	19/02155/2	19/02155/3	19/02155/4					Units	Method ref
Client Sample No										
Client Sample ID	WS409	WS408	WS410	WS406A						
Depth to Top	0.10	0.20	0.20	0.20						
Depth To Bottom	0.30	0.40	0.50	0.60						
Date Sampled	05-Mar-19	05-Mar-19	05-Mar-19	05-Mar-19						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4A	4A	5A	4AE						
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_A^{\#}$	-	NAD	-	NAD						A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	-	N/A	-	N/A						

Envirolab Job Number: 19/02155

Client Project Name: Mini Masterplan

Client Project Ref: 3733

Lab Sample ID	19/02155/1	19/02155/2	19/02155/3	19/02155/4					Units	Method ref
Client Sample No										
Client Sample ID	WS409	WS408	WS410	WS406A						
Depth to Top	0.10	0.20	0.20	0.20						
Depth To Bottom	0.30	0.40	0.50	0.60						
Date Sampled	05-Mar-19	05-Mar-19	05-Mar-19	05-Mar-19						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	4A	4A	5A	4AE						
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	0.43	0.03	<0.01					mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	0.04	<0.01	<0.01					mg/kg	A-T-019s
Anthracene$_A^{M\#}$	<0.02	0.90	0.05	<0.02					mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04	1.90	0.09	0.12					mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	<0.04	1.73	0.08	0.17					mg/kg	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	<0.05	2.04	0.09	0.20					mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05	1.02	<0.05	0.12					mg/kg	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	0.69	<0.07	<0.07					mg/kg	A-T-019s
Chrysene$_A^{M\#}$	<0.06	1.97	0.10	0.14					mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	0.28	<0.04	<0.04					mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08	4.50	0.24	0.19					mg/kg	A-T-019s
Fluorene$_A^{M\#}$	<0.01	0.36	0.03	<0.01					mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.03	1.18	0.05	0.13					mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	<0.03	0.14	<0.03	<0.03					mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	<0.03	3.45	0.24	0.09					mg/kg	A-T-019s
Pyrene$_A^{M\#}$	<0.07	3.96	0.23	0.19					mg/kg	A-T-019s
Total PAH-16MS$_A^{M\#}$	<0.08	24.6	1.23	1.35					mg/kg	A-T-019s

REPORT NOTES

General
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed.
Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: ROCP LIMITED, Commercial Wharf 6 Commercial Street, Castlefield, Manchester, M15 4PZ

Project: Mini Masterplan

Clients Project No: 3733

Project No: 19/02155

Date Received: 06/03/2019 (am)

Cool Box Temperatures (oC): 11.6

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT
SUPPLEMENT TO TEST REPORT 19/01780/1

Envirolab Job Number: 19/01780
Issue Number: 2 **Date:** 25 March, 2019

Client:
ROCP LIMITED
Commercial Wharf 6 Commercial Street
Castlefield
Manchester
M15 4PZ

Project Manager: Mabel Newby
Project Name: E Plots
Project Ref: 3733
Order No: 1394
Date Samples Received: 25/02/19
Date Instructions Received: 25/02/19
Date Analysis Completed: 25/03/19

Prepared by:

Melanie Marshall
Laboratory Coordinator

Approved by:

Richard Wong
Client Manager

Envirolab Job Number: 19/01780

Client Project Name: E Plots

Client Project Ref: 3733

Lab Sample ID	19/01780/1	19/01780/2	19/01780/3	19/01780/4	19/01780/5	19/01780/6	19/01780/7	19/01780/8	Units	Method ref
Client Sample No										
Client Sample ID	BH301	BH302	BH303	BH305	BH305	BH305A	BH306	BH307		
Depth to Top	0.20	1.00	0.80	0.50	1.00	0.80	0.50	0.20		
Depth To Bottom	0.30	1.10	0.90	0.60	1.10	0.90	0.60	0.40		
Date Sampled	20-Feb-19	21-Feb-19	19-Feb-19	18-Feb-19	18-Feb-19	18-Feb-19	18-Feb-19	18-Feb-19		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	6E	6ABE	6AE	6A	6A	6A	6A	6ABE		
% Stones >10mm$_A$	<0.1	6.3	8.1	3.4	<0.1	-	12.7	10.5	% w/w	A-T-044
pH$_D$$^{M\#}$	7.07	8.12	8.03	7.74	11.18	-	8.39	7.77	pH	A-T-031s
ANC to pH4$_D$	-	1.02	-	0.23	-	-	-	0.18	mol/kg	A-T-ANCs
ANC to pH6$_D$	-	0.08	-	0.08	-	-	-	0.03	mol/kg	A-T-ANCs
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	11	22	<10	-	102	-	36	46	mg/l	A-T-026s
Cyanide (total)$_A$$^{M\#}$	<1	3	<1	-	<1	-	<1	<1	mg/kg	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2	-	<0.2	-	<0.2	<0.2	mg/kg	A-T-050s
Loss on ignition (550degC)$_D$$^{M\#}$	-	3.3	-	4.4	-	-	-	5.5	% w/w	A-T-030s
Fraction of organic carbon$_D$$^{\#}$	0.0526	0.0055	0.0121	-	0.0207	-	0.0142	0.0188	N/A	A-T-032 FOC
Antimony$_D$	<5	<5	<5	-	<5	-	<5	<5	mg/kg	A-T-024s
Arsenic$_D$$^{M\#}$	7	2	<1	-	5	-	3	4	mg/kg	A-T-024s
Barium$_D$	92	82	81	-	178	-	90	88	mg/kg	A-T-024s
Beryllium$_D$$^{\#}$	0.7	0.6	0.7	-	<0.5	-	0.6	0.7	mg/kg	A-T-024s
Boron (water soluble)$_D$$^{M\#}$	1.5	<1.0	<1.0	-	<1.0	-	<1.0	<1.0	mg/kg	A-T-027s
Cadmium$_D$$^{M\#}$	0.9	0.7	1.1	-	0.8	-	1.0	0.7	mg/kg	A-T-024s
Copper$_D$$^{M\#}$	24	13	18	-	19	-	52	18	mg/kg	A-T-024s
Chromium$_D$$^{M\#}$	25	19	22	-	13	-	17	18	mg/kg	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1	-	<1	-	<1	<1	mg/kg	A-T-040s
Chromium (trivalent)	25	19	22	-	13	-	17	18	mg/kg	Calc
Lead$_D$$^{M\#}$	32	27	17	-	70	-	22	41	mg/kg	A-T-024s
Mercury$_D$	<0.17	0.25	<0.17	-	0.82	-	0.21	<0.17	mg/kg	A-T-024s
Molybdenum$_D$$^{M\#}$	<1	<1	<1	-	<1	-	<1	<1	mg/kg	A-T-024s
Nickel$_D$$^{M\#}$	18	18	25	-	13	-	20	14	mg/kg	A-T-024s
Selenium$_D$$^{M\#}$	<1	<1	<1	-	<1	-	<1	<1	mg/kg	A-T-024s
Vanadium$_D$$^{M\#}$	26	20	25	-	16	-	19	21	mg/kg	A-T-024s
Zinc$_D$$^{M\#}$	123	42	56	-	49	-	42	42	mg/kg	A-T-024s

Envirolab Job Number: 19/01780

Client Project Name: E Plots

Client Project Ref: 3733

Lab Sample ID	19/01780/1	19/01780/2	19/01780/3	19/01780/4	19/01780/5	19/01780/6	19/01780/7	19/01780/8	Units	Method ref
Client Sample No										
Client Sample ID	BH301	BH302	BH303	BH305	BH305	BH305A	BH306	BH307		
Depth to Top	0.20	1.00	0.80	0.50	1.00	0.80	0.50	0.20		
Depth To Bottom	0.30	1.10	0.90	0.60	1.10	0.90	0.60	0.40		
Date Sampled	20-Feb-19	21-Feb-19	19-Feb-19	18-Feb-19	18-Feb-19	18-Feb-19	18-Feb-19	18-Feb-19		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	6E	6ABE	6AE	6A	6A	6A	6A	6ABE		
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{A}^{\#}$	-	NAD	NAD	NAD	Chrysotile	NAD	NAD	NAD		A-T-045
Asbestos Matrix (microscope)$_{A}$	-	-	-	-	Loose fibres	-	-	-		A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Asbestos in Soil Quantification % (Hand Picking & Weighing)										
Asbestos in soil % composition (hand picking and weighing)$_{D}$	-	-	-	-	<0.001	-	-	-	% w/w	A-T-054

Envirolab Job Number: 19/01780

Client Project Name: E Plots

Client Project Ref: 3733

Lab Sample ID	19/01780/1	19/01780/2	19/01780/3	19/01780/4	19/01780/5	19/01780/6	19/01780/7	19/01780/8	Units	Method ref
Client Sample No										
Client Sample ID	BH301	BH302	BH303	BH305	BH305	BH305A	BH306	BH307		
Depth to Top	0.20	1.00	0.80	0.50	1.00	0.80	0.50	0.20		
Depth To Bottom	0.30	1.10	0.90	0.60	1.10	0.90	0.60	0.40		
Date Sampled	20-Feb-19	21-Feb-19	19-Feb-19	18-Feb-19	18-Feb-19	18-Feb-19	18-Feb-19	18-Feb-19		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	6E	6ABE	6AE	6A	6A	6A	6A	6ABE		
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	0.10	0.16	-	0.23	-	0.62	0.09	mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	<0.01	<0.01	-	0.01	-	0.02	0.02	mg/kg	A-T-019s
Anthracene$_A^{M\#}$	<0.02	0.19	0.12	-	0.35	-	0.67	0.21	mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.12	0.50	0.19	-	0.78	-	1.58	0.56	mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.10	0.31	0.17	-	0.60	-	1.19	0.47	mg/kg	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	0.13	0.40	0.20	-	0.69	-	1.42	0.58	mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.07	0.16	0.14	-	0.38	-	0.67	0.31	mg/kg	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	0.14	<0.07	-	0.25	-	0.50	0.20	mg/kg	A-T-019s
Chrysene$_A^{M\#}$	0.14	0.54	0.26	-	0.83	-	1.56	0.59	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	<0.04	<0.04	-	0.09	-	0.15	0.06	mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	0.22	1.19	0.51	-	1.86	-	4.17	1.42	mg/kg	A-T-019s
Fluorene$_A^{M\#}$	<0.01	0.07	0.10	-	0.18	-	0.49	0.08	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	0.09	0.20	0.15	-	0.45	-	0.86	0.38	mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	<0.03	0.09	0.05	-	0.13	-	0.29	0.06	mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	0.12	0.85	0.60	-	1.56	-	2.23	0.78	mg/kg	A-T-019s
Pyrene$_A^{M\#}$	0.20	0.97	0.48	-	1.63	-	3.44	1.15	mg/kg	A-T-019s
Total PAH-16MS$_A^{M\#}$	1.19	5.71	3.13	-	10	-	19.9	6.96	mg/kg	A-T-019s

Envirolab Job Number: 19/01780

Client Project Name: E Plots

Client Project Ref: 3733

Lab Sample ID	19/01780/9								Units	Method ref
Client Sample No										
Client Sample ID	BH304									
Depth to Top	0.40									
Depth To Bottom	0.50									
Date Sampled	22-Feb-19									
Sample Type	Soil - ES									
Sample Matrix Code	6AE									
% Stones >10mm$_A$	1.7								% w/w	A-T-044
pH$_D$$^{M\#}$	7.68								pH	A-T-031s
Sulphate BRE (water sol 2:1)$_D$$^{M\#}$	24								mg/l	A-T-026s
Cyanide (total)$_A$$^{M\#}$	<1								mg/kg	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2								mg/kg	A-T-050s
Fraction of organic carbon$_D$$^{\#}$	0.0275								N/A	A-T-032 FOC
Antimony$_D$	<5								mg/kg	A-T-024s
Arsenic$_D$$^{M\#}$	2								mg/kg	A-T-024s
Barium$_D$	75								mg/kg	A-T-024s
Beryllium$_D$$^{\#}$	0.6								mg/kg	A-T-024s
Boron (water soluble)$_D$$^{M\#}$	<1.0								mg/kg	A-T-027s
Cadmium$_D$$^{M\#}$	0.9								mg/kg	A-T-024s
Copper$_D$$^{M\#}$	17								mg/kg	A-T-024s
Chromium$_D$$^{M\#}$	20								mg/kg	A-T-024s
Chromium (hexavalent)$_D$	<1								mg/kg	A-T-040s
Chromium (trivalent)	20								mg/kg	Calc
Lead$_D$$^{M\#}$	21								mg/kg	A-T-024s
Mercury$_D$	<0.17								mg/kg	A-T-024s
Molybdenum$_D$$^{M\#}$	<1								mg/kg	A-T-024s
Nickel$_D$$^{M\#}$	20								mg/kg	A-T-024s
Selenium$_D$$^{M\#}$	<1								mg/kg	A-T-024s
Vanadium$_D$$^{M\#}$	20								mg/kg	A-T-024s
Zinc$_D$$^{M\#}$	49								mg/kg	A-T-024s

Envirolab Job Number: 19/01780

Client Project Name: E Plots

Client Project Ref: 3733

Lab Sample ID	**19/01780/9**								**Units**	**Method ref**
Client Sample No										
Client Sample ID	**BH304**									
Depth to Top	**0.40**									
Depth To Bottom	**0.50**									
Date Sampled	**22-Feb-19**									
Sample Type	**Soil - ES**									
Sample Matrix Code	**6AE**									
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{A}^{\#}$	**NAD**									**A-T-045**
Asbestos ACM - Suitable for Water Absorption Test?	**N/A**									

Envirolab Job Number: 19/01780

Client Project Name: E Plots

Client Project Ref: 3733

Lab Sample ID	19/01780/9								Units	Method ref
Client Sample No										
Client Sample ID	BH304									
Depth to Top	0.40									
Depth To Bottom	0.50									
Date Sampled	22-Feb-19									
Sample Type	Soil - ES									
Sample Matrix Code	6AE									
PAH-16MS										
Acenaphthene$_A^{M\#}$	1.50								mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	0.13								mg/kg	A-T-019s
Anthracene$_A^{M\#}$	3.76								mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	7.64								mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	5.08								mg/kg	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	5.65								mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	2.70								mg/kg	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	2.02								mg/kg	A-T-019s
Chrysene$_A^{M\#}$	6.13								mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	0.60								mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	18.1								mg/kg	A-T-019s
Fluorene$_A^{M\#}$	1.36								mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	3.71								mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	0.60								mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	12.1								mg/kg	A-T-019s
Pyrene$_A^{M\#}$	14.8								mg/kg	A-T-019s
Total PAH-16MS$_A^{M\#}$	85.9								mg/kg	A-T-019s

REPORT NOTES

General
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: ROCP LIMITED, Commercial Wharf 6 Commercial Street, Castlefield, Manchester, M15 4PZ

Project: E Plots

Clients Project No: 3733

Project No: 19/01780

Date Received: 25/02/2019 (am)

Cool Box Temperatures (oC): 7.2

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

envirolab
Units 7 & 8, Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

Final Test Report

Envirolab Job Number:	19/02148
Issue Number:	1
Date:	18-Mar-19

Client: ROCP LIMITED
Commercial Wharf 6 Commercial Street
Castlefield
Manchester
M15 4PZ

Project Manager:	Elizabeth Stewart
Project Name:	MM-Plan
Project Ref:	3733
Order No:	1395
Date Samples Received:	4-Mar-19
Date Instructions Received:	5-Mar-19
Date Analysis Completed:	18-Mar-19

Notes - Soil analysis

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.

Notes - General

This report shall not be reproduced, except in full, without written approval from Envirolab.

Subscript "A" indicates analysis performed on the sample as received. "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve, unless asbestos is found to be present in which case all analysis is performed on the sample as received.

All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts.

All analysis is performed on the sample as received for soil samples from outside the European Union and this supercedes any "D" subscripts

Superscript "M" indicates method accredited to MCERTS.

For complex, multi-compound analysis, quality control results do not always fall within chart limits for every compound and we have criteria for reporting in these situations.

If results are in italic font they are associated with such quality control failures and may be unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid

Predominant Matrix Codes: 1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited

Secondary Matrix Codes: A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

IS indicates Insufficient sample for analysis, NDP indicates No Determination Possible and NAD indicates No Asbestos Detected.

Superscript # indicates method accredited to ISO 17025.

Analytical results reflect the quality of the sample at the time of analysis only. Opinions and interpretations expressed are outside the scope of our accreditation.

Please contact us if you need any further information.

Prepared by:

G Walker

Gill Walker
Director/Laboratory Manager

Approved by:

Richard Wong
Client Manager

UKAS TESTING
No. 1247

MCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

envirolab

Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Sample Details						Landfill Waste Acceptance Criteria Limits		
Lab Sample ID	Method	ISO17025	MCERTS	19/02148/2				
Client Sample Number								
Client Sample ID				WS403				
Depth to Top				0.4				
Depth to Bottom				0.50				
Date Sampled				01/03/2019				
Sample Type				Soil - ES				
Sample Matrix Code				5A				
Solid Waste Analysis								
pH (pH Units)$_D$	A-T-031	Y	Y	**7.12**		-	>6	-
ANC to pH 4 (mol/kg)$_D$	A-T-ANC	N	N	**0.09**		-	to be evaluated	to be evaluated
ANC to pH 6 (mol/kg)$_D$	A-T-ANC	N	N	**0.04**		-	to be evaluated	to be evaluated
Loss on Ignition (%)$_D$	A-T-030	Y	Y	**4.7**		-	-	10
Total Organic Carbon (%)$_D$	A-T-032	Y	Y	**1.15**		3	5	6
PAH Sum of 17 (mg/kg) $_A$	A-T-019	N	N	**<0.08**		100	-	-
Mineral Oil (mg/kg)$_A$	A-T-007	N	N	**<10**		500	-	-
Sum of 7 PCBs (mg/kg)$_A$	A-T-004	N	N	**<0.007**		1	-	-
Sum of BTEX (mg/kg)$_A$	A-T-022	N	N	**<0.01**		6	-	-
Eluate Analysis				**10:1**	**10:1**	**Limit values for compliance leaching test using**		
				mg/l	**mg/kg**	**BS EN 12457-2 at L/S 10 l/kg (mg/kg)**		
Arsenic	A-T-025	N	N	0.003	**0.030**	0.5	2	25
Barium	A-T-025	N	N	0.120	**1.200**	20	100	300
Cadmium	A-T-025	N	N	<0.001	**<0.01**	0.04	1	5
Chromium	A-T-025	N	N	0.002	**0.020**	0.5	10	70
Copper	A-T-025	N	N	0.019	**0.190**	2	50	100
Mercury	A-T-025	N	N	<0.0005	**<0.005**	0.01	0.2	2
Molybdenum	A-T-025	N	N	<0.001	**<0.01**	0.5	10	30
Nickel	A-T-025	N	N	0.002	**0.020**	0.4	10	40
Lead	A-T-025	N	N	0.008	**0.080**	0.5	10	50
Antimony	A-T-025	N	N	<0.001	**<0.01**	0.06	0.7	5
Selenium	A-T-025	N	N	<0.001	**<0.01**	0.1	0.5	7
Zinc	A-T-025	N	N	0.003	**0.030**	4	50	200
Chloride	A-T-026	N	N	7	**72**	800	15000	25000
Fluoride	A-T-026	N	N	0.6	**6.0**	10	150	500
Sulphate as SO_4	A-T-026	N	N	40	**404**	1000	20000	50000
Total Dissolved Solids	A-T-035	N	N	<20	**<200**	4000	60000	100000
Phenol Index	A-T-050	N	N	<0.01	**<0.1**	1	-	-
Dissolved Organic Carbon	A-T-032	N	N	39.90	**399**	500	800	1000
Leach Test Information								
pH (pH Units)	A-T-031	N	N	7.2				
Conductivity (µS/cm)	A-T-037	N	N	29				
Mass Sample (kg)				0.215				
Dry Matter (%)	A-T-044	N	N	81.4				

Stated acceptance limits are for guidance only and Envirolab cannot be held responsible for any discrepancies with current legislation

envirolab
Units 7 & 8, Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

Final Test Report

SUPPLEMENT TO TEST REPORT 19/01780/1

Envirolab Job Number:	19/01780		
Issue Number:	2	Date:	2-Apr-19

Client:
ROCP LIMITED
Commercial Wharf 6 Commercial Street
Castlefield
Manchester
M15 4PZ

Project Manager:	Mabel Newby
Project Name:	E Plots
Project Ref:	3733
Order No:	1394
Date Samples Received:	25-Feb-19
Date Instructions Received:	25-Feb-19
Date Analysis Completed:	25-Mar-19

Notes - Soil analysis

All results are reported as dry weight (<40°C).

For samples with Matrix Codes 1 - 6 natural stones >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.

Notes - General

This report shall not be reproduced, except in full, without written approval from Envirolab.

Subscript "A" indicates analysis performed on the sample as received. "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve, unless asbestos is found to be present in which case all analysis is performed on the sample as received.

All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supercedes any "A" subscripts.

All analysis is performed on the sample as received for soil samples from outside the European Union and this supercedes any "D" subscripts

Superscript "M" indicates method accredited to MCERTS.

For complex, multi-compound analysis, quality control results do not always fall within chart limits for every compound and we have criteria for reporting in these situations.

If results are in italic font they are associated with such quality control failures and may be unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid

Predominant Matrix Codes: 1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample

Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited

Secondary Matrix Codes: A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

IS indicates Insufficient sample for analysis, NDP indicates No Determination Possible and NAD indicates No Asbestos Detected.

Superscript # indicates method accredited to ISO 17025.

Analytical results reflect the quality of the sample at the time of analysis only. Opinions and interpretations expressed are outside the scope of our accreditation.

Please contact us if you need any further information.

Prepared by:

Richard Wong
Client Manager

Approved by:

Georgia King
Admin & Client Services Supervisor

UKAS TESTING
No. 1247

mCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

envirolab

Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Sample Details						Landfill Waste Acceptance Criteria Limits		
Lab Sample ID	Method	ISO17025	MCERTS	19/01780/2				
Client Sample Number								
Client Sample ID				BH302				
Depth to Top				1				
Depth to Bottom				1.10				
Date Sampled				21/02/2019				
Sample Type				Soil - ES				
Sample Matrix Code				6ABE				
Solid Waste Analysis								
pH (pH Units)$_D$	A-T-031	Y	Y	**8.12**		-	>6	-
ANC to pH 4 (mol/kg)$_D$	A-T-ANC	N	N	**1.02**		-	to be evaluated	to be evaluated
ANC to pH 6 (mol/kg)$_D$	A-T-ANC	N	N	**0.08**		-	to be evaluated	to be evaluated
Loss on Ignition (%)$_D$	A-T-030	Y	Y	**3.3**		-	-	10
Total Organic Carbon (%)$_D$	A-T-032	Y	Y	**0.55**		3	5	6
PAH Sum of 17 (mg/kg) $_A$	A-T-019	N	N	**5.78**		100	-	-
Mineral Oil (mg/kg)$_A$	A-T-007	N	N	**16**		500	-	-
Sum of 7 PCBs (mg/kg)$_A$	A-T-004	N	N	**<0.007**		1	-	-
Sum of BTEX (mg/kg)$_A$	A-T-022	N	N	**<0.01**		6	-	-
Eluate Analysis				**10:1**	**10:1**	**Limit values for compliance leaching test using**		
				mg/l	**mg/kg**	**BS EN 12457-2 at L/S 10 l/kg (mg/kg)**		
Arsenic	A-T-025	N	N	0.003	**0.030**	0.5	2	25
Barium	A-T-025	N	N	0.052	**0.520**	20	100	300
Cadmium	A-T-025	N	N	<0.001	**<0.01**	0.04	1	5
Chromium	A-T-025	N	N	0.002	**0.020**	0.5	10	70
Copper	A-T-025	N	N	0.010	**0.100**	2	50	100
Mercury	A-T-025	N	N	<0.0005	**<0.005**	0.01	0.2	2
Molybdenum	A-T-025	N	N	0.002	**0.020**	0.5	10	30
Nickel	A-T-025	N	N	0.001	**0.010**	0.4	10	40
Lead	A-T-025	N	N	0.023	**0.230**	0.5	10	50
Antimony	A-T-025	N	N	0.003	**0.030**	0.06	0.7	5
Selenium	A-T-025	N	N	<0.001	**<0.01**	0.1	0.5	7
Zinc	A-T-025	N	N	0.007	**0.070**	4	50	200
Chloride	A-T-026	N	N	2	**16**	800	15000	25000
Fluoride	A-T-026	N	N	0.7	**7.0**	10	150	500
Sulphate as SO_4	A-T-026	N	N	8	**82**	1000	20000	50000
Total Dissolved Solids	A-T-035	N	N	44	**440**	4000	60000	100000
Phenol Index	A-T-050	N	N	<0.01	**<0.1**	1	-	-
Dissolved Organic Carbon	A-T-032	N	N	<0.2	**<200**	500	800	1000
Leach Test Information								
pH (pH Units)	A-T-031	N	N	8.2				
Conductivity (µS/cm)	A-T-037	N	N	89				
Mass Sample (kg)				0.202				
Dry Matter (%)	A-T-044	N	N	86.6				

Stated acceptance limits are for guidance only and Envirolab cannot be held responsible for any discrepancies with current legislation

envirolab

Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Sample Details						Landfill Waste Acceptance Criteria Limits		
Lab Sample ID	Method	ISO17025	MCERTS	19/01780/4				
Client Sample Number						Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Client Sample ID				BH305				
Depth to Top				0.5				
Depth to Bottom				0.60				
Date Sampled				18/02/2019				
Sample Type				Soil - ES				
Sample Matrix Code				6A				
Solid Waste Analysis								
pH (pH Units)$_D$	A-T-031	Y	Y	**7.74**		-	>6	-
ANC to pH 4 (mol/kg)$_D$	A-T-ANC	N	N	**0.23**		-	to be evaluated	to be evaluated
ANC to pH 6 (mol/kg)$_D$	A-T-ANC	N	N	**0.08**		-	to be evaluated	to be evaluated
Loss on Ignition (%)$_D$	A-T-030	Y	Y	**4.4**		-	-	10
Total Organic Carbon (%)$_D$	A-T-032	Y	Y	**1.15**		3	5	6
PAH Sum of 17 (mg/kg) $_A$	A-T-019	N	N	**6.09**		100	-	-
Mineral Oil (mg/kg)$_A$	A-T-007	N	N	**82**		500	-	-
Sum of 7 PCBs (mg/kg)$_A$	A-T-004	N	N	**<0.007**		1	-	-
Sum of BTEX (mg/kg)$_A$	A-T-022	N	N	**<0.01**		6	-	-
Eluate Analysis				**10:1**	**10:1**	**Limit values for compliance leaching test using**		
				mg/l	**mg/kg**	**BS EN 12457-2 at L/S 10 l/kg (mg/kg)**		
Arsenic	A-T-025	N	N	0.003	**0.030**	0.5	2	25
Barium	A-T-025	N	N	0.066	**0.660**	20	100	300
Cadmium	A-T-025	N	N	<0.001	**<0.01**	0.04	1	5
Chromium	A-T-025	N	N	0.002	**0.020**	0.5	10	70
Copper	A-T-025	N	N	0.016	**0.160**	2	50	100
Mercury	A-T-025	N	N	<0.0005	**<0.005**	0.01	0.2	2
Molybdenum	A-T-025	N	N	0.002	**0.020**	0.5	10	30
Nickel	A-T-025	N	N	0.002	**0.020**	0.4	10	40
Lead	A-T-025	N	N	0.023	**0.230**	0.5	10	50
Antimony	A-T-025	N	N	<0.001	**<0.01**	0.06	0.7	5
Selenium	A-T-025	N	N	<0.001	**<0.01**	0.1	0.5	7
Zinc	A-T-025	N	N	0.011	**0.110**	4	50	200
Chloride	A-T-026	N	N	<1.00	**<10**	800	15000	25000
Fluoride	A-T-026	N	N	0.9	**9.0**	10	150	500
Sulphate as SO_4	A-T-026	N	N	2	**22**	1000	20000	50000
Total Dissolved Solids	A-T-035	N	N	51	**510**	4000	60000	100000
Phenol Index	A-T-050	N	N	<0.01	**<0.1**	1	-	-
Dissolved Organic Carbon	A-T-032	N	N	<0.2	**<200**	500	800	1000
Leach Test Information								
pH (pH Units)	A-T-031	N	N	8.2				
Conductivity (µS/cm)	A-T-037	N	N	101				
Mass Sample (kg)				0.199				
Dry Matter (%)	A-T-044	N	N	87.7				

Stated acceptance limits are for guidance only and Envirolab cannot be held responsible for any discrepancies with current legislation

envirolab

Landfill WAC analysis must not be used for hazardous waste classification purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Sample Details						Landfill Waste Acceptance Criteria Limits		
Lab Sample ID	Method	ISO17025	MCERTS	19/01780/8				
Client Sample Number						Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Client Sample ID				BH307				
Depth to Top				0.2				
Depth to Bottom				0.40				
Date Sampled				18/02/2019				
Sample Type				Soil - ES				
Sample Matrix Code				6ABE				
Solid Waste Analysis								
pH (pH Units)$_D$	A-T-031	Y	Y	**7.77**		-	>6	-
ANC to pH 4 (mol/kg)$_D$	A-T-ANC	N	N	**0.18**		-	to be evaluated	to be evaluated
ANC to pH 6 (mol/kg)$_D$	A-T-ANC	N	N	**0.03**		-	to be evaluated	to be evaluated
Loss on Ignition (%)$_D$	A-T-030	Y	Y	**5.5**		-	-	10
Total Organic Carbon (%)$_D$	A-T-032	Y	Y	**1.88**		3	5	6
PAH Sum of 17 (mg/kg) $_A$	A-T-019	N	N	**7.05**		100	-	-
Mineral Oil (mg/kg)$_A$	A-T-007	N	N	**585**		500	-	-
Sum of 7 PCBs (mg/kg)$_A$	A-T-004	N	N	**<0.007**		1	-	-
Sum of BTEX (mg/kg)$_A$	A-T-022	N	N	**<0.01**		6	-	-
Eluate Analysis				**10:1**	**10:1**	**Limit values for compliance leaching test using**		
				mg/l	**mg/kg**	**BS EN 12457-2 at L/S 10 l/kg (mg/kg)**		
Arsenic	A-T-025	N	N	0.002	**0.020**	0.5	2	25
Barium	A-T-025	N	N	0.052	**0.520**	20	100	300
Cadmium	A-T-025	N	N	<0.001	**<0.01**	0.04	1	5
Chromium	A-T-025	N	N	0.001	**0.010**	0.5	10	70
Copper	A-T-025	N	N	0.012	**0.120**	2	50	100
Mercury	A-T-025	N	N	<0.0005	**<0.005**	0.01	0.2	2
Molybdenum	A-T-025	N	N	0.002	**0.020**	0.5	10	30
Nickel	A-T-025	N	N	0.001	**0.010**	0.4	10	40
Lead	A-T-025	N	N	0.013	**0.130**	0.5	10	50
Antimony	A-T-025	N	N	<0.001	**<0.01**	0.06	0.7	5
Selenium	A-T-025	N	N	<0.001	**<0.01**	0.1	0.5	7
Zinc	A-T-025	N	N	0.012	**0.120**	4	50	200
Chloride	A-T-026	N	N	1	**10**	800	15000	25000
Fluoride	A-T-026	N	N	0.8	**8.0**	10	150	500
Sulphate as SO_4	A-T-026	N	N	7	**69**	1000	20000	50000
Total Dissolved Solids	A-T-035	N	N	59	**590**	4000	60000	100000
Phenol Index	A-T-050	N	N	<0.01	**<0.1**	1	-	-
Dissolved Organic Carbon	A-T-032	N	N	<0.2	**<200**	500	800	1000
Leach Test Information								
pH (pH Units)	A-T-031	N	N	8.0				
Conductivity (µS/cm)	A-T-037	N	N	118				
Mass Sample (kg)				0.204				
Dry Matter (%)	A-T-044	N	N	85.8				

Stated acceptance limits are for guidance only and Envirolab cannot be held responsible for any discrepancies with current legislation

APPENDIX D – Geotechnical Testing Results

SUMMARY OF GEOTECHNICAL TESTING

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression				Chemical Tests			Other tests and comments
Borehole / Trial Pit	Depth (m)	Sample Ref	Type	Description	WC (%)	LL (%)	PL (%)	PI (%)	<425 µm (%)	Bulk Mg/m³	Dry Mg/m³	Condition	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 (g/L)	W/S Mg (mg/L)	
BH301	1.20-1.65		D	Grey mottled brown fine sandy silty CLAY with rare fine siltstone.	16.3	35	20	15	99										
BH302	5.00-5.45		C	Firm reddish brown mottled grey sandy CLAY with rare pockets of organic matter and fine to medium gravel.	21.2					2.00	1.65	Undisturbed	25 50 100	87 94 102	47				One Dimensional Consolidation
BH302	6.00-6.45		D	Multicoloured fine sandy silty CLAY with rare fine gravel.	16.6	35	16	19	98										
BH302	7.50-7.95		C	Stiff reddish brown sandy CLAY with rare fine to medium gravel and pockets of organic matter.	13.4					2.28	2.01	Undisturbed	50	135	67				One Dimensional Consolidation Specimen reached 20 % strain on 1st stage of multistage test.
BH303	2.00-2.45		D	Dark brown and brown fine sandy silty CLAY with rare fine gravel.	21.4	35	19	16	98										
BH303	3.00-3.45		C	Firm friable dark brown silty CLAY becoming firm fissured grey mottled yellowish brown silty CLAY.	28.7					1.92	1.49	Undisturbed	12 25 50	66 71 76	36				One Dimensional Consolidation
BH303	4.00-4.45		D	Light grey mottled grey brown fine sandy silty CLAY with rare fine siltstone.	21.4	41	26	15	100										
BH304	3.00-3.45		D	Dark brown and grey sandy silty CLAY.	14.8	38	21	17	100										
BH304	4.00-4.45		D	Brown and grey brown fine sandy silty CLAY with rare siltstone.	12.2	30	21	9.0	100										
BH304	6.00-6.45		D	Dark brown and grey fine sandy silty CLAY with rare siltstone.	9.9	31	20	11	100										

Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed)

Checked and Approved by

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS

SUMMARY OF GEOTECHNICAL TESTING

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression				Chemical Tests			Other tests and comments
Borehole / Trial Pit	Depth (m)	Sample Ref	Type	Description	WC (%)	LL (%)	PL (%)	PI (%)	<425 µm (%)	Bulk Mg/m³	Dry Mg/m³	Condition	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 (g/L)	W/S Mg (mg/L)	
BH305A	3.00-3.45		D	Brown mottled grey brown and grey fine sandy silty CLAY.	23.1	33	23	10	100										
BH305A	5.00-5.45		D	Grey mottled grey brown gravelly fine sandy silty CLAY. Gravel is siltstone.	19.8	35	21	14	52										
BH306A	3.00-3.45		C	Stiff friable dark brown very sandy CLAY.	19.0					2.07	1.74	Undisturbed	12 25 50	121 127 140	65				One Dimensional Consolidation
BH307	1.20-1.65		D	Brown and grey brown fine sandy silty CLAY with rare siltstone.	11.8	28	19	9.0	100										

Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed)

Checked and Approved by

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS

BS 1377 : Part 7 : 1990 Clause 9

QUICK UNDRAINED TRIAXIAL COMPRESSION TEST

BH/TP No	BH302
Depth (m)	5.00-5.45
Sample Type	C

Description:

Firm reddish brown mottled grey sandy CLAY with rare pockets of organic matter and fine to medium gravel.

Specimen Details

Specimen conditions		Undisturbed		
Length	(mm)	201.2		
Diameter	(mm)	103.0		
Moisture Content	(%)	21.2		
Bulk Density	(Mg/m³)	2.00		
Dry Density	(Mg/m³)	1.65		
Test Details		**1**	**2**	**3**
Latex membrane thickness	(mm)	0.3	0.3	0.3
Membrane correction	(kPa)	0.8	0.9	1.0
Axial displacement rate	(%/min)	1.0	1.0	1.0
Cell pressure	(kPa)	25	50	100
Strain at failure	(%)	11.9	14.4	16.9
Maximum Deviator Stress	(kPa)	87	94	102
Shear Stress Cu	(kPa)	43	47	51

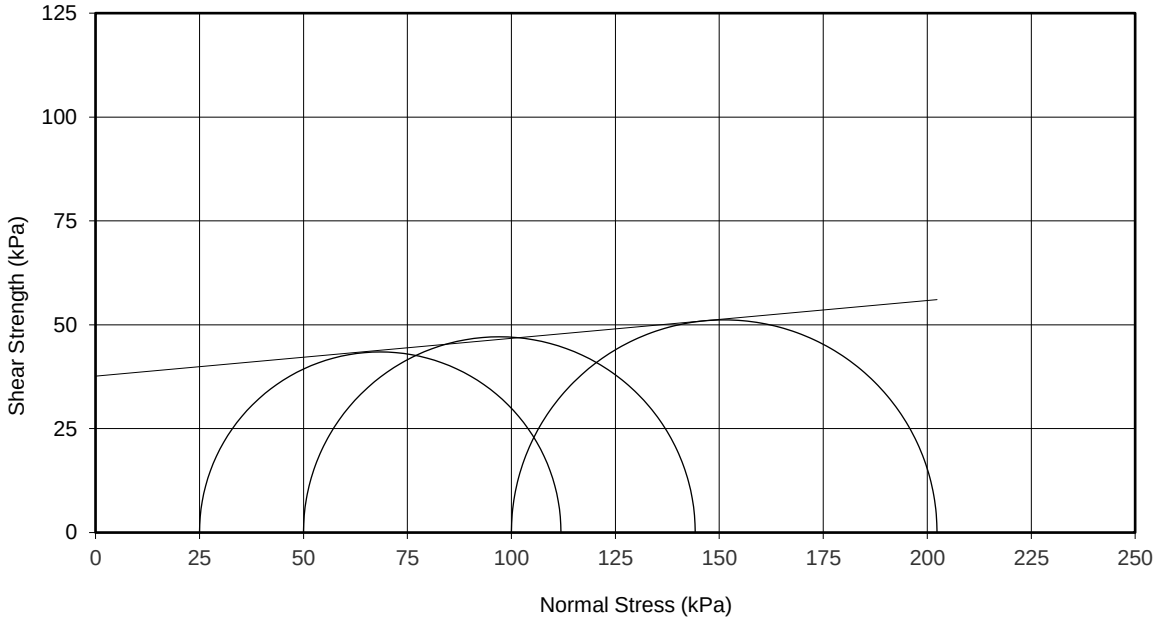
Mode of failure



Orientation of the sample	Vertical
Distance from top of tube mm	100

Shear Strength Parameters

Cohesion	(kPa)	38
Angle of Shear Resistance	(°)	5.0



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS

BS 1377 : Part 7 : 1990 Clause 8

QUICK UNDRAINED TRIAXIAL COMPRESSION TEST

BH/TP No	BH302
Depth (m)	7.50-7.95
Sample Type	C

Description:

Stiff reddish brown sandy CLAY with rare fine to medium gravel and pockets of organic matter.

Remarks : Specimen reached 20% strain on 1st stage of multistage test

Specimen Details

Specimen conditions		Undisturbed
Length	(mm)	201.9
Diameter	(mm)	103.3
Moisture Content	(%)	13.4
Bulk Density	(Mg/m³)	2.28
Dry Density	(Mg/m³)	2.01
Test Details		
Latex membrane thickness	(mm)	0.3
Membrane correction	(kPa)	1.1
Axial displacement rate	(%/min)	1.0
Cell pressure	(kPa)	50
Strain at failure	(%)	19.8
Maximum Deviator Stress	(kPa)	135
Shear Stress Cu	(kPa)	67

Mode of failure



Orientation of the sample	Vertical
Distance from top of tube mm	75

Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

BS 1377 : Part 7 : 1990 Clause 9

QUICK UNDRAINED TRIAXIAL COMPRESSION TEST

BH/TP No	BH303
Depth (m)	3.00-3.45
Sample Type	C

Description:

Firm friable dark brown silty CLAY becoming firm fissured grey mottled yellowish brown silty CLAY.

Specimen Details

Specimen conditions		Undisturbed		
Length	(mm)	192.1		
Diameter	(mm)	104.2		
Moisture Content	(%)	28.7		
Bulk Density	(Mg/m³)	1.92		
Dry Density	(Mg/m³)	1.49		
Test Details		**1**	**2**	**3**
Latex membrane thickness	(mm)	0.3	0.3	0.3
Membrane correction	(kPa)	0.5	0.7	0.8
Axial displacement rate	(%/min)	1.0	1.0	1.0
Cell pressure	(kPa)	12	25	50
Strain at failure	(%)	7.8	10.4	14.1
Maximum Deviator Stress	(kPa)	66	71	76
Shear Stress Cu	(kPa)	33	36	38

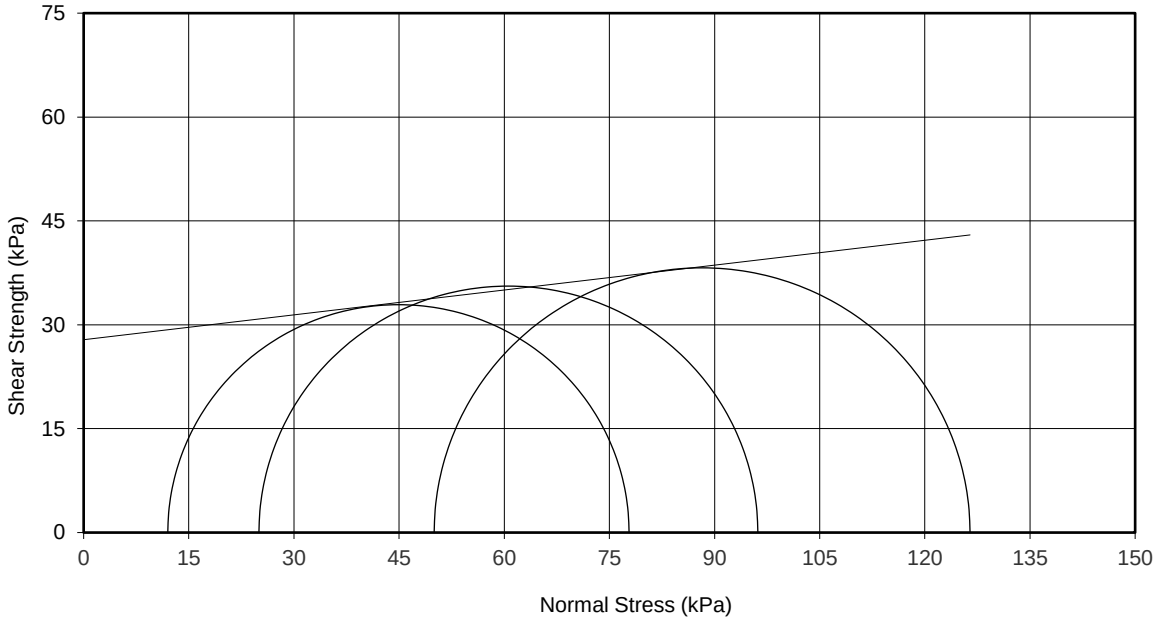
Mode of failure



Orientation of the sample	Vertical
Distance from top of tube mm	75

Shear Strength Parameters

Cohesion	(kPa)	28
Angle of Shear Resistance	(°)	7.0



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS

BS 1377 : Part 7 : 1990 Clause 9

QUICK UNDRAINED TRIAXIAL COMPRESSION TEST

BH/TP No	BH306A
Depth (m)	3.00-3.45
Sample Type	C

Description:

Stiff friable dark brown very sandy CLAY

Specimen Details

Specimen conditions		Undisturbed		
Length	(mm)	177.0		
Diameter	(mm)	103.1		
Moisture Content	(%)	19.0		
Bulk Density	(Mg/m³)	2.07		
Dry Density	(Mg/m³)	1.74		
Test Details		**1**	**2**	**3**
Latex membrane thickness	(mm)	0.3	0.3	0.3
Membrane correction	(kPa)	0.8	0.9	1.1
Axial displacement rate	(%/min)	1.1	1.1	1.1
Cell pressure	(kPa)	12	25	50
Strain at failure	(%)	13.6	15.3	19.2
Maximum Deviator Stress	(kPa)	121	127	140
Shear Stress Cu	(kPa)	61	63	70

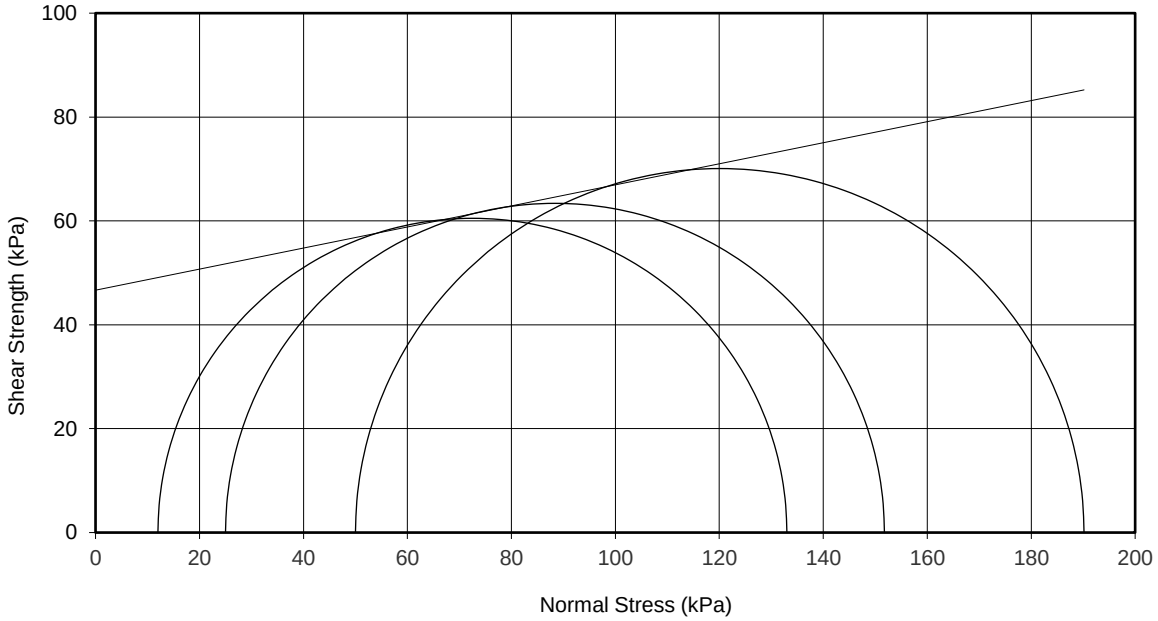
Mode of failure



Orientation of the sample	Vertical
Distance from top of tube mm	150

Shear Strength Parameters

Cohesion	(kPa)	47
Angle of Shear Resistance	(°)	11.5



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS

BS1377 : Part 2 : 1990 Clauses 4.4 & 5

LIQUID AND PLASTIC LIMITS

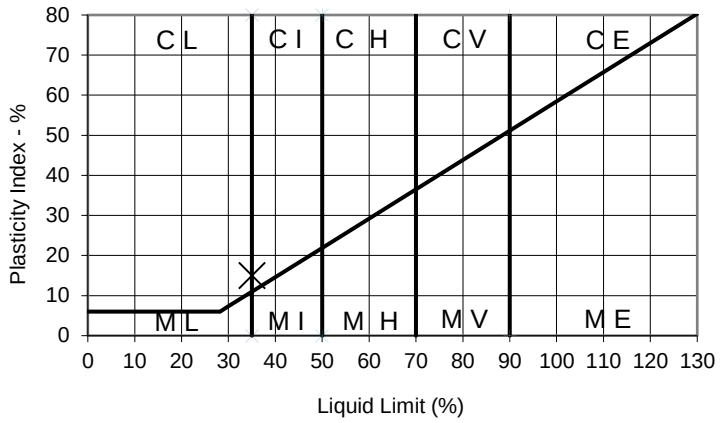
BH / TP	BH301
Depth (m)	1.20
Sample Type	D

Description:

Grey mottled brown fine sandy silty CLAY with rare fine siltstone.

Preparation : Sample as received

Water Content : (BS EN ISO 17892-1:2014)	16.3	%
Percentage passing 425µm sieve :	99	%
Liquid Limit :	35	%
Plastic Limit :	20	%
Plasticity Index :	15	%
Equivalent Water Content of material passing 425µm sieve :	16.5	%
Liquidity Index :	-0.23	



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

BS1377 : Part 2 : 1990 Clauses 4.4 & 5

LIQUID AND PLASTIC LIMITS

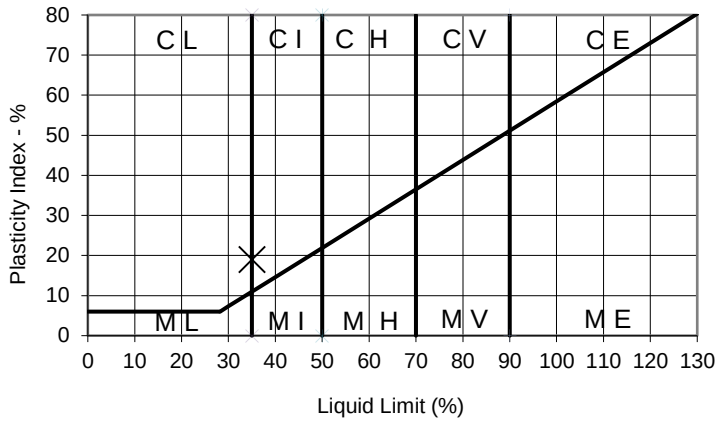
BH / TP	BH302
Depth (m)	6.00
Sample Type	D

Description:

Multicoloured fine sandy silty CLAY with rare fine gravel.

Preparation : Sample as received

Water Content : (BS EN ISO 17892-1:2014)	16.6	%
Percentage passing 425µm sieve :	98	%
Liquid Limit :	35	%
Plastic Limit :	16	%
Plasticity Index :	19	%
Equivalent Water Content of material passing 425µm sieve :	16.9	%
Liquidity Index :	0.05	



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

BS1377 : Part 2 : 1990 Clauses 4.4 & 5

LIQUID AND PLASTIC LIMITS

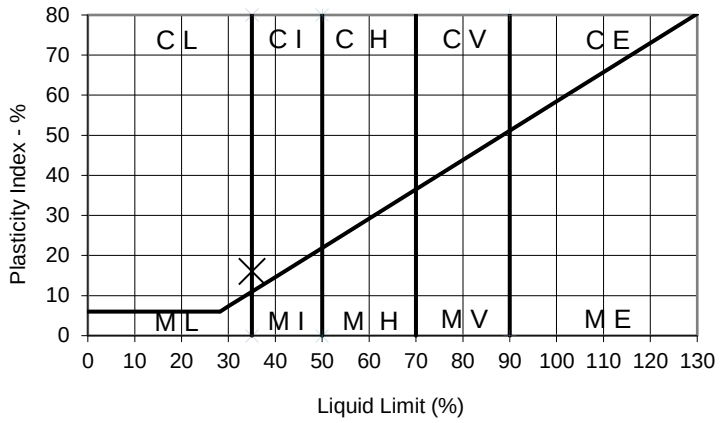
BH / TP	BH303
Depth (m)	2.00
Sample Type	D

Description:

Dark brown and brown fine sandy silty CLAY with rare fine gravel.

Preparation : Sample as received

Water Content : (BS EN ISO 17892-1:2014)	21.4	%
Percentage passing 425µm sieve :	98	%
Liquid Limit :	35	%
Plastic Limit :	19	%
Plasticity Index :	16	%
Equivalent Water Content of material passing 425µm sieve :	21.8	%
Liquidity Index :	0.18	



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

BS1377 : Part 2 : 1990 Clauses 4.4 & 5

LIQUID AND PLASTIC LIMITS

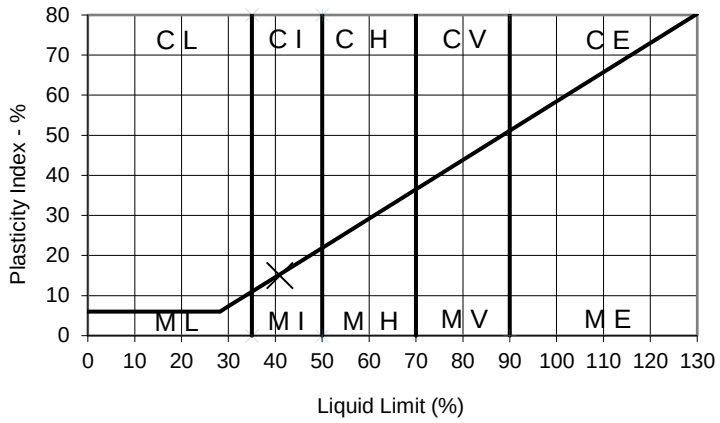
BH / TP	BH303
Depth (m)	4.00
Sample Type	D

Description:

Light grey mottled grey brown fine sandy silty CLAY with rare fine siltstone.

Preparation : Sample as received

Water Content : (BS EN ISO 17892-1:2014)	21.4	%
Percentage passing 425µm sieve :	100	%
Liquid Limit :	41	%
Plastic Limit :	26	%
Plasticity Index :	15	%
Equivalent Water Content of material passing 425µm sieve :	21.4	%
Liquidity Index :	-0.31	



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

BS1377 : Part 2 : 1990 Clauses 4.4 & 5

LIQUID AND PLASTIC LIMITS

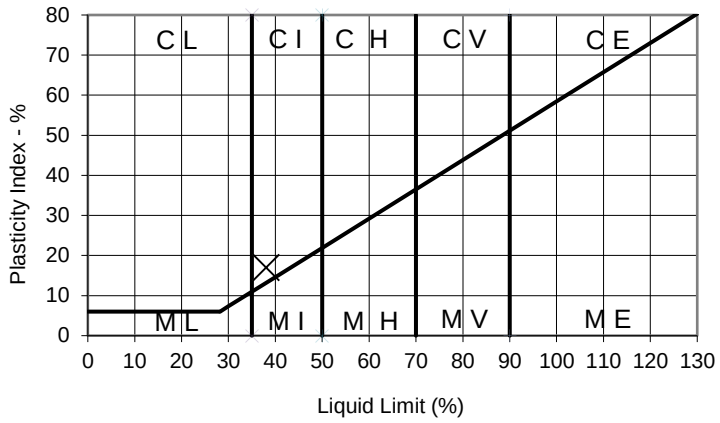
BH / TP	BH304
Depth (m)	3.00
Sample Type	D

Description:

Dark brown and grey sandy silty CLAY.

Preparation : Sample as received

Water Content : (BS EN ISO 17892-1:2014)	14.8	%
Percentage passing 425µm sieve :	100	%
Liquid Limit :	38	%
Plastic Limit :	21	%
Plasticity Index :	17	%
Equivalent Water Content of material passing 425µm sieve :	14.8	%
Liquidity Index :	-0.36	



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

BS1377 : Part 2 : 1990 Clauses 4.4 & 5

LIQUID AND PLASTIC LIMITS

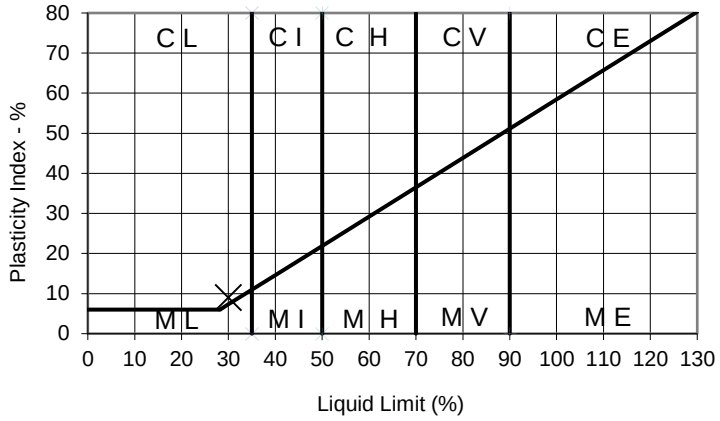
BH / TP	BH304
Depth (m)	4.00
Sample Type	D

Description:

Brown and grey brown fine sandy silty CLAY with rare siltstone.

Preparation : Sample as received

Water Content : (BS EN ISO 17892-1:2014)	12.2	%
Percentage passing 425µm sieve :	100	%
Liquid Limit :	30	%
Plastic Limit :	21	%
Plasticity Index :	9.0	%
Equivalent Water Content of material passing 425µm sieve :	12.2	%
Liquidity Index :	-0.98	



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

BS1377 : Part 2 : 1990 Clauses 4.4 & 5

LIQUID AND PLASTIC LIMITS

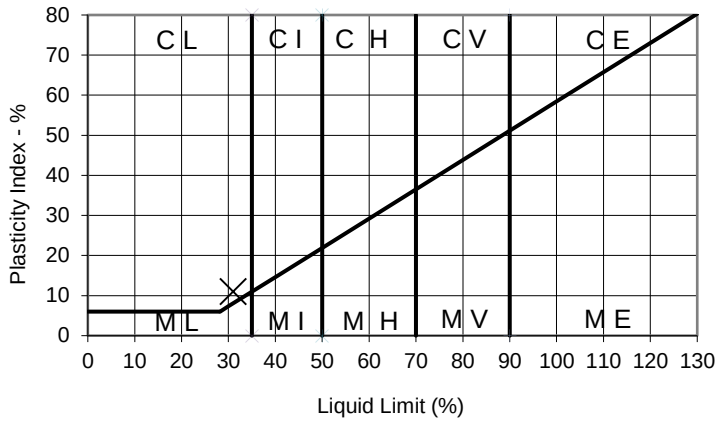
BH / TP	BH304
Depth (m)	6.00
Sample Type	D

Description:

Dark brown and grey fine sandy silty CLAY with rare siltstone.

Preparation : Sample as received

Water Content : (BS EN ISO 17892-1:2014)	9.9	%
Percentage passing 425µm sieve :	100	%
Liquid Limit :	31	%
Plastic Limit :	20	%
Plasticity Index :	11	%
Equivalent Water Content of material passing 425µm sieve :	9.9	%
Liquidity Index :	-0.92	



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

BS1377 : Part 2 : 1990 Clauses 4.4 & 5

LIQUID AND PLASTIC LIMITS

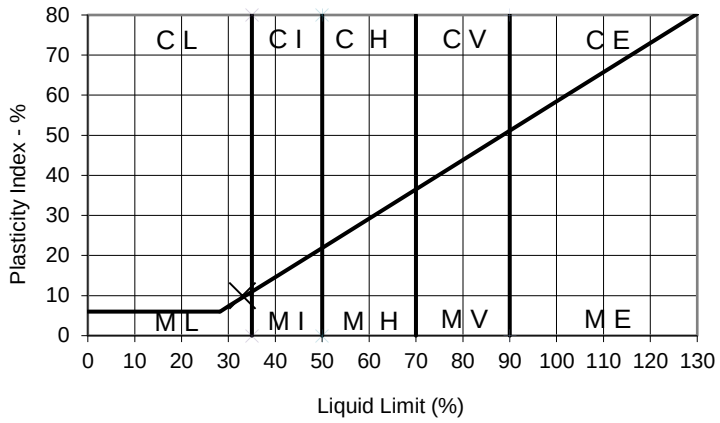
BH / TP	BH305A
Depth (m)	3.00
Sample Type	D

Description:

Brown mottled grey brown and grey fine sandy silty CLAY.

Preparation : Sample as received

Water Content : (BS EN ISO 17892-1:2014)	23.1	%
Percentage passing 425µm sieve :	100	%
Liquid Limit :	33	%
Plastic Limit :	23	%
Plasticity Index :	10	%
Equivalent Water Content of material passing 425µm sieve :	23.1	%
Liquidity Index :	0.01	



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

BS1377 : Part 2 : 1990 Clauses 4.4 & 5

LIQUID AND PLASTIC LIMITS

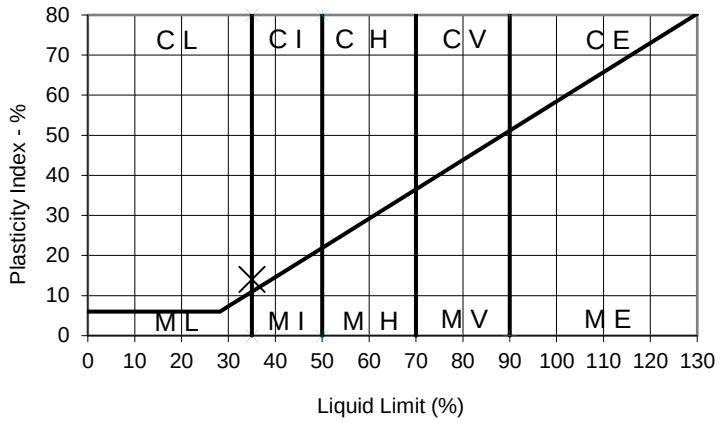
BH / TP	BH305A
Depth (m)	5.00
Sample Type	D

Description:

Grey mottled grey brown gravelly fine sandy silty CLAY. Gravel is siltstone.

Preparation : Sample washed and air dried

Water Content : (BS EN ISO 17892-1:2014)	19.8	%
Percentage passing 425µm sieve :	52	%
Liquid Limit :	35	%
Plastic Limit :	21	%
Plasticity Index :	14	%
Equivalent Water Content of material passing 425µm sieve :	38.1	%
Liquidity Index :	1.22	



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

BS1377 : Part 2 : 1990 Clauses 4.4 & 5

LIQUID AND PLASTIC LIMITS

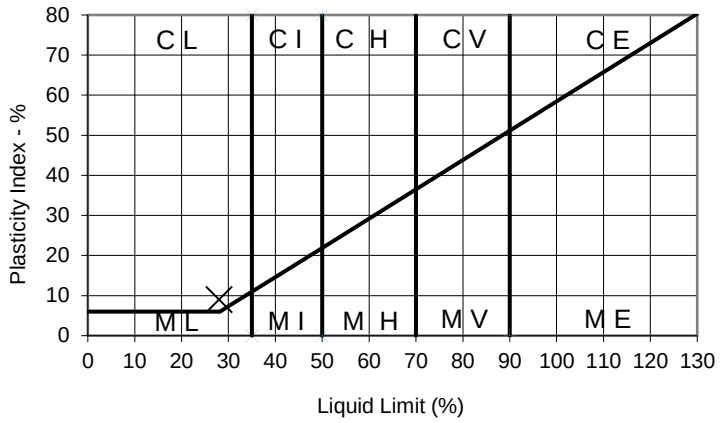
BH / TP	BH307
Depth (m)	1.20
Sample Type	D

Description:

Brown and grey brown fine sandy silty CLAY with rare siltstone.

Preparation : Sample as received

Water Content : (BS EN ISO 17892-1:2014)	11.8	%
Percentage passing 425µm sieve :	100	%
Liquid Limit :	28	%
Plastic Limit :	19	%
Plasticity Index :	9.0	%
Equivalent Water Content of material passing 425µm sieve :	11.8	%
Liquidity Index :	-0.80	



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

Test Report By GEOLABS Limited Bucknalls Lane, Garston, Watford, Hertfordshire, WD25 9XX

Client : RoC Consulting, Commercial Wharf, 6 Commercial Street, Manchester, M15 4PZ

(Ref 1553775509)

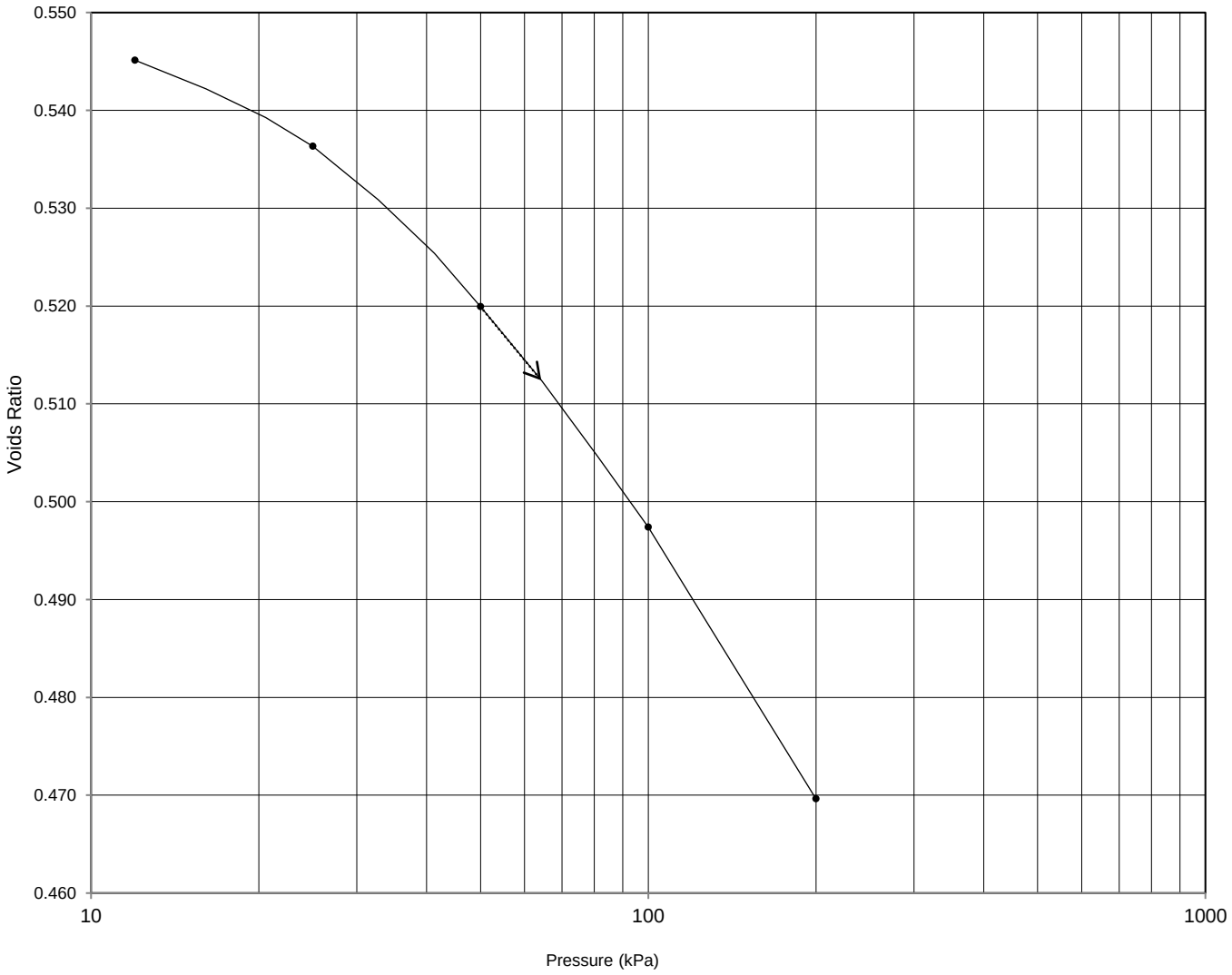
BS EN ISO 17892-5 : 2017

INCREMENTAL LOADING OEDOMETER TEST

BH / TP	BH302
Depth (m)	5.00-5.45
Sample Type	C
Depth within original (mm)	23
Orientation within original	Vertical
Specimen preparation	Undisturbed

Description:

Firm reddish brown mottled grey sandy CLAY with rare pockets of organic matter and fine to medium gravel.



Initial Conditions:

Height	(mm)	19.00	Water Content	(%)	22.4	(from trimmings)
Diameter	(mm)	75.00	Voids Ratio		0.551	
Area	(mm^2)	4418	Bulk Density	(Mg/m^3)	2.09	
Volume	(cm^3)	83.94	Dry Density	(Mg/m^3)	1.71	
Laboratory Temperature	(ºC)	20.0	Particle density	(Mg/m^3)	2.65 (Assumed)	
			Degree of Saturation	(%)	100.0	

Results have been corrected for equipment deformation

Checked and Approved by

J Sturges - Operations Manager
27/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS

BS EN ISO 17892-5 : 2017

INCREMENTAL LOADING OEDOMETER TEST

BH / TP	BH302
Depth (m)	5.00-5.45
Sample Type	C
Depth within original (mm)	23
Orientation within original	Vertical
Specimen preparation	Undisturbed

Description:

Firm reddish brown mottled grey sandy CLAY with rare pockets of organic matter and fine to medium gravel.

Pressure Range (kPa)	m_v (m^2/MN)	c_v (m^2/year)	Time Fitting		Voids Ratio
			Method	minutes	
0 - 12	0.33	1.9	t50	4.87	0.545
12 - 25	0.44	0.52	t50	17.9	0.536
25 - 50	0.43	0.67	t50	13.5	0.520
50 - 100	0.30	0.84	t50	10.6	0.497
100 - 200	0.19	0.85	t50	10.1	0.470

Checked and Approved by



J Sturges - Operations Manager
27/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS

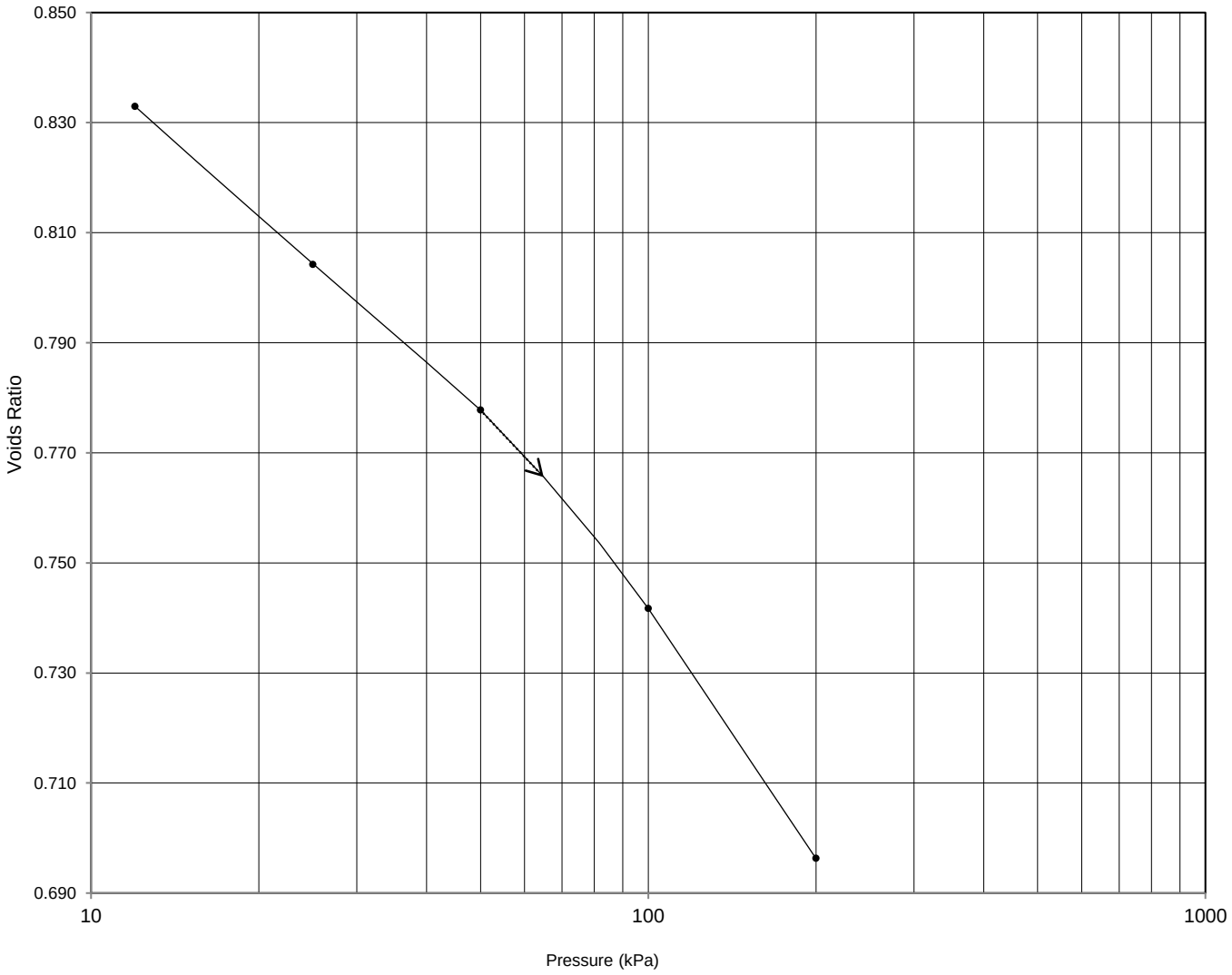
BS EN ISO 17892-5 : 2017

INCREMENTAL LOADING OEDOMETER TEST

BH / TP	BH303
Depth (m)	3.00-3.45
Sample Type	C
Orientation within original	Vertical
Specimen preparation	Undisturbed

Description:

Firm dark brownish grey mottled brown silty CLAY with rare fine to medium gravel.



Initial Conditions:

Height	(mm)	18.99	Water Content	(%)	33.0	(from trimmings)
Diameter	(mm)	74.79	Voids Ratio		0.859	
Area	(mm^2)	4393	Bulk Density	(Mg/m^3)	1.93	
Volume	(cm^3)	83.43	Dry Density	(Mg/m^3)	1.45	
Laboratory Temperature	(ºC)	20.0	Particle density	(Mg/m^3)	2.70 (Assumed)	
			Degree of Saturation	(%)	100.0	

Results have been corrected for equipment deformation

Checked and Approved by

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS

BS EN ISO 17892-5 : 2017

INCREMENTAL LOADING OEDOMETER TEST

BH / TP	BH303
Depth (m)	3.00-3.45
Sample Type	C
Orientation within original	Vertical
Specimen preparation	Undisturbed

Description:

Firm dark brownish grey mottled brown silty CLAY with rare fine to medium gravel.

Pressure Range (kPa)	m_v (m^2/MN)	c_v (m^2/year)	Time Fitting		Voids Ratio
			Method	minutes	
0 - 12	1.2	0.80	t50	11.6	0.833
12 - 25	1.2	3.4	t50	2.65	0.804
25 - 50	0.59	0.82	t50	10.6	0.778
50 - 100	0.41	1.1	t50	7.67	0.742
100 - 200	0.26	1.5	t50	5.35	0.696

Checked and Approved by

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS

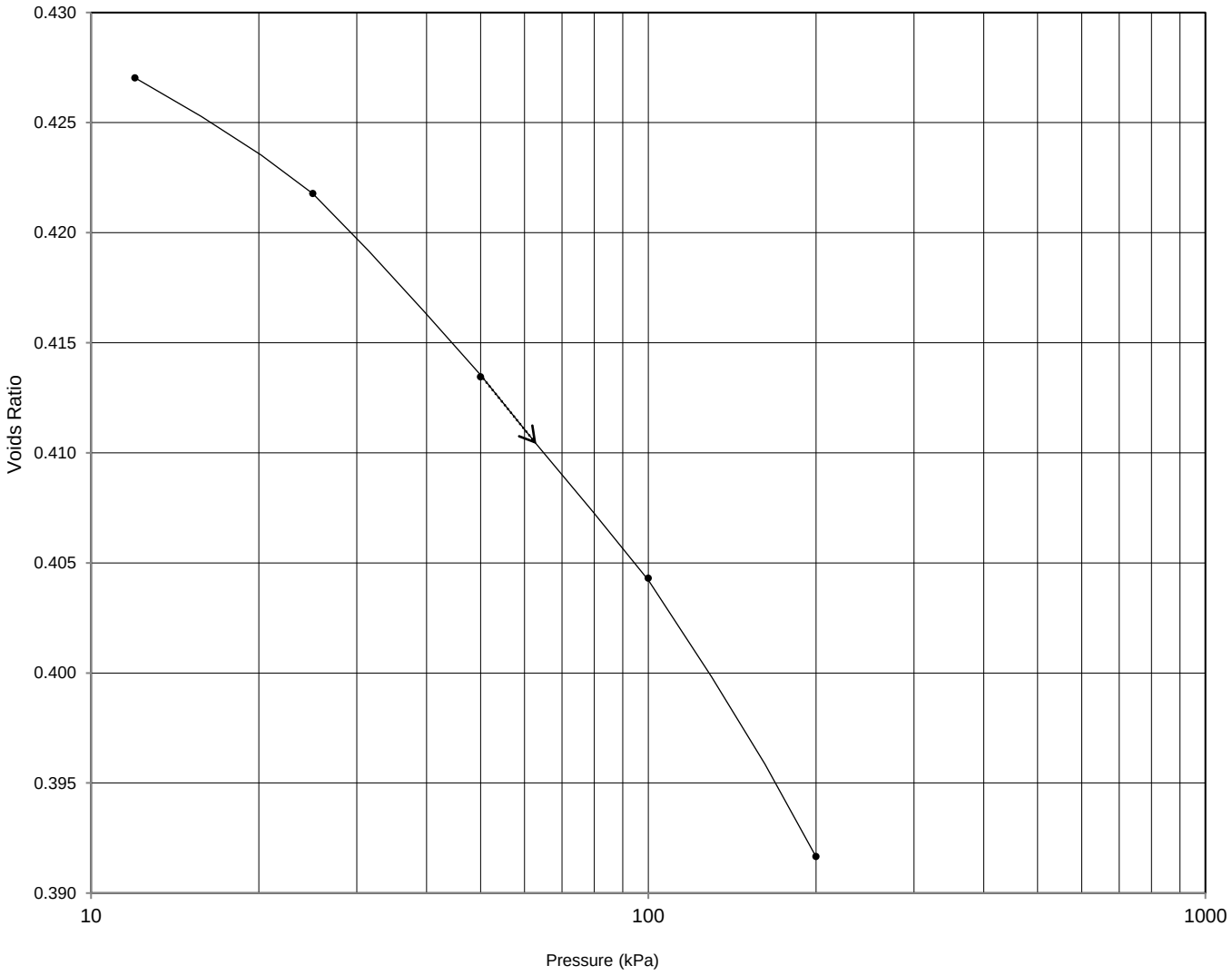
BS EN ISO 17892-5 : 2017

INCREMENTAL LOADING OEDOMETER TEST

BH / TP	BH306A
Depth (m)	3.00-3.45
Sample Type	C
Orientation within original	Vertical
Specimen preparation	Undisturbed

Description:

Firm greyish brown very sandy CLAY. Sand is fine to medium.



Initial Conditions:

Height	(mm)	19.01	Water Content	(%)	16.5	(from trimmings)
Diameter	(mm)	74.80	Voids Ratio		0.438	
Area	(mm^2)	4394	Bulk Density	(Mg/m^3)	2.15	
Volume	(cm^3)	83.54	Dry Density	(Mg/m^3)	1.84	
Laboratory Temperature	(ºC)	20.0	Particle density	(Mg/m^3)	2.65 (Assumed)	
			Degree of Saturation	(%)	99.9	

Results have been corrected for equipment deformation

Checked and Approved by

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS

BS EN ISO 17892-5 : 2017

INCREMENTAL LOADING OEDOMETER TEST

BH / TP	BH306A
Depth (m)	3.00-3.45
Sample Type	C
Orientation within original	Vertical
Specimen preparation	Undisturbed

Description:

Firm greyish brown very sandy CLAY. Sand is fine to medium.

Pressure Range (kPa)	m_v (m^2/MN)	c_v (m^2/year)	Time Fitting		Voids Ratio
			Method	minutes	
0 - 12	0.65	3.6	t50	2.58	0.427
12 - 25	0.28	14	t90	2.84	0.422
25 - 50	0.23	15	t50	0.598	0.413
50 - 100	0.13	13	t50	0.679	0.404
100 - 200	0.090	14	t50	0.622	0.392

Checked and Approved by



J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS

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
BH303	-	7.52-7.70	Weak to medium strong, thinly laminated, greenish grey fine grained SANDSTONE. Slightly weathered	5.5	64.2	2.32	2.20	86.70	172.10	2.0	129.7	22		19/03/19	

Note: The dimensional requirements of flatness (<0.02 mm), perpendicularity (<0.05 / 50 mm) and straightness (0.3 mm deviation) are not 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: 26/03/2019

Project Number: **GEO / 28935**

Project Name: **E PLOTS 3733**

GEOLABS®

UKAS TESTING 1982

ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 - 2006

Unconfined Compressive Strength

Borehole Ref.:	BH303
Sample Ref.:	-
Depth (m):	7.52-7.70

Description:
Weak to medium strong, thinly laminated, greenish grey fine grained SANDSTONE. Slightly weathered

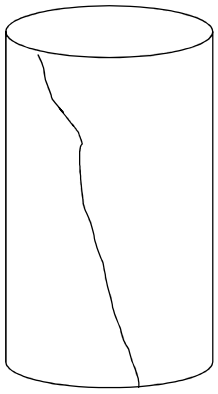
Diameter	86.70 mm
Height	172.10 mm
Bulk Density	2.32 Mg/m³
Dry Density	2.20 Mg/m³
Water Content	5.5 %

Degree of Saturation: 64.2 % Specific Gravity: 2.7 Mg/m³ (Assumed)

LF0879C (1000kN) compression frame used

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Angle of foliation/Horizontal: n/a
Angle of shear plane/Horizontal: 75°

Date tested: 19/03/2019

Test results

Unconfined Compressive Strength	22 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	n/a
Poisson's Ratio (secant at 10% failure load)	n/a

Sample type	**C**

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are not met.

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS®

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) Start D	Platen separation (mm) End D'	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)
BH301	-	4.45-4.56	Weak to very weak, thinly laminated, brown, fine grained SANDSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	86.2	63.8	56.2	-	78.5	1.52	0.25	1.23	0.31
BH301	-	5.80-5.90	Weak, thinly laminated, dark brown SILTSTONE. Moderately weathered	20/03/19	A	Pd	85.3	68.2	61.5	-	81.7	2.96	0.44	1.25	0.55
BH301	-	7.15-7.26	Very weak, thinly laminated, dark brown SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	86.2	72.5	65.4	-	84.7	0.76	0.11	1.27	0.14
BH301	-	8.59-8.71	Weak, thinly laminated, dark brown SILTSTONE. Moderately weathered	20/03/19	A	Pd	86.3	61.1	53.2	-	76.5	1.86	0.32	1.21	0.39
BH301	-	10.45-10.57	Weak, thinly laminated, dark brown SILTSTONE. Moderately weathered	20/03/19	A	Pd	86.3	66.6	60.5	-	81.5	6.57	0.99	1.25	1.23
BH301	-	10.84-10.96	Medium strong, thinly laminated, light brown SILTSTONE alternating with fine grained SANDSTONE. Moderately weathered	20/03/19	A	Pd	85.6	59.3	53.2	-	76.1	4.33	0.75	1.21	0.91
BH301	-	12.55-12.68	Weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	84.7	72.1	65.4	-	84.0	1.85	0.26	1.26	0.33
BH301	-	14.72-14.82	Weak, thinly laminated, grey SILTSTONE alternating with fine grained SANDSTONE. Moderately weathered	20/03/19	A	Pd	85.4	54.5	51.6	-	74.9	1.91	0.34	1.20	0.41
BH302	-	9.43-9.54	Very weak, thickly and thinly laminated, greenish grey SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	85.2	65.4	58.6	-	79.7	0.43	0.07	1.23	0.09
BH302	-	10.25-10.35	Weak, thickly and thinly laminated, greenish grey SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	85.8	54.3	50.2	-	74.1	3.56	0.65	1.19	0.78

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **L** - Irregular lump **Pd** - Perpendicular to planes of weakness **R** - Random or unknown orientation **Pl** - Parallel to planes of weakness

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS®

UKAS TESTING 1982

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) Start D	Platen separation (mm) End D'	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)
BH302	-	12.42-12.57	Weak, thinly laminated, dark brown SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	86.4	72.1	66.2	-	85.3	1.98	0.27	1.27	0.34
BH302	-	13.00-13.10	Very weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	86.5	61.5	56.4	-	78.8	0.25	0.04	1.23	0.05
BH302	-	14.00-14.14	Weak, thinly laminated, dark brown SILTSTONE. Moderately weathered	20/03/19	A	Pd	86.0	71.5	66.5	-	85.3	2.59	0.36	1.27	0.46
BH302	-	15.22-15.35	Weak to very weak, thinly laminated, greenish grey SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	85.6	77.2	71.6	-	88.3	0.87	0.11	1.29	0.14
BH302	-	16.25-16.35	Medium strong, thinly laminated, dark brown MUDSTONE alternating with SILTSTONE. Slightly to moderately weathered	20/03/19	A	Pd	86.3	72.1	67.6	-	86.2	17.28	2.33	1.28	2.98
BH302	-	16.79-16.89	Very weak, thinly laminated, dark brown SILTSTONE alternating with MUDSTONE, Moderately weathered	20/03/19	A	Pd	85.8	48.3	41.6	-	67.4	1.14	0.25	1.14	0.29
BH302	-	17.00-17.12	Weak, thinly laminated, brown fine grained SANDSTONE alternating with SILTSTONE. Moderately weathered	20/03/19	A	Pd	85.4	48.3	41.6	-	67.3	1.14	0.25	1.14	0.29
BH302	-	17.89-18.00	Very weak, thinly laminated, dark brown SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	86.3	52.6	46.4	-	71.4	0.99	0.19	1.17	0.22
BH302	-	18.76-18.86	Medium strong to weak, grey and dark brown fine grained SANDSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	85.3	48.2	43.1	-	68.4	3.15	0.67	1.15	0.77
BH302	-	20.35-20.47	Weak, thinly laminated, dark brown SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	86.4	68.5	62.1	-	82.7	3.24	0.47	1.25	0.59

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **L** - Irregular lump **Pd** - Perpendicular to planes of weakness **R** - Random or unknown orientation **Pl** - Parallel to planes of weakness

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS®

UKAS TESTING 1982

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) Start D	Platen separation (mm) End D'	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)
BH302	-	20.76-20.86	Weak, thinly laminated, greenish grey and purplish brown SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	85.6	60.4	55.2	-	77.6	1.43	0.24	1.22	0.29
BH303	-	5.75-5.86	Weak, thinly laminated, greenish grey SILTSTONE alternating with fine grained SANDSTONE. Moderately weathered	20/03/19	A	Pd	86.3	67.4	61.4	-	82.1	3.47	0.51	1.25	0.64
BH303	-	7.32-7.44	Strong to medium strong, thinly laminated, greenish grey fine grained SANDSTONE. Slightly weathered	20/03/19	A	Pd	86.3	72.5	67.4	-	86.1	22.16	2.99	1.28	3.82
BH303	-	8.30-8.40	Medium strong, thinly laminated, greenish grey SILTSTONE alternating with fine grained SANDSTONE. Slightly to moderately weathered	20/03/19	A	Pd	85.9	82.1	78.6	-	92.7	14.51	1.69	1.32	2.23
BH303	-	9.01-9.11	Very weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	86.1	48.2	41.6	-	67.5	0.52	0.11	1.14	0.13
BH303	-	11.49-11.62	Weak, thinly laminated, greenish grey SILTSTONE. Moderately weathered	20/03/19	A	Pd	86.1	46.2	34.2	-	61.2	2.24	0.60	1.10	0.66
BH303	-	11.72-11.83	Weak, thinly laminated, grey SILTSTONE. Moderately weathered	20/03/19	A	Pd	85.6	56.4	47.1	-	71.6	0.95	0.19	1.18	0.22
BH303	-	14.18-14.28	Medium strong to weak, thinly laminated, brownish grey, fine grained SANDSTONE. Moderately weathered	20/03/19	A	Pd	86.3	75.4	70.2	-	87.8	10.76	1.39	1.29	1.79
BH303	-	14.79-14.88	Weak, thinly laminated, greenish grey SILTSTONE alternating with fine grained SANDSTONE. Moderately weathered	20/03/19	A	Pd	86.4	81.0	75.6	-	91.2	5.68	0.68	1.31	0.89
BH304	-	8.21-8.30	Weak to very weak, thinly laminated, greenish grey SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	86.4	49.8	46.3	-	71.4	0.53	0.10	1.17	0.12

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **L** - Irregular lump **Pd** - Perpendicular to planes of weakness **R** - Random or unknown orientation **Pl** - Parallel to planes of weakness

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS®

UKAS TESTING 1982

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) Start D	Platen separation (mm) End D'	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)
BH304	-	8.68-8.78	Medium strong to weak, thickly laminated SILTSTONE alternating with MUDSTONE. Slightly to moderately weathered	20/03/19	A	Pd	86.3	67.5	60.4	-	81.5	0.56	0.08	1.25	0.1
BH304	-	9.26-9.36	Very weak, thinly laminated, greenish grey SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	85.9	62.3	56.4	-	78.5	0.76	0.12	1.23	0.15
BH304	-	9.59-9.75	Weak, thinly laminated, greenish grey SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	86.3	68.6	63.2	-	83.3	4.09	0.59	1.26	0.74
BH304	-	10.95-11.04	Weak, thinly laminated, greenish grey, SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	85.4	44.5	40.1	-	66.0	2.43	0.56	1.13	0.63
BH304	-	12.07-12.17	Medium strong, thinly laminated, greenish grey fine grained SANDSTONE. Slightly to moderately weathered	20/03/19	A	Pd	85.9	57.2	52.1	-	75.5	7.87	1.38	1.20	1.66
BH304	-	12.40-12.50	Medium strong, thinly laminated, greenish grey, fine grained SANDSTONE. Moderately weathered	20/03/19	A	Pd	86.7	72.4	67.5	-	86.3	11.55	1.55	1.28	1.98
BH304	-	14.06-14.15	Weak to very weak, thinly laminated, brown, SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	86.0	50.5	44.6	-	69.9	0.88	0.18	1.16	0.21
BH304	-	15.40-15.50	Medium strong, thinly laminated, grey, fine grained SANDSTONE. Moderately weathered.	20/03/19	A	Pd	85.7	77.3	72.1	-	88.7	9.79	1.24	1.29	1.6
BH305A	-	6.75-6.89	Weak, thinly laminated, greenish grey SILTSTONE. Moderately weathered	20/03/19	A	Pd	86.4	79.6	72.1	-	89.1	2.30	0.29	1.30	0.38
BH305A	-	7.25-7.36	Very weak, thinly laminated, greenish grey SILTSTONE. Moderately weathered	20/03/19	A	Pd	86.3	71.0	66.4	-	85.4	1.26	0.17	1.27	0.22

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **L** - Irregular lump **Pd** - Perpendicular to planes of weakness **R** - Random or unknown orientation **Pl** - Parallel to planes of weakness

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS®

UKAS TESTING 1982

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'						
BH305A	-	8.74-8.86	Weak, thinly laminated, SILTSTONE alternating with fine grained SANDSTONE. Moderately weathered	20/03/19	A	Pd	86.3	61.6	52.6	-	76.0	3.98	0.69	1.21	0.83
BH305A	-	9.72-9.86	Medium strong, thinly laminated, greenish grey, SILTSTONE fine grained SANDSTONE. Moderately weathered.	20/03/19	A	Pd	85.7	58.3	52.1	-	75.4	5.66	1.00	1.20	1.2
BH305A	-	12.06-12.15	Very weak, thinly laminated, dark brown MUDSTONE alternating with SILTSTONE. Moderately to highly weathered.	20/03/19	A	Pd	85.9	62.3	54.2	-	77.0	1.11	0.19	1.21	0.23
BH305A	-	15.27-15.37	Weak to very weak, thinly laminated, greenish grey MUDSTONE alternating with SILTSTONE. Moderately to highly weathered.	20/03/19	A	Pd	86.2	58.2	52.6	-	76.0	1.09	0.19	1.21	0.23
BH305A	-	16.09-16.17	Medium strong, thinly laminated, brownish grey, fine grained SANDSTONE. Moderately weathered.	20/03/19	A	Pd	86.7	74.3	67.7	-	86.4	14.36	1.92	1.28	2.46
BH305A	-	17.15-17.30	Weak, thinly laminated, dark brown and grey MUDSTONE alternating with SILTSTONE. Moderately weathered.	20/03/19	A	Pd	86.4	71.6	64.3	-	84.1	2.56	0.36	1.26	0.45
BH306A	-	5.33-5.43	Weak to very weak, thinly laminated, greenish grey SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	85.6	64.5	59.6	-	80.6	1.76	0.27	1.24	0.33
BH306A	-	5.85-5.94	Medium strong, thinly laminated, grey fine grained SANDSTONE. Moderately weathered	20/03/19	A	Pd	86.2	82.1	77.3	-	92.1	10.43	1.23	1.32	1.62
BH306A	-	6.10-6.20	Weak to very weak, thinly laminated, dark brown SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	85.7	54.5	48.6	-	72.8	1.46	0.28	1.18	0.33
BH306A	-	11.25-11.35	Very weak, thickly and thinly laminated, greenish dark grey SILTSTONE alternating with MUDSTONE. Moderately to Highly weathered	20/03/19	A	Pd	86.4	70.8	63.2	-	83.4	0.13	0.02	1.26	0.03

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **L** - Irregular lump **Pd** - Perpendicular to planes of weakness **R** - Random or unknown orientation **Pl** - Parallel to planes of weakness

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS®

UKAS TESTING 1982

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) Start D	Platen separation (mm) End D'	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)
BH306A	-	14.57-14.63	Weak to very weak, thinly laminated, dark brown SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	86.7	66.3	60.1	-	81.5	1.92	0.29	1.25	0.36
BH306A	-	14.92-15.02	Weak, thinly laminated, dark brown SILTSTONE. Moderately weathered	20/03/19	A	Pd	85.4	79.3	72.1	-	88.5	5.01	0.64	1.29	0.83
BH306A	-	16.18-16.31	Weak, thinly laminated, greenish grey SILTSTONE. Moderately weathered	20/03/19	A	Pd	86.4	71.6	63.2	-	83.4	1.25	0.18	1.26	0.23
BH307	-	5.19-5.27	Very weak, thinly laminated, greenish grey SILTSTONE alternating with MUDSTONE. Moderately weathered.	20/03/19	A	Pd	86.3	72.6	66.4	-	85.4	0.96	0.13	1.27	0.17
BH307	-	7.24-7.39	Very weak, thinly laminated, greenish grey SILTSTONE alternating with MUDSTONE. Moderately weathered.	20/03/19	A	Pd	86.1	71.1	64.3	-	84.0	0.24	0.03	1.26	0.04
BH307	-	8.86-8.90	Medium strong, thinly laminated, greenish grey, fine grained SANDSTONE. Slightly to moderately weathered	20/03/19	A	Pd	86.3	72.5	67.4	-	86.1	13.15	1.78	1.28	2.27
BH307	-	10.88-10.97	Medium strong, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	A	Pd	86.3	85.4	79.1	-	93.2	5.31	0.61	1.32	0.81
BH307	-	11.26-11.37	Weak, thinly laminated, dark brown SILTSTONE. Moderately weathered	20/03/19	A	Pd	85.9	71.5	64.3	-	83.9	3.58	0.51	1.26	0.64
BH307	-	13.32-13.40	Medium strong, thinly laminated, grey, fine grained SANDSTONE. Moderately weathered	20/03/19	A	Pd	86.1	82.3	78.2	-	92.6	10.71	1.25	1.32	1.65
BH307	-	14.12-14.22	Medium strong, thinly laminated, grey, fine grained SANDSTONE. Moderately weathered	20/03/19	A	Pd	85.7	68.4	62.1	-	82.3	9.88	1.46	1.25	1.83

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **L** - Irregular lump **Pd** - Perpendicular to planes of weakness **R** - Random or unknown orientation **Pl** - Parallel to planes of weakness

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS®

UKAS TESTING 1982

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) Start D	Platen separation (mm) End D'	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)
BH301	-	12.12-12.26	Medium strong, thinly laminated, light brown SILTSTONE alternating with fine grained SANDSTONE. Moderately weathered	20/03/19	D	Pl	86.5	86.3	82.1	-	84.2	0.79	0.11	1.26	0.14*
			Determination 2	20/03/19	A	Pd	86.4	70.2	64.6	-	84.3	2.77	0.39	1.26	0.49
			Determination 3	20/03/19	A	Pd	85.9	65.4	61.3	-	81.9	2.97	0.44	1.25	0.55
BH302	-	14.42-14.60	Medium strong to weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	D	Pl	86.6	85.7	80.4	-	83.0	1.66	0.24	1.26	0.3*
			Determination 2	20/03/19	A	Pd	85.4	75.4	68.7	-	86.4	2.22	0.30	1.28	0.38
			Determination 3	20/03/19	A	Pd	86.2	72.1	66.4	-	85.4	2.43	0.33	1.27	0.42
BH307	-	11.56-11.71	Weak, thinly laminated, dark brown SILTSTONE. Moderately weathered	20/03/19	D	Pl	86.2	85.7	80.2	-	82.9	1.96	0.28	1.26	0.35*
			Determination 2	20/03/19	A	Pd	85.2	64.3	60.3	-	80.9	2.09	0.32	1.24	0.4
			Determination 3	20/03/19	A	Pd	86.8	62.1	57.6	-	79.8	1.98	0.31	1.23	0.38
BH305A	-	11.32-11.49	Weak, thinly laminated, greenish grey, fine grained SANDSTONE. Moderately weathered	20/03/19	D	Pl	86.1	86.9	82.5	-	84.7	0.45	0.06	1.27	0.08*

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **L** - Irregular lump **Pd** - Perpendicular to planes of weakness **R** - Random or unknown orientation **Pl** - Parallel to planes of weakness

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS®

UKAS TESTING 1982

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) Start D	Platen separation (mm) End D'	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)
BH305A	-	11.32-11.49	2	20/03/19	A	Pd	85.7	63.5	58.5	-	79.9	3.56	0.56	1.23	0.69
			Determination 3	20/03/19	A	Pd	86.4	72.1	67.6	-	86.2	2.44	0.33	1.28	0.42
BH305A	-	8.10-8.36	Medium strong, thinly laminated, greenish grey, fine grained SANDSTONE. Moderately weathered	20/03/19	D	Pl	86.1	87.2	81.5	-	84.3	1.06	0.15	1.26	0.19*
			Determination 2	20/03/19	A	Pd	85.7	73.4	67.4	-	85.8	10.16	1.38	1.27	1.76
			Determination 3	20/03/19	A	Pd	86.4	71.5	66.7	-	85.7	12.16	1.66	1.27	2.12
BH302	-	19.05-19.22	Medium strong, thinly laminated, light brown, fine grained SANDSTONE. Slightly to moderately weathered	20/03/19	D	Pl	86.7	87.1	84.3	-	85.7	2.16	0.29	1.27	0.37*
			Determination 2	20/03/19	A	Pd	86.2	73.2	68.1	-	86.5	10.15	1.36	1.28	1.74
			Determination 3	20/03/19	A	Pd	86.1	70.5	66.3	-	85.3	9.76	1.34	1.27	1.7
BH307	-	8.69-8.86	Weak to very weak, thinly laminated, greenish grey SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	D	Pl	86.5	86.0	84.3	-	85.1	0.26	0.04	1.27	0.05*
			Determination 2	20/03/19	A	Pd	86.1	71.6	65.4	-	84.7	1.16	0.16	1.27	0.2

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **L** - Irregular lump **Pd** - Perpendicular to planes of weakness **R** - Random or unknown orientation **Pl** - Parallel to planes of weakness

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS®

UKAS TESTING 1982

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) Start D	Platen separation (mm) End D'	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)
BH307	-	8.69-8.86	3	20/03/19	A	Pd	85.7	58.6	51.6	-	75.0	1.37	0.24	1.20	0.29
BH306A	-	12.20-12.35	Strong to medium strong, thinly laminated, greenish grey SILTSTONE alternating with fine grained SANDSTONE. Slightly to moderately weathered	20/03/19	D	Pl	86.4	87.0	84.2	-	85.6	2.98	0.41	1.27	0.52*
			Determination 2	20/03/19	A	Pd	85.2	68.6	62.1	-	82.1	13.16	1.95	1.25	2.44
			Determination 3	20/03/19	A	Pd	86.3	71.0	66.3	-	85.4	15.28	2.10	1.27	2.67
BH305A	-	10.85-11.00	Medium strong, thinly laminated, greenish grey SILTSTONE alternating with fine grained SANDSTONE. Moderately weathered	20/03/19	D	Pl	86.3	87.4	84.2	-	85.8	0.22	0.03	1.27	0.04*
			Determination 2	20/03/19	A	Pd	85.4	68.0	64.3	-	83.6	7.22	1.03	1.26	1.3
			Determination 3	20/03/19	A	Pd	86.0	71.2	66.4	-	85.3	6.85	0.94	1.27	1.2
BH302	-	19.73-20.00	Very weak, thinly laminated, dark brown SILTSTONE alternating with MUDSTONE. Highly to moderately weathered	20/03/19	D	Pl	85.9	86.2	84.3	-	85.2	0.16	0.02	1.27	0.03*
			Determination 2	20/03/19	A	Pd	86.3	71.0	65.2	-	84.6	0.77	0.11	1.27	0.14
			Determination 3	20/03/19	A	Pd	85.7	66.4	59.0	-	80.2	0.81	0.13	1.24	0.16

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **L** - Irregular lump **Pd** - Perpendicular to planes of weakness **R** - Random or unknown orientation **Pl** - Parallel to planes of weakness

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS®

UKAS TESTING 1982

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) Start D	Platen separation (mm) End D'	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)
BH302	-	11.66-11.80	Weak to very weak, thinly laminated, dark brown SILTSTONE alternating with MUDSTONE. Moderately weathered	20/03/19	D	Pl	86.3	86.1	73.2	-	79.4	0.36	0.06	1.23	0.07*
			Determination 2	20/03/19	A	Pd	86.8	70.6	64.3	-	84.3	1.25	0.18	1.26	0.23
			Determination 3	20/03/19	A	Pd	85.4	65.6	60.1	-	80.8	1.63	0.25	1.24	0.31
BH305A	-	7.36-7.52	Weak, thinly laminated, dark grey SILTSTONE. Moderately weathered	20/03/19	D	Pl	86.4	85.9	82.4	-	84.1	0.46	0.06	1.26	0.08*
			Determination 2	20/03/19	A	Pd	86.9	74.6	70.1	-	88.1	2.16	0.28	1.29	0.36
			Determination 3	20/03/19	A	Pd	85.7	65.3	60.6	-	81.3	1.98	0.30	1.24	0.37

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **L** - Irregular lump **Pd** - Perpendicular to planes of weakness **R** - Random or unknown orientation **Pl** - Parallel to planes of weakness

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28935

Project Name:

E PLOTS
3733

GEOLABS®

UKAS TESTING 1982

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
BH401	-	9.49 - 9.76	Very weak to extremely weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Completely weathered. Low reaction to HCL	14	100	2.26	1.98	85.70	179.60	2.1	1.5	0.26		19/03/19	
BH401	-	12.63-12.85	Very weak to extremely weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Completely weathered. Low reaction to HCL	12	91.0	2.23	1.98	86.30	192.50	2.2	1.7	0.291		19/03/19	
BH402	-	10.66-10.84	Medium strong to weak, thinly laminated, greenish grey, fine grained SANDSTONE. Slightly to moderately weathered	4.4	89.0	2.49	2.38	86.40	172.10	2.0	137.5	23.5		19/03/19	
BH402	-	13.12-13.29	Very weak to extremely weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Highly to completely weathered. Low reaction to HCL	9.3	100	2.37	2.16	86.90	172.90	2.0	9.5	1.6		19/03/19	
BH403	-	13.70-13.93	Weak, to very weak, thinly laminated, greyish brown SILTSTONE alternating with fine grained SANDSTONE. Moderately to highly weathered	7.9	89.2	2.35	2.18	86.20	173.90	2.0	41.2	7.06		19/03/19	

Note: The dimensional requirements of flatness (<0.02 mm), perpendicularity (<0.05 / 50 mm) and straightness (0.3 mm deviation) are not 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: 26/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN 3733

GEOLABS®

UKAS TESTING 1982

ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 - 2006

Unconfined Compressive Strength

Borehole Ref.:	BH401
Sample Ref.:	-
Depth (m):	9.49 - 9.76

Description:
Very weak to extremely weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Completely weathered. Low reaction to HCL

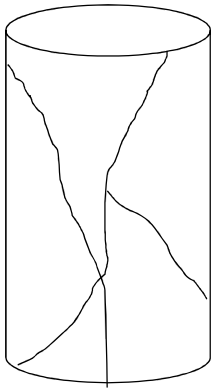
Diameter	85.70 mm
Height	179.60 mm
Bulk Density	2.26 Mg/m³
Dry Density	1.98 Mg/m³
Water Content	14 %

Degree of Saturation: 100 % Specific Gravity: 2.7 Mg/m³ (Assumed)

LF0879C (1000kN) compression frame used

Failure Sketch

Mode of failure: Multiple fracturing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Date tested: 19/03/2019

Angle of foliation/Horizontal: n/a
Angle of shear plane/Horizontal: n/a

Sample type	C

Test results

Unconfined Compressive Strength	0.26 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	n/a
Poisson's Ratio (secant at 10% failure load)	n/a

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are not met.

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN 3733

GEOLABS®

ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 - 2006

Unconfined Compressive Strength

Borehole Ref.:	BH401
Sample Ref.:	-
Depth (m):	12.63-12.85

Description:
Very weak to extremely weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Completely weathered. Low reaction to HCL

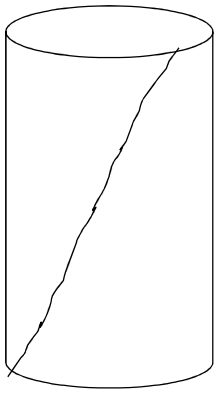
Diameter	86.30 mm
Height	192.50 mm
Bulk Density	2.23 Mg/m³
Dry Density	1.98 Mg/m³
Water Content	12 %

Degree of Saturation: 91.0 % Specific Gravity: 2.7 Mg/m³ (Assumed)

LF0879C (1000kN) compression frame used

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Angle of foliation/Horizontal: n/a
Angle of shear plane/Horizontal: 105°

Date tested: 19/03/2019

Test results

Unconfined Compressive Strength	0.291 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	n/a
Poisson's Ratio (secant at 10% failure load)	n/a

Sample type	**C**

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are not met.

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN 3733

GEOLABS®

ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 - 2006

Unconfined Compressive Strength

Borehole Ref.:	BH402
Sample Ref.:	-
Depth (m):	10.66-10.84

Description:
Medium strong to weak, thinly laminated, greenish grey, fine grained SANDSTONE. Slightly to moderately weathered

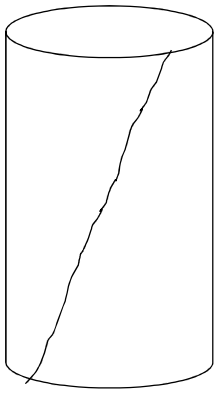
Diameter	86.40 mm
Height	172.10 mm
Bulk Density	2.49 Mg/m³
Dry Density	2.38 Mg/m³
Water Content	4.4 %

Degree of Saturation: 89.0 % Specific Gravity: 2.7 Mg/m³ (Assumed)

LF0879C (1000kN) compression frame used

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Angle of foliation/Horizontal: n/a
Angle of shear plane/Horizontal: 100°

Date tested: 19/03/2019

Test results

Unconfined Compressive Strength	23.5 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	n/a
Poisson's Ratio (secant at 10% failure load)	n/a

Sample type	**C**

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are not met.

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN 3733

GEOLABS®

ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 - 2006

Unconfined Compressive Strength

Borehole Ref.:	BH402
Sample Ref.:	-
Depth (m):	13.12-13.29

Description:
Very weak to extremely weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Highly to completely weathered. Low reaction to HCL

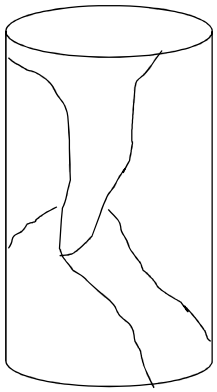
Diameter	86.90 mm
Height	172.90 mm
Bulk Density	2.37 Mg/m³
Dry Density	2.16 Mg/m³
Water Content	9.3 %

Degree of Saturation: 100 % Specific Gravity: 2.7 Mg/m³ (Assumed)

LF0879C (1000kN) compression frame used

Failure Sketch

Mode of failure: Multiple fracturing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Angle of foliation/Horizontal: n/a
Angle of shear plane/Horizontal: n/a

Sample type	C

Date tested: 19/03/2019

Test results

Unconfined Compressive Strength	1.6 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	n/a
Poisson's Ratio (secant at 10% failure load)	n/a

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are not met.

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN 3733

GEOLABS®

ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 - 2006

Unconfined Compressive Strength

Borehole Ref.:	BH403
Sample Ref.:	-
Depth (m):	13.70-13.93

Description:
Weak, to very weak, thinly laminated, greyish brown SILTSTONE alternating with fine grained SANDSTONE. Moderately to highly weathered

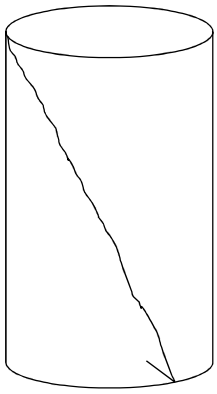
Diameter	86.20 mm
Height	173.90 mm
Bulk Density	2.35 Mg/m³
Dry Density	2.18 Mg/m³
Water Content	7.9 %

Degree of Saturation: 89.2 % Specific Gravity: 2.7 Mg/m³ (Assumed)

LF0879C (1000kN) compression frame used

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Angle of foliation/Horizontal: n/a
Angle of shear plane/Horizontal: 70°

Sample type	C

Date tested: 19/03/2019

Test results

Unconfined Compressive Strength	7.06 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	n/a
Poisson's Ratio (secant at 10% failure load)	n/a

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are not met.

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN 3733

GEOLABS®

SUMMARY OF GEOTECHNICAL TESTING

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression				Chemical Tests			Other tests and comments
Borehole / Trial Pit	Depth (m)	Sample Ref	Type	Description	WC (%)	LL (%)	PL (%)	PI (%)	<425 µm (%)	Bulk Mg/m³	Dry Mg/m³	Condition	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 (g/L)	W/S Mg (mg/L)	
BH401	1.20-1.65		D	Reddish brown mottled grey fine sandy silty CLAY with rare siltstone.	19.8	34	19	15	100										
BH401	2.00-2.45		D	Reddish brown mottled grey fine sandy silty CLAY with rare siltstone.	18.5	31	18	13	99										
BH401	3.00-3.45		D	Brown mottled grey fine sandy silty CLAY with rare siltstone.	19.5	28	18	10	99										
BH401	4.00-4.45		D	Reddish brown mottled grey fine sandy silty CLAY with rare siltstone.	18.1	33	20	13	99										
BH401	6.00-6.45		D	Reddish brown and grey fine sandy silty CLAY.	22.5	33	19	14	100										
BH401	7.50-7.95		D	Reddish brown and grey fine sandy silty CLAY with rare siltstone.	17.0	32	20	12	99										
BH402	1.20-1.65		U	Firm reddish brown mottled grey silty CLAY with rare fine to medium siltstone.	18.8					2.13	1.79	Undisturbed	12 25 50	44 51 67	27				One Dimensional Consolidation
BH403	1.20-1.65		D	Dark brown sandy silty CLAY with rare gravel.	27.1	43	24	19	98										
BH403	2.00-2.45		U	Firm dark greyish brown sandy gravelly CLAY. Sand and gravel is fine to medium.	15.2					2.15	1.87	Undisturbed	25 50	112 135	62				One Dimensional Consolidation
BH403	3.00-3.45		D	Dark grey fine sandy silty CLAY with rare siltstone.	13.0	38	20	18	99										

Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed)

Checked and Approved by



J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN 3733

GEOLABS

BS 1377 : Part 7 : 1990 Clause 9

QUICK UNDRAINED TRIAXIAL COMPRESSION TEST

BH/TP No	BH402
Depth (m)	1.20-1.65
Sample Type	U

Description:

Firm reddish brown mottled grey silty CLAY with rare fine to medium siltstone.

Specimen Details

Specimen conditions		Undisturbed		
Length	(mm)	201.7		
Diameter	(mm)	104.6		
Moisture Content	(%)	18.8		
Bulk Density	(Mg/m³)	2.13		
Dry Density	(Mg/m³)	1.79		
Test Details		**1**	**2**	**3**
Latex membrane thickness	(mm)	0.3	0.3	0.3
Membrane correction	(kPa)	0.6	0.7	1.1
Axial displacement rate	(%/min)	1.0	1.0	1.0
Cell pressure	(kPa)	12	25	50
Strain at failure	(%)	8.4	10.9	19.3
Maximum Deviator Stress	(kPa)	44	51	67
Shear Stress Cu	(kPa)	22	26	34

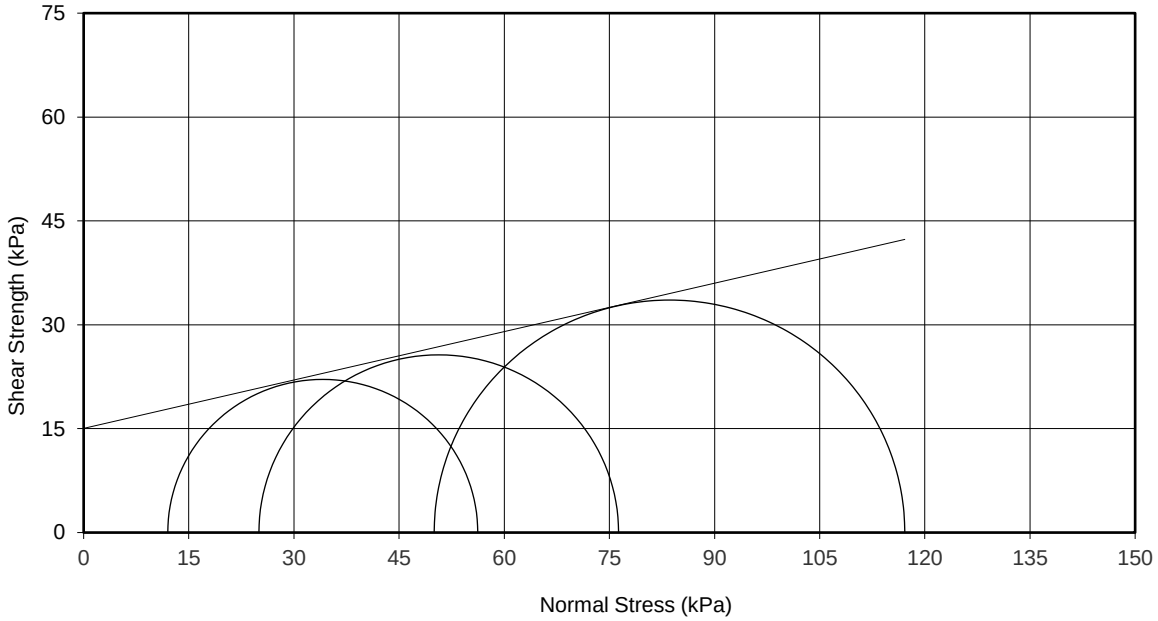
Mode of failure



Orientation of the sample	Vertical
Distance from top of tube mm	75

Shear Strength Parameters

Cohesion	(kPa)	15
Angle of Shear Resistance	(°)	13.0



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN 3733

GEOLABS

BS 1377 : Part 7 : 1990 Clause 9

QUICK UNDRAINED TRIAXIAL COMPRESSION TEST

BH/TP No	BH403
Depth (m)	2.00-2.45
Sample Type	U

Description:

Firm dark greyish brown sandy gravelly CLAY. Sand and gravel is fine to medium.

Remarks : Specimen reached 20% strain on 2nd stage of multistage test

Specimen Details

Specimen conditions		Undisturbed	
Length	(mm)	177.1	
Diameter	(mm)	103.3	
Moisture Content	(%)	15.2	
Bulk Density	(Mg/m³)	2.15	
Dry Density	(Mg/m³)	1.87	
Test Details		**1**	**2**
Latex membrane thickness	(mm)	0.3	0.3
Membrane correction	(kPa)	0.9	1.1
Axial displacement rate	(%/min)	1.1	1.1
Cell pressure	(kPa)	25	50
Strain at failure	(%)	15.2	19.8
Maximum Deviator Stress	(kPa)	112	135
Shear Stress Cu	(kPa)	56	67

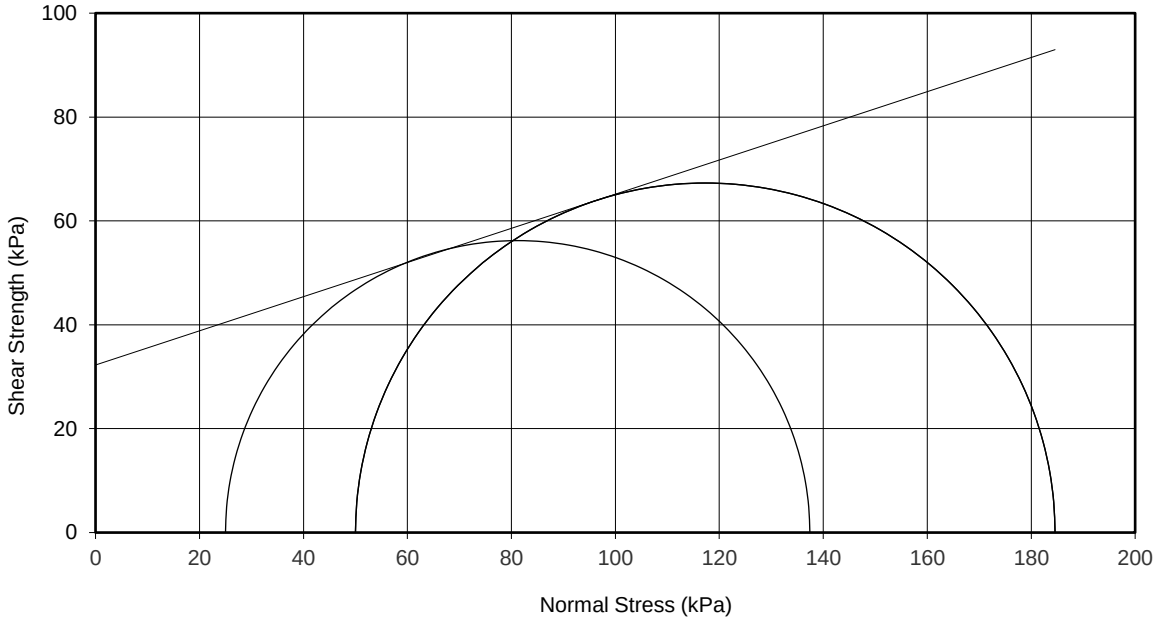
Mode of failure



Orientation of the sample	Vertical
Distance from top of tube mm	75

Shear Strength Parameters

Cohesion	(kPa)	32
Angle of Shear Resistance	(°)	18.0



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN 3733

GEOLABS®

UKAS TESTING 1982

BS1377 : Part 2 : 1990 Clauses 4.4 & 5

LIQUID AND PLASTIC LIMITS

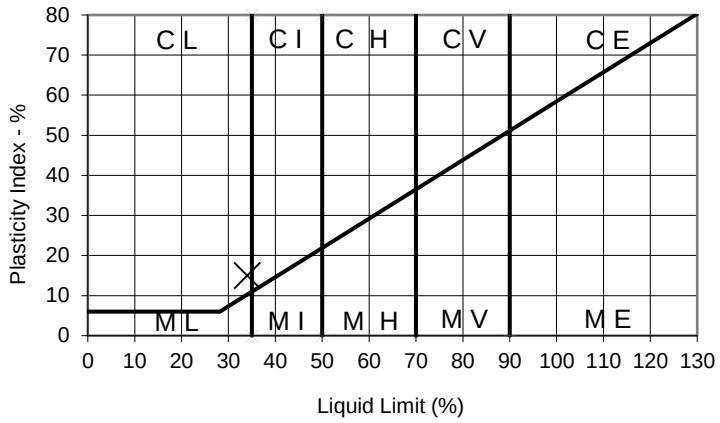
BH / TP	BH401
Depth (m)	1.20
Sample Type	D

Description:

Reddish brown mottled grey fine sandy silty CLAY with rare siltstone.

Preparation : Sample as received

Water Content : (BS EN ISO 17892-1:2014)	19.8	%
Percentage passing 425µm sieve :	100	%
Liquid Limit :	34	%
Plastic Limit :	19	%
Plasticity Index :	15	%
Equivalent Water Content of material passing 425µm sieve :	19.8	%
Liquidity Index :	0.05	



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN
3733

BS1377 : Part 2 : 1990 Clauses 4.4 & 5

LIQUID AND PLASTIC LIMITS

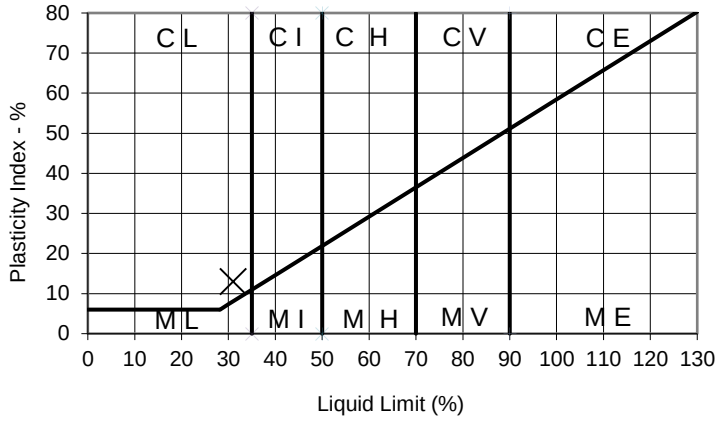
BH / TP	BH401
Depth (m)	2.00
Sample Type	D

Description:

Reddish brown mottled grey fine sandy silty CLAY with rare siltstone.

Preparation : Sample as received

Water Content : (BS EN ISO 17892-1:2014)	18.5	%
Percentage passing 425µm sieve :	99	%
Liquid Limit :	31	%
Plastic Limit :	18	%
Plasticity Index :	13	%
Equivalent Water Content of material passing 425µm sieve :	18.7	%
Liquidity Index :	0.05	



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN
3733

GEOLABS

UKAS TESTING 1982

BS1377 : Part 2 : 1990 Clauses 4.4 & 5

LIQUID AND PLASTIC LIMITS

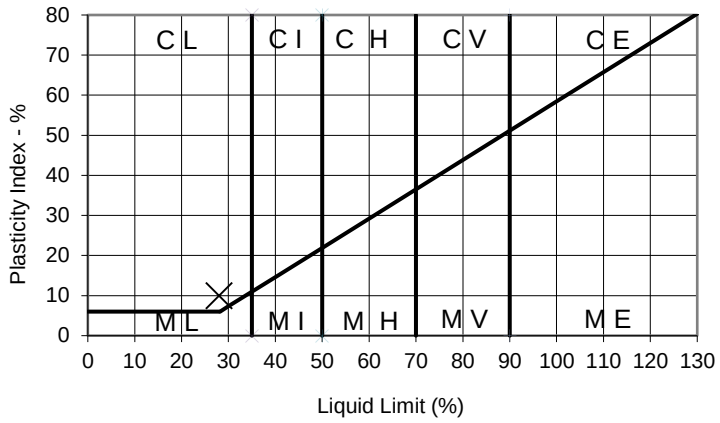
BH / TP	BH401
Depth (m)	3.00
Sample Type	D

Description:

Brown mottled grey fine sandy silty CLAY with rare siltstone.

Preparation : Sample as received

Water Content : (BS EN ISO 17892-1:2014)	19.5	%
Percentage passing 425µm sieve :	99	%
Liquid Limit :	28	%
Plastic Limit :	18	%
Plasticity Index :	10	%
Equivalent Water Content of material passing 425µm sieve :	19.7	%
Liquidity Index :	0.17	



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN
3733

GEOLABS

UKAS TESTING 1982

BS1377 : Part 2 : 1990 Clauses 4.4 & 5

LIQUID AND PLASTIC LIMITS

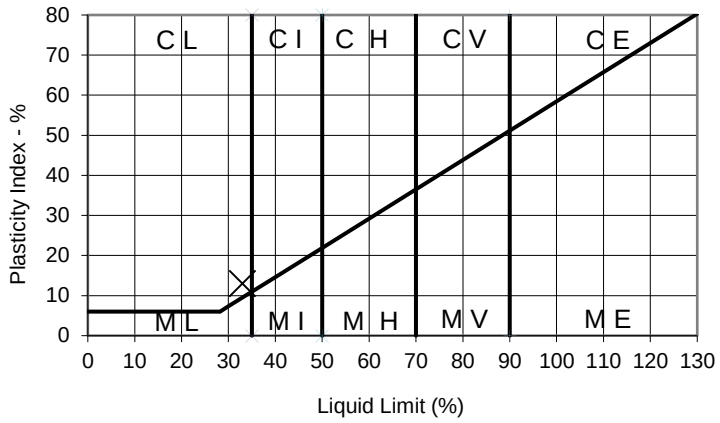
BH / TP	BH401
Depth (m)	4.00
Sample Type	D

Description:

Reddish brown mottled grey fine sandy silty CLAY with rare siltstone.

Preparation : Sample as received

Water Content : (BS EN ISO 17892-1:2014)	18.1	%
Percentage passing 425µm sieve :	99	%
Liquid Limit :	33	%
Plastic Limit :	20	%
Plasticity Index :	13	%
Equivalent Water Content of material passing 425µm sieve :	18.3	%
Liquidity Index :	-0.13	



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN
3733

GEOLABS

UKAS TESTING 1982

BS1377 : Part 2 : 1990 Clauses 4.4 & 5

LIQUID AND PLASTIC LIMITS

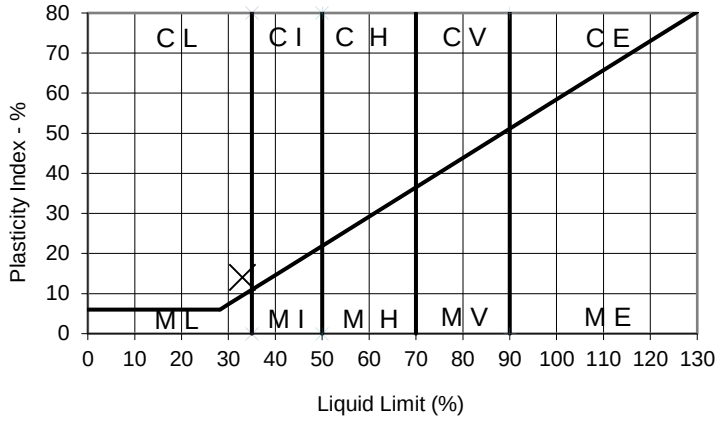
BH / TP	BH401
Depth (m)	6.00
Sample Type	D

Description:

Reddish brown and grey fine sandy silty CLAY.

Preparation : Sample as received

Water Content : (BS EN ISO 17892-1:2014)	22.5	%
Percentage passing 425µm sieve :	100	%
Liquid Limit :	33	%
Plastic Limit :	19	%
Plasticity Index :	14	%
Equivalent Water Content of material passing 425µm sieve :	22.5	%
Liquidity Index :	0.25	



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN
3733

GEOLABS

UKAS TESTING 1982

BS1377 : Part 2 : 1990 Clauses 4.4 & 5

LIQUID AND PLASTIC LIMITS

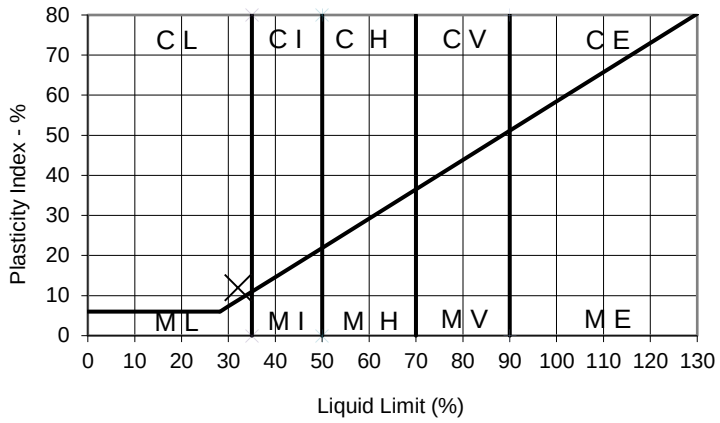
BH / TP	BH401
Depth (m)	7.50
Sample Type	D

Description:

Reddish brown and grey fine sandy silty CLAY with rare siltstone.

Preparation : Sample as received

Water Content : (BS EN ISO 17892-1:2014)	17.0	%
Percentage passing 425µm sieve :	99	%
Liquid Limit :	32	%
Plastic Limit :	20	%
Plasticity Index :	12	%
Equivalent Water Content of material passing 425µm sieve :	17.2	%
Liquidity Index :	-0.23	



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN
3733

GEOLABS

UKAS TESTING 1982

BS1377 : Part 2 : 1990 Clauses 4.4 & 5

LIQUID AND PLASTIC LIMITS

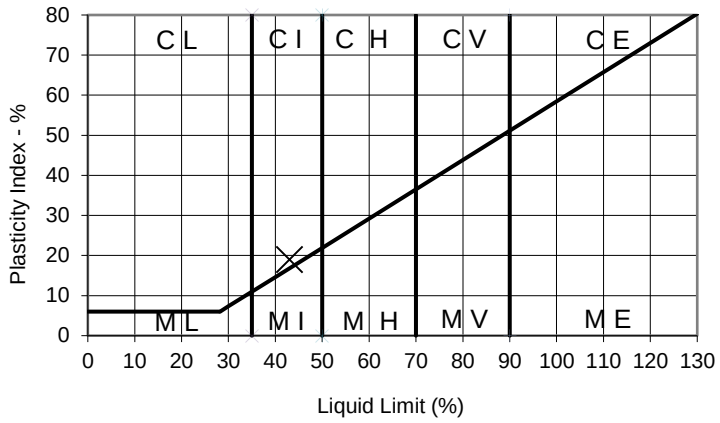
BH / TP	BH403
Depth (m)	1.20
Sample Type	D

Description:

Dark brown sandy silty CLAY with rare gravel.

Preparation : Sample as received

Water Content : (BS EN ISO 17892-1:2014)	27.1	%
Percentage passing 425µm sieve :	98	%
Liquid Limit :	43	%
Plastic Limit :	24	%
Plasticity Index :	19	%
Equivalent Water Content of material passing 425µm sieve :	27.7	%
Liquidity Index :	0.19	



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN
3733

GEOLABS

UKAS TESTING 1982

BS1377 : Part 2 : 1990 Clauses 4.4 & 5

LIQUID AND PLASTIC LIMITS

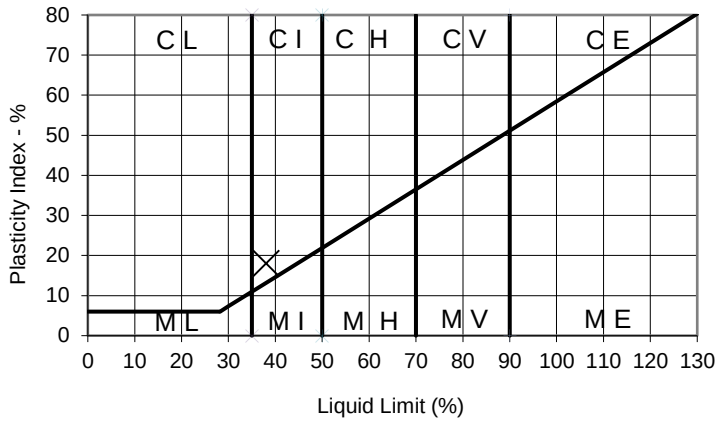
BH / TP	BH403
Depth (m)	3.00
Sample Type	D

Description:

Dark grey fine sandy silty CLAY with rare siltstone.

Preparation : Sample as received

Water Content : (BS EN ISO 17892-1:2014)	13.0	%
Percentage passing 425µm sieve :	99	%
Liquid Limit :	38	%
Plastic Limit :	20	%
Plasticity Index :	18	%
Equivalent Water Content of material passing 425µm sieve :	13.1	%
Liquidity Index :	-0.38	



Checked and Approved by:

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN
3733

GEOLABS

UKAS TESTING 1982

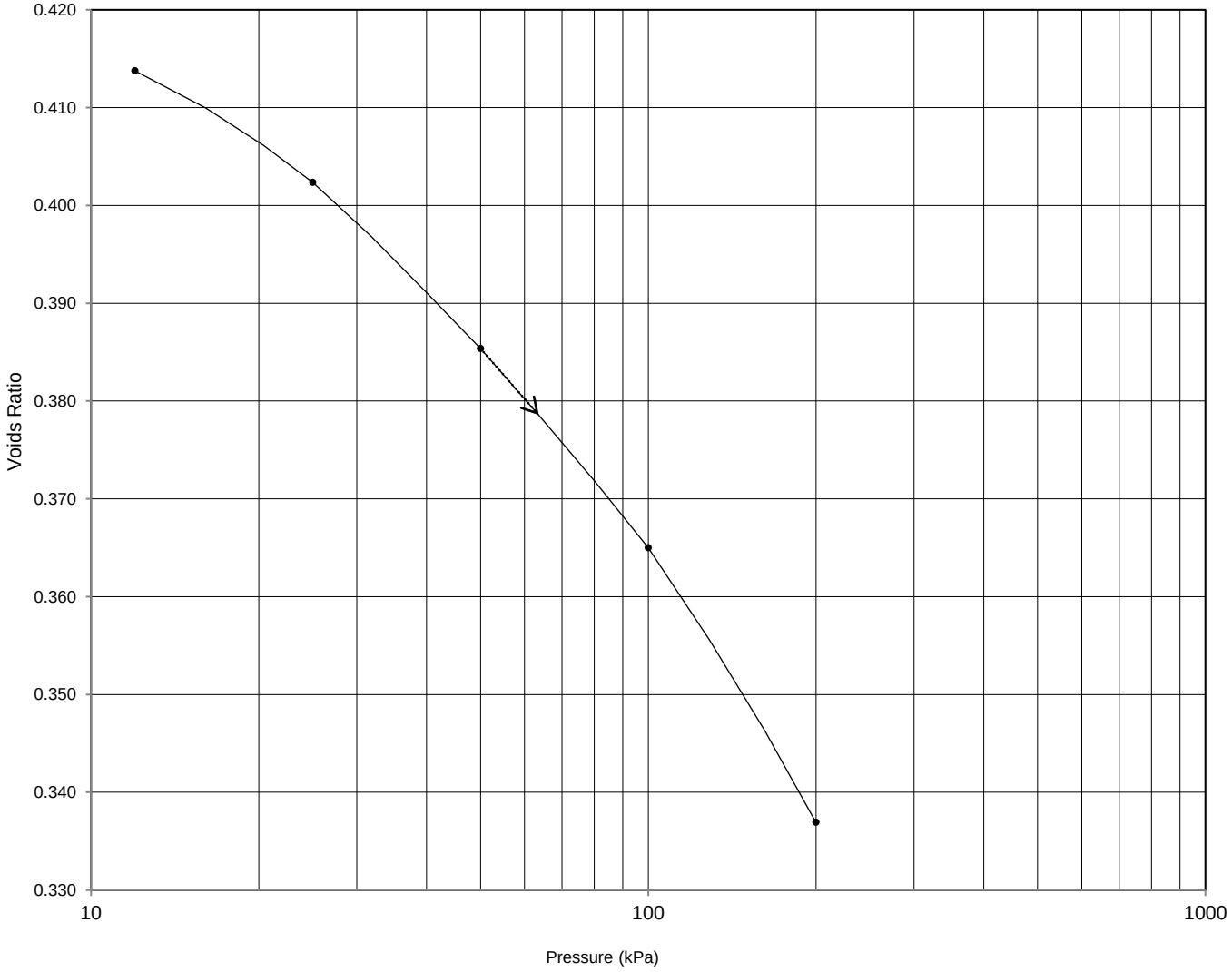
BS EN ISO 17892-5 : 2017

INCREMENTAL LOADING OEDOMETER TEST

BH / TP	BH402
Depth (m)	1.20-1.65
Sample Type	U
Orientation within original	Vertical
Specimen preparation	Undisturbed

Description:

Firm reddish brown mottled grey silty CLAY with rare fine to medium siltstone.



Initial Conditions:

Height	(mm)	19.00	Water Content	(%)	19.8	(from trimmings)
Diameter	(mm)	74.99	Voids Ratio		0.441	
Area	(mm^2)	4417	Bulk Density	(Mg/m^3)	2.20	
Volume	(cm^3)	83.92	Dry Density	(Mg/m^3)	1.84	
Laboratory Temperature	(ºC)	20.0	Particle density	(Mg/m^3)	2.65 (Assumed)	
			Degree of Saturation	(%)	100.0	

Results have been corrected for equipment deformation

Checked and Approved by

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN 3733

GEOLABS

BS EN ISO 17892-5 : 2017

INCREMENTAL LOADING OEDOMETER TEST

BH / TP	BH402
Depth (m)	1.20-1.65
Sample Type	U
Orientation within original	Vertical
Specimen preparation	Undisturbed

Description:

Firm reddish brown mottled grey silty CLAY with rare fine to medium siltstone.

Pressure Range (kPa)	m_v (m^2/MN)	c_v (m^2/year)	Time Fitting		Voids Ratio
			Method	minutes	
0 - 12	1.6	0.44	t50	20.8	0.414
12 - 25	0.62	0.67	t50	13.4	0.402
25 - 50	0.48	0.73	t50	12.0	0.385
50 - 100	0.29	1.1	t50	7.64	0.365
100 - 200	0.21	1.2	t50	6.92	0.337

Checked and Approved by

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN
3733

GEOLABS

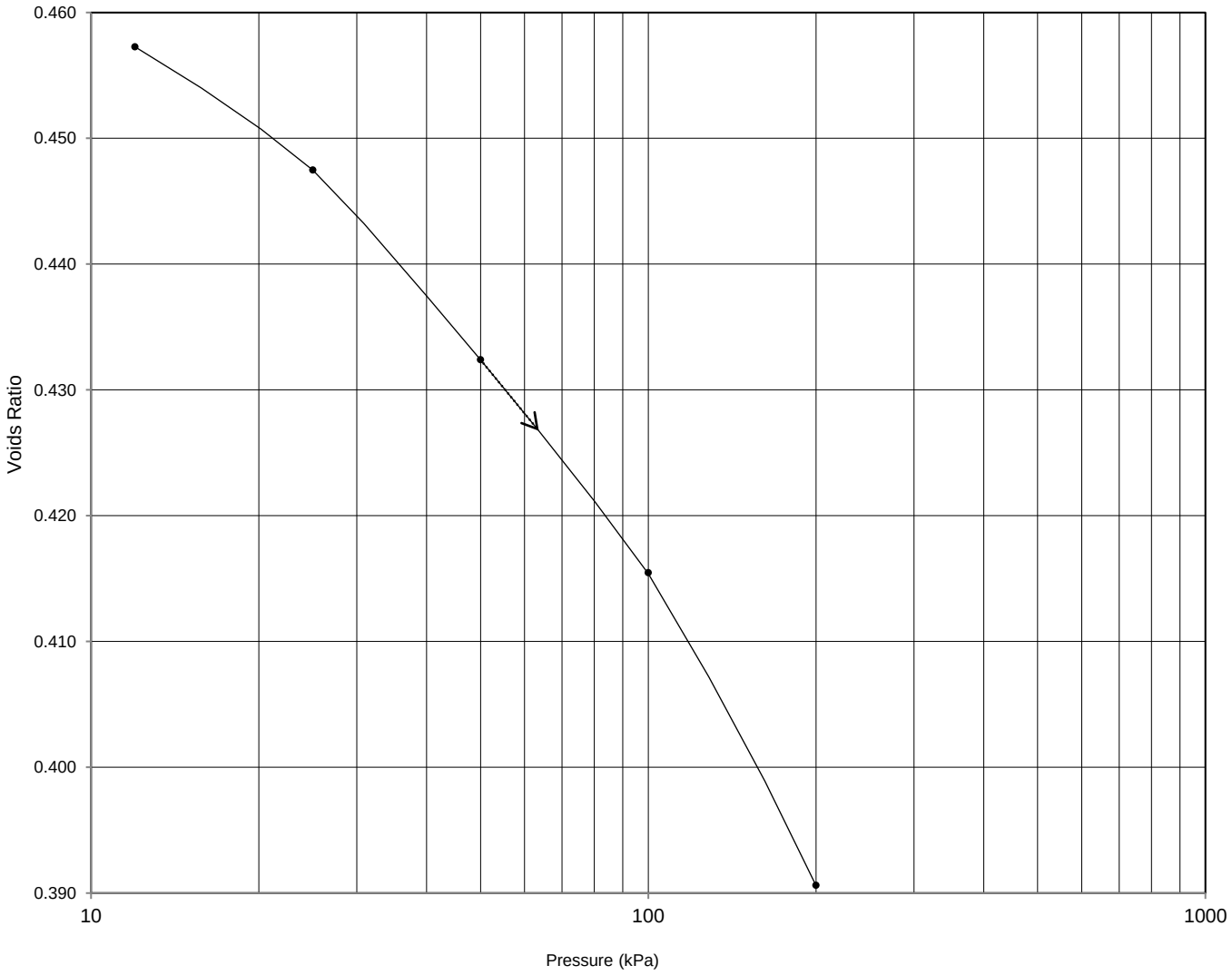
BS EN ISO 17892-5 : 2017

INCREMENTAL LOADING OEDOMETER TEST

BH / TP	BH403
Depth (m)	2.00-2.45
Sample Type	U
Orientation within original	Vertical
Specimen preparation	Undisturbed

Description:

Firm dark greyish brown sandy gravelly CLAY. Sand and gravel is fine to medium.



Initial Conditions:

Height	(mm)	18.99	Water Content	(%)	17.8	(from trimmings)
Diameter	(mm)	74.97	Voids Ratio		0.475	
Area	(mm^2)	4414	Bulk Density	(Mg/m^3)	2.12	
Volume	(cm^3)	83.83	Dry Density	(Mg/m^3)	1.80	
Laboratory Temperature	(ºC)	20.0	Particle density	(Mg/m^3)	2.65 (Assumed)	
			Degree of Saturation	(%)	99.3	

Results have been corrected for equipment deformation

Checked and Approved by

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN
3733

GEOLABS

BS EN ISO 17892-5 : 2017

INCREMENTAL LOADING OEDOMETER TEST

BH / TP	BH403
Depth (m)	2.00-2.45
Sample Type	U
Orientation within original	Vertical
Specimen preparation	Undisturbed

Description:

Firm dark greyish brown sandy gravelly CLAY. Sand and gravel is fine to medium.

Pressure Range (kPa)	m_v (m^2/MN)	c_v (m^2/year)	Time Fitting		Voids Ratio
			Method	minutes	
0 - 12	0.99	0.30	t50	31.0	0.457
12 - 25	0.52	0.34	t50	26.8	0.447
25 - 50	0.42	0.52	t50	17.2	0.432
50 - 100	0.24	0.67	t50	13.1	0.415
100 - 200	0.18	1.4	t50	6.06	0.391

Checked and Approved by

J Sturges - Operations Manager
28/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN
3733

GEOLABS

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
BH401	-	9.49 - 9.76	Very weak to extremely weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Completely weathered. Low reaction to HCL	14	100	2.26	1.98	85.70	179.60	2.1	1.5	0.26		19/03/19	
BH401	-	12.63-12.85	Very weak to extremely weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Completely weathered. Low reaction to HCL	12	91.0	2.23	1.98	86.30	192.50	2.2	1.7	0.291		19/03/19	
BH402	-	10.66-10.84	Medium strong to weak, thinly laminated, greenish grey, fine grained SANDSTONE. Slightly to moderately weathered	4.4	89.0	2.49	2.38	86.40	172.10	2.0	137.5	23.5		19/03/19	
BH402	-	13.12-13.29	Very weak to extremely weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Highly to completely weathered. Low reaction to HCL	9.3	100	2.37	2.16	86.90	172.90	2.0	9.5	1.6		19/03/19	
BH403	-	13.70-13.93	Weak, to very weak, thinly laminated, greyish brown SILTSTONE alternating with fine grained SANDSTONE. Moderately to highly weathered	7.9	89.2	2.35	2.18	86.20	173.90	2.0	41.2	7.06		19/03/19	

Note: The dimensional requirements of flatness (<0.02 mm), perpendicularity (<0.05 / 50 mm) and straightness (0.3 mm deviation) are not 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: 26/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN 3733

GEOLABS®

UKAS TESTING 1982

ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 - 2006

Unconfined Compressive Strength

Borehole Ref.:	BH401
Sample Ref.:	-
Depth (m):	9.49 - 9.76

Description:
Very weak to extremely weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Completely weathered. Low reaction to HCL

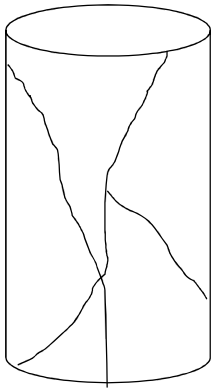
Diameter	85.70 mm
Height	179.60 mm
Bulk Density	2.26 Mg/m³
Dry Density	1.98 Mg/m³
Water Content	14 %

Degree of Saturation: 100 % Specific Gravity: 2.7 Mg/m³ (Assumed)

LF0879C (1000kN) compression frame used

Failure Sketch

Mode of failure: Multiple fracturing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Date tested: 19/03/2019

Angle of foliation/Horizontal: n/a
Angle of shear plane/Horizontal: n/a

Sample type	C

Test results

Unconfined Compressive Strength	0.26 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	n/a
Poisson's Ratio (secant at 10% failure load)	n/a

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are not met.

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN 3733

GEOLABS®

ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 - 2006

Unconfined Compressive Strength

Borehole Ref.:	BH401
Sample Ref.:	-
Depth (m):	12.63-12.85

Description:
Very weak to extremely weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Completely weathered. Low reaction to HCL

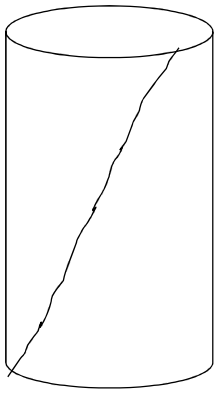
Diameter	86.30 mm
Height	192.50 mm
Bulk Density	2.23 Mg/m³
Dry Density	1.98 Mg/m³
Water Content	12 %

Degree of Saturation: 91.0 % Specific Gravity: 2.7 Mg/m³ (Assumed)

LF0879C (1000kN) compression frame used

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Angle of foliation/Horizontal: n/a
Angle of shear plane/Horizontal: 105°

Date tested: 19/03/2019

Test results

Unconfined Compressive Strength	0.291 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	n/a
Poisson's Ratio (secant at 10% failure load)	n/a

Sample type	**C**

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are not met.

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN 3733

GEOLABS®

ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 - 2006

Unconfined Compressive Strength

Borehole Ref.:	BH402
Sample Ref.:	-
Depth (m):	10.66-10.84

Description:
Medium strong to weak, thinly laminated, greenish grey, fine grained SANDSTONE. Slightly to moderately weathered

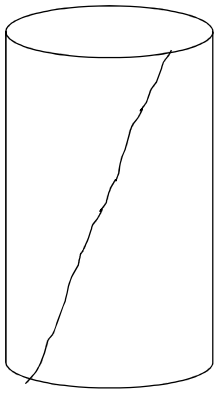
Diameter	86.40 mm
Height	172.10 mm
Bulk Density	2.49 Mg/m³
Dry Density	2.38 Mg/m³
Water Content	4.4 %

Degree of Saturation: 89.0 % Specific Gravity: 2.7 Mg/m³ (Assumed)

LF0879C (1000kN) compression frame used

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Angle of foliation/Horizontal: n/a
Angle of shear plane/Horizontal: 100°

Date tested: 19/03/2019

Test results

Unconfined Compressive Strength	23.5 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	n/a
Poisson's Ratio (secant at 10% failure load)	n/a

Sample type	**C**

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are not met.

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN 3733

GEOLABS®

ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 - 2006

Unconfined Compressive Strength

Borehole Ref.:	BH402
Sample Ref.:	-
Depth (m):	13.12-13.29

Description:
Very weak to extremely weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Highly to completely weathered. Low reaction to HCL

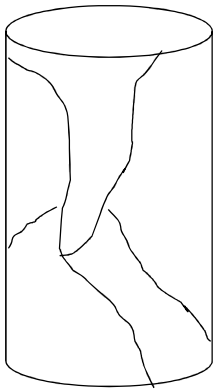
Diameter	86.90 mm
Height	172.90 mm
Bulk Density	2.37 Mg/m³
Dry Density	2.16 Mg/m³
Water Content	9.3 %

Degree of Saturation: 100 % Specific Gravity: 2.7 Mg/m³ (Assumed)

LF0879C (1000kN) compression frame used

Failure Sketch

Mode of failure: Multiple fracturing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Angle of foliation/Horizontal: n/a
Angle of shear plane/Horizontal: n/a

Sample type	C

Date tested: 19/03/2019

Test results

Unconfined Compressive Strength	1.6 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	n/a
Poisson's Ratio (secant at 10% failure load)	n/a

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are not met.

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN 3733

GEOLABS®

ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 - 2006

Unconfined Compressive Strength

Borehole Ref.:	BH403
Sample Ref.:	-
Depth (m):	13.70-13.93

Description:
Weak, to very weak, thinly laminated, greyish brown SILTSTONE alternating with fine grained SANDSTONE. Moderately to highly weathered

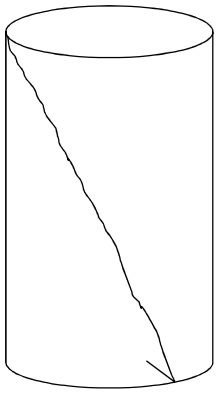
Diameter	86.20 mm
Height	173.90 mm
Bulk Density	2.35 Mg/m³
Dry Density	2.18 Mg/m³
Water Content	7.9 %

Degree of Saturation: 89.2 % Specific Gravity: 2.7 Mg/m³ (Assumed)

LF0879C (1000kN) compression frame used

Failure Sketch

Mode of failure: Diagonal shearing



Solid lines for material failures.
Dashed lines for apparent weakness failure.

Angle of foliation/Horizontal: n/a
Angle of shear plane/Horizontal: 70°

Sample type	C

Date tested: 19/03/2019

Test results

Unconfined Compressive Strength	7.06 MPa
Young's Modulus (tangential at 50% failure load)	n/a
Poisson's Ratio (tangential at 50% failure load)	n/a
Young's Modulus (secant at 10% failure load)	n/a
Poisson's Ratio (secant at 10% failure load)	n/a

Note: The dimensional requirements of Flatness (<0.02 mm), Perpendicularity (<0.05 / 50 mm) and Straightness (0.3 mm deviation) are not met.

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN 3733

GEOLABS®

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) Start D	Platen separation (mm) End D'	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)
BH401	-	12.35-12.52	Very weak to extremely weak, brown and greenish grey specks SILTSTONE / MUDSTONE. Completely weathered. High reaction to HCL	22/03/19	A	Pd	86.4	71.5	62.6	-	83.0	0.38	0.05	1.26	0.06
BH401	-	12.50-12.63	Very weak to extremely weak, brown and greenish grey specks SILTSTONE / MUDSTONE. Completely weathered. High reaction to HCL	22/03/19	A	Pd	85.8	69.3	62.1	-	82.4	0.48	0.07	1.25	0.09
BH401	-	10.00-10.12	Very weak to extremely weak, brown and greenish grey specks SILTSTONE / MUDSTONE. Completely weathered. High reaction to HCL	22/03/19	A	Pd	86.7	74.3	65.1	-	84.8	0.43	0.06	1.27	0.08
BH401	-	14.59-14.76	Very weak to extremely weak, thinly laminated brown and greenish grey specks SILTSTONE alternating with MUDSTONE. Highly weathered. High reaction to HCL	22/03/19	A	Pd	86.1	70.2	64.6	-	84.2	0.45	0.06	1.26	0.08
BH401	-	14.87-15.00	Very weak to extremely weak, brown and greenish grey specks SILTSTONE / MUDSTONE. Completely weathered. High reaction to HCL	22/03/19	A	Pd	86.4	75.4	67.1	-	85.9	0.33	0.04	1.28	0.05
BH402	-	5.65-5.77	Weak to very weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Moderately weathered. High reaction to HCL	22/03/19	A	Pd	86.3	72.4	67.5	-	86.1	0.76	0.10	1.28	0.13
BH402	-	5.84-5.97	Very weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Moderately weathered. High reaction to HCL	22/03/19	A	Pd	85.9	71.4	64.6	-	84.1	0.88	0.12	1.26	0.15
BH402	-	7.86-7.96	Weak, thinly laminated, greenish grey SILTSTONE alternating with fine grained SANDSTONE. Moderately weathered	22/03/19	A	Pd	86.4	60.3	54.1	-	77.1	3.60	0.61	1.22	0.74
BH402	-	8.50-8.63	Weak, thinly laminated, greenish grey SILTSTONE alternating with fine grained SANDSTONE. Moderately weathered	22/03/19	A	Pd	86.4	46.8	43.2	-	68.9	4.11	0.86	1.16	0.99
BH402	-	8.90-9.00	Weak, thinly laminated, greenish grey SILTSTONE alternating with fine grained SANDSTONE. Moderately weathered	22/03/19	A	Pd	86.4	58.6	51.7	-	75.4	7.86	1.38	1.20	1.66

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **L** - Irregular lump **Pd** - Perpendicular to planes of weakness **R** - Random or unknown orientation **Pl** - Parallel to planes of weakness

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN 3733

GEOLABS

UKAS TESTING 1982

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) Start D	Platen separation (mm) End D'	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)
BH402	-	10.20-10.35	Strong to medium strong, thinly laminated, greenish grey, fine grained SANDSTONE. Slightly to moderately weathered	22/03/19	A	Pd	86.7	78.5	73.2	-	89.9	21.52	2.66	1.30	3.46
BH402	-	11.56-11.70	Weak to very weak, thinly laminated, brownish grey SILTSTONE alternating with MUDSTONE. Moderately weathered	22/03/19	A	Pd	85.6	65.4	58.7	-	80.0	2.20	0.34	1.24	0.42
BH402	-	11.90-12.00	Weak, thinly laminated, greenish grey SILTSTONE alternating with fine grained SANDSTONE. Moderately weathered	22/03/19	A	Pd	86.4	66.1	52.4	-	75.9	5.43	0.94	1.21	1.13
BH402	-	12.70-12.84	Very weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Moderately weathered. High reaction to HCL	22/03/19	A	Pd	86.3	71.5	65.4	-	84.8	0.98	0.14	1.27	0.18
BH402	-	13.65-13.76	Very weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Moderately weathered. High reaction to HCL	22/03/19	A	Pd	86.3	64.6	56.2	-	78.6	0.85	0.14	1.23	0.17
BH403	-	9.85-10.00	Very weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Moderately weathered. High reaction to HCL	22/03/19	A	Pd	86.4	72.1	63.6	-	83.6	1.05	0.15	1.26	0.19
BH403	-	13.00-13.11	Very weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Moderately weathered. High reaction to HCL	22/03/19	A	Pd	85.4	68.9	63.1	-	82.8	0.68	0.10	1.26	0.13
BH403	-	14.00-14.10	Weak to very weak, thinly laminated brown and grey SILTSTONE alternating with MUDSTONE. Moderately weathered	22/03/19	A	Pd	86.0	46.4	41.5	-	67.4	1.62	0.36	1.14	0.41
BH403	-	14.27-14.39	Very weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Moderately weathered	22/03/19	A	Pd	85.9	63.2	57.4	-	79.2	0.28	0.05	1.23	0.06

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **L** - Irregular lump **Pd** - Perpendicular to planes of weakness **R** - Random or unknown orientation **Pl** - Parallel to planes of weakness

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN
3733

GEOLABS®

UKAS TESTING 1982

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) Start D	Platen separation (mm) End D'	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)
BH401	-	12.35-12.52	Very weak to extremely weak, brown and greenish grey specks SILTSTONE / MUDSTONE. Completely weathered. High reaction to HCL	22/03/19	A	Pd	86.4	71.5	62.6	-	83.0	0.38	0.05	1.26	0.06
BH401	-	12.50-12.63	Very weak to extremely weak, brown and greenish grey specks SILTSTONE / MUDSTONE. Completely weathered. High reaction to HCL	22/03/19	A	Pd	85.8	69.3	62.1	-	82.4	0.48	0.07	1.25	0.09
BH401	-	10.00-10.12	Very weak to extremely weak, brown and greenish grey specks SILTSTONE / MUDSTONE. Completely weathered. High reaction to HCL	22/03/19	A	Pd	86.7	74.3	65.1	-	84.8	0.43	0.06	1.27	0.08
BH401	-	14.59-14.76	Very weak to extremely weak, thinly laminated brown and greenish grey specks SILTSTONE alternating with MUDSTONE. Highly weathered. High reaction to HCL	22/03/19	A	Pd	86.1	70.2	64.6	-	84.2	0.45	0.06	1.26	0.08
BH401	-	14.87-15.00	Very weak to extremely weak, brown and greenish grey specks SILTSTONE / MUDSTONE. Completely weathered. High reaction to HCL	22/03/19	A	Pd	86.4	75.4	67.1	-	85.9	0.33	0.04	1.28	0.05
BH402	-	5.65-5.77	Weak to very weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Moderately weathered. High reaction to HCL	22/03/19	A	Pd	86.3	72.4	67.5	-	86.1	0.76	0.10	1.28	0.13
BH402	-	5.84-5.97	Very weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Moderately weathered. High reaction to HCL	22/03/19	A	Pd	85.9	71.4	64.6	-	84.1	0.88	0.12	1.26	0.15
BH402	-	7.86-7.96	Weak, thinly laminated, greenish grey SILTSTONE alternating with fine grained SANDSTONE. Moderately weathered	22/03/19	A	Pd	86.4	60.3	54.1	-	77.1	3.60	0.61	1.22	0.74
BH402	-	8.50-8.63	Weak, thinly laminated, greenish grey SILTSTONE alternating with fine grained SANDSTONE. Moderately weathered	22/03/19	A	Pd	86.4	46.8	43.2	-	68.9	4.11	0.86	1.16	0.99
BH402	-	8.90-9.00	Weak, thinly laminated, greenish grey SILTSTONE alternating with fine grained SANDSTONE. Moderately weathered	22/03/19	A	Pd	86.4	58.6	51.7	-	75.4	7.86	1.38	1.20	1.66

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **L** - Irregular lump **Pd** - Perpendicular to planes of weakness **R** - Random or unknown orientation **Pl** - Parallel to planes of weakness

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN 3733

GEOLABS

UKAS TESTING 1982

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) Start D	Platen separation (mm) End D'	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)
BH402	-	10.20-10.35	Strong to medium strong, thinly laminated, greenish grey, fine grained SANDSTONE. Slightly to moderately weathered	22/03/19	A	Pd	86.7	78.5	73.2	-	89.9	21.52	2.66	1.30	3.46
BH402	-	11.56-11.70	Weak to very weak, thinly laminated, brownish grey SILTSTONE alternating with MUDSTONE. Moderately weathered	22/03/19	A	Pd	85.6	65.4	58.7	-	80.0	2.20	0.34	1.24	0.42
BH402	-	11.90-12.00	Weak, thinly laminated, greenish grey SILTSTONE alternating with fine grained SANDSTONE. Moderately weathered	22/03/19	A	Pd	86.4	66.1	52.4	-	75.9	5.43	0.94	1.21	1.13
BH402	-	12.70-12.84	Very weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Moderately weathered. High reaction to HCL	22/03/19	A	Pd	86.3	71.5	65.4	-	84.8	0.98	0.14	1.27	0.18
BH402	-	13.65-13.76	Very weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Moderately weathered. High reaction to HCL	22/03/19	A	Pd	86.3	64.6	56.2	-	78.6	0.85	0.14	1.23	0.17
BH403	-	9.85-10.00	Very weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Moderately weathered. High reaction to HCL	22/03/19	A	Pd	86.4	72.1	63.6	-	83.6	1.05	0.15	1.26	0.19
BH403	-	13.00-13.11	Very weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Moderately weathered. High reaction to HCL	22/03/19	A	Pd	85.4	68.9	63.1	-	82.8	0.68	0.10	1.26	0.13
BH403	-	14.00-14.10	Weak to very weak, thinly laminated brown and grey SILTSTONE alternating with MUDSTONE. Moderately weathered	22/03/19	A	Pd	86.0	46.4	41.5	-	67.4	1.62	0.36	1.14	0.41
BH403	-	14.27-14.39	Very weak, thinly laminated, brown SILTSTONE alternating with MUDSTONE. Moderately weathered	22/03/19	A	Pd	85.9	63.2	57.4	-	79.2	0.28	0.05	1.23	0.06

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **L** - Irregular lump **Pd** - Perpendicular to planes of weakness **R** - Random or unknown orientation **Pl** - Parallel to planes of weakness

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 26/03/2019

Project Number:

GEO / 28934

Project Name:

MM PLAN
3733

GEOLABS®

UKAS TESTING 1982

COMPLEX CHALLENGES ...
MADE SIMPLE

APPENDIX E – Ground Gas / Water Monitoring Results

ROC CONSULTING **Civil, Structural & Environmental Engineers** Commercial Wharf, 6 Commercial St, MCR, M15 4PZ	**Job No:**	3733	**Site:**	E Plots & MM Plan
	Date:	28/03/2019	**Client:**	Airport City Ltd Partnership
	Engineer:	MN	**Equipment:**	GFM 436

	2 Days Prior	1 Day Prior	On day of Monitoring
Weather Conditions:	Mild, overcast	Mild, scattered clouds	Sunny, scattered clouds
Barometric Pressure Trend:	Falling	Rising	Steady
Surface Ground Conditions:			Dry

VISIT ONE	**Start**	**Finish**
Time:	2.45	**Time:** 3.45
Barometric Pressure:	1020	**Barometric Pressure:** 1020
Background Oxygen:	21.0	**Background Oxygen:** 21.3

Monitoring Point	**Gas Concentration**												**Groundwater**			
		Peak						**Steady**								
BH N°	**Flow Rate (l/h)**	**CH_4 %**	**CO_2 %**	**O_2 %**	**LEL %**	**H2S/CO (ppm)**	**Flow Rate (l/h)**	**CH_4 %**	**CO_2 %**	**O_2 %**	**LEL %**	**H2S/CO (ppm)**	**Depth to Water**	**Depth to Base**	**Head of water**	**Remarks**
BH302	0.00	0.00	2.30	10.00	0.00	0/0	0.00	0.00	2.30	10.00	0.00	0/0	DRY	3.05	N/A	
BH303	0.00	0.00	2.00	18.20	0.00	0/0	0.00	0.00	2.00	18.20	0.00	0/0	DRY	1.57	N/A	
BH306A	0.00	0.30	1.20	13.70	0.00	0/0	0.00	0.00	1.20	13.70	0.00	0/0	4.80	5.00	0.20	
BH403	0.00	0.00	13.20	5.30	0.00	0/0	0.00	0.00	13.20	5.30	0.00	0/0	2.43	5.00	2.57	
WS403	0.00	0.00	1.50	17.80	0.00	0/0	0.00	0.00	1.50	17.80	0.00	0/0	2.34	2.75	0.41	
WS409	0.00	0.00	0.50	19.20	0.00	0/0	0.00	0.00	0.50	19.20	0.00	0/0	1.52	4.50	2.98	

Comments:

ROC CONSULTING **Civil, Structural & Environmental Engineers** Commercial Wharf, 6 Commercial St, MCR, M15 4PZ	**Job No:**	3733	**Site:**	E Plots & MM Plan
	Date:	04/04/2019	**Client:**	Airport City Ltd Partnership
	Engineer:	MN	**Equipment:**	GFM 436

	2 Days Prior	1 Day Prior	On day of Monitoring
Weather Conditions:	Cold, scattered showers	Overcast, cold	Some clouds, cold, rain showers
Barometric Pressure Trend:	Steady	Falling	Falling
Surface Ground Conditions:			Dry

VISIT TWO	**Start**	**Finish**	
Time:	1.20	**Time:**	2.40
Barometric Pressure:	985	**Barometric Pressure:**	982
Background Oxygen:	20.9	**Background Oxygen:**	20.6

Monitoring Point	**Gas Concentration**												**Groundwater**			
		Peak						**Steady**								
BH N°	**Flow Rate (l/h)**	**CH_4 %**	**CO_2 %**	**O_2 %**	**LEL %**	**H2S/CO (ppm)**	**Flow Rate (l/h)**	**CH_4 %**	**CO_2 %**	**O_2 %**	**LEL %**	**H2S/CO (ppm)**	**Depth to Water**	**Depth to Base**	**Head of water**	**Remarks**
BH302	0.10	0.00	3.40	7.80	0.00	0/0	0.10	0.00	3.40	7.80	0.00	0/0	DRY	3.07	N/A	
BH303	0.60	0.00	3.90	16.90	0.00	0/0	0.40	0.00	3.90	16.90	0.00	0/0	DRY	1.58	N/A	
BH306A	0.00	0.00	1.30	12.10	0.00	0/0	0.00	0.00	1.30	12.10	0.00	0/0	4.89	5.00	0.11	
BH403	1.30	0.00	15.50	2.00	0.00	0/0	0.90	0.00	15.50	2.00	0.00	0/0	2.45	5.00	2.55	
WS403	0.90	0.00	0.90	19.90	0.00	0/0	0.60	0.00	0.90	19.90	0.00	0/0	2.35	2.73	0.38	
WS409	0.90	0.00	0.40	20.20	0.00	0/0	0.90	0.00	0.40	20.20	0.00	0/0	1.05	5.26	4.21	

Comments:

ROC CONSULTING **Civil, Structural & Environmental Engineers** Commercial Wharf, 6 Commercial St, MCR, M15 4PZ	**Job No:**	3733	**Site:**	E Plots & MM Plan
	Date:	10/04/2019	**Client:**	Airport City Ltd Partnership
	Engineer:	LS	**Equipment:**	GFM 436

	2 Days Prior	1 Day Prior	On day of Monitoring
Weather Conditions:	mild, sunny	mild, sunny	mild, sunny
Barometric Pressure Trend:	Rising	Rising	Falling
Surface Ground Conditions:			Dry

VISIT THREE	**Start**	**Finish**	
Time:	14.25	**Time:**	15.30
Barometric Pressure:	1015	**Barometric Pressure:**	1013
Background Oxygen:	20.9	**Background Oxygen:**	20.8

Monitoring Point	**Gas Concentration**												**Groundwater**			
		Peak						**Steady**								
BH N°	**Flow Rate (l/h)**	**CH_4 %**	**CO_2 %**	**O_2 %**	**LEL %**	**H2S/CO (ppm)**	**Flow Rate (l/h)**	**CH_4 %**	**CO_2 %**	**O_2 %**	**LEL %**	**H2S/CO (ppm)**	**Depth to Water**	**Depth to Base**	**Head of water**	**Remarks**
BH302	0.00	0.00	3.70	8.30	<<<	0/0	0.00	0.00	3.70	8.30	<<<	0/0	DRY	3.70	DRY	
BH303	0.00	0.00	3.50	17.80	<<<	0/0	0.00	0.00	3.50	17.80	<<<	0/0	DRY	1.57	DRY	
BH306A	0.00	0.00	1.20	12.40	<<<	0/0	0.00	0.00	1.20	12.40	<<<	0/0	4.88	4.98	0.10	
BH403	0.00	0.00	14.80	2.00	<<<	0/0	0.00	0.00	14.80	2.00	<<<	0/0	2.70	4.94	2.24	
WS403	0.00	0.00	1.50	18.90	<<<	0/0	0.00	0.00	1.50	18.90	<<<	0/0	2.39	2.74	0.35	
WS409	0.00	0.00	0.40	20.10	<<<	0/0	0.00	0.00	0.40	20.10	<<<	0/0	1.40	5.21	3.81	

Comments:

ROC CONSULTING **Civil, Structural & Environmental Engineers** Commercial Wharf, 6 Commercial St, MCR, M15 4PZ	**Job No:**	3733	**Site:**	E Plots & MM Plan
	Date:	12/11/2019	**Client:**	Airport City Ltd Partnership
	Engineer:	LS	**Equipment:**	GFM 436

	2 Days Prior	1 Day Prior	On day of Monitoring
Weather Conditions:	Scattered showers	Rain	Cold, windy
Barometric Pressure Trend:	falling	falling	rising
Surface Ground Conditions:			Wet

VISIT FOUR	**Start**	**Finish**	
Time:	14:15	**Time:**	15:00
Barometric Pressure:	985	**Barometric Pressure:**	986
Background Oxygen:	20.8	**Background Oxygen:**	20.5

Monitoring Point	**Gas Concentration**												**Groundwater**			
		Peak						**Steady**								
BH N°	**Flow Rate (l/h)**	**CH_4 %**	**CO_2 %**	**O_2 %**	**LEL %**	**H2S/CO (ppm)**	**Flow Rate (l/h)**	**CH_4 %**	**CO_2 %**	**O_2 %**	**LEL %**	**H2S/CO (ppm)**	**Depth to Water**	**Depth to Base**	**Head of water**	**Remarks**
BH302	Well destroyed / inaccessible															
BH303	Well inaccessible															
BH306A	Well inaccessible															
BH403	Well destroyed															
WS403	0.00	0.00	0.10	19.20	<<<	0/0	0.00	0.00	0.10	19.20	<<<	0/0	0.50	2.63	2.13	
WS409	Flooded, unable to open cover															

Comments:



Picture 1: BH403



Picture 2: Approximate area of BH302



Picture 3: Approximate area of BH303



Picture 4: Approximate area of BH306a

Client: Airport City Ltd Partnerships

Name: E Plots & Mini Masterplan

Project number: 3733

Commercial Wharf,
6 Commercial Street,
Manchester,
M15 4PZ
T 0161 214 5390
W rocconsulting.com

RoC CONSULTING

APPENDIX F – Previous Site Investigation Information

Rotary Core Log

Borehole No. **BH202**

Sheet 1 of 4

Project Name: Airport City Bridge	Project No. 3590	Co-ords: 381889.57 - 385681.44	Hole Type RC
Location: Manchester Airport		Level: 69.41	Scale 1:30
Client: Manchester Airport Partnerships		Dates: 14/08/2017 - 16/08/2017	Logged By MN

Well	Water Strikes	Depth (m)	Type / Fl	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.02	69.39		Brown reworked CLAY with numerous roots, rootlets and organic matter (MADE GROUND)
										Orangish brown mottled grey, black and reddish brown slightly sandy REWORKED CLAY (MADE GROUND)
							0.60	68.81		Reddish brown occasionally mottled grey silty CLAY
							1.50	67.91		Light grey completely WEATHERED MUDSTONE. Recovered as silty gravelly clay.
							3.00	66.41		Dark reddish brown, becoming grey with depth, highly/completely WEATHERED MUDSTONE. Recovered as very clayey silty gravel.
		3.00 - 6.00		59	8	0				
		5.90	C				5.90	63.51		Dark grey, becoming reddish brown with depth,
										Continued on next sheet

Remarks

1) Hand dug inspection pit completed to 1.2mbgl 2) Groundwater not encountered 3) Borehole terminated at 19.5mbgl

Rotary Core Log

Borehole No. **BH202**

Sheet 2 of 4

Project Name: Airport City Bridge	Project No. 3590	Co-ords: 381889.57 - 385681.44	Hole Type RC
Location: Manchester Airport		Level: 69.41	Scale 1:30
Client: Manchester Airport Partnerships		Dates: 14/08/2017 - 16/08/2017	Logged By MN

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		6.00 - 8.50		73	52	19				thinly bedded MUDSTONE with numerous highly/completely weathered bands noted to 8.5m
		7.85	C							
		8.50	C							
		8.50 - 11.00		95	89	24				... 9.5m becoming grey
		10.10	C							
		10.40	C							
		10.75	C							
		11.60	C							

7 8 9 10 11 12

Continued on next sheet

Remarks

1) Hand dug inspection pit completed to 1.2mbgl 2) Groundwater not encountered 3) Borehole terminated at 19.5mbgl

Rotary Core Log

Borehole No. **BH202**

Sheet 3 of 4

Project Name: Airport City Bridge	Project No. 3590	Co-ords: 381889.57 - 385681.44	Hole Type RC
Location: Manchester Airport		Level: 69.41	Scale 1:30
Client: Manchester Airport Partnerships		Dates: 14/08/2017 - 16/08/2017	Logged By MN

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		12.10	C							
		11.00 - 13.50		70	41	0				
		13.50 - 16.70		73	51	9				
		15.25	C				15.30	54.11		... 14.7 - 14.9m band of dark reddish brown highly/ completely weathered
										Dark reddish brown highly/completely WEATHERED MUDSTONE. Recovered as clayey gravel with occasional intact sections.

13 14 15 16 17 18

Continued on next sheet

Remarks

1) Hand dug inspection pit completed to 1.2mbgl 2) Groundwater not encountered 3) Borehole terminated at 19.5mbgl

Rotary Core Log

Borehole No.
BH202
Sheet 4 of 4

Project Name: Airport City Bridge	Project No. 3590	Co-ords: 381889.57 - 385681.44	Hole Type RC
Location: Manchester Airport		Level: 69.41	Scale 1:30
Client: Manchester Airport Partnerships		Dates: 14/08/2017 - 16/08/2017	Logged By MN

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
		16.70 - 19.50		37	18	0	19.50	49.91		End of borehole at 19.50 m

19
20
21
22
23
24

Remarks
1) Hand dug inspection pit completed to 1.2mbgl 2) Groundwater not encountered 3) Borehole terminated at 19.5mbgl

Borehole Log

Borehole No. **BH203**

Sheet 1 of 2

Project Name: Airport City Bridge	Project No. 3590	Co-ords: 381900.26 - 385705.03	Hole Type CP
Location: Manchester Airport		Level: 72.87	Scale 1:25
Client: Manchester Airport Partnerships		Dates: 28/06/2017 - 28/06/2017	Logged By MN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.02	72.85		Brown slightly gravelly silty sand with numerous roots, rootlets and organic matter (TOPSOIL)
		0.30 - 0.40	ES					Brown mottled grey sandy clayey fine to coarse angular to rounded GRAVEL of brick, tile, concrete and mixed lithologies with rare plastic and wood fragments (MADE GROUND)
								... 0.4m large concrete boulder
		1.20		N=10 (3,4/3,3,2,2)	1.20	71.67		Brown mottled grey and yellowish brown very sandy very gravelly CLAY. Gravel is fine to coarse subangular to subrounded of brick, concrete and other lithologies (MADE GROUND)
								... 1.5m whole brick
		2.00		N=13 (6,3/3,4,3,3)				
		3.00		N=15 (4,3/2,3,6,4)				
					3.50	69.37		Brown mottled grey, black and orange slightly silty CLAY
					3.90	68.97		Reddish brown mottled light grey very silty CLAY with rare fine gravel of mudstone
		4.00		N=33 (4,4/7,9,6,11)				
					4.20	68.67		Light grey silty gravelly CLAY. Gravel is rare, fine, subangular of mudstone (HIGHLY WEATHERED MUDSTONE)
					5.00	67.87		Continued on next sheet

Remarks

1) Hand dug inspection pit completed to 1.2mbgl 2) Groundwater not encountered 3) Borehole terminated at 5.32mbgl due to SPT refusal on suspected bedrock

Borehole Log

Borehole No. **BH203**

Sheet 2 of 2

Project Name:	Airport City Bridge	Project No. 3590	Co-ords:	381900.26 - 385705.03	Hole Type CP
Location:	Manchester Airport		Level:	72.87	Scale 1:25
Client:	Manchester Airport Partnerships		Dates:	28/06/2017 - 28/06/2017	Logged By MN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		5.00		58 (4,8/58 for 245mm)				Light grey WEATHERED MUDSTONE with numerous mudstone fragments
					5.32	67.55		End of borehole at 5.32 m

6 7 8 9 10

Remarks

1) Hand dug inspection pit completed to 1.2mbgl 2) Groundwater not encountered 3) Borehole terminated at 5.32mbgl due to SPT refusal on suspected bedrock

Borehole Log

Borehole No. **BH204**

Sheet 1 of 2

Project Name: Airport City Bridge	Project No. 3590	Co-ords: 381852.96 - 385714.75	Hole Type CP
Location: Manchester Airport		Level: 75.62	Scale 1:25
Client: Manchester Airport Partnerships		Dates: 27/06/2017 - 27/06/2017	Logged By MN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.02	75.60		Brown slightly gravelly silty sand with numerous roots, rootlets and organic matter (TOPSOIL)	
								Brown mottled grey sandy clayey fine to coarse angular to rounded GRAVEL of brick, tile and mixed lithologies (MADE GROUND)	
								... 0.5m section of brick wall	
		0.60 - 0.70	ES						
		0.70 - 0.80	ES					*... 0.7m whole brick*	
					1.00	74.62			1
		1.20		N=24 (5,3/5,6,7,6)				Brown mottled orange, grey and black slightly sandy gravelly CLAY. Gravel is fine to medium subangular to subrounded of brick, concrete and other mixed lithologies (MADE GROUND)	
		2.00		N=17 (4,4/3,4,5,5)					2
		3.00		N=12 (3,2/2,2,4,4)					3
		4.00		N=12 (2,2/3,3,3,3)				*... 4.0m becoming silty and less gravelly*	4
		5.00		N=15 (2,2/3,4,4,4)					5

Continued on next sheet

Remarks

1) Hand dug inspection pit completed to 1.2mbgl 2) Groundwater not encountered 3) Borehole terminated at 8.31mbgl due to SPT refusal on suspected bedrock

Borehole Log

Borehole No. **BH204**

Sheet 2 of 2

Project Name: Airport City Bridge	Project No. 3590	Co-ords: 381852.96 - 385714.75	Hole Type CP
Location: Manchester Airport		Level: 75.62	Scale 1:25
Client: Manchester Airport Partnerships		Dates: 27/06/2017 - 27/06/2017	Logged By MN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		6.00 - 6.45	U	Ublow=25	6.00	69.62		Reddish brown mottled bluish grey, yellowish brown and orange very sandy slightly gravelly CLAY
		7.00		N=26 (2,3/4,5,7,10)	7.10	68.52		Light grey mottled brown silty gravelly CLAY. Gravel is fine subangular to angular of mudstone (HIGHLY WEATHERED MUDSTONE)
								... 7.7m siltstone boulder
		8.00		50 (11,13/50 for 230mm)	8.00	67.62		Light grey WEATHERED MUDSTONE with numerous mudstone fragments
					8.31	67.32		End of borehole at 8.31 m

Remarks

1) Hand dug inspection pit completed to 1.2mbgl 2) Groundwater not encountered 3) Borehole terminated at 8.31mbgl due to SPT refusal on suspected bedrock

DRAFT

ROC CONSULTING

Location **Airport City North Jetparks 1**

Client: **Airport City Partnerships** Project Ref.:

Borehole No. **BH102**

Job No.: **ROC3407**

Equipment and methods **Rotary Diamond Core**

Start Date:	End Date:	Final Depth:	Casing Diameter	Casing Depth
15/03/2016	15/03/2016	15.30m	125mm	6.00m

Field Records: Drilling Records (Casing) Depth (m) / Core Dia. mm	Mechanical Log: RUN No	TCR %	SCR %	RQD %	If mm (Imax) [Imin]	Description: Detail Descriptions	Description: Stratum Descriptions	Strata: Depth & Thickness m	Strata: Reduced Level (m)	Strata: Legend
							Drillers Description: large stone Fill	(2.00)		
							Drillers Description: brown clay	2.00 (1.50)	68.40	
							Drillers Description: siltstone (reddish brown)	3.50 (2.50)	66.90	
CASED										
6.00					NI	.. 6.0-6.12m core loss	missing core	6.00 (0.12)	64.40	
					30 (60) [10]		Weak thinly bedded silty slightly fine sandy MUDSTONE, partially weathered low angle bedding, Numerous DIFs	6.12 (0.36)	64.28	
							Weak thinly bedded reddish brown silty slightly fine sandy MUDSTONE, partially weathered, low angle bedding, Numerous DIFs	6.48	63.92	
90mm	1	53	84	43			BOLLIN MUDSTONE	(2.72)		
					40 (160) [0]	.. 8.2-8.3m broken core recovered as mudstone gravel on bedding break .. 8.65-9.0m broken core recovered as mudstone gravel				
9.00							Weak locally very weak light brown colour banded thinly bedded silty slightly fine sandy MUDSTONE, partially weathered, low angle bedding, Numerous DIFs	9.20 (0.22)	61.20	
							Weak thinly bedded weak reddish brown silty MUDSTONE, partially weathered, low angle bedding. Core broken	9.42	60.98	

Remarks

1) Inspection pit to 1.0m
2) Open-hole drilled to 6.0m water flush with dragbit
3) Cased to 6.0m, 125mm dia
4) Core drilled using PWF (90mm) water flush to 15.3m
5) Borehole backfilled to surface with bentonite pellets

Logged by **NJ**

Drilled by **Danbar**

Ground level **70.40mAD**

Co-ordinates: **E:381848** **N:385839**

Note: DIF's refer to Drilling Induced Fractures

ROC CONSULTING

Location **Airport City North Jetparks 1**

Client: **Airport City Partnerships** Project Ref.:

DRAFT

Borehole No. **BH102**

Job No.: **ROC3407**

Equipment and methods **Rotary Diamond Core** Diameter Casing Depth

Start Date: **15/03/2016** End Date: **15/03/2016** Final Depth: **15.30m**

Field Records: Drilling Records (Casing) Depth (m) / Core Dia. mm	Mechanical Log: RUN No	TCR %	SCR %	RQD %	If mm ([max] [min])	Description: Detail Descriptions	Description: Stratum Descriptions	Strata: Depth & Thickness m	Strata: Reduced Level (m)	Legend
90mm	2	42	77	22	50 (160) [0]		and significant core loss, Numerous DIFs BOLLIN MUDSTONE	(1.18)		
								10.60	59.80	
							Weak thinly bedded reddish brown colour banded silty MUDSTONE, partially weathered, low angle bedding	(0.10)	59.70	
							Weak and medium strong thinly bedded greenish grey silty slightly fine sandy MUDSTONE, partially weathered, low angle bedding, Numerous DIFs BOLLIN MUDSTONE	10.70		
11.30					NI 40 NI	.. broken core .. 11.54-11.65m broken core recovered as mudstone gravel		(2.25)		
					60 (155) [10]	12.3-12.4m 60° cross cutting smooth joint .. 12.45-12.5m stiff clay infill on bedding .. 12.65-12.8m subvertical joint with core loss				
90mm	3	94	74	50	50 (101) [20] NI 30 (50) [10] NI 90 (430) [50]	..12.95-13.12m broken core recovered as mudstone gravel ..13.3m possible core loss	Weak and medium strong thinly bedded reddish brown silty slightly fine sandy MUDSTONE, partially weathered low angle bedding. , Numerous DIFs. Grey banding noted below 15.2m. BOLLIN MUDSTONE	12.95	57.45	
14.30								(2.35)		
90mm	4	91	86	82	150 (600) [0]	.. 14.5-14.67m wedge set of joints subhorizontal				
-{15/03/2016}-							**Borehole Complete**	15.30	55.10	

Remarks
1) Inspection pit to 1.0m
2) Open-hole drilled to 6.0m water flush with dragbit
3) Cased to 6.0m, 125mm dia
4) Core drilled using PWF (90mm) water flush to 15.3m
5) Borehole backfilled to surface with bentonite pellets

Logged by **NJ** Drilled by **Danbar**

Ground level **70.40mAD**

Co-ordinates: **E:381848** **N:385839**

Note: DIF's refer to Drilling Induced Fractures

ROC CONSULTING

Location **Airport City North Jetparks 2**

Client: **Airport City Partnerships** Project Ref.:

DRAFT

Borehole No. **BH202**

Job No.: **ROC3407**

Equipment and methods **Rotary Diamond Core**

Start Date:	End Date:	Final Depth:	Casing Diameter	Casing Depth
16/03/2016	16/03/2016	15.00m	125mm	6.00m

Field Records: Drilling Records (Casing) Depth (m) / Core Dia. mm	Mechanical Log: RUN No	TCR %	SCR %	RQD %	If mm (Imax) [Imin]	Description: Detail Descriptions	Description: Stratum Descriptions	Strata: Depth & Thickness m	Strata: Reduced Level (m)	Legend
							Drillers Description: road stone, 300mm over 100mm of granular fill	(0.30) 0.30	69.57	
							Drillers Descriptions: weathered grey mudstone	(2.70)		
3.00					0	..3.0-3.18m lost core		3.00	66.87	
					80 (80) [80]	.. 3.18-3.30m broken core recovered as mudstone gravel	Weak and medium strong thinly bedded silty slightly fine sandy MUDSTONE, partially weathered, broken core low angle bedding	(0.40) 3.40	66.47	
					NI	.. 3.4-3.5m broken on bedding				
90mm	1	67	71	0	200 (490) [70]	.. 3.5-3.67m subvertical slightly rough .. 3.67-3.75m broken core recovered as mudstone gravel .. 3.7-3.95m two cross cutting joint sets 40° and 50° to core axis	Weak and medium strong thinly bedded reddish brown some dark brown banding silty slightly fine sandy MUDSTONE, partially weathered, low angle bedding BOLLIN MUDSTONE	(2.60)		
					NI	.. 4.9m 10mm stiff clay infilled bedding break .. 5.05-5.15m broken core recovered as mudstone gravel				
					100 (340) [30]	5.5m DIF at 60° to core axis .. 5.67-5.7m broken core recovered as mudstone gravel				
CASED					NI			6.00	63.87	
6.00					40 (40) [0]	.. 6.3-6.36m broken core recovered as mudstone gravel	Core Loss	(0.12) 6.12	63.75	
							Weak thinly bedded reddish brown silty slightly fine sandy MUDSTONE, partially weathered, low angle bedding	(0.13) 6.25	63.62	
							Medium strong greenish grey thinly bedded silty slightly fine sandy MUDSTONE, partially weathered, horizontal bedding	(1.05)		
	2	89	40	88	NI	.. 7.33-7.4m broken core on bedding, 40°		7.30	62.57	
					40 (40) [30]		Weak thinly bedded greenish grey silty MUDSTONE partially weathered broken and some washouts BOLLIN MUDSTONE	(1.25)		
					NI	.. 7.55-7.74m broken core recovered as mudstone gravel				
					60 (100) [30]	.. 8.28-8.47m cross cutting joint slightly rough 70° to core axis				
					NI	.. 8.47-8.56m broken core recovered as mudstone gravel		8.55	61.32	
					60 (60) [40]		Weak and medium strong thinly bedded greyish brown and reddish brown silty slightly fine sandy MUDSTONE, partially weathered, some washouts on core	(0.45) 9.00	60.87	
9.00					NI	.. 8.87-9.14 broken core recovered as mudstone gravel				
					80 (104) [70]	.. 9.2-9.38m subvertical joint slightly	Weak thinly bedded reddish brown some greenish grey spots silty MUDSTONE, partially weathered low angle bedding steep angle cross cutting gypsum veins. Numerous DIFs	(1.35)		

Remarks
1) Inspection pit to 1.0m
2) Open-hole drilled to 3.0m water flush with dragbit
3) Cased to 3.0m, 125mm dia
4) Core drilled using PWF (90mm) water flush to 15.0m
5) Standpipe piezometer installed response zone 0.5-6.0m

Logged by **NJ** Drilled by **Danbar**

Ground level **69.87mAD**

Co-ordinates: **E:381975** **N:385746**

Note: DIF's refer to Drilling Induced Fractures

ROC CONSULTING

Location **Airport City North Jetparks 2**

Client: **Airport City Partnerships** Project Ref.:

DRAFT

Borehole No. **BH202**

Job No.: **ROC3407**

Equipment and methods **Rotary Diamond Core** Diameter Casing Depth

Start Date: **16/03/2016** End Date: **16/03/2016** Final Depth: **15.00m**

Field Records: Drilling Records {Casing} Depth (m) Core Dia. mm	Mechanical Log: RUN No	TCR %	SCR %	RQD %	If mm (Imax) [Imin]	Description: Detail Descriptions	Description: Stratum Descriptions	Strata: Depth & Thickness m	Strata: Reduced Level (m)	Legend
					NI	*rough*				
						.. 9.75-9.90 80º joint slightly rough				
90mm	3	85	65	42	100 (380) [60]	*.. 10.37-10.44 broken core recovered as mudstone gravel*	Medium strong thinly bedded reddish brown silty fine sandy MUDSTONE, partially weathered. Low angle bedding. Numerous DIFs BOLLIN MUDSTONE	10.35	59.52	
					NI					
					150 (200) [85]	*.. 10.72-10.84, 70º slightly rough joint, to core axis* *.. 11.28-11.40 Joint slightly rough 50º to core axis* *.. 11.6m broken core with 40º joint* *.. 11.66 subvertical joint on face of core.*		(1.65)		
					100 (140) [60]			12.00	57.87	
12.00						*..12.0-12.3m broken core with mudstone lumps*		(0.28)		
					NI		Weak thinly bedded greenish grey silty slightly fine sandy MUDSTONE, partially weathered, core broken.	12.28	57.59	
					100 (160) [100]	*.. 12.3-12.45m broken core recovered as mudstone gravel, 50º joint*		(0.42)		
90mm	4	35	71	23			Weak thinly bedded reddish brown silty MUDSTONE partially weathered, bedding 50º-60º to core axis Significant core loss core recovered is reddish brown mudstone gravel with silty fine sandy clay BOLLIN MUDSTONE	12.70	57.17	
					NI	*.. 13.0-14.0m core loss*		(1.30)		
14.00							Weak thinly bedded reddish brown colour banded silty slightly fine sandy MUDSTONE, partially weathered bedding, 40º to core axis	14.00	55.87	
								(0.50)		
90mm	5	100	81	35		*.. Broken core on 40º bedding*		14.50	55.37	
					60 (30) [100]		Weak medium strong reddish brown, some light brown colour banding silty fine slightly fine sandy MUDSTONE, partially weathered low subhorizonal bedding 60º to axis. Numerous DIFs	(0.30) 14.80	55.07	
-{16/03/2016}-						*.. 14.6-14.7m broken core on bedding, 40º*		(0.20) 15.00	54.87	
							Weak thinly bedded greenish grey silty MUDSTONE, partially weathered low angle bedding **Borehole Complete**			

Remarks

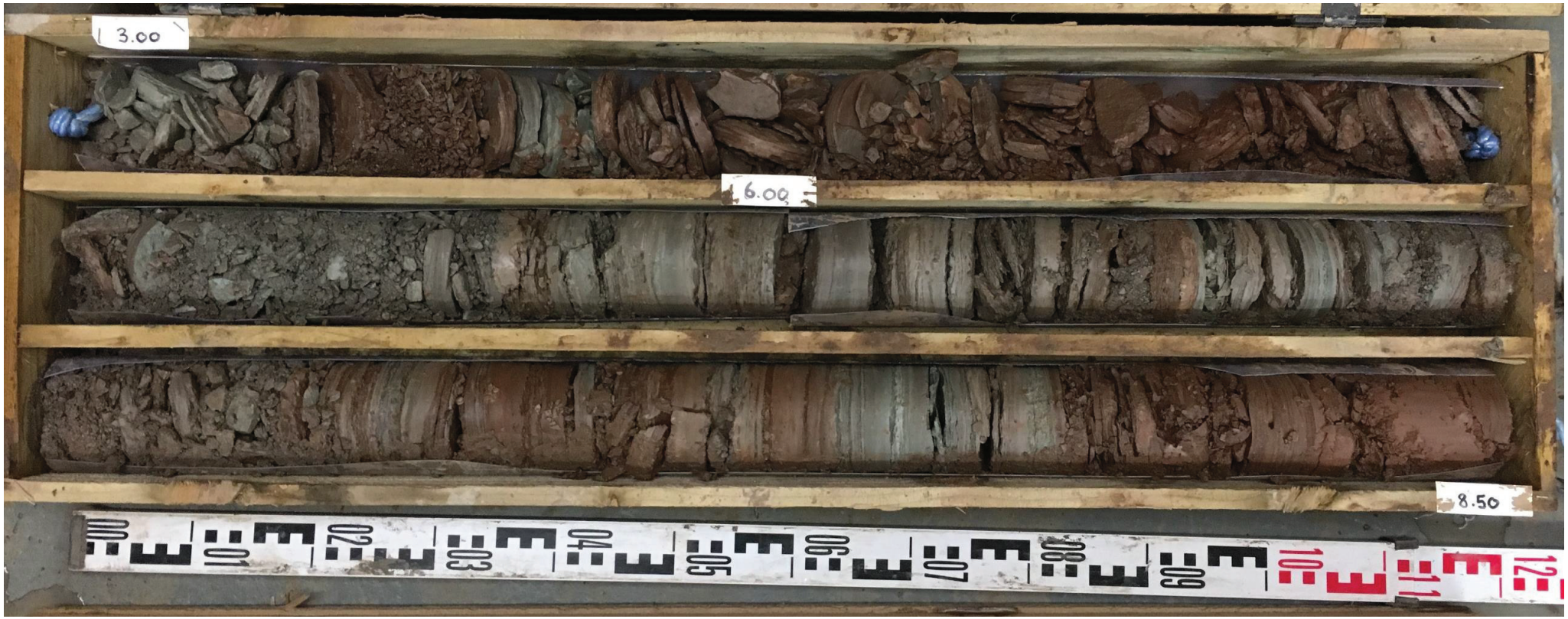
1) Inspection pit to 1.0m
2) Open-hole drilled to 3.0m water flush with dragbit
3) Cased to 3.0m, 125mm dia
4) Core drilled using PWF (90mm) water flush to 15.0m
5) Standpipe piezometer installed response zone 0.5-6.0m

Logged by **NJ** Drilled by **Danbar**

Ground level **69.87mAD**

Co-ordinates: **E:381975** **N:385746**

Note: DIF's refer to Drilling Induced Fractures



RoC CONSULTING	JOB NO	3590	SKETCH	BH202 Core Photographs	DRAWN BY
	PROJECT TITLE	Airport City Bridge	SKETCH TITLE	Core Runs 1 & 2 – 3.0m to 6.0m and 6.0m to 8.5m	MN 21/08/2017



RoC CONSULTING	JOB NO	3590	SKETCH	BH202 Core Photographs	DRAWN BY
	PROJECT TITLE	Airport City Bridge	SKETCH TITLE	Core Run 3 – 8.5m to 11.0m	MN 21/08/2017

COMPLEX CHALLENGES ... MADE SIMPLE



RoC CONSULTING	JOB NO	3590	SKETCH	BH202 Core Photographs	DRAWN BY
	PROJECT TITLE	Airport City Bridge	SKETCH TITLE	Core Run 4 – 11.0m to 13.5m	MN 21/08/2017



RoC CONSULTING	JOB NO	3590	SKETCH	BH202 Core Photographs	DRAWN BY
	PROJECT TITLE	Airport City Bridge	SKETCH TITLE	Core Run 5 – 13.5m to 16.7m	MN 21/08/2017



RoC CONSULTING	JOB NO	3590	SKETCH	BH202 Core Photographs	DRAWN BY
	PROJECT TITLE	Airport City Bridge	SKETCH TITLE	Core Run 6 – 16.7m to 19.5m	MN 21/08/2017

CORE RECORD PHOTOGRAPHS

Borehole Nº 102

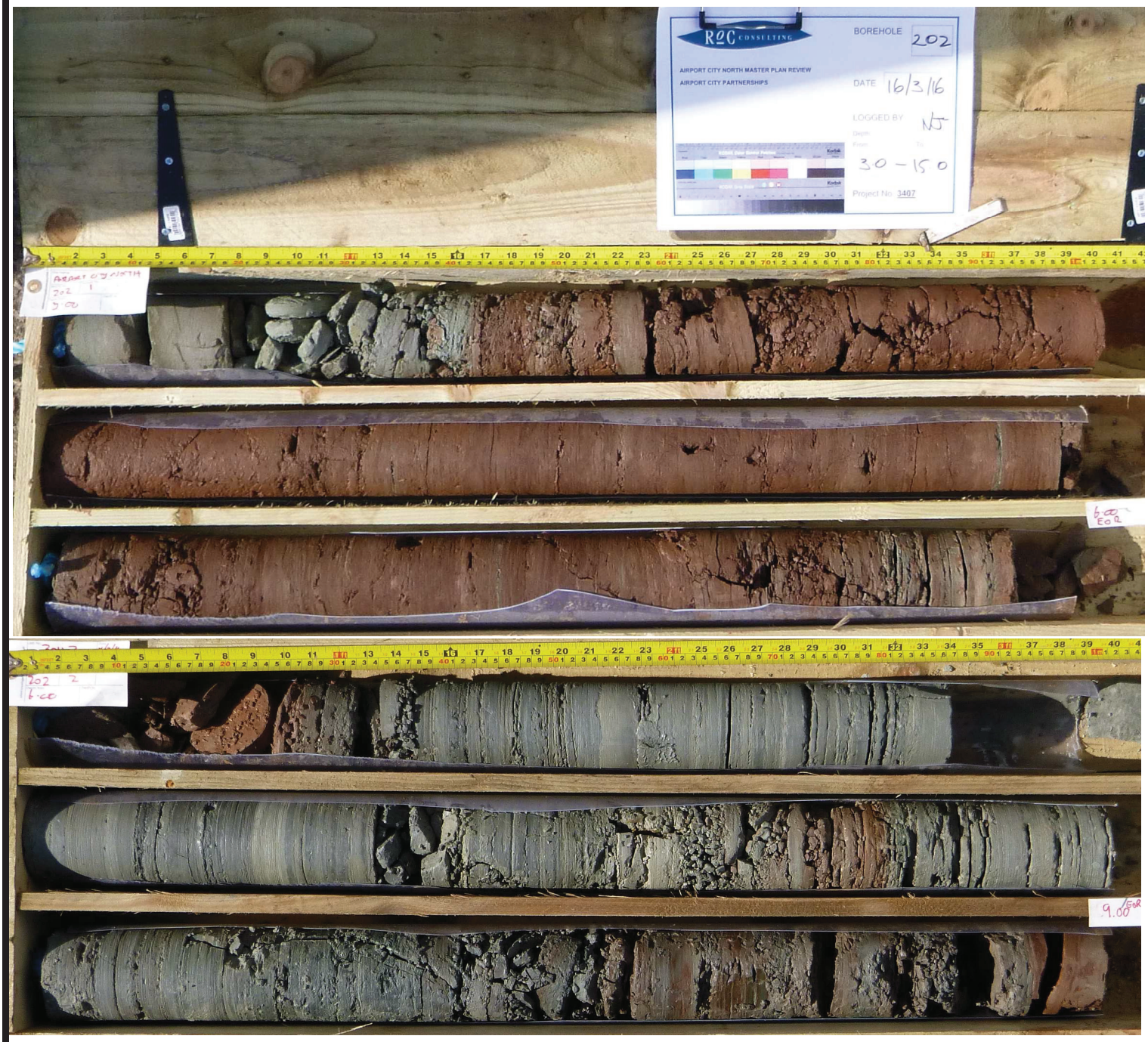


R⌀C CONSULTING

INFORMATION	
Job No.	3407
Project Title	Airport City North
Sketch Title	Rock Core Photographs.

CORE RECORD PHOTOGRAPHS

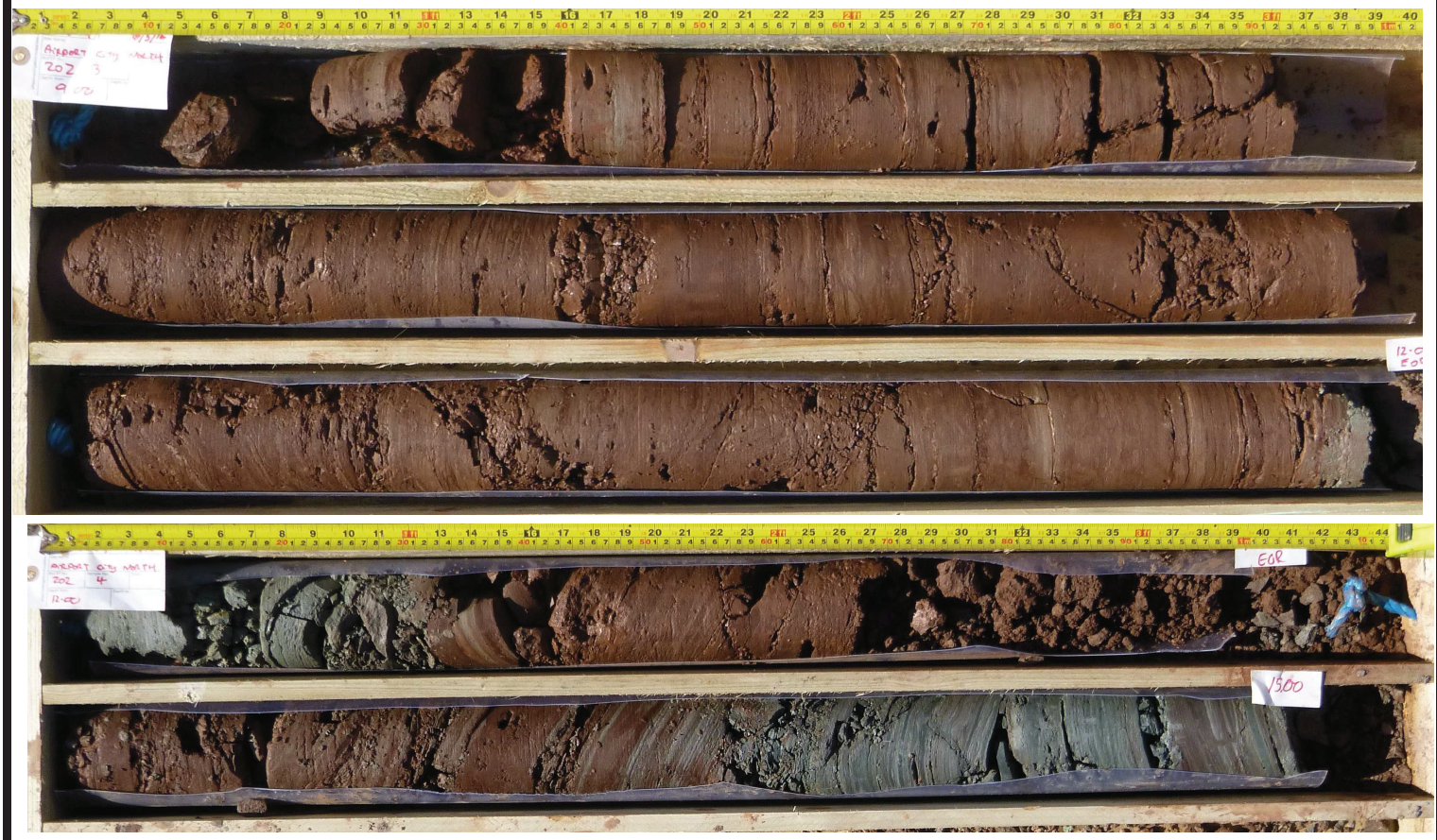
Borehole Nº 202



INFORMATION	
Job No.	3407
Project Title	Airport City North
Sketch Title	Rock Core Photographs.

CORE RECORD PHOTOGRAPHS

Borehole Nº 202



INFORMATION	
Job No.	3407
Project Title	Airport City North
Sketch Title	Rock Core Photographs.

APPENDIX C - CHEMICAL TESTING RESULTS

CONCEPT LIFE SCIENCES
DELIVERING SCIENCE

Concept Life Sciences is a trading name of Scientific Analysis Laboratories registered in England and Wales (No 2514788)

Concept Life Sciences

Certificate of Analysis

Hadfield House
Hadfield Street
Cornbrook
Manchester
M16 9FE
Tel : 0161 874 2400
Fax : 0161 874 2468

Report Number: 666193-1 Interim

Date of Report: 19-Jul-2017

Customer: RoC Consulting
Commercial Wharf
6 Commercial Street
Manchester
M15 4PZ

Customer Contact: Mr Alex Smiles

Customer Job Reference: 3590
Customer Purchase Order: 1219
Customer Site Reference: MAG Green Bridge
Date Job Received at Concept: 05-Jul-2017
Date Analysis Started: 06-Jul-2017
Date Analysis Completed:

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

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

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

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

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

UKAS TESTING
1549

mCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Report checked and authorised by :

Issued by :
Aleksandra Pacula
Project Manager

This document has been printed from a digitally signed master copy

Waste Acceptance Criteria

Customer Sample Reference : BH204 WAC
SAL Sample Reference : 666193 002
Project Site : MAG Green Bridge
Customer Reference : 3590
Top Depth : 0.60
Bottom Depth : 0.70
Date Sampled : 27-JUN-2017
Matrix Class : Sandy Soil

Soil					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Acid Neutralising Capacity (pH 4)	Titration	2	Mol/kg	N	<2			
Acid Neutralising Capacity (pH 7)	Titration	2	Mol/kg	N	<2			
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
Loss on Ignition	Grav	0.1	%	N	**4.2**			10.0
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
PCB EC7 (Sum)	Calc	0.070	mg/kg	U	(9, 26) <0.070	1.0		
pH	Probe			M	**7.7**		> 6.0	
Total Organic Carbon	OX/IR	0.1	%	N	<0.1	3.0	5.0	6.0
Total Petroleum Hydrocarbons C10-C40 (Sum)	Calc	1	mg/kg	N	(13) **130**	500.0		

Data for BS EN 12457-2 (10:1)					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic	Calc WAC ICP/MS	0.0020	mg/kg	N	**0.0065**	0.5	2.0	25.0
Barium	Calc WAC ICP/MS	0.010	mg/kg	N	**0.047**	20.0	100.0	300.0
Cadmium	Calc WAC ICP/MS	0.00020	mg/kg	N	<0.00020	0.04	1.0	5.0
Chloride	Calc (W)	10	mg/kg	N	<10	800.0	15000.0	25000.0
Chromium	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper	Calc WAC ICP/MS	0.0050	mg/kg	N	**0.010**	2.0	50.0	100.0
Dissolved Organic Carbon	Calc	10	mg/kg	N	**60**	500.0	800.0	1000.0
Fluoride	Calc (W)	0.50	mg/kg	N	**2.2**	10.0	150.0	500.0
Lead	Calc WAC ICP/MS	0.0030	mg/kg	N	**0.0095**	0.5	10.0	50.0
Mercury	Calc WAC ICP/MS	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.5	10.0	30.0
Nickel	Calc WAC ICP/MS	0.010	mg/kg	N	<0.010	0.4	10.0	40.0
Phenols (Total-Mono)	Calc	1.0	mg/kg	N	<1.0	1.0		
Selenium	Calc WAC ICP/MS	0.0050	mg/kg	N	<0.0050	0.1	0.5	7.0
Sulphate	Calc (W)	5	mg/kg	N	**14**	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc WAC ICP/MS	1000	mg/kg	N	<1000	4000.0	60000.0	100000.0
Zinc	Calc WAC ICP/MS	0.020	mg/kg	N	**0.022**	4.0	50.0	200.0

Following the recommendation from the Environment Agency (England and Wales)*, the leachate preparation in this report has been carried out to BS EN 12457-2 : One Stage batch test at a liquid to solid ratio of 10 l/kg. This is also compliant with Schedule 10 of the Environmental Permitting Regulations 2010.

Note : This is the minimum amount of testing which is required.

Further testing may be required if :

- evidence of immediately leachable parameters becomes available.
- evidence to indicate that the sample could be classified as hazardous under H1-H14 of the Waste(England and Wales) Regulations 2011(as amended) becomes available.

Acceptance of waste at landfill is always at the discretion of the Landfill Operator.

*** Waste Sampling and Testing for Disposal at Landfill, EBPRI 11507B, Environment Agency (England and Wales) March 2013**

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

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

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

Concept Reference: 666193
Project Site: MAG Green Bridge
Customer Reference: 3590

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	666193 001	666193 002	666193 003
				Customer Sample Reference	BH204 MG	BH204 WAC	BH203 MG
				Test Sample	AR	AR	AR
				Bottom Depth	0.80	0.70	0.40
				Top Depth	0.70	0.60	0.30
				Date Sampled	27-JUN-2017	27-JUN-2017	28-JUN-2017
				Matrix Class	Sandy Soil	Sandy Soil	Sandy Soil
Determinand	**Method**	**LOD**	**Units**	**Symbol**			
Moisture @105C	Grav (1 Dec) (105 C)	0.1	%	N	13	8.6	10

Concept Reference: 666193
Project Site: MAG Green Bridge
Customer Reference: 3590

Soil Analysed as Soil
MCERTS Preparation

				Concept Reference	666193 001	666193 002	666193 003
				Customer Sample Reference	BH204 MG	BH204 WAC	BH203 MG
				Test Sample	M40	M40	M40
				Bottom Depth	0.80	0.70	0.40
				Top Depth	0.70	0.60	0.30
				Date Sampled	27-JUN-2017	27-JUN-2017	28-JUN-2017
				Matrix Class	Sandy Soil	Sandy Soil	Sandy Soil
Determinand	**Method**	**LOD**	**Units**	**Symbol**			
Retained on 10mm sieve	Grav	0.1	%	N	<0.1	<0.1	<0.1

Concept Reference: 666193
Project Site: MAG Green Bridge
Customer Reference: 3590

Soil Analysed as Soil
RoC Maxi Suite 1

				Concept Reference	666193 001	666193 003
				Customer Sample Reference	BH204 MG	BH203 MG
				Test Sample	A40	A40
				Bottom Depth	0.80	0.40
				Top Depth	0.70	0.30
				Date Sampled	27-JUN-2017	28-JUN-2017
				Matrix Class	Sandy Soil	Sandy Soil
Determinand	**Method**	**LOD**	**Units**	**Symbol**		
Antimony	ICP/OES	1	mg/kg	U	3	3
Barium	ICP/OES	1	mg/kg	U	96	92
Sulphate (Total)	ICP/OES	0.01	%	N	0.02	0.05
Mass Fraction of organic carbon	Calc TOC/100			N	0.0091	0.0000
Beryllium	ICP/OES	2	mg/kg	U	<2	<2

Concept Reference: 666193
Project Site: MAG Green Bridge
Customer Reference: 3590

Soil Analysed as Soil
RoC Maxi Suite 1

					Concept Reference	666193 001	666193 003
					Customer Sample Reference	BH204 MG	BH203 MG
					Test Sample	AR	AR
					Bottom Depth	0.80	0.40
					Top Depth	0.70	0.30
					Date Sampled	27-JUN-2017	28-JUN-2017
					Matrix Class	Sandy Soil	Sandy Soil
Determinand	**Method**	**LOD**	**Units**	**Symbol**			
Boron (water-soluble)	ICP/OES	1	mg/kg	N		<1	<1
Chromium (trivalent)	Calc	2	mg/kg	N		**27**	**23**
Chromium VI	ICP/OES	1	mg/kg	N		<1	<1
pH	Probe			M		**7.7**	**7.8**
Sulphate(2:1)	ICP/OES	0.1	g/l	N		<0.1	<0.1
Cyanide (Total)	Colorimetry (CF)	1	mg/kg	M		<1	<1
Cyanide(free)	Colorimetry (CF)	1	mg/kg	M		<1	<1
Phenols (Total-Mono)	Colorimetry (CF)	1	mg/kg	M		<1	<1

Concept Reference: 666193
Project Site: MAG Green Bridge
Customer Reference: 3590

Soil Analysed as Soil
RoC Maxi Suite 1

					Concept Reference	666193 001	666193 003
					Customer Sample Reference	BH204 MG	BH203 MG
					Test Sample	M40	M40
					Bottom Depth	0.80	0.40
					Top Depth	0.70	0.30
					Date Sampled	27-JUN-2017	28-JUN-2017
					Matrix Class	Sandy Soil	Sandy Soil
Determinand	**Method**	**LOD**	**Units**	**Symbol**			
Arsenic	ICP/OES	2	mg/kg	M		**9**	**8**
Cadmium	ICP/OES	1	mg/kg	M		<1	<1
Copper	ICP/OES	1	mg/kg	M		**19**	**22**
Mercury	ICP/OES	1	mg/kg	M		<1	<1
Molybdenum	ICP/OES	1	mg/kg	M		**4**	**3**
Nickel	ICP/OES	1	mg/kg	M		**22**	**22**
Selenium	ICP/OES	3	mg/kg	M		<3	<3
Vanadium	ICP/OES	1	mg/kg	M		**28**	**26**
Zinc	ICP/OES	1	mg/kg	M		**45**	**60**
Chromium	ICP/OES	1	mg/kg	M		**27**	**23**
Lead	ICP/OES	1	mg/kg	M		**34**	**35**

Concept Reference: 666193
Project Site: MAG Green Bridge
Customer Reference: 3590

Soil Analysed as Soil
BTEX

Concept Reference	666193 002
Customer Sample Reference	BH204 WAC
Test Sample	M105
Bottom Depth	0.70
Top Depth	0.60
Date Sampled	27-JUN-2017
Matrix Class	Sandy Soil

Determinand	Method	LOD	Units	Symbol	
Benzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	(13) <10
Toluene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10
EthylBenzene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10
Meta/Para-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10
Ortho-Xylene	GC/MS (Head Space)(MCERTS)	10	µg/kg	M	<10

Concept Reference: 666193
Project Site: MAG Green Bridge
Customer Reference: 3590

Soil Analysed as Soil
PCB EC7

Concept Reference	666193 002
Customer Sample Reference	BH204 WAC
Test Sample	M105
Bottom Depth	0.70
Top Depth	0.60
Date Sampled	27-JUN-2017
Matrix Class	Sandy Soil

Determinand	Method	LOD	Units	Symbol	
Polychlorinated biphenyl BZ#28	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	(9,26) <10
Polychlorinated biphenyl BZ#52	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	(9,26) <10
Polychlorinated biphenyl BZ#101	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	(26,9) <10
Polychlorinated biphenyl BZ#118	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	(26,9) <10
Polychlorinated biphenyl BZ#153	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	(9,26) <10
Polychlorinated biphenyl BZ#138	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	(9,26) <10
Polychlorinated biphenyl BZ#180	GC/MS (HR) (MCERTS)	0.05	µg/kg	M	(26,9) <10

Concept Reference: 666193
Project Site: MAG Green Bridge
Customer Reference: 3590

Soil Analysed as Soil
Total and Speciated USEPA16 PAH

				Concept Reference	666193 001	666193 002	666193 003
				Customer Sample Reference	BH204 MG	BH204 WAC	BH203 MG
				Test Sample	M105	M105	M105
				Bottom Depth	0.80	0.70	0.40
				Top Depth	0.70	0.60	0.30
				Date Sampled	27-JUN-2017	27-JUN-2017	28-JUN-2017
				Matrix Class	Sandy Soil	Sandy Soil	Sandy Soil
Determinand	**Method**	**LOD**	**Units**	**Symbol**			
Naphthalene	GC/MS (MCERTS)	0.1	mg/kg	M	-	<0.1	-
Acenaphthylene	GC/MS (MCERTS)	0.1	mg/kg	U	-	<0.1	-
Acenaphthene	GC/MS (MCERTS)	0.1	mg/kg	M	-	<0.1	-
Fluorene	GC/MS (MCERTS)	0.1	mg/kg	M	-	<0.1	-
Phenanthrene	GC/MS (MCERTS)	0.1	mg/kg	M	-	<0.1	-
Anthracene	GC/MS (MCERTS)	0.1	mg/kg	U	-	<0.1	-
Fluoranthene	GC/MS (MCERTS)	0.1	mg/kg	M	-	**0.2**	-
Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	-	**0.2**	-
Benzo(a)Anthracene	GC/MS (MCERTS)	0.1	mg/kg	M	-	<0.1	-
Chrysene	GC/MS (MCERTS)	0.1	mg/kg	M	-	<0.1	-
Benzo(b/k)Fluoranthene	GC/MS (MCERTS)	0.1	mg/kg	M	-	**0.2**	-
Benzo(a)Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	-	<0.1	-
Indeno(123-cd)Pyrene	GC/MS (MCERTS)	0.1	mg/kg	M	-	<0.1	-
Dibenzo(ah)Anthracene	GC/MS (MCERTS)	0.1	mg/kg	M	-	<0.1	-
Benzo(ghi)Perylene	GC/MS (MCERTS)	0.1	mg/kg	M	-	<0.1	-
Polyaromatic Hydrocarbons (Total)	GC/MS (MCERTS)	0.1	mg/kg	U	-	**0.6**	-
Coronene	GC/MS	0.1	mg/kg	N	-	<0.1	-
Phenol	GC/MS (MCERTS)	0.1	mg/kg	M	-	<0.1	-

Concept Reference: 666193
Project Site: MAG Green Bridge
Customer Reference: 3590

Soil Analysed as Soil
Total Petroleum Hydrocarbons

				Concept Reference	666193 002
				Customer Sample Reference	BH204 WAC
				Test Sample	M105
				Bottom Depth	0.70
				Top Depth	0.60
				Date Sampled	27-JUN-2017
				Matrix Class	Sandy Soil
Determinand	**Method**	**LOD**	**Units**	**Symbol**	
Total Petroleum Hydrocarbons	GC/FID	1	mg/kg	M	(13) **110**
Total Petroleum Hydrocarbons (C35-C40)	GC/FID	1	mg/kg	N	(13) **26**

Concept Reference: 666193
Project Site: MAG Green Bridge
Customer Reference: 3590

Soil Analysed as Soil
Miscellaneous

				Concept Reference	666193 001	666193 002	666193 003
				Customer Sample Reference	BH204 MG	BH204 WAC	BH203 MG
				Test Sample	AR	AR	AR
				Bottom Depth	0.80	0.70	0.40
				Top Depth	0.70	0.60	0.30
				Date Sampled	27-JUN-2017	27-JUN-2017	28-JUN-2017
				Matrix Class	Sandy Soil	Sandy Soil	Sandy Soil
Determinand	**Method**	**LOD**	**Units**	**Symbol**			
Asbestos ID	PLM			SU	N.D.	N.D.	N.D.

Concept Reference: 666193
Project Site: MAG Green Bridge
Customer Reference: 3590

Leachate to BS EN 12457-2 (10:1) Analysed as Water
Waste Acceptance Criteria

Concept Reference	**666193 002**
Customer Sample Reference	**BH204 WAC**
Test Sample	**10:1**
Bottom Depth	**0.70**
Top Depth	**0.60**
Date Sampled	**27-JUN-2017**
Matrix Class	**Sandy Soil**

Determinand	Method	LOD	Units	Symbol	
Arsenic (Dissolved)	ICP/MS (Filtered)	0.2	µg/l	U	**0.6**
Barium (Dissolved)	ICP/MS (Filtered)	1	µg/l	U	**5**
Molybdenum (Dissolved)	ICP/MS (Filtered)	1	µg/l	N	<1
Total Dissolved Solids	Grav	100	mg/l	N	<100
Phenols (Total-Mono)	Colorimetry	0.1	mg/l	U	<0.1
Dissolved Organic Carbon	OX/IR	1	mg/l	N	**6**
Electrical Conductivity	Probe	10	µS/cm	N	**43**
Antimony (Dissolved)	ICP/MS (Filtered)	1	µg/l	U	<1
Cadmium (Dissolved)	ICP/MS (Filtered)	0.02	µg/l	U	<0.02
Chromium (Dissolved)	ICP/MS (Filtered)	1	µg/l	U	<1
Copper (Dissolved)	ICP/MS (Filtered)	0.5	µg/l	U	**1.0**
Lead (Dissolved)	ICP/MS (Filtered)	0.3	µg/l	U	**0.9**
Mercury (Dissolved)	ICP/MS (Filtered)	0.05	µg/l	U	<0.05
Nickel (Dissolved)	ICP/MS (Filtered)	1	µg/l	U	<1
Selenium (Dissolved)	ICP/MS (Filtered)	0.5	µg/l	U	<0.5
Zinc (Dissolved)	ICP/MS (Filtered)	2	µg/l	U	**2**
Chloride	Discrete Analyser	1	mg/l	U	<1
Fluoride	Discrete Analyser	0.05	mg/l	U	**0.22**
Sulphate	Discrete Analyser	0.5	mg/l	U	**1.4**

Index to symbols used in 666193-1 Interim

Value	Description
M40	Analysis conducted on sample assisted dried at no more than 40C. Results are reported on a dry weight basis.
10:1 S	Data for BS EN 12457-2 (10:1)
10:1	Leachate to BS EN 12457-2 (10:1)
AR	As Received
A40	Assisted dried < 40C
M105	Analysis conducted on an "as received" aliquot. Results are reported on a dry weight basis where moisture content was determined by assisted drying of sample at 105C
N.D.	Not Detected
9	LOD raised due to dilution of sample
13	Results have been blank corrected.
26	LOD raised because the analysis was performed by an alternative technique
S	Analysis was subcontracted
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Asbestos was subcontracted to REC Asbestos.
These samples have been analysed exceeding recommended holding times for pH. It is possible therefore that the results provided may be compromised.
Please note interim results are considered preliminary and are subject to change.

APPENDIX D - GEOTECHNICAL TESTING RESULTS

TEST CERTIFICATE

Determination of Liquid and Plastic Limits

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

UKAS TESTING 4041

Tested in Accordance with BS1377-2: 1990: Clause 4.4 & 5: One Point Method

Client:	ROC Consulting Ltd	Client Reference:	3590
Client Address:	Commercial Wharf 6 Commercial Street Castlefield Manchester M15 4PZ	Job Number:	17-58283
		Date Sampled:	Not Given
		Date Received:	22/08/2017
Contact:	Mabel Newby	Date Tested:	30/08/2017
Site Name:	Airport City Bridge	Sampled By:	Mabel Newby
Site Address:	Not Given		

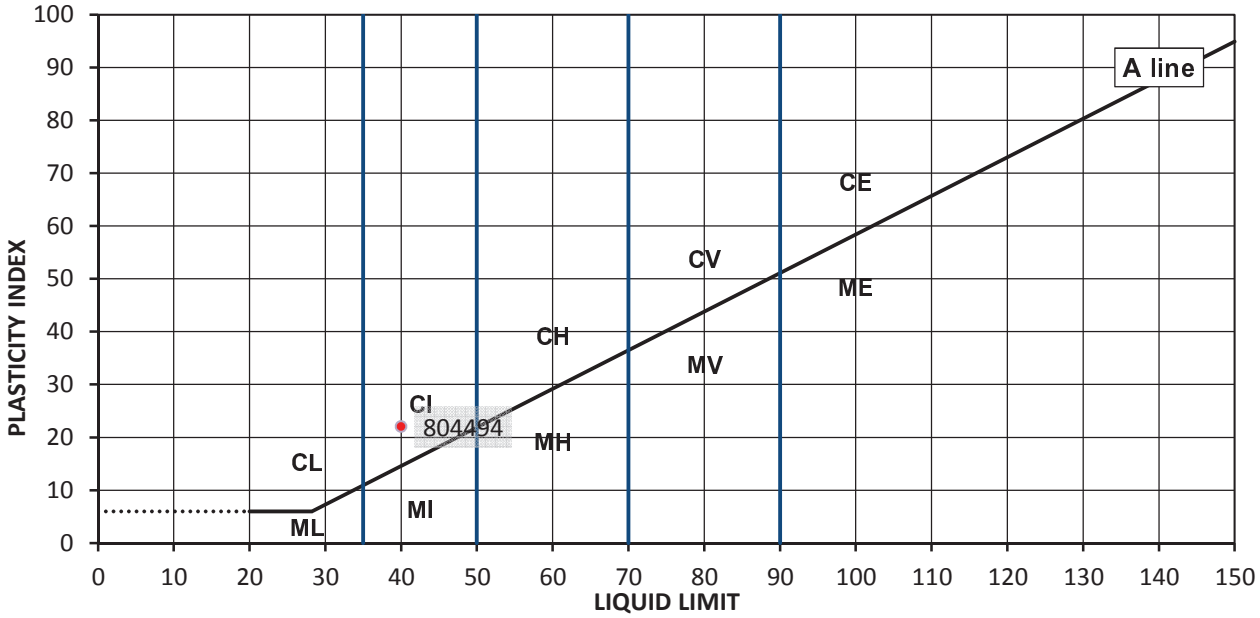
TEST RESULTS

Laboratory Reference: 804494
Sample Reference: Not Given

Description: Mottled brown slightly gravelly sandy CLAY
Location: BH204
Sample Preparation: Tested after washing to remove >425um

Sample Type: U
Depth Top [m]: 6.00
Depth Base [m]: 6.45

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
18	40	18	22	90



Legend, based on BS 5930:2015 Code of practice for site investigations

		Plasticity		Liquid Limit
C	Clay	L	Low	below 35
M	Silt	I	Medium	35 to 50
		H	High	50 to 70
		V	Very high	70 to 90
		E	Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)	

Remarks

Approved:

Dariusz Piotrowski
PL Laboratory Manager Geotechnical Section
Date Reported: 06/09/2017

Signed:

Sushil Sharda
Technical Manager (Geotechnical Division)

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed here in are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."

GF 105.11

TEST CERTIFICATE

Determination of Unconsolidated Undrained Triaxial Compression

Tested in Accordance with BS1377: Part 7: 1990, clause 8, single specimen

UKAS TESTING 4041

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

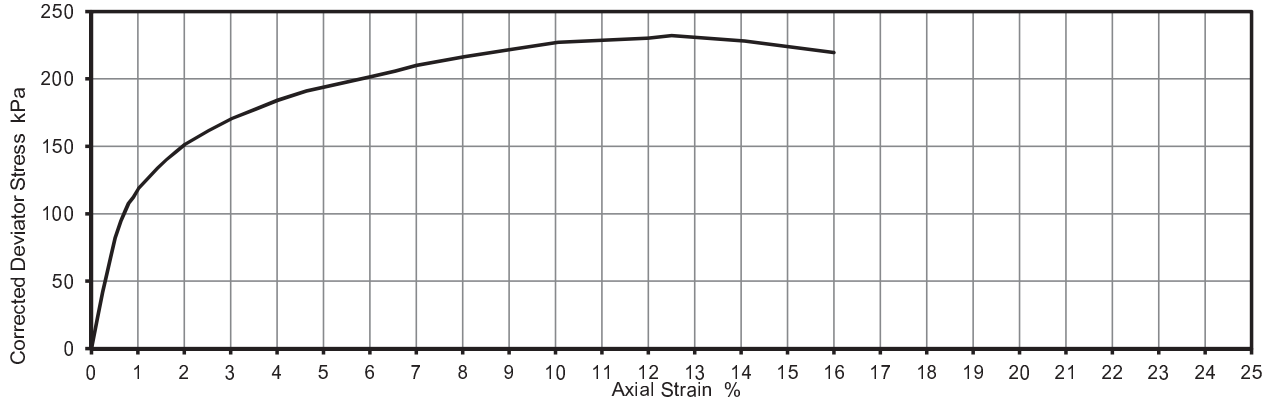
Client:	ROC Consulting Ltd	Client Reference:	3590
Client Address:	Commercial Wharf 6 Commercial Street Castlefield Manchester M15 4PZ	Job Number:	17-58283
		Date Sampled:	Not Given
		Date Received:	22/08/2017
Contact:	Mabel Newby	Date Tested:	30/08/2017
Site Name:	Airport City Bridge	Sampled By:	Mabel Newby
Site Address:	Not Given		

Test Result

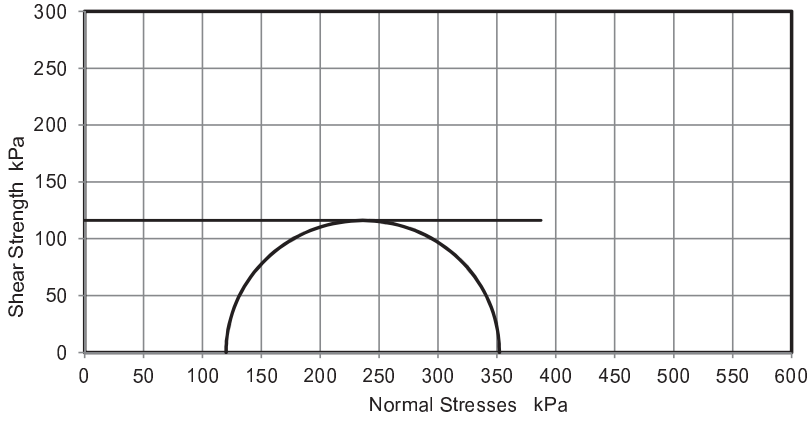
Laboratory Reference:	804494
Hole No.:	BH204
Sample Reference:	Not Given
Sample Description:	Mottled brown slightly gravelly sandy CLAY
Depth Top [m]:	6.00
Depth Base [m]:	6.45
Sample Type:	U

Test Number	1		Rate of Strain	2.00	%/min
Length	99.73	mm	Cell Pressure	120	kPa
Diameter	49.83	mm	Axial Strain at failure	12.5	%
Bulk Density	2.12	Mg/m3	Deviator Stress, (σ1 - σ3)f	232	kPa
Moisture Content	18	%	Undrained Shear Strength, cu	116	kPa ½(σ1 - σ3)f
Dry Density	1.80	Mg/m3	Mode of Failure	Compound	

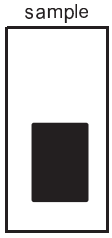
Deviator Stress v Axial Strain



Mohr Circles



Position within sample





Notes:

Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Comments:

Approved:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Date Reported: 05/09/2017

Signed:

Sushil Sharda
Technical Manager
(Geotechnical Division)

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."

TEST CERTIFICATE

Point Load Strength Index Tests Summary of Results

Tested in Accordance with ISRM : 2007, pages 125-132

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

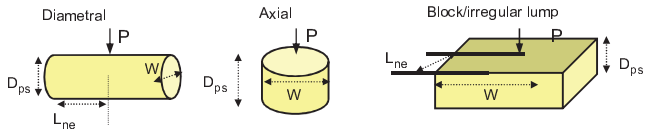
Client: ROC Consulting Ltd
Client Address: Commercial Wharf
6 Commercial Street
Castlefield
Manchester
M15 4PZ
Contact: Mabel Newby
Site Name: Airport City Bridge
Site Address: Not Given

Client Reference: 3590
Job Number: 17-58283
Date Sampled: Not Given
Date Received: 22/08/2017
Date Tested: 04/09/2017
Sampled By: Mabel Newby

Test results

Laboratory Reference	Hole No.	Sample				Specimen		Description	Rock Type and Test condition	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index		Remarks (including water content if measured)
		Reference	Depth Top [m]	Depth Base [m]	Type	Reference	Depth [m]			Type (D, A, I, B)	Direction (L, P or U)		Lne mm	W mm	Dps mm	Dps' mm	kN	mm	Is MPa	Is(50) MPa	
804467	BH201	Not Given	6.20	Not Given	C	Not Given	Not Given	Brown MUDSTONE	MUDSTONE	A	U	YES		83.7	82.0	55.0	1.2	76.6	0.20	0.25	
804468	BH201	Not Given	7.60	Not Given	C	Not Given	Not Given	Grey MUDSTONE	MUDSTONE	A	U	YES		86.6	83.0	65.0	4.3	84.6	0.60	0.76	
804469	BH201	Not Given	8.90	Not Given	C	Not Given	Not Given	Brown MUDSTONE	MUDSTONE	A	U	YES		86.4	63.0	57.0	2.3	79.2	0.37	0.46	Unable to carry out diameter test due to sample dimensions
804470	BH201	Not Given	10.10	Not Given	C	Not Given	Not Given	Brown MUDSTONE	MUDSTONE	A	U	YES		86.6	80.0	45.0	2.6	70.4	0.53	0.62	
804472	BH201	Not Given	10.95	Not Given	C	Not Given	Not Given	Brown to grey MUDSTONE	MUDSTONE	A	U	YES		86.7	67.0	40.0	2.2	66.4	0.50	0.57	
804474	BH201	Not Given	12.95	Not Given	C	Not Given	Not Given	Brown MUDSTONE	MUDSTONE	D	U	YES	44.0	87.1	87.0	84.0	0.6	85.6	0.08	0.10	
804476	BH201	Not Given	14.30	Not Given	C	Not Given	Not Given	Grey MUDSTONE	MUDSTONE	A	U	YES		86.0	73.0	40.0	6.4	66.2	1.46	1.65	
804478	BH201	Not Given	14.70	Not Given	C	Not Given	Not Given	Grey MUDSTONE	MUDSTONE	A	U	YES		86.2	67.0	41.0	7.1	67.1	1.59	1.81	
804479	BH201	Not Given	15.30	Not Given	C	Not Given	Not Given	Brown to grey MUDSTONE	MUDSTONE	D	U	YES	54.4	86.6	86.0	78.0	1.7	82.2	0.26	0.32	
804481	BH201	Not Given	17.05	Not Given	C	Not Given	Not Given	Grey MUDSTONE	MUDSTONE	A	U	YES		87.0	63.0	56.0	1.7	78.8	0.27	0.33	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
L - parallel to planes of weakness
P - perpendicular to planes of weakness
U - unknown or random
Dimensions
Dps - Distance between platens (platen separation)
Dps' - at failure (see ISRM note 6)
Lne - Length from platens to nearest free end
W - Width of shortest dimension perpendicular to load, P



Detailed legend for test and dimensions, based on ISRM, is shown above.
Size factor, F = (De/50)0.45 for all tests.

Comments:

Approved:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section
Date Reported: 04/09/2017

Signed:

Sushil Sharda
Technical Manager
(Geotechnical Division)

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."

GF 134.4

TEST CERTIFICATE

Point Load Strength Index Tests Summary of Results

Tested in Accordance with ISRM : 2007, pages 125-132

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

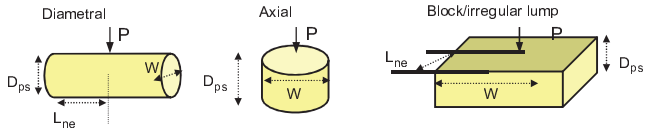
Client: ROC Consulting Ltd
Client Address: Commercial Wharf
6 Commercial Street
Castlefield
Manchester
M15 4PZ
Contact: Mabel Newby
Site Name: Airport City Bridge
Site Address: Not Given

Client Reference: 3590
Job Number: 17-58283
Date Sampled: Not Given
Date Received: 22/08/2017
Date Tested: 04/09/2017
Sampled By: Not Given

Test results

Laboratory Reference	Hole No.	Sample				Specimen		Description	Rock Type and Test condition	Test Type see ISRM		Failure Valid (Y/N)	Dimensions				Force P	Equivalent diameter, De	Point Load Strength Index		Remarks (including water content if measured)
		Reference	Depth Top [m]	Depth Base [m]	Type	Reference	Depth [m]			Type (D, A, I, B)	Direction (L, P or U)		Lne mm	W mm	Dps mm	Dps' mm	kN	mm	Is MPa	Is(50) MPa	
804483	BH201	Not Given	18.70	Not Given	C	Not Given	Not Given	Brown to grey MUDSTONE	MUDSTONE	A	U	YES		86.7	64.0	56.0	9.7	78.6	1.57	1.93	Unable to carry out diameter test due to sample dimensions
804484	BH201	Not Given	19.70	Not Given	C	Not Given	Not Given	Brown MUDSTONE	MUDSTONE	A	U	YES		86.7	57.0	48.0	0.7	72.8	0.12	0.15	
804485	BH202	Not Given	5.90	Not Given	C	Not Given	Not Given	Grey MUDSTONE	MUDSTONE	A	U	YES		86.3	72.0	47.0	1.3	71.9	0.25	0.30	
804488	BH202	Not Given	10.10	Not Given	C	Not Given	Not Given	Brown to grey MUDSTONE	MUDSTONE	A	U	YES		86.7	59.0	35.0	3.8	62.1	0.99	1.10	
804489	BH202	Not Given	10.40	Not Given	C	Not Given	Not Given	Grey MUDSTONE	MUDSTONE	D	U	YES	49.0	86.9	87.0	80.0	2.1	83.4	0.30	0.38	
804491	BH202	Not Given	11.60	Not Given	C	Not Given	Not Given	Grey MUDSTONE	MUDSTONE	A	U	YES		86.0	50.0	39.0	7.5	65.3	1.76	1.99	Unable to carry out diameter test due to sample dimensions
804492	BH202	Not Given	12.10	Not Given	C	Not Given	Not Given	Brown MUDSTONE	MUDSTONE	A	U	YES		85.2	65.0	44.0	12.5	69.1	2.61	3.02	
804493	BH202	Not Given	15.25	Not Given	C	Not Given	Not Given	Brown MUDSTONE	MUDSTONE	A	U	YES		86.9	70.0	50.0	13.0	74.4	2.35	2.81	

Test Type
D - Diametral, A - Axial, I - Irregular Lump, B - Block
Direction
L - parallel to planes of weakness
P - perpendicular to planes of weakness
U - unknown or random
Dimensions
Dps - Distance between platens (platen separation)
Dps' - at failure (see ISRM note 6)
Lne - Length from platens to nearest free end
W - Width of shortest dimension perpendicular to load, P



Detailed legend for test and dimensions, based on ISRM, is shown above.
Size factor, F = (De/50)0.45 for all tests.

Comments:

Approved:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section
Date Reported: 04/09/2017

Signed:

Sushil Sharda
Technical Manager
(Geotechnical Division)

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."

GF 134.4

TEST CERTIFICATE

Unconfined Compressive Strength Test

I.S.R.M. Suggested Methods 1981 for Determination of Uniaxial Compressive Strength Part 1

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

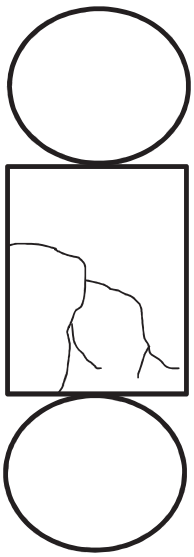
Client:	ROC Consulting Ltd	Client Reference:	3590
Client Address:	Commercial Wharf 6 Commercial Street Castlefield Manchester M15 4PZ	Job Number:	17-58283
		Date Sampled:	Not Given
		Date Received:	22/08/2017
Contact:	Mabel Newby	Date Tested:	04/09/2017
Site Name:	Airport City Bridge	Sampled By:	Not Given
Site Address:	Not Given		

Test results

Laboratory Reference:	804471	Depth Top [m]:	10.65
Hole No.:	BH201	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	C
Sample Description:	Brown to grey MUDSTONE	Specimen Depth [m]:	Not Given
Specimen Reference:	Not Given	Date and method of sampling:	Not Given
Storage history and environmer	Not Given		

Specimen length	mm	158.4
Specimen diameter	mm	86.3
Test duration	min	0.5
Stress rate	kN/s	1
Machine type		Autocon
U.C.S.	MPa	3.6
Mode of failure		Cleavage
Loading axis relative to anisotropy		
Water content	%	9
Bulk density	Mg/m3	2.30
Dry density	Mg/m3	2.11
Degree of saturation	%	N/A

Failure sketch



Remarks:

Approved:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Date Reported: 05/09/2017

Signed:

Sushil Sharda
Technical Manager
(Geotechnical Division)

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."

TEST CERTIFICATE

Unconfined Compressive Strength Test

I.S.R.M. Suggested Methods 1981 for Determination of Uniaxial Compressive Strength Part 1

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

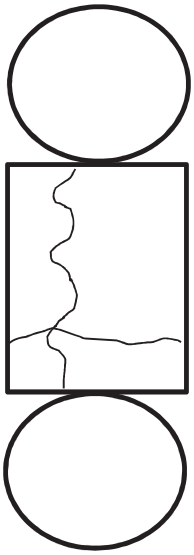
Client:	ROC Consulting Ltd	Client Reference:	3590
Client Address:	Commercial Wharf 6 Commercial Street Castlefield Manchester M15 4PZ	Job Number:	17-58283
		Date Sampled:	Not Given
		Date Received:	22/08/2017
Contact:	Mabel Newby	Date Tested:	04/09/2017
Site Name:	Airport City Bridge	Sampled By:	Not Given
Site Address:	Not Given		

Test results

Laboratory Reference:	804473	Depth Top [m]:	11.10
Hole No.:	BH201	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	C
Sample Description:	Brown to grey MUDSTONE	Specimen Depth [m]:	Not Given
Specimen Reference:	Not Given	Date and method of sampling:	Not Given
Storage history and environmer	Not Given		

Specimen length	mm	126.3
Specimen diameter	mm	86.4
Test duration	min	1
Stress rate	kN/s	1
Machine type		Autocon
U.C.S.	MPa	6.8
Mode of failure		Cleavage
Loading axis relative to anisotropy		
Water content	%	8.4
Bulk density	Mg/m3	2.39
Dry density	Mg/m3	2.21
Degree of saturation	%	N/A

Failure sketch



Remarks:

Approved:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Date Reported: 05/09/2017

Signed:

Sushil Sharda
Technical Manager
(Geotechnical Division)

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."

TEST CERTIFICATE

Unconfined Compressive Strength Test

I.S.R.M. Suggested Methods 1981 for Determination of Uniaxial Compressive Strength Part 1

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

Client:	ROC Consulting Ltd	Client Reference:	3590
Client Address:	Commercial Wharf 6 Commercial Street Castlefield Manchester M15 4PZ	Job Number:	17-58283
		Date Sampled:	Not Given
		Date Received:	22/08/2017
Contact:	Mabel Newby	Date Tested:	04/09/2017
Site Name:	Airport City Bridge	Sampled By:	Not Given
Site Address:	Not Given		

Test results

Laboratory Reference:	804475	Depth Top [m]:	13.45
Hole No.:	BH201	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	C
Sample Description:	Brown to grey MUDSTONE	Specimen Depth [m]:	Not Given
Specimen Reference:	Not Given	Date and method of sampling:	Not Given
Storage history and environmer	Not Given		

Specimen length	mm	140.5
Specimen diameter	mm	86.4
Test duration	min	1.5
Stress rate	kN/s	1
Machine type		Autocon
U.C.S.	MPa	13.6
Mode of failure		Cleavage
Loading axis relative to anisotropy		
Water content	%	6.1
Bulk density	Mg/m3	2.50
Dry density	Mg/m3	2.36
Degree of saturation	%	N/A

Failure sketch



Remarks:

Approved:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Date Reported: 05/09/2017

Signed:

Sushil Sharda
Technical Manager
(Geotechnical Division)

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."

TEST CERTIFICATE

Unconfined Compressive Strength Test

I.S.R.M. Suggested Methods 1981 for Determination of Uniaxial Compressive Strength Part 1

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

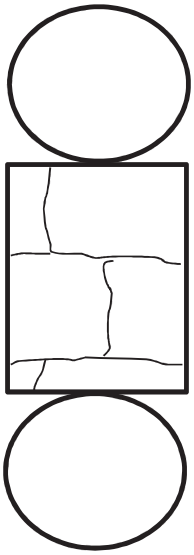
Client:	ROC Consulting Ltd	Client Reference:	3590
Client Address:	Commercial Wharf 6 Commercial Street Castlefield Manchester M15 4PZ	Job Number:	17-58283
		Date Sampled:	Not Given
		Date Received:	22/08/2017
Contact:	Mabel Newby	Date Tested:	04/09/2017
Site Name:	Airport City Bridge	Sampled By:	Not Given
Site Address:	Not Given		

Test results

Laboratory Reference:	804477	Depth Top [m]:	14.55
Hole No.:	BH201	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	C
Sample Description:	Grey MUDSTONE	Specimen Depth [m]:	Not Given
Specimen Reference:	Not Given	Date and method of sampling:	Not Given
Storage history and environmer	Not Given		

Specimen length	mm	120.2
Specimen diameter	mm	86.6
Test duration	min	2.5
Stress rate	kN/s	1
Machine type		Autocon
U.C.S.	MPa	23.2
Mode of failure		Cleavage
Loading axis relative to anisotropy		
Water content	%	5.1
Bulk density	Mg/m3	2.52
Dry density	Mg/m3	2.40
Degree of saturation	%	N/A

Failure sketch



Remarks:

Approved:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Date Reported: 05/09/2017

Signed:

Sushil Sharda
Technical Manager
(Geotechnical Division)

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."

TEST CERTIFICATE

Unconfined Compressive Strength Test

I.S.R.M. Suggested Methods 1981 for Determination of Uniaxial Compressive Strength Part 1

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

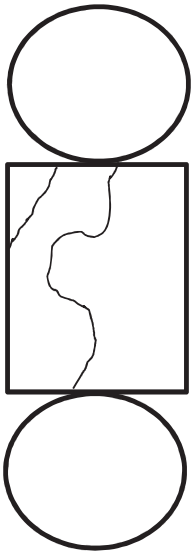
Client:	ROC Consulting Ltd	Client Reference:	3590
Client Address:	Commercial Wharf 6 Commercial Street Castlefield Manchester M15 4PZ	Job Number:	17-58283
		Date Sampled:	Not Given
		Date Received:	22/08/2017
Contact:	Mabel Newby	Date Tested:	04/09/2017
Site Name:	Airport City Bridge	Sampled By:	Not Given
Site Address:	Not Given		

Test results

Laboratory Reference:	804480	Depth Top [m]:	16.40
Hole No.:	BH201	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	C
Sample Description:	Grey MUDSTONE	Specimen Depth [m]:	Not Given
Specimen Reference:	Not Given	Date and method of sampling:	Not Given
Storage history and environmer	Not Given		

Specimen length	mm	88.2
Specimen diameter	mm	86.4
Test duration	min	4
Stress rate	kN/s	1
Machine type		Autocon
U.C.S.	MPa	41.8
Mode of failure		Cleavage
Loading axis relative to anisotropy		
Water content	%	7.9
Bulk density	Mg/m3	2.42
Dry density	Mg/m3	2.24
Degree of saturation	%	N/A

Failure sketch



Remarks: Sample is to short

Approved:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Date Reported: 05/09/2017

Signed:

Sushil Sharda
Technical Manager
(Geotechnical Division)

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."

TEST CERTIFICATE

Unconfined Compressive Strength Test

I.S.R.M. Suggested Methods 1981 for Determination of Uniaxial Compressive Strength Part 1

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

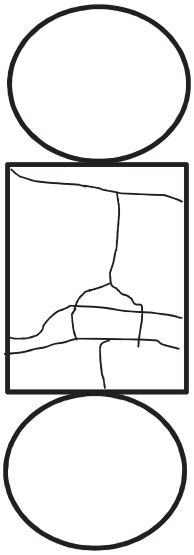
Client:	ROC Consulting Ltd	Client Reference:	3590
Client Address:	Commercial Wharf 6 Commercial Street Castlefield Manchester M15 4PZ	Job Number:	17-58283
		Date Sampled:	Not Given
		Date Received:	22/08/2017
Contact:	Mabel Newby	Date Tested:	04/09/2017
Site Name:	Airport City Bridge	Sampled By:	Not Given
Site Address:	Not Given		

Test results

Laboratory Reference:	804482	Depth Top [m]:	18.15
Hole No.:	BH201	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	C
Sample Description:	Grey MUDSTONE	Specimen Depth [m]:	Not Given
Specimen Reference:	Not Given	Date and method of sampling:	Not Given
Storage history and environmer	Not Given		

Specimen length	mm	135.1
Specimen diameter	mm	86.5
Test duration	min	2
Stress rate	kN/s	1
Machine type		Autocon
U.C.S.	MPa	18.1
Mode of failure		Cleavage
Loading axis relative to anisotropy		
Water content	%	5.5
Bulk density	Mg/m3	2.54
Dry density	Mg/m3	2.41
Degree of saturation	%	N/A

Failure sketch



Remarks:

Approved:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Date Reported: 05/09/2017

Signed:

Sushil Sharda
Technical Manager
(Geotechnical Division)

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."

TEST CERTIFICATE

Unconfined Compressive Strength Test

I.S.R.M. Suggested Methods 1981 for Determination of Uniaxial Compressive Strength Part 1

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

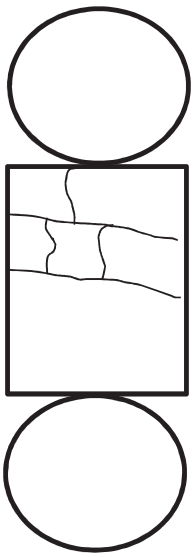
Client:	ROC Consulting Ltd	Client Reference:	3590
Client Address:	Commercial Wharf 6 Commercial Street Castlefield Manchester M15 4PZ	Job Number:	17-58283
		Date Sampled:	Not Given
		Date Received:	22/08/2017
Contact:	Mabel Newby	Date Tested:	04/09/2017
Site Name:	Airport City Bridge	Sampled By:	Not Given
Site Address:	Not Given		

Test results

Laboratory Reference:	804486	Depth Top [m]:	7.85
Hole No.:	BH202	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	C
Sample Description:	Brown to grey MUDSTONE	Specimen Depth [m]:	Not Given
Specimen Reference:	Not Given	Date and method of sampling:	Not Given
Storage history and environmer	Not Given		

Specimen length	mm	167.7
Specimen diameter	mm	86.6
Test duration	min	2.5
Stress rate	kN/s	1
Machine type		Autocon
U.C.S.	MPa	1.7
Mode of failure		Cleavage
Loading axis relative to anisotropy		
Water content	%	8.6
Bulk density	Mg/m3	2.25
Dry density	Mg/m3	2.07
Degree of saturation	%	N/A

Failure sketch



Remarks:

Approved:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Date Reported: 05/09/2017

Signed:

Sushil Sharda
Technical Manager
(Geotechnical Division)

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."

TEST CERTIFICATE

Unconfined Compressive Strength Test

I.S.R.M. Suggested Methods 1981 for Determination of Uniaxial Compressive Strength Part 1

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

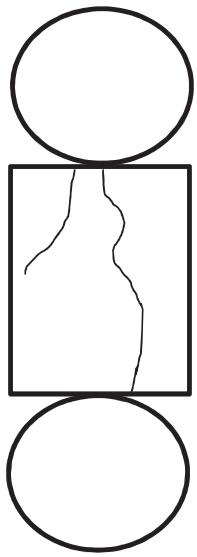
Client:	ROC Consulting Ltd	Client Reference:	3590
Client Address:	Commercial Wharf 6 Commercial Street Castlefield Manchester M15 4PZ	Job Number:	17-58283
		Date Sampled:	Not Given
		Date Received:	22/08/2017
Contact:	Mabel Newby	Date Tested:	04/09/2017
Site Name:	Airport City Bridge	Sampled By:	Not Given
Site Address:	Not Given		

Test results

Laboratory Reference:	804487	Depth Top [m]:	8.50
Hole No.:	BH202	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	C
Sample Description:	Brown MUDSTONE	Specimen Depth [m]:	Not Given
Specimen Reference:	Not Given	Date and method of sampling:	Not Given
Storage history and environmer	Not Given		

Specimen length	mm	77.2
Specimen diameter	mm	86.4
Test duration	min	1
Stress rate	kN/s	1
Machine type		Autocon
U.C.S.	MPa	9.4
Mode of failure		Cleavage
Loading axis relative to anisotropy		
Water content	%	4.5
Bulk density	Mg/m3	2.37
Dry density	Mg/m3	2.26
Degree of saturation	%	N/A

Failure sketch



Remarks: Sample is to short

Approved:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Date Reported: 05/09/2017

Signed:

Sushil Sharda
Technical Manager
(Geotechnical Division)

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."

TEST CERTIFICATE

Unconfined Compressive Strength Test

I.S.R.M. Suggested Methods 1981 for Determination of Uniaxial Compressive Strength Part 1

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS

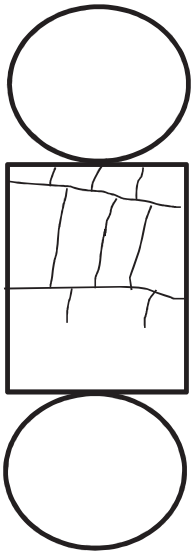
Client:	ROC Consulting Ltd	Client Reference:	3590
Client Address:	Commercial Wharf 6 Commercial Street Castlefield Manchester M15 4PZ	Job Number:	17-58283
		Date Sampled:	Not Given
		Date Received:	22/08/2017
Contact:	Mabel Newby	Date Tested:	04/09/2017
Site Name:	Airport City Bridge	Sampled By:	Not Given
Site Address:	Not Given		

Test results

Laboratory Reference:	804490	Depth Top [m]:	10.75
Hole No.:	BH202	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	C
Sample Description:	Brown to grey MUDSTONE	Specimen Depth [m]:	Not Given
Specimen Reference:	Not Given	Date and method of sampling:	Not Given
Storage history and environmer	Not Given		

Specimen length	mm	80.4
Specimen diameter	mm	86.4
Test duration	min	1
Stress rate	kN/s	1
Machine type		Autocon
U.C.S.	MPa	8.7
Mode of failure		Cleavage
Loading axis relative to anisotropy		
Water content	%	7
Bulk density	Mg/m3	2.28
Dry density	Mg/m3	2.13
Degree of saturation	%	N/A

Failure sketch



Remarks: Sample is to short

Approved:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Date Reported: 05/09/2017

Signed:

Sushil Sharda
Technical Manager
(Geotechnical Division)

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."

APPENDIX D

GEOTECHNICAL TESTING RESULTS



LABORATORY REPORT

4043

Contract Number: PSL16/1450

Report Date: 21 April 2016

Client's Reference: 3407

Client Name: ROC Consulting
81 Chapel Street
Manchester
M3 5DF

For the attention of: Alex Smiles

Contract Title: Airport City North

Date Received: 1/4/2016
Date Commenced: 1/4/2016
Date Completed: 21/4/2016

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson (Director)	A Watkins (Director)	R Berriman (Quality Manager)
D Lambe (Senior Technician)	S Royle (Senior Technician)	W Allen (Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		Area	D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	W	D	(mm2)		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH101	10.10		A	Par	86	41	1681	4489.44	67.00	-	2.94	0.655	1.141	0.75	Valid	
BH101	20.00		A	Par	86	37	1369	4051.45	63.65	-	0.21	0.052	1.115	0.06	Valid	
BH101	9.20		A	Par	86	29	841	3175.46	56.35	-	0.53	0.167	1.055	0.18	Valid	
BH101	15.50		A	Par	86	38	1444	4160.95	64.51	-	5.22	1.255	1.121	1.41	Valid	
BH101	17.80		A	Par	86	40	1600	4379.94	66.18	-	0.29	0.066	1.134	0.08	Valid	
BH101	10.80		A	Par	86	36	1296	3941.95	62.78	-	0.53	0.134	1.108	0.15	Valid	
BH101	8.30		A	Par	86	33	1089	3613.45	60.11	-	1.44	0.399	1.086	0.43	Valid	
BH102	11.50		A	Par	86	29	841	3175.46	56.35	-	0.39	0.123	1.055	0.13	Valid	
BH102	14.10		A	Par	86	44	1936	4817.94	69.41	-	0.42	0.087	1.159	0.10	Valid	
BH102	10.30		A	Par	86	36	1296	3941.95	62.78	-	0.34	0.086	1.108	0.10	Valid	
BH102	6.30		A	Par	86	33	1089	3613.45	60.11	-	6.14	1.699	1.086	1.85	Valid	
BH102	7.00		A	Par	86	40	1600	4379.94	66.18	-	0.48	0.110	1.134	0.12	Valid	
BH201	11.20		A	Par	86	42	1764	4598.94	67.82	-	0.26	0.057	1.147	0.06	Valid	
BH201	9.00		A	Par	86	39	1521	4270.45	65.35	-	0.52	0.122	1.128	0.14	Valid	
BH201	13.60		A	Par	86	36	1296	3941.95	62.78	-	0.61	0.155	1.108	0.17	Valid	
BH201	14.50		A	Par	86	33	1089	3613.45	60.11	-	0.40	0.111	1.086	0.12	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular

UKAS TESTING 4043

PSL Professional Soils Laboratory

Checked / Approved		Date	21/04/16	Contract No:
Airport City North				PSL16/1450
				Client Ref:
				3407

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		D_e^2	D_e	Failure Load		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	L	D		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH101	10.10		D	Perp		86	7396	86.00	-	2.22	0.300	1.276	0.38	Valid	
BH101	20.00		D	Perp		86	7396	86.00	-	0.16	0.022	1.276	0.03	Valid	
BH101	9.20		D	Perp		86	7396	86.00	-	0.22	0.030	1.276	0.04	Valid	
BH101	15.50		D	Perp		86	7396	86.00	-	7.86	1.063	1.276	1.36	Valid	
BH101	17.80		D	Perp		86	7396	86.00	-	0.12	0.016	1.276	0.02	Valid	
BH101	10.80		D	Perp		86	7396	86.00	-	0.17	0.023	1.276	0.03	Valid	
BH101	8.30		D	Perp		86	7396	86.00	-	1.37	0.185	1.276	0.24	Valid	
BH102	11.50		D	Perp		86	7396	86.00	-	0.26	0.035	1.276	0.04	Valid	
BH102	14.10		D	Perp		86	7396	86.00	-	0.24	0.032	1.276	0.04	Valid	
BH102	10.30		D	Perp		86	7396	86.00	-	0.29	0.039	1.276	0.05	Valid	
BH102	6.30		D	Perp		86	7396	86.00	-	8.21	1.110	1.276	1.42	Valid	
BH102	7.00		D	Perp		86	7396	86.00	-	0.22	0.030	1.276	0.04	Valid	
BH201	11.20		D	Perp		86	7396	86.00	-	0.14	0.019	1.276	0.02	Valid	
BH201	9.00		D	Perp		86	7396	86.00	-	0.30	0.041	1.276	0.05	Valid	
BH201	13.60		D	Perp		86	7396	86.00	-	0.31	0.042	1.276	0.05	Valid	
BH201	14.50		D	Perp		86	7396	86.00	-	0.26	0.035	1.276	0.04	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular

UKAS TESTING 4043

PSL Professional Soils Laboratory

Checked / Approved		Date	21/04/16	Contract No:
Airport City North				PSL16/1450
				Client Ref:
				3407

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		Area	D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	W	D	(mm2)		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH202	6.50		A	Par	86	31	961	3394.46	58.26	-	2.94	0.866	1.071	0.93	Valid	
BH202	7.20		A	Par	86	36	1296	3941.95	62.78	-	3.17	0.804	1.108	0.89	Valid	
BH202	14.60		A	Par	86	38	1444	4160.95	64.51	-	0.68	0.163	1.121	0.18	Valid	
BH202	5.70		I	Par	42	27	729	1443.85	38.00	-	0.36	0.249	0.884	0.22	Valid	
BH202	12.40		A	Par	86	29	841	3175.46	56.35	-	0.52	0.164	1.055	0.17	Valid	
BH202	4.80		A	Par	86	32	1024	3503.96	59.19	-	0.84	0.240	1.079	0.26	Valid	
BH202	8.60		A	Par	86	27	729	2956.46	54.37	-	0.38	0.129	1.038	0.13	Valid	
BH202	10.00		A	Par	86	41	1681	4489.44	67.00	-	0.24	0.053	1.141	0.06	Valid	
BH301	18.50		A	Par	86	42	1764	4598.94	67.82	-	0.74	0.161	1.147	0.18	Valid	
BH301	19.50		A	Par	86	33	1089	3613.45	60.11	-	2.29	0.634	1.086	0.69	Valid	
BH301	20.20		A	Par	86	39	1521	4270.45	65.35	-	0.81	0.190	1.128	0.21	Valid	
BH301	16.50		A	Par	86	40	1600	4379.94	66.18	-	1.44	0.329	1.134	0.37	Valid	
BH301	12.20		A	Par	86	37	1369	4051.45	63.65	-	0.48	0.118	1.115	0.13	Valid	
BH301	10.20		A	Par	86	28	784	3065.96	55.37	-	0.62	0.202	1.047	0.21	Valid	
BH301	8.60		A	Par	86	35	1225	3832.45	61.91	-	0.56	0.146	1.101	0.16	Valid	
BH302	16.00		A	Par	86	32	1024	3503.96	59.19	-	0.54	0.154	1.079	0.17	Valid	
BH302	18.10		A	Par	86	36	1296	3941.95	62.78	-	0.94	0.238	1.108	0.26	Valid	
BH302	12.40		A	Par	86	40	1600	4379.94	66.18	-	0.86	0.196	1.134	0.22	Valid	
BH302	13.90		A	Par	86	42	1764	4598.94	67.82	-	0.49	0.107	1.147	0.12	Valid	
BH302	7.00		A	Par	86	31	961	3394.46	58.26	-	0.24	0.071	1.071	0.08	Valid	
BH302	8.60		A	Par	86	33	1089	3613.45	60.11	-	0.22	0.061	1.086	0.07	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular

UKAS TESTING 4043	PSL Professional Soils Laboratory	Checked / Approved	Date	21/04/16
		Airport City North		Contract No: PSL16/1450
				Client Ref: 3407

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		D_e^2	D_e	Failure Load		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	L	D		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH202	6.50		D	Perp		86	7396	86.00	-	0.37	0.050	1.276	0.06	Valid	
BH202	7.20		D	Perp		86	7396	86.00	-	0.52	0.070	1.276	0.09	Valid	
BH202	14.60		D	Perp		86	7396	86.00	-	0.42	0.057	1.276	0.07	Valid	
BH202	12.40		D	Perp		86	7396	86.00	-	0.34	0.046	1.276	0.06	Valid	
BH202	4.80		D	Perp		86	7396	86.00	-	0.25	0.034	1.276	0.04	Valid	
BH202	8.60		D	Perp		86	7396	86.00	-	0.14	0.019	1.276	0.02	Valid	
BH202	10.00		D	Perp		86	7396	86.00	-	0.27	0.037	1.276	0.05	Valid	
BH301	18.50		D	Perp		86	7396	86.00	-	0.57	0.077	1.276	0.10	Valid	
BH301	19.50		D	Perp		86	7396	86.00	-	1.92	0.260	1.276	0.33	Valid	
BH301	20.20		D	Perp		86	7396	86.00	-	0.32	0.043	1.276	0.06	Valid	
BH301	16.50		D	Perp		86	7396	86.00	-	0.69	0.093	1.276	0.12	Valid	
BH301	12.20		D	Perp		86	7396	86.00	-	0.23	0.031	1.276	0.04	Valid	
BH301	10.20		D	Perp		86	7396	86.00	-	0.54	0.073	1.276	0.09	Valid	
BH301	8.60		D	Perp		86	7396	86.00	-	0.40	0.054	1.276	0.07	Valid	
BH302	16.00		D	Perp		86	7396	86.00	-	0.23	0.031	1.276	0.04	Valid	
BH302	18.10		D	Perp		86	7396	86.00	-	0.28	0.038	1.276	0.05	Valid	
BH302	12.40		D	Perp		86	7396	86.00	-	0.38	0.051	1.276	0.07	Valid	
BH302	13.90		D	Perp		86	7396	86.00	-	0.28	0.038	1.276	0.05	Valid	
BH302	7.00		D	Perp		86	7396	86.00	-	0.38	0.051	1.276	0.07	Valid	
BH302	8.60		D	Perp		86	7396	86.00	-	0.12	0.016	1.276	0.02	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular

UKAS TESTING 4043

PSL Professional Soils Laboratory

Checked / Approved		Date	21/04/16	Contract No:
Airport City North				PSL16/1450
				Client Ref:
				3407

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		Area	D_e^2	D_e	Failure Load (P)		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	W	D	(mm2)		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH303	8.50		A	Par	86	29	841	3175.46	56.35	-	1.34	0.422	1.055	0.45	Valid	
BH303	11.80		A	Par	86	32	1024	3503.96	59.19	-	2.76	0.788	1.079	0.85	Valid	
BH303	12.70		A	Par	86	39	1521	4270.45	65.35	-	0.22	0.052	1.128	0.06	Valid	
BH304	15.50		A	Par	86	29	841	3175.46	56.35	-	0.68	0.214	1.055	0.23	Valid	
BH304	16.60		A	Par	86	32	1024	3503.96	59.19	-	0.42	0.120	1.079	0.13	Valid	
BH304	17.60		A	Par	86	36	1296	3941.95	62.78	-	0.84	0.213	1.108	0.24	Valid	
BH304	14.60		A	Par	86	40	1600	4379.94	66.18	-	3.26	0.744	1.134	0.84	Valid	
BH304	9.40		A	Par	86	32	1024	3503.96	59.19	-	3.14	0.896	1.079	0.97	Valid	
BH304	11.30		A	Par	86	29	841	3175.46	56.35	-	0.48	0.151	1.055	0.16	Valid	
BH304	6.00		A	Par	86	38	1444	4160.95	64.51	-	0.66	0.159	1.121	0.18	Valid	
BH304	8.10		A	Par	86	29	841	3175.46	56.35	-	0.68	0.214	1.055	0.23	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular

UKAS TESTING 4043

PSL Professional Soils Laboratory

Checked / Approved		Date	21/04/16	Contract No:
Airport City North				PSL16/1450
				Client Ref:
				3407

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

Borehole Number	Depth (m)	Sample Ref	Test Type	Orientation	Dimensions (mm)		D_e^2	D_e	Failure Load		I_s	Corr Fac	I_{s50}	Failure Type	Remarks
				Par / Perp	L	D		(mm)	(Mpa)	(kN)	(MPa)	F	(MPa)		
BH303	8.50		D	Perp		86	7396	86.00	-	1.27	0.172	1.276	0.22	Valid	
BH303	11.80		D	Perp		86	7396	86.00	-	0.84	0.114	1.276	0.14	Valid	
BH303	12.70		D	Perp		86	7396	86.00	-	0.35	0.047	1.276	0.06	Valid	
BH304	15.50		D	Perp		86	7396	86.00	-	0.44	0.059	1.276	0.08	Valid	
BH304	16.60		D	Perp		86	7396	86.00	-	0.36	0.049	1.276	0.06	Valid	
BH304	17.60		D	Perp		86	7396	86.00	-	0.46	0.062	1.276	0.08	Valid	
BH304	14.60		D	Perp		86	7396	86.00	-	0.09	0.012	1.276	0.01	Valid	
BH304	9.40		D	Perp		86	7396	86.00	-	2.25	0.304	1.276	0.39	Valid	
BH304	11.30		D	Perp		86	7396	86.00	-	0.12	0.016	1.276	0.02	Valid	
BH304	6.00		D	Perp		86	7396	86.00	-	0.39	0.053	1.276	0.07	Valid	
BH304	8.10		D	Perp		86	7396	86.00	-	0.44	0.059	1.276	0.08	Valid	

Note All testing carried out on samples at as received water content

Par = parallel, Perp = perpendicular

UKAS TESTING 4043

PSL Professional Soils Laboratory

Checked / Approved		Date	21/04/16	Contract No:
Airport City North				PSL16/1450
				Client Ref:
				3407

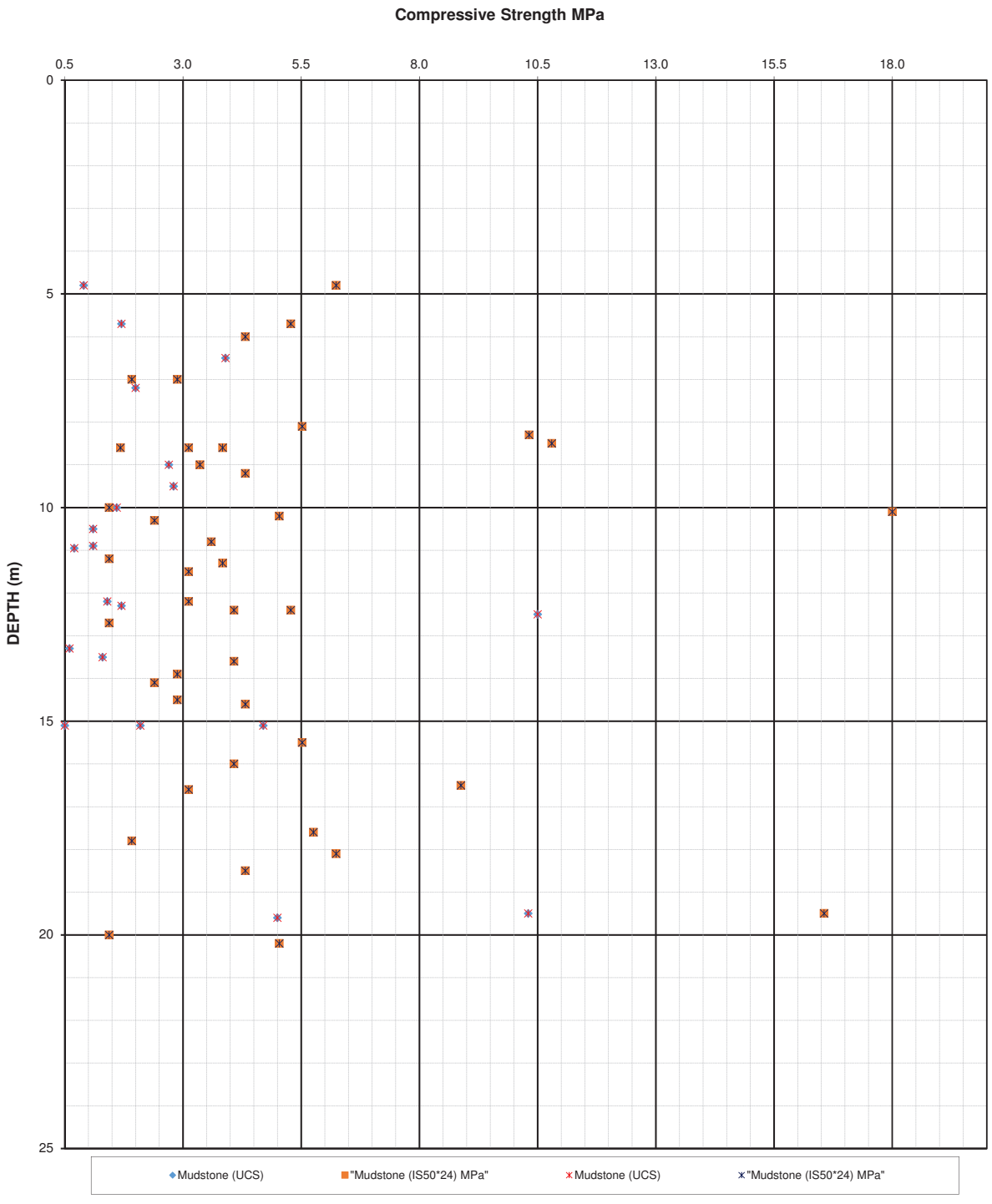
DETERMINATION OF UNCONFINED COMPRESSIVE STRENGTH

ISRM Suggested Methods, pp 111 –116, 1981.

Hole Number	Sample Number	Sample Type	Top Depth (m)	Base Depth (m)	Sample Diameter (mm)	Sample Length (mm)	Height Ratio	Initial Mass (g)	Bulk Density (Mg/m)	Moisture Content (%)	Dry Density (Mg/m)	Load Failure	UCS (MPa)	Failure Mode	Date Tested	Remarks
BH101		C	12.50	12.80	86	114	1.3	1623	2.45	9.1	2.25	60.9	10.5	Brittle	20/04/16	
BH102		C	13.50		86	189	2.2	2650	2.41	9.0	2.21	7.4	1.3	Brittle	20/04/16	
BH102		C	15.10	15.30	86	88	1.0	1268	2.48	5.7	2.35	27.1	4.7	Brittle	20/04/16	
BH201		C	10.90	11.90	86	86	1.0	1189	2.38	9.8	2.17	6.3	1.1	Brittle	20/04/16	
BH201		C	15.10	15.40	86	103	1.2	1347	2.25	13.6	1.98	12.1	2.1	Brittle	20/04/16	
BH201		C	13.30	13.50	86	107	1.2	1490	2.40	12.6	2.13	3.3	0.6	Brittle	20/04/16	
BH202		C	6.50	6.75	86	110	1.3	1479	2.31	11.2	2.08	22.9	3.9	Brittle	20/04/16	
BH202		C	7.20	7.45	86	128	1.5	1718	2.31	14.4	2.02	11.8	2.0	Brittle	20/04/16	
BH202		C	5.70	6.00	86	86	1.0	1189	2.38	8.9	2.19	9.8	1.7	Brittle	20/04/16	
BH202		C	4.80	5.00	86	109	1.3	1519	2.40	9.1	2.20	5.2	0.9	Brittle	20/04/16	
BH202		C	10.50	10.60	86	86	1.0	1234	2.47	10.1	2.24	6.2	1.1	Brittle	20/04/16	
BH301		C	19.50	19.70	86	200	2.3	2822	2.43	11.9	2.17	60.1	10.3	Brittle	20/04/16	
BH301		C	15.10	15.40	86	168	2.0	2308	2.37	13.4	2.09	2.7	0.5	Brittle	20/04/16	
BH301		C	9.00	9.10	86	198	2.3	2617	2.27	15.8	1.96	15.5	2.7	Brittle	20/04/16	
BH302		C	9.50	9.65	86	89	1.0	1156	2.24	9.5	2.04	16.4	2.8	Brittle	20/04/16	
BH302		C	10.00	10.15	86	121	1.4	1702	2.42	11.0	2.18	9.3	1.6	Brittle	20/04/16	
BH302		C	10.95	11.10	86	90	1.0	1138	2.18	13.4	1.92	3.8	0.7	Brittle	20/04/16	
BH303		C	12.20	12.40	86	131	1.5	1802	2.37	15.8	2.05	8.0	1.4	Brittle	20/04/16	
BH304		C	19.60	19.80	86	112	1.3	1618	2.49	9.5	2.27	29.1	5.0	Brittle	20/04/16	
BH304		C	12.30	12.50	86	199	2.3	2781	2.41	11.0	2.17	9.7	1.7	Brittle	20/04/16	

UKAS TESTING 4043	PSL Professional Soils Laboratory	Checked / Approved		Date	21/04/16
		Airport City North			Contract No: PSL16/1450
					Client Ref: 3407

UCS ISRM Method v Depth



3407 : Airport City North,

Mudstone UCS MPa	
Maximum	10.5
Average	2.83
Minimum	0.5

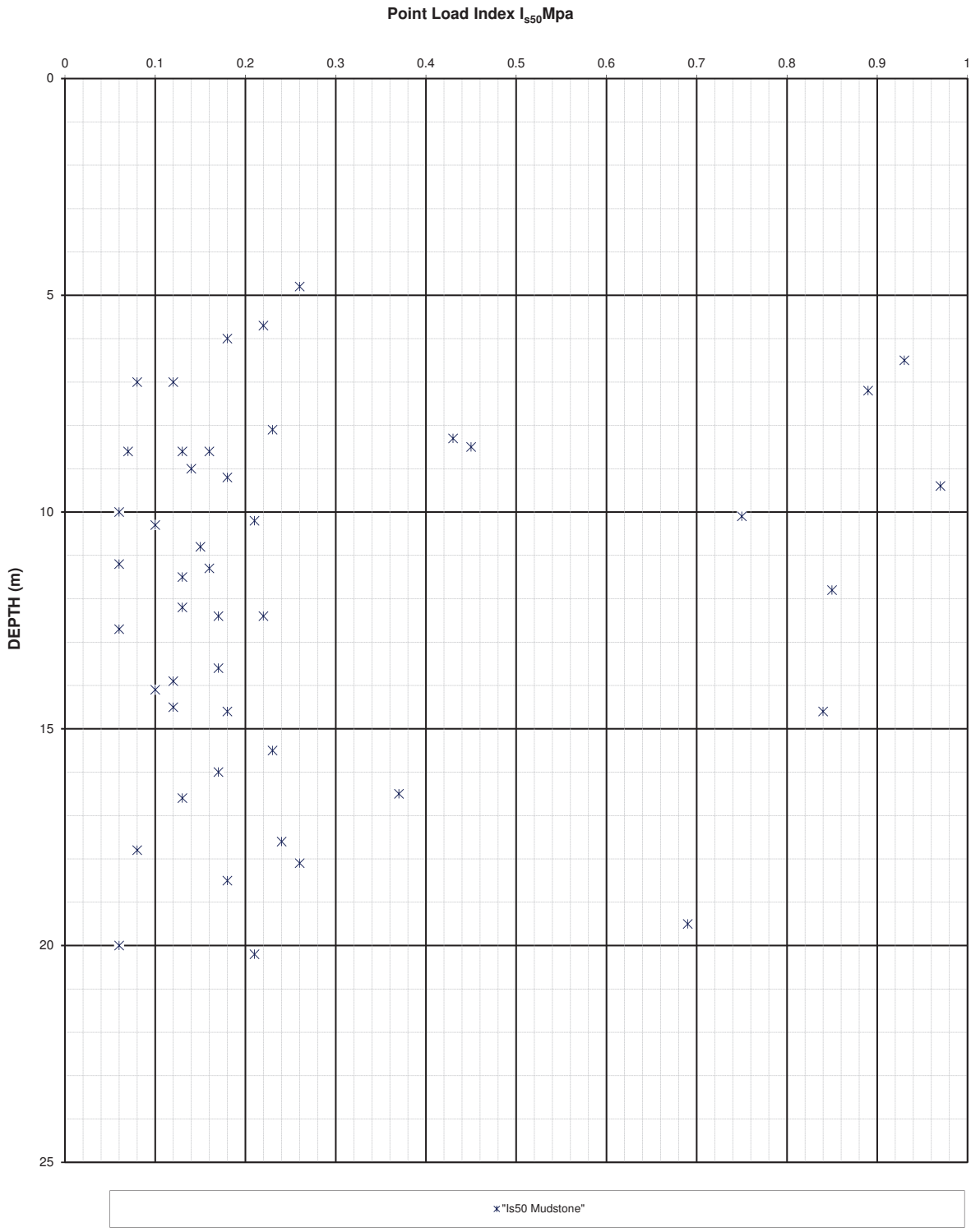
Is50*24 (axial)	
Maximum	44.4
Average	7.95
Minimum	1.4

Extremely weak: less than 1MPa
Very weak : 1 to 5 MPa
Weak: 5 to 25 MPa
Medium strong: 25 to 50MPa
Strong : 50 to 100MPa

UCS(p) = PLT*24

FIGURE 6.1

Point Load Index Test v Depth



3407 : Airport City North,

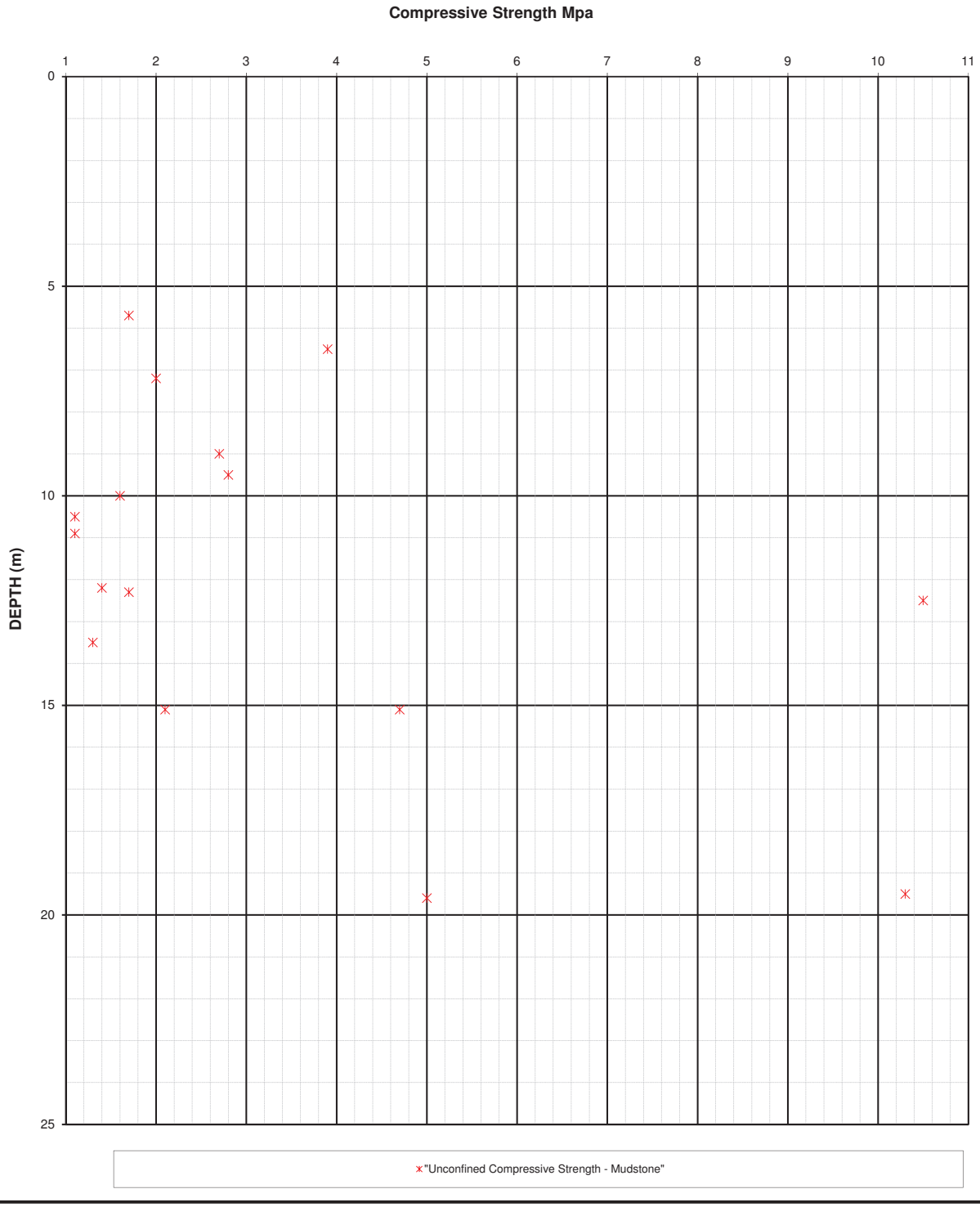
Mudstone Point Load Test Is50

	Axial	Diametral
Maximum	1.85	1.42
Average	0.33	0.13
Minimum	0.06	0.01

	$I_{s(50)}$ MN/m^2	U.C.S. MN/m^2
Very Weak	< 0.05	<1.25
Weak	0.05-0.20	1.25-5
Moderately W	0.20-0.50	5-12.5
Moderately St	0.50 - 2.00	12.5-50

FIGURE 6.2

UCS ISRM Method v Depth



3407 : Airport City North,

Mudstone UCS Mpa	
Maximum	10.5
Average	2.83
Minimum	0.50

Extremely weak: less than 1MPa
Very weak : 1 to 5 MPa
Weak: 5 to 25 MPa
Medium strong: 25 to 50MPa
Strong : 50 to 100MPa

UCS(p) = PLT*24

FIGURE 6.3

TRL - Transport Research Dynamic Cone Penetration CBR

Job No.	3407	Surface Covering	Gravel
Site Name	ACN - Zone 2 Jet Parks 2	Anticpated Ground Conditions	Gravel car park formation overlying clay
Engineer	AS & JB		
Comments	Refer to RoC Consulting drawing ES04 for test locations	Date	26/02/2016

Test No:	DCP 201A		Test No.	DPC 201B	
Blows	Penetration (mm)	CBR (%)	Blows	Penetration (mm)	CBR (%)
Top	115	>50%	Top	105	>50%
2	160		2	131	
2	163		2	141	
5	171		5	150	
5	181		5	159	
10	122		5	170	
			10	210	
			10	210	
			10	210	

TRL - Transport Research Dynamic Cone Penetration CBR

Job No.	3407	Surface Covering	Gravel
Site Name	ACN - Zone 2 Jet Parks 2	Anticpated Ground Conditions	Gravel car park formation overlying clay
Engineer	AS & JB		
Comments	Refer to RoC Consulting drawing ES04 for test locations	Date	26/02/2016

Test No:	DCP 204		Test No.	DPC 205	
Blows	Penetration (mm)	CBR (%)	Blows	Penetration (mm)	CBR (%)
Top	135		Top	100	31%
2	184	43%	2	141	
2	241		2	160	
5	286		5	182	
10	351		5	213	
10	396		10	306	6%
10	424		10	392	
10	457	12%	10	680	
10	475		5	980	
10	569				
5	656				
5	752				
5	862				
5	981				

TRL - Transport Research Dynamic Cone Penetration CBR

Job No.	3407	Surface Covering	Gravel
Site Name	ACN - Zone 2 Jet Parks 2	Anticpated Ground Conditions	Topsoil overlying Clay
Engineer	AS & JB		
Comments	Refer to RoC Consulting drawing ES04 for test locations	Date	26/02/2016

Test No:	DCP 208		Test No.	DPC 209	
Blows	Penetration (mm)	CBR (%)	Blows	Penetration (mm)	CBR (%)
Top	321	5%	Top	115	5%
2	471		2	276	
2	494		2	349	
5	793		5	510	
4	980		5	780	
			5	965	

TRL - Transport Research Dynamic Cone Penetration CBR

Job No.	3407	Surface Covering	Gravel
Site Name	ACN - Zone 2 Jet Parks 2	Anticpated Ground Conditions	Gravel car park formation overlying clay
Engineer	AS & JB		
Comments	Refer to RoC Consulting drawing ES04 for test locations	Date	26/02/2016

Test No:	DCP 202		Test No.	DCP 203	
Blows	Penetration (mm)	CBR (%)	Blows	Penetration (mm)	CBR (%)
Top	110		Top	110	
2	159		2	151	
2	180		2	160	
5	209		5	210	
5	230	>50%	5	223	44%
10	270		10	290	
10	310		10	331	
10	325		10	410	
10	350		10	450	
			10	506	
			10	570	
			10	697	16%
			10	891	
			5	982	

TRL - Transport Research Dynamic Cone Penetration CBR

Job No.	3407	Surface Covering	Gravel
Site Name	ACN - Zone 2 Jet Parks 2	Anticpated Ground Conditions	Gravel car park formation overlying clay
Engineer	AS & JB		
Comments	Refer to RoC Consulting drawing ES04 for test locations	Date	26/02/2016

Test No:	DCP 206		Test No.	DCP 207	
Blows	Penetration (mm)	CBR (%)	Blows	Penetration (mm)	CBR (%)
Top	130	53%	Top	116	50%
2	161		2	151	
2	175		2	170	
5	210		5	192	
5	233		5	214	
10	272		10	256	
10	299	19%	10	281	
10	330		10	310	
10	408		10	346	
10	563		10	380	22%
10	770		10	419	
10	877		10	470	
10	945		10	610	
			10	690	
			10	770	
			10	951	

TRL - Transport Research Dynamic Cone Penetration CBR

Job No.	3407	Surface Covering	Grass
Site Name	ACN - Zone 3 Goodmans	Anticpated Ground Conditions	Topsoil overlying Clay
Engineer	AS & JB		
Comments	Refer to RoC Consulting drawing ES04 for test locations	Date	26/02/2016

Test No:	DCP 301		Test No.	DCP 302	
Blows	Penetration (mm)	CBR (%)	Blows	Penetration (mm)	CBR (%)
Top	125	26%	Top	151	6%
2	162		2	326	
2	191		2	443	
5	250		5	730	
5	270		5	910	
5	345	15%	5	971	
10	550				
10	780				
10	900				
5	950				

TRL - Transport Research Dynamic Cone Penetration CBR

Job No.	3407	Surface Covering	Grass
Site Name	ACN - Zone 3 Goodmans	Anticpated Ground Conditions	Topsoil overlying Clay
Engineer	AS & JB		
Comments	Refer to RoC Consulting drawing ES04 for test locations	Date	26/02/2016

Test No:	DCP 305		Test No.	DCP 306	
Blows	Penetration (mm)	CBR (%)	Blows	Penetration (mm)	CBR (%)
Top	143	9%	Top	196	5%
2	312		2	378	
2	365		2	486	
5	460		5	783	
5	635		5	940	
10	920				
5	971				

TRL - Transport Research Dynamic Cone Penetration CBR

Job No.	3407	Surface Covering	Grass
Site Name	ACN - Zone 3 Goodmans	Anticpated Ground Conditions	Topsoil overlying Clay
Engineer	AS & JB		
Comments	Refer to RoC Consulting drawing ES04 for test locations	Date	26/02/2016

Test No:	DCP 309		Test No.	DCP 310	
Blows	Penetration (mm)	CBR (%)	Blows	Penetration (mm)	CBR (%)
Top	172	6%	Top	101	5%
2	310		2	221	
2	387		2	325	
5	631		5	610	
5	836		5	830	
5	980		5	980	

TRL - Transport Research Dynamic Cone Penetration CBR

Job No.	3407	Surface Covering	Grass
Site Name	ACN - Zone 3 Goodmans	Anticpated Ground Conditions	Topsoil overlying Clay
Engineer	AS & JB		
Comments	Refer to RoC Consulting drawing ES04 for test locations	Date	26/02/2016

Test No:	DCP 303		Test No.	DCP 304	
Blows	Penetration (mm)	CBR (%)	Blows	Penetration (mm)	CBR (%)
Top	160	6%	Top	190	3%
2	250		2	373	
2	321		2	503	
5	680		5	600	20%
5	880		5	675	
5	973		10	843	
			10	930	
			5	962	

TRL - Transport Research Dynamic Cone Penetration CBR

Job No.	3407	Surface Covering	Grass
Site Name	ACN - Zone 3 Goodmans	Anticpated Ground Conditions	Topsoil overlying Clay
Engineer	AS & JB		
Comments	Refer to RoC Consulting drawing ES04 for test locations	Date	26/02/2016

Test No:	DCP 307		Test No.	DCP 308	
Blows	Penetration (mm)	CBR (%)	Blows	Penetration (mm)	CBR (%)
Top	180	7%	Top	141	7%
2	341		2	230	
2	382		2	284	
5	587		5	430	
5	708		5	593	
5	870		5	777	
4	969		5	926	
			1	990	

TRL - Transport Research Dynamic Cone Penetration CBR

Job No.	3407	Surface Covering	Gravel
Site Name	ACN - Zone 2 Jet Parks 2	Anticpated Ground Conditions	Gravel car park formation overlying clay
Engineer	AS & JB		
Comments	Refer to RoC Consulting drawing ES04 for test locations	Date	26/02/2016

Test No:	DCP 204		Test No.	DPC 205	
Blows	Penetration (mm)	CBR (%)	Blows	Penetration (mm)	CBR (%)
Top	135		Top	100	31%
2	184	43%	2	141	
2	241		2	160	
5	286		5	182	
10	351		5	213	
10	396		10	306	6%
10	424		10	392	
10	457	12%	10	680	
10	475		5	980	
10	569				
5	656				
5	752				
5	862				
5	981				

TRL - Transport Research Dynamic Cone Penetration CBR

Job No.	3407	Surface Covering	Gravel
Site Name	ACN - Zone 2 Jet Parks 2	Anticpated Ground Conditions	Gravel car park formation overlying clay
Engineer	AS & JB		
Comments	Refer to RoC Consulting drawing ES04 for test locations	Date	26/02/2016

Test No.	DCP 207	
Blows	Penetration (mm)	CBR (%)
Top	116	
2	151	
2	170	
5	192	
5	214	50%
10	256	
10	281	
10	310	
10	346	
10	380	
10	419	
10	470	
10	610	22%
10	690	
10	770	
10	951	

TRL - Transport Research Dynamic Cone Penetration CBR

Job No.	3407	Surface Covering	Gravel
Site Name	ACN - Zone 2 Jet Parks 2	Anticpated Ground Conditions	Topsoil overlying Clay
Engineer	AS & JB		
Comments	Refer to RoC Consulting drawing ES04 for test locations	Date	26/02/2016

Test No.	DPC 209	
Blows	Penetration (mm)	CBR (%)
Top	115	5%
2	276	
2	349	
5	510	
5	780	
5	965	

APPENDIX G – Preliminary Earthworks Proposals

THIS DRAWING IS THE PROPERTY OF RgCp. COPYRIGHT IS RESERVED BY THEM AND THE DRAWING IS ISSUED ON THE CONDITION THAT IT IS NOT COPIED, REPRODUCED, RETAINED OR DISCLOSED TO ANY UNAUTHORISED PERSON EITHER WHOLLY OR IN PART WITHOUT THE WRITTEN CONSENT OF RgCp

NOTES

KEY

- MAJOR CONTOUR (0.2m INTERVALS)
- MINOR CONTOUR (0.05m INTERVALS)
- RETAINING WALL
- 1 IN 3 EARTHWORKS BATTER TO EXISTING

1 IN 3 EARTHWORKS BATTER TO EXISTING

LINK INTO EXISTING JET PARKS SITE

1 IN 3 EARTHWORKS BATTER TO EXISTING

1 IN 3 EARTHWORKS BATTER TO EXISTING

VARYING EARTHWORKS BATTER TO FORMATION LEVEL

VARYING EARTHWORKS BATTER TO FORMATION LEVEL

TIE INTO FORMATION LEVEL FOR CONSTRUCTION TRAFFIC

VARYING EARTHWORKS BATTER TO FORMATION LEVEL

TIE INTO FORMATION LEVEL FOR CONSTRUCTION TRAFFIC

1 IN 3 EARTHWORKS BATTER TO EXISTING

1 IN 3 EARTHWORKS BATTER TO EXISTING

CONTOURS TO THE REAR OF RETAINING WALL TO BE ADJUSTED TO A MAXIMUM OF 1:3 TO MEET ARCHITECTS CONFIRMED RETAINING WALL ALIGNMENT

RETAINING WALL. MAX HEIGHT: 3.5m

E1
FFL: 72:000

E2
FFL: 72:000

REV.	DATE	DETAILS	DRN.	CHK.
1	05:04:19	STAGE 3 ISSUE	TS	MJN

DRAWING STATUS
TENDER

RIBA STAGE
STAGE 3

RoC CONSULTING
Commercial Wharf
6 Commercial Street
Manchester M15 4PZ
T 0161 214 5390
W rocconsulting.com

DRAWN	DATE	SCALES
TS	APR 2019	1:750
CHECKED	DATE	THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE --DO NOT SCALE--
PW	APR 2019	
APPRVD.	DATE	EMAIL FOR DRAWINGS
JS	APR 2019	info@rocconsulting.com

CLIENT
AIRPORT CITY LTD PARTNERSHIP

PROJECT TITLE
AIRPORT CITY MANCHESTER

DRAWING TITLE
FINISHED SURFACE CONTOURS

PROJECT No.	DRAWING No.	REV.
3733	CIV-200	1

© RgCp Ltd.

TOPSOIL STRIP (150mm THICKNESS)
7,425m³

CUT AND FILL VOLUMES (EXCLUDING ABOVE TOPSOIL VOLUME)		
GROSS CUT (m³)	GROSS FILL (m³)	NET CUT/FILL (m³)
34,127	20,146	13,981 CUT

THIS DRAWING IS THE PROPERTY OF RgCp. COPYRIGHT IS RESERVED BY THEM AND THE DRAWING IS ISSUED ON THE CONDITION THAT IT IS NOT COPIED, REPRODUCED, RETAINED OR DISCLOSED TO ANY UNAUTHORISED PERSON EITHER WHOLLY OR IN PART WITHOUT THE WRITTEN CONSENT OF RgCp

NOTES

1) VOLUMES ARE BASED ON A COMPARISON OF EXISTING LEVELS (MINUS 150mm TOPSOIL STRIP) TO APPROXIMATE PROPOSED FORMATION LEVEL.
2) THE INFORMATION IS INDICATIVE ONLY AND FOR COMPARISON PURPOSES ONLY. INFORMATION SHOWN SHOULD NOT BE RELIED UPON FOR CONSTRUCTION OR COSTING PURPOSES
3) CUT AND FILL VOLUMES DO NOT ALLOW FOR ANY OTHER EXCAVATION (SUCH AS DRAINAGE AND FOUNDATIONS)
4) VOLUMES DO NOT ALLOW FOR ANY CONSTRUCTION ABOVE FORMATION LEVEL
5) THE VOLUMES SHOWN DO NOT ALLOW FOR ANY BULKING OF EXCAVATED MATERIAL

KEY

- MAJOR FILL CONTOUR (1m INTERVALS)
- MINOR FILL CONTOUR (0.25m INTERVALS)
- ZERO CUT / FILL CONTOUR
- MINOR CUR CONTOUR (0.25m INTERVALS)
- MAJOR CUT CONTOUR (1m INTERVALS)

CONTOURS TO THE REAR OF RETAINING WALL TO BE ADJUSTED TO A MAXIMUM OF 1:3 TO MEET ARCHITECTS CONFIRMED RETAINING WALL ALIGNMENT

RETAINING WALL. MAX HEIGHT: 3.5m

E1
FFL: 72:000

E2
FFL: 72:000

REV.	DATE	DETAILS	DRN.	CHK.
1	05:04:19	STAGE 3 ISSUE	TS	MJN

DRAWING STATUS
TENDER

RIBA STAGE
STAGE 3

RoC CONSULTING
Commercial Wharf
6 Commercial Street
Manchester M15 4PZ
T 0161 214 5390
W rocconsulting.com

DRAWN	DATE	SCALES
TS	APR 2019	1:750
CHECKED: PW	DATE: APR 2019	THE ABOVE SCALES APPLY WHEN PLOTTED AT A1 SIZE --DO NOT SCALE--
APPRVD.: JS	DATE: APR 2019	EMAIL FOR DRAWINGS: info@rocconsulting.com

CLIENT
AIRPORT CITY LTD PARTNERSHIP

PROJECT TITLE
AIRPORT CITY MANCHESTER

DRAWING TITLE
CUT AND FILL ANALYSIS

PROJECT No.	DRAWING No.	REV.
3733	CIV-201	1

© RgCp Ltd.











An award-winning practice serving the property and construction industry for more than 25 years

RoCP Ltd
(Trading as RoC Consulting)
Commercial Wharf
6 Commercial Street
MANCHESTER
M15 4PZ

T | 0161 214 5390
W | www.rocconsulting.com