







Proposed Lidl, Cross Keys Lane, Hoyland

Phase 2 Ground Investigation Report

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Site Address: Cross Keys Lane, Hoyland, Barnsley S74 0PY (nearest postcode)

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Executive Summary

Appointment	In April 2021, Curtins were instructed by Lidl GB to undertake a Ground Investigation at site located off Cross Keys Lane, Hoyland, Barnsley. The site is centred at National Grid Reference (NGR) 35205 00470. It is proposed that the site will be developed as a Lidl store with associated car parking areas and landscape embankments. The proposed redevelopment plans are enclosed within Appendix A.
Current Site Status	The site is currently vacant. The site is grassed with a strip of vegetation including bushes and trees along the centre of the site running north south. The site is accessed via a single gate on the eastern site boundary.
Summary of Phase 1	A detailed review of the available historical mapping and other information for the site, was undertaken by GD Pickles Limited (GDP) in 2021 (1). Historical mapping included within the Phase 1 report indicates the site has primarily been used as agricultural land. The South Yorkshire Mining Advisory Service Report (2) indicates that the western part of the site is within the boundary of Rockingham Opencast Coal Mine. A review of available historical mapping and information including within the Phase 1 report indicates the following geological sequence underlying the site: • Made ground - quarry spoil/overburden on the western side of the site; • Superficial deposits – none identified. • Bedrock -Pennine Middle Coal Measures The GDP Phase I Environmental Site Assessment summarised the environmental site setting and developed a conceptual site model. The report identified five contaminant sources: soil contamination, groundwater contamination, off site sourced contamination, ACM's and ground gas. The identified human health risks from soil and groundwater were Low or Very Low. The ACM risk to end users and construction workers was classified as Moderate/Low. The ground gas risk was classified as moderate. The identified risk from soil to construction materials (aggressive ground) was classified as moderate.
Fieldworks Undertaken	A first phase of site investigation was undertaken on the 17th to 21st May 2021 comprised, two rotary boreholes, seven window sample boreholes (three installed with gas and groundwater monitoring wells), ten trial pits, three trial trenches and twelve dynamic probe holes. Selected soil samples were subjected to laboratory analysis and four return gas monitoring visits have been undertaken. A second phase was undertaken on the 26th and 27th October aimed at further information the ground profile and location of the high wall and comprised additional window sample holes, trial trenches and CPT testing.
Encountered Ground Conditions	Surface cover across the site was grass. Topsoil was found in all locations across the site, the topsoil was typically brown sandy gravelly clay. Gravel was medium sub angular to angular of shale. Made Ground on the west of the site (infilled opencast area) typically comprised red and black sandy gravel, variable thickness 0.0 to > 4.7m, underlain by clayey gravel of siltstone and mudstone (colliery spoil). The thickness of the made ground deposits varied spatially across the western side of the site. The base of the made ground was not identified during the site investigation. On the eastern side of the site Made Ground was not found beneath the topsoil layer. Superficial deposits were identified in WS103 to WS107, TP105, TP106, TP107, TP109, TP111, TT101, R101 and R102 in the first phase of works, and TT201, TT202, TT204 and TT205 in the second phase of works. The superficial deposits were typically described as light brown soft sandy gravelly clay. Weathered bedrock typically comprising mudstone sandstone and siltstone was encountered in WS103, WS105, WS107, TP107 and TP108 in the first phase of SI, and in TT203 in the second phase. Solid geology owing to the PMCM formation comprising mudstone and sandstone at depths ranging from 1.2 to 30 m bgl was encountered in R101, R102, TP105, TP107 and TP110 in the first phase of works, and WS201, WS203 and WS204 in the second phase. Perched water levels across the site were variable. Within the opencast backfill area shallow groundwater strikes were between 0.3 and 0.9 m bgl. Groundwater was not encountered in the shallow monitoring wells installed on the east of the site.
Environmental Laboratory Testing and	The environmental chemistry soil results have been compared with the General Assessment Criteria for soils with respect to human health against '*Commercial'* thresholds with a SOM of 2.5%. With respect to the proposed end-use of the site. With respect to the proposed end-use of the site, no exceedances of the GAC were reported. Asbestos was not detected in any of the samples scheduled for asbestos testing. Due to the proposed nature of the proposed development (Lidl store with associated car parking) it is unlikely that site users will come into contact with soil at the site. There is low likelihood that the soils at the site will present an unacceptable risk to human health.

Ground Gas Monitoring Results	The results from the ground gas monitoring from both phases are indicative of a CS1 scenario. The foundation solution selected will need to be taken into account when assessing the ground gas risks at the site.
Ground Contamination and Ground Gas Assessment	A **Low** risk rating has been proposed to commercial end users from made ground on site. A **Low** risk rating from asbestos inhalation has been proposed for commercial end users, construction workers and residents of adjacent properties. A **Moderate**/**Low** risk rating is proposed to residential end users associated with ground gases and mine gases. The risk to the sensitive Secondary A Aquifer, which underlies the is assessed as **Low.**
Geotechnical Assessment and Recommendations	**Summary** The presence of deep backfill material and mining legacy features, notably the highwall are key constraints to the proposed development. The made ground (opencast backfill area to the west and the made ground to east) is not considered a suitable founding stratum due to its inherent variability in composition and consistency. The superficial deposits encountered are predominantly described as soft. They have been encountered in limited thickness therefore limited testing has been undertaken on these deposits. The soft superficial deposits are compressible and therefore unsuitable as a founding stratum. **Foundation Design** To the eastern areas where shallow rock has been encountered, foundations solutions such as deep trench filled foundations, founded on bedrock or adoption of a ground improvement solution such as Vibro Stone Columns can be adopted. Within the western areas, subject to further ground investigations within the made ground, ground improvement solutions such as Vibro Stone Columns, Controlled Module Columns or Piled foundations can be adopted. Static cone penetration testing undertaken within the second phase of works, with 12 locations in the eastern part of the site, and 4 locations in the area of the highwall. The results of the CPT's support the above recommendations that Vibro Stone Columns are likely to be suitable. However, it is recommended that a specialist designer is consulted to confirm the detailed design of adopted ground improvement. Any ground improvements or deep foundations solutions must be designed by a suitably qualified and experienced ground improvement contractor/piling designer. **Ground Floor Slabs** Based on observation onsite together with the results of laboratory tests it is recommended that, ground floor slabs should be suspended. However, where ground improvement is utilised, it can be designed and installed to allow adoption of a ground bearing slab. **Road and Pavement Design** For detailed design the designer should assess the appropriate CBR value to be adopted based on the proposed formation level, determined following detailed design of proposed carriageways/hardstanding and (where applicable) the minimum Local Highway Authority requirements for carriageway construction thicknesses. The designer should take into account the nature of the deposits that will form the sub-formation to any proposed capping and subbase design. The predominantly cohesive nature of the shallow soils encountered is likely to be sensitive to seasonal changes and inclement weather. Any CBR value adopted in detailed design (including any values taken from the results appended to this report) must be confirmed on site at the time of construction through appropriate inspection and validation testing at the specific line and level of the proposed carriageway/hardstanding sub-formation. A suitable Earthworks Strategy must be adopted which details suitable validation testing methods and criteria. The Strategy should provide suitable process for dealing with the potential degradation of the sub-formation during periods of heavy rain or other inclement weather conditions (e.g. frost). Based on the current layout it is identified that the majority of car parking and external hard standing is within the fill areas to the west of the site. The potential for the backfill material to continue to settle is considered likely. Investigations to date have not conclusively confirmed the depth to bedrock however historic information (Section 3) suggests that that all exploratory holes in the area refuse between depths of c 3.5m and 7m depth. This accords with Curtins dynamic probing. Although the settlement potential of the fill will reduce over time differential settlement will be observed in this material owing to the varying thickness of the fill. Of note is the highwall in the centre of the site which is stepped where differential settlement may be most observed. However, the total potential differential settlement will be dependent on the thickness of fill and any proposed changes in loading through construction. It is recommended that the depth to bedrock within the fill is confirmed to confirm the likely settlement potential of the fill and the requirement for any additional mitigation with regards to long term settlement

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1.0 Introduction

1.1 Project Background

In April 2021, Curtins were instructed by Lidl GB to undertake a Ground Investigation at site located off Cross Keys Lane, Hoyland, Barnsley. The site is centred at National Grid Reference (NGR) 35205 00470.

It is proposed that the site will be developed as a Lidl store with associated car parking areas and landscape embankments. The proposed redevelopment plans are enclosed within *Appendix A*.

1.2 Scope of Services

A Phase 1 Preliminary Environmental Assessment providing an overview of the geo-environmental site setting has been undertaken by GD Pickles Limited.

A Phase 2 Ground Investigation Report (GIR) has subsequently been undertaken to address the findings of the Phase 1.

The GIR will be sufficient to support discharge of planning conditions relating to contamination and coal mining legacy and to support civil and structural design.

Specifically, the Phase 2 investigation and report are intended to provide:

- An assessment of the near surface and underlying ground conditions;
- Chemical analysis of soil data followed by human health risk assessment;
- Screening of environmental soil samples to obtain relevant waste codes for near surface soils;
- Geotechnical soils testing of the founding strata to assess its strength and to determine suitable grades of buried concrete;
- An updated coal mining risk assessment;
- Ground gas monitoring and risk assessment appropriate to the site's proposed end use;

Consideration of flood risk, ecology and archaeological issues are outside of the scope of this report.

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2.0 Phase 1 Preliminary Site Assessment

2.1 Current Setting

Site use, location and description are shown below in *Table 2.1* and *Figure 2.1.*

Table 2-1 Site Details

Site Address	Cross Keys Lane, Hoyland, Barnsley S74 0PY (nearest postcode).
NGR	35205 00470
Area of Site	2.3 acres
Current Site Use and Description	The site is currently vacant. The site is grassed with a strip of vegetation including bushes and trees along the centre of the site running north south. The site is accessed via a single gate on the eastern site boundary.



***Figure 2.1** – Site Location Plan*

Table 2-2 Surrounding Area

Surrounding Area	**N**	Residential properties and fields
	E	Cross Keys Lane, residential properties, lorry garage/scrap yard
	S	Sheffield Road, Rockingham Colliery Cricket Club
	W	Sheffield Road and the A6195

2.2 Previous Site Use

A detailed review of the available historical maps and other information for the site, was undertaken by GD Pickles Limited (GDP) in 2021 (1).

Historical maps included within the Phase 1 report indicates the site has primarily been used as agricultural land. The South Yorkshire Mining Advisory Service Report (2) indicates that the western part of the site is within the boundary of Rockingham Opencast Coal Mine. A plan of the site is included in Appendix A.

2.3 Geology and Hydrogeology

2.3.1 Geology and Hydrogeology

A study of the Groundsure Report (3) contained in the GDP report (1) and the British Geological Survey's (BGS) Geology of Britain Viewer (4) and The 1:50,000 scale BGS Map Sheet 87 'Barnsley', dated 2008 mapping records indicates the following geological and hydrogeological succession underlying the site:

Table 2-3 Geological/Hydrogeological Succession

Geology	Hydrogeological Classification
Made Ground	**Associated Hydrogeological Classification**
Reference to the Groundsure report indicates that Artificial/Made Ground is not present on site. However as noted in section 2.2 the western part of the site is located within the boundary of an opencast coal mine which has been subsequently backfilled with overburden/spoil.	Not Classified
Superficial Geology	**Associated Hydrogeological Classification**
None identified.	Not Classified
Bedrock Geology	**Associated Hydrogeological Classification**
Pennine Middle Coal Measures (PMCM) The eastern half of the site is underlain by a sandstone unit and the western half is	Secondary A Aquifer[1].

Geology	Hydrogeological Classification
underlain by mudstone and siltstone. To the west of the site a coal outcrop is indicated orientated approximately north to south which dips below the site.	

Notes:

1. *These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.*

The 1:50,000 scale BGS Map Sheet 87 'Barnsley', dated 2008 indicates the coal outcrop to the west of the site to be the Swallow Wood Coal which is indicated to be between 0.2 and 3.7m thick. The Swallow Wood Coal is underlain by the Haigh Moor (Kexbrough) Rock, a named sandstone unit between 0.0 and 28m thick. Further coal seams (Top Haigh Moor Coal, Haigh Moor Coal and Low Haigh Moor Coal) are indicated to be present within the lower part of the sandstone unit.

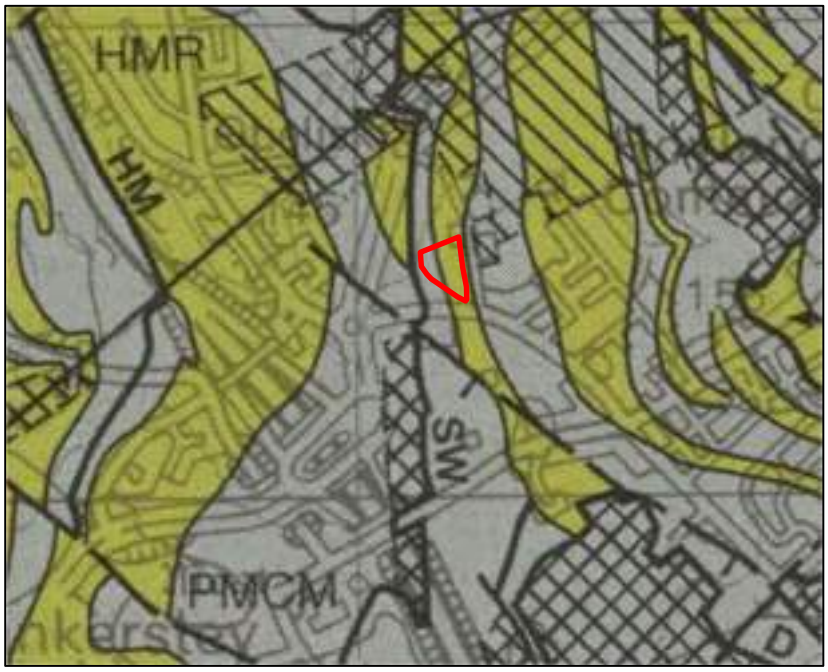


Figure 2.3 Map Extract from 1:50,000 scale BGS Map Sheet 87 'Barnsley', dated 2008

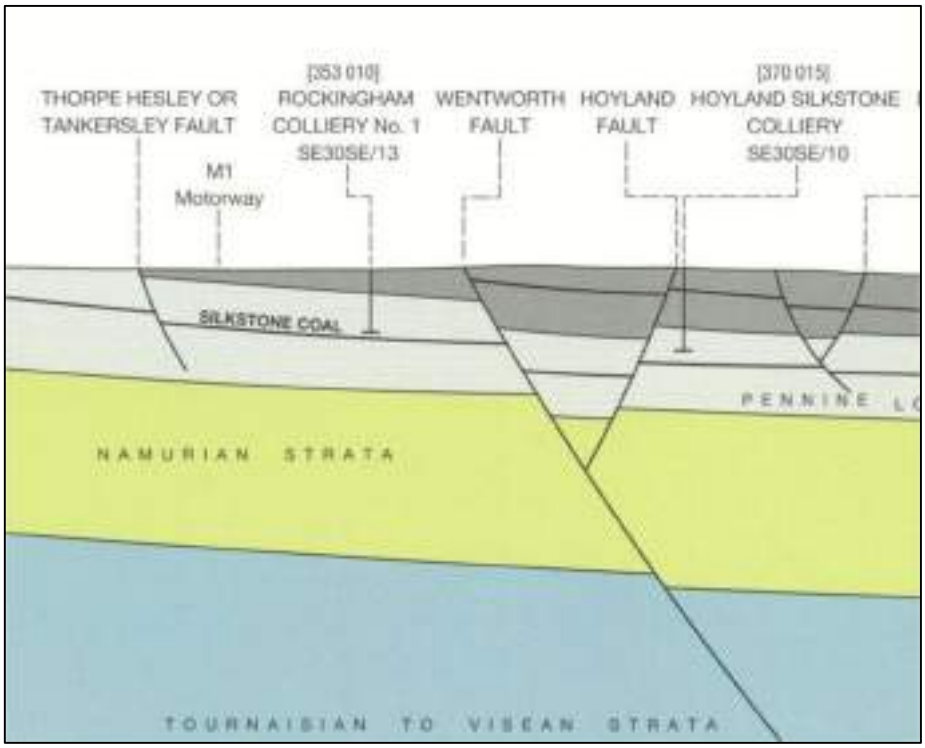


Figure 2.4 'Cross Section Showing The General Relationships of Rocks' extracted from Map 1:50,000 scale BGS Map Sheet 87 'Barnsley', dated 2008

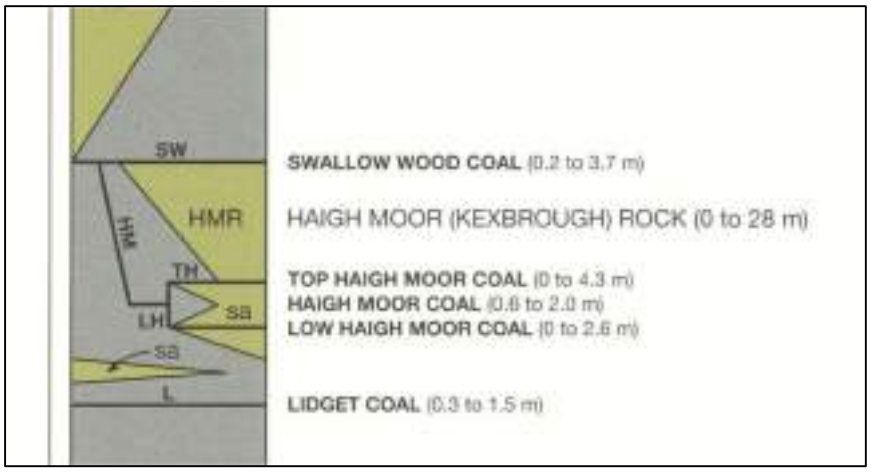


Figure 2.5 Vertical Cross Section from Map Extract from 1:50,000 scale BGS Map Sheet 87 'Barnsley', dated 2008

Approximately 100m to the southwest of the site a fault line is indicated, orientated northwest to southeast with the downthrown side to the southwest (As shown on Figure 2-3).

The sandstone unit underlying the eastern part of the site overlays the Swallow Wood Coal. Therefore, the coal seam is likely to extend under the site, very likely the seam taken in the Rockingham opencast site up to the mapped high wall and possibly underground from there. Mining and Quarrying

Information presented on the Coal Authority Interactive Web Viewer (5) indicates that the site is located within a Development High Risk area.

A Coal Authority mining report was obtained for the site as part of the Phase 1 Assessment undertaken by GDP (1).

Table 2-4 Summary of the Coal Authority Consultants Coal Mining Report

Detailed findings of Coal Authority Report	Does it affect the site
Past or present underground mining	Seven worked coal seams were present on site: • Lidgett (last worked in 1942) • Low Fenton (last worked in 1948) • Top Fenton (last worked in 1920) • Parkgate (last worked in 1885) • Middleton Main (last worked in 1904) • Silkstone (last worked in 1918) • Whinmoor (last worked in 1948)
Future underground coal mining	The property is not in an area where the Coal Authority has plans to grant a licence to remove coal using underground methods. The property is not in an area where a licence has been granted to remove or otherwise work coal using underground methods. The property is not in an area likely to be affected from any planned future underground coal mining. However, reserves of coal exist in the local area which could be worked at some time in the future. No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.
Mine entries within 100m of the site boundary	There are no known coal mine entries within, or within 100 metres of, the boundary of the property.
Coal Mining Subsidence	The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres, since 31 October 1994. There is no current Stop Notice delaying the start of remedial works or repairs to the property. The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.
Mine Gas	The Coal Authority has no record of a mine gas emission requiring action within 500m of the site boundary.

Detailed findings of Coal Authority Report	Does it affect the site
Past, present or future opencast coal mining	The property is located within the boundary of a former opencast site 'Rockingham' from which coal has been removed by opencast methods. There are no current or future licence requests outstanding to remove coal by opencast methods within 200 metres of the boundary.

2.3.2 Other Ground Stability Issues

The Groundsure report (3) indicates that the hazards from shrink-swell clays, landslides, running sands, compressible deposits and collapsible deposits are very low and the hazard from ground dissolution of soluble rocks is negligible.

2.4 Land Gases

2.4.1 Landfill and Infilled Land

There is an Environment Agency historic landfill located 239m northwest of the site. There are two historic waste sites derived from local authority planning records located 285m northwest and 474m north.

As specified in section 2.3 the western half of the site (former opencast area) is infilled with spoil/overburden.

2.4.2 Radon

According to the Groundsure report the site is not in a Radon Affected Area as less than 1% of properties are above the action level. Radon protection measures are therefore not required as part of new dwellings or extensions. In the event a basement is to be incorporated in the proposed development the advice of a radon specialist should be obtained.

2.5 Hydrology

The closest surface water feature is a land drain 94m northeast located within the area of the former tip.

Reference to the Groundsure Enviro Insight report indicates the Site is not vulnerable to the risk of flooding from rivers and seas. Consideration of the potential risks from flooding fall outside the scope of this assessment.

2.6 Unexploded Ordnance (UXO) Risk Assessment

A Reference to the Zetica UXO Unexploded Bomb Risk Map (6) indicates the site lies in a Low Risk Area.

3.0 Existing Reports

As part of this assessment Curtins have been provided the following documents:

- GDP Phase 1 Environmental Assessment and Desk Based Coal Mining Risk Assessment Proposed Retail Development, Cross Keys Lane, Hoyland 2021.
- WSP Parsons Brinkerhoff Phase 1 Ground Conditions Report, no 70019822-001, Land at Rockingham Barnsley, March 2016 (available on the Planning Portal).

3.1 GDP Phase 1 Environmental Assessment and Desk Based Coal Mining Risk Assessment, 2021

The GDP Phase I Environmental Site Assessment summarised the environmental site setting and developed a conceptual site model. The report identified five contaminant sources: soil contamination, groundwater contamination, off site sourced contamination, ACM's and ground gas. The identified human health risks from soil and groundwater were Low or Very Low. The ACM risk to end users and construction workers was classified as Moderate/Low. The ground gas risk was classified as moderate. The identified risk from soil to construction materials (aggressive ground) was classified as moderate.

3.2 WSP Parsons Brinkerhoff Phase 1 Ground Investigation Report no 70019822-001, Land at Rockingham Barnsley, March 2016

The WSP Phase 1 report covers three plots of land, the area of relevance to the proposed Lidl store is Plot 3. The report summarises the site environmental setting, potential contaminated land constraints as well as potential ground engineering constraints. The report also includes borehole logs from the historic site investigations undertaken by Mott Macdonald in 2003 BH02 and BH04 located on the east of the site note depths of made ground 4.5 and 7.6 m bgl respectively.

4.0 Preliminary Conceptual Site Model & Qualitative Risk Assessment

The preliminary conceptual site model (PCSM) and Qualitative Risk Assessment (QRA) are presented in the table presented in this section.

The PCSM details the source-pathway-receptor linkages or potential pollutant linkages (PPL) that have been identified for the site. The QRA details the associated level of risk relating to these potential pollutant linkages.

The PCSM and QRA concern risk to human health and water environment with additional, more specific risk assessment protocols contained within the main body of this reporting, as detailed in *Section 4.1*.

The QRA follows the framework outlined within CIRIA C552 (7) which is summarised within *Appendix G.*

The 'risk rating' within the QRA refers to the risk that the source, pathway, receptor linkage or PPL is complete. Unless specifically stated it does not necessarily refer to an immediate risk and is intended to be used as a tool to assess the necessity for further assessment/investigation.

4.1 Additional Risk Assessments

The following risk assessments, listed below, are not included within the main CSM and QRA as they are not of relevance to this site. They have already been considered as listed below;

- The risk presented by Radon is discussed and assessed in Section *2.4.2* and
- The risk presented by Unexploded Ordnance is discussed and assessed in *Section 0.*

Under current health and safety legislation, employers are required to carry out their own appropriate risk assessments and mitigation to protect themselves and their employees, other human receptors and the environment from potential contamination. Such risks must be adequately mitigated by law, specifically the Construction Design Management (CDM) Regulations (2015) (8). which require that potential risks to human health and the environment from construction activities are appropriately identified and all necessary steps taken to eliminate / manage that risk. It has been assumed that any future construction works on site will be undertaken in compliance with these requirements and therefore construction workers involved in the building works at the site.



- The table below represents the first stage in the land quality risk assessment process: The Qualitative Risk Assessment.
- For a development site to be deemed 'suitable for use', the level of risk needs to be brought down to acceptable levels, i.e. low to very low risk. The purpose of each stage of risk assessment is ultimately to establish, if there is a requirement for additional levels of assessment to be made to have sufficient confidence to support a risk characterisation or management decision, e.g. remedial action.
- In the absence of specific site data, a Generic Quantitative Risk Assessment is invariably recommended.

Conceptual Site Model			Qualitative Risk Assessment			Recommended Actions
Source	**Pathway(s)**	**Receptor(s)**	**Consequence**	**Likelihood of Occurrence**	**Risk Rating**	
Made Ground (colliery spoil and overburden)	**Direct contact/ingestion/inhalation of contaminated soils and shallow/ surface groundwater**	**Site End Users** Commercial	**Medium** Chronic health risk.	**Unlikely**	**Low**	Ground Investigation and Contamination Testing Generic Quantitative Risk Assessment.
		Construction and maintenance workers	**Medium** Chronic health risk.	**Unlikely** Standard Health & Safety precautions likely to be adopted by construction workers which will reduce likelihood of contact with contaminated soils.	**Low**	Construction Workers should be provided with appropriate PPE during all groundwork activities. Generic Quantitative Risk Assessment.
	Ingestion, inhalation of asbestos fibres	**Site End Users** Commercial	**Medium** Chronic health risk.	**Low**	**Moderate/Low**	Ground Investigation with Contamination Testing
		Construction and maintenance workers	**Medium** Chronic health risk.	**Unlikely** Standard Health & Safety precautions likely to be adopted by construction workers which will reduce likelihood of contact with contaminated soils.	**Low**	Construction Workers should be provided with appropriate PPE during all groundwork activities. Generic Quantitative Risk Assessment.
		Residents of adjacent properties	**Medium** Chronic health risk.	**Low**	**Moderate/Low**	Ground Investigation with Contamination Testing
	Horizontal and vertical migration of contaminants	**Controlled Waters** Surface Water Drain located 94 m to the north of the site	**Mild** Pollution of non-sensitive waters.	**Low** Given the distance from the site to the nearest surface water receptor	**Low**	Ground investigation to confirm no mobile/gross contamination in shallow soils
		Controlled Waters Groundwater Bedrock - Secondary A Aquifer	**Medium** Site is not located within a Source Protection Zone.	**Low** The underlying bedrock predominantly comprises mudstone which limits vertical migration of contaminants.	**Moderate/Low**	Ground investigation to confirm no mobile/gross contamination in shallow soils

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Conceptual Site Model			Qualitative Risk Assessment			Recommended Actions
Source	Pathway(s)	Receptor(s)	Consequence	Likelihood of Occurrence	Risk Rating	
	Direct contact	Construction Materials	Medium	Low	Moderate/Low	Ground Investigation with aggressive ground testing.
	Horizontal and vertical migration of ground gas	Site End Users (Commercial)	Medium	Low	Moderate/Low	Ground gas monitoring under the building footprint.

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5.0 Phase 2 Investigation Scope of Works

Site investigation works were undertaken on the 17th to 21st May and 26th to 27th October 2021.

The scope of the ground investigation was designed in general accordance with current UK guidance including the Environment Agency's Land Contamination Risk Management (9), British Standard (BS) 10175 (10), BS5930:2010 (11), and BSEN1997: Part 2:2007 Eurocode 7 (12). A summary of the scope and rationale are summarised in Table 5-1.Table 5-1 Scope and Rationale of Fieldwork

Table 5-1 Scope and Rationale of Fieldwork

Exploratory Hole Type	Exploratory Hole Ref.	Exploratory Hole Depth (mbgl)	Rationale
Rotary Boreholes	R101 R102	30 30	To investigate the eastern side of the site to identify the presence of voids or coal.
Window Sample Boreholes	WS101A WS101B WS102 WS103* WS104 WS105 WS106* WS107* WS201 WS202* WS203* WS204	0.7 0.9 1.8 1.94 1.2 1.3 2.0 2.2 1.6 2.6 2.6 2.4	To investigate ground conditions across the site. To obtain soil samples for environmental and geotechnical testing. Installation of gas monitoring wells.
Trial Pits	TP101 **TP102** **TP103** TP105 **TP106** TP107 **TP108** **TP109** TP110 **TP111**	3.5 0.3 0.3 1.6 0.3 3.2 0.4 0.4 1.2 0.5	To investigate ground conditions across the site. To obtain soil samples for geotechnical and environmental testing. CBR Testing (selected trial pits).
Trial Trenches	TT101 TT102 TT103 TT201 TT202 TT203 TT204 TT205 TT206	5.0 4.7 4.7 2.0 4.0 4.0 1.5 1.5 0.3	To locate and investigate the highwall.
Dynamic Probe Hole	DP101 DP102 DP103 P101A P101B P101C	5.6 3.3 3.6 3.4 2.3 2.0	To investigate the depth of fill across the high wall zone, to investigate the depth of fill on the west of the site and to obtain geotechnical data to characterise the ground.

	P102A P102B P102C P103A P103B P103C	3.9 2.3 2.2 2.8 3.0 2.2	
CPT Probes	CPT101 CPT102 CPT103 CPT104 CPT104A CPT105 CPT106 CPT107 CPT108 CPT108A CPT109 CPT109A CPT110 CPT110A CPT111 CPT112 CPT112A CPT113 CPT114 CPT115 CPT116	2.48 2.63 2.22 1.34 1.96 1.05 1.29 2.78 1.09 1.1 1.78 1.34 2.18 3.44 2.37 1.87 2.45 2.29 1.87 2.31 2.31	To inform potential ground improvement design

Notes
*Installed as gas monitoring well
Bold denotes CBR Testing

Exploratory Hole Location Plan ref. 078794-CUR-00-XX-DR-GE-002 records the locations of the intrusive investigation, a copy of which is included within *Appendix A*.

5.1 Soil Logging and Sampling

Exploratory hole arisings were logged onsite by a qualified Engineer and in accordance with the requirements of BS5930 (11), including recording observed visual and olfactory indications of contamination. Exploratory hole logs for the rotary boreholes, window sample boreholes and trial pits are provided in *Appendix B*. Due to varying geology laterally across the trial trenches the trial trench logs are presented on cross section drawings, provided in Appendix B.

5.2 Monitoring Well Installations

Ground gas monitoring installations (50 mm diameter) were installed in three window sample boreholes (WS103, WS106, WS107) in the first phase of works, with a further two window sample boreholes (WS202 and WS203) installed in phase 2. A bentonite seal was placed above and below the screened section of the borehole to minimise potential for downward migration of contaminants and the creation of a preferential migratory pathway. A gravel surround was installed in the annulus between the sides of the borehole and the slotted sections of pipe.

A summary of the response zones is presented in *Table 5.2* on the following page.

Table 5-2 Monitoring Well Response Zones

Borehole Ref.	Response Zone(s) (m bgl)	Strata Description(s)
WS103	1.0 – 1.94	PMCM
WS106	1.0 – 2.0	Cohesive Superficial
WS107	1.0 – 2.2	PMCM
WS202	1.0 – 2.5	Made Ground
WS203	1.0 – 2.5	Made Ground

Copies of borehole logs can be referred to in *Appendix B* of this report.

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6.0 Laboratory Analysis

Representative soil samples were selected for laboratory chemical analysis, based on field observations and to provide a characterisation of the Made Ground and natural strata encountered. Selected soil and groundwater samples were placed in laboratory provided containers and stored in cool boxes prior to being transported to the nominated laboratory under the laboratory's chain of custody documentation. The laboratory selected by Curtins for chemical and geotechnical analysis was i2 Analytical Laboratories (UKAS and MCERTS accredited).

Soil samples were recovered across all exploratory hole locations in a non-targeted, systematic array to give adequate and representative coverage of the site accounting for the historical site use, proposed end-use and the immediate environmental setting.

6.1 Soil Analysis

The soils were tested as per the environmental testing suite listed below in Table 6-1.

Table 6-1 Environmental Chemistry Analysis Suite: Soils

Suite Ref.	Analyte	LOD
Soils Suite A	Asbestos Screen, pH and Soil Organic Matter (SOM)	-
	Arsenic, Chromium, Chromium VI, Copper, Lead, Selenium, Zinc, Nickel	1 to 1.2 mg/kg
	Boron (water soluble)	0.2 mg/kg
	Cadmium	0.2 mg/kg
	Mercury	0.3 mg/kg
	Cyanide (total)	1 mg/kg
	Sulphate as SO_4 (water soluble)	1.25 mg/l
	Total Phenols (screen)	1 mg/kg
	Speciated PAHs (USEPA 16)	0.05 to 0.1 mg/kg
	TPH CWG (Aro/Ali Split) including BTEX and MTBE	0.1 to 10 mg/kg
	Ammoniacal Nitrogen (NH3 & NH4)	0.5 mg/kg
	Cyanide (free)	1 mg/kg
	SVOCs	0.05 to 0.3 mg/kg
	VOCs	1 mg/kg

Ten soil samples were submitted for soils analysis (suite A). Two samples were also submitted for WAC (Waste Acceptance Criteria) testing to inform preliminary waste disposal options.

Copies of the environmental chemistry testing certificates are presented in *Appendix C*.

6.2 Geotechnical Analysis

Soil samples for testing were prepared in accordance with BS1377: Part 1:2016 (13) and representative sub-samples were taken for testing. The geotechnical tests carried out are listed in *Table 6.2*.

Table 6-2 Geotechnical Analysis: Soils

Test Type	Quantity
Moisture Content	8
Atterberg Limit (4 point)	6
Particle Size Distributions (Wet Sieve)	5
BRE Suite D	5
Compaction Testing	3

The results of the geotechnical testing are summarised in *Section 7.0.* Copies of the geotechnical testing certificates are presented in *Appendix D*.

7.0 Encountered Ground Conditions & Ground Model

7.1 General

A summary of the ground conditions encountered during the site investigation works is presented below, with detailed information presented in the exploratory hole logs included in *Appendix B.*

Due to anticipating a high wall, and the ground conditions encountered on site including the thickness of made ground identified on the western side of the site, the site has been divided into western and eastern sections, see drawing 078794-CUR-00-XX-DR-GE-001.

Table 7.1 – *Summary of Ground Conditions Encountered (Western Part of the Site)*

Stratum	Depth to top of strata (mbgl)	Thickness (m)		Description
		Min	Max	
MADE GROUND (TOPSOIL)	0.0	0.15	0.3	Brown sandy gravelly clay topsoil. Gravel medium sub angular to angular of brick and shale.
MADE GROUND (Colliery Spoil)	0.25	0.05*	4.7*	Red and black sandy gravel of shale.
MADE GROUND (Colliery Spoil)	0.15	Not present in some locations	3.2*	Clayey gravel of siltstone, sandstone and mudstone.

* Thickness not proven.

Table 7.2 – *Summary of Ground Conditions Encountered (Eastern Part of the Site)*

Stratum	Depth to top of strata (mbgl)	Thickness (m)		Description/Notes
		Min	Max	
MADE GROUND (TOPSOIL)	0.0	Not present in some locations	0.4	Brown sandy gravelly clay topsoil. Gravel medium sub angular to angular of shale.
CLAY	0.3	0.7	1.7	Yellowish brown soft gravelly clay.
PENNINE MIDDLE COAL MEASURES (Cohesive Natural Deposits)	1.0	-	28.3*	Mudstone, siltstone & sandstone
COAL	8.4	0.3		Only encountered in R102

* Thickness not proven.

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7.2 Made Ground

7.2.1 Topsoil

Topsoil was encountered in all locations across the site, the topsoil was typically brown sandy gravelly clay. Gravel was medium sub angular to angular of shale.

7.2.2 Made Ground – Western side of the site

Made Ground on the west of the site (infilled opencast area) typically comprised red and black sandy gravel of shale with a variable thickness between 0.05 and > 4.7m, underlain by clayey gravel of siltstone, mudstone and sandstone.

The thickness of the made ground varied across the western side of the site. The base of the made ground was not identified during the site investigation.

CPT tests undertaken to the west of the highwall generally recorded a medium dense to dense sand.

7.2.3 Made Ground – Eastern side of the site

On the eastern side made ground was only encountered as topsoil to maximum depth of 0.4m bgl.

7.2.4 Summary of Geotechnical Results

A summary of the geotechnical test results recorded within the made ground are presented in Table 7-1. Full details of the geotechnical results recorded are presented on the exploratory hole logs in *Appendix B* and test result certificates in *Appendix D*.

Table 7-1 *Summary of Geotechnical Test Results – Made Ground*

Parameter	No. of tests	Minimum	Maximum	Average
In-situ Testing				
SPT 'N' Value Made Ground	2	21, >50		
Laboratory Testing				
pH	9	6	7.6	7
Water Soluble Sulphate (mg/l)	2	31, 38		
Moisture Content (%)	1	9.7		
Liquid Limit (%)	1	37		
Plastic Limit (%)	1	24		

Plasticity Index (%)	1	13
Modified Plasticity Index (%) (1)	1	7.02
PSD (%) Cobbles Gravel Sand Silt Clay	1	 0 62 23 10 5

Due to highly variable nature of made ground and its unsuitable nature to act as a founding stratum, in its current conditions, no parameters have been derived for this stratum.

7.3 Superficial Deposits (Clay)

Superficial deposits were identified in WS103 to WS107, TP105 to TP107, TP109, TP111, TT101, R101 and R102 in the first phase of the investigation, then in TT201, TT202, TT204 and TT205 in the second phase of SI. The superficial deposits were typically described as light brown soft sandy gravelly clay.

7.3.1 Summary of Geotechnical Results

Table 7-2 Summary of Geotechnical Test Results – Clay

Parameter	No. of tests	Minimum	Maximum	Average
pH	5	5.5	6.8	6.2
Water Soluble Sulphate (mg/l)	2	14.9 & 18.2		
SPT 'N' Value – Clay	3	11,14, 54		
Moisture Content (%)	5	17	23	20.6
Liquid Limit (%)	5	31	45	38.6
Plastic Limit (%)	5	21	24	22
Plasticity Index (%)	5	10	21	16.6
Modified Plasticity Index (1) (%)	5	9.6	18.43	14.88

(1) Modified plasticity index is the plasticity of components <425 µm.

Three SPT 'N' values were recorded ranging between 11 and >50. The results are reflective of very soft to very stiff clays. The SPT of >50 is likely due to the presence of a gravel/cobble. The SPT 'N' values are variable at the equal depths therefore do not show spatial uniformity across the site with regards to strength.

Two SPT refusals were reported at WS104 1.2 m bgl and WS106 2.0 m bgl, these 'N' values were not included in any parametric analysis as it is anticipated these are refusals on rockhead.

An estimation of undrained sheer strength (c_u) has been determined from the relationship between SPT 'N' values and the Plasticity Indices (PI), based on the equation by Tomlinson (14) as presented below:

$$Cu = SPT\ N.F_1$$

Where:
Cu is the Undrained Shear Strength
N is SPT 'N' *value*
F_1 is the Stroud Factor

c_u values ranging from 71 to 325 kPa were estimated.

CPT tests undertaken within the second phase of works recorded a generally high to very high undrained shear strength, with occasional recordings of medium strengths.

An estimation of Modulus of Compressibility m_v has been determined using the following equation:

$$m_v = 1/F_2.SPT\ N$$

Where:
mv is the Modulus of Compressibility
N is the SPT 'N' value
F_2 is the Stroud Factor

m_v values ranging from 0.03 to 0.135 m^2/MN were estimated. The results are of very low to medium compressibility.

The Drained Angle of Shearing Resistance (ϕd) for cohesive soils has been derived from the correlation with Plasticity Indices, after Gibson, 1953. The ϕd values are presented on Figure 7.4 A moderately conservative characteristic value of 29° is deemed suitable for the clay.

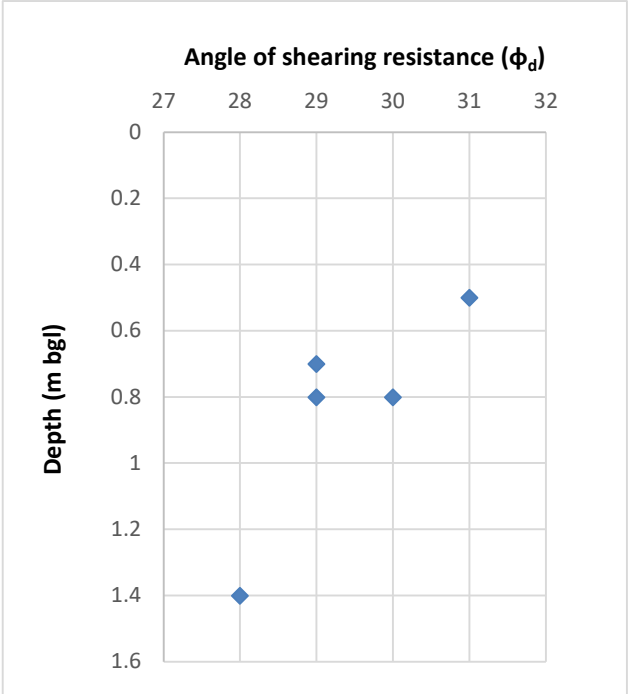


Figure 7.4 Angle of Shearing Resistance (Clay)

Following a review of published values, a moderately conservative unit weight, ɣ', of 17-22kN/m^3 (above the water table) and 19-24 (below the water table) has been deemed suitable.

7.4 Bedrock

Weathered bedrock typically comprising mudstone sandstone and siltstone was encountered in WS103, WS105, WS107, TP107 and TP108.

Solid geology owing to the PMCM formation comprising mudstone and sandstone at depths ranging from 1.2 to 30 m bgl was encountered in R101, R102, TP105, and TP107.

7.4.1 Summary of Geotechnical Results

A summary of the geotechnical test results recorded within the solid geology are presented in Table 7-3. Full details of the geotechnical results recorded are presented on the exploratory hole logs in *Appendix B* and test result certificates in *Appendix D*.

Table 7-3 Summary of Geotechnical Test Results – Solid Geology

Parameter	No. of tests	Values
pH	1	5.7
Water Soluble Sulphate (mg/l)	1	14.9
SPT 'N' Value (2)	3	50, 50, >100

Parameter	No. of tests	Values
PSD (%) Cobbles Gravel Sand Silt Clay	2	 0 62 23 10 5

(1) Modified plasticity index is the plasticity of components <425µm.
(2) Includes SPT refusals

7.5 Coal

Coal was identified in one location, R102 between 8.4 and 8.7 m bgl. Due to the limited thickness of the coal it is unlikely that coal workings underneath the site will affect the construction works at the site.

7.6 Classification Testing

Compaction tests were undertaken on three samples, the results are summarised in Table 7-4 below.

Table 7-4 Dry Density/ Moisture Content Relationship Results

Location	Depth	Optimum Moisture Content (%)	Maximum Dry Density Mg/m^3
TT101	2.00	16	1.77
TP105	0.7	17	1.77
TP110	0.5	8.1	2.09

7.7 Highwall Assessment

The position and nature of the highwall was investigated through dynamic probing and targeted trial pitting and trenching.

7.7.1 Dynamic Probing

Dynamic probing was undertaken in a total of twelve locations to a maximum depth if 5.6 m bgl. Three transects each of three dynamic probe holes (P101A-C, P102A-C and P103A-C) were located across the high wall to inform an assessment of the profile of the wall.

Three additional dynamic probes, DP101, DP102 and DP103 located on the western side of the site to further investigate the made ground, specifically the presence of boulders.

The depth to refusal of the dynamic probing is presented on *Figure 7.2* and the dynamic probing results are included as Appendix D2.

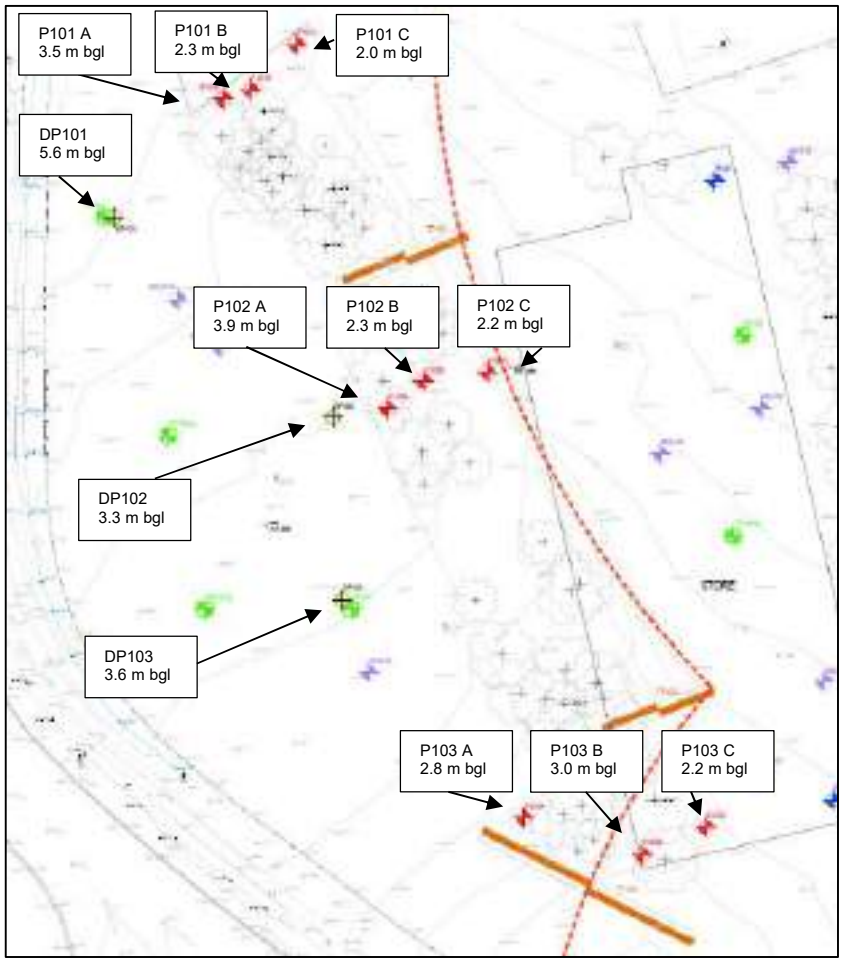


Figure 7.2 Dynamic Probe - Depth to Refusal Results

The dynamic probe results for P101A-C, P102A-C and P103A-C suggest rock comes in at between 2.0 and 4.0 m bgl (across the stepped high wall) deepening towards the west as shown on Figure 7.2.

Refusal depths observed in P101 are reflective of the stepped highwall observed in TT101. P102 and P103 off a less clear highwall profile with suspected refusals on boulders.

The dynamic probe results for DP101, DP102 and DP103 located on the western side of the site record refusals at 5.6, 3.3, and 3.6 m bgl respectively, these refusals are likely to be obstruction such as boulders. The CPTs undertaken in the western part of the site all refused between 2.18m and 3.44m bgl, with a medium dense to dense material reported up to refusal.

7.7.2 Trial Trenching

Cross sections of the stepped high wall are presented in Appendix B.

The stepped high wall was clearly visible in several trial trenches, however the stepped high wall was less evident in TT102 where a steep wall was encountered to the base of the trial pit. In the second

phase of ground investigation, the highwall boundary was further delineated, with TT201, TT202, TT204 and TT205 all positively identified the stepped highwall.

7.8 Observed Potential Contamination

No visual or olfactory evidence of contamination was identified during the site investigation.

7.9 Groundwater

A summary of groundwater and perched water levels recorded during the site investigation are presented in Table 7-5.

Table 7-5 Groundwater and Perched Water Noted During Site Investigation

Exploratory Hole Location	Water Strikes	
	Strike Depth (mbgl)	Strata
WS101A	0.3	Made Ground
WS101B	0.3	Made Ground
WS102	0.9	Made Ground
TT103	Groundwater seepage at 2.6 m bgl on the eastern side of the trench	Made Ground
TP101	Slight seepage from 1m	Made Ground
TP107	Water seepage from 3.1 m	Mudstone, siltstone and sandstone
TP110	Water strike at 0.8 m bgl	Mudstone

Groundwater strikes in the made ground are considered to represent perched water.

Four rounds of groundwater monitoring have been undertaken between 26 May and 25 June 2021, the results are presented in Table 7-6.

Table 7-6 Groundwater Monitoring Results

Borehole Ref.	Installation Strata	Response Zone (m bgl)	26/05/2021	03/06/2021	10/06/2021	25/06/2021
			Depth (mbgl)	Depth (mbgl)	Depth (mbgl)	Depth (mbgl)
WS103	PMCM	1 – 1.94	Dry	Dry	Dry	Dry
WS106	Cohesive Superficial	1 – 2.0	Dry	Dry	Dry	Dry
WS107	PMCM	1 – 2.2	2.03	Dry	Dry	Dry

No groundwater was recorded with WS202 and WS203 in the return monitoring visits following the completion of phase 2.

7.10 Aggressive Ground Conditions

The classification of the site in terms of concrete in aggressive ground is based on the guidance provided in Table C2 of the Building Research Establishment (BRE) Special Digest 1, third edition of 2005 (14). Table 7-7 Table 7-7 details the classification.

Table 7-7 Aggressive Chemical Environment for Concrete (ACEC) Site Classification

Stratum	Design Sulphate Class	ACEC Class
Made Ground	DS1	AC-1
Clay	DS1	AC-1
Mudstone, siltstone and sandstone	DS1	AC-1

8.0 Ground and Groundwater Contamination Assessment

This section of the report includes the assessment of the potential contamination identified on the subject site which may present a risk to the proposed end-users, associated utilities and the wider environment.

In guidance published by the Environment Agency, the risk to human health or Water Environment is determined through an assessment of pollutant linkages between a source of contamination (within the ground or groundwater either on or off site) and a sensitive receptor such as end-users of the site, building materials, edible plants grown in gardens or groundwater abstracted for drinking. This is termed a source-pathway-receptor relationship. The same model is applied to the assessment of risk arising from ground gases as detailed within BS8576:2013 (15).

These models have a common approach, which is one of a tiered assessment. At each stage of the assessment further detail can be applied to the conceptual site model to provide a detailed interpretation on a site by site basis. As part of the planning process this approach is adopted to establish either if the site is 'suitable for use' or whether additional work or else remedial work is required for the site to be deemed so.

The sub-sections hereafter therefore incorporate the first tier (Tier 1) of this approach otherwise referred to as the Generic Quantitative Risk Assessment (GQRA). The GQRA builds on the qualitative risk assessment presented in Section 4.0 in conjunction with observations made during the ground investigation and is based solely on the results of the chemical and other testing data obtained as part of Curtins ground investigation. The GQRA is used to build/refine the Conceptual Site Model (CSM) for the site as detailed and presented in *Section 10.0* of this report.

The following sections present more detail on the risk assessment methodology rationale for the main receptors.

8.1 Human Health GQRA

Detailed guidance on human health risk assessment is available within several documents, published by both the Environment Agency and Defra. Guidance includes Contaminated Land Exposure Assessment (CLEA) v1.071 model (16), (Report SC050021/SR2: Human Health Toxicological Assessment of Contaminants in Soil (17) and Report SC059921/SR3: Updated Technical Background to the CLEA Model (18).

A generic quantitative risk assessment (GQRA) has been carried out for the Potential Contaminant Linkages (PCLs) investigated by screening of soil contamination data against relevant Generic Assessment Criteria (GAC) where available, including:

i) **Soil Guideline Values (SGVs):** These have been published by the Environment Agency and are trigger values for screening out low risk areas of land contamination. SGV's give an indication of representative average concentrations of chemicals in soil, below which long-term health risks are likely to be minimal. SGVs have been published for several contaminants

including arsenic, cadmium, mercury, nickel, selenium, BTEX, phenols and dioxins, furans and dioxin-like PCB substances for land uses including residential, allotments and commercial. The SGVs have been developed for a sandy loam soil with 6% soil organic matter (SOM) content;

ii) **Supplementary Screening Values (SSVs):** In addition to the SGVs developed by the EA, other third-party organisations have derived SSVs for a wider range of contaminants and land uses using the CLEA Model. Curtins have adopted these numbers where applicable, including those developed by Atkins AtriskSoil™, the LQM/CIEH Suitable for Use Levels (S4UL) and EIC/AGS/CL:AIRE published thresholds;

iii) **Category 4 Screening Levels (C4SLs):** In March 2014 Defra published C4SLs for arsenic, benzene, benzo(a)pyrene, cadmium, hexavalent chromium and lead. These values were derived to support the revised Part 2A Statutory Guidance issued in 2012 (19) in which four categories of contaminated land are included, ranging from Category 1 (significant/high risk) to Category 4 (low risk). C4SLs are not representative of significant possibility of significant harm (SPoSH) and are low risk levels which, and therefore where the C4SLs are not exceeded, land can be demonstrated to be in Category 4 and cannot be determined as contaminated land.

8.1.1 Adopted Soil Human Health GACs Screening Methodology

It is anticipated that the end-use of the site be most analogous with a *Commercial* end-use scenario and so assessment has been undertaken against the following GACs, in order of preference:

1. Environment Agency Soil Guideline Values,
2. CL:AIRE, AGS, EIC. Soil Generic Assessment Criteria for Human Health Risk Assessments,
3. LQM/CIEH 2015 S4ULs for Human Health Risk Assessment, and
4. DEFRA Category 4 Screening Levels.

The soil organic matter (SOM) content has an influence on the sorption capacity of contaminants. Soil organic matter (SOM) values for the site soils (ranged from 0.4 % to 9.5%). The geometric average SOM of ten soil samples collected across the site is 2.96%. As such, a comparison against *Residential* end-use General Assessment Criteria SOM of 2.5% has been adopted. The adopted GAC's are listed in *Appendix F*.

8.1.2 Generic Assessment Criteria Screening of Soil Laboratory Results

The results of the environmental testing can be referred to in *Appendix C*.

With respect to the proposed end-use of the site, no exceedances of the GAC were reported.

8.1.3 Asbestos

Ten samples of were scheduled for asbestos identification.

Asbestos was not detected in any of the ten samples scheduled for asbestos testing.

8.1.4 Discussion of Human Health Assessment

No exceedances of the commercial GAC were identified. Furthermore, due to the proposed nature of the proposed development (Lidl store with associated car parking) it is unlikely that site users will come into contact with soil at the site, there is low likelihood that the soils at the site will present an unacceptable risk to human health.

8.2 Materials Management

8.2.1 Re-use of Site Soils

Based on the geochemical testing results presented as part of this investigation it is considered that there is no specific requirement to remove soils from site because of them presenting an unacceptable risk to human health or the environment.

The re-use of site-won soils may therefore be undertaken if the following principles are met:

i) the geotechnical suitability of the material needs to be confirmed;
ii) the re-use of the material needs to be covered as part of the planning approval, e.g. site levels maintained within agreed limits;
iii) the volume of the material being re-used needs to be confirmed and traceable; and
iv) regulatory approval from the relevant authorities has been sought.

These principles are outlined within the CL;AIRE Definition of Waste Code of Practice (v2) (20) and if and where the re-use of site-won soils is proposed as part of the development works it is recommended that a Materials Management Plan is produced in line with the Definition of Waste Code of Practice to detail and document the process.

8.2.2 Preliminary Waste Assessment

A preliminary Waste Soils Characterisation Assessment has been undertaken using CAT-WASTE Soil. This assessment was based on ten soil samples recovered be representative of the variable Made Ground strata encountered.

Table 8-2 below provides a summary of the waste screening.

Table 8-2 Preliminary Waste Assessment Summary

Hole ID	Sample Depth	Strata	WM3 Screen	Waste Code
TP110	0.3	Made Ground - Granular	Non hazardous	17 05 04
TP105	0.7	Clay	Non hazardous	17 05 04
WS102	0.1	Made Ground - Cohesive	Non hazardous	17 05 04
WS105	0.5	Clay	Non hazardous	17 05 04
WS107	0.15	Clay	Non hazardous	17 05 04
TT101	0.4	Clay	Non hazardous	17 05 04
TT102	1.5	Made Ground - Granular	Non hazardous	17 05 04
TP101	0.2	Made Ground – Cohesive	Non hazardous	17 05 04
TP101	0.35	Made Ground	Non hazardous	17 05 04
TP105	0.2	Made Ground	Non hazardous	17 05 04

Based on the above it is anticipated that the vast majority of soils removed from site would be considered non-hazardous (waste code 17 05 04).

The results presented herein and summarised above should be provided to the proposed waste carrier/receiver and should be considered preliminary. Landfill operators are not obliged to accept waste and may require additional testing above that provided here prior to classifying and or receiving the waste.

9.0 Ground Gas Assessment

The assessment of risk presented by ground gases is assessed with reference to guidance published by CIRIA (Assessing Risks Posed by Hazardous Ground Gases to Buildings, C665 (21), BSI Publication (Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings BS8485:2015 (22) and other broadly accepted references such as the Ground Gas Handbook 2009 (23).

The gas risk assessment adopts a tiered approach. In the first instance this involves a re-evaluation of the Conceptual Site Model described within *Section 4* and thereafter validating this conceptual model with the ground gas data, the semi-quantitative risk assessment.

9.1 Conceptual Site Model

The Conceptual Site Model presented within the Phase 1 Preliminary Site Assessment in *Section 4* identified potential ground gas sources associated with made ground, identified in the preliminary as a **Low** Risk, and potential sources of mine gas on site identified as **Moderate/Low** Risk.

The Curtins 2021 ground investigation identified made ground (colliery spoil/overburden) present from the centre of the site to the western site boundary.

9.2 Ground Gas Monitoring Results

To characterise the site's ground gas regime and validate the qualitative assessment of ground gas risk standpipe installations were incorporated within three borehole locations as detailed in Section 5.2.

Four gas monitoring visits were undertaken between 26th May and 25 June 2021 for the boreholes from the first phase, with barometric pressure recorded between 995 and 1002mb. Two further gas monitoring visits have been undertaken for the boreholes installed within the second phase, with barometric pressures ranging 1005 to 1006. The results log sheets are contained within *Appendix E* and summarised in Table 9-1*:*

Table 9-1 Summary of Ground Gas Monitoring Results

Borehole Ref.	Maximum CH_4 Concentration (%)	Maximum CO_2 Concentration (%)	Minimum Steady O_2 Concentration (%)	Maximum gas flow (l/hr)	
				Peak	Steady State
WS103	<0.1	4.1	14.5	<0.1	<0.1
WS106	<0.1	3.2	15.6	<0.1	<0.1
WS107	<0.1	3.2	14.5	<0.1	<0.1
WS202	<0.1	1.6	16.3	<0.1	<0.1
WS203	<0.1	3.0	14.3	<0.1	<0.1

9.3 Ground Gas Assessment

The results from WS103, WS106 and WS107 are indicative of a CS1 scenario. WS202 and WS203 were installed in the made ground to the west of the highwall, as previous recommended, and the results are considered to be in accordance with the results from the first phase, with a CS1 classification still considered appropriate.

The foundation solution selected will need to be taken into account when determining the ground gas risks at the site.

The potential risks from ground gases to the excavations are to be dealt with by the Contractor, in accordance with the Confined Space Regulations, during construction. Appropriate ground gas monitoring and safety measures should be in place during the works, as the potential presence of ground gases could pose a risk in any confined spaces of deep excavations.

10.0 Revised Conceptual Site Model

The Preliminary Conceptual Site Model (PCSM) presented in *Section 4.0* of this report has been revised following the GQRA in *Section 8.0 and 9.0* above. The Revised Conceptual Site Model (CSM) is summarised in the table overleaf.

The CSM details the source-pathway-receptor linkages or potential pollutant linkages (PPL) that have been identified as relevant for the site. The GQRA details the associated level of risk relating to these potential pollutant linkages.

The CSM follows the framework outlined within CIRIA C552 (7) which is summarised within *Appendix G*.

The 'risk rating' within the CSM refers to the risk that the source, pathway, receptor linkage or PPL is complete. Unless specifically stated it does not necessarily refer to an immediate risk and is intended to be used as a tool to assess the necessity for further assessment/investigation.

Risks presented by Unexploded Ordnance are discussed and assessed in Section *2.6.*

Under current health and safety legislation, employers are required to carry out their own appropriate risk assessments and mitigation to protect themselves and their employees, other human receptors and the environment from potential contamination. Such risks must be adequately mitigated by law, specifically the Construction Design Management (CDM) Regulations, 2015 (8) which require that potential risks to human health and the environment from construction activities are appropriately identified and all necessary steps taken to eliminate / manage that risk. It has been assumed that any future construction works onsite will be undertaken in compliance with these requirements. Reference should be given to the environmental testing results discussed within *Section 6.0* and presented within *Appendix C*.

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- The table below represents the Second stage in the land quality risk assessment process; the Revised Conceptual Site Model following the Quantitative Risk Assessment.
- For a development site to be deemed 'suitable for use' the level of risk needs to be brought down to acceptable levels, i.e. low to very low risk. The purpose of each stage of risk assessment is ultimately to establish if there is a requirement for additional levels of assessment to be made to have sufficient confidence to support a risk characterisation or management decision, e.g. remedial action.
- In the absence of specific site data, a Generic Quantitative Risk Assessment is invariably recommended.

Conceptual Site Model			Qualitative Risk Assessment			Recommended Actions
Source	**Pathway(s)**	**Receptor(s)**	**Consequence**	**Likelihood of Occurrence**	**Risk Rating**	
Made Ground (colliery spoil and overburden)	**Direct contact/ingestion/inhalation of contaminated soils and shallow/ surface groundwater**	**Site End Users** Commercial	**Medium** Chronic health risk.	**Unlikely** No exceedances of GAC's were identified in the GQRA.	**Low**	No further action required
		Construction and maintenance workers	**Medium** Chronic health risk.	**Unlikely** No exceedances of GAC's were identified in the GQRA. Standard Health & Safety precautions likely to be adopted by construction workers which will reduce likelihood of contact with contaminated soils.	**Low**	Construction Workers should be provided with appropriate PPE during all groundwork activities.
	Ingestion, inhalation of asbestos fibres	**Site End Users** Commercial	**Medium** Chronic health risk	**Unlikely** No asbestos detected in the samples tested. Made ground backfill was colliery spoil, no evidence of material which would potentially contain asbestos.	**Low**	No further action required. Capping the made ground would remove the pathway and therefore remove the risk.
		Construction and maintenance workers	**Medium** Chronic health risk	**Unlikely** Standard Health & Safety precautions likely to be adopted by construction workers which will reduce likelihood of contact with contaminated soils.	**Low**	Construction Workers should be provided with appropriate PPE during all groundwork activities.
		Residents of adjacent properties	**Medium** Chronic health risk	**Unlikely** No asbestos detected in the samples tested. Made ground backfill was colliery spoil, no evidence of material which would potentially contain asbestos.	**Low**	No further action required. Capping the made ground would remove the pathway and therefore remove the risk.
	Horizontal and vertical migration of contaminants	**Controlled Waters** Surface Water Drain located 94 m to the north of the site	**Mild** Pollution of non-sensitive waters.	**Low** Given the distance from the site to the nearest surface water receptor. No contamination identified in the site investigation.	**Low**	No further action required.
		Controlled Waters Groundwater Bedrock - Secondary A Aquifer	**Medium** Site is not located within a Source Protection Zone.	**Unlikely** No contamination identified in the site investigation.	**Low**	No further action required.

Conceptual Site Model			Qualitative Risk Assessment			Recommended Actions
Source	Pathway(s)	Receptor(s)	Consequence	Likelihood of Occurrence	Risk Rating	
	Direct contact	Construction Materials	Medium	Unlikely	Low	
	Horizontal and vertical migration of ground gas	Site End Users (Commercial)	Medium	Low	Low	No further action required.

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10.1 Summary of Pollutant Linkages

No exceedances of the commercial GAC were identified. Furthermore, due to the proposed nature of the proposed development (Lidl store with associated car parking) it is unlikely that site users will come into contact there is low likelihood that the soils at the site will present an unacceptable risk to human health. A **Low** risk rating has been proposed to residential end users from contaminated made ground on site.

Asbestos was noy identified in the samples tested, a **Low** risk rating from asbestos inhalation has been proposed for residential end users and construction workers. However, if the site is capped with clean hardstanding, this pathway would be removed and therefore the risk from asbestos would be removed.

The initial ground gas monitoring results are indicative of a CS1 scenario and ground gas protection measures are not anticipated to be required; however this will need to be re assessed following the installation of an additional monitoring well under the building footprint and to the west of the high wall and follow up monitoring. A **Moderate/Low** risk rating is proposed to residential end users associated with ground gases and mine gases.

The risk to the sensitive Secondary A Aquifer, which underlies the site from leachable contamination in site soils through vertical and horizontal migration through the superficial deposits is assessed as **Low** as no contamination was identified during the site investigation.

11.0 Engineering Assessment and Recommendations

11.1 Introduction

This section will assess the relevant geotechnical issues for a proposed commercial development. The engineering assessment considers foundation design, bearing capacity, excavations, ground floor slabs and concrete design for the site. The structure proposed for the site is a single storey Lidl store as show on the Proposed Site Plan in Appendix A. It should be noted that detail may change in the development of designs beyond the issue of this Phase 2 Report and the Construction Designer should satisfy themselves regarding the adequacy of their design and proposed approach to construction by reference to the on-going project design proposals, the site investigation information and their own examination of the site.

11.2 Summary of Ground Conditions

Based on a review of the readily available information and the ground investigation outcome, it is understood that the western part of the site form part of an opencast coal mine which has been subsequently backfilled with colliery spoil/overburden. The ground conditions in the opencast backfill area generally comprised granular made ground. The western site has been separated from the eastern part, by a stepped highwall located to the centre of the site (running approximately north south) as identified partially during the ground investigation works.

The eastern part of the site the ground conditions generally comprised topsoil, underlain by cohesive superficial deposits and further by the solid geology of Pennine Middle Coal Measures.

Based on the current proposed development plans, included in Appendix A of this report, the majority of the building footprint is located within the eastern part of the site, however the southwest corner of the building is located over the highwall.

Perched water levels across the site were variable. Within the opencast backfill area shallow groundwater strikes were between 0.3 and 0.9 m bgl. Groundwater was not encountered in the shallow monitoring wells installed on the east of the site.

11.3 Foundation Design

It is understood that the proposed development is to consist of one single storey retail store.

The proposed foundations solution is dictated by the observed ground conditions.

The made ground (opencast backfill area to the west and the made ground to east) is not considered a suitable founding stratum due to its inherent variability in composition and consistency.

The superficial deposits encountered are predominantly described as soft. They have been encountered in limited thickness therefore limited testing has been undertaken on these deposits. The soft superficial deposits are compressible and therefore unsuitable as a founding stratum.

To the eastern areas where shallow rock has been encountered, foundations solutions such as deep trench filled foundations, founded on bedrock or adoption of a ground improvement solution such as Vibro Stone Columns can be adopted.

Within the western areas, subject to further ground investigations within the made ground, ground improvement solutions such as Vibro Stone Columns, Controlled Module Columns or Piled foundations can be adopted.

Within the second phase of ground investigation, Cone Penetration Testing was undertaken, with 12 locations in the eastern part of the site and 4 locations in the zones of the highwall. The results are considered to support the above recommendations of Vibro Stone Columns. However, it is recommended that a specialist designer is consulted for adoption of ground improvement solution.

Any ground improvements or deep foundations solutions must be designed by a suitably qualified and experiences ground improvement contractor/piling designer.

11.4 Ground Floor Slabs

Based on observation onsite together with the results of laboratory tests it is recommended that, ground floor slabs should be suspended. However, where ground improvement is utilised, it can be designed and installed to allow adoption of a ground bearing slab.

11.5 Road and Pavement Design

CBR values have been derived from plate load tests (455mm diameter) undertaken in five trial pits at depths between 0.3 and 0.5 m bgl, the average CBR value was 7.5 %. The results are summarised below in table 11-1. The CBR testing report is included as Appendix D3.

Table 11-1 CBR Testing Summary

Location	Depth (m)	Geology	Area of site	CBR Value %
TP102	0.3	Made Ground - Colliery Spoil	Car Park Area	17.7
TP103	0.3	Made Ground - Colliery Spoil	Car Park Area	11.5
TP106	0.3	Superficial Deposits	Store footprint	3.7
TP108	0.4	Superficial Deposits	Road	8.8
TP109	0.4	Superficial Deposits	Road	0.7

Location	Depth (m)	Geology	Area of site	CBR Value %
TP111	0.5	Superficial Deposits -	Road	2.7

For detailed design the designer should assess the appropriate CBR value to be adopted based on the proposed formation level, determined following detailed design of proposed carriageways/hardstanding and (where applicable) the minimum Local Highway Authority requirements for carriageway construction thicknesses.

The designer should take into account the nature of the deposits that will form the sub-formation to any proposed capping and subbase design. The predominantly cohesive nature of the shallow soils encountered is likely to be sensitive to seasonal changes and inclement weather.

Any CBR value adopted in detailed design (including any values taken from the results appended to this report) must be confirmed on site at the time of construction through appropriate inspection and validation testing at the specific line and level of the proposed carriageway/hardstanding sub-formation. A suitable Earthworks Strategy must be adopted which details suitable validation testing methods and criteria. The Strategy should provide suitable process for dealing with the potential degradation of the sub-formation during periods of heavy rain or other inclement weather conditions (e.g. frost).

Based on the current layout it is identified that the majority of car parking and external hard standing is within the fill areas to the west of the site.

The potential for the backfill material to continue to settle is considered likely. Investigations to date have not conclusively confirmed the depth to bedrock however historic information (Section 3) suggests that that all exploratory holes in the area refuse between depths of c 3.5m and 7m depth. This accords with Curtins dynamic probing.

Although the settlement potential of the fill will reduce over time differential settlement will be observed in this material owing to the varying thickness of the fill. Of note is the highwall in the centre of the site which is stepped where differential settlement may be most observed. However the total potential differential settlement will be dependent on the thickness of fill and any proposed changes in loading through construction. It is recommended that the depth to bedrock within the fill is confirmed to confirm the likely settlement potential of the fill and the requirement for any additional mitigation with regards to long term settlement.

11.6 Utilities

Similar to the consideration for external areas and pavement design proposed utilities placed within deep fill should consider the potential for ongoing and differential settlement.

11.7 Chemical Attack on Buried Concrete

See *Section 7.9*.

11.8 Excavation and Support

Given the mining legacy features encountered and the variable fill material it is recommended that all excavations on the west of the highwall should be considered unstable.

Any excavations progressed on the site should be undertaken in accordance with CIRIA (2001) Trenching Practice, 2nd Edition (report no. 97) (25) taking into account the ground conditions encountered on site. The temporary works designer is responsible for design of the temporary works and ensuring that the excavations remain stable throughout the period of the works. An experienced temporary works contractor must be consulted.

Perched water is likely to be encountered in shallow excavations.

11.9 Drainage

In the event that Soakaways are considered for the site these should not be located in areas of opencast backfill where the localised release of water may cause inundation settlement within the fill.

12.0 Environmental Conclusions & Recommendations

12.1 Conclusions and Recommendations

A revised tabulated revised Conceptual Site Model has been derived following the findings on the Generic Quantitative Risk Assessment risk assessment and is presented in *Section 9.0*.

12.1.1 Ground Contamination

Environmental testing indicates that there is low risk to future site users and low risk to controlled water receptors from levels of contaminants in the soils encountered as part of the ground investigation.

The risks from asbestos are low, no further actions are required, however capping and clean cover would eliminate the risk

The results from the ground gas monitoring are indicative of a CS1 scenario. The foundation solution selected will need to be taken into account when assessing the ground gas risks at the site.

It is recommended that construction workers are provided with appropriate PPE and sanitary facilities with reference to the environmental testing results presented herein.

It is recommended that a Materials Management Plan is produced if and where the re-use of site-won soils is proposed as part of the development works.

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Appendix A Drawings

Curtins Exploratory Hole Location Plan 078794-CUR-00-XX-DR-GE-001

Proposed site plan 7200-SMR-30-XX-DR-A-8005-S3-P1 PROPOSED SITE PLAN

SYMAS Report Rockingham Opencast Site Plan

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GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

TP DENOTES TRIAL PIT POSITION

R DENOTES ROTARY BOREHOLE POSITION (30m)

WS DENOTES WINDOW SAMPLE

CPT DENOTES CPT LOCATION

P DENOTES DYNAMIC PROPE

TT DENOTES TRIAL TRENCH POSITION

* DENOTES TRIAL PIT WITH CBR TEST

DENOTES APPROXIMATE HIGH WALL LOCATION

Rev.	Description:	Date:	By:	Chkd:
P01	ISSUED FOR INFORMATION	15/06/21	NG	CB

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Birmingham • Bristol • Cambridge • Cardiff • Douglas • Dublin • Edinburgh • Glasgow • Kendal • Leeds • Liverpool • London • Manchester • Nottingham

Status:

PRELIMINARY

Project:

LIDL CROSS KEYS LANE

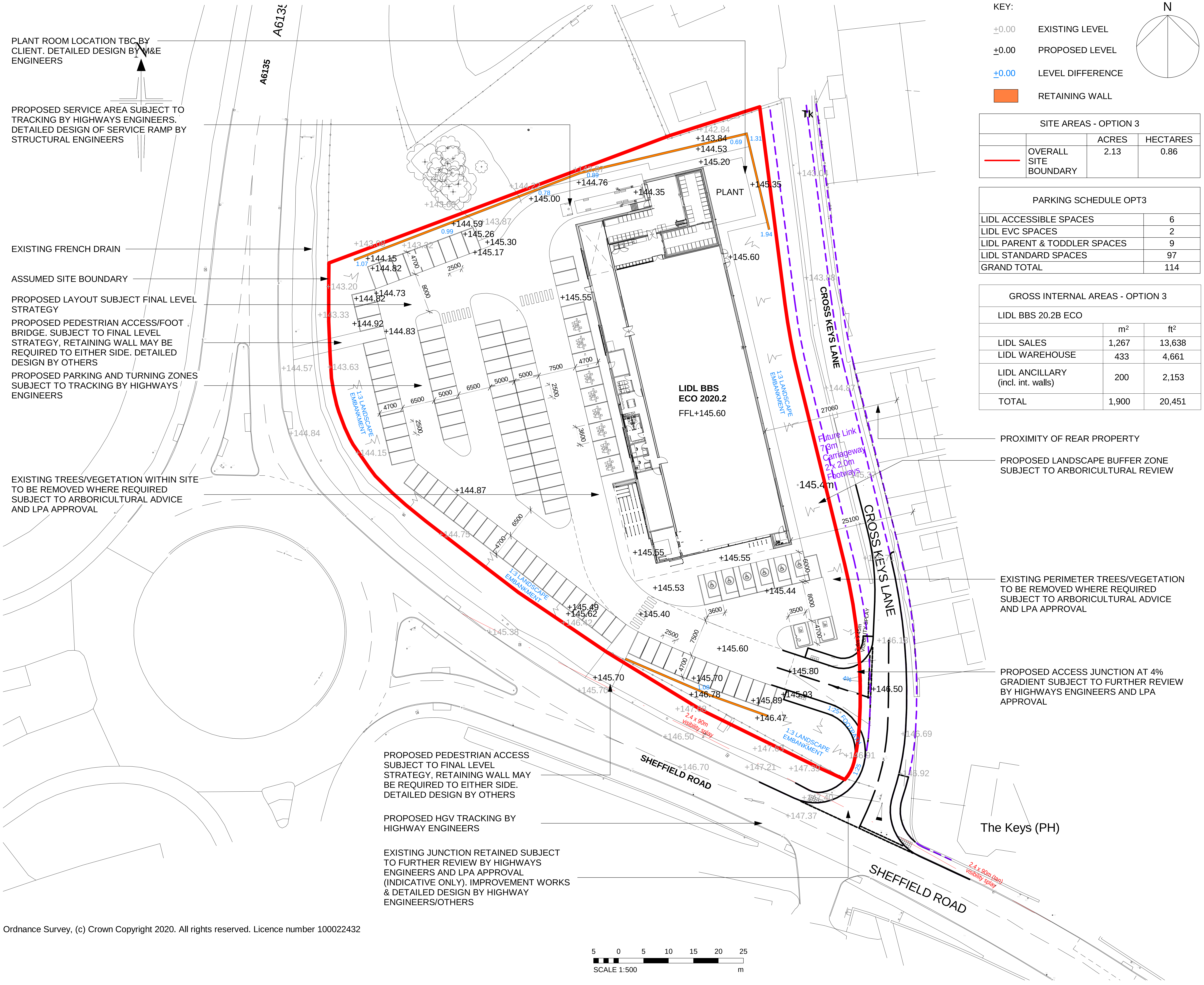
Drg Title:

EXPLORATORY HOLE LOCATION PLAN

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	21/12/21	N. GILL	E. SCHOLES	E. SCHOLES
Scale: 1:250				

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
078794	CUR	00	XX	DR	GE	001	P02

W:\e0z\Projects\078794 Lidl Cross Keys Lane, Hoylandr34-Production\44-Models-Drawings\GE\CAD\



KEY:

- ±0.00 EXISTING LEVEL
- ±0.00 PROPOSED LEVEL
- ±0.00 LEVEL DIFFERENCE
- RETAINING WALL

N

SITE AREAS - OPTION 3			
		ACRES	HECTARES
(red line)	OVERALL SITE BOUNDARY	2.13	0.86

PARKING SCHEDULE OPT3	
LIDL ACCESSIBLE SPACES	6
LIDL EVC SPACES	2
LIDL PARENT & TODDLER SPACES	9
LIDL STANDARD SPACES	97
GRAND TOTAL	114

GROSS INTERNAL AREAS - OPTION 3		
LIDL BBS 20.2B ECO		
	m²	ft²
LIDL SALES	1,267	13,638
LIDL WAREHOUSE	433	4,661
LIDL ANCILLARY (incl. int. walls)	200	2,153
TOTAL	1,900	20,451

Do not scale this drawing.
Architects are to be notified of any discrepancies.
Contractors must check all dimensions on site.
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FEASIBILITY CHECKLIST

X	Initial Client Brief
X	Ordinance Survey Map
	Legal Input to include Title Information
X	Topographical Information Incorporation
	Client Review
X	Highways Input / Review
	Structural Input / Review
	Landscape Design Input / Review
	Existing Statutory Services / Utilities Review
	Planning Consultant Guidance / Input
	Cost Managment Advice - Budget Determined

Rev	Description	Date	Drn	Ckd
P1	First issue	01.03.21	DM	JM

Status
SKETCH - NOT FOR CONSTRUCTION

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Project
HOYLAND, CROSS KEYS LANE

Client
LIDL

Drawing Title
PROPOSED SITE PLAN - OPTION 3

Proj Ref	Origin	Zone	Level	Type	Role	Num	Status	Rev
- - - 7200	SMR	30	XX	DR	A	8005	S3	P1

SMR Job Ref	Sheet	Scale	Drawn
7200-30-8005	A2	As indicated	DM

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Appendix B Exploratory Hole Logs

Window Sample Logs WS101 – WS107, WS201 – WS204

Trial Pit Logs TP101 - TP110

Trial Trench Cross Section TT101 -TT103, TT104 – TT107

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Rotary Core Log

Borehole No. **R102**

Sheet 1 of 3

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435236.00 - 400453.00	Hole Type RO
Location: Barnsley		Level:	Scale 1:50
Client: Lidl GB		Dates: 18/05/2021 - 19/05/2021	Logged By CB

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.30			MADE GROUND: Brown sandy CLAY TOPSOIL. Sand is Medium.
										Brown gravelly CLAY. Gravel is coarse of mudstone.
							1.60			Grey MUDSTONE.
							8.40			Black COAL.
							8.70			Grey SANDSTONE.
										Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks
Open hole drilling.

AGS

Rotary Core Log

Borehole No.
R102
Sheet 2 of 3

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435236.00 - 400453.00	Hole Type RO
Location: Barnsley		Level:	Scale 1:50
Client: Lidl GB		Dates: 18/05/2021 - 19/05/2021	Logged By CB

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							15.60			No recovery, loss of flush. Hard ground (no voids reported).
										Continued on next sheet

11 12 13 14 15 16 17 18 19 20

Remarks
Open hole drilling.

AGS

Rotary Core Log

Borehole No.
R102
Sheet 3 of 3

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435236.00 - 400453.00	Hole Type RO
Location: Barnsley		Level:	Scale 1:50
Client: Lidl GB		Dates: 18/05/2021 - 19/05/2021	Logged By CB

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				
							30.00			End of borehole at 30.00 m

21 22 23 24 25 26 27 28 29 30

Remarks
Open hole drilling.

AGS

Rotary Core Log

Borehole No.
R101
Sheet 1 of 3

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435223.00 - 435223.00	Hole Type RO
Location: Barnsley		Level:	Scale 1:50
Client: Lidl GB		Dates: 17/05/2021 - 18/05/2021	Logged By CB

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							0.50			Brown slightly gravelly CLAY.
							1.70			Light brown slightly gravelly CLAY. Gravel is fine to coarse of MUDSTONE.
							3.40			Yellow sandstone.
										Grey MUDSTONE wth small bands of SANDSTONE.
										Continued on next sheet

1 2 3 4 5 6 7 8 9 10

Remarks
Open hole drilling.

AGS

Rotary Core Log

Borehole No.
R101
Sheet 2 of 3

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435223.00 - 435223.00	Hole Type RO
Location: Barnsley		Level:	Scale 1:50
Client: Lidl GB		Dates: 17/05/2021 - 18/05/2021	Logged By CB

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description
				TCR	SCR	RQD				

11
12
13
14
15
16
17
18
19
20

Continued on next sheet

Remarks
Open hole drilling.

AGS

Rotary Core Log

Borehole No. **R101**

Sheet 3 of 3

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435223.00 - 435223.00	Hole Type RO
Location: Barnsley		Level:	Scale 1:50
Client: Lidl GB		Dates: 17/05/2021 - 18/05/2021	Logged By CB

Well	Water Strikes	Depth (m)	Type / FI	Coring TCR	Coring SCR	Coring RQD	Depth (m)	Level (m)	Legend	Stratum Description
							24.90			Grey SANDSTONE.
							30.00			End of borehole at 30.00 m

21 22 23 24 25 26 27 28 29 30

Remarks
Open hole drilling.

Trial Pit Log

Trialpit No **TP101**

Sheet 1 of 1

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435156.00 - 400517.00 Level:	Date 17/05/2021
Location: Barnsley		Dimensions (m): Depth 3.50	Scale 1:50
Client: Lidl GB			Logged CB

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20 0.35 0.35	ES ES WAC		0.15 0.30			MADE GROUND: Dark brown sandy CLAY TOPSOIL. Sand is medium. Occasional fragments of red shale. MADE GROUND: Grey and red gravelly CLAY. Gravel is fine to coarse of sub rounded to angular red shale, siltsone and mudstone.
	1.10	D					MADE GROUND: Grey clayey GRAVEL of siltstone, sandstone and mudstone. Gravel is fine to coarse with frequent sandstone cobbles and boulders.
				3.50			End of pit at 3.50 m

1 2 3 4 5 6 7 8 9 10

Remarks: No water strike but some slight groundwater seepage.

Stability:

AGS

Trial Pit Log

Trialpit No
TP102
Sheet 1 of 1

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435163.00 - 400493.00 Level:	Date 20/05/2021
Location: Barnsley		Dimensions (m): Depth 0.30	Scale 1:50
Client: Lidl GB			Logged CB

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.25 0.30			MADE GROUND: Dark brown sandy gravelly clay TOPSOIL. Sand is medium. Gravel is fine to medium of brick and shale. Occasional rootlets MADE GROUND: Red and black sandy GRAVEL. Gravel is fine to coarse, sub angular to angular of red shale and coal. Sand is coarse. End of pit at 0.30 m

1 2 3 4 5 6 7 8 9 10

Remarks: No groundwater encountered.

Stability:

Trial Pit Log

Trialpit No
TP103
Sheet 1 of 1

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435167.00 - 400474.00 Level:	Date 20/05/2021
Location: Barnsley		Dimensions (m): Depth 3.00	Scale 1:50
Client: Lidl GB			Logged CB

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.25			MADE GROUND: Dark brown sandy gravelly CLAY TOPSOIL. Sand is medium. Gravel is fine to medium of brick and shale. Occasional rootlets
							MADE GROUND: Dark grey clayey GRAVEL. Gravel is fine to coarse of sub rounded to sub angular siltstone and mudstone with occasional sandstone cobbles. Occasional pieces of coal.
				3.00			End of pit at 3.00 m

Remarks: No groundwater encountered.

Stability:

Trial Pit Log

Trialpit No **TP105**

Sheet 1 of 1

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435226.00 - 400504.00 Level:	Date 18/05/2021
Location: Barnsley		Dimensions (m): Depth 1.60	Scale 1:50
Client: Lidl GB			Logged CB

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.30			MADE GROUND: Brown sandy CLAY TOPSOIL. Sand is medium. Occasional rootlets.
	0.70	B					Yellowish brown with grey and orange mottling stiff CLAY.
	0.70	D					
	0.70	ES					
	0.70	LB		1.20			
	0.70	WAC					Strong orangish light brown fine grained SANDSTONE.
	1.30	D		1.60			End of pit at 1.60 m

Remarks: No groundwater encountered.

Stability:

Trial Pit Log

Trialpit No **TP107**

Sheet 1 of 1

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435230.00 - 400433.00 Level:	Date 18/05/2021
Location: Barnsley		Dimensions (m): Depth 3.20	Scale 1:50
Client: Lidl GB			Logged CB

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.50	D		0.40			MADE GROUND: Dark brown sandy CLAY TOPSOIL. Sand is medium.
							Yellowish brown sandy gravelly CLAY with frequent mudstone and sandstone cobbles (possibly weathered sandstone). Gravel is coarse of angular sandstone.
	1.70	D		1.20			Grey and orange gravel of MUDSTONE, SILTSTONE and SANDSTONE recovered as coarse angular gravel.
	2.50	LB					
	2.80	D					
				3.20			End of pit at 3.20 m

Remarks: Water seepage at 3.1 m bgl.

Stability:

Trial Pit Log

Trialpit No
TP106
Sheet 1 of 1

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435225.00 - 400482.00 Level:	Date 20/05/2021
Location: Barnsley		Dimensions (m): Depth 0.30	Scale 1:50
Client: Lidl GB			Logged CB

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.25			MADE GROUND: Dark brown sandy CLAY TOPSOIL. Sand is medium.
				0.30			Brownish orange slightly gravelly CLAY. Gravel is fine to medium, angular to sub angular of sandstone.
							End of pit at 0.30 m

Remarks: No groundwater encountered.

Stability:

Trial Pit Log

Trialpit No
TP108
Sheet 1 of 1

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435226.00 - 400431.00 Level:	Date 20/05/2021
Location: Barnsley		Dimensions (m): Depth 0.40	Scale 1:50
Client: Lidl GB			Logged CB

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.39			MADE GROUND: Dark brown sandy CLAY TOPSOIL. Sand is medium. Occaional rootlets.
				0.40			Orangish brown slightly clayey sandy GRAVEL. Gravel is coarse of angular to sub angular sandstone (possibly weathered sandstone).
							End of pit at 0.40 m

Remarks: No groundwater encountered.

Stability:

Trial Pit Log

Trialpit No
TP109
Sheet 1 of 1

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435255.00 - 400426.00 Level:	Date 20/05/2021
Location: Barnsley		Dimensions (m): Depth 0.40	Scale 1:50
Client: Lidl GB			Logged CB

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.38			MADE GROUND: Dark brown sandy clay TOPSOIL. Sand is medium. Occasional rootlets.
				0.40			Yellowish brown slightly sandy silty CLAY. End of pit at 0.40 m

1 2 3 4 5 6 7 8 9 10

Remarks: No groundwater encountered.

Stability:

AGS

Trial Pit Log

Trialpit No **TP110**

Sheet 1 of 1

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435183.00 - 400474.00 Level:	Date 18/05/2021
Location: Barnsley		Dimensions (m): Depth 1.20	Scale 1:50
Client: Lidl GB			Logged CB

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼	0.30 0.30 0.30 0.50 0.50	D ES WAC D LB		0.20 0.40 1.20			MADE GROUND: Dark brown sandy gravelly TOPSOIL. Sand is medium. Gravel is fine to coarse of red shale. MADE GROUND Red and brown sandy GRAVEL Gravel is fine to medium, sub angular to angular. MADE GROUND: Grey clayey GRAVEL of fine to coarse mudstone with mudstone cobbles and boulders. End of pit at 1.20 m

Remarks: Water strike 0.8m, trial pit terminated at 1.2 m due to significant water ingress.

Stability:

Trial Pit Log

Trialpit No
TP111
Sheet 1 of 1

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435243.00 - 400428.00 Level:	Date 20/05/2021
Location: Barnsley		Dimensions (m): Depth 0.50	Scale 1:50
Client: Lidl GB			Logged CB

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.35			MADE GROUND: Dark brown sandy gravelly clay TOPSOIL. Sand is medium. Gravel is fine to coarse of red shale.
				0.50			Brown slightly sandy gravelly CLAY. Gravel is medium to coarse of sandstone
							End of pit at 0.50 m

Remarks: No groundwater encountered.

Stability:

Borehole Log

Borehole No.
WS101A
Sheet 1 of 1

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435164.00 - 400508.00	Hole Type WS
Location: Barnsley		Level:	Scale 1:50
Client: Lidl GB		Dates: 17/05/2021 - 17/05/2021	Logged By CB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
	▼				0.30			MADE GROUND: Brown sandy slightly gravelly CLAY TOPSOIL. Gravel is medium, angular to sub angular of red shale. Sand is medium.
					0.70			MADE GROUND: Soft dark grey gravelly CLAY. Gravel is fine to medium, angular to sub angular of mudstone and sandstone.
								End of borehole at 0.70 m

Remarks
Water strike at 0.3m bgl.

Borehole Log

Borehole No. **WS101B**

Sheet 1 of 1

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435167.00 - 400502.00	Hole Type WS
Location: Barnsley		Level:	Scale 1:50
Client: Lidl GB		Dates: 17/05/2021 - 17/05/2021	Logged By CB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
	▼				0.30			MADE GROUND: Brown sandy slightly gravelly CLAY TOPSOIL. Gravel is medium, angular to sub angular of red shale. Sand is medium.
					0.90			MADE GROUND: Soft dark grey gravelly CLAY. Gravel is fine to medium, angular to sub angular of mudstone and sandstone.
								End of borehole at 0.90 m

Remarks
Water strike at 0.3m bgl.

Borehole Log

Borehole No. **WS102**

Sheet 1 of 1

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435185.00 - 435185.00	Hole Type WS
Location: Barnsley		Level:	Scale 1:50
Client: Lidl GB		Dates: 18/05/2021 - 18/05/2021	Logged By CB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES		0.20			MADE GROUND: Dark brown slightly gravelly sandy CLAY TOPSOIL. Gravel is fine to coarse, sub angular to angular of red shale. Sand is medium.
		0.25	D					
		0.40	D		0.40			
					0.80			MADE GROUND: Red sandy GRAVEL. Gravel is fine to coarse of sub angular to angular red shale. Sand is medium to coarse.
					0.81			
		1.20		N=21 (3,3/2,5,6,8)				MADE GROUND: Sandy clayey GRAVEL. Gravel is fine to coarse sub rounded to angular of mudstone and siltstone. Sand is fine to coarse. Dry.
					1.40			
					1.75			MADE GROUND: SANDSTONE COBBLE
		1.80		N=72 (9,15/37,12,12,11)	1.80			MADE GROUND: Sandy clayey GRAVEL. Gravel is fine to coarse sub rounded to angular of mudstone and siltstone. Sand is fine to coarse. Dry.
								MADE GROUND: Brown clayey gravel of fine to medium coal and shale.
								MADE GROUND: SANDSTONE COBBLE
								End of borehole at 1.80 m

Remarks
Groundwater strike at 0.9 mbgl.

Borehole Log

Borehole No. **WS103**

Sheet 1 of 1

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435231.00 - 400523.00	Hole Type WS
Location: Barnsley		Level:	Scale 1:50
Client: Lidl GB		Dates: 17/05/2021 - 17/05/2021	Logged By CB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.30			MADE GROUND: Brown sandy CLAY TOPSOIL. Sand is medium.
		0.80	D					Yellowish brown soft gravelly CLAY. Gravel is fine to coarse sub rounded to sub angular of sandstone and mudstone.
		1.20		N=54 (3,3/5,6,18,25)				
		1.40	D					
		1.80	D		1.70			Yellowish brown highly weathered MUDSTONE and SANDSTONE.
		1.80		50 (18 for 75mm/50 for 50mm)	1.94			End of borehole at 1.94 m

Remarks
No groundwater encountered.

Borehole Log

Borehole No. **WS104**

Sheet 1 of 1

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435217.00 - 400491.00	Hole Type WS
Location: Barnsley		Level:	Scale 1:50
Client: Lidl GB		Dates: 18/05/2021 - 18/05/2021	Logged By CB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50	D		0.30			MADE GROUND: Brown sandy CLAY TOPSOIL. Sand is medium.
		0.80	D					Light brown slightly sandy soft CLAY. Sand is fine to medium.
		1.20		68 (6,9/68 for 200mm)	1.20			End of borehole at 1.20 m

Remarks
No groundwater encountered.

AGS

Borehole Log

Borehole No. **WS105**

Sheet 1 of 1

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435228.00 - 400496.00	Hole Type WS
Location: Barnsley		Level:	Scale 1:50
Client: Lidl GB		Dates: 18/05/2021 - 18/05/2021	Logged By CB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50 0.50	D ES		0.30			MADE GROUND: Brown sandy CLAY TOPSOIL. Sand is medium.
		1.20		50 (19,48/50 for 50mm)	1.00 1.30			Light brown gravelly CLAY. Gravel is fine to coarse of angular to sub angular mudtsone, siltstone and sandstone. Light brown highly weathered MUDSTONE. End of borehole at 1.30 m

Remarks
No groundwater encountered.

Borehole Log

Borehole No. **WS106**

Sheet 1 of 1

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435235.00 - 400466.00	Hole Type WS
Location: Barnsley		Level:	Scale 1:50
Client: Lidl GB		Dates: 17/05/2021 - 17/05/2021	Logged By CB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50	D		0.30			MADE GROUND: Brown sandy CLAY TOPSOIL. Sand is medium. Occasional rootlets.
		1.20		N=11 (1,1/2,3,3,3)				Light brown gravelly slightly sandy soft CLAY. Gravel is fine to medium of sub angular to angular sandstone. Sand is fine to medium.
		2.00		N=104 (4,8/104 for 265mm)	2.00			End of borehole at 2.00 m

Remarks
No groundwater encountered.

Borehole Log

Borehole No. **WS107**

Sheet 1 of 1

Project Name: Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords: 435228.00 - 435228.00	Hole Type WS
Location: Barnsley		Level:	Scale 1:50
Client: Lidl GB		Dates: 17/05/2021 - 17/05/2021	Logged By CB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.15	ES		0.26			MADE GROUND: Brown sandy CLAY TOPSOIL. Sand is medium. Occasional fragments of red shale.
		1.00 1.00 1.20	D WAC	N=14 (1,1/2,3,4,5)	1.30			Light brown gravelly slightly sandy soft CLAY. Gravel is fine to coarse of sub angular to angular sandstone. Sand is fine to medium.
		2.00 2.00	D	117 (10,20/117 for 190mm)	2.20			Light brown highly weathered MUDSTONE and SILTSTONE. End of borehole at 2.20 m

Remarks
No groundwater encountered.

AGS

Borehole Log

Borehole No. **WS201**

Sheet 1 of 1

Project Name:	Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords:	435215.75 - 400446.02	Hole Type WS
Location:	Barnsley		Level:	146.47	Scale 1:20
Client:	Lidl GB		Dates:	27/11/2021 - 27/11/2021	Logged By CB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15	146.32		Brown sandy clay TOPSOIL.
		0.70	D					MADE GROUND: Reddish brown clayey gravelly fine to medium SAND. Gravel is fine to coarse, sub rounded to sub angular of sandstone, mudstone and brick. Low brick cobble content. Rare pieces of coal, concrete and ceramics.
					1.30	145.17		Brownish yellow weathered SANDSTONE.
					1.60	144.87		End of borehole at 1.60 m

Remarks

Hole terminated at 1.6m bgl, refusal. No groundwater encountered.

Borehole Log

Borehole No. **WS202**

Sheet 1 of 1

Project Name:	Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords:	435213.92 - 400457.28	Hole Type WS
Location:	Barnsley		Level:	145.84	Scale 1:20
Client:	Lidl GB		Dates:	27/10/2021 - 27/10/2021	Logged By CB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								MADE GROUND: Reddish brown clayey sandy gravel. Gravel is fine to coarse of sandstone, brick, burnt shale. Rare concrete and coal gravel.
		2.50	D					
					2.60	143.24		End of borehole at 2.60 m

Remarks

Hole terminated at 2.6 m bgl, refusal. No groundwater encountered.

Borehole Log

Borehole No. **WS203**

Sheet 1 of 1

Project Name:	Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords:	435215.95 - 400465.51	Hole Type WS
Location:	Barnsley		Level:	145.59	Scale 1:20
Client:	Lidl GB		Dates:	27/10/2021 -	Logged By CB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		1.50	D					MADE GROUND: Reddish brown clayey sandy gravel. Gravel is fine to coarse of sandstone, brick, burnt shale. Rare concrete and coal gravel.
					2.60	142.99		Brownish yellow weathered SANDSTONE.
					2.80	142.79		End of borehole at 2.80 m

Remarks

Hole terminated at 2.8m bgl, refusal. No groundwater encountered.

AGS

Borehole Log

Borehole No. **WS204**

Sheet 1 of 1

Project Name:	Lidl Cross Keys Lane, Hoyland	Project No. 078794	Co-ords:	435211.77 - 400473.86	Hole Type WS
Location:	Barnsley		Level:	145.37	Scale 1:20
Client:	Lidl GB		Dates:	27/10/2021 -	Logged By CB

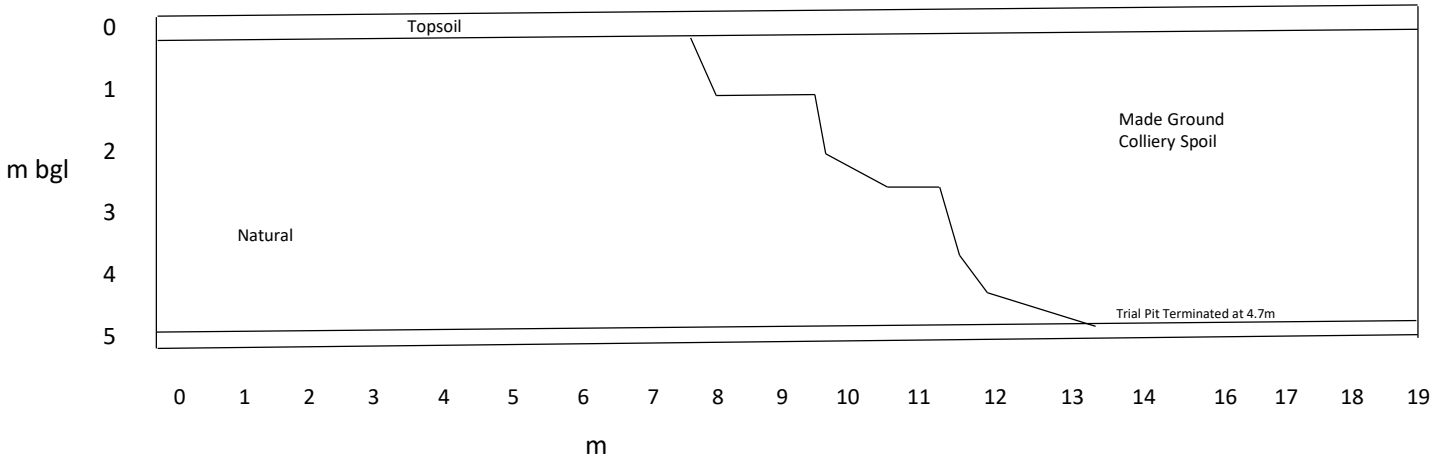
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	145.17		MADE GROUND: Brown silty sand TOPSOIL.
								MADE GROUND: Reddish brown clayey sandy gravel. Gravel is fine to coarse of sandstone, brick, burnt shale. Rare concrete and coal gravel.
		2.50	D		2.40	142.97		Brownish yellow weathered SANDSTONE.
					2.60	142.77		End of borehole at 2.60 m

Remarks
Hole terminated at 2.6m bgl (refusal). No groundwater encountered.

Trial Trench Cross Section:TT103
Date: 18/05/2021
Job Number: 078794
Site: Cross Keys Lane Hoyland

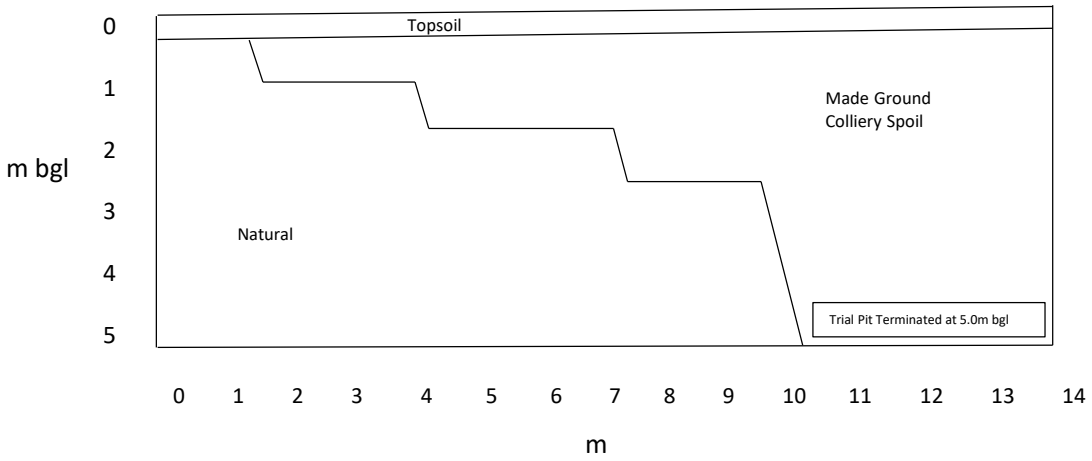
South East

North West



Trial Trench Cross Section: TT101
Date: 17/05/2021
Job Number: 078794
Site: Cross Keys Lane Hoyland

East

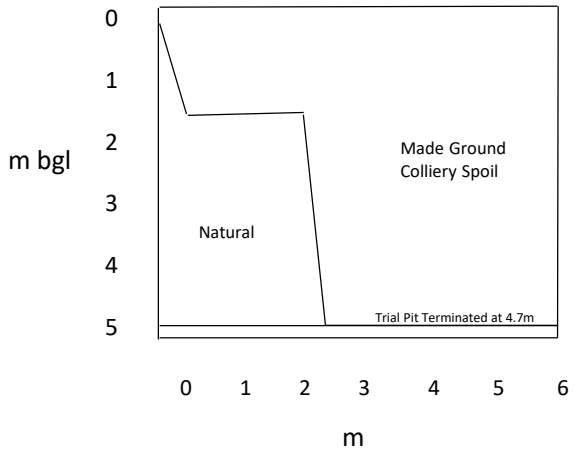


West

Trial Trench Cross Section :TT102
Date: 17/05/2021
Job Number: 078794
Site: Cross Keys Lane Hoyland

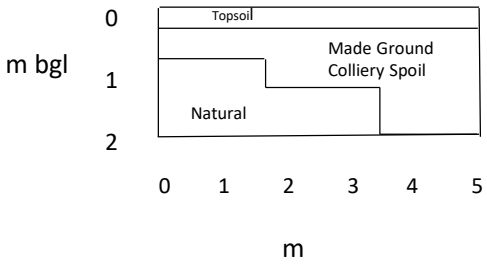
East

West



Trial Trench Cross Section:TT201 (Additional SI)
Date: 26/10/2021
Job Number: 078794
Site: Cross Keys Lane Hoyland

East



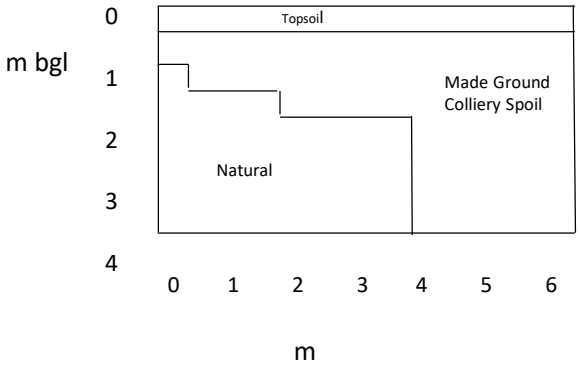
West



All measurements are approximate

Trial Trench Cross Section:TT202 (Additional SI)
Date: 26/10/2021
Job Number: 078794
Site: Cross Keys Lane Hoyland

East



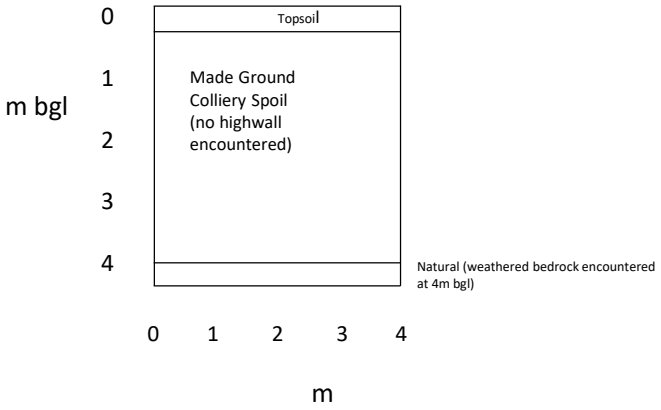
West



Trial Trench Cross Section:TT203 (Additional SI)
Date: 26/10/2021
Job Number: 078794
Site: Cross Keys Lane Hoyland

East

West



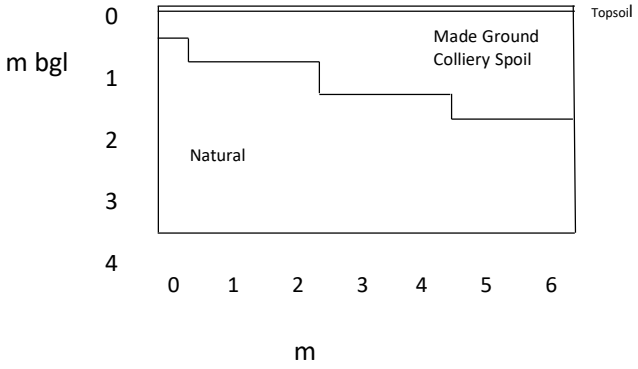
All measurements are approximate



Trial Trench Cross Section:TT204 (Additional SI)
Date: 26/10/2021
Job Number: 078794
Site: Cross Keys Lane Hoyland

East

West



All measurements are approximate



Trial Trench Cross Section:TT205 (Additional SI)
Date: 26/10/2021
Job Number: 078794
Site: Cross Keys Lane Hoyland

East

West





All measurements are approximate

Trial Trench Cross Section:TT206 (Additional SI)
Date: 26/10/2021
Job Number: 078794
Site: Cross Keys Lane Hoyland

Shallow TP only (to 0.3 m bgl) to identify confirm wall location. Start of MG/highwall area shown on post SI EHLP.



Appendix C Chemical Laboratory Testing Results

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Analytical Report Number : 21-77936

Project / Site name:	Cross Key Lane, Hoyland	**Samples received on:**	20/05/2021
Your job number:	078794	**Samples instructed on/ Analysis started on:**	28/05/2021
Your order number:	EBLE1115	**Analysis completed by:**	09/06/2021
Report Issue Number:	1	**Report issued on:**	09/06/2021
Samples Analysed:	10 soil samples		

Signed: A Czerwińska

Agnieszka Czerwińska
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 21-77936
Project / Site name: Cross Key Lane, Hoyland
Your Order No: EBLE1115

Lab Sample Number				1886759	1886760	1886761	1886762	1886763
Sample Reference				TP110	TP105	WS102	WS105	WS107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.70	0.10	0.50	0.15
Date Sampled				Deviating	Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	11	14	18	12	22
Total mass of sample received	kg	0.001	NONE	2.0	2.0	1.2	1.5	1.0
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.5	6.4	7.3	6.7	7.0
Total Cyanide	mg/kg	1	MCERTS	1.5	< 1.0	39	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ammoniacal Nitrogen as N	mg/kg	0.5	MCERTS	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ammoniacal Nitrogen as NH3	mg/kg	0.5	MCERTS	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ammoniacal Nitrogen as NH4	mg/kg	0.5	MCERTS	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Organic Matter	%	0.1	MCERTS	2.2	0.4	8.9	0.7	4.7
Phenols by HPLC								
Catechol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Resorcinol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Cresols (o-, m-, p-)	mg/kg	0.3	ISO 17025	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
Total Naphthols (sum of 1- and 2- Naphthol)	mg/kg	0.2	ISO 17025	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
2-Isopropylphenol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Trimethylphenol (2,3,5-)	mg/kg	0.1	ISO 17025	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Xylenols and Ethylphenols	mg/kg	0.3	ISO 17025	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
Total Phenols								
Total Phenols (HPLC)	mg/kg	1.3	ISO 17025	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3

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Analytical Report Number: 21-77936
Project / Site name: Cross Key Lane, Hoyland
Your Order No: EBLE1115

Lab Sample Number				1886759	1886760	1886761	1886762	1886763
Sample Reference				TP110	TP105	WS102	WS105	WS107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.70	0.10	0.50	0.15
Date Sampled				Deviating	Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	21	4.5	53	7.4	15
Boron (water soluble)	mg/kg	0.2	MCERTS	0.7	< 0.2	0.6	0.2	0.9
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	23	23	24	21	22
Copper (aqua regia extractable)	mg/kg	1	MCERTS	33	14	67	17	60
Lead (aqua regia extractable)	mg/kg	1	MCERTS	25	9.9	89	8.3	58
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	1.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	31	20	37	23	21
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	54	63	140	37	95
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	9.2	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	11	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	18	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	< 10	30	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	67	< 10	15

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Analytical Report Number: 21-77936
Project / Site name: Cross Key Lane, Hoyland
Your Order No: EBLE1115

Lab Sample Number				1886759	1886760	1886761	1886762	1886763
Sample Reference				TP110	TP105	WS102	WS105	WS107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.70	0.10	0.50	0.15
Date Sampled				Deviating	Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

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Analytical Report Number: 21-77936
Project / Site name: Cross Key Lane, Hoyland
Your Order No: EBLE1115

Lab Sample Number				1886759	1886760	1886761	1886762	1886763
Sample Reference				TP110	TP105	WS102	WS105	WS107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.70	0.10	0.50	0.15
Date Sampled				Deviating	Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

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Analytical Report Number: 21-77936
Project / Site name: Cross Key Lane, Hoyland
Your Order No: EBLE1115

Lab Sample Number				1886759	1886760	1886761	1886762	1886763
Sample Reference				TP110	TP105	WS102	WS105	WS107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.70	0.10	0.50	0.15
Date Sampled				Deviating	Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenol	mg/kg	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Chlorophenol	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylphenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Hexachloroethane	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
4-Methylphenol	mg/kg	0.2	NONE	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Isophorone	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Nitrophenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	9.5	< 0.05	< 0.05
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
4-Chloroaniline	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorobutadiene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Methylnaphthalene	mg/kg	0.1	NONE	< 0.1	< 0.1	6.4	< 0.1	< 0.1
2-Chloronaphthalene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dimethylphthalate	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.38	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.80	< 0.05	< 0.05
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Dibenzofuran	mg/kg	0.2	MCERTS	< 0.2	< 0.2	3.4	< 0.2	< 0.2
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Diethyl phthalate	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
4-Nitroaniline	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.67	< 0.05	< 0.05
Azobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Hexachlorobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	7.0	< 0.05	0.60
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	1.7	< 0.05	< 0.05
Carbazole	mg/kg	0.3	MCERTS	< 0.3	< 0.3	0.4	< 0.3	< 0.3
Dibutyl phthalate	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Anthraquinone	mg/kg	0.3	MCERTS	< 0.3	< 0.3	1.2	< 0.3	< 0.3
Fluoranthene	mg/kg	0.05	MCERTS	0.34	< 0.05	5.8	< 0.05	1.2
Pyrene	mg/kg	0.05	MCERTS	0.30	< 0.05	4.5	< 0.05	1.0
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	3.3	< 0.05	0.60
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	3.3	< 0.05	0.81
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	5.1	< 0.05	0.92
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	2.1	< 0.05	0.36
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	3.0	< 0.05	0.71

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Analytical Report Number: 21-77936
Project / Site name: Cross Key Lane, Hoyland
Your Order No: EBLE1115

Lab Sample Number				1886759	1886760	1886761	1886762	1886763
Sample Reference				TP110	TP105	WS102	WS105	WS107
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.70	0.10	0.50	0.15
Date Sampled				Deviating	Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	3.0	< 0.05	0.46
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	1.0	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	2.9	< 0.05	0.42

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number: 21-77936
Project / Site name: Cross Key Lane, Hoyland
Your Order No: EBLE1115

Lab Sample Number				1886764	1886765	1886766	1886767	1886768
Sample Reference				TT101	TT102	TP101	TP101	TP105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	1.50	0.20	0.35	0.20
Date Sampled				Deviating	Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	10	12	26	13	20
Total mass of sample received	kg	0.001	NONE	1.2	1.2	1.5	1.2	1.0
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	6.8	6.7	6.9	7.4	6.0
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	7.3	7.9	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ammoniacal Nitrogen as N	mg/kg	0.5	MCERTS	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ammoniacal Nitrogen as NH3	mg/kg	0.5	MCERTS	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ammoniacal Nitrogen as NH4	mg/kg	0.5	MCERTS	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Organic Matter	%	0.1	MCERTS	5.3	2.4	9.5	2.3	7.3

Phenols by HPLC

Catechol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Resorcinol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Cresols (o-, m-, p-)	mg/kg	0.3	ISO 17025	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
Total Naphthols (sum of 1- and 2- Naphthol)	mg/kg	0.2	ISO 17025	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
2-Isopropylphenol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Trimethylphenol (2,3,5-)	mg/kg	0.1	ISO 17025	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Xylenols and Ethylphenols	mg/kg	0.3	ISO 17025	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30

Total Phenols

Total Phenols (HPLC)	mg/kg	1.3	ISO 17025	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3

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Analytical Report Number: 21-77936
Project / Site name: Cross Key Lane, Hoyland
Your Order No: EBLE1115

Lab Sample Number				1886764	1886765	1886766	1886767	1886768
Sample Reference				TT101	TT102	TP101	TP101	TP105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	1.50	0.20	0.35	0.20
Date Sampled				Deviating	Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	59	33	43	16	15
Boron (water soluble)	mg/kg	0.2	MCERTS	0.6	0.6	0.9	0.2	0.8
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	19	19	21	23	22
Copper (aqua regia extractable)	mg/kg	1	MCERTS	52	39	66	35	30
Lead (aqua regia extractable)	mg/kg	1	MCERTS	40	29	76	24	71
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	0.9	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	30	26	27	41	16
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	49	45	100	110	99
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	5.4	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	11	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	42	< 8.0	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	58	< 10	< 10
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	9.1	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	12	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	21	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	< 10	35	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	76	< 10	< 10

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Analytical Report Number: 21-77936
Project / Site name: Cross Key Lane, Hoyland
Your Order No: EBLE1115

Lab Sample Number				1886764	1886765	1886766	1886767	1886768
Sample Reference				TT101	TT102	TP101	TP101	TP105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	1.50	0.20	0.35	0.20
Date Sampled				Deviating	Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

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Analytical Report Number: 21-77936
Project / Site name: Cross Key Lane, Hoyland
Your Order No: EBLE1115

Lab Sample Number				1886764	1886765	1886766	1886767	1886768
Sample Reference				TT101	TT102	TP101	TP101	TP105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	1.50	0.20	0.35	0.20
Date Sampled				Deviating	Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

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Analytical Report Number: 21-77936
Project / Site name: Cross Key Lane, Hoyland
Your Order No: EBLE1115

Lab Sample Number				1886764	1886765	1886766	1886767	1886768
Sample Reference				TT101	TT102	TP101	TP101	TP105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	1.50	0.20	0.35	0.20
Date Sampled				Deviating	Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenol	mg/kg	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Chlorophenol	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylphenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Hexachloroethane	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
4-Methylphenol	mg/kg	0.2	NONE	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Isophorone	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Nitrophenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	0.82	8.9	1.5	0.38
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
4-Chloroaniline	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorobutadiene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Methylnaphthalene	mg/kg	0.1	NONE	< 0.1	0.6	6.2	1.2	< 0.1
2-Chloronaphthalene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dimethylphthalate	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.32	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.71	< 0.05	< 0.05
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Dibenzofuran	mg/kg	0.2	MCERTS	< 0.2	< 0.2	3.1	0.4	< 0.2
4-Chlorophenyl phenyl ether	mg/kg	0.3	ISO 17025	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Diethyl phthalate	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
4-Nitroaniline	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.69	< 0.05	< 0.05
Azobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Hexachlorobenzene	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	0.59	6.7	0.96	0.71
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	1.7	0.22	< 0.05
Carbazole	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Dibutyl phthalate	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Anthraquinone	mg/kg	0.3	MCERTS	< 0.3	< 0.3	1.0	< 0.3	< 0.3
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.35	6.0	0.65	1.4
Pyrene	mg/kg	0.05	MCERTS	< 0.05	0.27	4.8	0.53	1.3
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	3.4	0.33	0.82
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	3.3	0.39	0.76
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	5.4	0.49	0.89
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	1.9	0.20	0.54
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	2.8	0.32	0.90

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 21-77936
Project / Site name: Cross Key Lane, Hoyland
Your Order No: EBLE1115

Lab Sample Number				1886764	1886765	1886766	1886767	1886768
Sample Reference				TT101	TT102	TP101	TP101	TP105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	1.50	0.20	0.35	0.20
Date Sampled				Deviating	Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	2.6	0.28	0.43
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.89	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	2.6	0.35	0.49

U/S = Unsuitable Sample I/S = Insufficient Sample

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number : 21-77936
Project / Site name: Cross Key Lane, Hoyland

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1886759	TP110	None Supplied	0.3	Brown clay and loam with vegetation and brick.
1886760	TP105	None Supplied	0.7	Brown sandy clay.
1886761	WS102	None Supplied	0.1	Brown clay and loam with vegetation and gravel
1886762	WS105	None Supplied	0.5	Brown sandy clay.
1886763	WS107	None Supplied	0.15	Brown clay and loam with brick and vegetation.
1886764	TT101	None Supplied	0.4	Brown clay and loam with vegetation and brick.
1886765	TT102	None Supplied	1.5	Brown clay and loam with brick and gravel
1886766	TP101	None Supplied	0.2	Brown clay and loam with vegetation and gravel
1886767	TP101	None Supplied	0.35	Light brown sandy clay with vegetation.
1886768	TP105	None Supplied	0.2	Brown loam and clay with vegetation and gravel

Analytical Report Number : 21-77936
Project / Site name: Cross Key Lane, Hoyland

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Phenols, speciated, in soil, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
D.O. for Gravimetric Quant if free fibres detected	Dependent option for Gravimetric Quant if Screen/ID positive for free fibres	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds in soil by extraction in dichloromethane and hexane followed by GC-MS.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Ammonia as NH3 in soil	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method, 10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	MCERTS
Ammoniacal Nitrogen as N in soil	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method,10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	MCERTS

Analytical Report Number : 21-77936
Project / Site name: Cross Key Lane, Hoyland

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammonium as NH4 in soil	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method, 10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Sample Deviation Report

Analytical Report Number : 21-77936
Project / Site name: Cross Key Lane, Hoyland

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
TP101	None Supplied	S	1886766	a	None Supplied	None Supplied	None Supplied
TP101	None Supplied	S	1886767	a	None Supplied	None Supplied	None Supplied
TP105	None Supplied	S	1886760	a	None Supplied	None Supplied	None Supplied
TP105	None Supplied	S	1886768	a	None Supplied	None Supplied	None Supplied
TP110	None Supplied	S	1886759	a	None Supplied	None Supplied	None Supplied
TT101	None Supplied	S	1886764	a	None Supplied	None Supplied	None Supplied
TT102	None Supplied	S	1886765	a	None Supplied	None Supplied	None Supplied
WS102	None Supplied	S	1886761	a	None Supplied	None Supplied	None Supplied
WS105	None Supplied	S	1886762	a	None Supplied	None Supplied	None Supplied
WS107	None Supplied	S	1886763	a	None Supplied	None Supplied	None Supplied

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Analytical Report Number : 21-77940

Project / Site name:	Cross keys Lane, Hoyland	**Samples received on:**	20/05/2021
Your job number:	078794	**Samples instructed on/ Analysis started on:**	28/05/2021
Your order number:	EBLE1115	**Analysis completed by:**	08/06/2021
Report Issue Number:	1	**Report issued on:**	08/06/2021
Samples Analysed:	2 10:1 WAC samples		

Signed:

Joanna Wawrzeczko
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

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Waste Acceptance Criteria Analytical Results

Report No:	**21-77940**						
					Client: CURTINS		
Location	**Cross keys Lane, Hoyland**						
Lab Reference (Sample Number)	1886792 / 1886793				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date					Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TP110						
Depth (m)	0.30						
Solid Waste Analysis							
TOC (%)**	1.0				3%	5%	6%
Loss on Ignition (%) **	3.9				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.007				1	--	--
Mineral Oil (mg/kg)	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.85				100	--	--
pH (units)**	7.1				--	>6	--
Acid Neutralisation Capacity (mol / kg)	0.11				--	To be evaluated	To be evaluated
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	< 0.0010			< 0.0100	0.5	2	25
Barium *	0.0098			0.0878	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	< 0.0004			< 0.0040	0.5	10	70
Copper *	0.0040			0.036	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0035			0.0309	0.5	10	30
Nickel *	0.0023			0.021	0.4	10	40
Lead *	< 0.0010			< 0.010	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.013			0.11	4	50	200
Chloride *	1.3			12	800	15000	25000
Fluoride	0.25			2.3	10	150	500
Sulphate *	3.2			28	1000	20000	50000
TDS*	19			170	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	8.15			72.6	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	2.0						
Dry Matter (%)	92						
Moisture (%)	8.5						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.
*= UKAS accredited (liquid eluate analysis only)
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation
** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

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Waste Acceptance Criteria Analytical Results

Report No:	**21-77940**						
					Client: CURTINS		
Location	**Cross keys Lane, Hoyland**						
Lab Reference (Sample Number)	1886794 / 1886795				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date					Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TP105						
Depth (m)	0.70						
Solid Waste Analysis							
TOC (%)**	0.3				3%	5%	6%
Loss on Ignition (%) **	2.4				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.007				1	--	--
Mineral Oil (mg/kg)	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.85				100	--	--
pH (units)**	5.7				--	>6	--
Acid Neutralisation Capacity (mol / kg)	-11				--	To be evaluated	To be evaluated
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.0056			0.0464	0.5	2	25
Barium *	0.0168			0.138	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0032			0.026	0.5	10	70
Copper *	0.0026			0.021	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0022			0.0184	0.5	10	30
Nickel *	0.0033			0.027	0.4	10	40
Lead *	0.0010			< 0.010	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.0098			0.081	4	50	200
Chloride *	1.5			12	800	15000	25000
Fluoride	< 0.050			< 0.50	10	150	500
Sulphate *	4.4			36	1000	20000	50000
TDS*	14			120	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	7.65			62.9	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	2.0						
Dry Matter (%)	84						
Moisture (%)	16						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.
*= UKAS accredited (liquid eluate analysis only)
Stated limits are for guidance only and i2 cannot be held responsible for any discrepencies with current legislation
** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 21-77940
Project / Site name: Cross keys Lane, Hoyland

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1886792	TP110	None Supplied	0.3	Brown clay and loam with brick and vegetation.
1886794	TP105	None Supplied	0.7	Light brown sandy clay with vegetation.

Analytical Report Number : 21-77940
Project / Site name: Cross keys Lane, Hoyland

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270. MCERTS accredited except Coronene.	L064-PL	D	NONE
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH at 20oC in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Total BTEX in soil (Poland)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073-PL	W	MCERTS
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by EC probe using a factor of 0.6.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L004-PL	W	ISO 17025

Analytical Report Number : 21-77940
Project / Site name: Cross keys Lane, Hoyland

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Sample Deviation Report

Analytical Report Number : 21-77940
Project / Site name: Cross keys Lane, Hoyland

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
TP105	None Supplied	L	1886795	a	None Supplied	None Supplied	None Supplied
TP105	None Supplied	S	1886794	a	None Supplied	None Supplied	None Supplied
TP110	None Supplied	L	1886793	a	None Supplied	None Supplied	None Supplied
TP110	None Supplied	S	1886792	a	None Supplied	None Supplied	None Supplied

Key: **a** - No sampling date **b** - Incorrect container
c - Holding time **d** - Headspace **e** - Temperature

Appendix D1 Geotechnical Laboratory Testing Results

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Analytical Report Number : 21-78418

Project / Site name:	Cross Keys Lane, Hoyland	**Samples received on:**	28/05/2021
Your job number:	078794	**Samples instructed on/ Analysis started on:**	28/05/2021
Your order number:	EBLE1115	**Analysis completed by:**	21/07/2021
Report Issue Number:	1	**Report issued on:**	21/07/2021
Samples Analysed:	4 soil samples		

Signed: Izabela Wójcik

Izabela Wójcik
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 21-78418
Project / Site name: Cross Keys Lane, Hoyland
Your Order No: EBLE1115

Lab Sample Number				1889158	1889159	1889162	1889165
Sample Reference				WS102	WS103	TP105	TP110
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.80	0.70	0.30
Date Sampled				28/05/2021	28/05/2021	28/05/2021	28/05/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	4.9	18	15	9.2
Total mass of sample received	kg	0.001	NONE	0.30	0.30	0.50	0.50
General Inorganics							
pH - Automated	pH Units	N/A	MCERTS	7.6	5.5	5.6	6.6
Total Sulphate as SO4	%	0.005	MCERTS	0.025	0.030	0.020	0.231
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.031	0.018	0.015	0.038
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	31.1	18.2	15.1	37.8
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	< 0.5	0.7	0.6	2.5
Total Sulphur	%	0.005	MCERTS	0.021	0.009	0.007	0.069
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0
Heavy Metals / Metalloids							
Magnesium (water soluble)	mg/kg	5	NONE	16	< 5.0	< 5.0	5.4
Magnesium (leachate equivalent)	mg/l	2.5	NONE	7.8	< 2.5	< 2.5	2.7

U/S = Unsuitable Sample I/S = Insufficient Sample

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Analytical Report Number : 21-78418
Project / Site name: Cross Keys Lane, Hoyland

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1889158	WS102	None Supplied	0.4	Brown clay and sand with gravel.
1889159	WS103	None Supplied	0.8	Light brown sandy clay with gravel.
1889162	TP105	None Supplied	0.7	Light brown sandy clay with gravel.
1889165	TP110	None Supplied	0.3	Brown loam and sand with gravel and vegetation.

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Analytical Report Number : 21-78418
Project / Site name: Cross Keys Lane, Hoyland

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

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TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

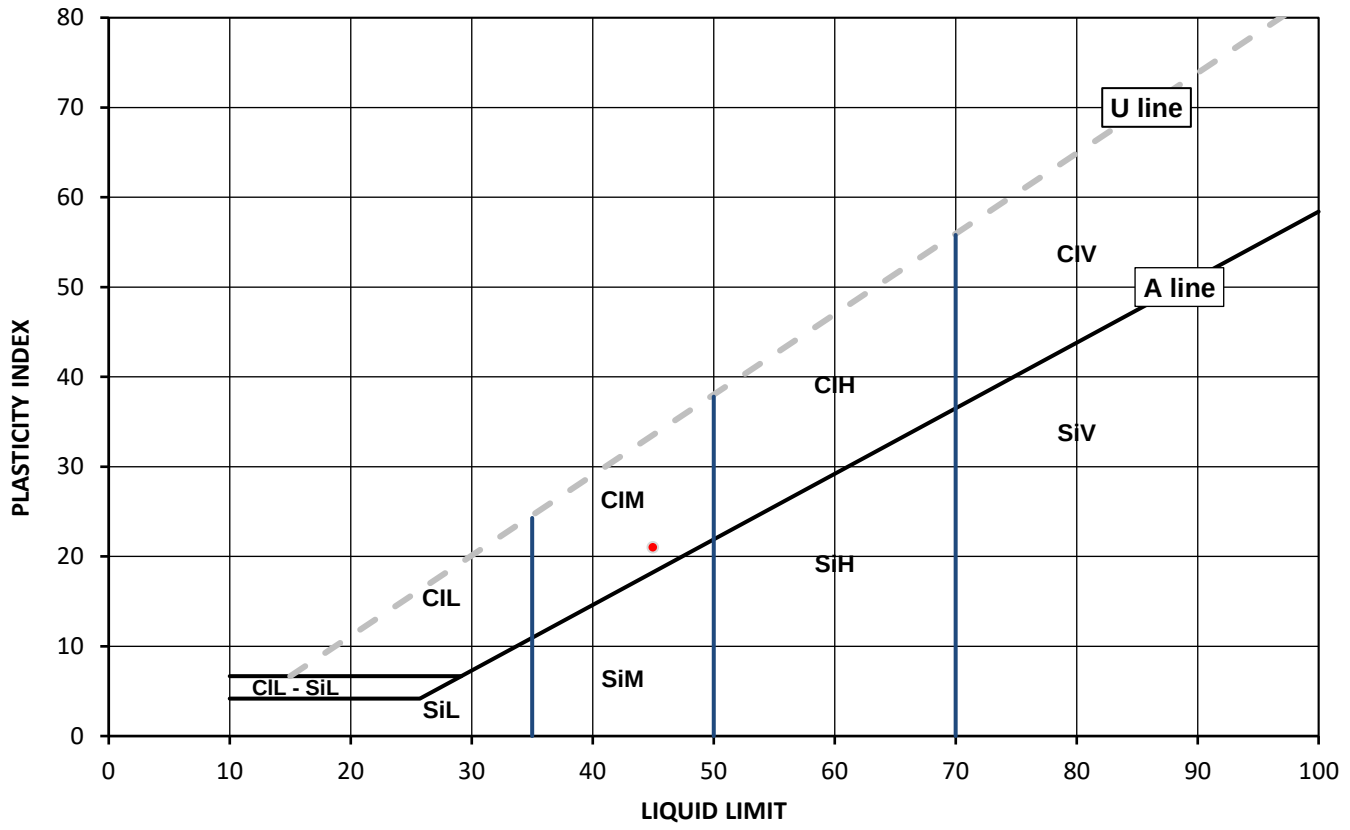
Client:	CURTINS	Client Reference:	78794
Client Address:	Rose Wharf, Ground Floor, 78-80 East Street, Leeds, LS9 8EE	Job Number:	21-78444
		Date Sampled:	28/05/2021
		Date Received:	28/05/2021
Contact:	Claire Battersby	Date Tested:	01/07/2021
Site Address:	Cross Keys Lane, Hoyland	Sampled By:	Client

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1889322	Depth Top [m]:	0.80
Hole No.:	WS103	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Soil Description:	Yellowish brown mottled grey gravelly sandy very clayey SILT		
Sample Preparation:	Tested after washing to remove >425um		

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
23	45	24	21	81



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Signed:

Szczepan Bielatowicz
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/07/2021

GF 232.10

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

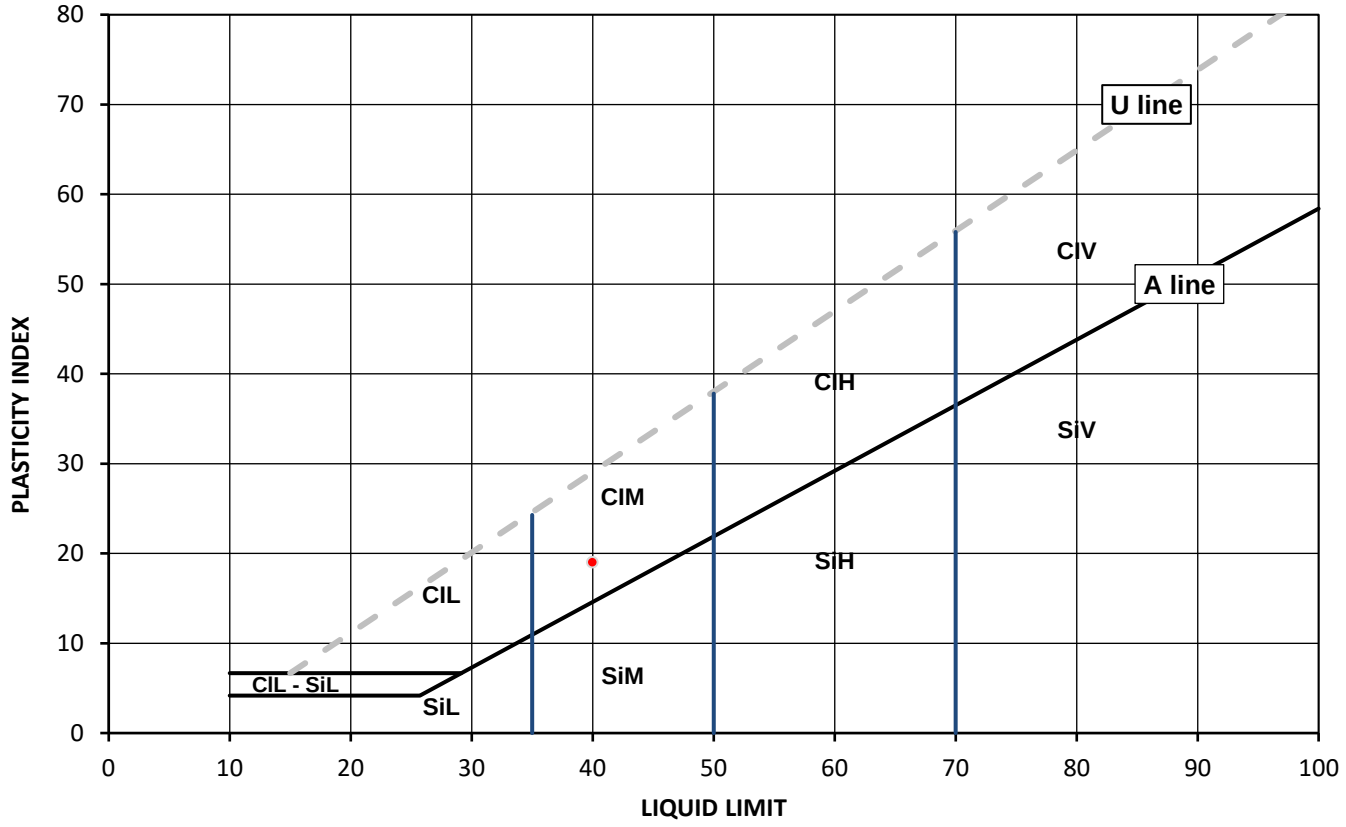
Client:	CURTINS	Client Reference:	78794
Client Address:	Rose Wharf, Ground Floor, 78-80 East Street, Leeds, LS9 8EE	Job Number:	21-78444
		Date Sampled:	28/05/2021
		Date Received:	28/05/2021
Contact:	Claire Battersby	Date Tested:	01/07/2021
Site Address:	Cross Keys Lane, Hoyland	Sampled By:	Client

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1889323	Depth Top [m]:	1.40
Hole No.:	WS103	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Soil Description:	Yellowish brown mottled grey slightly gravelly sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
22	40	21	19	97



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

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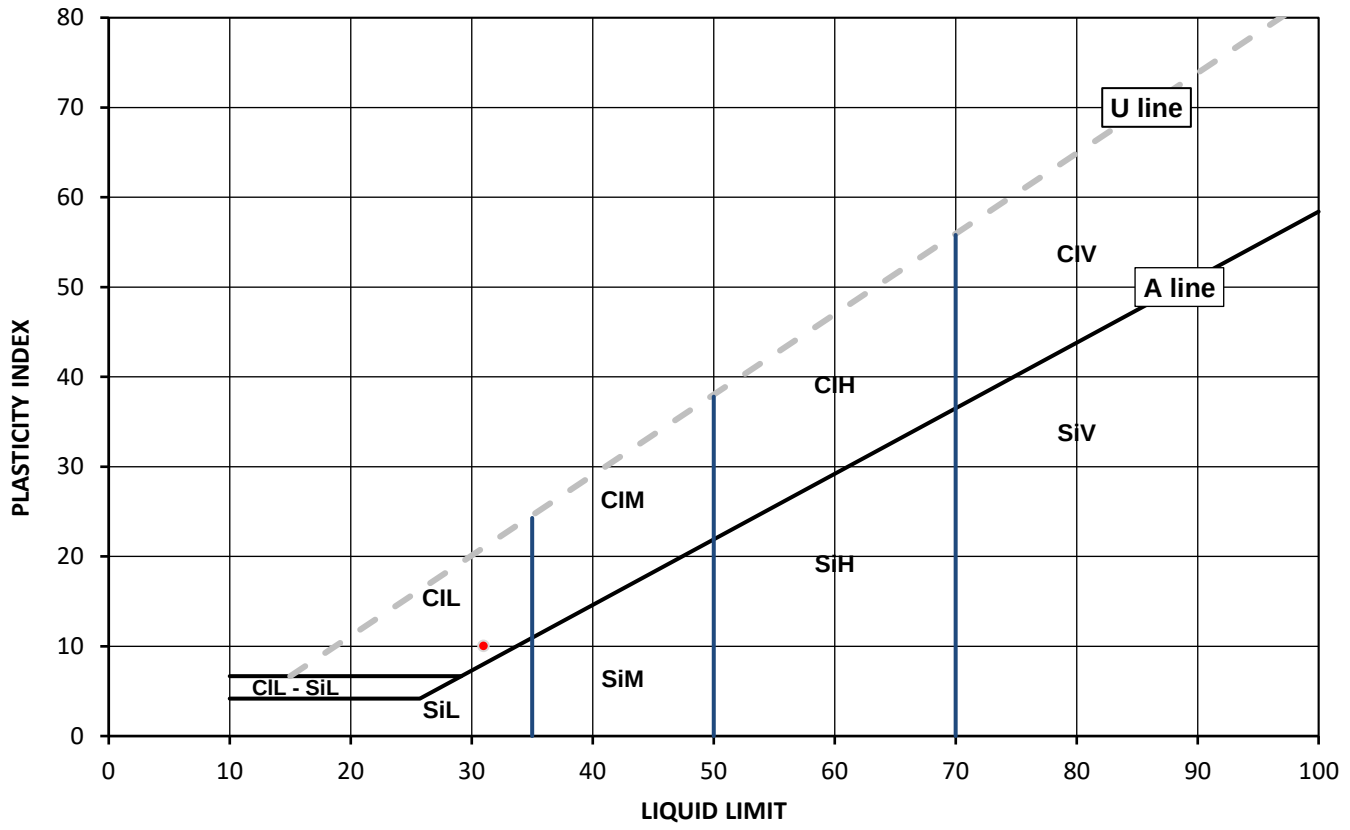
Client:	CURTINS	Client Reference:	78794
Client Address:	Rose Wharf, Ground Floor, 78-80 East Street, Leeds, LS9 8EE	Job Number:	21-78444
		Date Sampled:	28/05/2021
		Date Received:	28/05/2021
Contact:	Claire Battersby	Date Tested:	01/07/2021
Site Address:	Cross Keys Lane, Hoyland	Sampled By:	Client

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1889325	Depth Top [m]:	0.50
Hole No.:	WS104	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Soil Description:	Yellowish brown slightly gravelly very sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
18	31	21	10	96



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

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Brackmills Industrial Estate
Northampton NN4 7EB

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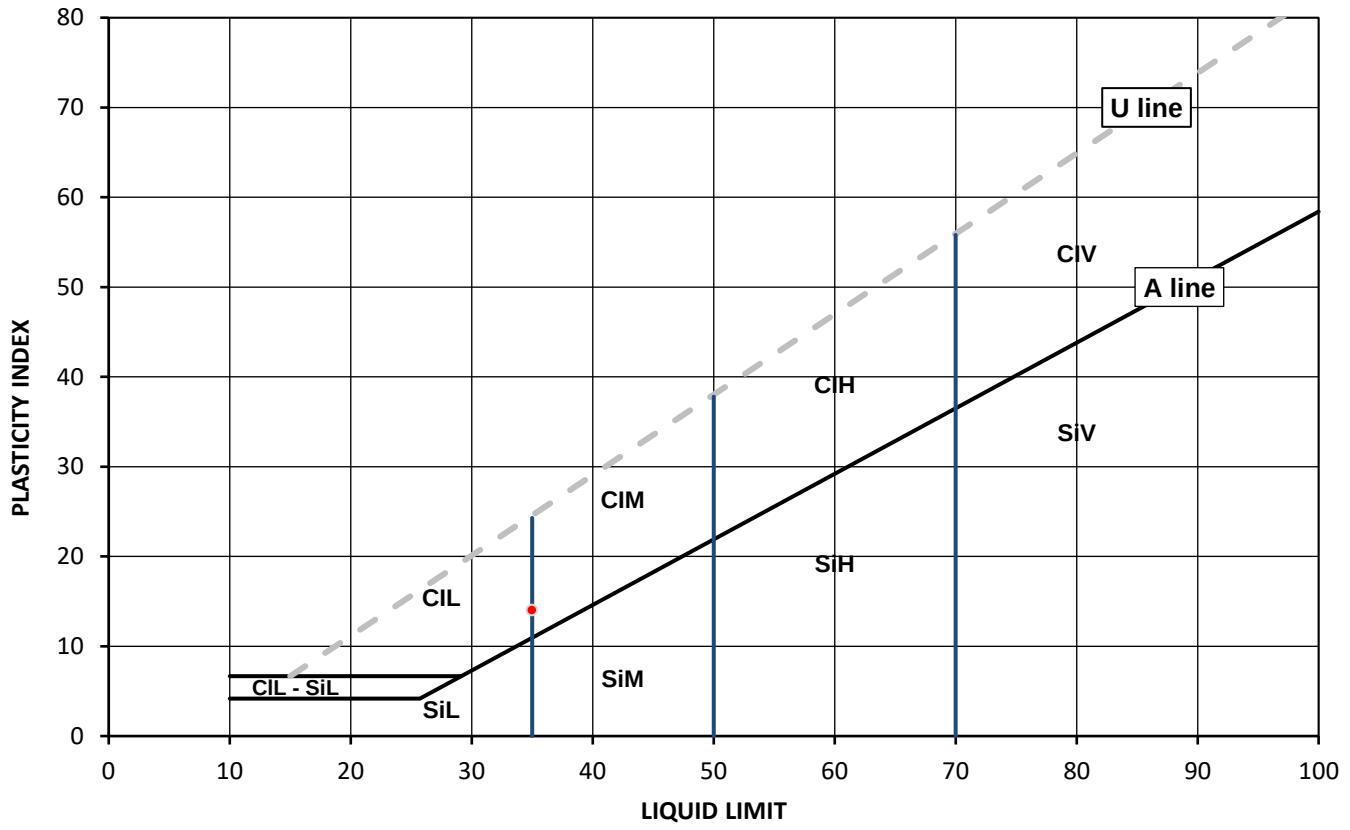
Client:	CURTINS	Client Reference:	78794
Client Address:	Rose Wharf, Ground Floor, 78-80 East Street, Leeds, LS9 8EE	Job Number:	21-78444
		Date Sampled:	28/05/2021
		Date Received:	28/05/2021
Contact:	Claire Battersby	Date Tested:	01/07/2021
Site Address:	Cross Keys Lane, Hoyland	Sampled By:	Client

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1889326	Depth Top [m]:	0.80
Hole No.:	WS104	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Soil Description:	Yellowish brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
17	35	21	14	85



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

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TEST CERTIFICATE

Liquid and Plastic Limits

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Brackmills Industrial Estate
Northampton NN4 7EB

4041

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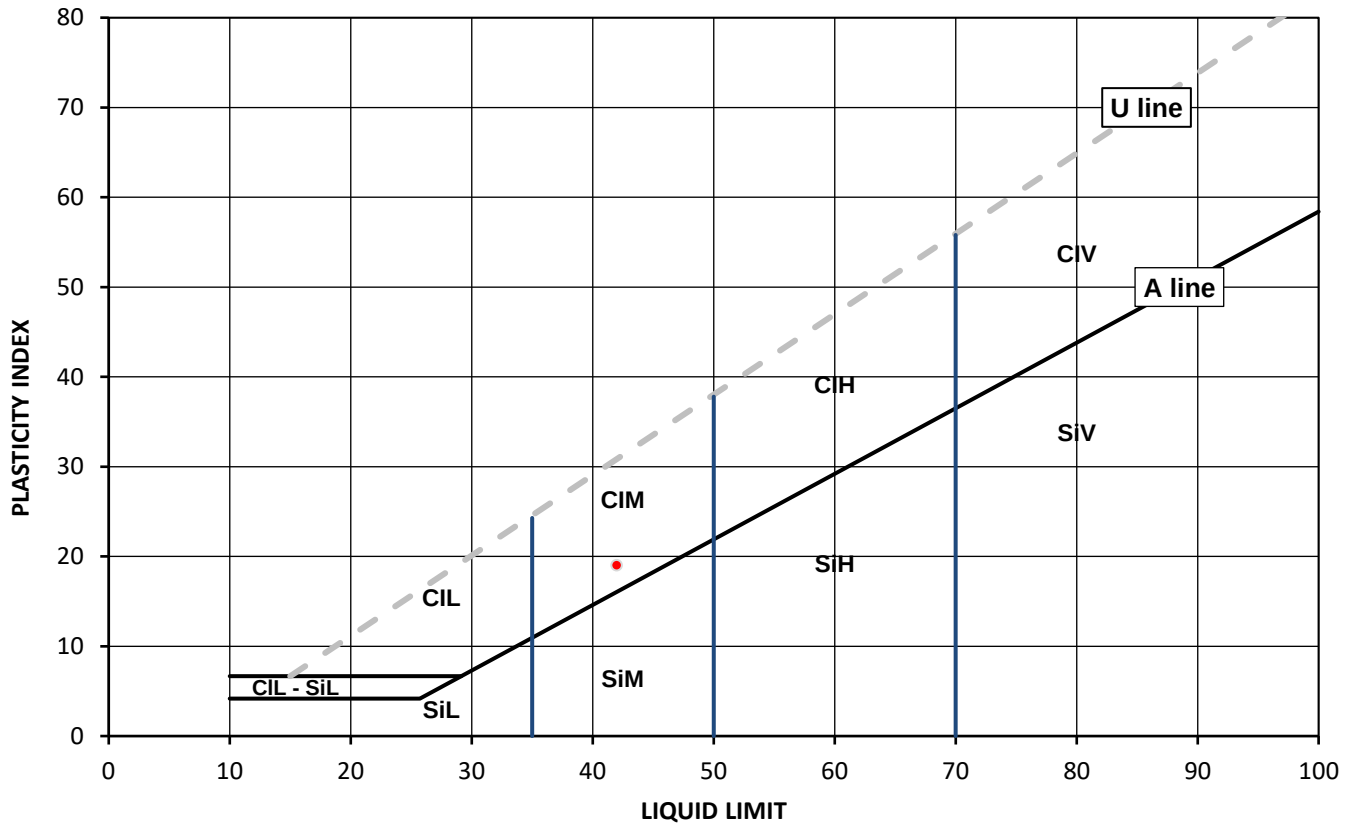
Client:	CURTINS	Client Reference:	78794
Client Address:	Rose Wharf, Ground Floor, 78-80 East Street, Leeds, LS9 8EE	Job Number:	21-78444
		Date Sampled:	28/05/2021
		Date Received:	28/05/2021
Contact:	Claire Battersby	Date Tested:	01/07/2021
Site Address:	Cross Keys Lane, Hoyland	Sampled By:	Client

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1889333	Depth Top [m]:	0.70
Hole No.:	TP105	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Soil Description:	Greyish brown slightly sandy slightly gravelly clayey SILT		
Sample Preparation:	Tested after >425um removed by hand		

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
23	42	23	19	92



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Northampton NN4 7EB

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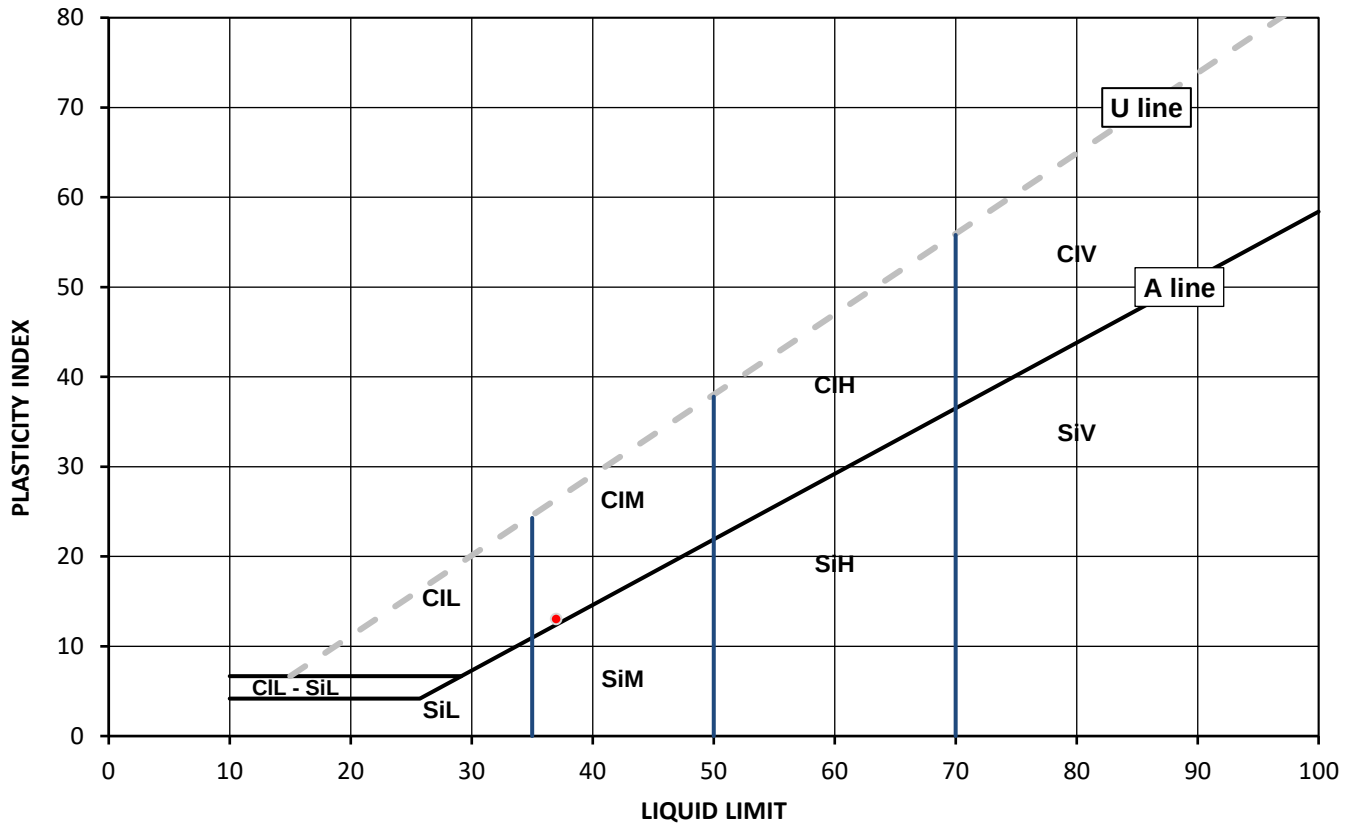
Client:	CURTINS	Client Reference:	78794
Client Address:	Rose Wharf, Ground Floor, 78-80 East Street, Leeds, LS9 8EE	Job Number:	21-78444
		Date Sampled:	28/05/2021
		Date Received:	28/05/2021
Contact:	Claire Battersby	Date Tested:	01/07/2021
Site Address:	Cross Keys Lane, Hoyland	Sampled By:	Client

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1889335	Depth Top [m]:	0.50
Hole No.:	TP110	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Soil Description:	Grey gravelly silty CLAY with fragments of shale		
Sample Preparation:	Tested after washing to remove >425um		

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
9.7	37	24	13	54



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/07/2021

GF 232.10

SUMMARY REPORT

Summary of Classification Test Results

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with:

Moisture Content by BS 1377-2: 1990: Clause 3.2; Water Content by BS EN 17892-1: 2014; Atterberg by BS 1377-2: 1990: Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5; PD by BS 1377-2: 1990: Clause 8.2

Client: CURTINS

Client Address: Rose Wharf, Ground Floor, 78-80 East Street, Leeds, LS9 8EE

Contact: Claire Battersby

Site Address: Cross Keys Lane, Hoyland

Client Reference: 78794
Job Number: 21-78444
Date Sampled: 28/05/2021
Date Received: 28/05/2021
Date Tested: 01/07/2021
Sampled By: Client

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Moisture Content [W]	Water Content [W]	Atterberg				Density			Total Porosity#		
		Reference	Depth Top m	Depth Base m	Type			%	%	% Passing 425um %	WL %	Wp %	Ip %	bulk Mg/m3	dry Mg/m3	PD Mg/m3	%		
1889333	TP105	Not Given	0.70	Not Given	B	Greyish brown slightly sandy slightly gravelly clayey SILT	Atterberg 1 Point	23		92	42	23	19						
1889335	TP110	Not Given	0.50	Not Given	B	Grey gravelly silty CLAY with fragments of shale	Atterberg 1 Point	9.7		54	37	24	13						
1889329	TT101	Not Given	2.00	Not Given	B	Reddish brown slightly clayey sandy silty GRAVEL with fragments of bricks		17											
1889332	TT103	Not Given	1.50	Not Given	B	Brown mottled grey CLAY		13											
1889322	WS103	Not Given	0.80	Not Given	B	Yellowish brown mottled grey gravelly sandy very clayey SILT	Atterberg 1 Point	23		81	45	24	21						
1889323	WS103	Not Given	1.40	Not Given	B	Yellowish brown mottled grey slightly gravelly sandy CLAY	Atterberg 1 Point	22		97	40	21	19						
1889325	WS104	Not Given	0.50	Not Given	B	Yellowish brown slightly gravelly very sandy CLAY	Atterberg 1 Point	18		96	31	21	10						
1889326	WS104	Not Given	0.80	Not Given	B	Yellowish brown slightly gravelly sandy CLAY	Atterberg 1 Point	17		85	35	21	14						

Note: # Non accredited; NP - Non plastic

Comments:

Signed:

Szczepan Bielatowicz
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

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Date Reported: 12/07/2021

GF 234.12

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

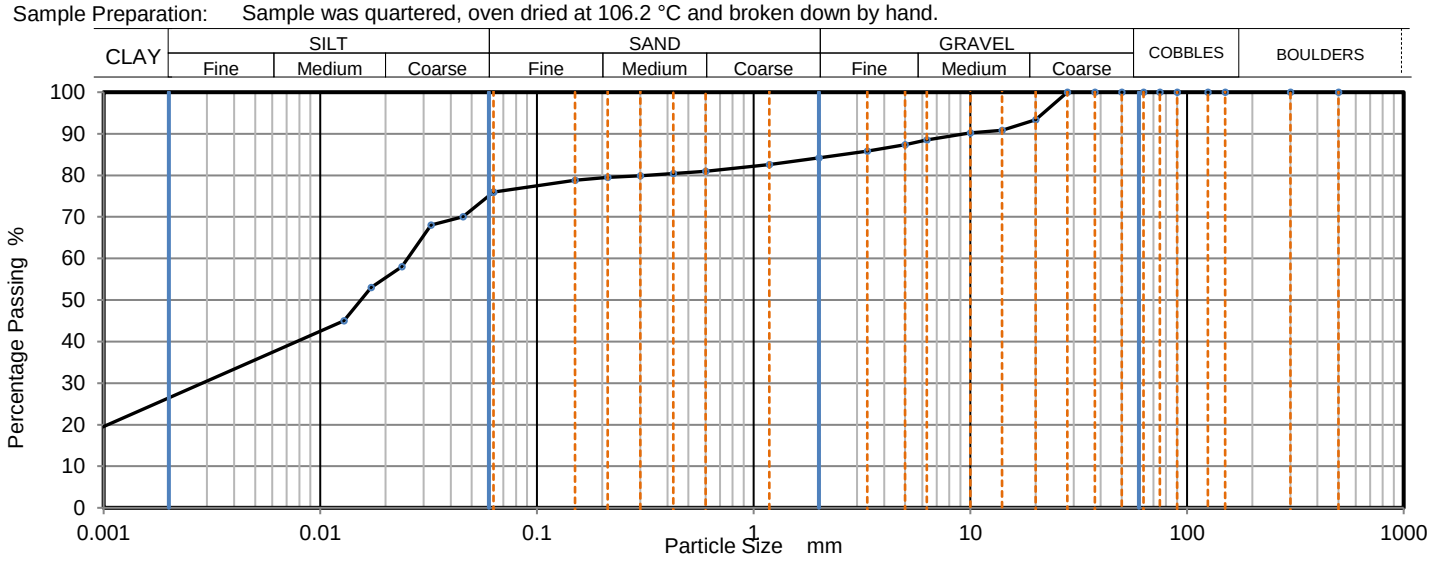
4041

Client:	CURTINS	Client Reference:	78794
Client Address:	Rose Wharf, Ground Floor, 78-80 East Street, Leeds, LS9 8EE	Job Number:	21-78444
		Date Sampled:	28/05/2021
		Date Received:	28/05/2021
Contact:	Claire Battersby	Date Tested:	01/07/2021
Site Address:	Cross Keys Lane, Hoyland	Sampled By:	Client

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1889322	Depth Top [m]:	0.80
Hole No.:	WS103	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Yellowish brown mottled grey gravelly sandy very clayey SILT		
Sample Preparation:	Sample was quartered, oven dried at 106.2 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0629	76
300	100	0.0455	70
150	100	0.0324	68
125	100	0.0238	58
90	100	0.0172	53
75	100	0.0129	45
63	100	0.0009	18
50	100		
37.5	100		
28	100		
20	93		
14	91		
10	90		
6.3	89		
5	87		
3.35	86	Particle density	(assumed)
2	84	2.65	Mg/m3
1.18	83		
0.6	81		
0.425	80		
0.3	80		
0.212	80		
0.15	79		
0.063	76		

Sample Proportions	% dry mass
Very coarse	0
Gravel	16
Sand	8
Silt	50
Clay	26

Grading Analysis		
D100	mm	28
D60	mm	0.025
D30	mm	0.00295
D10	mm	
Uniformity Coefficient		> 29
Curvature Coefficient		

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks:

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PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/07/2021

GF 100.20

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

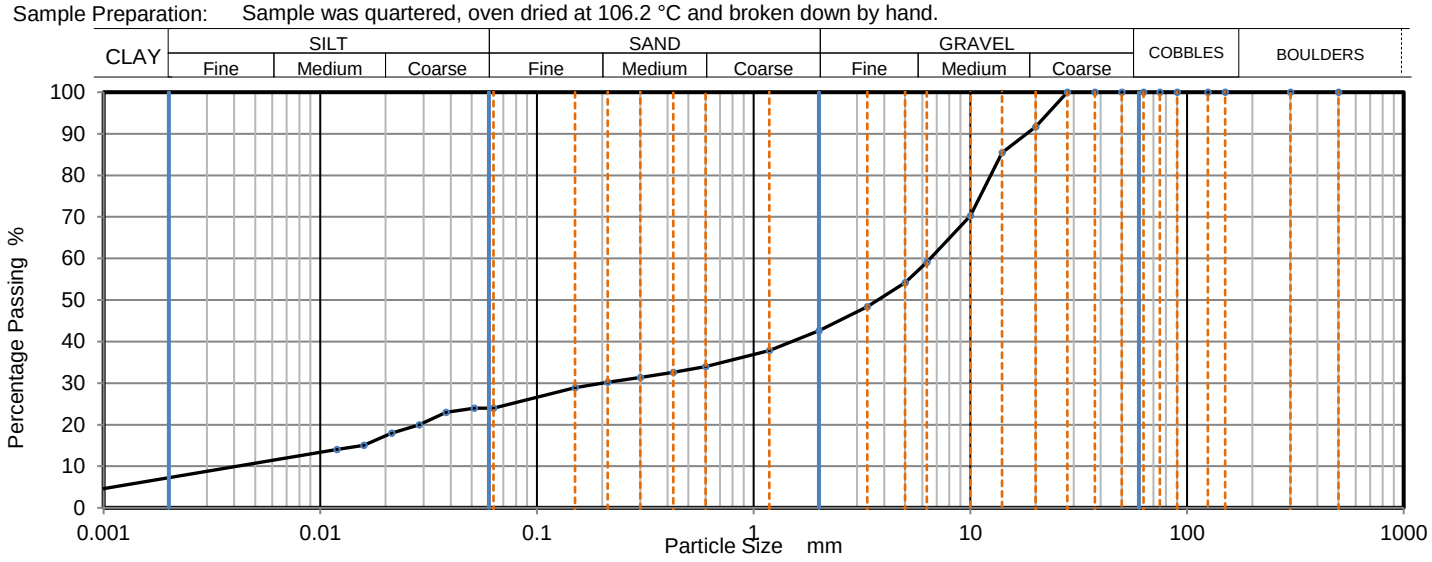
4041

Client:	CURTINS	Client Reference:	78794
Client Address:	Rose Wharf, Ground Floor, 78-80 East Street, Leeds, LS9 8EE	Job Number:	21-78444
		Date Sampled:	28/05/2021
		Date Received:	28/05/2021
Contact:	Claire Battersby	Date Tested:	01/07/2021
Site Address:	Cross Keys Lane, Hoyland	Sampled By:	Client

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1889324	Depth Top [m]:	1.80
Hole No.:	WS103	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Yellowish brown sandy clayey silty GRAVEL		
Sample Preparation:	Sample was quartered, oven dried at 106.2 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0514	24
300	100	0.0380	23
150	100	0.0286	20
125	100	0.0213	18
90	100	0.0158	15
75	100	0.0119	14
63	100	0.0008	4
50	100		
37.5	100		
28	100		
20	92		
14	85		
10	70		
6.3	59		
5	54		
3.35	48	Particle density	(assumed)
2	43	2.65	Mg/m3
1.18	38		
0.6	34		
0.425	33		
0.3	31		
0.212	30		
0.15	29		
0.063	24		

Sample Proportions	% dry mass
Very coarse	0
Gravel	57
Sand	18
Silt	18
Clay	7

Grading Analysis		
D100	mm	28
D60	mm	6.54
D30	mm	0.201
D10	mm	0.00423
Uniformity Coefficient		1500
Curvature Coefficient		1.5

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks: The material submitted - fails to meet the minimum mass requirements as stated in BS1377 Part 2 Table 3

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Signed:

Szczepan Bielatowicz
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/07/2021

GF 100.20

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

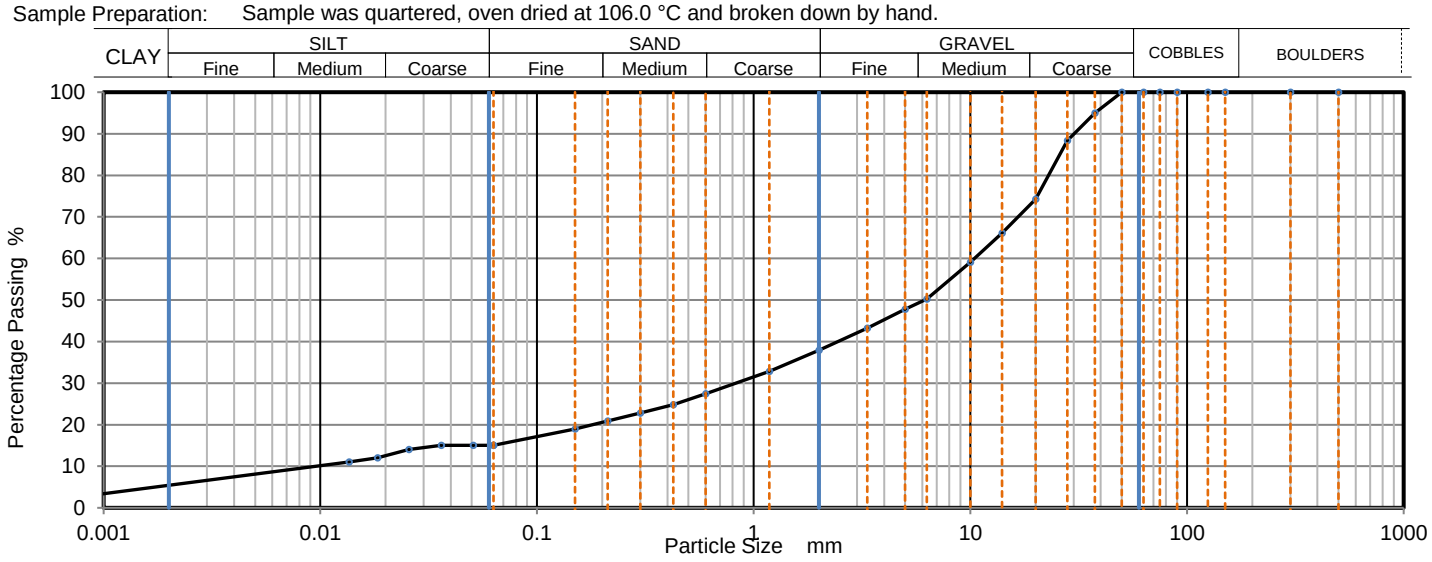
4041

Client:	CURTINS	Client Reference:	78794
Client Address:	Rose Wharf, Ground Floor, 78-80 East Street, Leeds, LS9 8EE	Job Number:	21-78444
		Date Sampled:	28/05/2021
		Date Received:	28/05/2021
Contact:	Claire Battersby	Date Tested:	01/07/2021
Site Address:	Cross Keys Lane, Hoyland	Sampled By:	Client

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1889329	Depth Top [m]:	2.00
Hole No.:	TT101	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Reddish brown slightly clayey sandy silty GRAVEL with fragments of bricks		
Sample Preparation:	Sample was quartered, oven dried at 106.0 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0630	15
300	100	0.0507	15
150	100	0.0361	15
125	100	0.0257	14
90	100	0.0184	12
75	100	0.0136	11
63	100	0.0009	3
50	100		
37.5	95		
28	88		
20	74		
14	66		
10	59		
6.3	50		
5	48		
3.35	43	Particle density	(assumed)
2	38	2.65	Mg/m3
1.18	33		
0.6	27		
0.425	25		
0.3	23		
0.212	21		
0.15	19		
0.063	15		

Sample Proportions	% dry mass
Very coarse	0
Gravel	62
Sand	23
Silt	10
Clay	5

Grading Analysis		
D100	mm	50
D60	mm	10.4
D30	mm	0.835
D10	mm	0.0105
Uniformity Coefficient		990
Curvature Coefficient		6.3

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks: The material submitted - fails to meet the minimum mass requirements as stated in BS1377 Part 2 Table 3

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Signed:

Szczepan Bielatowicz
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/07/2021

GF 100.20

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

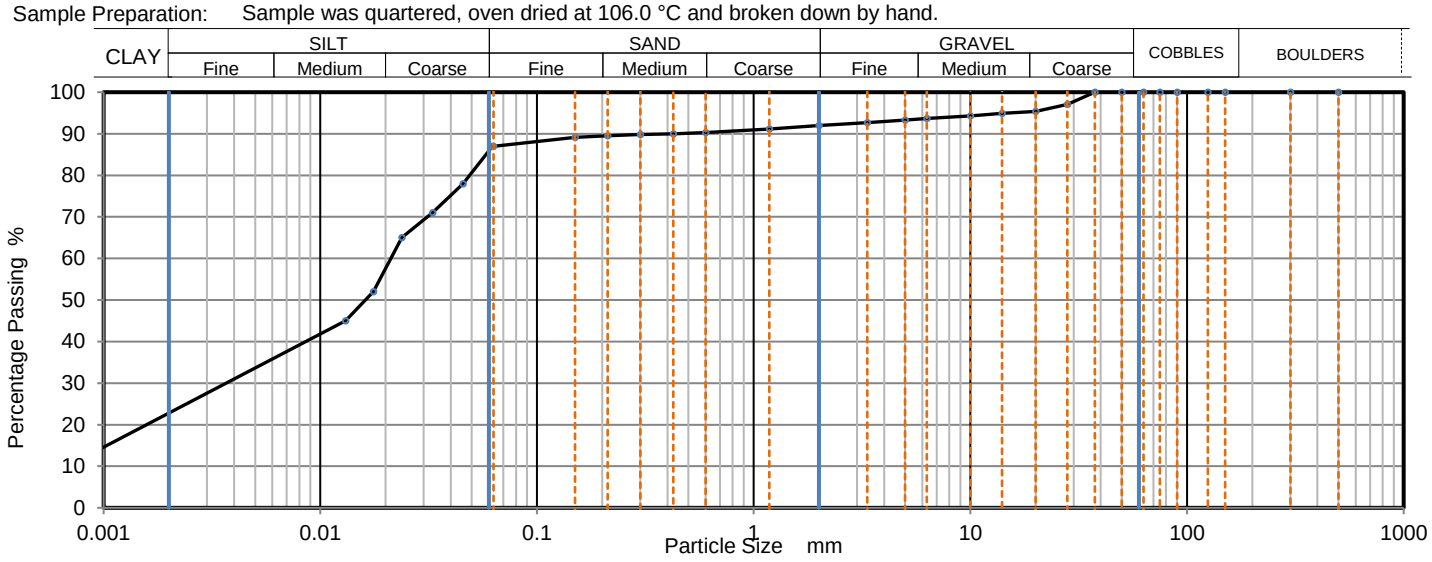
4041

Client:	CURTINS	Client Reference:	78794
Client Address:	Rose Wharf, Ground Floor, 78-80 East Street, Leeds, LS9 8EE	Job Number:	21-78444
		Date Sampled:	28/05/2021
		Date Received:	28/05/2021
Contact:	Claire Battersby	Date Tested:	01/07/2021
Site Address:	Cross Keys Lane, Hoyland	Sampled By:	Client

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1889333	Depth Top [m]:	0.70
Hole No.:	TP105	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Greyish brown slightly sandy slightly gravelly clayey SILT		
Sample Preparation:	Sample was quartered, oven dried at 106.0 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0623	87
300	100	0.0455	78
150	100	0.0329	71
125	100	0.0238	65
90	100	0.0175	52
75	100	0.0131	45
63	100	0.0009	13
50	100		
37.5	100		
28	97		
20	95		
14	95		
10	94		
6.3	94		
5	93		
3.35	93	Particle density	(assumed)
2	92	2.65	Mg/m3
1.18	91		
0.6	90		
0.425	90		
0.3	90		
0.212	90		
0.15	89		
0.063	87		

Sample Proportions	% dry mass
Very coarse	0
Gravel	8
Sand	5
Silt	64
Clay	23

Grading Analysis		
D100	mm	37.5
D60	mm	0.0212
D30	mm	0.0036
D10	mm	
Uniformity Coefficient		> 24
Curvature Coefficient		

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks:

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Signed:

Szczepan Bielatowicz
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/07/2021

GF 100.20

TEST CERTIFICATE

Particle Size Distribution

Tested in Accordance with: BS 1377-2: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

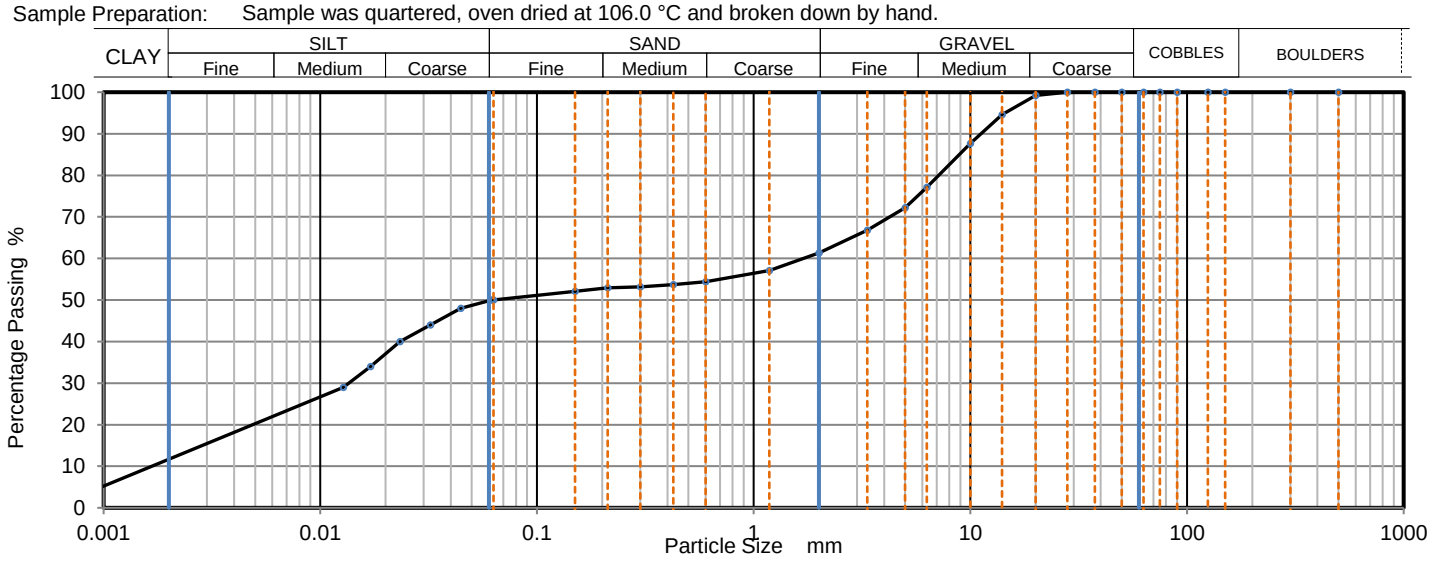
4041

Client:	CURTINS	Client Reference:	78794
Client Address:	Rose Wharf, Ground Floor, 78-80 East Street, Leeds, LS9 8EE	Job Number:	21-78444
		Date Sampled:	28/05/2021
		Date Received:	28/05/2021
Contact:	Claire Battersby	Date Tested:	01/07/2021
Site Address:	Cross Keys Lane, Hoyland	Sampled By:	Client

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1889335	Depth Top [m]:	0.50
Hole No.:	TP110	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Grey gravelly silty CLAY with fragments of shale		
Sample Preparation:	Sample was quartered, oven dried at 106.0 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100	0.0619	50
300	100	0.0445	48
150	100	0.0322	44
125	100	0.0233	40
90	100	0.0170	34
75	100	0.0128	29
63	100	0.0009	4
50	100		
37.5	100		
28	100		
20	99		
14	95		
10	88		
6.3	77		
5	72		
3.35	67	Particle density	(assumed)
2	61	2.65	Mg/m3
1.18	57		
0.6	54		
0.425	54		
0.3	53		
0.212	53		
0.15	52		
0.063	50		

Sample Proportions	% dry mass
Very coarse	0
Gravel	39
Sand	11
Silt	38
Clay	12

Grading Analysis		
D100	mm	28
D60	mm	1.7
D30	mm	0.0132
D10	mm	0.00169
Uniformity Coefficient		1000
Curvature Coefficient		0.061

Uniformity Coefficient and Coefficient of Curvature calculated in accordance with BS EN ISO 14688-2: 2004 + A1: 2013

Note: Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Remarks:

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Signed:

Szczepan Bielatowicz
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/07/2021

GF 100.20

TEST CERTIFICATE

Dry Density / Moisture Content

Relationship Light Compaction

Tested in Accordance with:
BS 1377-4: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

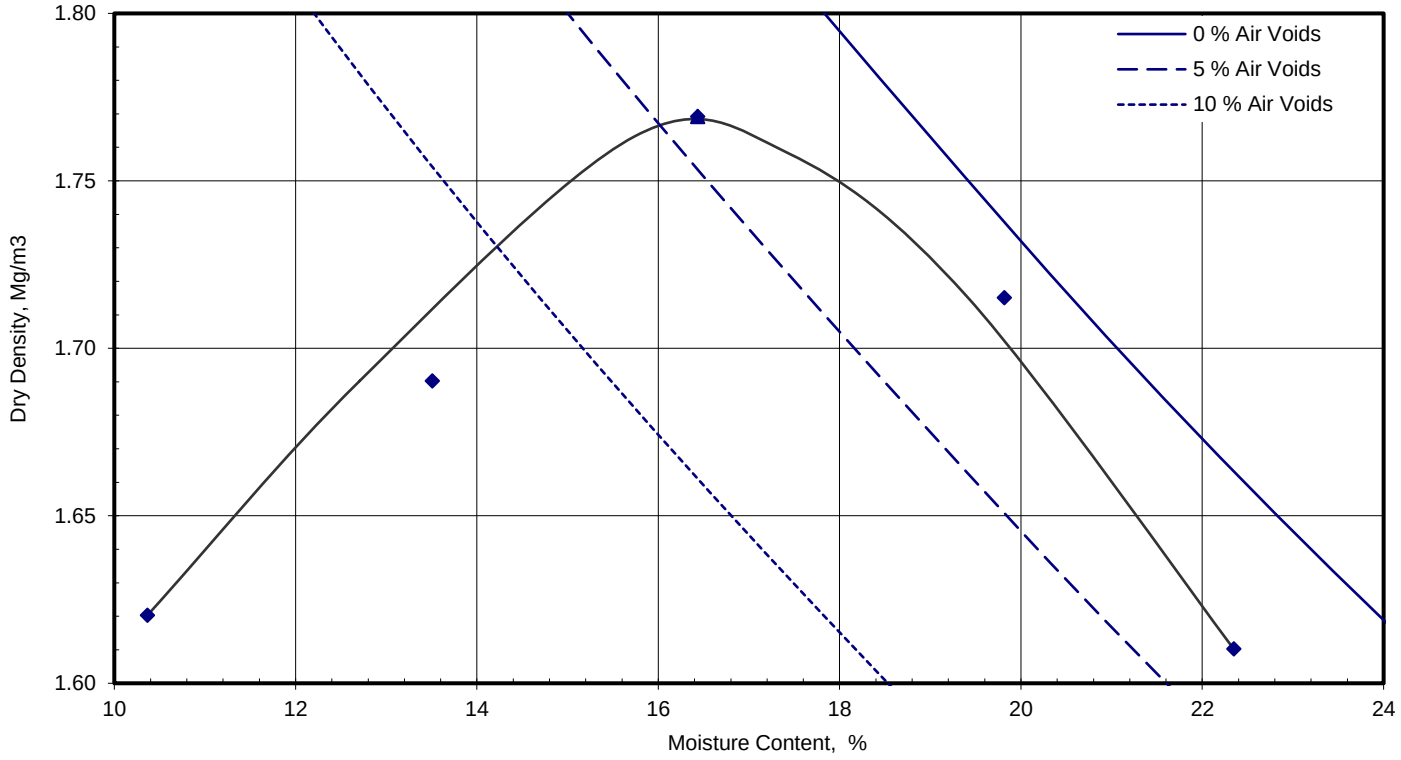
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Client:	CURTINS	Client Reference:	78794
Client Address:	Rose Wharf, Ground Floor, 78-80 East Street, Leeds, LS9 8EE	Job Number:	21-78444
		Date Sampled:	28/05/2021
		Date Received:	28/05/2021
Contact:	Claire Battersby	Date Tested:	01/07/2021
Site Address:	Cross Keys Lane, Hoyland	Sampled By:	Client

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1889329	Depth Top [m]:	2.00
Hole No.:	TT101	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Reddish brown slightly clayey sandy silty GRAVEL with fragments of bricks		
Sample Preparation:	Sample was quartered and broken down by hand. Material used was natural.		



Compaction Point No.		1	2	3	4	5
Moisture Content	%	10	14	16	20	22
Dry Density	Mg/m³	1.62	1.69	1.77	1.72	1.61

Mould Type		CBR
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	5
Material Retained on 20.0 mm Sieve	%	26
Particle Density - Assumed	Mg/m³	2.65
As received Moisture Content	%	17
Maximum Dry Density	Mg/m³	**1.77**

Optimum Moisture Content	%	**16**

Note: Tested in Accordance with BS 1377-4: 1990: Clause 3.4 using 2.5kg [light] Rammer

Remarks:

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Signed:

Szczepan Bielatowicz
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/07/2021

GF 109.21

TEST CERTIFICATE

Dry Density / Moisture Content

Relationship Light Compaction

Tested in Accordance with:
BS 1377-4: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

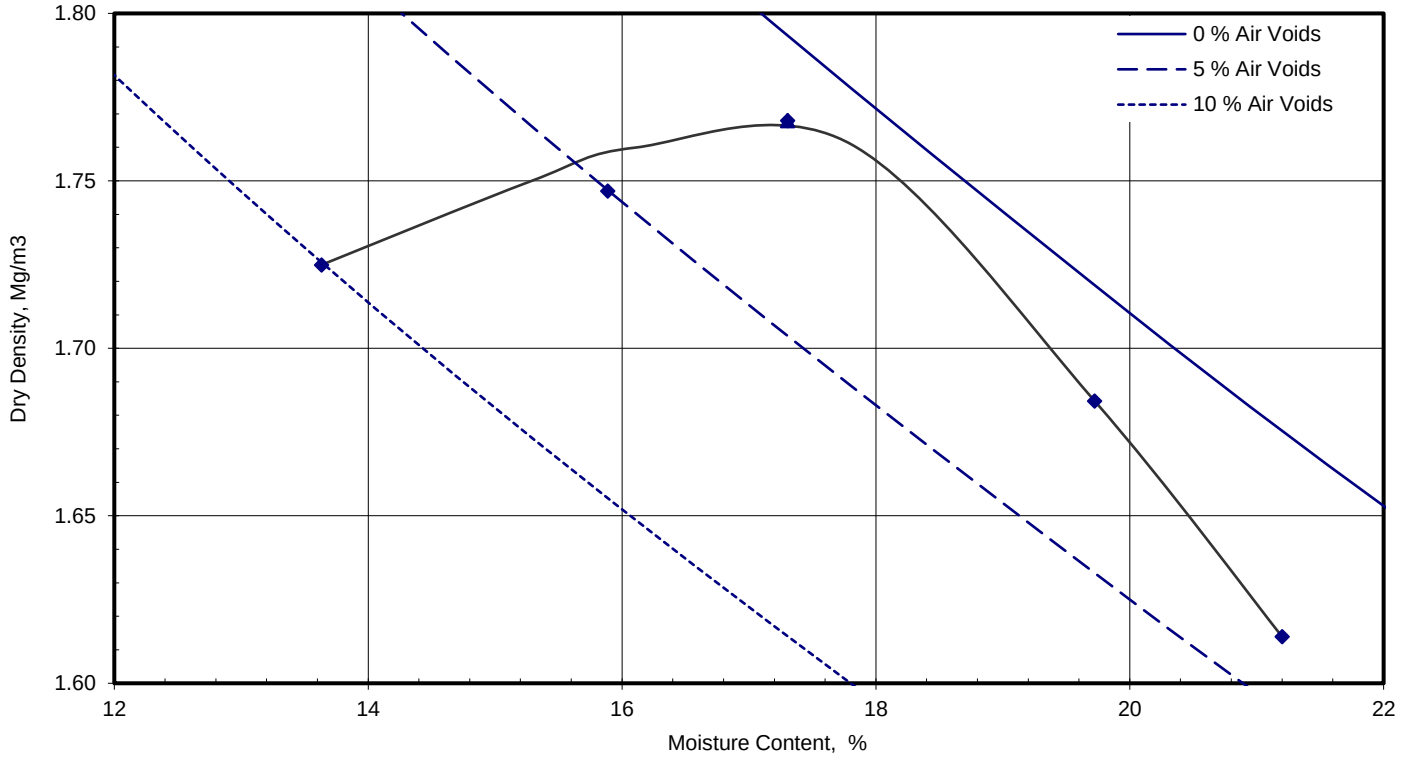
4041

Client:	CURTINS	Client Reference:	78794
Client Address:	Rose Wharf, Ground Floor, 78-80 East Street, Leeds, LS9 8EE	Job Number:	21-78444
		Date Sampled:	28/05/2021
		Date Received:	28/05/2021
Contact:	Claire Battersby	Date Tested:	01/07/2021
Site Address:	Cross Keys Lane, Hoyland	Sampled By:	Client

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1889333	Depth Top [m]:	0.70
Hole No.:	TP105	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Greyish brown slightly sandy slightly gravelly clayey SILT		
Sample Preparation:	Sample was quartered and broken down by hand. Material used was natural.		



Compaction Point No.		1	2	3	4	5
Moisture Content	%	14	16	17	20	21
Dry Density	Mg/m³	1.72	1.75	1.77	1.68	1.61

Mould Type		1 Litre
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0
Material Retained on 20.0 mm Sieve	%	5
Particle Density - Assumed	Mg/m³	2.60
As received Moisture Content	%	23
Maximum Dry Density	Mg/m³	**1.77**

Optimum Moisture Content	%	**17**

Note: Tested in Accordance with BS 1377-4: 1990: Clause 3.3 using 2.5kg [light] Rammer

Remarks:

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Signed:

Szczepan Bielatowicz
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/07/2021

GF 109.21

TEST CERTIFICATE

Dry Density / Moisture Content

Relationship Light Compaction

Tested in Accordance with:
BS 1377-4: 1990

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

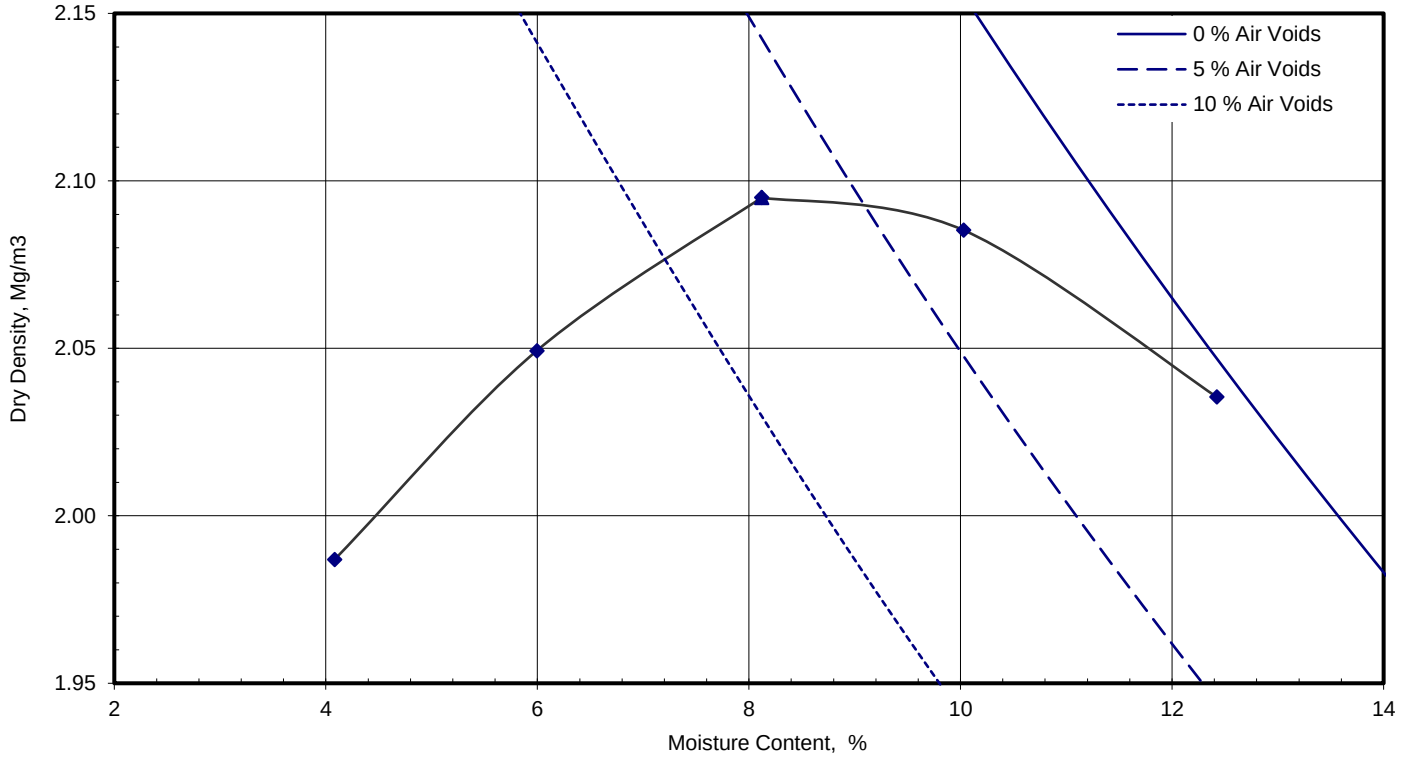
4041

Client:	CURTINS	Client Reference:	78794
Client Address:	Rose Wharf, Ground Floor, 78-80 East Street, Leeds, LS9 8EE	Job Number:	21-78444
		Date Sampled:	28/05/2021
		Date Received:	28/05/2021
Contact:	Claire Battersby	Date Tested:	01/07/2021
Site Address:	Cross Keys Lane, Hoyland	Sampled By:	Client

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1889335	Depth Top [m]:	0.50
Hole No.:	TP110	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Grey gravelly silty CLAY with fragments of shale		
Sample Preparation:	Sample was quartered and broken down by hand. Material used was natural.		



Compaction Point No.		1	2	3	4	5
Moisture Content	%	4.1	6.0	8.1	10	12
Dry Density	Mg/m³	1.99	2.05	2.09	2.09	2.04

Mould Type		1 Litre
Samples Used		Single sample tested
Material Retained on 37.5 mm Sieve	%	0
Material Retained on 20.0 mm Sieve	%	1
Particle Density - Assumed	Mg/m³	2.75
As received Moisture Content	%	9.7
Maximum Dry Density	Mg/m³	**2.09**

Optimum Moisture Content	%	**8.1**

Note: Tested in Accordance with BS 1377-4: 1990: Clause 3.3 using 2.5kg [light] Rammer

Remarks:

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Signed:

Szczepan Bielatowicz
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 12/07/2021

GF 109.21

SUMMARY REPORT

Summary of Moisture Condition Value Test Results

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING
4041

Tested in Accordance with: BS 1377-4: 1990: Clause 5.4

Client: CURTINS

Client Address: Rose Wharf, Ground Floor,
78-80 East Street, Leeds,
LS9 8EE

Contact: Claire Battersby

Site Address: Cross Keys Lane, Hoyland

Client Reference: 78794
Job Number: 21-78444
Date Sampled: 28/05/2021
Date Received: 28/05/2021
Date Tested: 01/07/2021
Sampled By: Client

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Retained on 20mm sieve %	Moisture Content <20mm %	Moisture Condition Value	Method of Interpretation							
		Reference	Depth Top m	Depth Base m	Type													
1889333	TP105	Not Given	0.70	Not Given	B	Greyish brown slightly sandy slightly gravelly clayey SILT		6	24	8.7	Steepest straight line							
1889329	TT101	Not Given	2.00	Not Given	B	Reddish brown slightly clayey sandy silty GRAVEL with fragments of bricks		31	22	14.2	Steepest straight line							

Comments:

Signed:

Szczepan Bielatowicz
PL Deputy Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

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Date Reported: 12/07/2021

GF 107.14

Claire Battersby
Curtins
Rose Wharf
Ground Floor
78-80 East Street
Leeds
LS9 8EE

e: Claire.Battersby@curtins.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 21-81620

Project / Site name:	Cross Keys Lane, Hoyland	**Samples received on:**	11/06/2021
Your job number:	078794	**Samples instructed on/ Analysis started on:**	11/06/2021
Your order number:	EBLE1116	**Analysis completed by:**	25/06/2021
Report Issue Number:	1	**Report issued on:**	25/06/2021
Samples Analysed:	1 soil sample		

Signed:

Joanna Wawrzeczko
Technical Reviewer (Reporting Team)
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 21-81620
Project / Site name: Cross Keys Lane, Hoyland
Your Order No: EBLE1116

Lab Sample Number				1905842
Sample Reference				TP107
Sample Number				None Supplied
Depth (m)				1.70
Date Sampled				Deviating
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	7.9
Total mass of sample received	kg	0.001	NONE	0.50

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	5.7
Total Sulphate as SO4	%	0.005	MCERTS	0.021
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.015
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	14.9
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	1.6
Total Sulphur	%	0.005	MCERTS	0.010
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	< 5.0
Magnesium (leachate equivalent)	mg/l	2.5	NONE	< 2.5

U/S = Unsuitable Sample I/S = Insufficient Sample

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number : 21-81620
Project / Site name: Cross Keys Lane, Hoyland

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1905842	TP107	None Supplied	1.7	Brown sandy clay.

Analytical Report Number : 21-81620
Project / Site name: Cross Keys Lane, Hoyland

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Sample Deviation Report

Analytical Report Number : 21-81620
Project / Site name: Cross Keys Lane, Hoyland

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
TP107	None Supplied	S	1905842	a	None Supplied	None Supplied	None Supplied

Key: **a** - No sampling date **b** - Incorrect container
c - Holding time **d** - Headspace **e** - Temperature

Appendix D2 Dynamic Probing Results

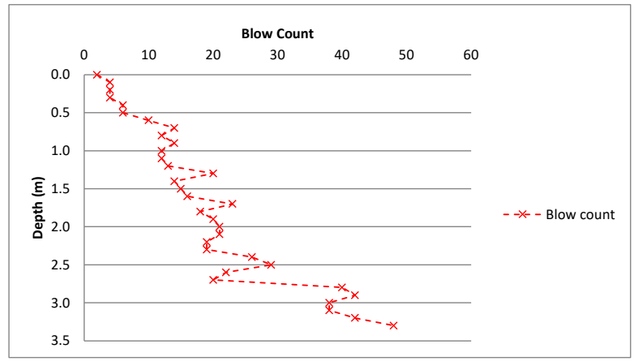
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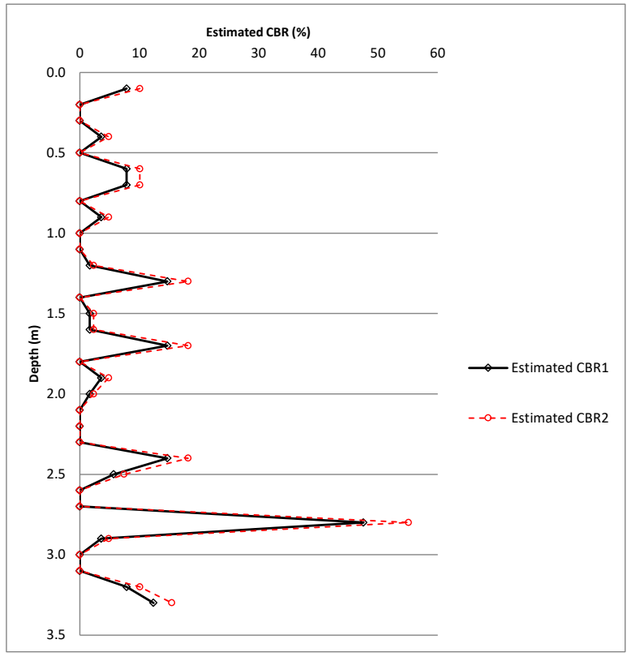
RESULTS OF DYNAMIC PROBE TESTING

Project:	Cross Keys Lane, Hoyland
Project No.	78794
Test No.	DP102

Date of Test:	21-May-21
Operator:	Geocore
Soil type:	MADE GROUND
Soil condition:	

Blow count	Penetration (mm)	Penetration (m)	Penetration Index (DPI) mm/blow	log DPI	log CBR	Estimated CBR1 (%)[1]	log CBR	Estimated CBR2 (%)[2]
2	0	0.0						
4	100	0.1	25.0	1.398	0.894	8	1.002	10
4	200	0.2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
4	300	0.3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
6	400	0.4	50.0	1.699	0.557	4	0.684	5
6	500	0.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
10	600	0.6	25.0	1.398	0.894	8	1.002	10
14	700	0.7	25.0	1.398	0.894	8	1.002	10
12	800	0.8	-50.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
14	900	0.9	50.0	1.699	0.557	4	0.684	5
12	1000	1.0	-50.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
12	1100	1.1	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
13	1200	1.2	100.0	2.000	0.220	2	0.366	2
20	1300	1.3	14.3	1.155	1.167	15	1.259	18
14	1400	1.4	-16.7	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
15	1500	1.5	100.0	2.000	0.220	2	0.366	2
16	1600	1.6	100.0	2.000	0.220	2	0.366	2
23	1700	1.7	14.3	1.155	1.167	15	1.259	18
18	1800	1.8	-20.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
20	1900	1.9	50.0	1.699	0.557	4	0.684	5
21	2000	2.0	100.0	2.000	0.220	2	0.366	2
21	2100	2.1	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
19	2200	2.2	-50.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
19	2300	2.3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
26	2400	2.4	14.3	1.155	1.167	15	1.259	18
29	2500	2.5	33.3	1.523	0.754	6	0.870	7
22	2600	2.6	-14.3	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
20	2700	2.7	-50.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
40	2800	2.8	5.0	0.699	1.677	48	1.741	55
42	2900	2.9	50.0	1.699	0.557	4	0.684	5
38	3000	3.0	-25.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
38	3100	3.1	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
42	3200	3.2	25.0	1.398	0.894	8	1.002	10
48	3300	3.3	16.7	1.222	1.092	12	1.189	15





Notes:

1. CBR calculated based on Webster et al, 1992.
2. CBR calculated based on DMRB, 2008.
3. CBR values less than 2.5% highlighted in red and bold. Soils unsuitable in pavements.

Reference:

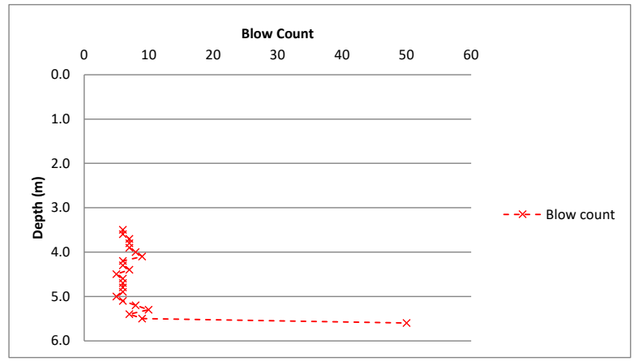
- Webster S, Grau R and Williams T. 1992. Description and Application of Dual Mass Dynamic Cone Penetrometer. Dept of Army Waterways Equipment Station, Instruction rpt GL-92-3.
- Highways Agency, 2008. Design Manual for Roads and Bridges (DMRB), Data for Pavement Assessment. HD29/08.

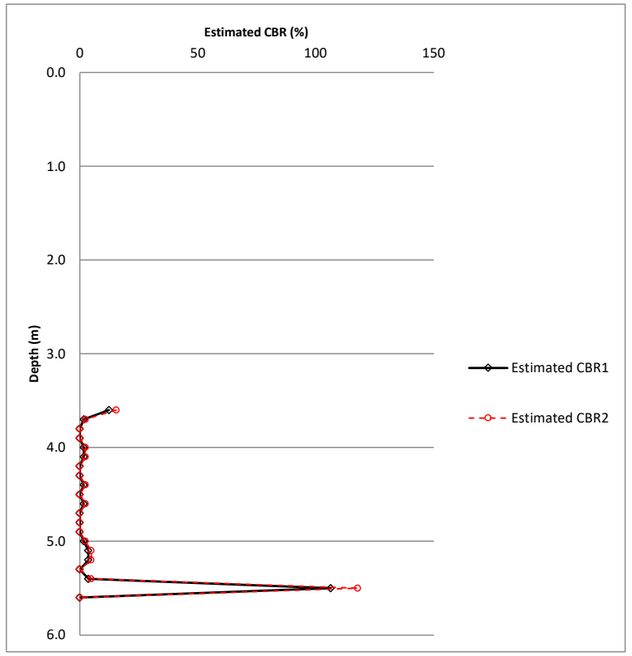
RESULTS OF DYNAMIC PROBE TESTING

Project:	Cross Keys Lane, Hoyland
Project No.	78794
Test No.	DP101

Date of Test:	21-May-21
Operator:	Geocore
Soil type:	MADE GROUND
Soil condition:	

Blow count	Penetration (mm)	Penetration (m)	Penetration Index (DPI) mm/blow	log DPI	log CBR	Estimated CBR1 (%)[1]	log CBR	Estimated CBR2 (%)[2]
6	3500	3.5						
6	3600	3.6	16.7	1.222	1.092	12	1.189	15
7	3700	3.7	100.0	2.000	0.220	2	0.366	2
7	3800	3.8	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
7	3900	3.9	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
8	4000	4.0	100.0	2.000	0.220	2	0.366	2
9	4100	4.1	100.0	2.000	0.220	2	0.366	2
6	4200	4.2	-33.3	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
6	4300	4.3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
7	4400	4.4	100.0	2.000	0.220	2	0.366	2
5	4500	4.5	-50.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
6	4600	4.6	100.0	2.000	0.220	2	0.366	2
6	4700	4.7	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
6	4800	4.8	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
6	4900	4.9	-100.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
5	5000	5.0	100.0	2.000	0.220	2	0.366	2
6	5100	5.1	50.0	1.699	0.557	4	0.684	5
8	5200	5.2	50.0	1.699	0.557	4	0.684	5
10	5300	5.3	-33.3	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
7	5400	5.4	50.0	1.699	0.557	4	0.684	5
9	5500	5.5	2.4	0.387	2.026	106	2.071	118
50	5600	5.6	-2.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!





Notes:

1. CBR calculated based on Webster et al, 1992.
2. CBR calculated based on DMRB, 2008.
3. CBR values less than 2.5% highlighted in red and bold. Soils unsuitable in pavements.

Reference: - Webster S, Grau R and Williams T. 1992. Description and Application of Dual Mass Dynamic Cone Penetrometer. Dept of Army Waterways Equipment Station, Instruction rpt GL-92-3.

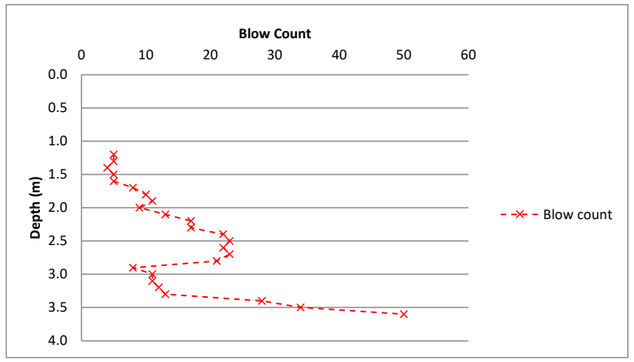
- Highways Agency, 2008. Design Manual for Roads and Bridges (DMRB), Data for Pavement Assessment. HD29/08.

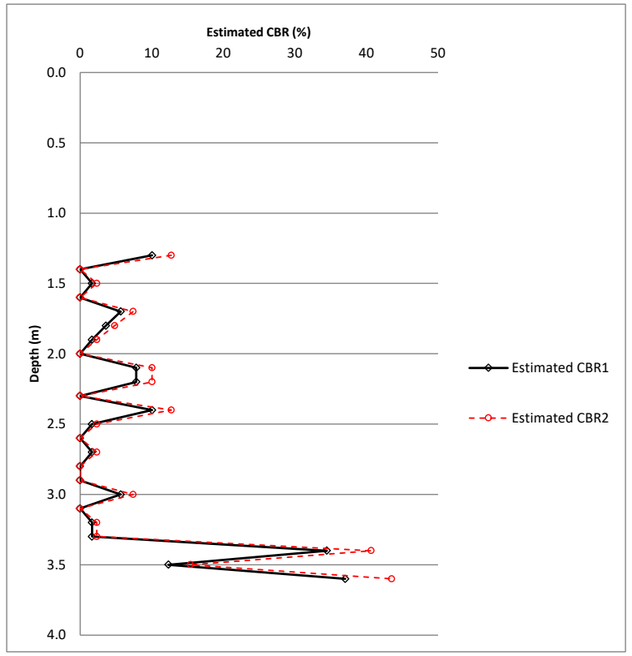
RESULTS OF DYNAMIC PROBE TESTING

Project:	Cross Keys Lane, Hoyland
Project No.	78794
Test No.	DP103

Date of Test:	21-May-21
Operator:	Geocore
Soil type:	MADE GROUND
Soil condition:	

Blow count	Penetration (mm)	Penetration (m)	Penetration Index (DPI) mm/blow	log DPI	log CBR	Estimated CBR1 (%)[1]	log CBR	Estimated CBR2 (%)[2]
5	1200	1.2						
5	1300	1.3	20.0	1.301	1.003	10	1.105	13
4	1400	1.4	-100.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
5	1500	1.5	100.0	2.000	0.220	2	0.366	2
5	1600	1.6	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
8	1700	1.7	33.3	1.523	0.754	6	0.870	7
10	1800	1.8	50.0	1.699	0.557	4	0.684	5
11	1900	1.9	100.0	2.000	0.220	2	0.366	2
9	2000	2.0	-50.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
13	2100	2.1	25.0	1.398	0.894	8	1.002	10
17	2200	2.2	25.0	1.398	0.894	8	1.002	10
17	2300	2.3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
22	2400	2.4	20.0	1.301	1.003	10	1.105	13
23	2500	2.5	100.0	2.000	0.220	2	0.366	2
22	2600	2.6	-100.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
23	2700	2.7	100.0	2.000	0.220	2	0.366	2
21	2800	2.8	-50.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
8	2900	2.9	-7.7	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
11	3000	3.0	33.3	1.523	0.754	6	0.870	7
11	3100	3.1	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
12	3200	3.2	100.0	2.000	0.220	2	0.366	2
13	3300	3.3	100.0	2.000	0.220	2	0.366	2
28	3400	3.4	6.7	0.824	1.537	34	1.609	41
34	3500	3.5	16.7	1.222	1.092	12	1.189	15
50	3600	3.6	6.3	0.796	1.569	37	1.639	44





Notes:

1. CBR calculated based on Webster et al, 1992.
2. CBR calculated based on DMRB, 2008.
3. CBR values less than 2.5% highlighted in red and bold. Soils unsuitable in pavements.

Reference: - Webster S, Grau R and Williams T. 1992. Description and Application of Dual Mass Dynamic Cone Penetrometer. Dept of Army Waterways Equipment Station, Instruction rpt GL-92-3.

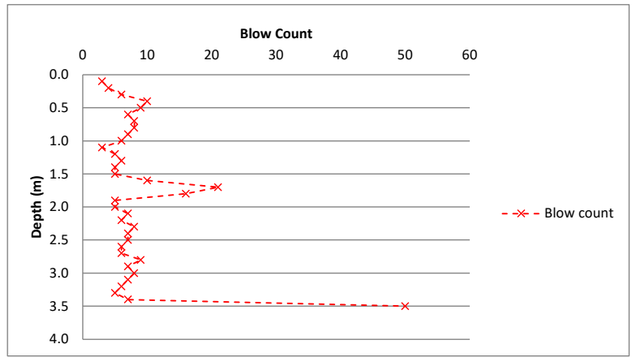
- Highways Agency, 2008. Design Manual for Roads and Bridges (DMRB), Data for Pavement Assessment. HD29/08.

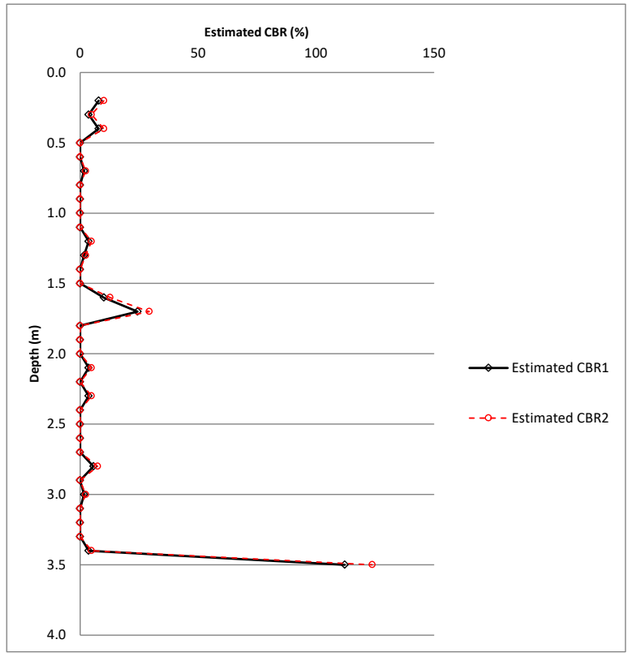
RESULTS OF DYNAMIC PROBE TESTING

Project:	Cross Keys Lane, Hoyland
Project No.	78794
Test No.	**P101A**

Date of Test:	21-May-21
Operator:	Geocore
Soil type:	MADE GROUND
Soil condition:	

Blow count	Penetration (mm)	Penetration (m)	Penetration Index (DPI) mm/blow	log DPI	log CBR	Estimated CBR1 (%)[1]	log CBR	Estimated CBR2 (%)[2]
3	100	0.1						
4	200	0.2	25.0	1.398	0.894	**8**	1.002	10
6	300	0.3	50.0	1.699	0.557	**4**	0.684	5
10	400	0.4	25.0	1.398	0.894	**8**	1.002	10
9	500	0.5	-100.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
7	600	0.6	-50.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
8	700	0.7	100.0	2.000	0.220	**2**	0.366	2
8	800	0.8	#DIV/0!	#DIV/0!	#DIV/0!	**#DIV/0!**	#DIV/0!	#DIV/0!
7	900	0.9	-100.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
6	1000	1.0	-100.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
3	1100	1.1	-33.3	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
5	1200	1.2	50.0	1.699	0.557	**4**	0.684	5
6	1300	1.3	100.0	2.000	0.220	**2**	0.366	2
5	1400	1.4	-100.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
5	1500	1.5	#DIV/0!	#DIV/0!	#DIV/0!	**#DIV/0!**	#DIV/0!	#DIV/0!
10	1600	1.6	20.0	1.301	1.003	**10**	1.105	13
21	1700	1.7	9.1	0.959	1.386	**24**	1.467	29
16	1800	1.8	-20.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
5	1900	1.9	-9.1	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
5	2000	2.0	#DIV/0!	#DIV/0!	#DIV/0!	**#DIV/0!**	#DIV/0!	#DIV/0!
7	2100	2.1	50.0	1.699	0.557	**4**	0.684	5
6	2200	2.2	-100.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
8	2300	2.3	50.0	1.699	0.557	**4**	0.684	5
7	2400	2.4	-100.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
7	2500	2.5	#DIV/0!	#DIV/0!	#DIV/0!	**#DIV/0!**	#DIV/0!	#DIV/0!
6	2600	2.6	-100.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
6	2700	2.7	#DIV/0!	#DIV/0!	#DIV/0!	**#DIV/0!**	#DIV/0!	#DIV/0!
9	2800	2.8	33.3	1.523	0.754	**6**	0.870	7
7	2900	2.9	-50.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
8	3000	3.0	100.0	2.000	0.220	**2**	0.366	2
7	3100	3.1	-100.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
6	3200	3.2	-100.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
5	3300	3.3	-100.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
7	3400	3.4	50.0	1.699	0.557	**4**	0.684	5
50	3500	3.5	2.3	0.367	2.049	**112**	2.093	124





Notes:

1. CBR calculated based on Webster et al, 1992.
2. CBR calculated based on DMRB, 2008.
3. CBR values less than 2.5% highlighted in red and bold. Soils unsuitable in pavements.

Reference: - Webster S, Grau R and Williams T. 1992. Description and Application of Dual Mass Dynamic Cone Penetrometer. Dept of Army Waterways Equipment Station, Instruction rpt GL-92-3.

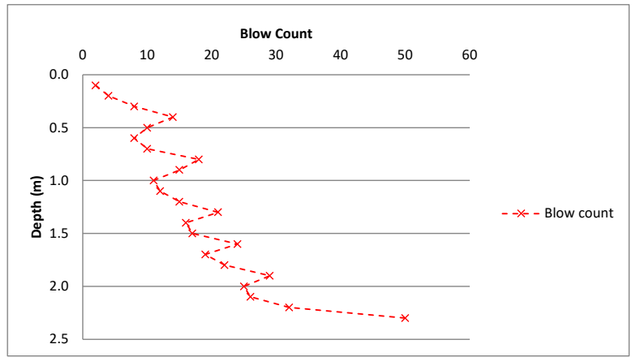
- Highways Agency, 2008. Design Manual for Roads and Bridges (DMRB), Data for Pavement Assessment. HD29/08.

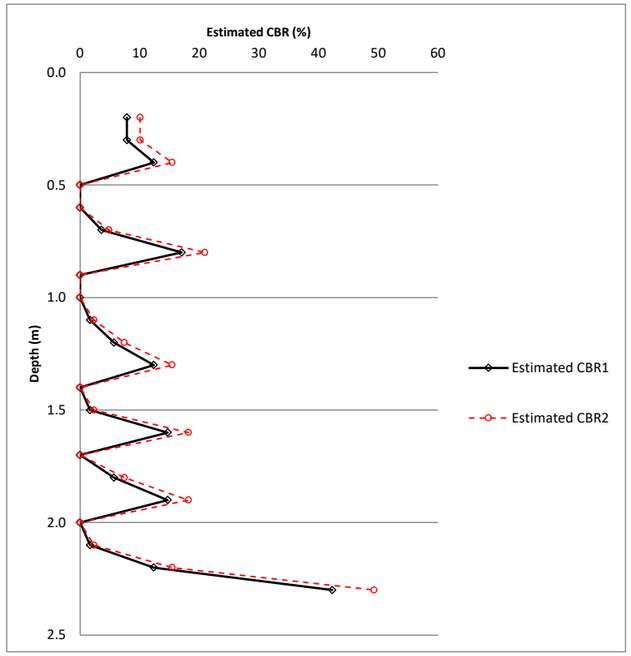
RESULTS OF DYNAMIC PROBE TESTING

Project:	Cross Keys Lane, Hoyland
Project No.	78794
Test No.	P101B

Date of Test:	21-May-21
Operator:	Geocore
Soil type:	MADE GROUND
Soil condition:	

Blow count	Penetration (mm)	Penetration (m)	Penetration Index (DPI) mm/blow	log DPI	log CBR	Estimated CBR1 (%)[1]	log CBR	Estimated CBR2 (%)[2]
2	100	0.1						
4	200	0.2	25.0	1.398	0.894	**8**	1.002	10
8	300	0.3	25.0	1.398	0.894	**8**	1.002	10
14	400	0.4	16.7	1.222	1.092	**12**	1.189	15
10	500	0.5	-25.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
8	600	0.6	-50.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
10	700	0.7	50.0	1.699	0.557	**4**	0.684	5
18	800	0.8	12.5	1.097	1.231	**17**	1.321	21
15	900	0.9	-33.3	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
11	1000	1.0	-25.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
12	1100	1.1	100.0	2.000	0.220	**2**	0.366	2
15	1200	1.2	33.3	1.523	0.754	**6**	0.870	7
21	1300	1.3	16.7	1.222	1.092	**12**	1.189	15
16	1400	1.4	-20.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
17	1500	1.5	100.0	2.000	0.220	**2**	0.366	2
24	1600	1.6	14.3	1.155	1.167	**15**	1.259	18
19	1700	1.7	-20.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
22	1800	1.8	33.3	1.523	0.754	**6**	0.870	7
29	1900	1.9	14.3	1.155	1.167	**15**	1.259	18
25	2000	2.0	-25.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
26	2100	2.1	100.0	2.000	0.220	**2**	0.366	2
32	2200	2.2	16.7	1.222	1.092	**12**	1.189	15
50	2300	2.3	5.6	0.745	1.626	**42**	1.693	49





Notes:

1. CBR calculated based on Webster et al, 1992.
2. CBR calculated based on DMRB, 2008.
3. CBR values less than 2.5% highlighted in red and bold. Soils unsuitable in pavements.

Reference: - Webster S, Grau R and Williams T. 1992. Description and Application of Dual Mass Dynamic Cone Penetrometer. Dept of Army Waterways Equipment Station, Instruction rpt GL-92-3.

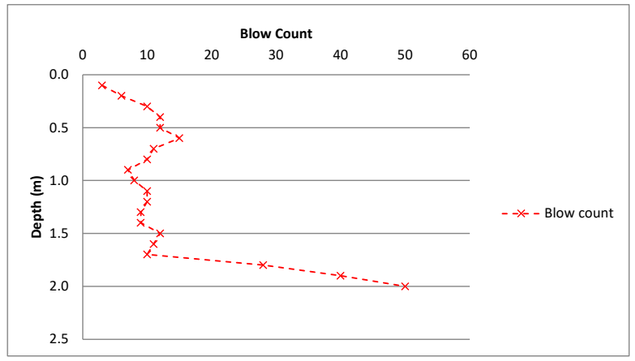
- Highways Agency, 2008. Design Manual for Roads and Bridges (DMRB), Data for Pavement Assessment. HD29/08.

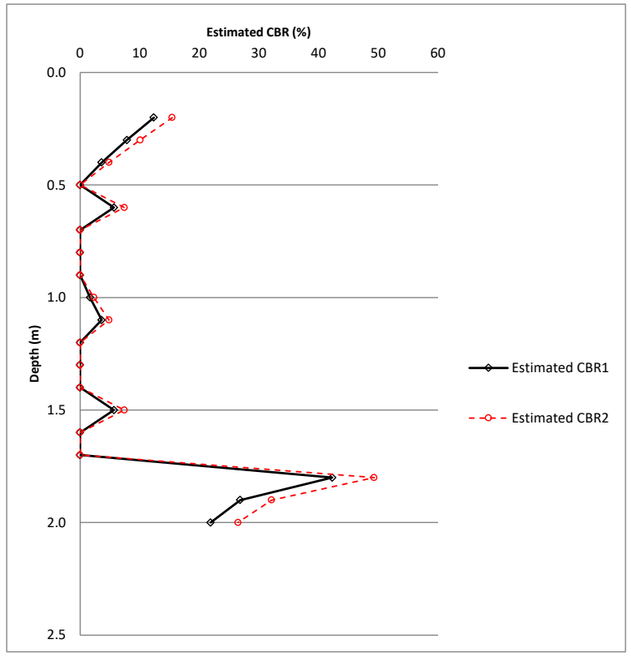
RESULTS OF DYNAMIC PROBE TESTING

Project:	Cross Keys Lane, Hoyland
Project No.	78794
Test No.	P101C

Date of Test:	21-May-21
Operator:	Geocore
Soil type:	MADE GROUND
Soil condition:	

Blow count	Penetration (mm)	Penetration (m)	Penetration Index (DPI) mm/blow	log DPI	log CBR	Estimated CBR1 (%)[1]	log CBR	Estimated CBR2 (%)[2]
3	100	0.1						
6	200	0.2	16.7	1.222	1.092	**12**	1.189	15
10	300	0.3	25.0	1.398	0.894	**8**	1.002	10
12	400	0.4	50.0	1.699	0.557	**4**	0.684	5
12	500	0.5	#DIV/0!	#DIV/0!	#DIV/0!	**#DIV/0!**	#DIV/0!	#DIV/0!
15	600	0.6	33.3	1.523	0.754	**6**	0.870	7
11	700	0.7	-25.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
10	800	0.8	-100.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
7	900	0.9	-33.3	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
8	1000	1.0	100.0	2.000	0.220	**2**	0.366	2
10	1100	1.1	50.0	1.699	0.557	**4**	0.684	5
10	1200	1.2	#DIV/0!	#DIV/0!	#DIV/0!	**#DIV/0!**	#DIV/0!	#DIV/0!
9	1300	1.3	-100.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
9	1400	1.4	#DIV/0!	#DIV/0!	#DIV/0!	**#DIV/0!**	#DIV/0!	#DIV/0!
12	1500	1.5	33.3	1.523	0.754	**6**	0.870	7
11	1600	1.6	-100.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
10	1700	1.7	-100.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
28	1800	1.8	5.6	0.745	1.626	**42**	1.693	49
40	1900	1.9	8.3	0.921	1.429	**27**	1.507	32
50	2000	2.0	10.0	1.000	1.340	**22**	1.423	26





Notes:

1. CBR calculated based on Webster et al, 1992.
2. CBR calculated based on DMRB, 2008.
3. CBR values less than 2.5% highlighted in red and bold. Soils unsuitable in pavements.

Reference: - Webster S, Grau R and Williams T. 1992. Description and Application of Dual Mass Dynamic Cone Penetrometer. Dept of Army Waterways Equipment Station, Instruction rpt GL-92-3.

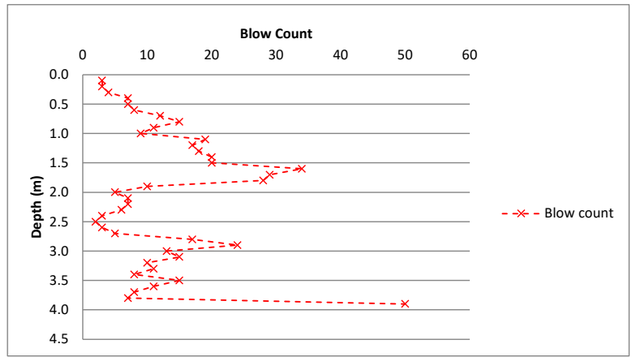
- Highways Agency, 2008. Design Manual for Roads and Bridges (DMRB), Data for Pavement Assessment. HD29/08.

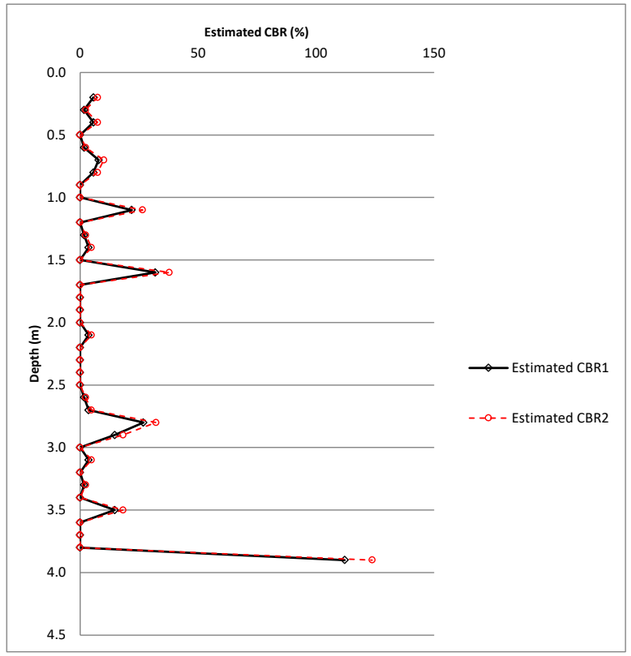
RESULTS OF DYNAMIC PROBE TESTING

Project:	Cross Keys Lane, Hoyland
Project No.	78794
Test No.	P102A

Date of Test:	21-May-21
Operator:	Geocore
Soil type:	MADE GROUND
Soil condition:	

Blow count	Penetration (mm)	Penetration (m)	Penetration Index (DPI) mm/blow	log DPI	log CBR	Estimated CBR1 (%)[1]	log CBR	Estimated CBR2 (%)[2]
3	100	0.1						
3	200	0.2	33.3	1.523	0.754	**6**	0.870	7
4	300	0.3	100.0	2.000	0.220	**2**	0.366	2
7	400	0.4	33.3	1.523	0.754	**6**	0.870	7
7	500	0.5	#DIV/0!	#DIV/0!	#DIV/0!	**#DIV/0!**	#DIV/0!	#DIV/0!
8	600	0.6	100.0	2.000	0.220	**2**	0.366	2
12	700	0.7	25.0	1.398	0.894	**8**	1.002	10
15	800	0.8	33.3	1.523	0.754	**6**	0.870	7
11	900	0.9	-25.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
9	1000	1.0	-50.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
19	1100	1.1	10.0	1.000	1.340	**22**	1.423	26
17	1200	1.2	-50.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
18	1300	1.3	100.0	2.000	0.220	**2**	0.366	2
20	1400	1.4	50.0	1.699	0.557	**4**	0.684	5
20	1500	1.5	#DIV/0!	#DIV/0!	#DIV/0!	**#DIV/0!**	#DIV/0!	#DIV/0!
34	1600	1.6	7.1	0.854	1.504	**32**	1.577	38
29	1700	1.7	-20.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
28	1800	1.8	-100.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
10	1900	1.9	-5.6	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
5	2000	2.0	-20.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
7	2100	2.1	50.0	1.699	0.557	**4**	0.684	5
7	2200	2.2	#DIV/0!	#DIV/0!	#DIV/0!	**#DIV/0!**	#DIV/0!	#DIV/0!
6	2300	2.3	-100.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
3	2400	2.4	-33.3	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
2	2500	2.5	-100.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
3	2600	2.6	100.0	2.000	0.220	**2**	0.366	2
5	2700	2.7	50.0	1.699	0.557	**4**	0.684	5
17	2800	2.8	8.3	0.921	1.429	**27**	1.507	32
24	2900	2.9	14.3	1.155	1.167	**15**	1.259	18
13	3000	3.0	-9.1	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
15	3100	3.1	50.0	1.699	0.557	**4**	0.684	5
10	3200	3.2	-20.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
11	3300	3.3	100.0	2.000	0.220	**2**	0.366	2
8	3400	3.4	-33.3	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
15	3500	3.5	14.3	1.155	1.167	**15**	1.259	18
11	3600	3.6	-25.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
8	3700	3.7	-33.3	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
7	3800	3.8	-100.0	#NUM!	#NUM!	**#NUM!**	#NUM!	#NUM!
50	3900.0000	3.9	2.3	0.367	2.049	**112**	2.093	124





Notes:

1. CBR calculated based on Webster et al, 1992.
2. CBR calculated based on DMRB, 2008.
3. CBR values less than 2.5% highlighted in red and bold. Soils unsuitable in pavements.

Reference: - Webster S, Grau R and Williams T. 1992. Description and Application of Dual Mass Dynamic Cone Penetrometer. Dept of Army Waterways Equipment Station, Instruction rpt GL-92-3.

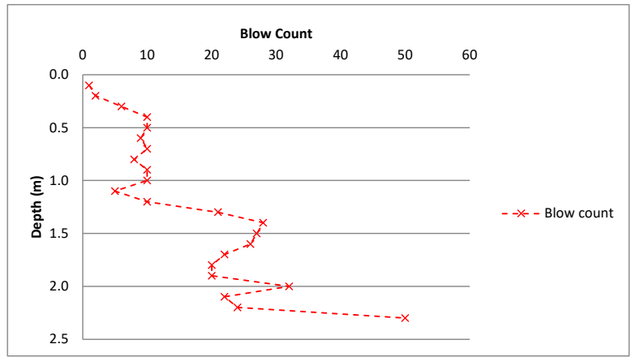
- Highways Agency, 2008. Design Manual for Roads and Bridges (DMRB), Data for Pavement Assessment. HD29/08.

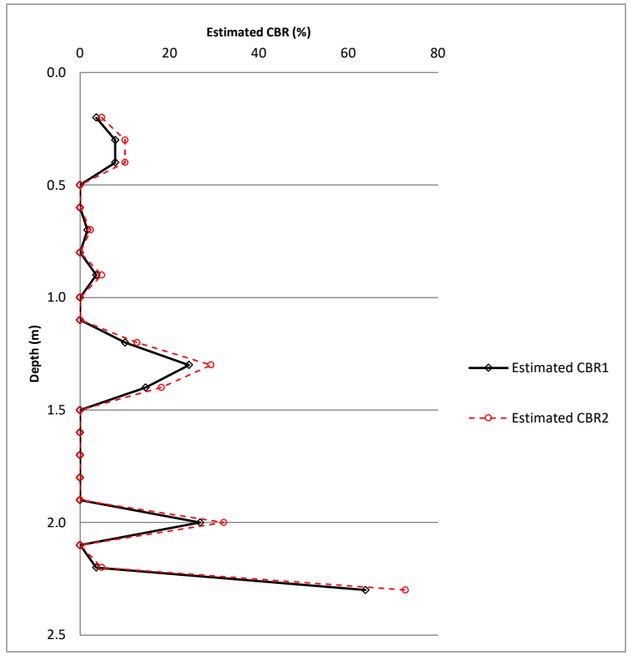
RESULTS OF DYNAMIC PROBE TESTING

Project:	Cross Keys Lane, Hoyland
Project No.	78794
Test No.	P102B

Date of Test:	21-May-21
Operator:	Geocore
Soil type:	MADE GROUND
Soil condition:	

Blow count	Penetration (mm)	Penetration (m)	Penetration Index (DPI) mm/blow	log DPI	log CBR	Estimated CBR1 (%)[1]	log CBR	Estimated CBR2 (%)[2]
1	100	0.1						
2	200	0.2	50.0	1.699	0.557	4	0.684	5
6	300	0.3	25.0	1.398	0.894	8	1.002	10
10	400	0.4	25.0	1.398	0.894	8	1.002	10
10	500	0.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
9	600	0.6	-100.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
10	700	0.7	100.0	2.000	0.220	2	0.366	2
8	800	0.8	-50.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
10	900	0.9	50.0	1.699	0.557	4	0.684	5
10	1000	1.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	1100	1.1	-20.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
10	1200	1.2	20.0	1.301	1.003	10	1.105	13
21	1300	1.3	9.1	0.959	1.386	24	1.467	29
28	1400	1.4	14.3	1.155	1.167	15	1.259	18
27	1500	1.5	-100.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
26	1600	1.6	-100.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
22	1700	1.7	-25.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
20	1800	1.8	-50.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
20	1900	1.9	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
32	2000	2.0	8.3	0.921	1.429	27	1.507	32
22	2100	2.1	-10.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
24	2200	2.2	50.0	1.699	0.557	4	0.684	5
50	2300	2.3	3.8	0.585	1.805	64	1.862	73





Notes:

1. CBR calculated based on Webster et al, 1992.
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Reference: - Webster S, Grau R and Williams T. 1992. Description and Application of Dual Mass Dynamic Cone Penetrometer. Dept of Army Waterways Equipment Station, Instruction rpt GL-92-3.

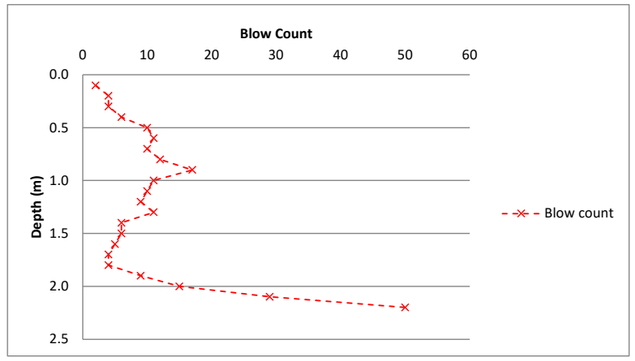
- Highways Agency, 2008. Design Manual for Roads and Bridges (DMRB), Data for Pavement Assessment. HD29/08.

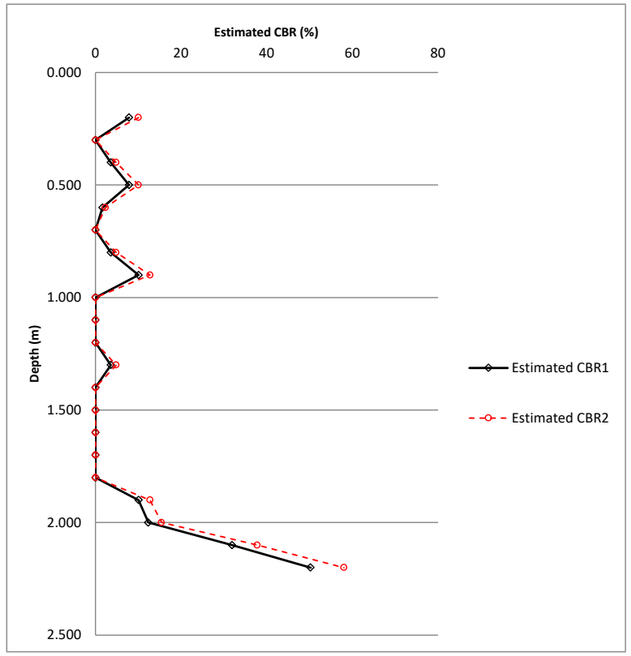
RESULTS OF DYNAMIC PROBE TESTING

Project:	Cross Keys Lane, Hoyland
Project No.	78794
Test No.	P102C

Date of Test:	21-May-21
Operator:	Geocore
Soil type:	MADE GROUND
Soil condition:	

Blow count	Penetration (mm)	Penetration (m)	Penetration Index (DPI) mm/blow	log DPI	log CBR	Estimated CBR1 (%)[1]	log CBR	Estimated CBR2 (%)[2]
2	100	0.1						
4	200	0.2	25.0	1.398	0.894	8	1.002	10
4	300	0.3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
6	400	0.4	50.0	1.699	0.557	4	0.684	5
10	500	0.5	25.0	1.398	0.894	8	1.002	10
11	600	0.6	100.0	2.000	0.220	2	0.366	2
10	700	0.7	-100.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
12	800	0.8	50.0	1.699	0.557	4	0.684	5
17	900	0.9	20.0	1.301	1.003	10	1.105	13
11	1000	1.0	-16.7	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
10	1100	1.1	-100.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
9	1200	1.2	-100.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
11	1300	1.3	50.0	1.699	0.557	4	0.684	5
6	1400	1.4	-20.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
6	1500	1.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	1600	1.6	-100.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
4	1700	1.7	-100.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
4	1800	1.8	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
9	1900	1.9	20.0	1.301	1.003	10	1.105	13
15	2000	2.0	16.7	1.222	1.092	12	1.189	15
29	2100	2.1	7.1	0.854	1.504	32	1.577	38
50	2200	2.2	4.8	0.678	1.701	50	1.764	58
								1





Notes:

1. CBR calculated based on Webster et al, 1992.
2. CBR calculated based on DMRB, 2008.
3. CBR values less than 2.5% highlighted in red and bold. Soils unsuitable in pavements.

Reference: - Webster S, Grau R and Williams T. 1992. Description and Application of Dual Mass Dynamic Cone Penetrometer. Dept of Army Waterways Equipment Station, Instruction rpt GL-92-3.

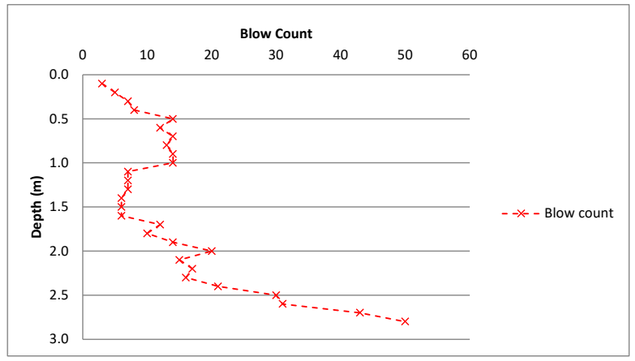
- Highways Agency, 2008. Design Manual for Roads and Bridges (DMRB), Data for Pavement Assessment. HD29/08.

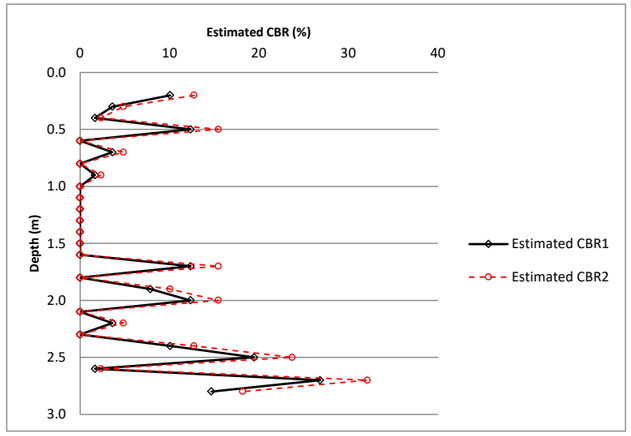
RESULTS OF DYNAMIC PROBE TESTING

Project:	Cross Keys Lane, Hoyland
Project No.	78794
Test No.	P103A

Date of Test:	21-May-21
Operator:	Geocore
Soil type:	MADE GROUND
Soil condition:	

Blow count	Penetration (mm)	Penetration (m)	Penetration Index (DPI) mm/blow	log DPI	log CBR	Estimated CBR1 (%)[1]	log CBR	Estimated CBR2 (%)[2]
3	100	0.1						
5	200	0.2	20.0	1.301	1.003	**10**	1.105	13
7	300	0.3	50.0	1.699	0.557	4	0.684	5
8	400	0.4	100.0	2.000	0.220	2	0.366	2
14	500	0.5	16.7	1.222	1.092	12	1.189	15
12	600	0.6	-50.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
14	700	0.7	50.0	1.699	0.557	4	0.684	5
13	800	0.8	-100.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
14	900	0.9	100.0	2.000	0.220	2	0.366	2
14	1000	1.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
7	1100	1.1	-14.3	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
7	1200	1.2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
7	1300	1.3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
6	1400	1.4	-100.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
6	1500	1.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
6	1600	1.6	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
12	1700	1.7	16.7	1.222	1.092	12	1.189	15
10	1800	1.8	-50.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
14	1900	1.9	25.0	1.398	0.894	8	1.002	10
20	2000	2.0	16.7	1.222	1.092	12	1.189	15
15	2100	2.1	-20.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
17	2200	2.2	50.0	1.699	0.557	4	0.684	5
16	2300	2.3	-100.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
21	2400	2.4	20.0	1.301	1.003	10	1.105	13
30	2500	2.5	11.1	1.046	1.289	19	1.375	24
31	2600	2.6	100.0	2.000	0.220	2	0.366	2
43	2700	2.7	8.3	0.921	1.429	27	1.507	32
50	2800	2.8	14.3	1.155	1.167	15	1.259	18





Notes:

1. CBR calculated based on Webster et al, 1992.
2. CBR calculated based on DMRB, 2008.
3. CBR values less than 2.5% highlighted in red and bold. Soils unsuitable in pavements.

Reference: - Webster S, Grau R and Williams T. 1992. Description and Application of Dual Mass Dynamic Cone Penetrometer. Dept of Army Waterways Equipment Station, Instruction rpt GL-92-3.

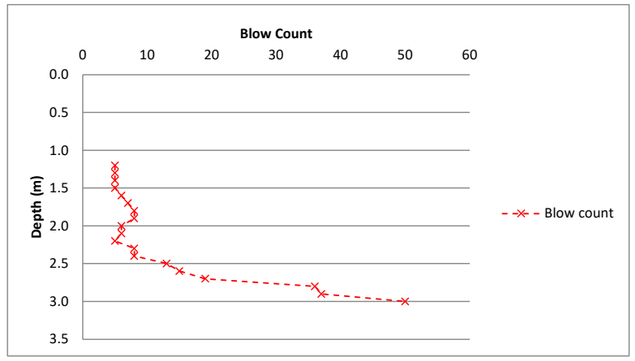
- Highways Agency, 2008. Design Manual for Roads and Bridges (DMRB), Data for Pavement Assessment. HD29/08.

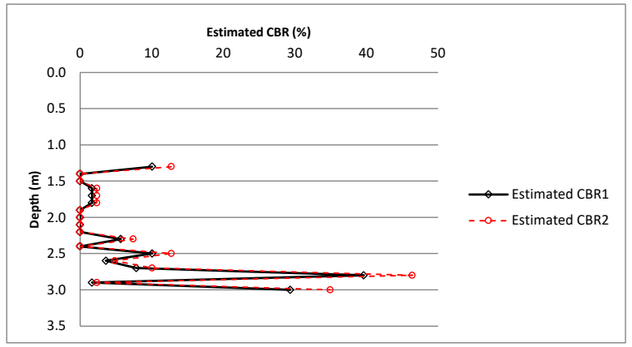
RESULTS OF DYNAMIC PROBE TESTING

Project:	Cross Keys Lane, Hoyland
Project No.	78794
Test No.	P103B

Date of Test:	18-May-21
Operator:	Geocore
Soil type:	MADE GROUND
Soil condition:	

Blow count	Penetration (mm)	Penetration (m)	Penetration Index (DPI) mm/blow	log DPI	log CBR	Estimated CBR1 (%)[1]	log CBR	Estimated CBR2 (%)[2]
5	1200	1.2						
5	1300	1.3	20.0	1.301	1.003	**10**	1.105	13
5	1400	1.4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	1500	1.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
6	1600	1.6	100.0	2.000	0.220	2	0.366	2
7	1700	1.7	100.0	2.000	0.220	2	0.366	2
8	1800	1.8	100.0	2.000	0.220	2	0.366	2
8	1900	1.9	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
6	2000	2.0	-50.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
6	2100	2.1	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
5	2200	2.2	-100.0	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
8	2300	2.3	33.3	1.523	0.754	6	0.870	7
8	2400	2.4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
13	2500	2.5	20.0	1.301	1.003	10	1.105	13
15	2600	2.6	50.0	1.699	0.557	4	0.684	5
19	2700	2.7	25.0	1.398	0.894	8	1.002	10
36	2800	2.8	5.9	0.770	1.598	40	1.667	46
37	2900	2.9	100.0	2.000	0.220	2	0.366	2
50	3000	3.0	7.7	0.886	1.468	29	1.543	35





Notes:

1. CBR calculated based on Webster et al, 1992.
2. CBR calculated based on DMRB, 2008.
3. CBR values less than 2.5% highlighted in red and bold. Soils unsuitable in pavements.

Reference:

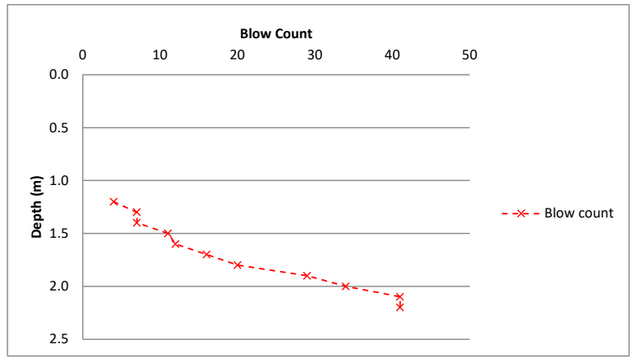
- Webster S, Grau R and Williams T. 1992. Description and Application of Dual Mass Dynamic Cone Penetrometer. Dept of Army Waterways Equipment Station, Instruction rpt GL-92-3.
- Highways Agency, 2008. Design Manual for Roads and Bridges (DMRB), Data for Pavement Assessment. HD29/08.

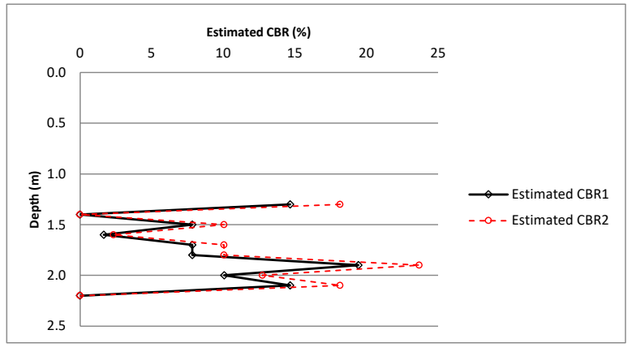
RESULTS OF DYNAMIC PROBE TESTING

Project:	Cross Keys Lane, Hoyland
Project No.	78794
Test No.	P103C

Date of Test:	18-May-21
Operator:	Geocore
Soil type:	MADE GROUND
Soil condition:	

Blow count	Penetration (mm)	Penetration (m)	Penetration Index (DPI) mm/blow	log DPI	log CBR	Estimated CBR1 (%)[1]	log CBR	Estimated CBR2 (%)[2]
4	1200	1.2						
7	1300	1.3	14.3	1.155	1.167	**15**	1.259	18
7	1400	1.4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
11	1500	1.5	25.0	1.398	0.894	8	1.002	10
12	1600	1.6	100.0	2.000	0.220	2	0.366	2
16	1700	1.7	25.0	1.398	0.894	8	1.002	10
20	1800	1.8	25.0	1.398	0.894	8	1.002	10
29	1900	1.9	11.1	1.046	1.289	19	1.375	24
34	2000	2.0	20.0	1.301	1.003	10	1.105	13
41	2100	2.1	14.3	1.155	1.167	15	1.259	18
41	2200	2.2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!





Notes:

1. CBR calculated based on Webster et al, 1992.
2. CBR calculated based on DMRB, 2008.
3. CBR values less than 2.5% highlighted in red and bold. Soils unsuitable in pavements.

Reference: - Webster S, Grau R and Williams T. 1992. Description and Application of Dual Mass Dynamic Cone Penetrometer. Dept of Army Waterways Equipment Station, Instruction rpt GL-92-3.

- Highways Agency, 2008. Design Manual for Roads and Bridges (DMRB), Data for Pavement Assessment. HD29/08.

Appendix D3 CBR Testing Report

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LABORATORY REPORT

4043

Contract Number: PSL21/4175

Report Date: 21 May 2021

Client's Reference:

Client Name: Geocore Site Investigations Ltd
Tralee Close
Kirkleatham Business Park
Redcar
Cleveland
TS10 5SG

For the attention of: Nikki

Contract Title: Cross Keys Lane, Hoyland, Barnsley

Date Received: 20/5/2021
Date Commenced: 20/5/2021
Date Completed: 21/5/2021

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 other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins (Director)
R Berriman (Quality Manager)
S Royle (Laboratory Manager)
L Knight (Assistant Laboratory Manager)
S Eyre (Senior Technician)
T Watkins (Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: awatkins@prosoils.co.uk
rberriman@prosoils.co.uk

VERTICAL DEFORMATION TESTS.

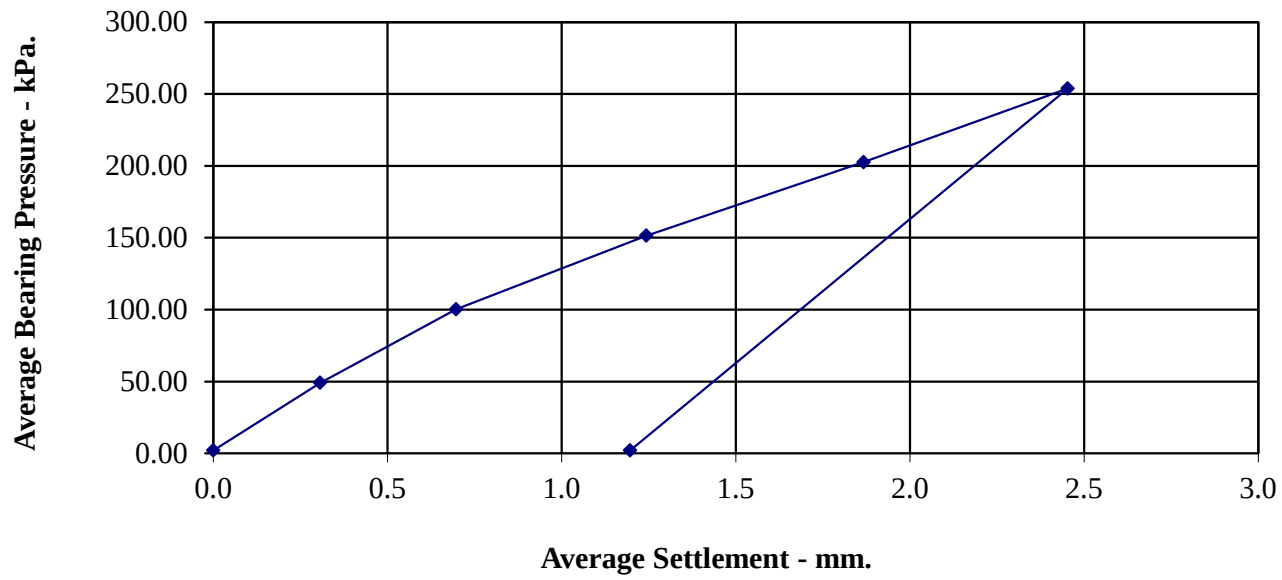
BS 1377 : Part 9 : 1990.

Date of Test: 20-May-21

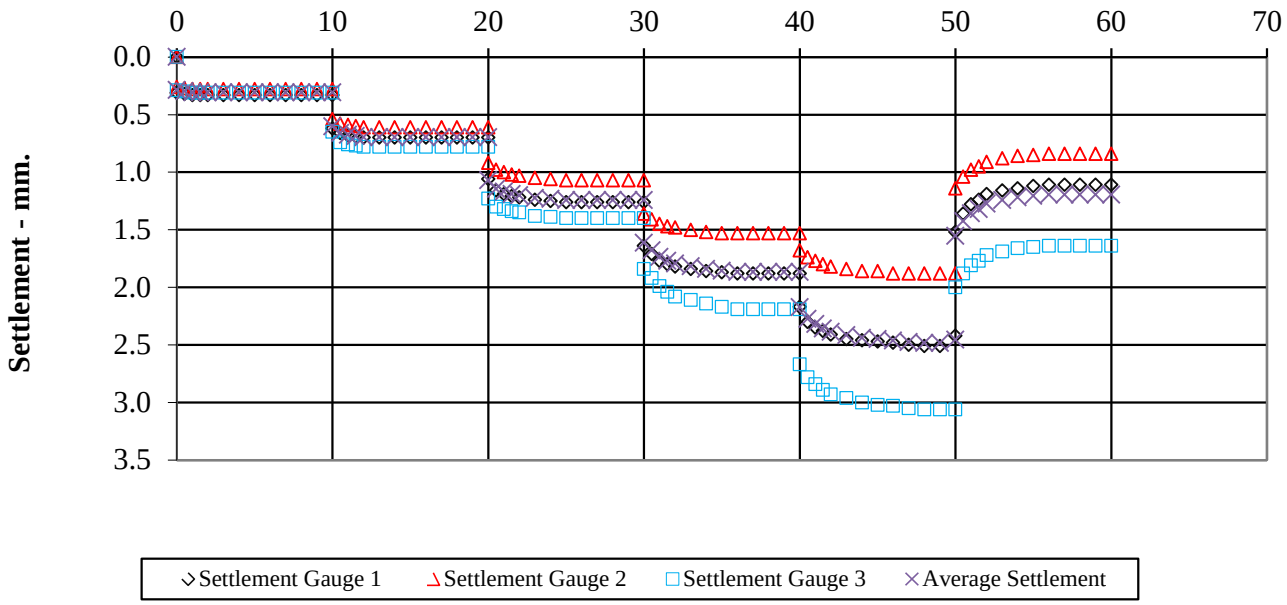
Test Position: TP102 **Depth (m):** -300.00

Plate Area (m2): 0.1625971 **Type of Kentledge:** Wheeled

Maximum Applied Pressure (kPa): 253.74
Maximum Deformation (mm): 2.45
Description: Brown sandy clayey gravel



Time - minutes.



Calculation of Equivalent CBR Value from Plate Bearing Test

Design Manual for Roads and Bridges Volume 7 Section 2 Chapter 4
Incorporating IAN 73/06

Date of Test	**20-May-21**	
Test Position	**TP102**	
Depth (m)	**-300.00**	
Description	**Brown sandy clayey gravel**	
Maximum Deflection	**2.45**	**mm**
Deflection required for CBR value	**1.25**	**mm**
Load at 1.25mm	**152**	**kN/m^2**
Plate diameter	**455**	**mm**
Conversion factor for plate diameter	**0.629**	
K_{762}(modulus of subgrade reaction) calculated using 1.25mm settlement	**76.5**	**$kN/m^2/mm$**
CBR Value	**17.7**	**%**

VERTICAL DEFORMATION TESTS.

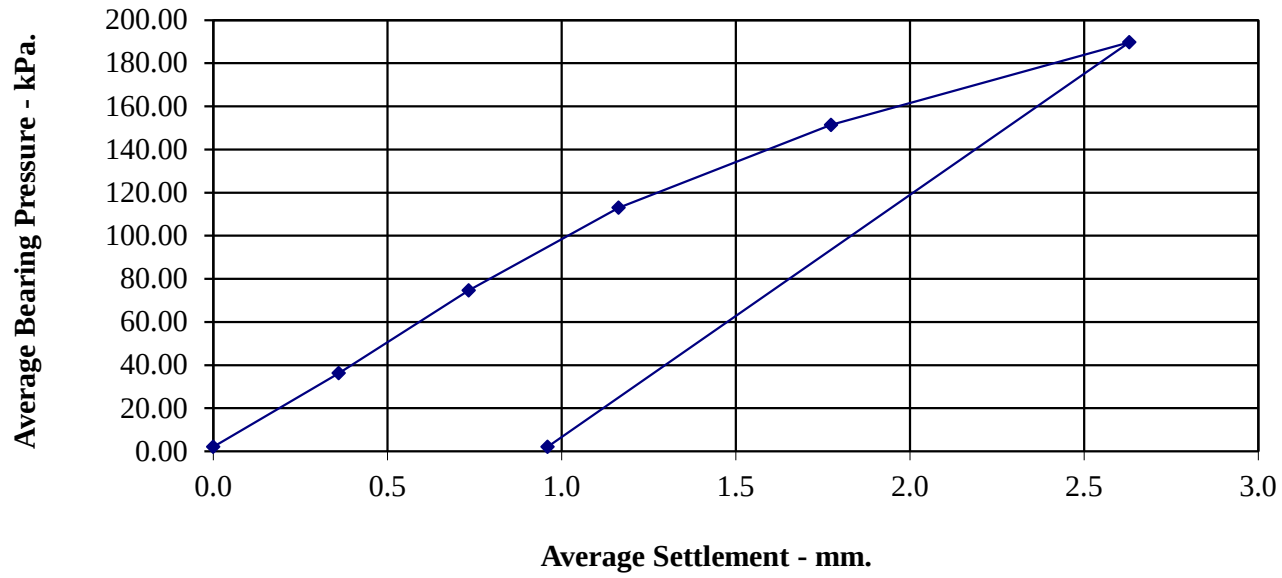
BS 1377 : Part 9 : 1990.

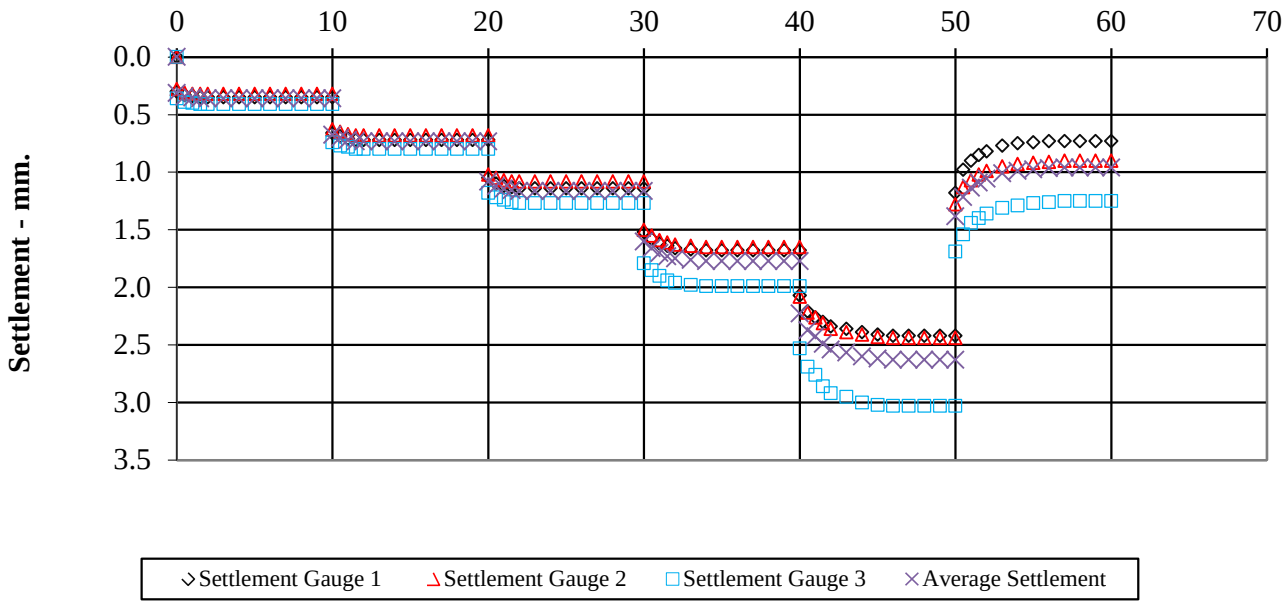
Date of Test: 20-May-21

Test Position: TP103 **Depth (m):** -310.00

Plate Area (m2): 0.1625971 **Type of Kentledge:** Wheeled

Maximum Applied Pressure (kPa): 189.77
Maximum Deformation (mm): 2.63
Description: Grey MUDSTONE





Calculation of Equivalent CBR Value from Plate Bearing Test

Design Manual for Roads and Bridges Volume 7 Section 2 Chapter 4
Incorporating IAN 73/06

Date of Test	**20-May-21**	
Test Position	**TP103**	
Depth (m)	**-310.00**	
Description	**Grey MUDSTONE**	
Maximum Deflection	**2.63**	**mm**
Deflection required for CBR value	**1.25**	**mm**
Load at 1.25mm	**118**	**kN/m^2**
Plate diameter	**455**	**mm**
Conversion factor for plate diameter	**0.629**	
K_{762}(modulus of subgrade reaction) calculated using 1.25mm settlement	**59.6**	**kN/m^2/mm**
CBR Value	**11.5**	**%**

VERTICAL DEFORMATION TESTS.

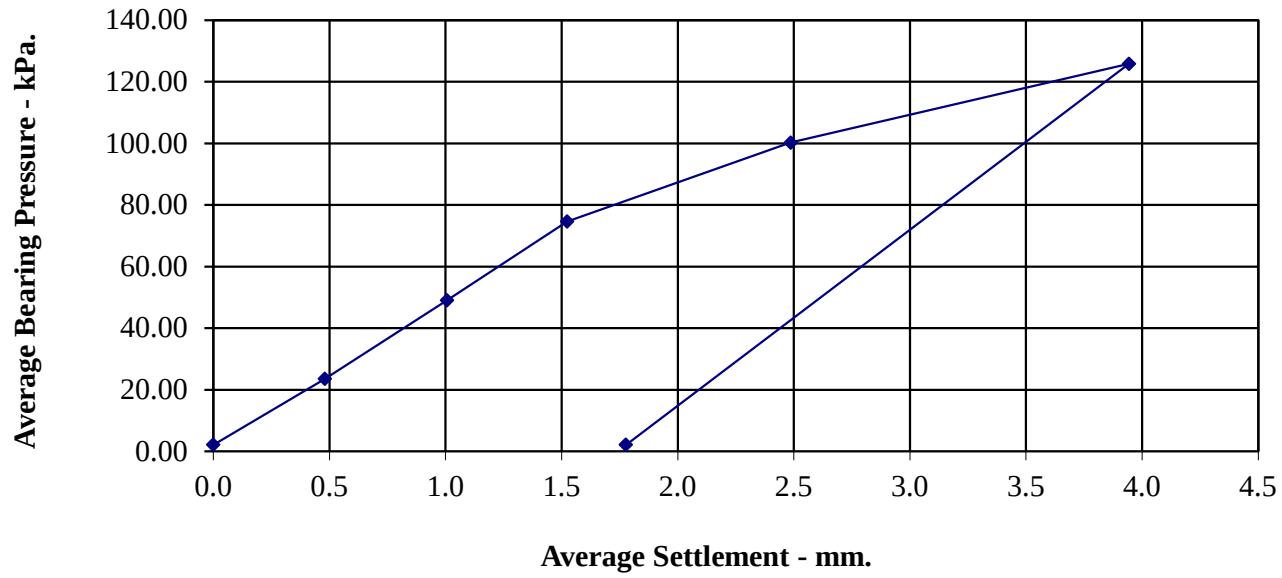
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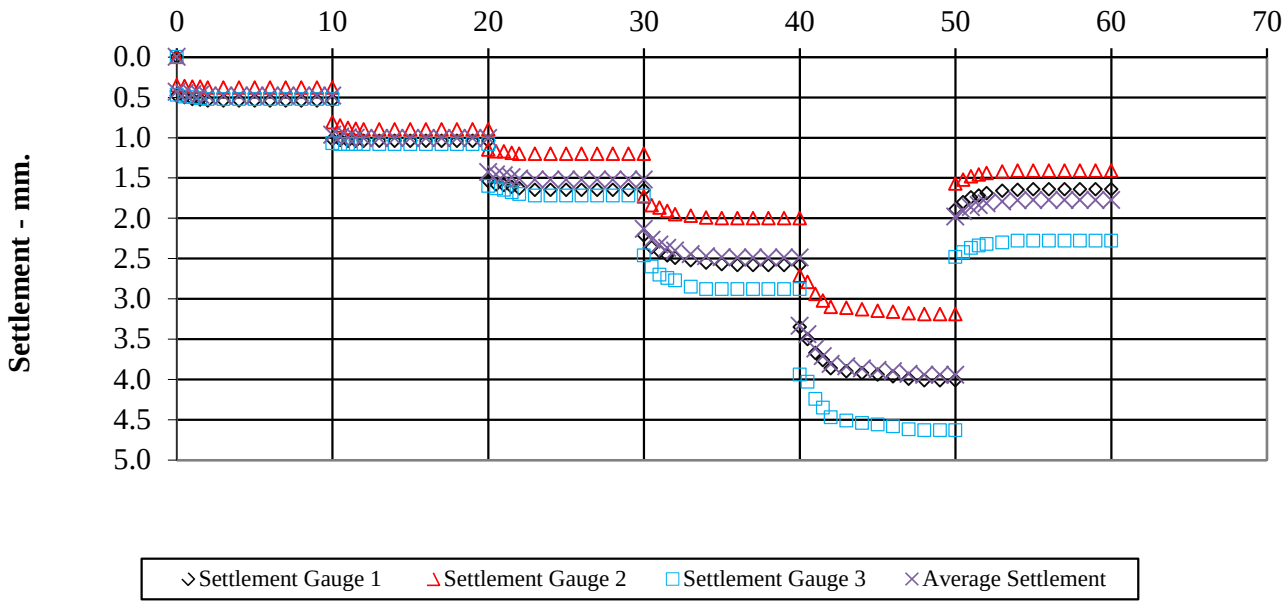
Date of Test: 20-May-21

Test Position: TP106 **Depth (m):** -0.30

Plate Area (m2): 0.1625971 **Type of Kentledge:** Wheeled

Maximum Applied Pressure (kPa): 125.81
Maximum Deformation (mm): 3.94
Description: Brown sandy clayey gravel.





Calculation of Equivalent CBR Value from Plate Bearing Test

Design Manual for Roads and Bridges Volume 7 Section 2 Chapter 4
Incorporating IAN 73/06

Date of Test	**20-May-21**	
Test Position	**TP106**	
Depth (m)	**-0.30**	
Description	**Brown sandy clayey gravel.**	
Maximum Deflection	**3.94**	**mm**
Deflection required for CBR value	**1.25**	**mm**
Load at 1.25mm	**61**	**kN/m^2**
Plate diameter	**455**	**mm**
Conversion factor for plate diameter	**0.629**	
K_{762}(modulus of subgrade reaction) calculated using 1.25mm settlement	**30.8**	**kN/m^2/mm**
CBR Value	**3.7**	**%**

VERTICAL DEFORMATION TESTS.

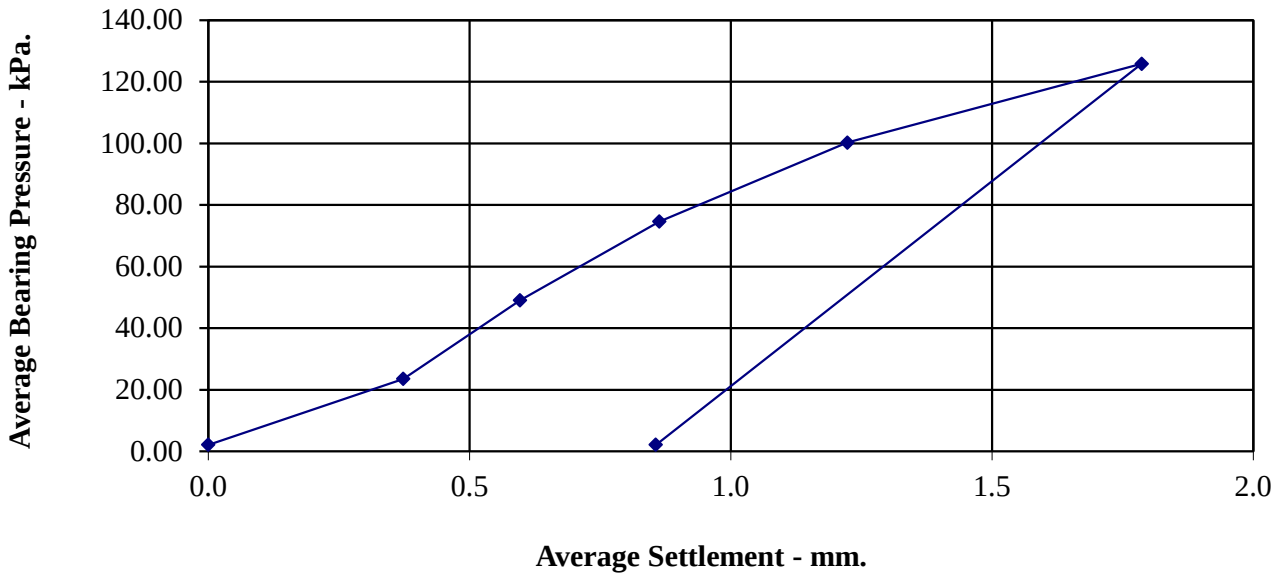
BS 1377 : Part 9 : 1990.

Date of Test: 20-May-21

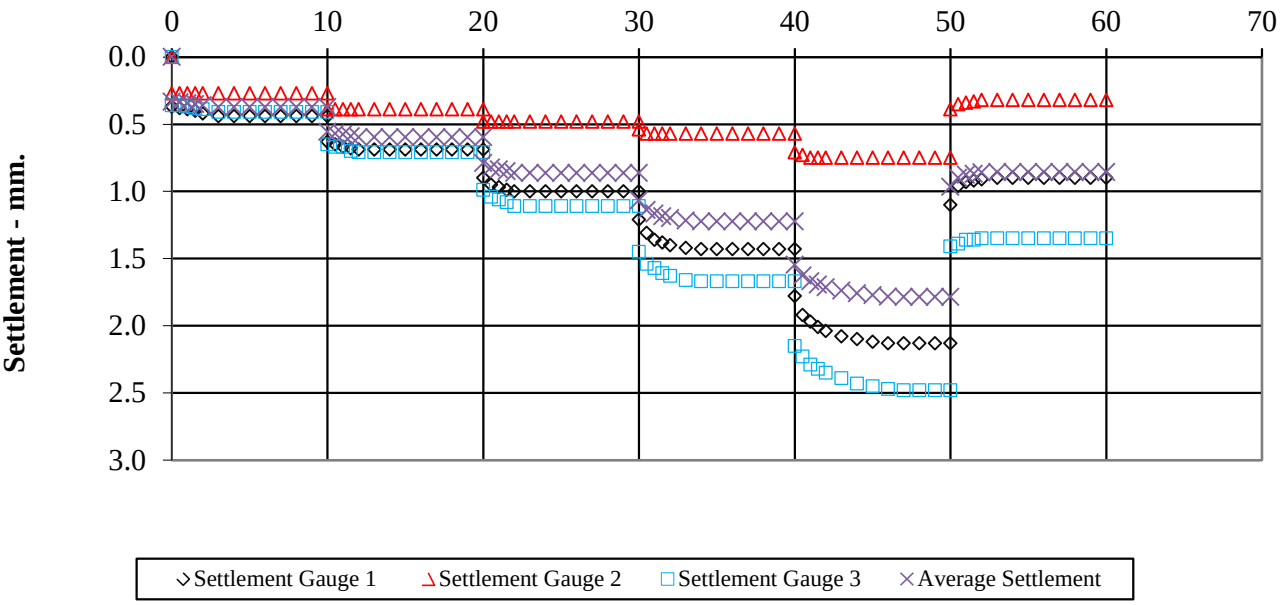
Test Position: TP108 **Depth (m):** -0.40

Plate Area (m2): 0.1625971 **Type of Kentledge:** Wheeled

Maximum Applied Pressure (kPa): 125.81
Maximum Deformation (mm): 1.79
Description: Brown sandy clayey gravel



Time - minutes.



UKAS TESTING 4043

PSL Professional Soils Laboratory

Cross Keys Lane, Hoyland, Barnsley

Contract No:
PSL21/4175
Client Ref:

Calculation of Equivalent CBR Value from Plate Bearing Test

Design Manual for Roads and Bridges Volume 7 Section 2 Chapter 4
Incorporating IAN 73/06

Date of Test	**20-May-21**	
Test Position	**TP108**	
Depth (m)	**-0.40**	
Description	**Brown sandy clayey gravel**	
Maximum Deflection	**1.79**	**mm**
Deflection required for CBR value	**1.25**	**mm**
Load at 1.25mm	**101**	**kN/m^2**
Plate diameter	**455**	**mm**
Conversion factor for plate diameter	**0.629**	
K_{762}(modulus of subgrade reaction) calculated using 1.25mm settlement	**51.1**	**$kN/m^2/mm$**
CBR Value	**8.8**	**%**

VERTICAL DEFORMATION TESTS.

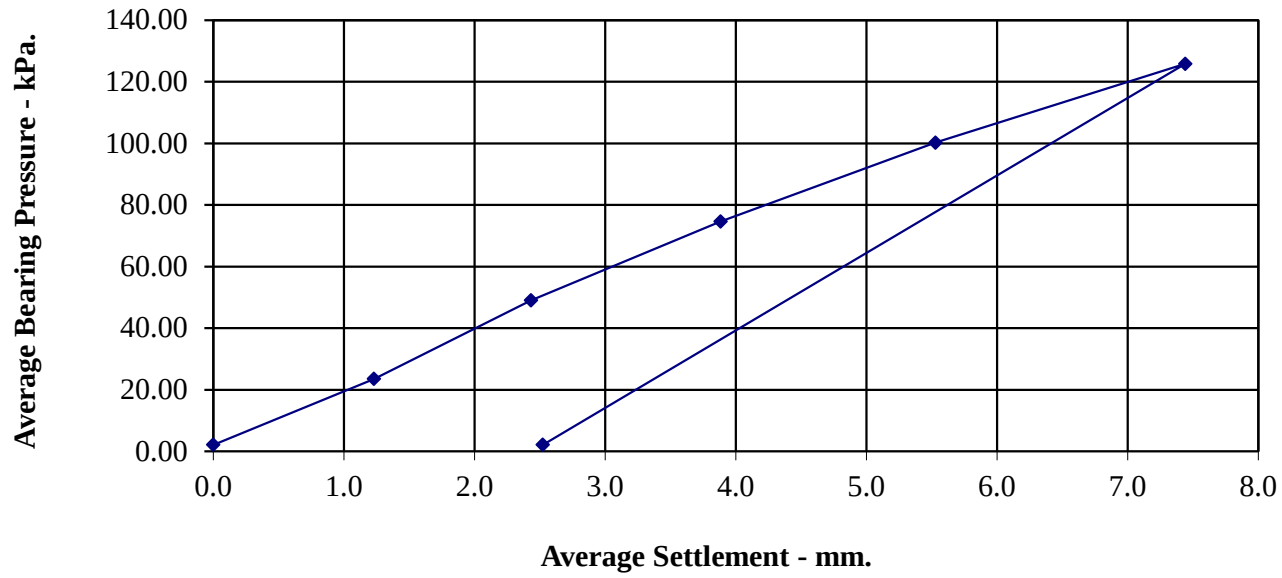
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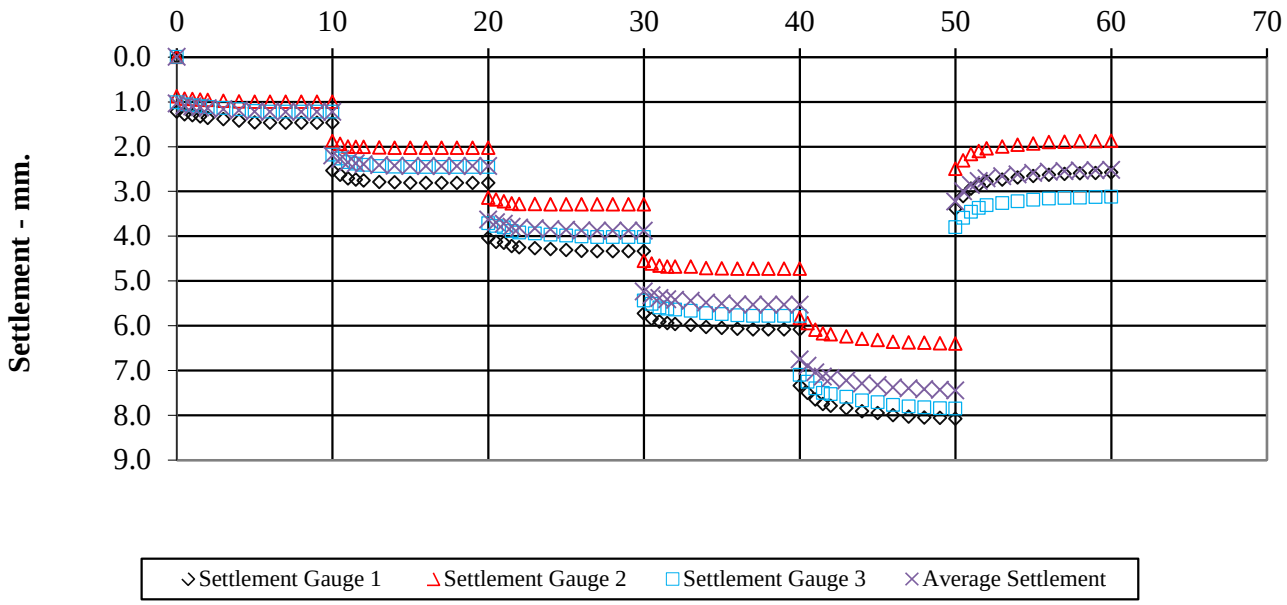
Date of Test: 20-May-21

Test Position: TP109 **Depth (m):** -0.30

Plate Area (m2): 0.1625971 **Type of Kentledge:** Wheeled

Maximum Applied Pressure (kPa): 125.81
Maximum Deformation (mm): 7.44
Description: Brown sandy clayey gravel





UKAS TESTING 4043

PSL Professional Soils Laboratory

Cross Keys Lane, Hoyland, Barnsley

Contract No:
PSL21/4175
Client Ref:

Calculation of Equivalent CBR Value from Plate Bearing Test

Design Manual for Roads and Bridges Volume 7 Section 2 Chapter 4
Incorporating IAN 73/06

Date of Test	**20-May-21**	
Test Position	**TP109**	
Depth (m)	**-0.30**	
Description	**Brown sandy clayey gravel**	
Maximum Deflection	**7.44**	**mm**
Deflection required for CBR value	**1.25**	**mm**
Load at 1.25mm	**24**	**kN/m^2**
Plate diameter	**455**	**mm**
Conversion factor for plate diameter	**0.629**	
K_{762}(modulus of subgrade reaction) calculated using 1.25mm settlement	**12.0**	**kN/m^2/mm**
CBR Value	**0.7**	**%**

VERTICAL DEFORMATION TESTS.

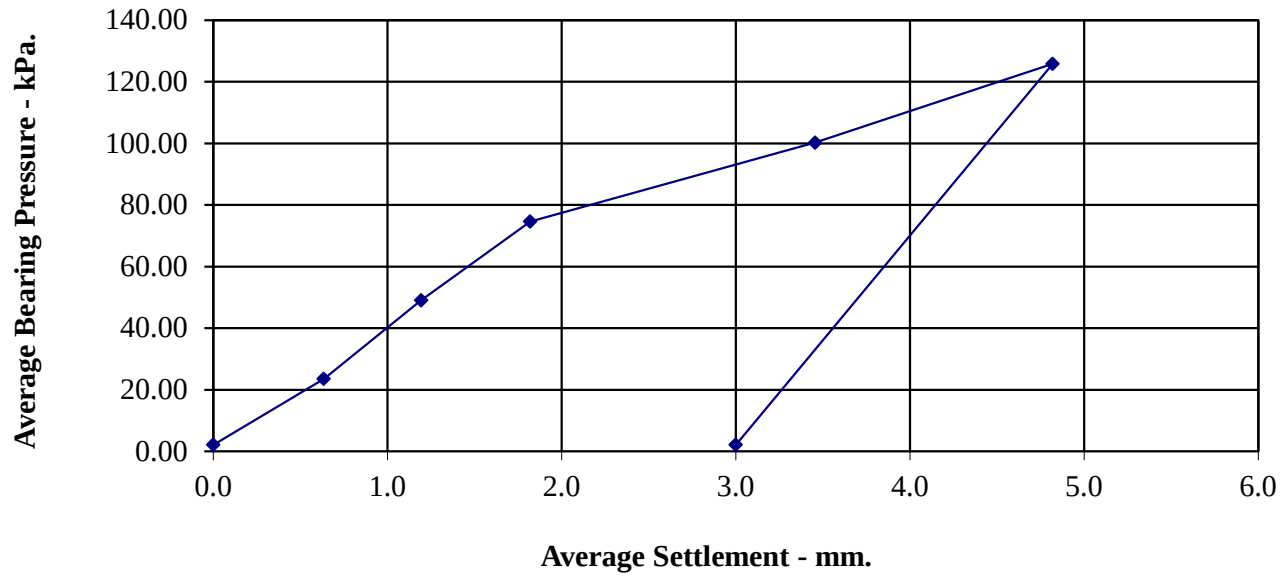
BS 1377 : Part 9 : 1990.

Date of Test: 20-May-21

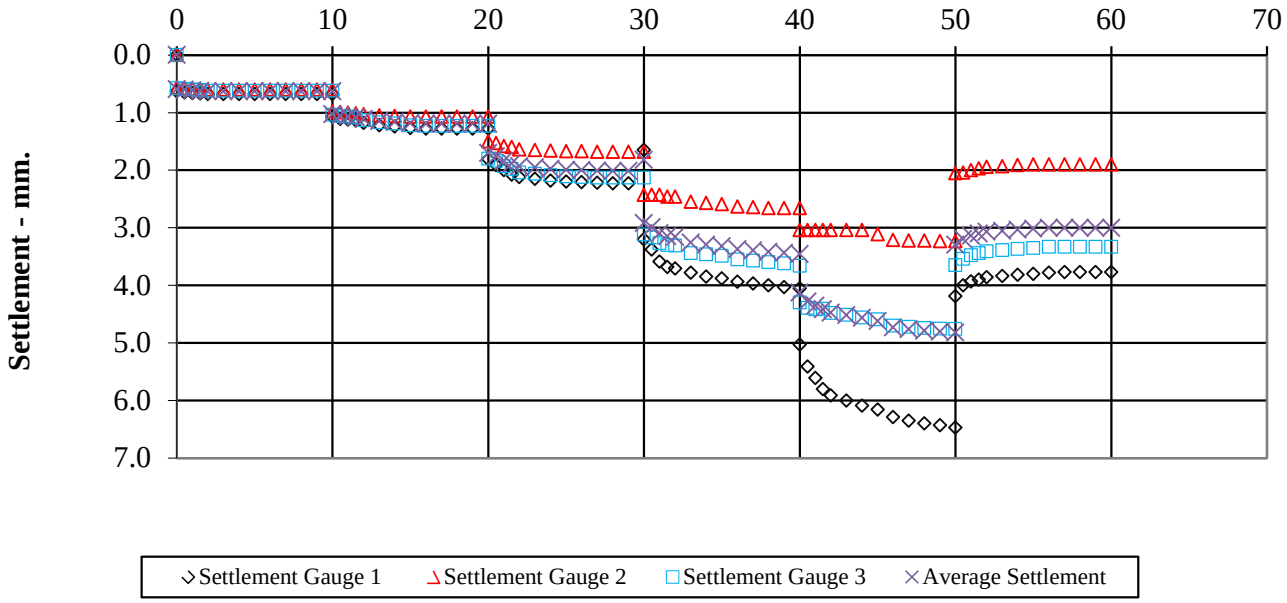
Test Position: TP111 **Depth (m):** -0.50

Plate Area (m2): 0.1625971 **Type of Kentledge:** Wheeled

Maximum Applied Pressure (kPa): 125.81
Maximum Deformation (mm): 4.82
Description: Brown sandy clayey gravel



Time - minutes.



UKAS TESTING 4043

PSL Professional Soils Laboratory

Cross Keys Lane, Hoyland, Barnsley

Contract No:
PSL21/4175
Client Ref:

Calculation of Equivalent CBR Value from Plate Bearing Test

Design Manual for Roads and Bridges Volume 7 Section 2 Chapter 4
Incorporating IAN 73/06

Date of Test	**20-May-21**	
Test Position	**TP111**	
Depth (m)	**-0.50**	
Description	**Brown sandy clayey gravel**	
Maximum Deflection	**4.82**	**mm**
Deflection required for CBR value	**1.25**	**mm**
Load at 1.25mm	**51**	**kN/m^2**
Plate diameter	**455**	**mm**
Conversion factor for plate diameter	**0.629**	
K_{762}(modulus of subgrade reaction) calculated using 1.25mm settlement	**25.9**	**kN/m^2/mm**
CBR Value	**2.7**	**%**

Appendix D4 CPT Report

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IN SITU
SITE INVESTIGATION



STATIC CONE PENETRATION TEST

FACTUAL REPORT

CLIENT: Curtins

PROJECT: Proposed Lidl
Cross Keys Hoyland

Project	**Proposed Lidl Cross Keys Hoyland**
Project No.	**1210518**
Client	**Curtins**
Address	**Rose Wharf, East Street, Leeds, LS9 8EE**

Attention: Ms Claire Battersby

Dear Ms Battersby,

We have pleasure in providing a digital copy of our report and data in AGS format for the above project.

We hope that you are satisfied with the performance of our staff, equipment and reporting on this project. If you should have any queries about any aspect of the works carried out, please do not hesitate to contact us. We look forward to being of service to you in the future.

Yours faithfully,
In Situ Site Investigation Limited



Darren Ward
Director

Report Issue

Issue	Date	Prepared	Sign	Checked	Sign	Approved	Sign
01	30/10/2021	Chloe Donovan		Luisa Dhimitri		Darren Ward	

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1.0 INTRODUCTION

In Situ Site Investigation Limited (In Situ) was engaged in a geotechnical site investigation at Proposed Lidl Cross Keys Hoyland at the request of Curtins. The site investigation consisted of completing 21 Static Piezocone Penetration Tests (CPTU) to provide information on the soil conditions and derived geotechnical parameters at:

Cross Keys Lane,
Hoyland,
Barnsley
S74 0PY

All test locations were provided by the client. A site map is included in the end of Appendix A of this report (if provided by the client). The tests were stopped when they reached the target depth as per the client's technical specifications or for other technical reasons, as detailed in the *Project Summary Table* in *Appendix A.1* and on each CPTU log included in Appendix B of this report.

The fieldwork was carried out from 26th October 2021 to 27th October 2021 as per the client's request.

The work on site and the final factual reporting have been undertaken in accordance with the international technical standard *BS EN ISO 22476-1:2012*.

2.0 FIELDWORK

2.1 CONE PENETRATION TESTS

The fieldwork activity is summarised in Table 2.1.

Table 2.1 Fieldwork Summary	
CPT Operator/s	Darren Holder & Danny Bowns
Date Started	26th October 2021
Date Finished	27th October 2021
In Situ S.I. Project Manager	Darren Ward
Main Contractor's Site Manager	Claire Battersby

2.1.1 Rig Information

Details of CPTU rig used in this project are shown in Table 2.2. Full data sheet for the rig is presented in *Appendix A.2*.

Table 2.2 Rig Summary	
Rig Name	**Rig Description**
CPT006	14 Tonne Track Mounted CPT Rig

2.1.2 CPTU Cone

Details of electric CPTU cone (Type TE2) used in this project conforming to the requirements of Application Class 2 of *ISO 22476-1:2012*, are shown in Table 2.3.

Table 2.3 Cone Summary		
Number	**Cross-section area**	**Filter position**
S15-CFIP.1867	15cm^2	u_2

A full datasheet of the cone used is shown in *Appendix A.3*.

The cone's measured parameters are shown in Table 2.4.

Table 2.4 Completed Fieldwork Summary
21 CPTU to a maximum depth of 3.44m. Each test measured Cone Resistance, q_c, Sleeve Friction, f_s, Porewater Pressure in the shoulder position, u_2, Inclination in X and Y axes.
Provision of factual report with estimated soil type, derived geotechnical parameters & AGS data file.

2.1.3 CPTU Cone Calibration

The cone resistance and sleeve friction are recorded by calibrated load cells in the cone. The CPTU load cells and pressure transducers are regularly calibrated in line with *ISO 22476-1:2012* standard by the cone manufacturer. The cone calibration certificate for the cone used at this site are presented in *Appendix A.4*.

2.1.4 CPTU Cone Saturation

The pore water pressure is recorded using a calibrated pressure transducer located in the piezocone. To ensure pore water pressure measurements are not affected by the presence of air in the measuring transducer, a de-airing procedure is carried out prior to each test. The cone and filter are saturated using a glycerine fluid with a viscosity of 10,000 CST.

2.1.5 Test Procedure

The tests are carried out in accordance with the *International Standard for Electrical Cone and Piezocone Penetration Test (ISO 22476-1:2012)*.

The final depths of the tests were determined by either completion to the specified test depth or when the maximal safe capacity of the equipment was reached. A schedule of the tests performed is shown in *Appendix A.1*, which has been compiled from the operators' daily progress reports.

The data is transmitted from the digital CPTU through an umbilical cable that runs through the push rods to the data acquisition system. Results are displayed instantaneously on the computer logging screen. The results are recorded on the computer hard disc.

The rate of penetration is kept constant at 20 mm/s ± 5 mm/s except when penetrating very dense or hard strata. Before each test is carried out zero values are taken of the cone to check if it is within calibration. At the end of each test, zero values are taken again to see if there has been any drift during the test. These values are inspected during the post processing stage. This is a quality check on the data and the testing procedure. Individual test zero values are shown on their corresponding test results in *Appendix B*.

2.1.6 In Situ Pore Pressure (u_0)

The in situ or hydrostatic pore pressure is required for the calculation of several derived parameters included in this report. For this report, the groundwater level is assumed at 2.00 m below ground surface, for calculation purposes. The in situ pore pressure (u_0) values are presented on the pore pressure plot, on *CPT Log 01,* which is included in *Appendix B*.

2.2 POSITIONING

Positioning and surveying of all investigated locations was the responsibility of the client.

3.0 CONE PENETRATION MEASURED PARAMETERS

All measured parameters of tests carried with the CPTU cone are shown in *Appendix B* and all the information about data processing and results are given in sections *3.1*, *3.2* and *3.3*.

3.1 DATA PROCESSING

The measured parameters, cone end resistance, q_c, sleeve friction, f_s, porewater pressure measurements with filter in shoulder position, u_2 and inclination for *x* and *y* axis, I_x, I_y, were recorded for every *10 mm* of penetration keeping a constant speed of *20 mm/s ± 5 mm/s*, which may slightly change when the cone is penetrating hard strata.

The measured data from the site works is processed and presented using specialised CPT software. The interpretations on the CPTU results were carried out following the recommendations of *Lunne et al. (1997)*, *Robertson (2015)* and *BS EN ISO 22476-1:2012.* Measured parameters, mentioned in *Sections 3.2* and *3.3*, were used to derive all the geotechnical parameters, which are presented in *Chapter 4.0*. The soil behaviour type method used on this report is *Robertson et al. (1986)*, shown in *Figure 3.2*.

3.1.1 Zero Measurements

Before and after each CPTU test, zero measurements are recorded for each channel of the cone. The zero measurements are presented on the logs in *Appendix B*. This is a routine quality check carried out on site.

3.2 MEASURED PARAMETERS

3.2.1 Cone Resistance (q_c)

Cone resistance, q_c, is measured as the total force acting on the cone, divided by the projected area of the cone. The results are presented in *MPa*, on *CPT Log 01*, in *Appendix B*, scale *0-20 MPa* with a minor scale printing on the same graph at *0-4 MPa*.

3.2.2 Sleeve Friction (f_s)

Sleeve friction, f_s, is measured as the total frictional force acting on the friction sleeve divided by its surface area. The results are presented in *kPa*, on *CPT Log 01*, in *Appendix B*, using a scale of *0-500 kPa*.

3.2.3 Porewater pressure (u_2)

The pore pressure, u_2, is measured during the test. If the material is free draining and saturation is maintained it will normally measure hydrostatic pore pressure. In materials that are not free draining, it will record the total pore pressure (hydrostatic plus any excess pore pressures generated) created by the cone penetration through this material.

The filter element can be mounted in one of three positions. For all tests carried out in this project the filter was mounted in the u_2 position (see *Figure 3.1*).

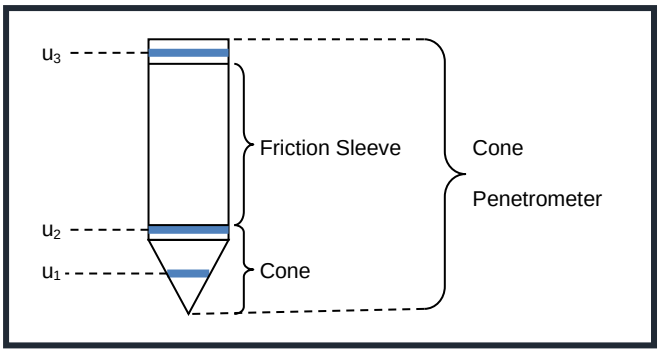


Figure 3.1: *Diagram showing pore pressure filter locations (after Lunne et al., 1997)*

3.2.4 Inclination (I_x, I_y)

The CPT rig was set up to obtain a thrust direction as near as possible to vertical. The CPTU cones have inclinometers incorporated to measure the non-verticality of the test. For test depths less than *15 m*, significant non-verticality is unusual, provided the initial thrust direction is vertical.

3.3 ESTIMATED SOIL BEHAVIOUR TYPE

3.3.1 Friction Ratio (R_f)

The friction ratio, R_f is the ratio between the sleeve friction and the cone resistance (Lunne *et al.,* 1997).

$$Fricton\ Ratio\ (R_f) = \left(\frac{Sleeve\ Friction\ (f_s)}{Cone\ Resistance\ (q_c)}\right) \times 100$$

3.3.2 Estimated Soil Behaviour Type (SBT)

The estimation of soil behaviour type, *SBT*, using measurements of cone resistance and sleeve friction is based upon the variations of the friction ratio and cone resistance. The friction

ratio varies depending upon whether the soil is cohesive or granular. The cone resistance varies depending on the strength and densities of the soil.

The interpretation used in this report is *Robertson et al. (1986)*, which is shown in Figure 3.2. The results are presented on *CPT Log 01*, in *Appendix B*.

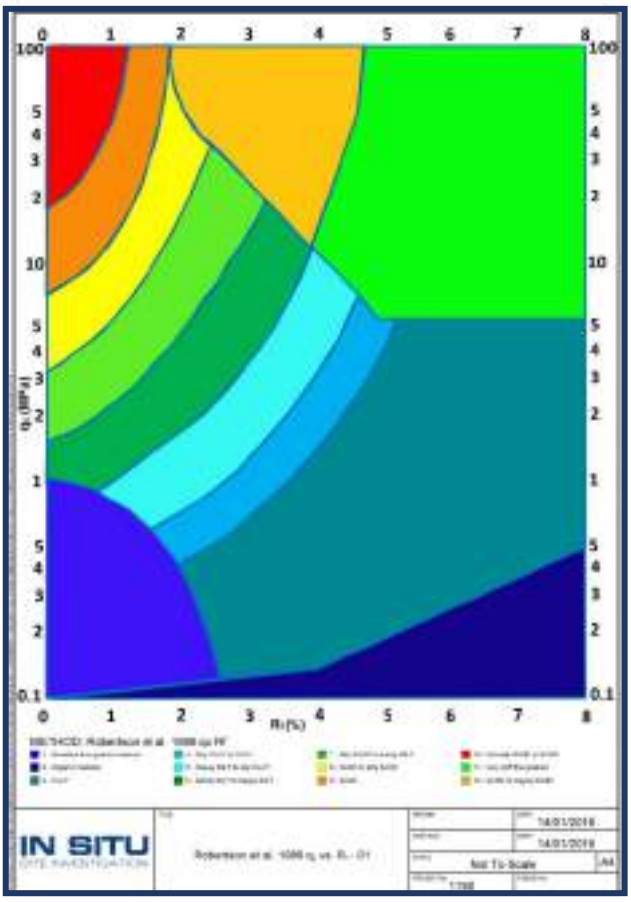


Figure 3.2: *Robertson et al., 1986 soil behaviour type chart.*

3.3.3 Pore Pressure Ratio (B_q)

Pore pressure ratio, B_q is the ratio between the measured pore pressure generated during penetration and the corrected cone resistance minus the total overburden stress.

Pore pressure ratio as defined by *Senneset and Janbu (1985)* is defined as:

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

where

u_2	is pore pressure measured between the cone and the friction sleeve
u_0	is equilibrium pore pressure
σ_{vo}	is total overburden stress
q_t	is cone resistance corrected for unequal end area effects

3.4 APPLIED CORRECTIONS

3.4.1 Corrected Cone Resistance (q_t)

For each penetration test, the measured cone resistance, q_c, can be corrected for the ''unequal area effect'' due to the influence of the ambient pore water pressure acting on the cone.

The correction has been applied using the following equation by Lunne et *al.,* 1997:

$$q_t = q_c + [u_2.(1 - \alpha)]$$

where

α is the cone area ratio

The cone used on this project has a cone area ratio of *0.79*. This value is geometrically measured.

3.4.2 Depth Correction

All tests in the report have been corrected for depth difference caused by inclination. This has been calculated using the method described in *ISO 22476-1:2012*.

To calculate the corrected depth the following formula is used:

$$z = \int_0^l C_{inc} \cdot dl$$

where

z is penetration depth, in *m*
l is penetration length, in *m*
C_{inc} is correction factor for the effect of the inclination of the CPTU relative to the vertical axis.

The equation for calculating the correction factor for the influence of the inclination for a bi-axial inclinometer is:

$$C_{inc} = \frac{1}{\sqrt{(1 + tan^2\beta_1 + tan^2\beta_2}}$$

where

β_1 is the angle between the vertical axis and the projection of the axis of the CPTU on a vertical plane, in degrees
β_2 is the angle between the vertical axis and the projection of the axis of the CPTU on a vertical plane that is perpendicular to the plane of angle β_1, in degrees

4.0 GEOTECHNICAL DERIVED PARAMETERS

A number of empirical correlations can be used to derive geotechnical parameters from CPTU data. This report includes only the parameters which are described in this chapter. The results of all correlations used to obtain the geotechnical derived parameters are presented on *CPT Log 02* and *CPT Log 03* in *Appendix B*.

Please, note that each empirical correlation is derived for a certain type of soil, and may not be appropriate for all the soil types encountered on this project.

4.1 SOIL BEHAVIOUR TYPE INDEX (I_c)

The soil behaviour type index, I_c, was derived by *Jefferies and Davies (1991)*, and was created to simplify the application of CPTU SBT chart shown in *Chapter 3*, *Figure 3.2*. This approach has been modified for use with the *Robertson (1990)* normalised CPT soil classification chart, *Figure 4.1*. The normalised cone parameters Q_t and F_r (for definitions see *Appendix A5* Symbol List) can be combined into one Soil Behaviour Type Index, I_c, *(Lunne et al., 1997)*.

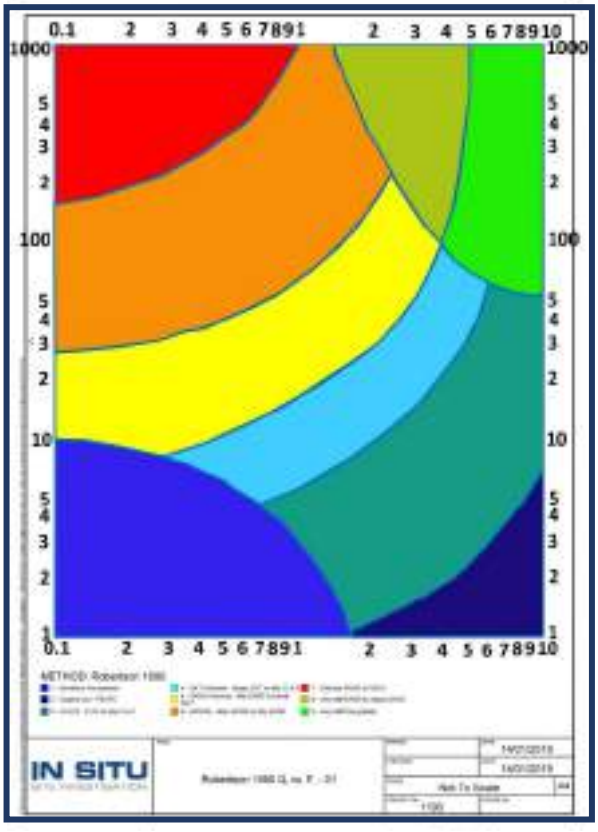


Figure 4.1: *Robertson 1990 soil behaviour type chart.*

The soil behaviour type index, I_c, can then be defined using *Robertson (2010)* formula, given below:

$$I_c = ((3.47 - logQ_t)^2 + (logF_r + 1.22)^2)^{0.5}$$

where

Q_t is the normalized cone resistance which represents the simple normalization with a stress exponent (n) of *1.0*, which applies well to clay-like soils

F_R is the normalized friction ratio, in *%*

The boundaries of soil behaviour type are then given in terms of the index, I_c, presented in *Table 4.1* below.

The soils behaviour type index does not apply to zones *1*, *8* and *9*. The profiles of I_c provide a simple guide to the continuous variation of soil behaviour type in a given soil profile based on CPTU results, with a reliability greater than *80%* compared with soil samples *(Robertson, 2015).*

Zone	Soil Behaviour Type	I_c
1	Sensitive fine grained	N/A
2	Organic Soils – clay	>3.6
3	Clays – silty clay to clay	2.95 – 3.6
4	Silt mixtures – clayey silt to silty clay	2.60 – 2.95
5	Sand mixtures – silty sand to sandy silt	2.05 – 2.6
6	Sands – clean sand to silty sand	1.31 – 2.05
7	Gravelly sand to dense sand	<1.31
8	Very stiff sand to clayey sand*	N/A
9	Very stiff fine grained *	N/A

** Heavily over consolidated or cemented*

Table 4.1: *Normalized CPTU Soil Behaviour Type (SBT_n) Index values, I_c.(Robertson, 2010)*

4.2 N VALUE OF STANDARD PENETRATION TEST (SPT) (N_{60})

The derived *N* value of *SPT,* N_{60}, is strongly and directly related to the cone resistance, q_c.

In this report the N_{60} value is derived using the following correlations, developed by *Robertson and Wride (1998)* and *Jefferies and Davies (1998)*

1) *Robertson & Wride (1998)*

$$N_{60} = \frac{q_c}{8.5 \cdot p_a \left(1 - \frac{I_C}{4.6}\right)}$$

2) *Jefferies and Davies (1993)*

$$N_{60} = \frac{q_c}{0.85 \cdot \left(1 - \frac{I_C}{4.75}\right)}$$

where

q_c	is the cone resistance
p_a	is the atmospheric pressure equal to *100 kPa*
I_c	is the soil behaviour type index calculated as given in *section 4.1*

It is suggested that this method provides a better estimation of the *N* value than the actual *SPT* test, due to its poor repeatability. But in fine grained soil with high sensitivity these methods of estimating N_{60} may overestimate it *(Jefferies and Davies, 1991).*

4.3 RELATIVE DENSITY (D_r)

Relative density, D_r, is an intermediate parameter for coarse grained soils, widely used to describe sand deposits. All the research on deriving the relative density from CPTU tests results are carried out for ***clean predominantly quartz sands***. The studies have shown that CPTU resistance in granular soils is controlled by sand relative density, in situ effective stresses and compressibility. The more compressible sands tend to give lower penetration resistance for a given relative density then less compressible sands.

In this report relative density is calculated using the methods suggested by *Baldi et al., (1986)*, *Jamiolkowski et al., (2001)* and *Kulhawy and Mayne (1990)* as shown in the equations below:

1) Baldi et al., (1986)

$$D_r = \frac{1}{C_2} \cdot ln\left(\frac{q_c \cdot Wehr}{C_1 \cdot (\sigma'_{v0})^{0.55}}\right) \cdot 100$$

where

C_1 is a consolidation coefficient which is *157* for normally consolidated soils and *181* for over consolidated soils

C_2 is a consolidation coefficient which is *2.41* for normally consolidated soils and *2.46* for over consolidated soils

Wehr is a correction coefficient for calcareous soils

2) Jamiolkowski et al., (2001)

$$D_r = 100 \cdot \left[0.268 \cdot ln\left(\frac{q_t/\sigma_{atm}}{\sqrt{\sigma'_{v0}/\sigma_{atm}}}\right) + C_1\right]$$

where

C_1 is a compressibility coefficient which is *-0.675* for average compressible soils, ≤*1.0* for high compressible soils and carbonate or calcareous sands and ≥*-2.0* for low compressible soils

q_t is corrected cone resistance

σ_{atm} is the atmospheric pressure

3) Kulhawy and Mayne, (1990)

$$D_r = \left[\frac{q_{c1}}{305 \cdot C_1 \cdot OCR^{0.18} \cdot \left(1.2 + 0.05 \cdot log(t/100)\right)}\right]^{0.5} \cdot 100$$

where

q_{c1} is the cone resistance corrected for initial vertical effective stress and atmospheric pressure, calculated by the following formula

$$q_{c1} = \frac{q_c}{\sqrt{\sigma'_{v0} \cdot \sigma_{atm}}}$$

where

q_c is the cone resistance in *kPa*

σ'_{v0} is the initial vertical effective stress in *kPa*

C_1 is a compressibility coefficient which is *-0.91* for low compressible sands, *1.0* for medium compressible sands and *1.09* for high compressible sands

t is time in years

4.4 FRICTION ANGLE (φ')

Friction angle, *φ*', is used to express the shear strength of uncemented, coarse grained soils. In this report friction angle is derived by the correlations of *Mayne and Campanella (2005)*, *Robertson and Campanella (1983)* and *Kulhawy and Mayne (1990)*.

1) Mayne and Campanella, (2005)

$$\varphi' = 29.5^0 \cdot B_q^{0.121} \cdot \left[0.256 + 0.336 \cdot B_q + logQ_t\right]$$

where

B_q is the pore pressure ratio, calculated as in Session 3.3

Q_t is the normalized cone resistance

2) Robertson and Campanella, (1983)

$$\varphi' = \tan^{-1}\left(0.1 + 0.38 \cdot log\left(\frac{q_t}{\sigma'_{v0}}\right)\right)$$

where

q_c is the cone resistance in *kPa*

σ'_{v0} is the initial vertical effective stress in *kPa*

3) Kulhawy and Mayne, (1990)

$$\varphi' = 17.6^0 + 11.0^0 \cdot log(q_{t1})$$

where

q_{t1} is the corrected cone resistance corrected for initial vertical effective stress and atmospheric pressure, calculated by the following formula

$$q_{t1} = \frac{q_t}{\sqrt{\sigma'_{v0} \cdot \sigma_{atm}}}$$

The method suggested by *Mayne and Campanella (2005)* will not provide reliable results for heavily over consolidated soils, fissured geomaterials and highly cemented or structures clays. This approach gives reliable results when pore pressure is positive and varies $0.1 < B_q < 1.0$. The correlation suggested by *Robertson and Campanella (1983)* estimates the peak friction angle for uncemented, unaged, moderately compressible, predominately quartz sands. For sands of higher compressibility, the method will tend to predict low friction angles. The method suggested by *Kulhawy and Mayne (1990)* is an alternate relationship for clean, rounded, uncemented, quartz sands.

4.5 FINES CONTENT (*FC*)

The fines content, *FC*, in this report is estimated using two different methods, one from *Robertson and Wride (1998)* and the other, *Suzuki et al. (1998)* as presented below:

1) Robertson and Wride (1998)

$$I_C < 1.26: FC = 0$$
$$1.26 \leq I_C \leq 3.5: FC(\%) = 1.75I_C^{3.25} - 3.7$$
$$3.5 < I_C: \ FC = 100\%$$

2) Suzuki et al. (1998)

$$FC(\%) = 2.8I_C^{2.6}$$

where

I_c is the soil behaviour type index, calculated as in section 4.1

4.6 UNDRAINED SHEAR STRENGTH (s_u)

Estimation of undrained shear strength, s_u, from CPTU tests using corrected cone resistance is carried out using the following correlation from *Lunne et al. (1981)*:

$$S_u = \frac{(q_t - \sigma_{v0})}{N_{kt}}$$

where

N_{kt} is the empirical cone factor, which varies from *10* (*6* for very soft sensitive fine grained soils) to *20*. In this report 3 values are considered: *15*, *17.5* and *20*. N_{kt} tends to increase with increasing plasticity and decrease with increasing soil sensitivity. It decreases as B_q increases. (*Lunne et al., 1997*)
σ_{vo} = total overburden stress.

This report only presents the undrained shear strength data on soils with soil behaviour type index, I_c values greater than *2.60*.

The value of undrained shear strength, s_u to be used in analysis depends on the design problem. In general, the simple shear in the direction of loading often represents the average undrained strength. For larger, moderate to high risk projects, where high quality field and laboratory data may be available, site specific correlations should be developed based on appropriate and reliable values of s_u.

4.7 SENSITIVITY (S_t)

The sensitivity, S_t of clays is defined as the ratio of undisturbed peak undrained shear strength to totally remoulded undrained shear strength.

In this report S_t is calculated using two correlations developed by *Schmertmann (1978)* and *Mayne (2007)*.

1) Schmertmann (1978)

$$S_t = \frac{s_u}{s_{u(rem)}} = \frac{q_t - \sigma_v}{N_{kt}} \left(\frac{1}{f_s}\right)$$

where

$s_{u(rem)}$ is the remoulded undrained shear strength. It can be assumed equal to the sleeve resistance, f_s.

2) Mayne (2007)

$$S_t = \frac{0.073 \cdot (q_t - \sigma_{v0})}{f_s}$$

For relatively sensitive clays, $S_t > 10$, the value of f_s can be very low and not very accurate, hence the estimate of sensitivity should be used as a guide only.

4.8 SOIL UNIT WEIGHT (γ)

Soil unit weight, γ in this report is calculated by using one method for sands, considered under dry conditions and two methods for clays, considered under saturated conditions. These relationships are developed by *Mayne (2007)* and the equations are presented below:

1) Mayne (2007)

Dry unit weight for sands:

$$\gamma_{dry} = 1.89 \cdot log(q_{t1}) + 11.82$$

Saturated unit weight for clays method 1

$$\gamma_{sat} = 8.32 \cdot log(V_S) - 1.61 \cdot log(z)$$

Saturated unit for clays method 2

$$\gamma_{sat} = 2.60 \cdot log(f_s) + 15 \cdot G_s - 26.5$$

where

q_{t1} is the corrected cone resistance corrected for initial vertical effective stress and atmospheric pressure, calculated by the following formula:

$$q_{t1} = \frac{q_t}{\sqrt{\sigma'_{v0} \cdot \sigma_{atm}}}$$

z is the depth

V_s is the shear wave velocity, calculated as $V_S = 118.8 \cdot log\left(f_s\right) + 18.5$

G_s is the specific gravity of solids, typically between *2.40* and *2.90*

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APPENDIX A

APPENDIX A1 – Project Summary Sheet

Piezocone Tests Summary Sheet

HOLE ID	Final Depth (m)	Date of Test	Cone Used	Test Remarks
CPT101	2.48	26/10/2021	S15-CFIP.1867	Test refused on tip resistance.
CPT102	2.63	26/10/2021	S15-CFIP.1867	Test refused on tip resistance.
CPT103	2.22	27/10/2021	S15-CFIP.1867	Test refused on tip resistance.
CPT104	1.34	26/10/2021	S15-CFIP.1867	Test refused on tip resistance.
CPT104A	1.96	26/10/2021	S15-CFIP.1867	Test refused on tip resistance.
CPT105	1.05	26/10/2021	S15-CFIP.1867	Test refused on tip resistance.
CPT106	1.29	27/10/2021	S15-CFIP.1867	Test refused on tip resistance.
CPT107	2.78	26/10/2021	S15-CFIP.1867	Test refused on tip resistance.
CPT108	1.09	26/10/2021	S15-CFIP.1867	Test refused on tip resistance.
CPT108A	1.10	26/10/2021	S15-CFIP.1867	Test refused on tip resistance.
CPT109	1.78	27/10/2021	S15-CFIP.1867	Test refused on tip resistance.
CPT109a	1.34	27/10/2021	S15-CFIP.1867	Test refused on tip resistance.
CPT110	2.18	26/10/2021	S15-CFIP.1867	Test refused on tip resistance.
CPT110A	3.44	26/10/2021	S15-CFIP.1867	Test refused on total pressure.
CPT111	2.37	26/10/2021	S15-CFIP.1867	Test refused on tip resistance.
CPT112	1.87	27/10/2021	S15-CFIP.1867	Test refused on inclination.
CPT112a	2.45	27/10/2021	S15-CFIP.1867	Test refused on tip resistance.
CPT113	2.29	26/10/2021	S15-CFIP.1867	Test refused on tip resistance.
CPT114	1.87	27/10/2021	S15-CFIP.1867	Test refused on tip resistance.
CPT115	2.31	27/10/2021	S15-CFIP.1867	Test refused on tip resistance.
CPT116	2.31	27/10/2021	S15-CFIP.1867	Test refused on tip resistance.

APPENDIX A2 – CPT Rig Datasheet

RIGS

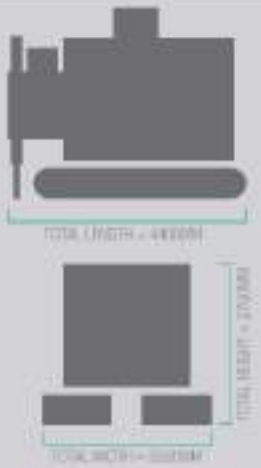
14 TONNE MOUNTED RIGS (CPT005 and CPT006)

We have two 14 tonne track mounted CPT rigs, each weighing 14 tonnes. One of our rigs, CPT005, 'Erik' is based in the Middle East and the other, CPT006, 'Zoe' in the UK. These rigs have low ground bearing pressure and are ideal for soft, boggy sites. They are capable of pushing up to 120 metres a day, depending on access to positions.

CPT RIG DETAILS

TOTAL WEIGHT	14 TONNES
CPT RAM THRUST CAPACITY	20 TONNES
MAXIMUM PENETRATION	20-30M DEPENDING ON THE GROUND CONDITIONS
PERFORMANCE RATES	120M OF TESTING IN A DAY DEPENDING ON ACCESS TO POSITIONS
TYPICAL SITES FOR THIS RIG	SOFT BOGGY SITES. THE RIG HAS LOW GROUND BEARING PRESSURE

CPT RIG DIMENSIONS





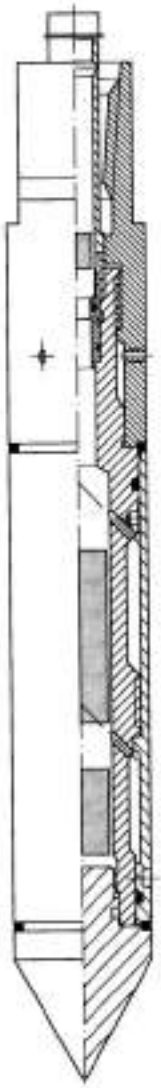




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APPENDIX A3 – Cone Datasheet

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Postbank : 5226758
BTW nr. : NL808331627B01



SPECIFICATIONS
S15 SERIES
ELECTRICAL CONES

The electronic subtraction cones have been developed to address the durability problems inherent in other cone designs. The unit consists of a single element temperature compensated strain gauge transducer for measuring both cone resistance and local sleeve friction. This design is therefore more robust than a compression type cone. The cone support electronics package is located directly behind the transducer. The precision strain gauge amplifiers and power supply eliminate the effects of cable resistance on the measurements. A standard subtraction cone is capable of measuring simultaneously the following channels: Tip, Local friction, Pore pressure, Temperature and Inclination.

GENERAL SPECIFICATIONS

Cone Tip Section Area	1,500 mm2
Friction Sleeve Surface	22,500 mm2
Total Length	325 mm
Weight	4200 g
Power Supply	± 15 VDC, 100 mA.
Output	0 – 10 VDC*
Working Temperature	0 - 60˚C
Storage Temperature	- 40 to + 85˚C
Connector	Lemo 10 pins (others on request)

TIP RESISTANCE

Range	100/150* kN
Accuracy	0.25 % FS
Maximum Load	150 % of range
Cone Area Ratio	0.75

LOCAL SLEEVE FRICTION

Range	100/150* kN
Accuracy	0.50 % FS
Maximum Load	150 %
Sleeve Area Ratio	1.0 (EA)

PORE PRESSURE

Range	1/2/5/10* MPa
Accuracy	0.5 % FS
Maximum Load	150 % of range

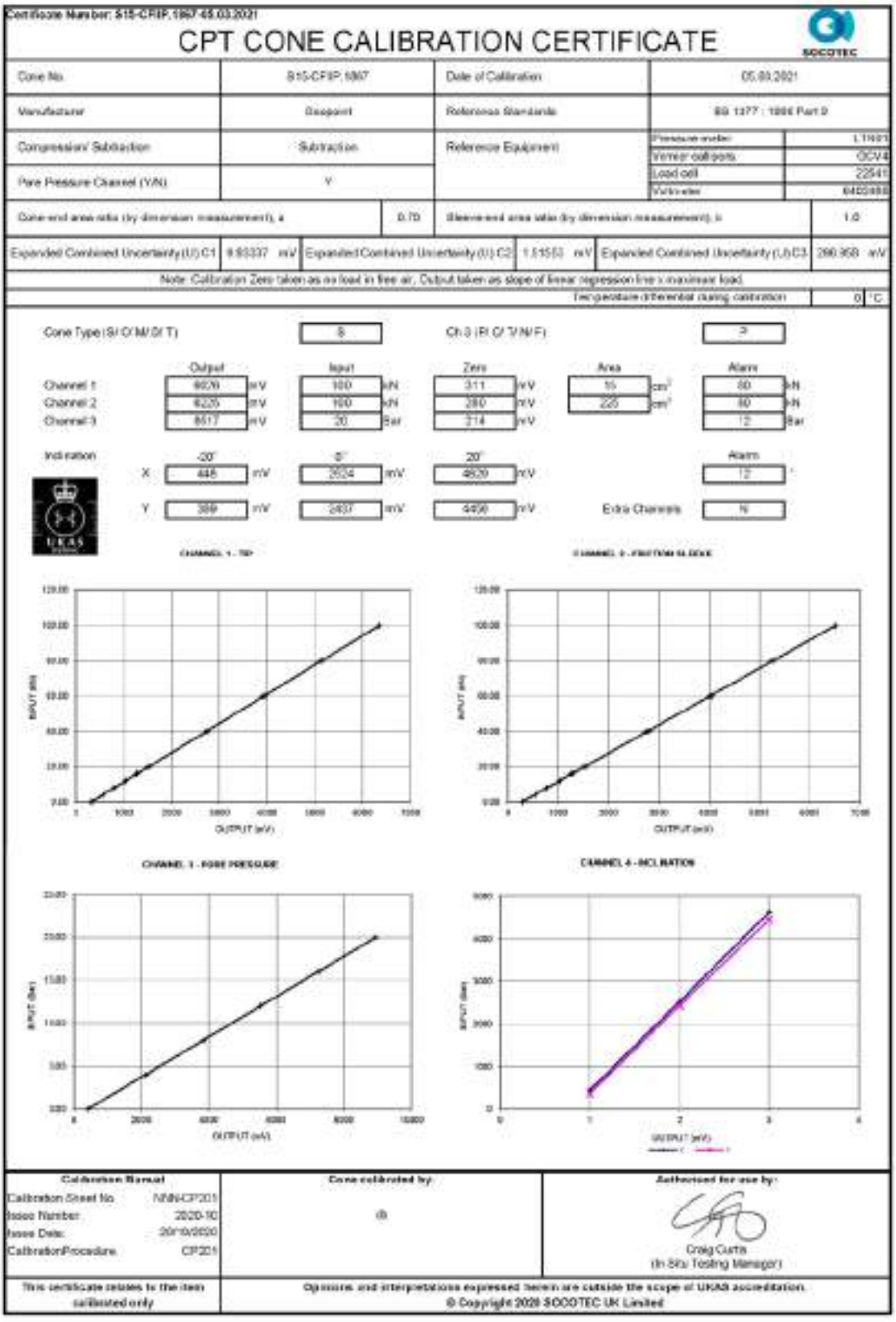
INCLINATION

Range	25 ˚ (biaxial)
Accuracy	< 2 ˚

All our equipment complies with the ISSMGE, ASTM, DIN and NEN Standards.

*Other output and voltage ranges available on request. Load cells may be calibrated for lower ranges.

APPENDIX A4 – Cone Calibration Certificate



Certificate Number: S15-CFIP.1807.45.03.2021

CPT CONE CALIBRATION CERTIFICATE

SOCOTEC

Cone No.	S15-CFIP.1807	Date of Calibration	05.03.2021
Manufacturer	Geospent	Reference Standards	BS 1377 : 1990 Part 9
Compression/ Subtraction	Subtraction	Reference Equipment	Pressure meter: LTH01 Vernier callipers: OCV4 Load cell: 22541 Voltmeter: 84020888
Pore Pressure Channel (Y/N)	Y		
Cone-end area ratio (by dimension measurement), a	0.70	Sleeve-end area ratio (by dimension measurement), b	1.0
Expanded Combined Uncertainty (U) C1	0.83337 mV	Expanded Combined Uncertainty (U) C2	1.51553 mV
Expanded Combined Uncertainty (U) C3	290.958 mV		

Note: Calibration Zero taken as no load in free air, Output taken as slope of linear regression line x maximum load.

Temperature differential during calibration: 0 °C

Cone Type (S/ C/ M/ D/ T): S

Ch 3 (R/ C/ Y/ N/ F): Y

	Output	Input	Zero	Area	Alarm
Channel 1	9026 mV	100 kN	311 mV	10 cm²	80 kN
Channel 2	6225 mV	100 kN	280 mV	225 cm²	80 kN
Channel 3	8617 mV	20 Bar	314 mV		12 Bar

Inclination	-20°	0°	20°	Alarm
X	445 mV	2624 mV	4820 mV	12 °
Y	389 mV	2497 mV	4496 mV	Extra Channels: N

UKAS

Calibration Manual	Cone calibrated by:	Authorised for use by:
Calibration Sheet No: NMN-CP201 Issue Number: 2020-10 Issue Date: 20/10/2020 Calibration Procedure: CP201	dt	Craig Curtis (In Situ Testing Manager)

This certificate relates to the item calibrated only

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

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APPENDIX A5 – Symbol List

English

a	is area ratio of the cone ($= {}^{A_n}/_{A_c}$)
A	is area
A_c	is projected area of the cone
A_n	is cross sectional area of load cell or shaft
A_s	is area of friction sleeve
A_{sb}	is bottom end area of friction sleeve
A_{st}	is top end area of friction sleeve
B_q	is pore pressure parameter ($= {}^{(u_2 - u_0)}/_{(q_t - \sigma_{v0})}$)
c_h	is horizontal coefficient of consolidation
c_v	is vertical coefficient of consolidation
D	is diameter
D_r	is relative density ($= \frac{e_{max} - e}{e_{max} - e_{min}} x100\%$)
e	is void ratio
e_{max}	is maximum void ratio
e_{min}	is minimum void ratio
E	is Young's modulus
f_s	is unit sleeve friction resistance
f_t	is sleeve friction corrected for pore pressure effects
F_s	is total force acting on friction sleeve
F_R	is normalized friction ratio ($= {}^{f_s}/_{(q_t - \sigma_{v0})}$)
FoS	is factor of safety
FC	is fines content
g	is acceleration due to gravity
G_0	is initial or maximum shear modulus, shear stiffness
I_c	is soil behavior type index
I_r	is rigidity index ($= {}^{G}/_{s_u}$)
I_p	is plasticity index
k	is coefficient of permeability
k_h	is coefficient of permeability in horizontal direction
k_v	is coefficient of permeability in vertical direction
K_0	is coefficient of earth pressure at rest ($= {}^{\sigma'_{h0}}/_{\sigma'_{v0}}$)
L	is length
m_v	is coefficient of volume change
M	is constrained deformation modulus
M7.5	is earthquake magnitude of 7.5 Richter scale
N	is number of blows of SPT
N_{60}	is SPT energy ratio
N_k	is cone factor
N_{ke}	is cone factor
N_{kt}	is cone factor
$N_{\Delta u}$	is cone factor
p_a	is reference stress ($= 100\ kPa$)
q_c	is measured cone resistance
q_e	is effective cone resistance ($= q_t - u_2$)
q_n	is net cone resistance ($= q_t - \sigma_{v0}$)
q_t	is corrected cone resistance ($= q_c - (1 - a)u_2$)
Q_c	is total force acting on the cone
Q_t	is normalized cone resistance ($= {}^{q_t - \sigma_{v0}}/_{\sigma'_{v0}}$)

R_f is friction ratio ($= \left({}^{f_t}/_{q_t}\right) x100\%$ or alternatively $= \left({}^{f_t}/_{q_t}\right) x100\%$)
s_u is undrained shear strength
s_{ur} is remoulded undrained shear strength
S_t is sensitivity
t is time
t_{50} is time for 50% dissipation of excess pore water pressure
T_{50} is time factor at $U = 50\ \%$
u is pore water pressure
u_0 is in situ pore pressure
u_1 is pore pressure measured on the cone
u_2 is pore pressure measured behind the cone
u_3 is pore pressure measured behind sleeve friction
Δu is excess pore water pressure
U is normalized excess pore pressure
V_s is shear wave velocity
z is depth

Greek

α is constant
α is cone roughness
β is constant
β_1 is the angle between the vertical axis and the projection of the axis of the CPTU on a vertical plane, in degrees
β_2 is the angle between the vertical axis and the projection of the axis of the CPTU on a vertical plane that is perpendicular to the plane of angle β_1, in degrees
γ is unit weight of soil
γ_w unit weight of water
Δ is change
Δu is excess pore pressure ($= u - u_0$)
μ is Poisson's ratio
ρ is density
ψ is state parameter
σ, σ' is normal stress (total, effective)
σ_h, σ_h' is horizontal stress (total, effective)
σ_v, σ_v' is horizontal stress (total, effective)
σ_{v0},σ_{v0}' is overburden stress (total, effective)
τ_{av} is average cyclic shear stress
τ_{cy} is cyclic shear stress
φ' is effective friction angle

APPENDIX A6 – Abbreviations

ASTM	American Society for Testing and Materials
CPTU	Cone Penetration Test with Pore Pressure Measurement (Piezocone Test)
CRR	Cyclic Resistance Ratio
CSR	Cyclic Stress Ratio
GWT	Ground Water Table
NC	Normally Consolidated
OC	Over consolidated
OCR	Over consolidation Ratio
PL	Limit Pressure
SDMT	Seismic Dilatometer Marchetti
SPT	Standard Penetration Test
TC	Technical Committee

APPENDIX A7 – Glossary

CPT
Cone Penetration Test.

Cone
The part of the cone penetrometer on which the end bearing is developed.

Cone Penetrometer
The assembly containing the *cone*, *friction sleeve*, any other sensors and measuring systems, as well as the connections to the *push-rods.*

Cone resistance, q_c
The total force acting on the cone, Q_c, divided by the projected area of the cone, A_c. $q_c = {Q_c}/{A_c}$

Corrected cone resistance, q_t
The *cone resistance*, q_c corrected for pore water pressure effects.

Corrected sleeve friction, f_t
The *sleeve friction* corrected for pore water pressure effects on the ends of the *friction sleeve*.

Data acquisition system
The system used to measure and record the measurements made by the *cone penetrometer*.

Dissipation Test
A test when the decay of the pore water pressure is monitored during a pause in penetration.

Filter element
The porous element inserted into the cone penetrometer to allow transmission of the pore water pressure to the pore pressure sensor, while maintaining the correct profile of the *cone penetrometer*.

Friction ratio, R_f
The ratio, expressed as a percentage of the *sleeve friction*, f_s, to the *cone resistance*, q_c, both measured at the same depth.

Friction reducer
A local enlargement on the push-rod surface, placed at a distance above the cone penetrometer, and provided to reduce the friction on the *push-rods*.

Friction sleeve
The section of the *cone penetrometer* upon which the *sleeve friction* is measured.

Normalized cone resistance, Q_c or Q_t
The *cone resistance* expressed in a non-dimensional form and taking account of stress changes *in situ*, $Q_c = {(q_c - \sigma_{v0})}/{\sigma'_{v0}}$, or when the *corrected cone resistance* is used $Q_t = {(q_t - \sigma_{v0})}/{\sigma'_{v0}}$. where σ_{v0} and σ'_{v0} are the total and effective vertical stress respectively.

Net cone resistance, q_n
The *corrected cone resistance* minus the vertical total stress. $q_n = q_t - \sigma_{v0}$

Normalized friction ratio, F_r
The *sleeve friction* normalized by the *net cone resistance*.

Piezocone
A *cone penetrometer* containing a pore pressure sensor.

Pore pressure, *u*
The pore pressure generated during penetration and measured by a pore pressure sensor, u_1 when measured on the cone, u_2 when measured just behind the cone and u_3 when measured just behind the friction sleeve.

Pore pressure ratio, B_q
The *net pore pressure* normalized with respect to the *net cone resistance*.

Push-rods
The thick-walled tubes or rods used for advancing the cone penetrometer.

Rig machine
The equipment which pushes the cone penetrometer and rods into the ground.

Sleeve friction, f_s
The total frictional force acting on the *friction sleeve*, F_s, divided by its *surface area*, A_s. $f_s = {F_s}/{A_s}$

APPENDIX A8 – Soils Description Tables

GRANULAR SOILS (Sands and Gravels)

Description	Relative Density D_r (%)	SPT N value, N_{SPT}
Very Loose	0 – 15	0 - 4
Loose	15 – 35	4 - 10
Medium Dense	35 – 65	10 - 30
Dense	65 – 85	30 - 50
Very Dense	>85	>50

COHESIVE SOILS (Clays and Silts)

Term based on measurement	Undrained Shear Strength Classification, s_u (kPa)
Extremely low	<10
Very low	10 - 20
Low	20 - 40
Medium	40 - 75
High	75 - 150
Very high	150 - 300
Extremely high	>300

APPENDIX B

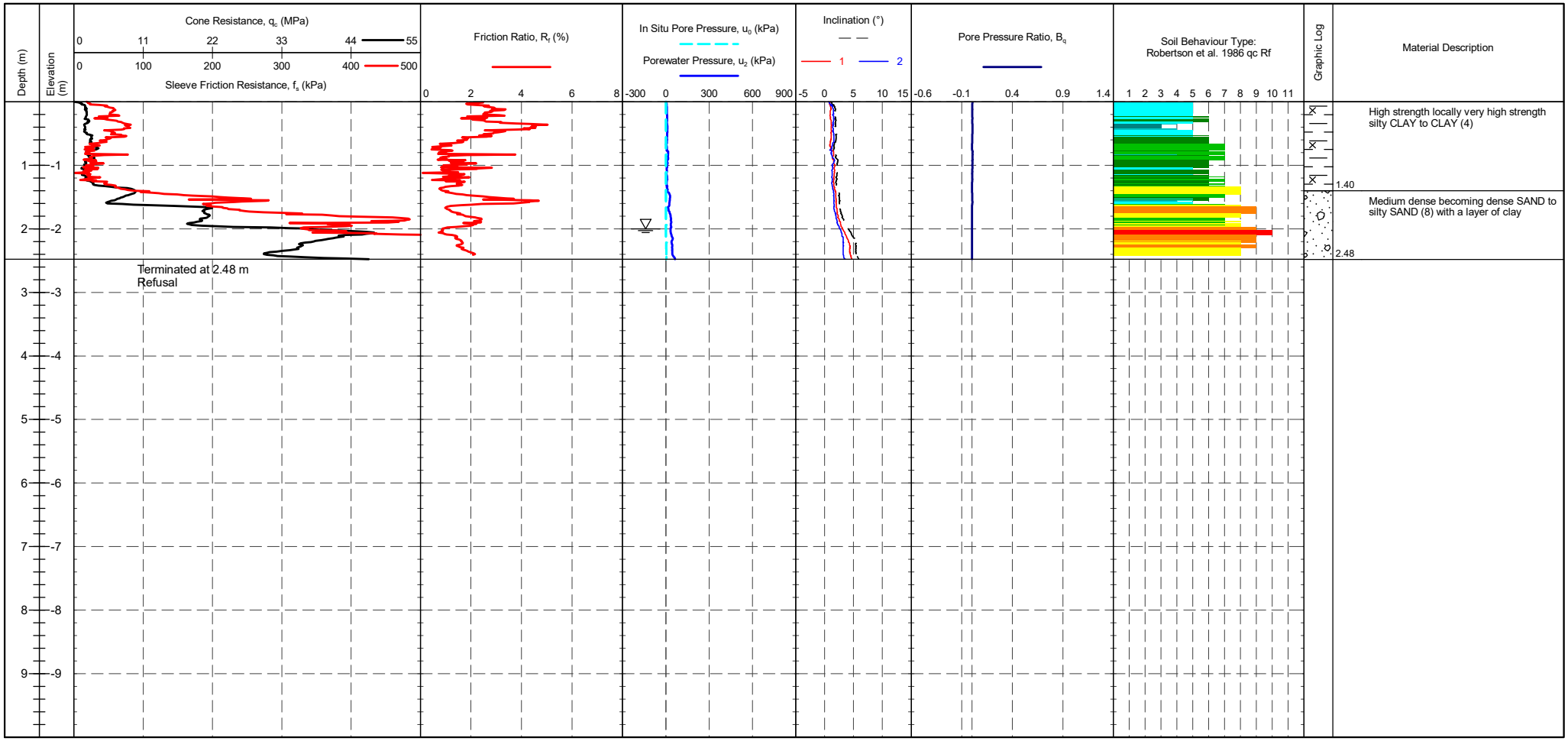
Cone Penetration Measured Parameters and Geotechnical Derived Parameters

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 01

PointID: **CPT101**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 26/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2
CALIBRATION DATE	: 05/03/2021	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 006 - Zoe
CONE AREA	: 15cm^2	OPERATOR	: DHo
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Overcast & Cold
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	317 mV	320 mV	0.033 MPa
Sleeve	270 mV	270 mV	0 kPa
Pore Pressure 2	167 mV	147 mV	-0.005 kPa
X-Y Inclinometer	2611 mV	2605 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

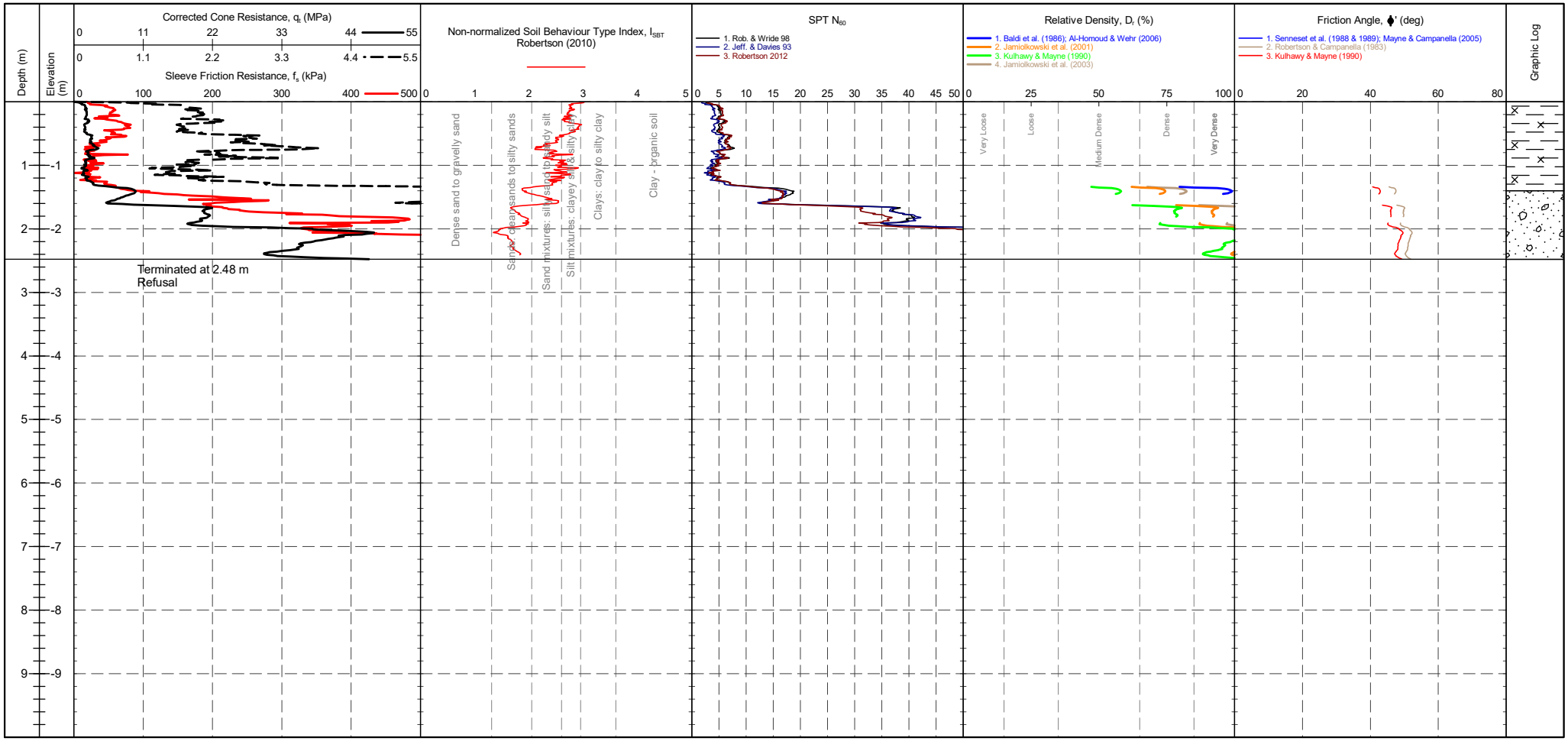
PointID **CPT101**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 26/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2		
CONE AREA	: 15cm²	RIG	: CPT 006 - Zoe		
CONE AREA RATIO	: 0.79	OPERATOR	: DHo		
FILTER POSITION	: u2	FRICTION REDUCER	: None		
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold		

CPTU ZERO VALUES

	Pre	Post	Difference
Transducer			
Tip	317 mV	320 mV	0.033 MPa
Sleeve	270 mV	270 mV	0 kPa
Pore Pressure 2	167 mV	147 mV	-0.005 kPa
X-Y Inclinometer	2611 mV	2605 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

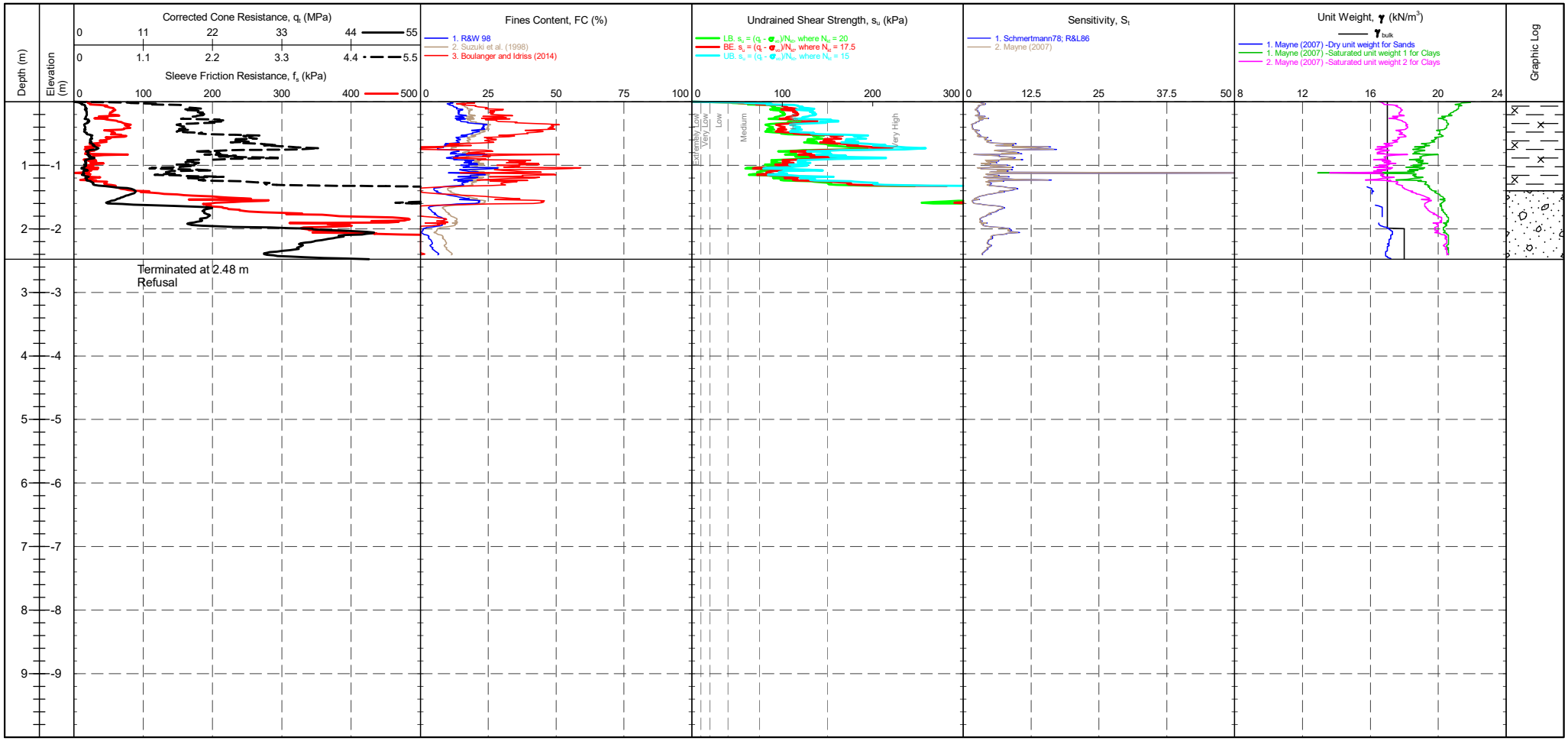
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 03

PointID: **CPT101**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 26/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



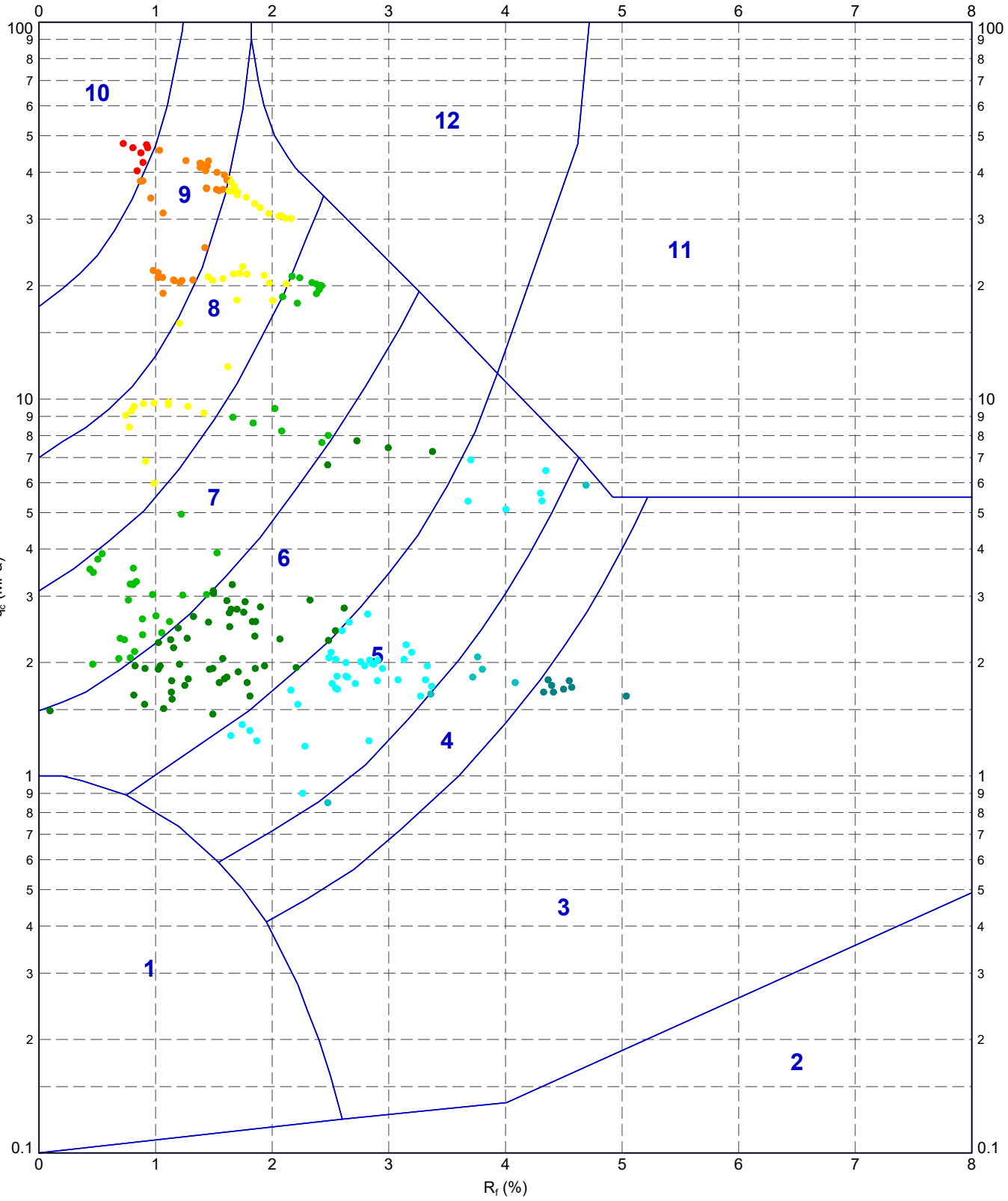
CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe	Tip	317 mV	320 mV	0.033 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: DHo	Sleeve	270 mV	270 mV	0 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	167 mV	147 mV	-0.005 kPa
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold	X-Y Inclinometer	2611 mV	2605 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT101

DRAWN	DATE 29/10/2021
CHECKED	DATE 29/10/2021
SCALE Not To Scale	A4
PROJECT No 1210518	FIGURE No

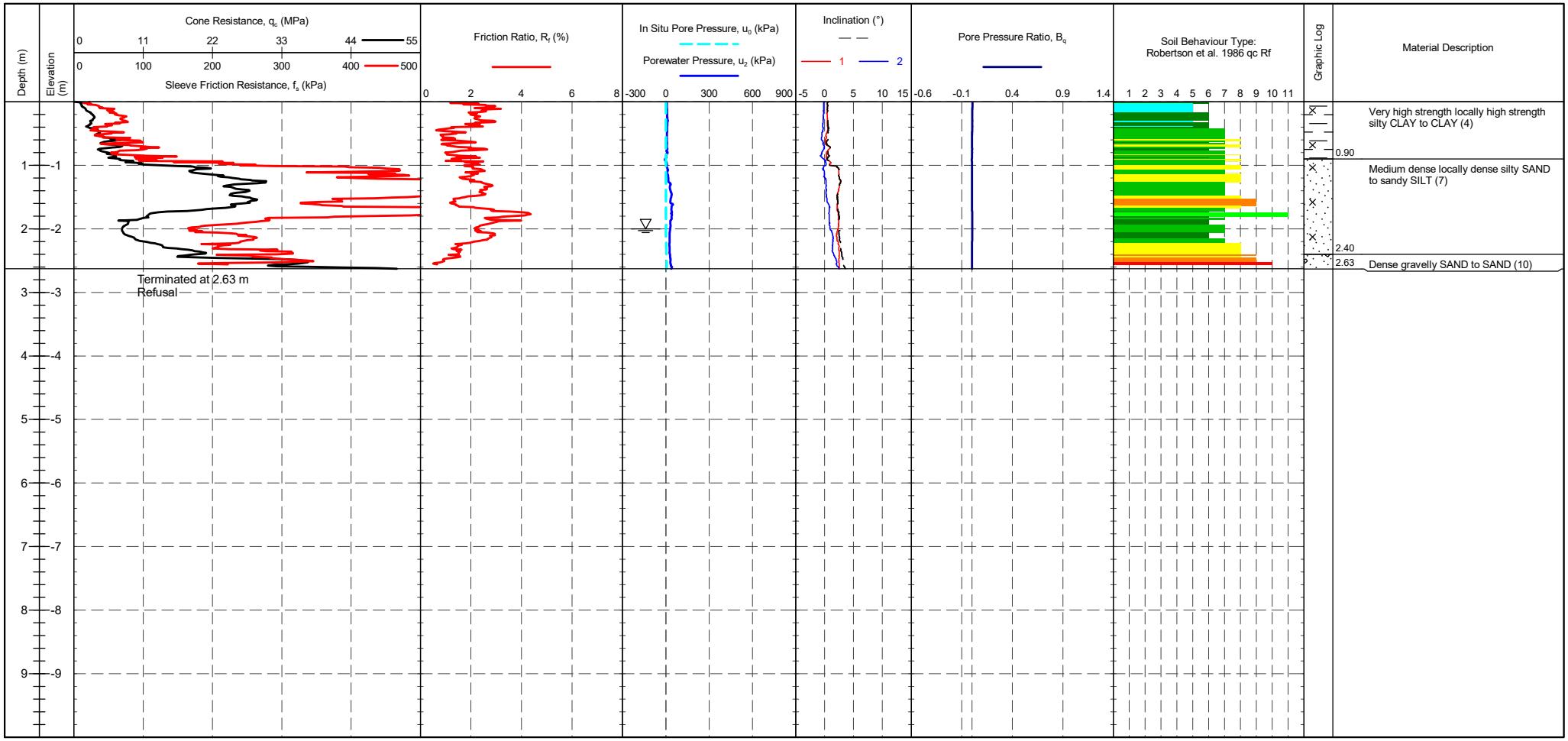
210713-ADVANCED REPORT INSITUSI 2.02.1.LIB - LUISA.GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF A4P 1210518-PROPOSED LIDL.GPJ <<DrawingFile>> 29/10/2021 16:14 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Pfj: In Situ SI 2.02.0 2017-07-10

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 01

PointID: **CPT102**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 26/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CALIBRATION DATE	: 05/03/2021	APPLICATION CLASS	: 2		
CONE MODEL	: Subtraction	RIG	: CPT 006 - Zoe		
CONE AREA	: 15cm^2	OPERATOR	: DHo		
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None		
FILTER POSITION	: u2	WEATHER	: Overcast & Cold		
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	316 mV	319 mV	0.033 MPa
Sleeve	269 mV	271 mV	0.001 kPa
Pore Pressure 2	178 mV	157 mV	-0.005 kPa
X-Y Inclinometer	2600 mV	2585 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

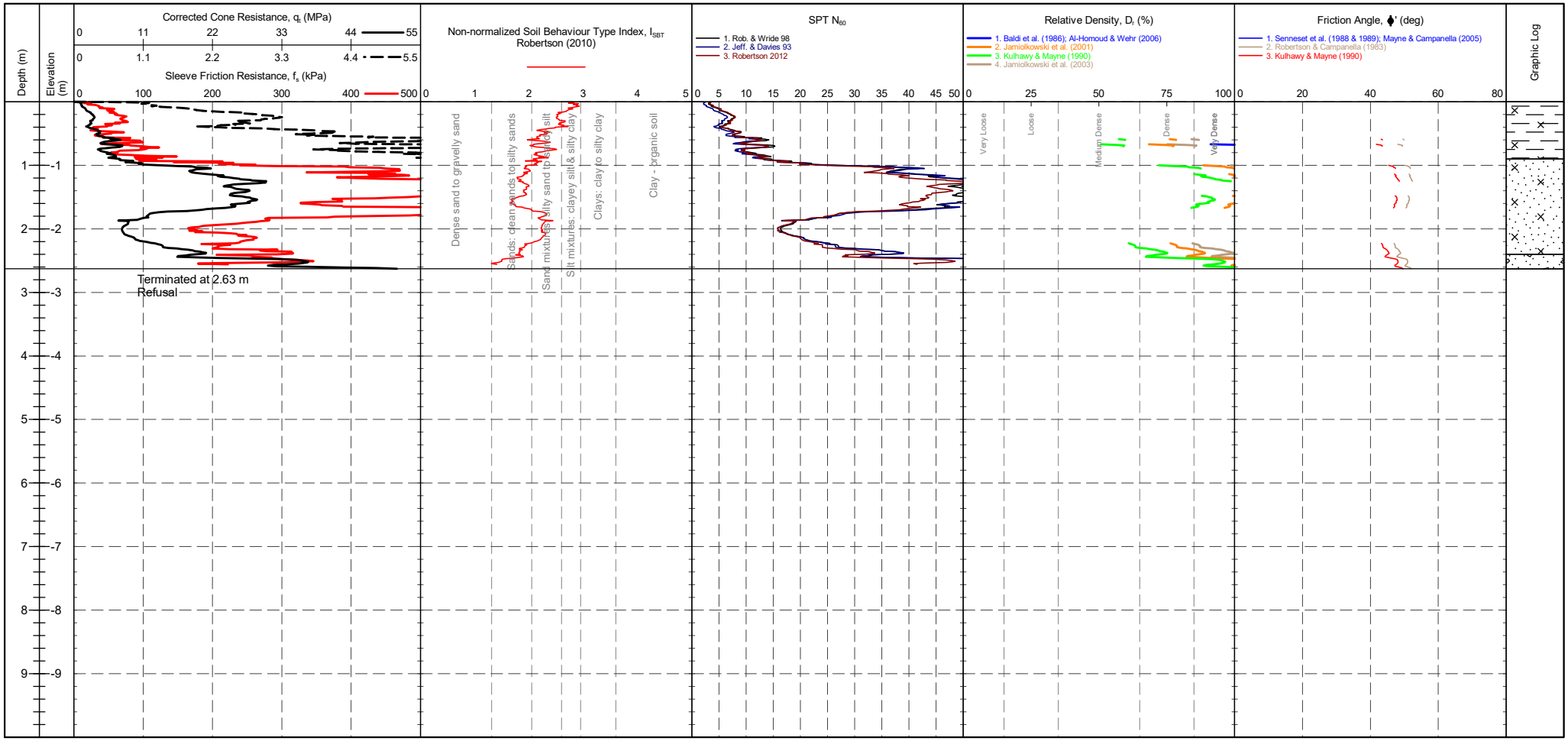
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

PointID **CPT102**

CLIENT : Curtins PROJECT : Proposed LIDL LOCATION : Cross Keys Hoyland PROJECT No. : 1210518	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 26/10/2021 PLOT DATE : 29/10/2021 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm²	RIG	: CPT 006 - Zoe	Tip	316 mV	319 mV	0.033 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: DHo	Sleeve	269 mV	271 mV	0.001 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	178 mV	157 mV	-0.005 kPa
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold	X-Y Inclinometer	2600 mV	2585 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

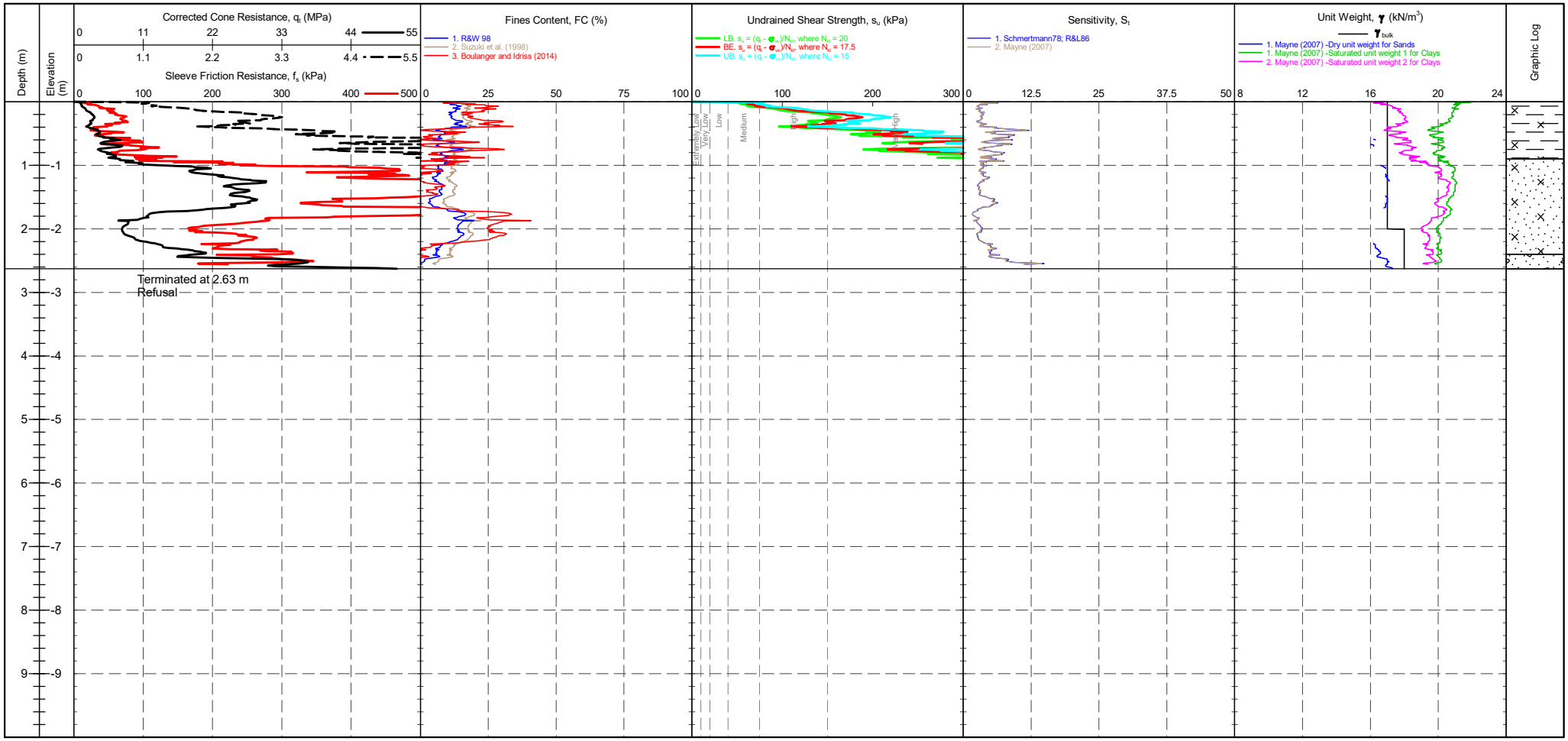
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 03

PointID **CPT102**

CLIENT : Curtins PROJECT : Proposed LIDL LOCATION : Cross Keys Hoyland PROJECT No. : 1210518	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 26/10/2021 PLOT DATE : 29/10/2021 METHOD : ISO 22476-1:2012



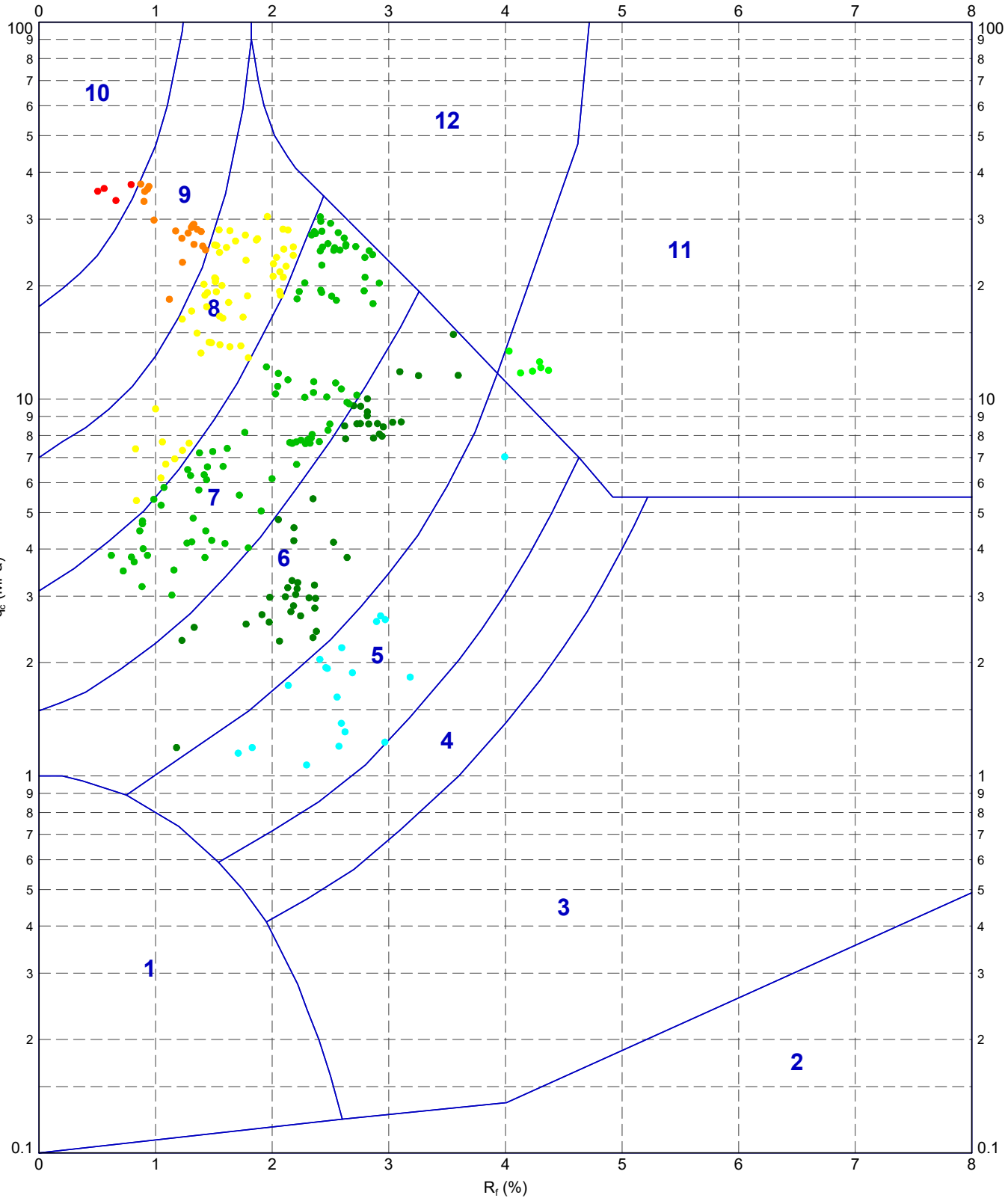
CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe	Tip	316 mV	319 mV	0.033 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: DHo	Sleeve	269 mV	271 mV	0.001 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	178 mV	157 mV	-0.005 kPa
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold	X-Y Inclinometer	2600 mV	2585 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT102

DRAWN	DATE 29/10/2021
CHECKED	DATE 29/10/2021
SCALE Not To Scale	A4
PROJECT No 1210518	FIGURE No

210713-ADVANCED REPORT INSITUSI 2.02.1.LIB - LUISA.GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF A4P 1210518-PROPOSED LIDL.GPJ <<DrawingFile>> 29/10/2021 16:15 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Pfj: In Situ SI 2.02.0 2017-07-10

IN SITU SITE INVESTIGATION

Working with: Curtins

CPT LOG 01

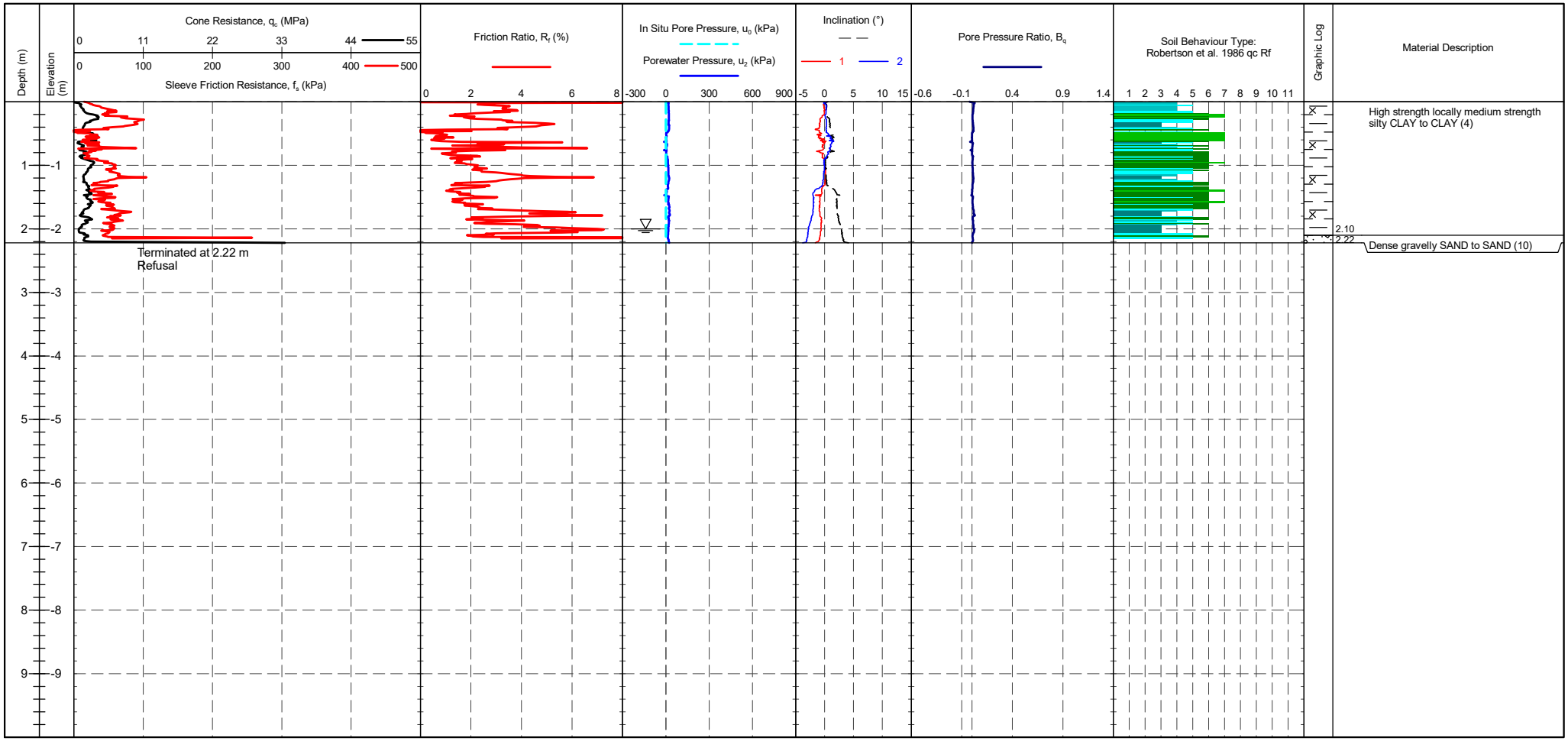
PointID: **CPT103**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 27/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2
CALIBRATION DATE	: 05/03/2021	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 006 - Zoe
CONE AREA	: 15cm^2	OPERATOR	: DB
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Overcast & Mild
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	324 mV	325 mV	0.011 MPa
Sleeve	270 mV	273 mV	0.002 kPa
Pore Pressure 2	178 mV	203 mV	0.006 kPa
X-Y Inclinometer	2579 mV	2533 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

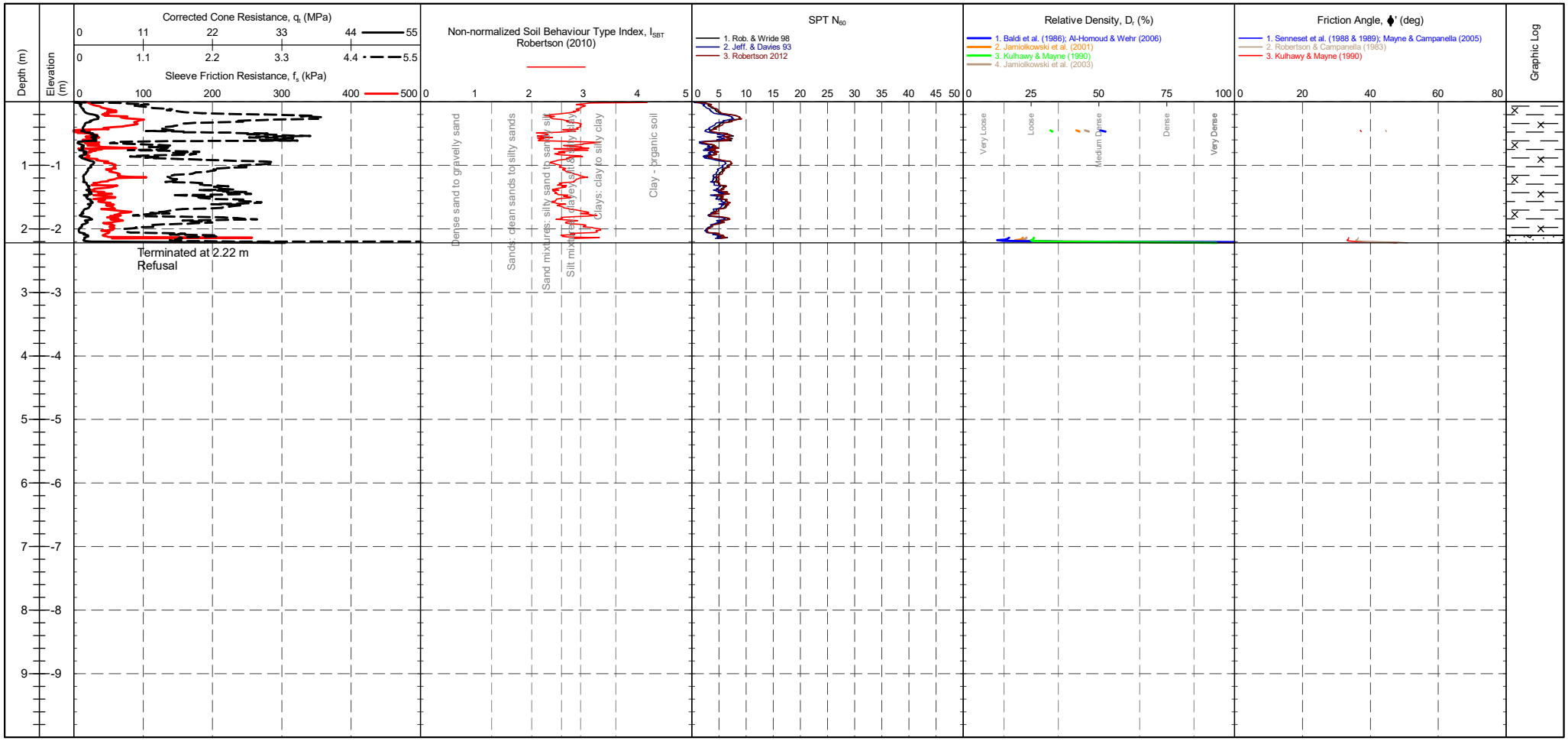
PointID **CPT103**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 27/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2		
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe		
CONE AREA RATIO	: 0.79	OPERATOR	: DB		
FILTER POSITION	: u2	FRICTION REDUCER	: None		
FILTER TYPE	: HDPE	WEATHER	: Overcast & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	324 mV	325 mV	0.011 MPa
Sleeve	270 mV	273 mV	0.002 kPa
Pore Pressure 2	178 mV	203 mV	0.006 kPa
X-Y Inclinometer	2579 mV	2533 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

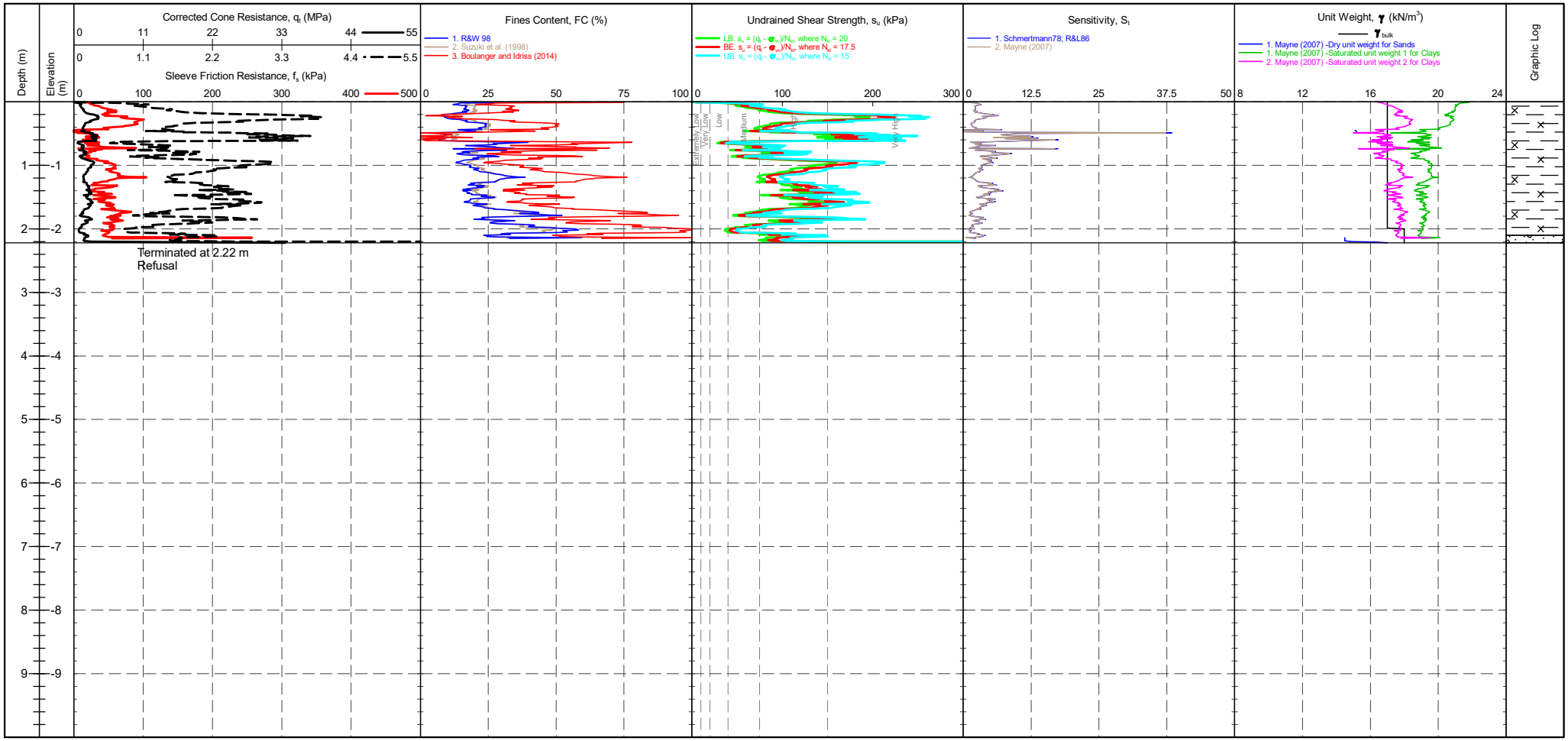
Dissipation Test

CPT LOG 03

IN SITU SITE INVESTIGATION Working with: Curtins

PointID: **CPT103**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 27/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2		
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe		
CONE AREA RATIO	: 0.79	OPERATOR	: DB		
FILTER POSITION	: u2	FRICTION REDUCER	: None		
FILTER TYPE	: HDPE	WEATHER	: Overcast & Mild		

CPTU ZERO VALUES

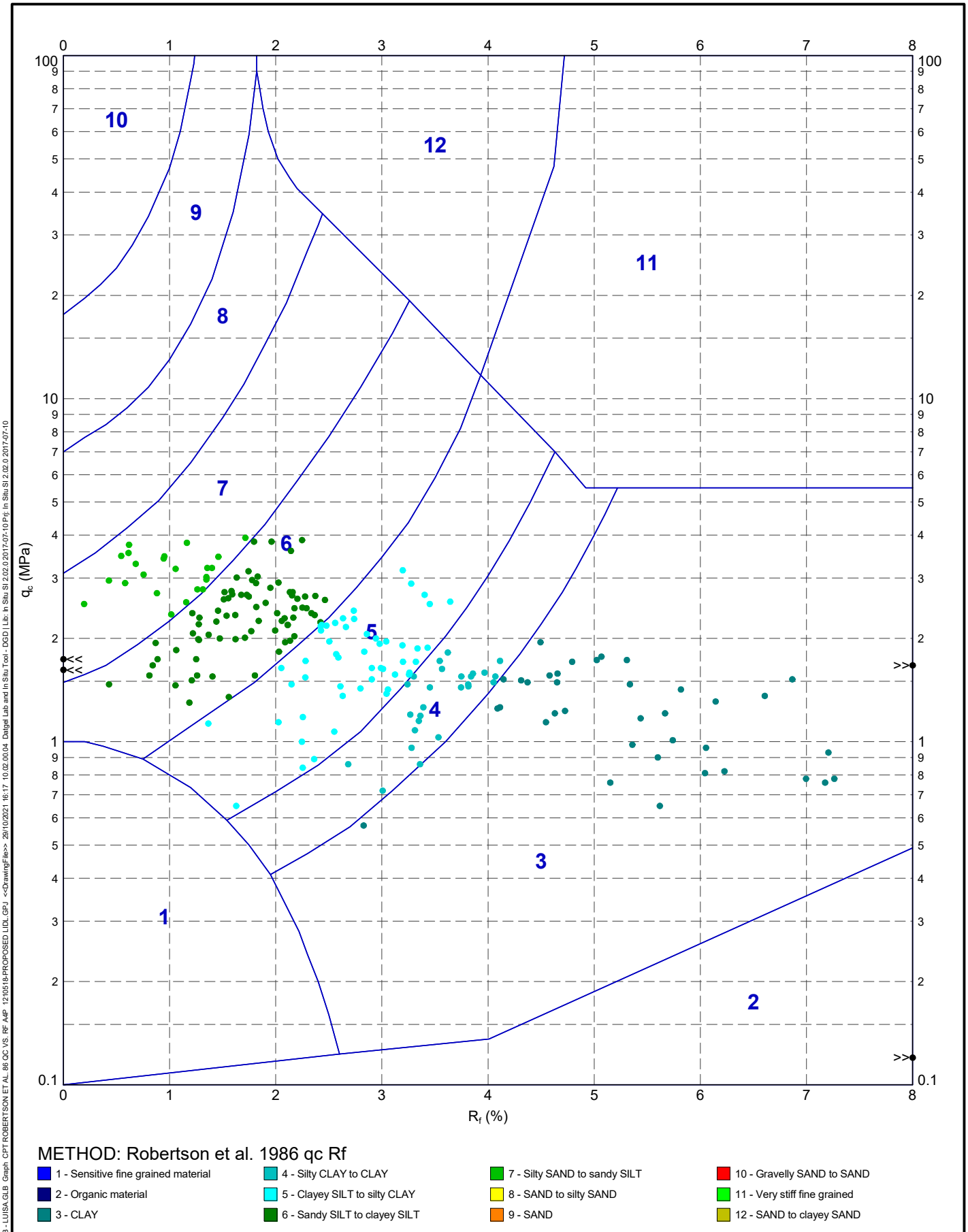
Transducer	Pre	Post	Difference
Tip	324 mV	325 mV	0.011 MPa
Sleeve	270 mV	273 mV	0.002 kPa
Pore Pressure 2	178 mV	203 mV	0.006 kPa
X-Y Inclinometer	2579 mV	2533 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT103

DRAWN	DATE 29/10/2021
CHECKED	DATE 29/10/2021
SCALE Not To Scale	A4
PROJECT No 1210518	FIGURE No

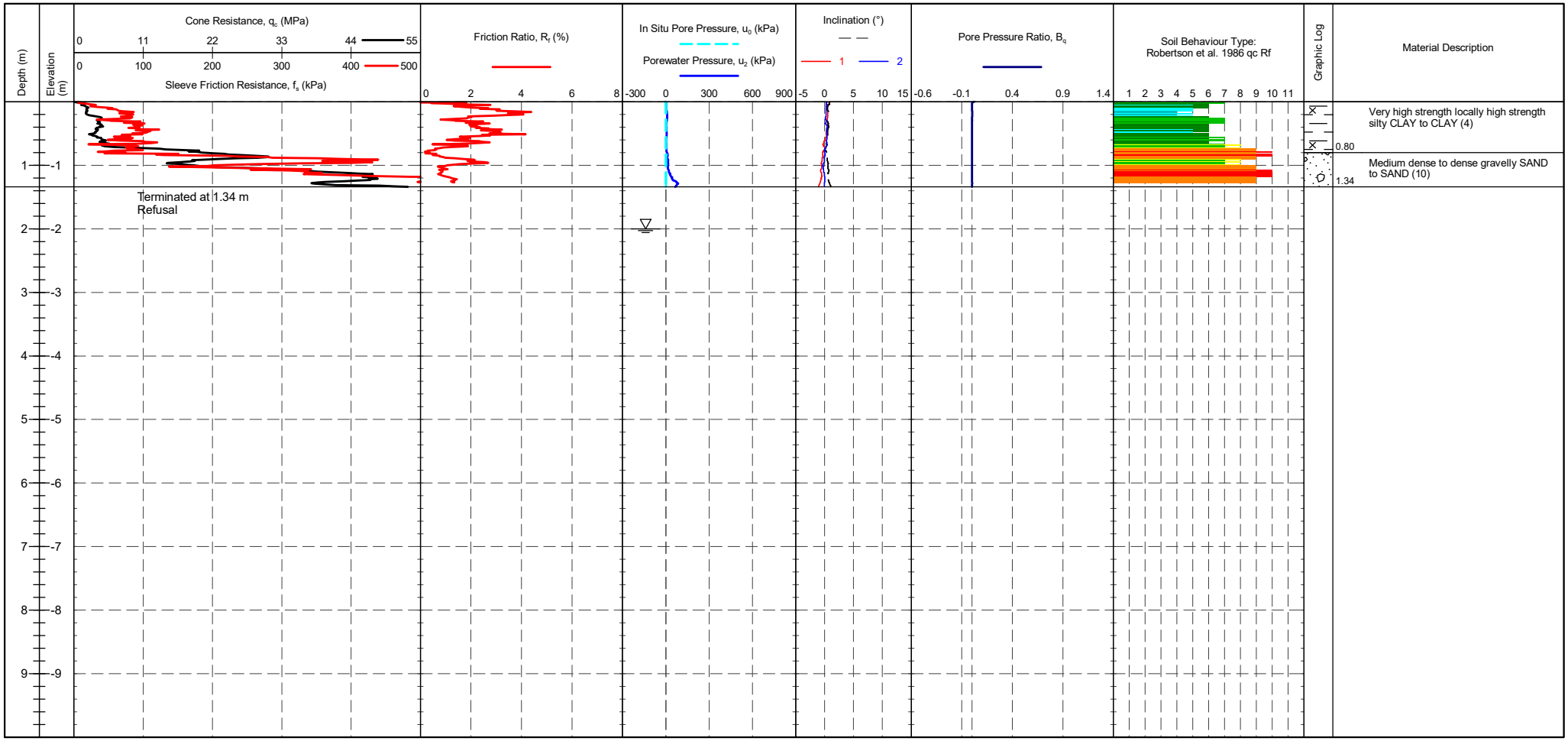
210713-ADVANCED REPORT INSITUSI 2.02.1.LIB - LUISA.GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF A4P 1210518-PROPOSED LIDL.GPJ <<DrawingFile>> 29/10/2021 16:17 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Pfj: In Situ SI 2.02.0 2017-07-10

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 01

PointID: **CPT104**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 26/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CALIBRATION DATE	: 05/03/2021	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE MODEL	: Subtraction	RIG	: CPT 006 - Zoe	Tip	313 mV	317 mV	0.044 MPa
CONE AREA	: 15cm^2	OPERATOR	: DHo	Sleeve	265 mV	270 mV	0.004 kPa
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None	Pore Pressure 2	146 mV	162 mV	0.004 kPa
FILTER POSITION	: u2	WEATHER	: Overcast & Cold	X-Y Inclinometer	2605 mV	2609 mV	
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes				

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

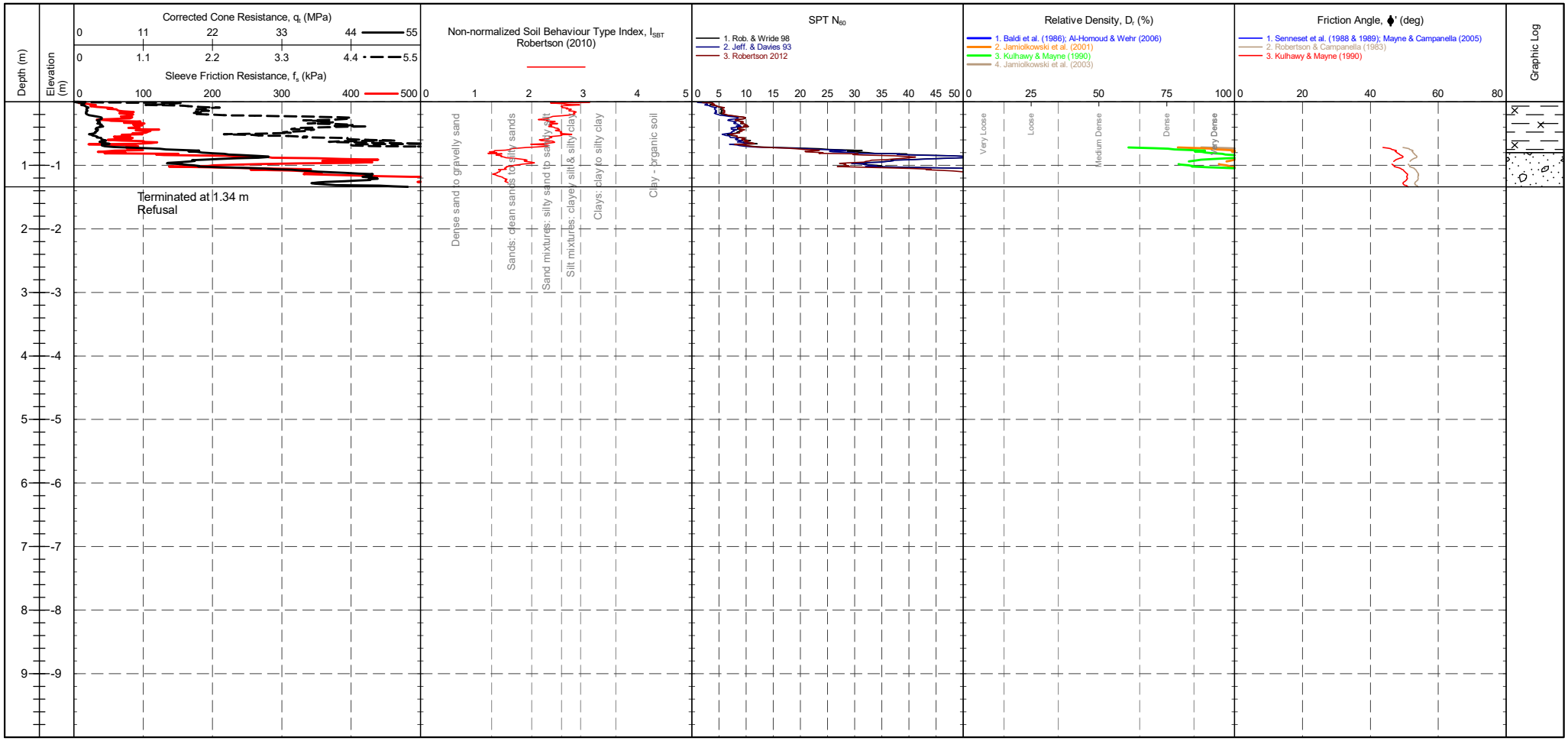
PointID **CPT104**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 26/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2		
CONE AREA	: 15cm²	RIG	: CPT 006 - Zoe		
CONE AREA RATIO	: 0.79	OPERATOR	: DHo		
FILTER POSITION	: u2	FRICTION REDUCER	: None		
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold		

CPTU ZERO VALUES

	Pre	Post	Difference
Transducer			
Tip	313 mV	317 mV	0.044 MPa
Sleeve	265 mV	270 mV	0.004 kPa
Pore Pressure 2	146 mV	162 mV	0.004 kPa
X-Y Inclinometer	2605 mV	2609 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

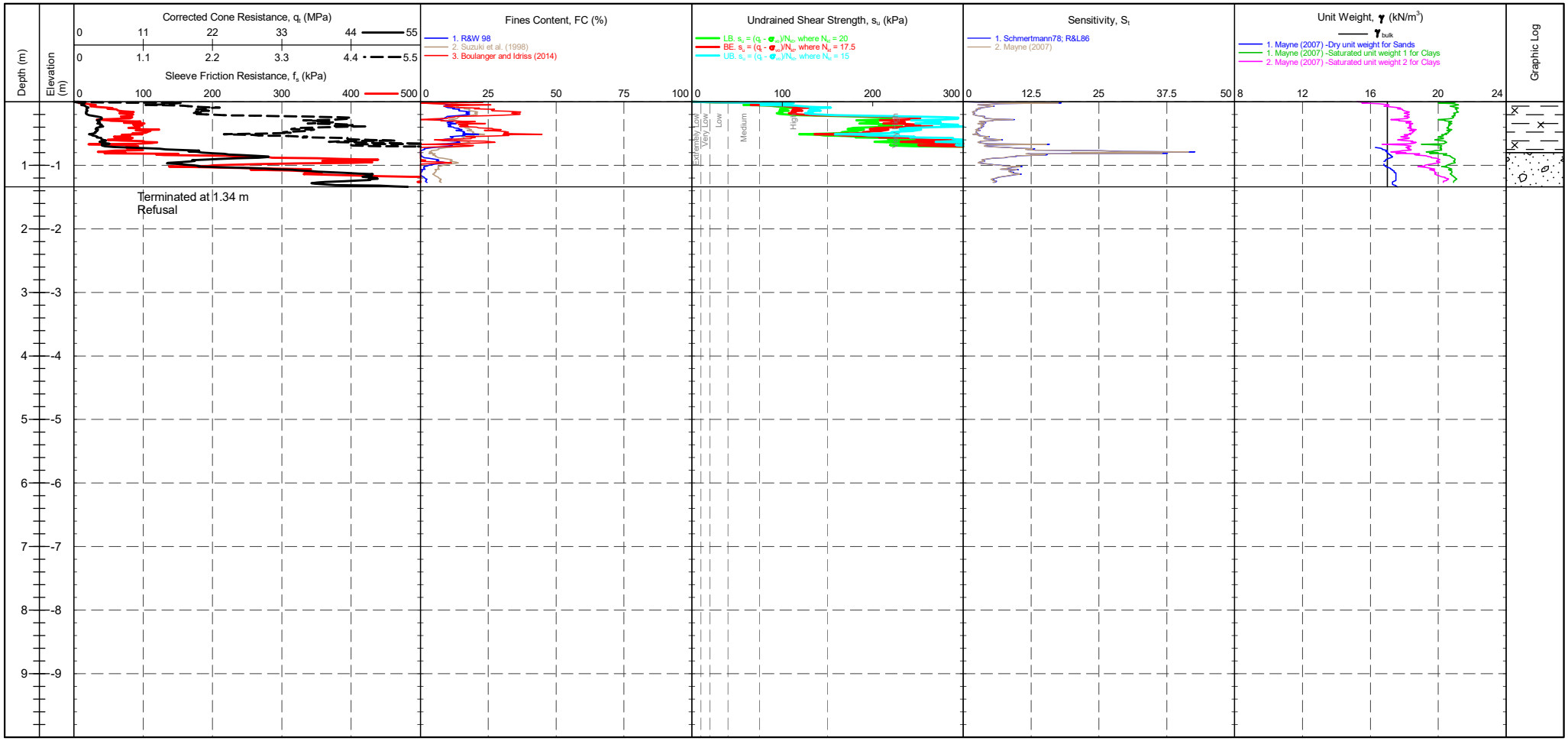
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 03

PointID **CPT104**

CLIENT : Curtins PROJECT : Proposed LIDL LOCATION : Cross Keys Hoyland PROJECT No. : 1210518	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 26/10/2021 PLOT DATE : 29/10/2021 METHOD : ISO 22476-1:2012



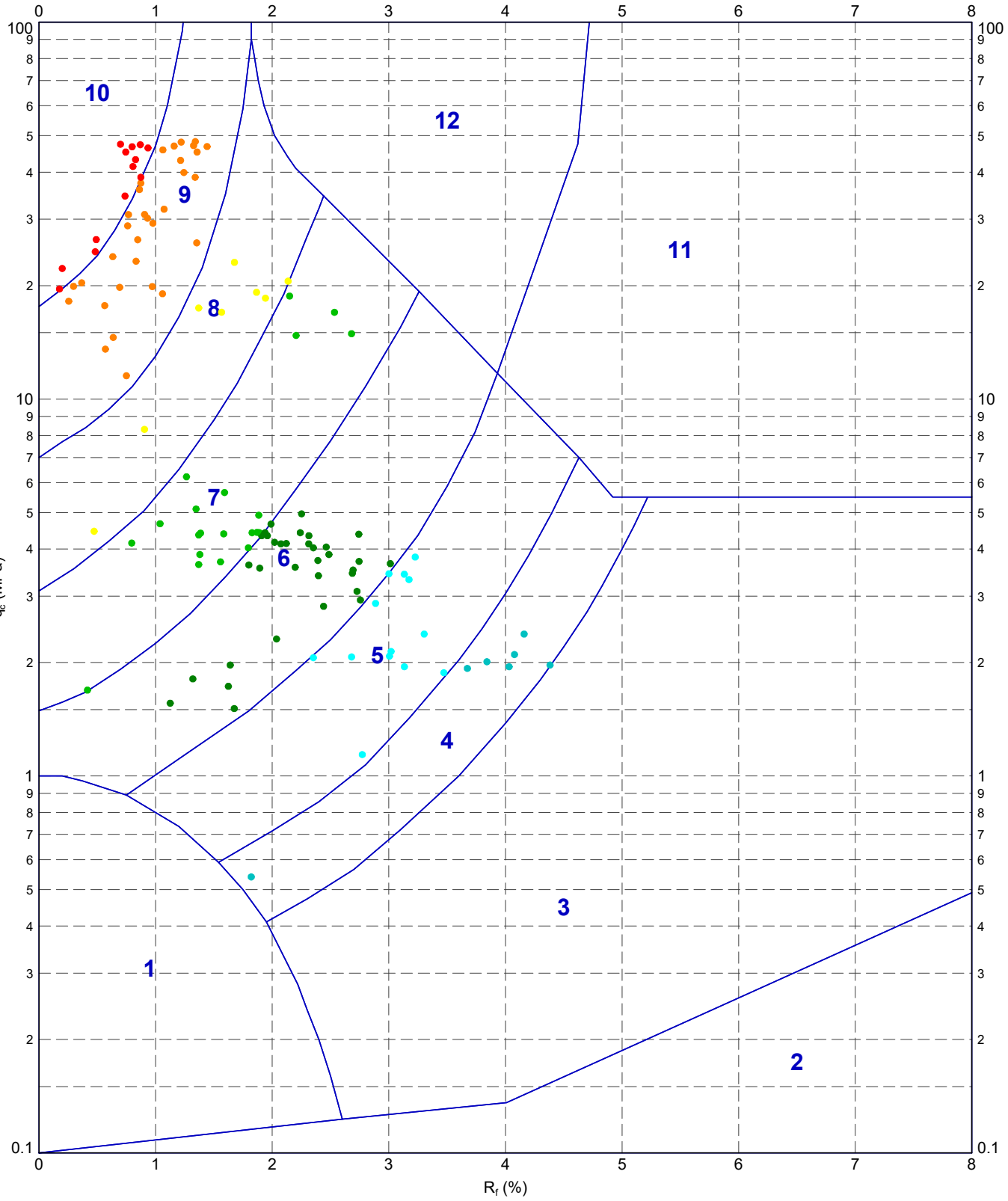
CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe	Tip	313 mV	317 mV	0.044 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: DHo	Sleeve	265 mV	270 mV	0.004 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	146 mV	162 mV	0.004 kPa
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold	X-Y Inclinometer	2605 mV	2609 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	4 - Silty CLAY to CLAY	7 - Silty SAND to sandy SILT	10 - Gravelly SAND to SAND
2 - Organic material	5 - Clayey SILT to silty CLAY	8 - SAND to silty SAND	11 - Very stiff fine grained
3 - CLAY	6 - Sandy SILT to clayey SILT	9 - SAND	12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT104

DRAWN	DATE 29/10/2021	
CHECKED	DATE 29/10/2021	
SCALE Not To Scale		A4
PROJECT No 1210518	FIGURE No	

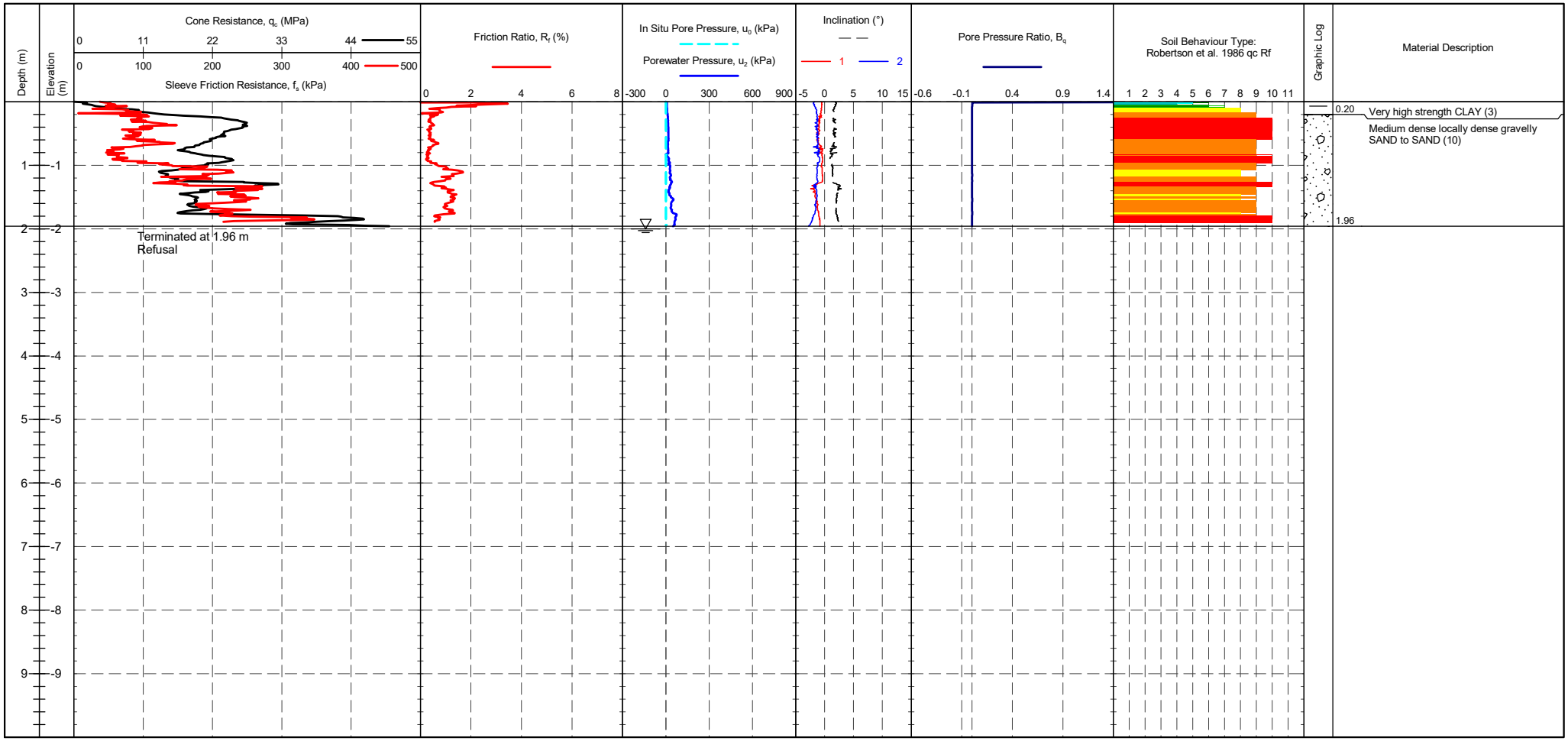
210713-ADVANCED REPORT INSITUSI 2.02.1.LIB - LUISA.GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF A4P 1210518-PROPOSED LIDL.GPJ <<DrawingFile>> 29/10/2021 16:18 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Pfj: In Situ SI 2.02.0 2017-07-10

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 01

PointID: **CPT104A**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 26/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CALIBRATION DATE	: 05/03/2021	APPLICATION CLASS	: 2		
CONE MODEL	: Subtraction	RIG	: CPT 006 - Zoe		
CONE AREA	: 15cm^2	OPERATOR	: DHo		
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None		
FILTER POSITION	: u2	WEATHER	: Overcast & Cold		
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	317 mV	319 mV	0.022 MPa
Sleeve	268 mV	270 mV	0.001 kPa
Pore Pressure 2	159 mV	152 mV	-0.002 kPa
X-Y Inclinometer	2462 mV	2471 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

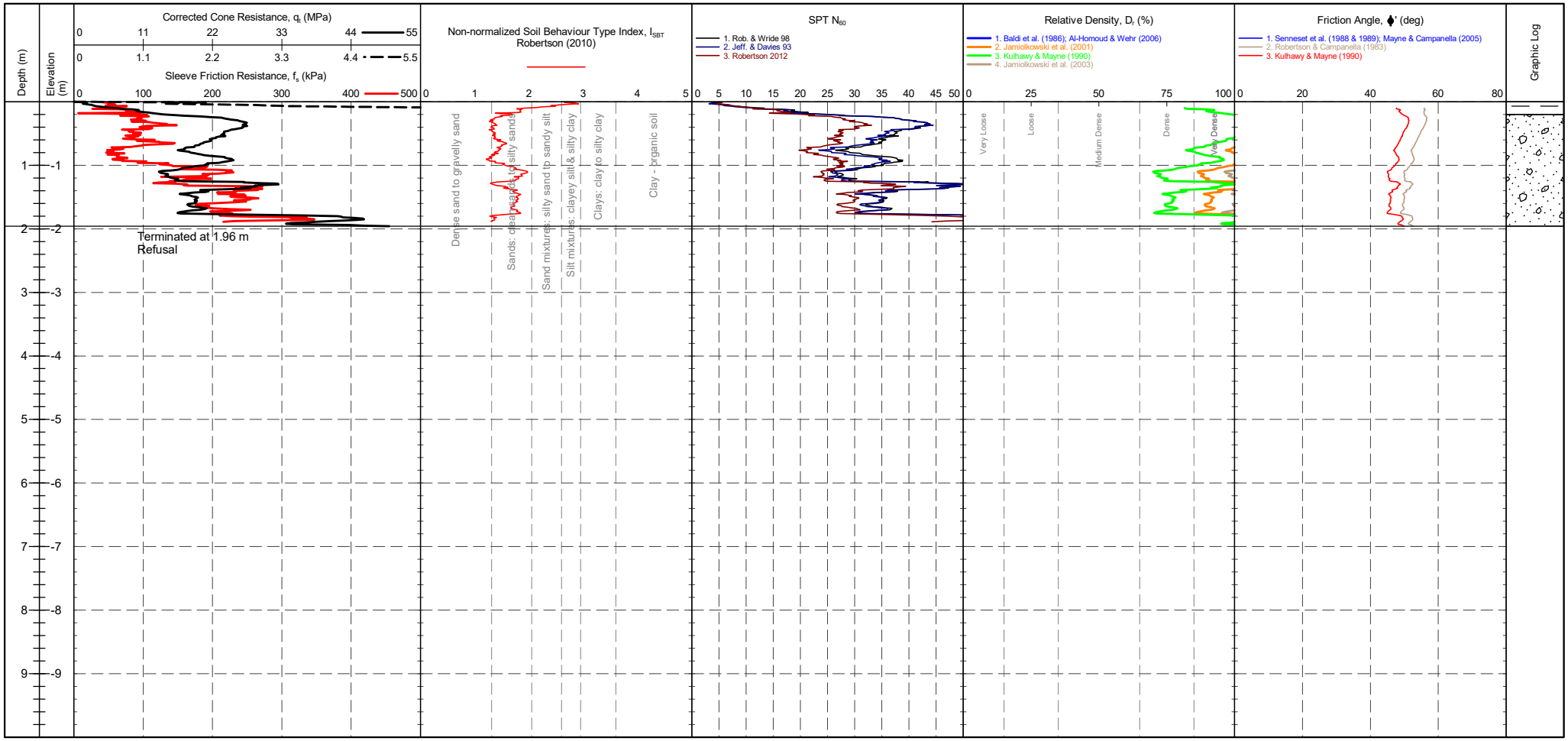
PointID **CPT104A**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 26/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2		
CONE AREA	: 15cm²	RIG	: CPT 006 - Zoe		
CONE AREA RATIO	: 0.79	OPERATOR	: DHo		
FILTER POSITION	: u2	FRICTION REDUCER	: None		
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold		

CPTU ZERO VALUES

	Pre	Post	Difference
Transducer			
Tip	317 mV	319 mV	0.022 MPa
Sleeve	268 mV	270 mV	0.001 kPa
Pore Pressure 2	159 mV	152 mV	-0.002 kPa
X-Y Inclinometer	2462 mV	2471 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

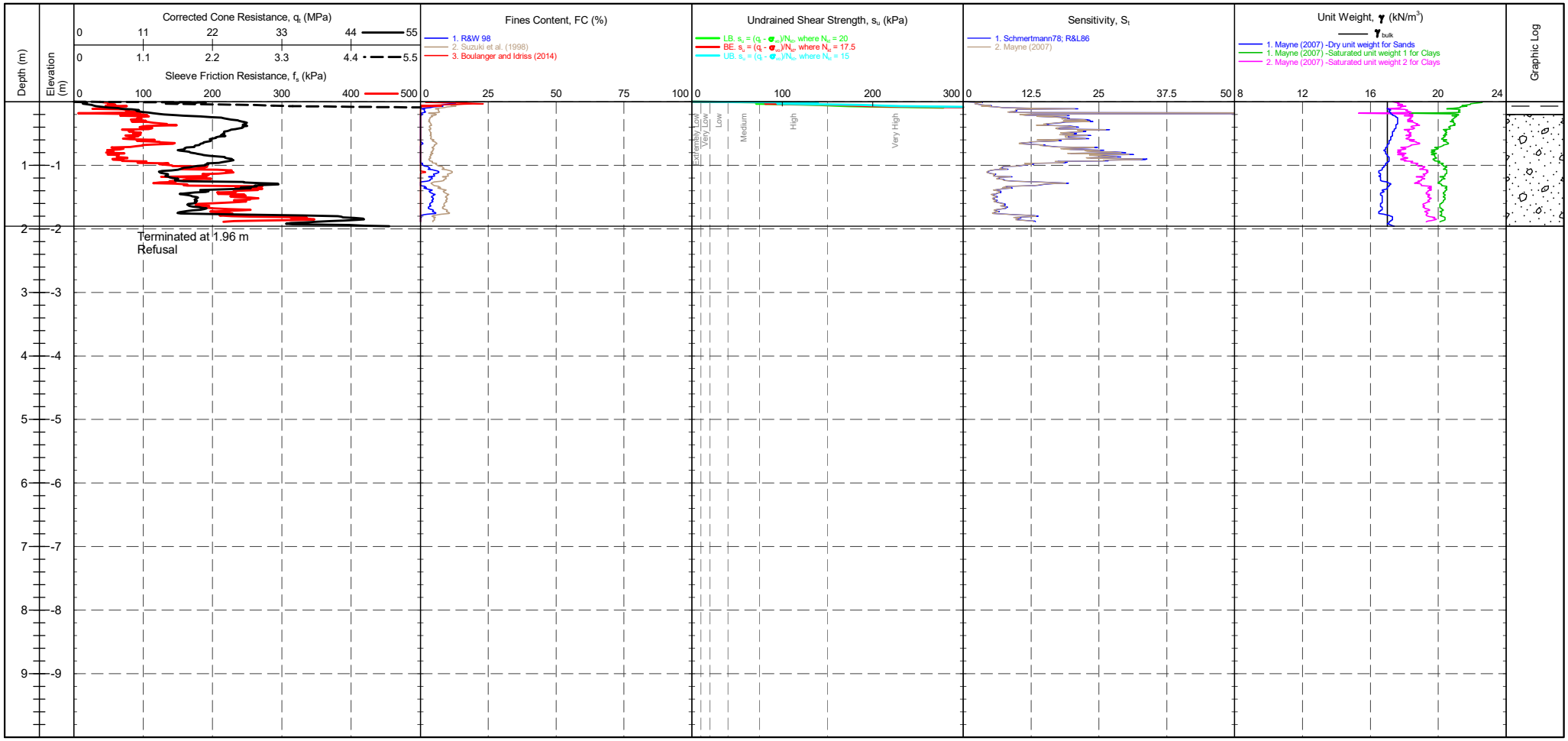
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 03

PointID **CPT104A**

CLIENT : Curtins PROJECT : Proposed LIDL LOCATION : Cross Keys Hoyland PROJECT No. : 1210518	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 26/10/2021 PLOT DATE : 29/10/2021 METHOD : ISO 22476-1:2012



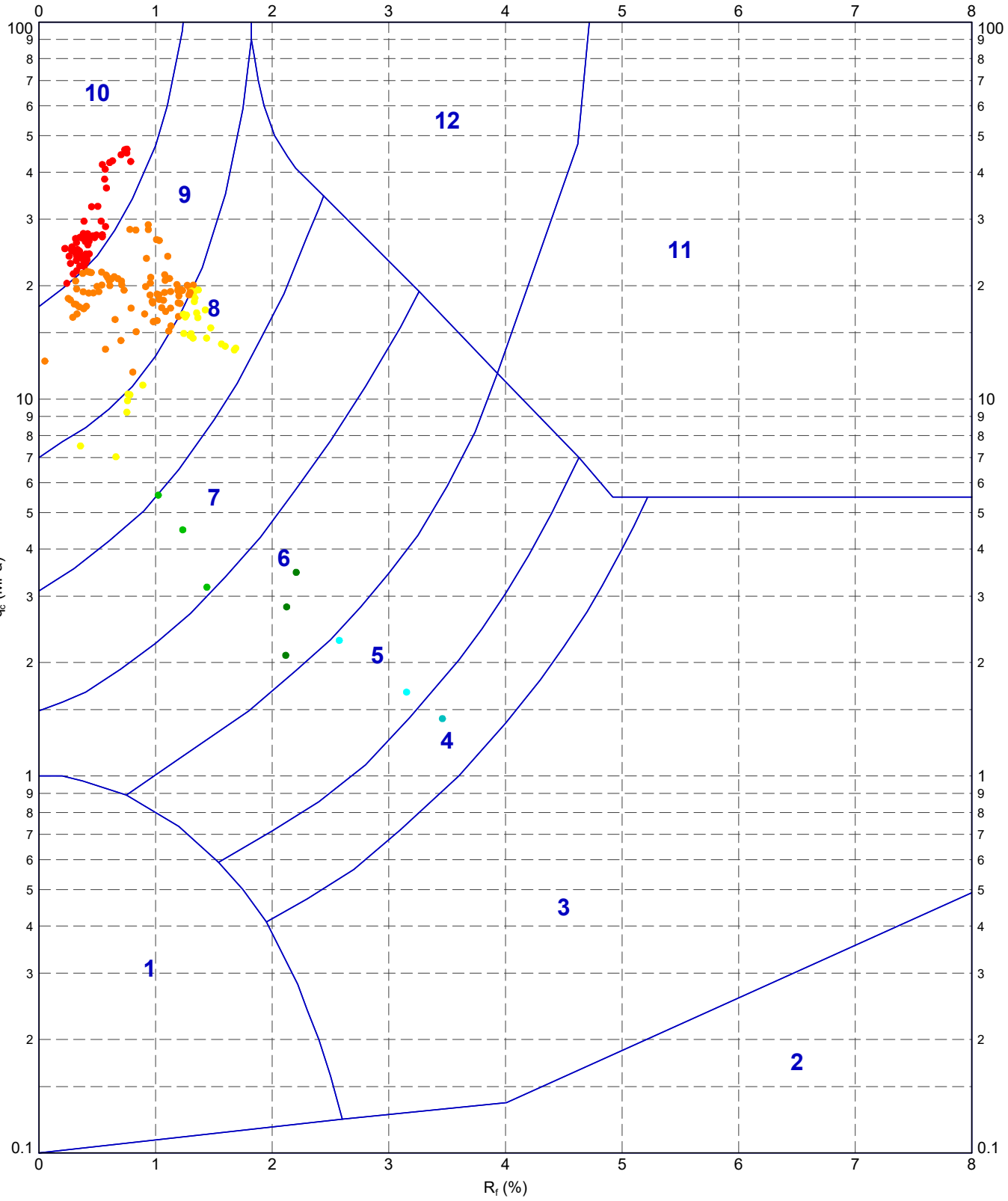
CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe	Tip	317 mV	319 mV	0.022 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: DHo	Sleeve	268 mV	270 mV	0.001 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	159 mV	152 mV	-0.002 kPa
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold	X-Y Inclinometer	2462 mV	2471 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT104A

DRAWN	DATE 29/10/2021
CHECKED	DATE 29/10/2021
SCALE Not To Scale	A4
PROJECT No 1210518	FIGURE No

210713-ADVANCED REPORT INSITUSI 2.02.1.LIB - LUISA.GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF A4P 1210518-PROPOSED LIDL.GPJ <<DrawingFile>> 29/10/2021 16:19 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Pfj: In Situ SI 2.02.0 2017-07-10

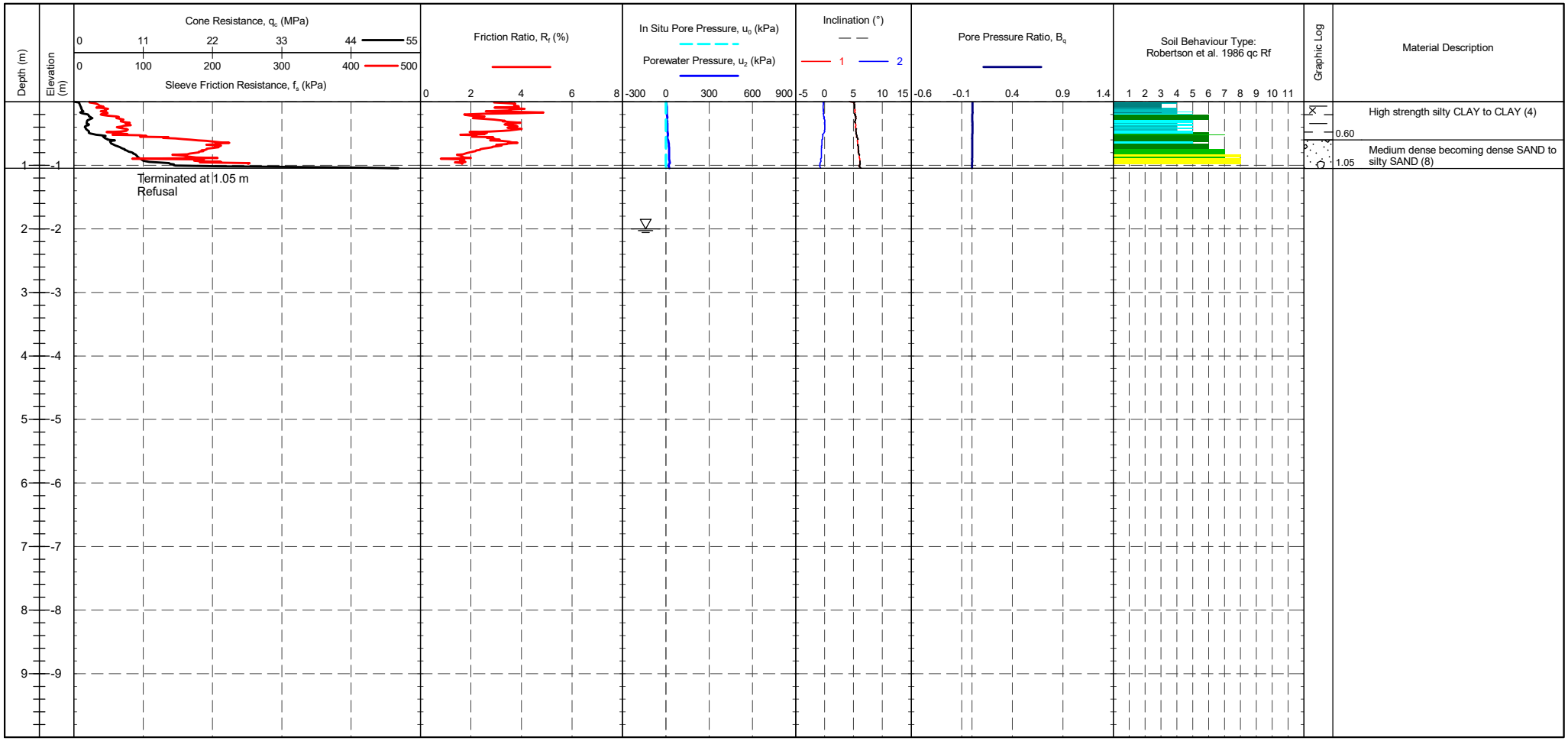
IN SITU SITE INVESTIGATION

Working with: Curtins

CPT LOG 01

PointID: **CPT105**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 26/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2
CALIBRATION DATE	: 05/03/2021	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 006 - Zoe
CONE AREA	: 15cm^2	OPERATOR	: DHo
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Overcast & Cold
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	323 mV	323 mV	0 MPa
Sleeve	273 mV	315 mV	0.03 kPa
Pore Pressure 2	190 mV	206 mV	0.004 kPa
X-Y Inclinometer	2960 mV	3109 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

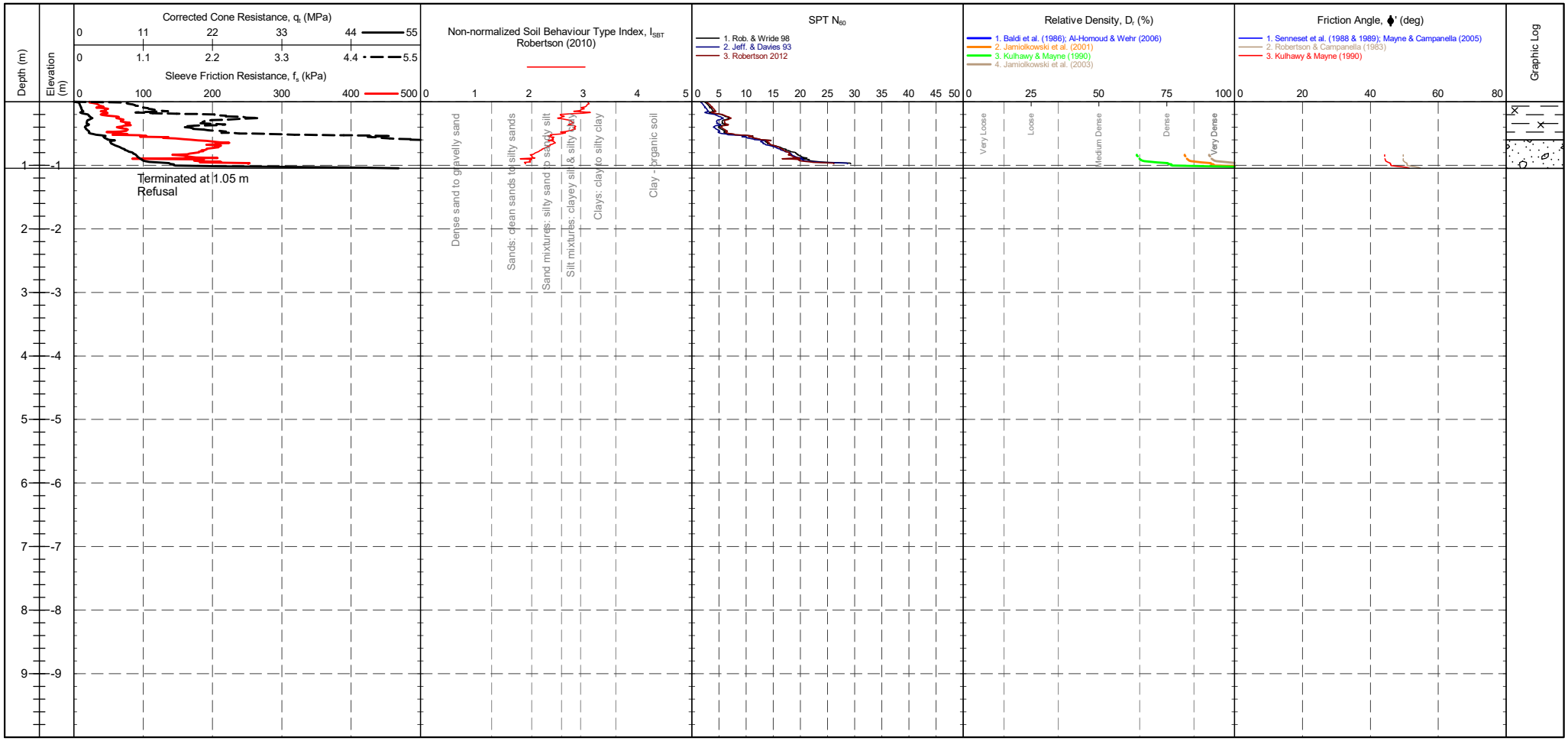
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

PointID: **CPT105**

CLIENT : Curtins PROJECT : Proposed LIDL LOCATION : Cross Keys Hoyland PROJECT No. : 1210518	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 26/10/2021 PLOT DATE : 29/10/2021 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1867 CONE MODEL : Subtraction CONE AREA : 15cm² CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 006 - Zoe OPERATOR : DHo FRICTION REDUCER : None WEATHER : Overcast & Cold	CPTU ZERO VALUES		
		Transducer	Pre	Post / Difference
		Tip	323 mV	323 mV / 0 MPa
		Sleeve	273 mV	315 mV / 0.03 kPa
		Pore Pressure 2	190 mV	206 mV / 0.004 kPa
		X-Y Inclinometer	2960 mV	3109 mV

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

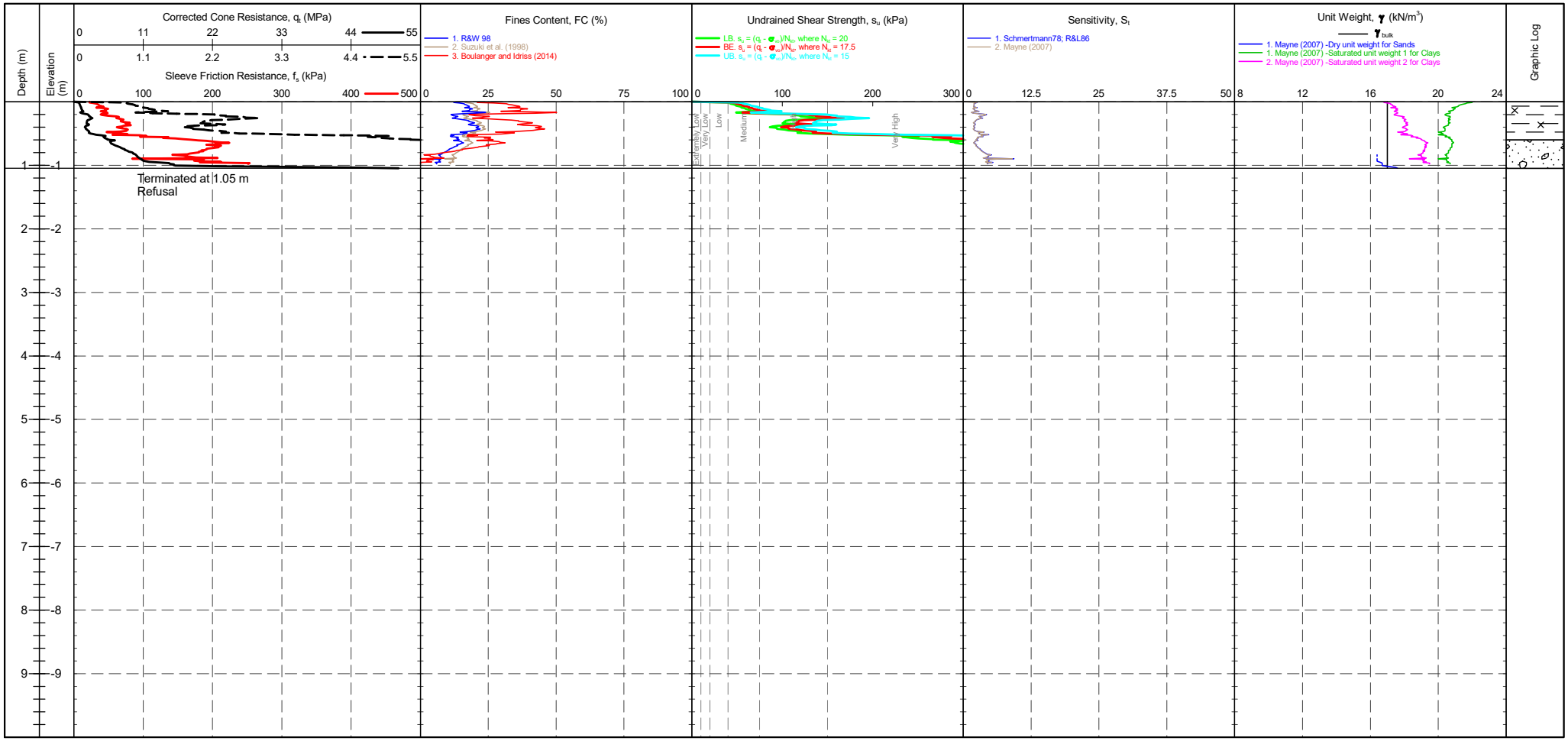
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 03

PointID: **CPT105**

CLIENT : Curtins PROJECT : Proposed LIDL LOCATION : Cross Keys Hoyland PROJECT No. : 1210518	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 26/10/2021 PLOT DATE : 29/10/2021 METHOD : ISO 22476-1:2012



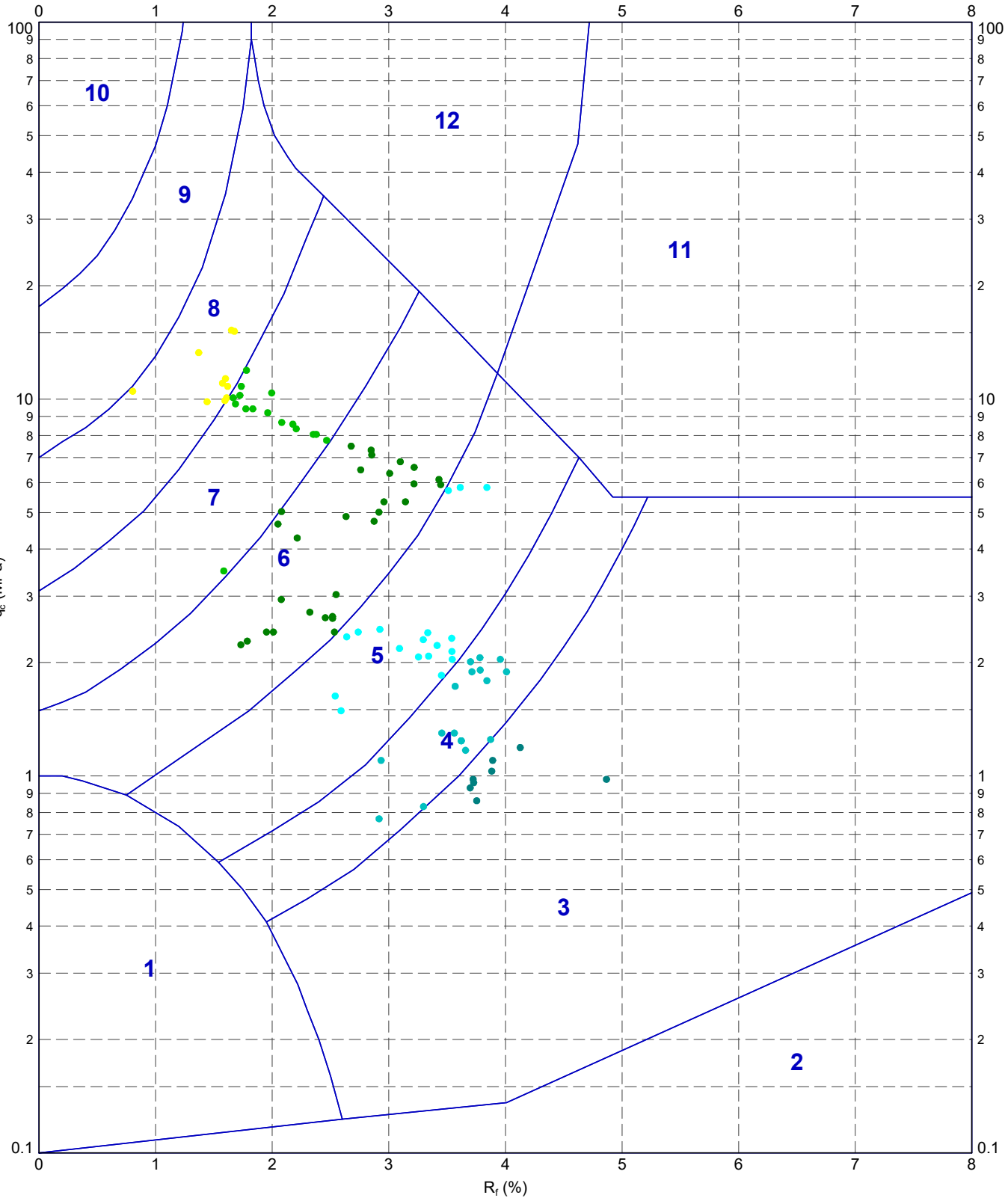
CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe	Tip	323 mV	323 mV	0 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: DHo	Sleeve	273 mV	315 mV	0.03 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	190 mV	206 mV	0.004 kPa
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold	X-Y Inclinometer	2960 mV	3109 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT105

DRAWN	DATE 29/10/2021
CHECKED	DATE 29/10/2021
SCALE Not To Scale	A4
PROJECT No 1210518	FIGURE No

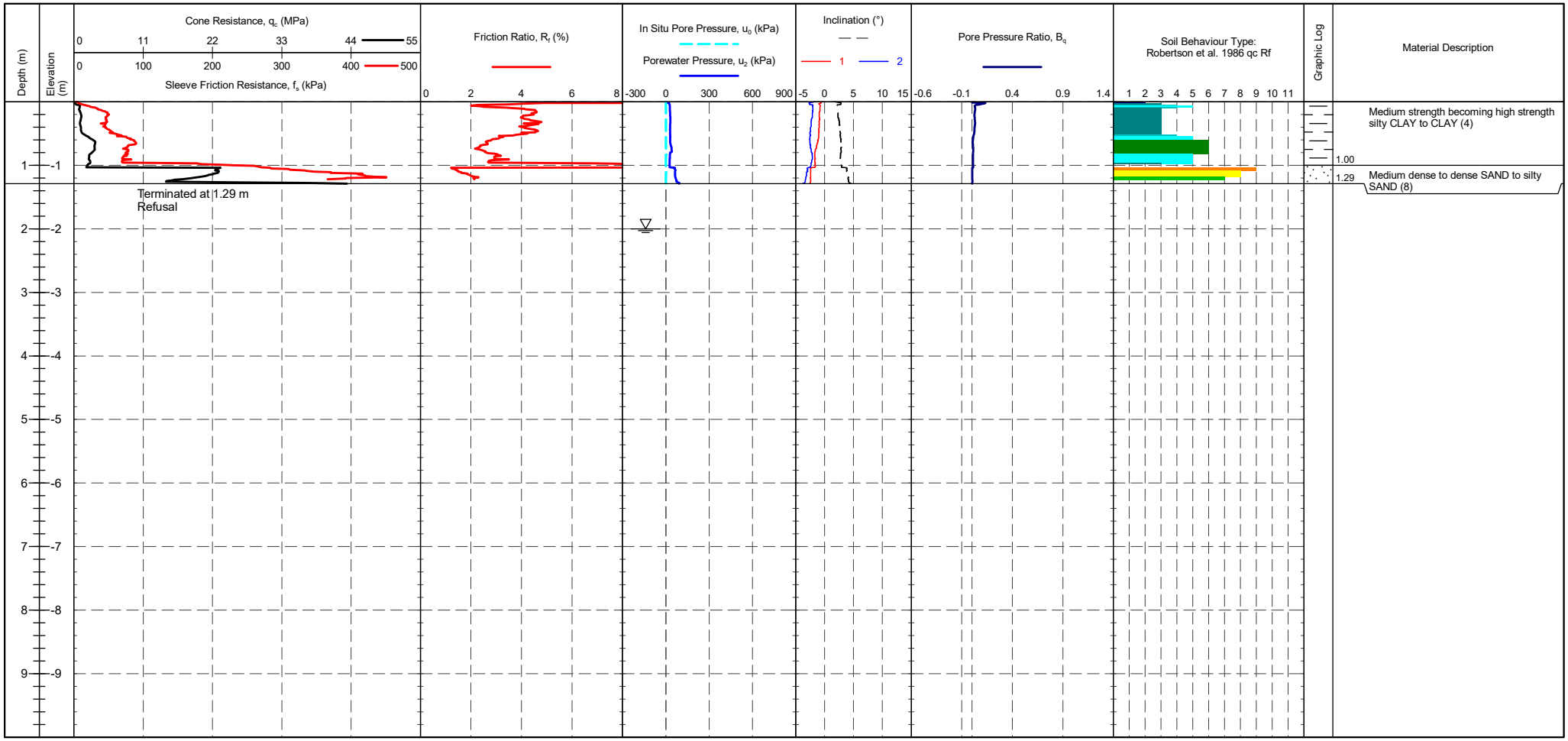
210713-ADVANCED REPORT INSITUSI 2.02.1.LIB - LUISA.GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF AAP 1210518-PROPOSED LIDL.GPJ <<DrawingFile>> 29/10/2021 16:21 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Pfj: In Situ SI 2.02.0 2017-07-10

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 01

PointID: **CPT106**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 27/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CALIBRATION DATE	: 05/03/2021	APPLICATION CLASS	: 2		
CONE MODEL	: Subtraction	RIG	: CPT 006 - Zoe		
CONE AREA	: 15cm^2	OPERATOR	: DB		
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None		
FILTER POSITION	: u2	WEATHER	: Overcast & Mild		
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	325 mV	327 mV	0.022 MPa
Sleeve	273 mV	274 mV	0.001 kPa
Pore Pressure 2	202 mV	190 mV	-0.003 kPa
X-Y Inclinometer	2478 mV	2359 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

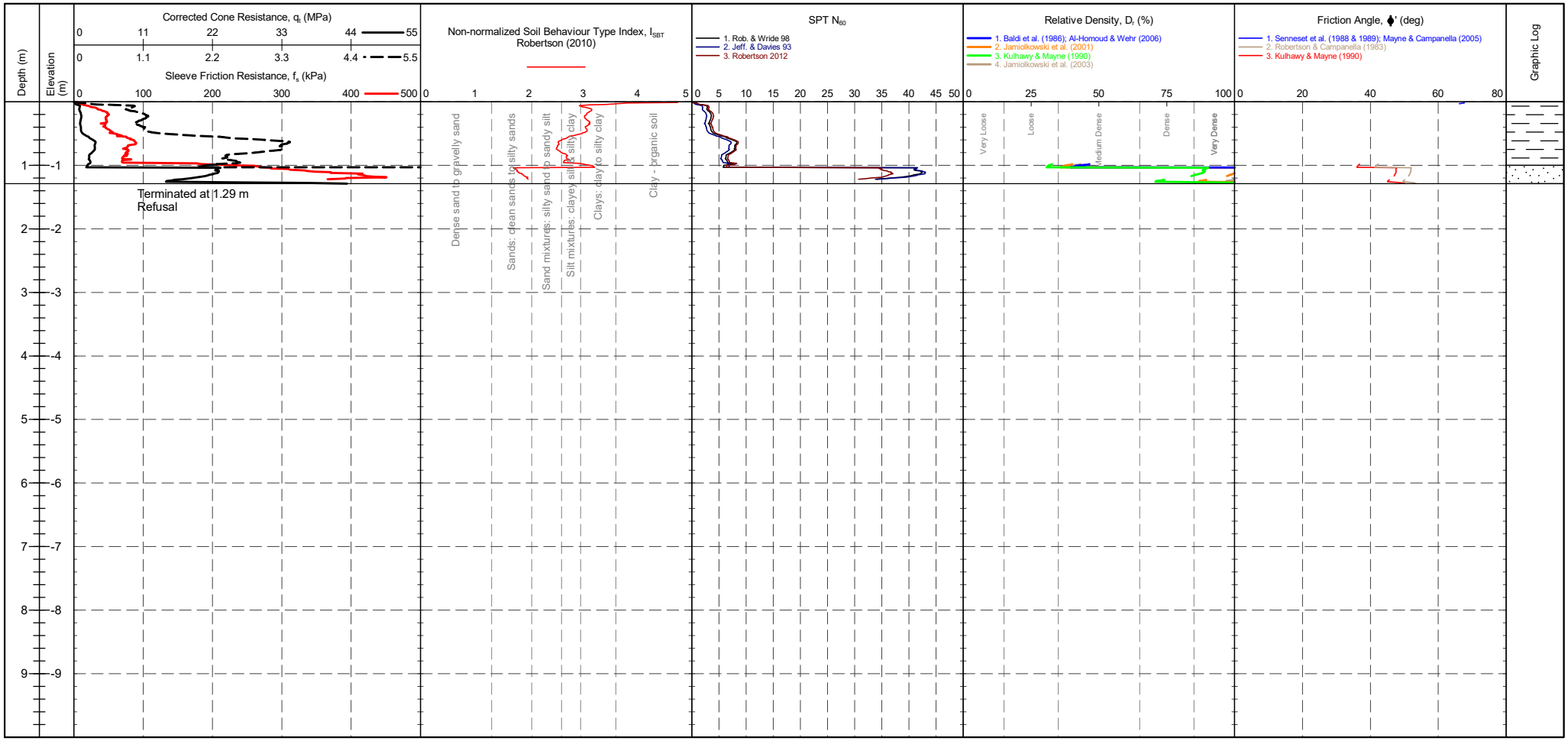
PointID: **CPT106**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 27/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867
CONE MODEL	: Subtraction
CONE AREA	: 15cm^2
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 006 - Zoe
OPERATOR	: DB
FRICTION REDUCER	: None
WEATHER	: Overcast & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	325 mV	327 mV	0.022 MPa
Sleeve	273 mV	274 mV	0.001 kPa
Pore Pressure 2	202 mV	190 mV	-0.003 kPa
X-Y Inclinometer	2478 mV	2359 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

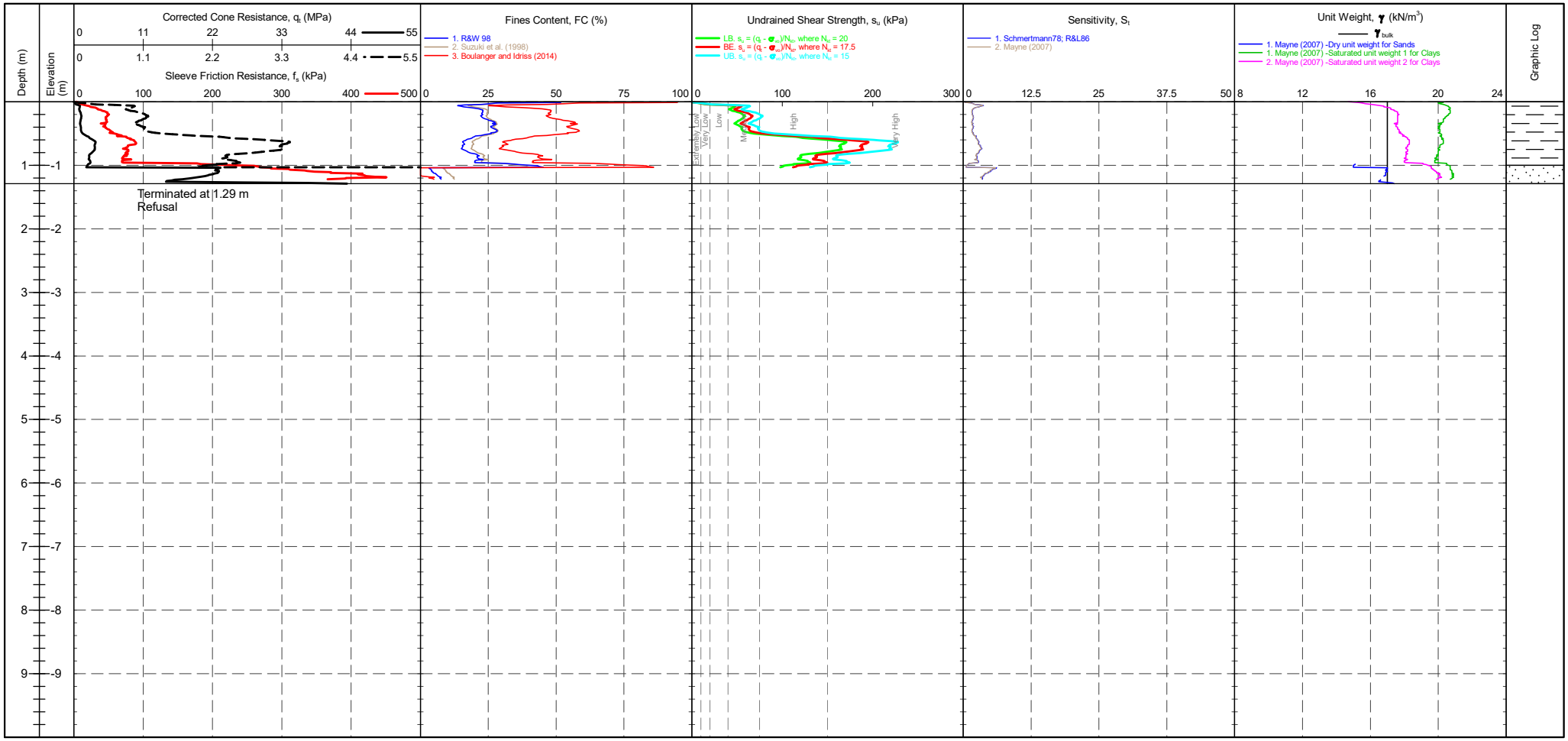
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 03

PointID: **CPT106**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 27/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



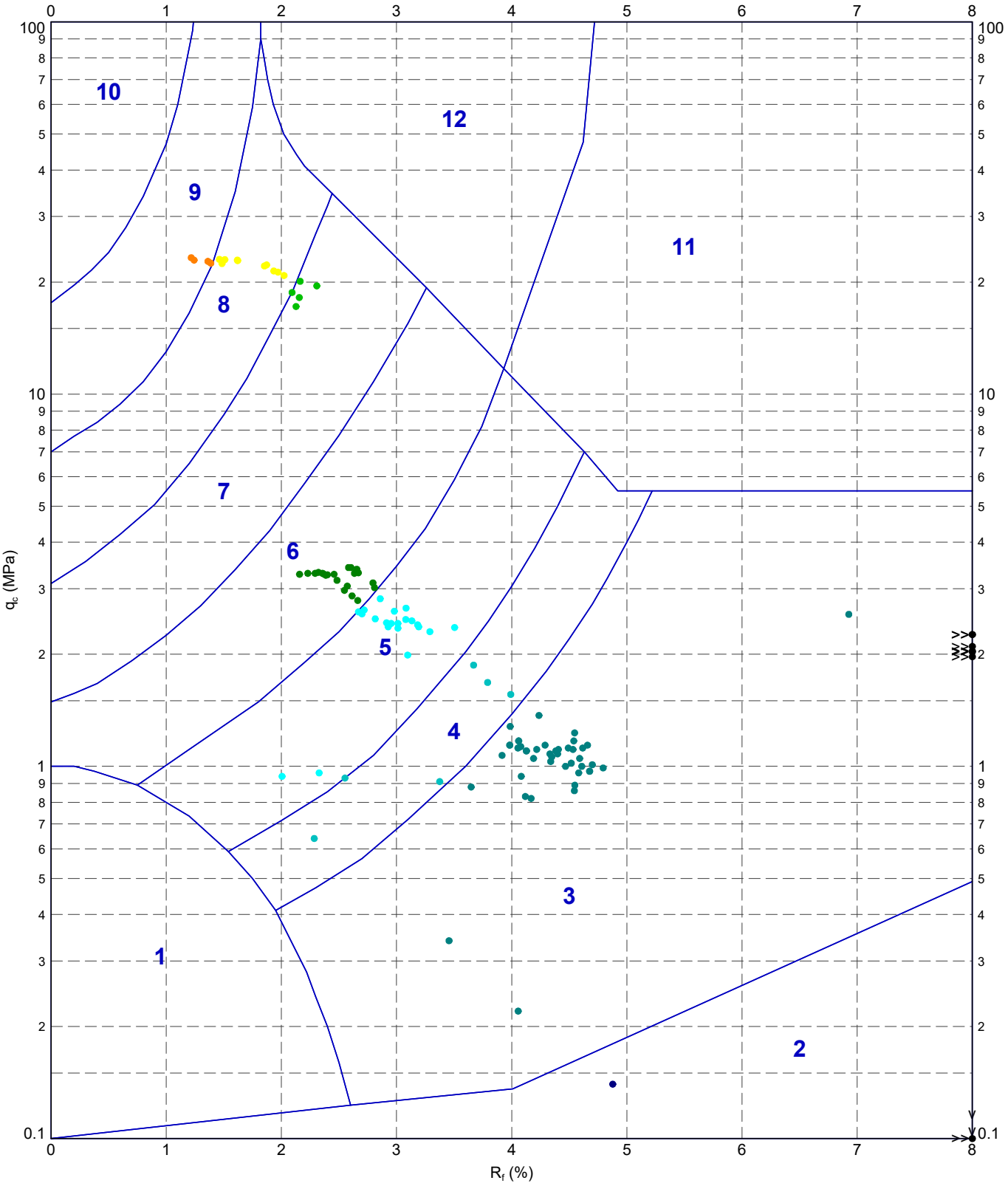
CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe	Tip	325 mV	327 mV	0.022 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: DB	Sleeve	273 mV	274 mV	0.001 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	202 mV	190 mV	-0.003 kPa
FILTER TYPE	: HDPE	WEATHER	: Overcast & Mild	X-Y Inclinometer	2478 mV	2359 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT106

DRAWN	DATE 29/10/2021
CHECKED	DATE 29/10/2021
SCALE Not To Scale	A4
PROJECT No 1210518	FIGURE No

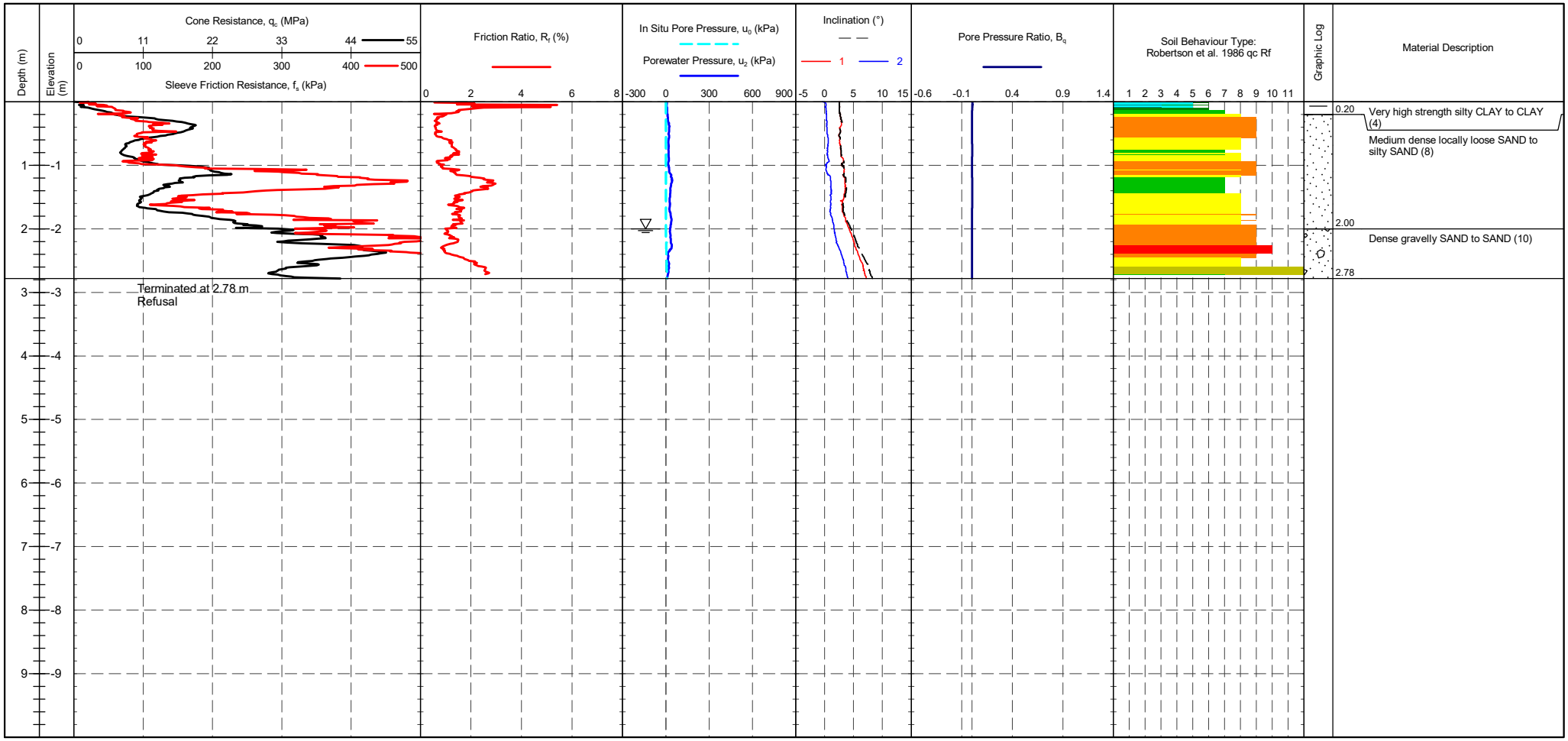
210713-ADVANCED REPORT INSITUSI 2.02.1.LIB - LUISA.GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF AAP 1210518-PROPOSED LIDL.GPJ <<DrawingFile>> 29/10/2021 16:22 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Pfj: In Situ SI 2.02.0 2017-07-10

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 01

PointID: **CPT107**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 26/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CALIBRATION DATE	: 05/03/2021	APPLICATION CLASS	: 2		
CONE MODEL	: Subtraction	RIG	: CPT 006 - Zoe		
CONE AREA	: 15cm^2	OPERATOR	: DHo		
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None		
FILTER POSITION	: u2	WEATHER	: Overcast & Cold		
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	320 mV	316 mV	-0.044 MPa
Sleeve	272 mV	265 mV	-0.005 kPa
Pore Pressure 2	195 mV	127 mV	-0.016 kPa
X-Y Inclinometer	2783 mV	2746 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

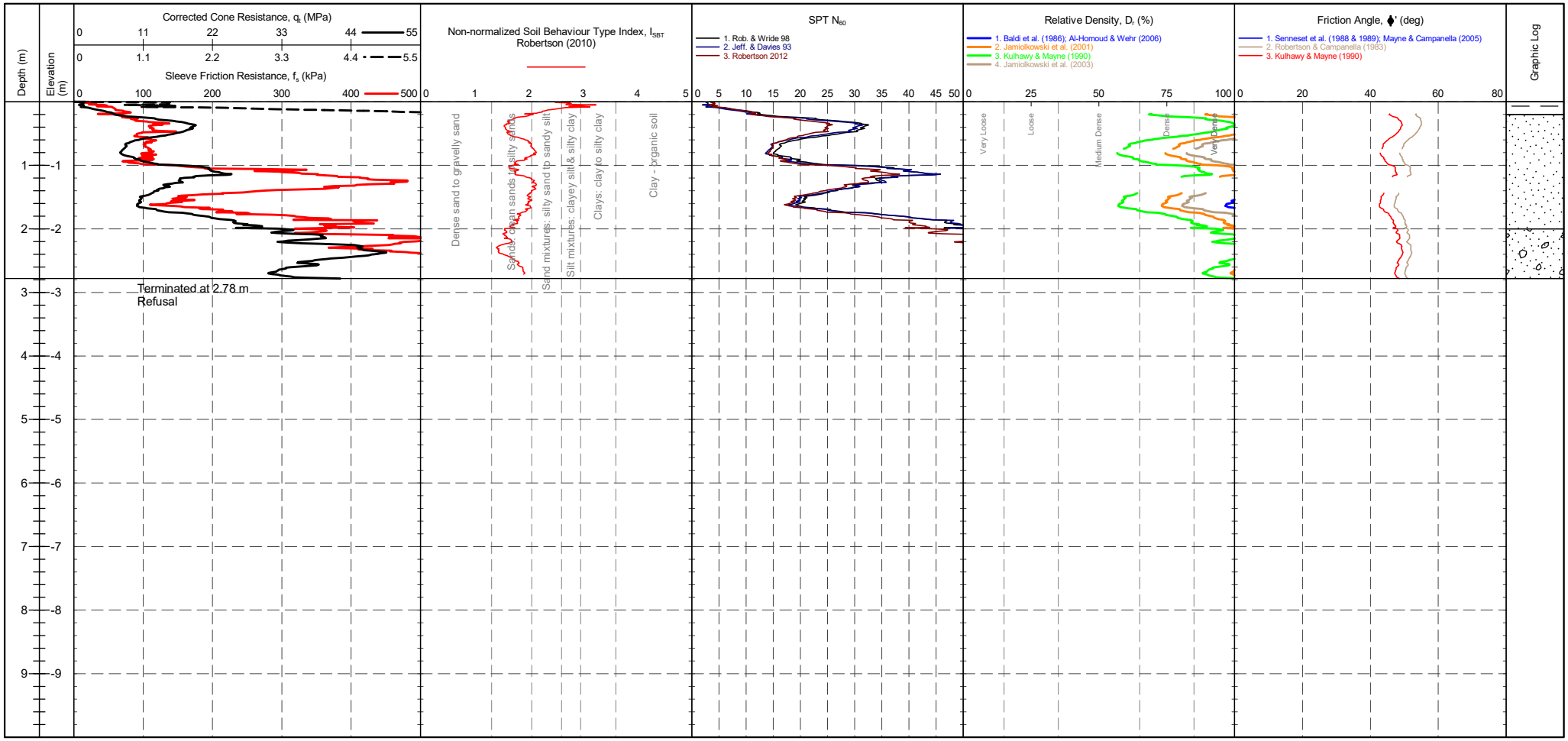
PointID **CPT107**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 26/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm²	RIG	: CPT 006 - Zoe
CONE AREA RATIO	: 0.79	OPERATOR	: DHo
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	320 mV	316 mV	-0.044 MPa
Sleeve	272 mV	265 mV	-0.005 kPa
Pore Pressure 2	195 mV	127 mV	-0.016 kPa
X-Y Inclinometer	2783 mV	2746 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

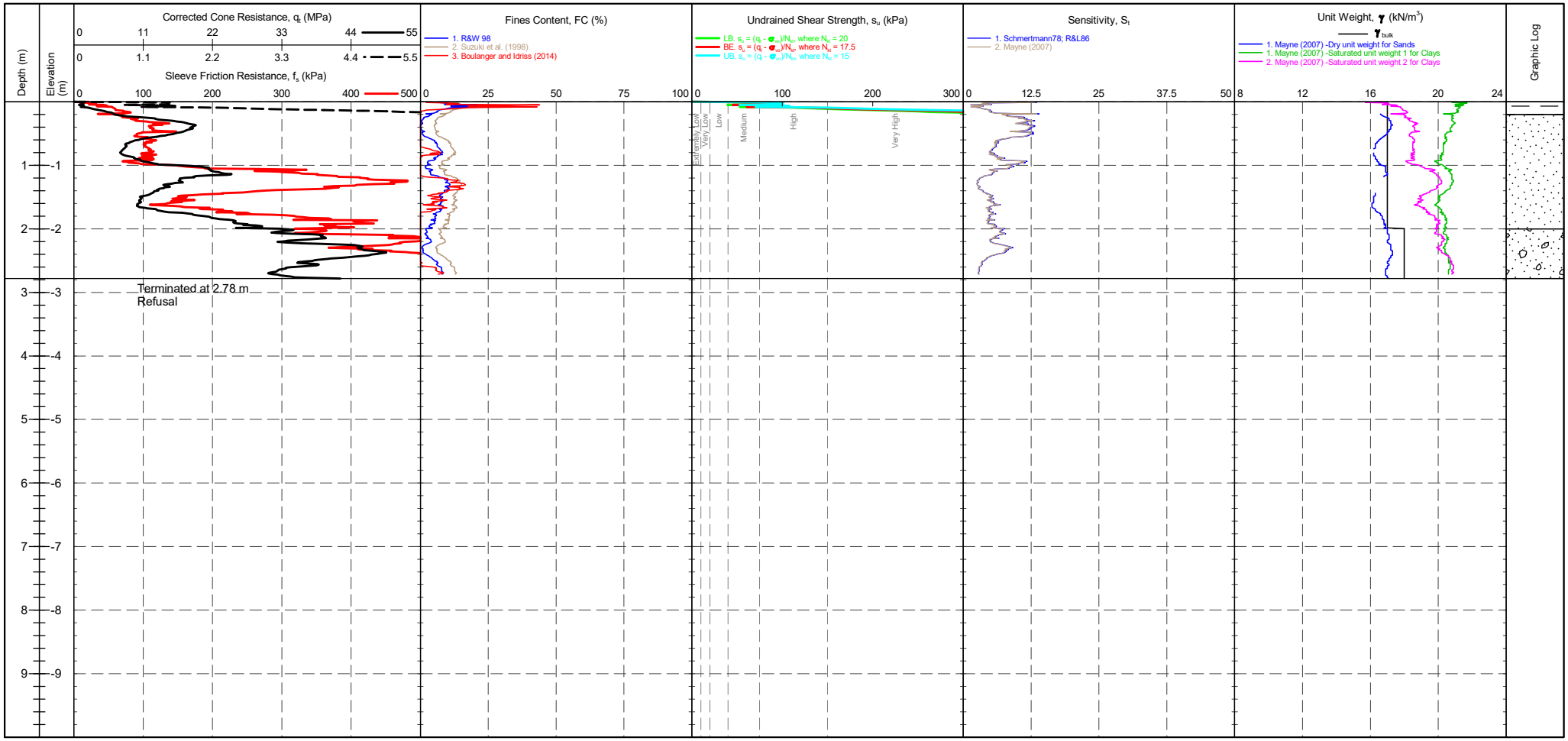
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 03

PointID: **CPT107**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 26/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



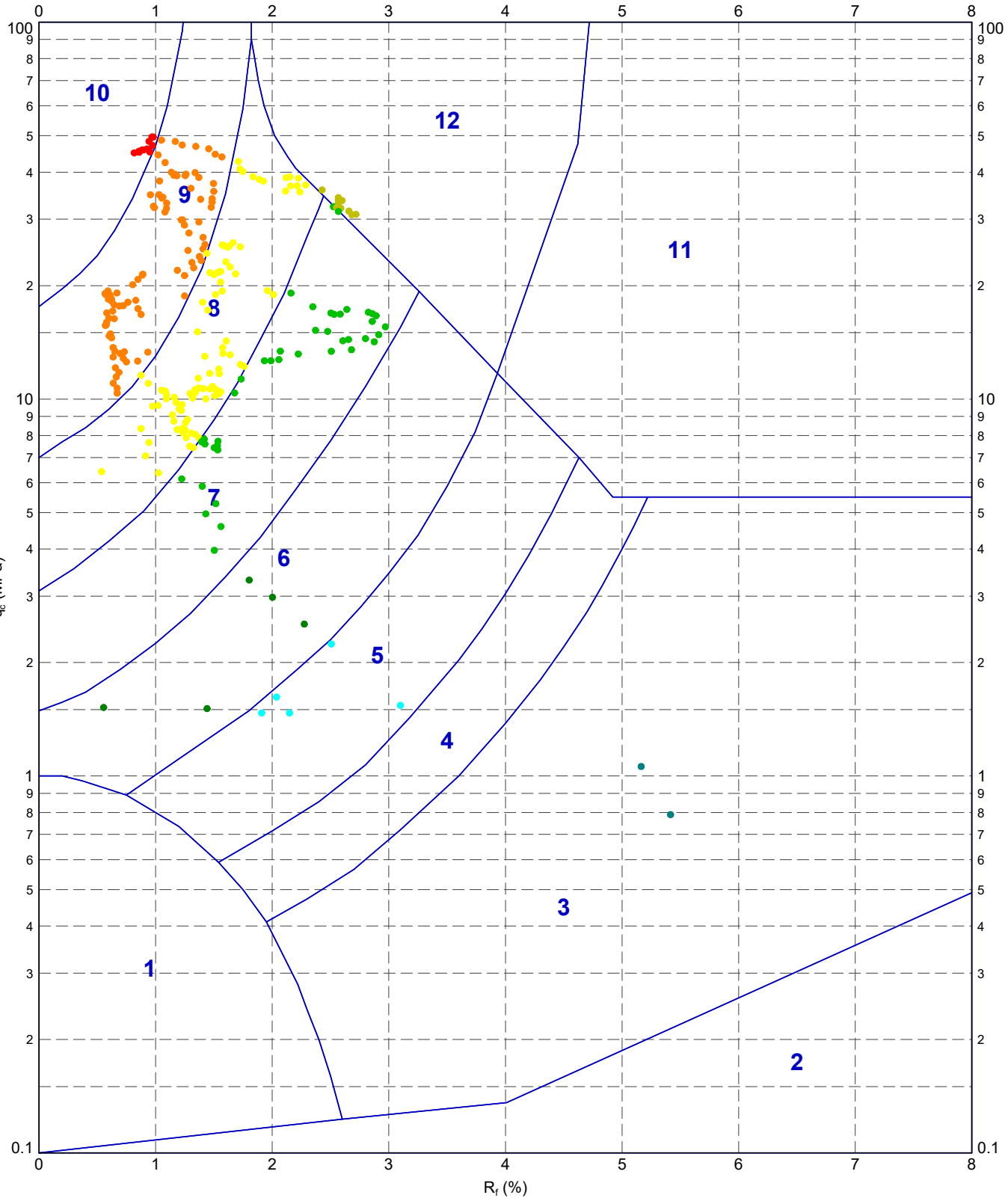
CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe	Tip	320 mV	316 mV	-0.044 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: DHo	Sleeve	272 mV	265 mV	-0.005 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	195 mV	127 mV	-0.016 kPa
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold	X-Y Inclinometer	2783 mV	2746 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	4 - Silty CLAY to CLAY	7 - Silty SAND to sandy SILT	10 - Gravelly SAND to SAND
2 - Organic material	5 - Clayey SILT to silty CLAY	8 - SAND to silty SAND	11 - Very stiff fine grained
3 - CLAY	6 - Sandy SILT to clayey SILT	9 - SAND	12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT107

DRAWN	DATE 29/10/2021	
CHECKED	DATE 29/10/2021	
SCALE Not To Scale		A4
PROJECT No 1210518	FIGURE No	

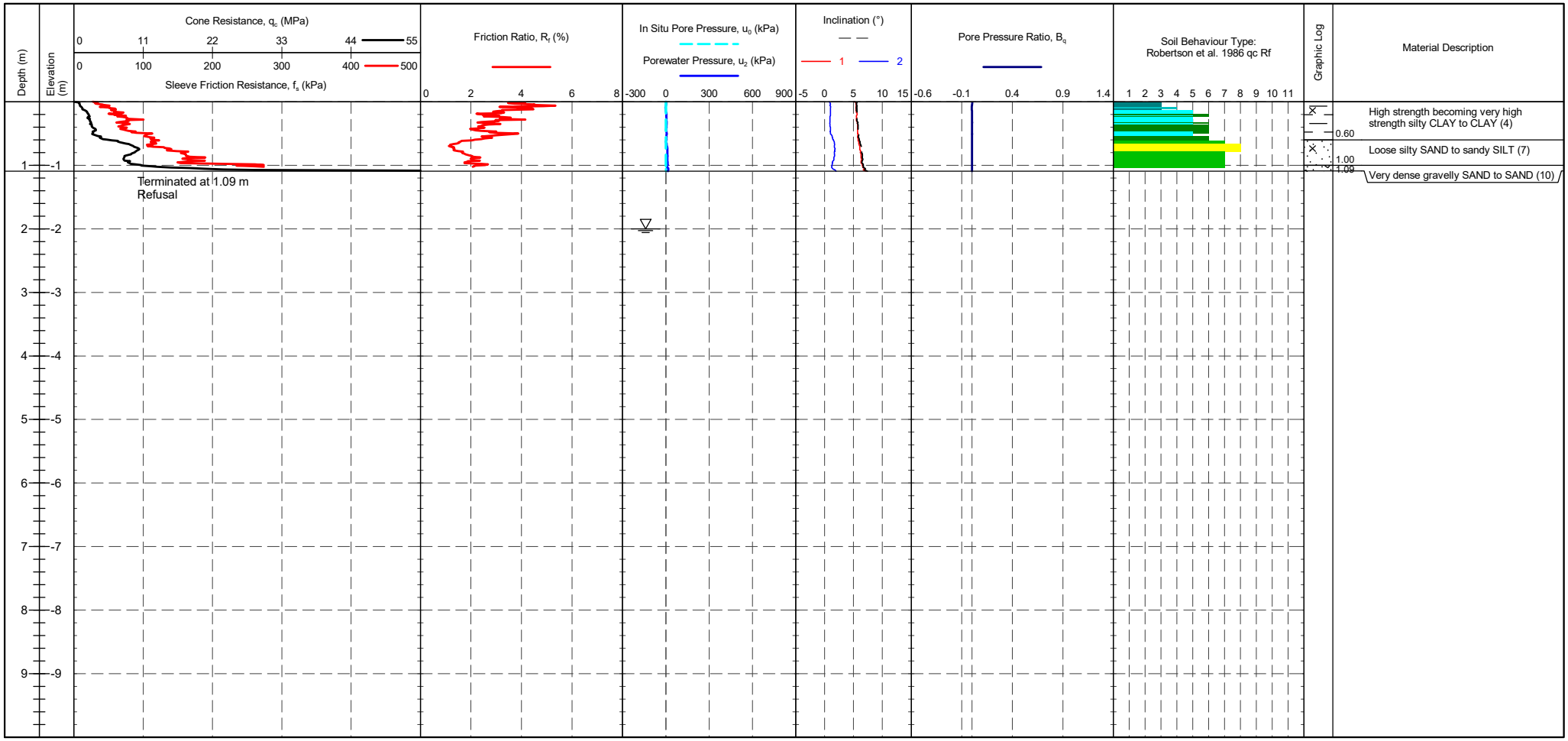
210713-ADVANCED REPORT INSITUSI 2.02.1.LIB - LUISA.GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF A4P 1210518-PROPOSED LIDL.GPJ <<DrawingFile>> 29/10/2021 16:24 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Pfj: In Situ SI 2.02.0 2017-07-10

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 01

PointID: **CPT108**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 26/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2
CALIBRATION DATE	: 05/03/2021	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 006 - Zoe
CONE AREA	: 15cm^2	OPERATOR	: DHo
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Overcast & Cold
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	322 mV	324 mV	0.022 MPa
Sleeve	270 mV	273 mV	0.002 kPa
Pore Pressure 2	180 mV	187 mV	0.002 kPa
X-Y Inclinometer	3018 mV	2995 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

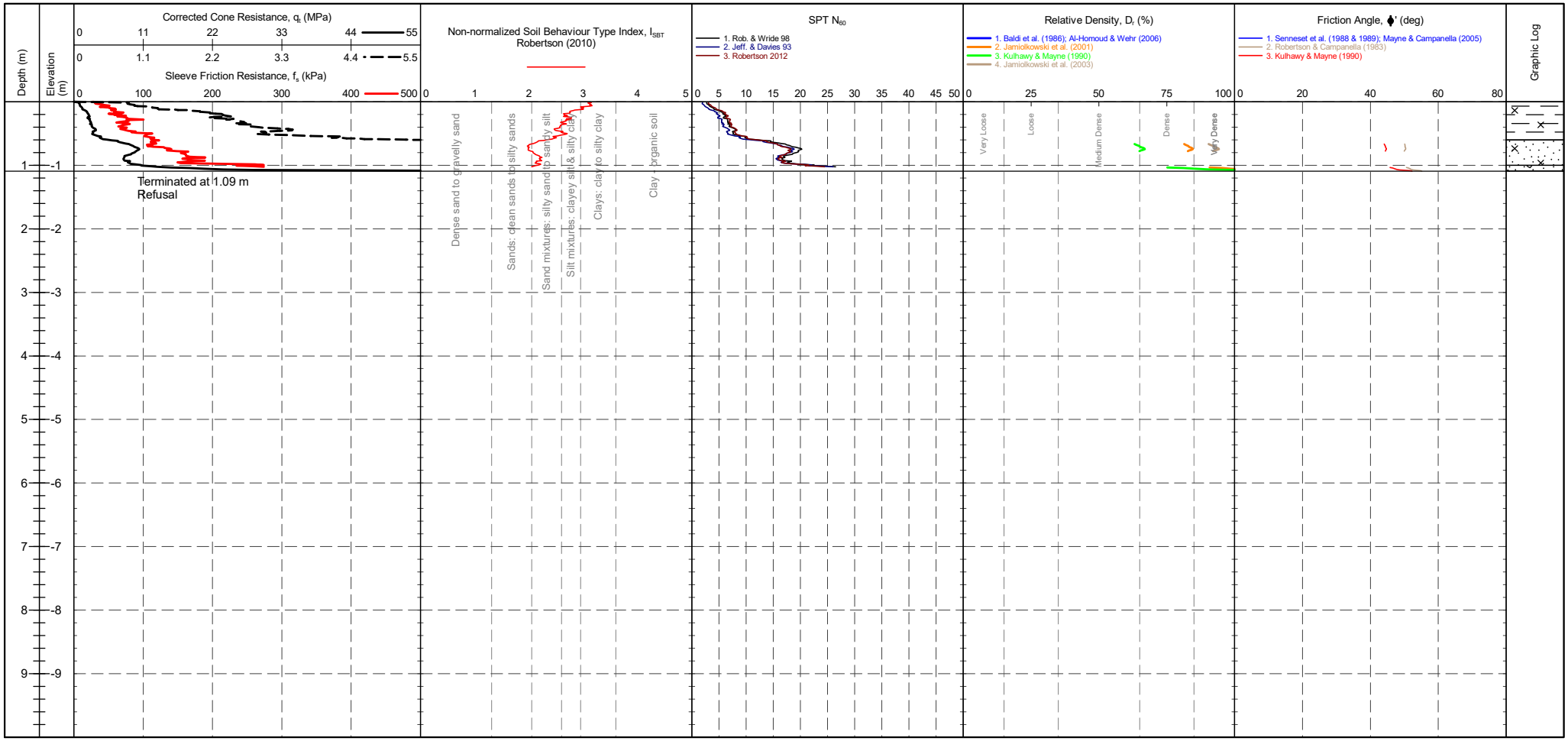
PointID **CPT108**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 26/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867
CONE MODEL	: Subtraction
CONE AREA	: 15cm^2
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 006 - Zoe
OPERATOR	: DHo
FRICTION REDUCER	: None
WEATHER	: Overcast & Cold

CPTU ZERO VALUES

	Pre	Post	Difference
Transducer			
Tip	322 mV	324 mV	0.022 MPa
Sleeve	270 mV	273 mV	0.002 kPa
Pore Pressure 2	180 mV	187 mV	0.002 kPa
X-Y Inclinometer	3018 mV	2995 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic
Clays	2.95-3.60
Silt mixtures	2.60-2.95
Sand mixtures	2.05-2.60
Sands	1.31-2.05
Gravelly sand	<1.31

Description	SPT N value, NSPT
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	>50

Description	Relative Density Dr (%)
Very Loose	0 - 15
Loose	15 - 35
Medium Dense	35 - 65
Dense	65 - 85
Very Dense	>85

Groundwater Level

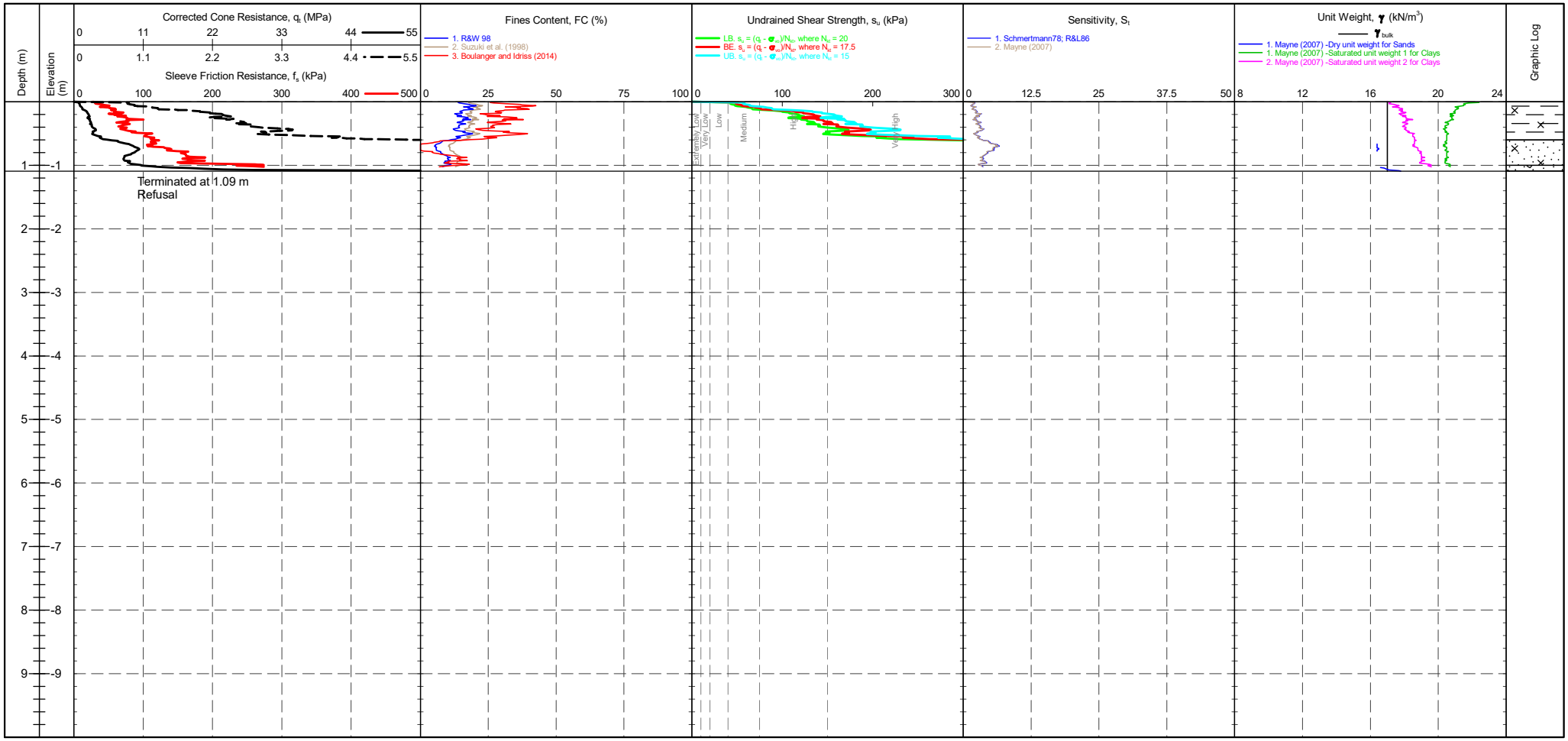
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 03

PointID: **CPT108**

CLIENT : Curtins PROJECT : Proposed LIDL LOCATION : Cross Keys Hoyland PROJECT No. : 1210518	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 26/10/2021 PLOT DATE : 29/10/2021 METHOD : ISO 22476-1:2012



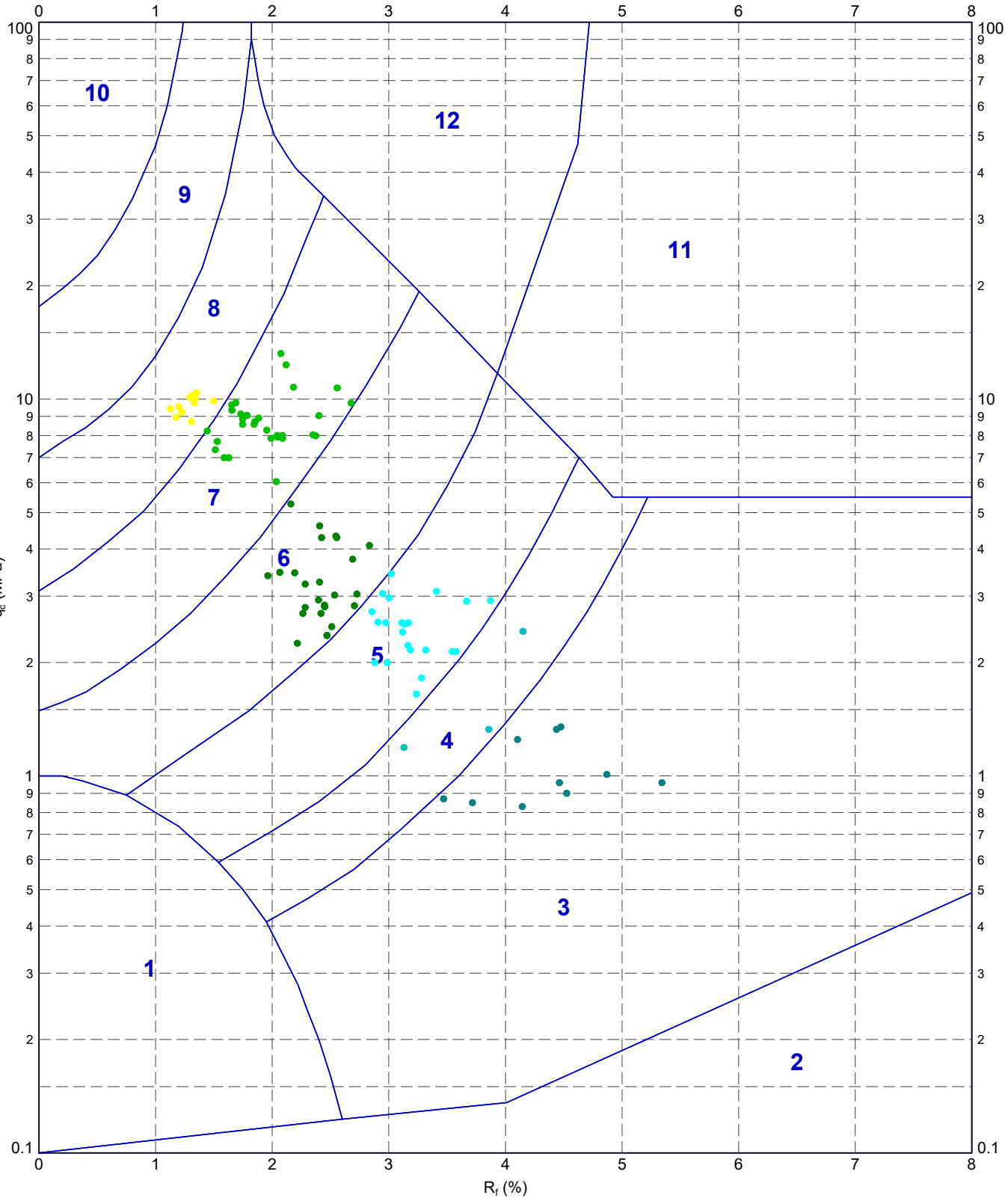
CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe	Tip	322 mV	324 mV	0.022 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: DHo	Sleeve	270 mV	273 mV	0.002 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	180 mV	187 mV	0.002 kPa
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold	X-Y Inclinometer	3018 mV	2995 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT108

DRAWN	DATE 29/10/2021
CHECKED	DATE 29/10/2021
SCALE Not To Scale	A4
PROJECT No 1210518	FIGURE No

210713-ADVANCED REPORT INSITUSI 2.02.1.LIB - LUISA.GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF A4P 1210518-PROPOSED LIDL.GPJ <<DrawingFile>> 29/10/2021 16:25 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Pfj: In Situ SI 2.02.0 2017-07-10

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 01

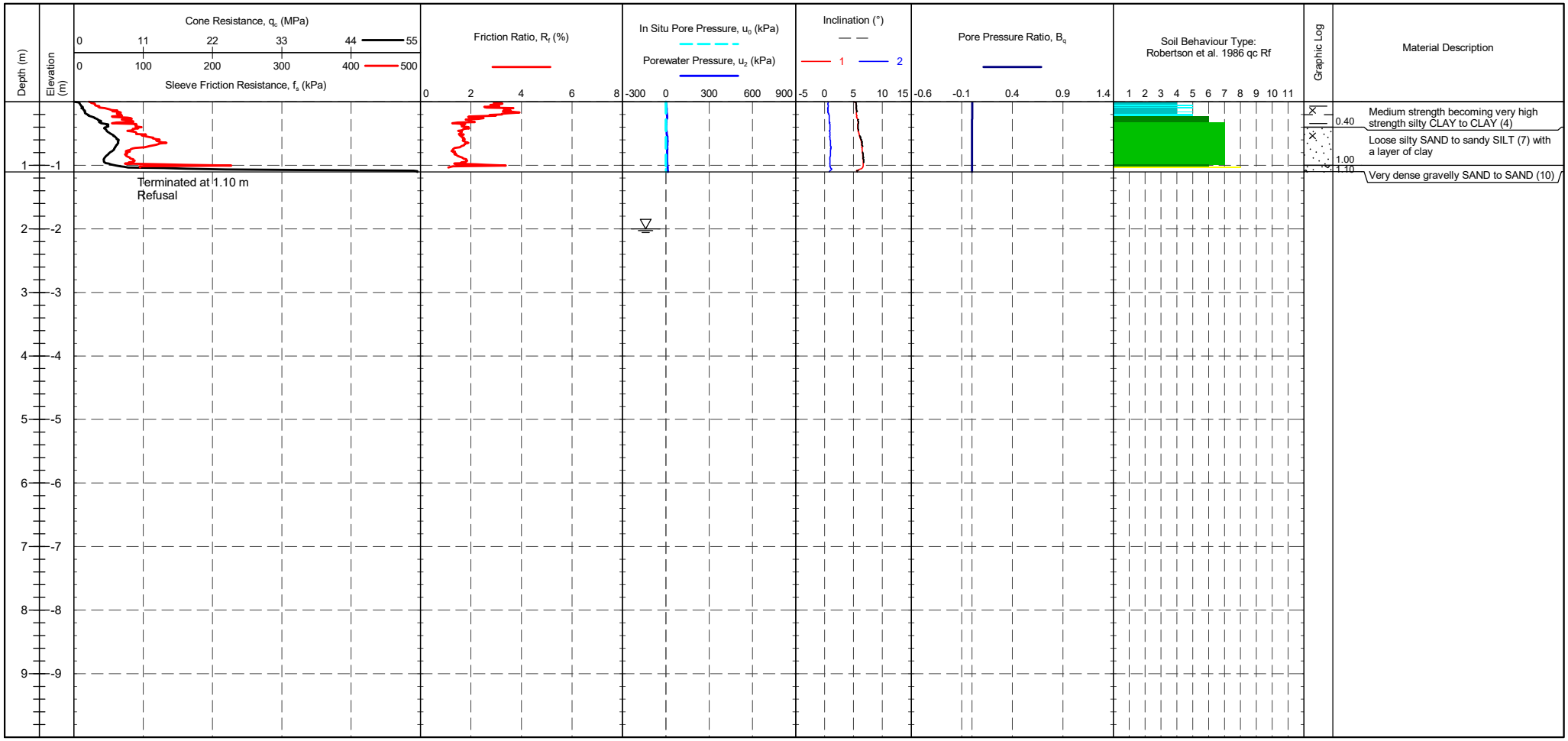
PointID: **CPT108A**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 26/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2
CALIBRATION DATE	: 05/03/2021	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 006 - Zoe
CONE AREA	: 15cm^2	OPERATOR	: DHo
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Overcast & Cold
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	324 mV	323 mV	-0.011 MPa
Sleeve	273 mV	273 mV	0 kPa
Pore Pressure 2	187 mV	190 mV	0.001 kPa
X-Y Inclinometer	3025 mV	2961 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

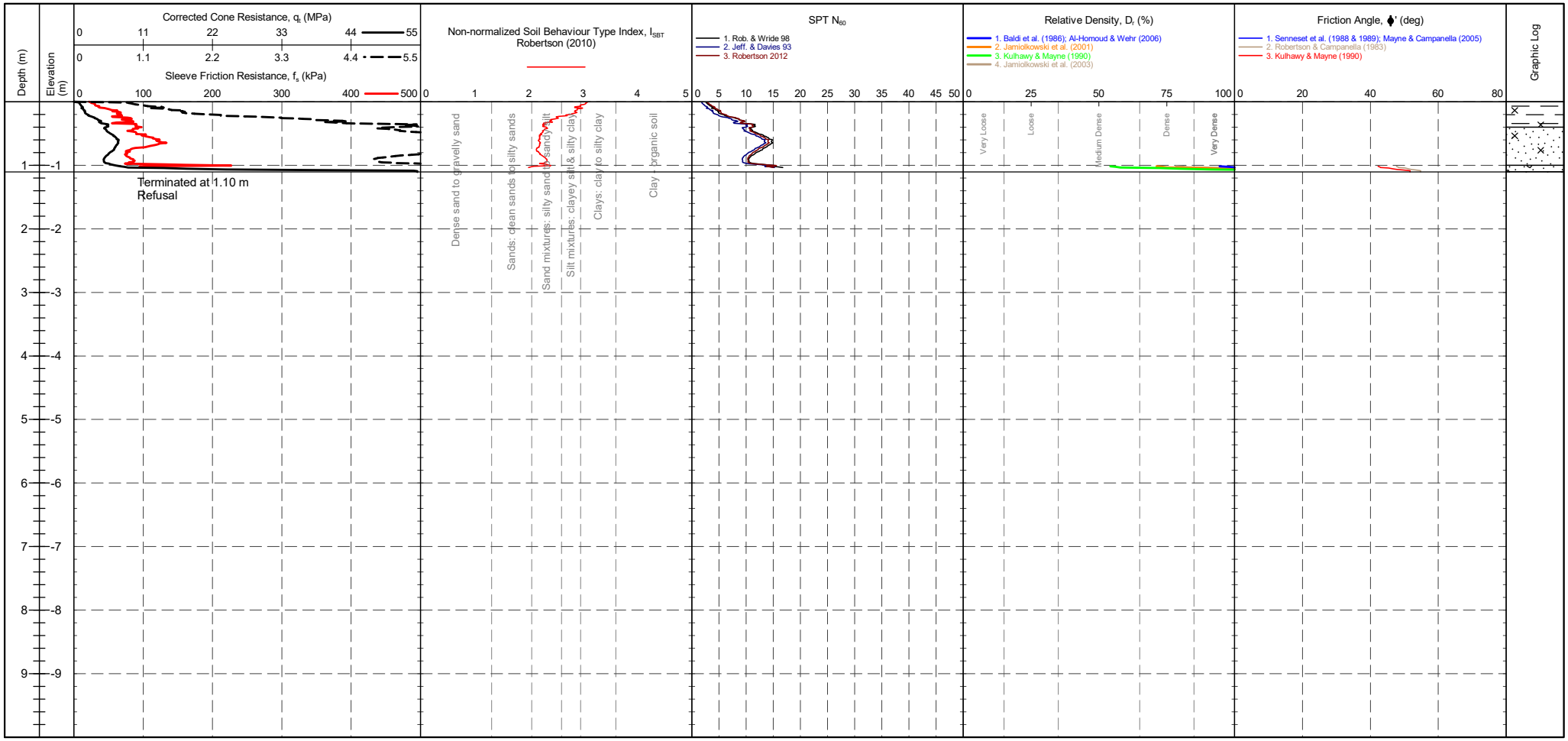
PointID **CPT108A**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 26/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2		
CONE AREA	: 15cm²	RIG	: CPT 006 - Zoe		
CONE AREA RATIO	: 0.79	OPERATOR	: DHo		
FILTER POSITION	: u2	FRICTION REDUCER	: None		
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	324 mV	323 mV	-0.011 MPa
Sleeve	273 mV	273 mV	0 kPa
Pore Pressure 2	187 mV	190 mV	0.001 kPa
X-Y Inclinometer	3025 mV	2961 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

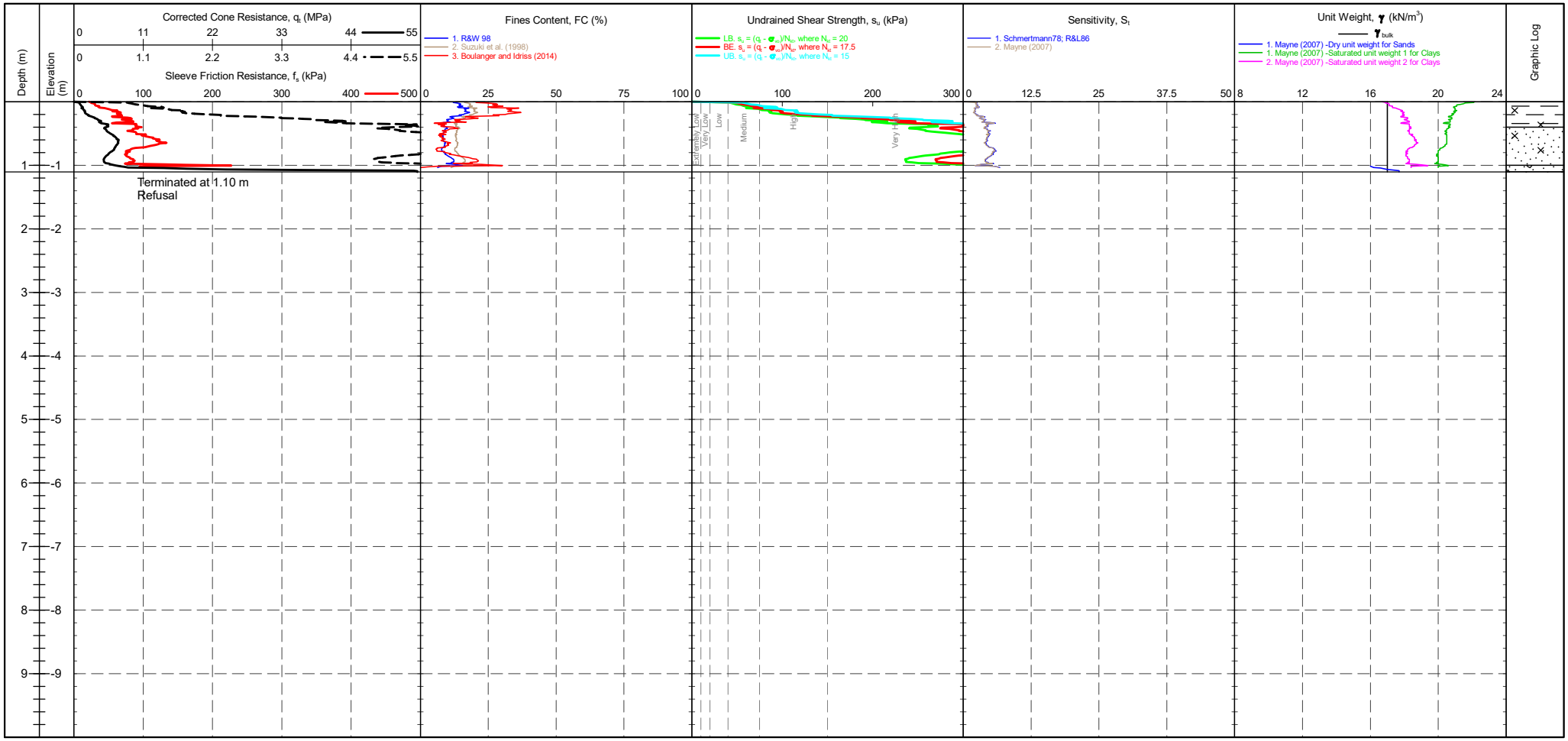
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 03

PointID **CPT108A**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 26/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



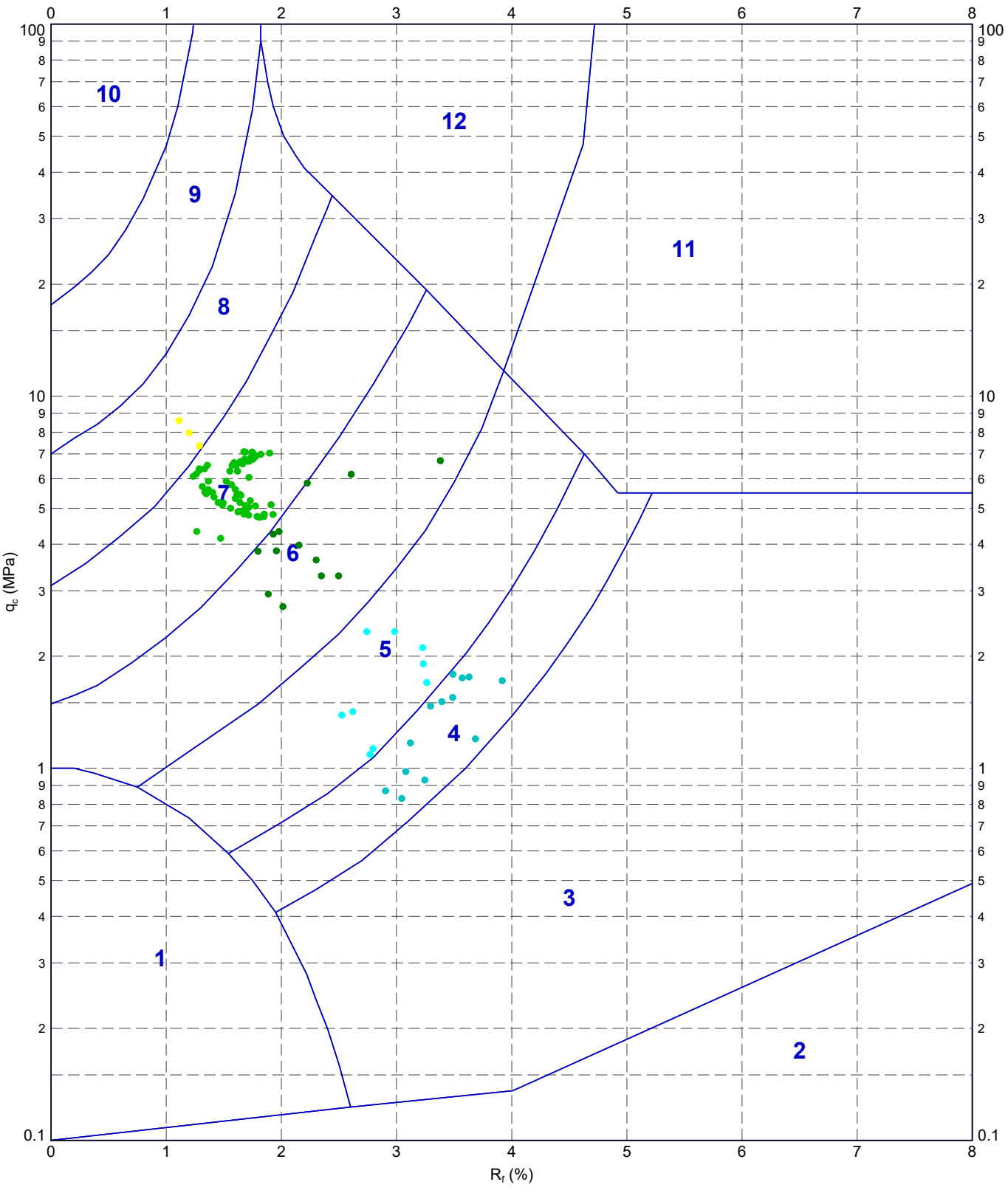
CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe	Tip	324 mV	323 mV	-0.011 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: DHo	Sleeve	273 mV	273 mV	0 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	187 mV	190 mV	0.001 kPa
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold	X-Y Inclinometer	3025 mV	2961 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	4 - Silty CLAY to CLAY	7 - Silty SAND to sandy SILT	10 - Gravelly SAND to SAND
2 - Organic material	5 - Clayey SILT to silty CLAY	8 - SAND to silty SAND	11 - Very stiff fine grained
3 - CLAY	6 - Sandy SILT to clayey SILT	9 - SAND	12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT108A

DRAWN	DATE 29/10/2021	
CHECKED	DATE 29/10/2021	
SCALE Not To Scale		A4
PROJECT No 1210518	FIGURE No	

210713-ADVANCED REPORT INSITUSI 2.02.1.LIB - LUISA.GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF A4P 1210518-PROPOSED LIDL.GPJ <<DrawingFile>> 29/10/2021 16:27 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Pfj: In Situ SI 2.02.0 2017-07-10

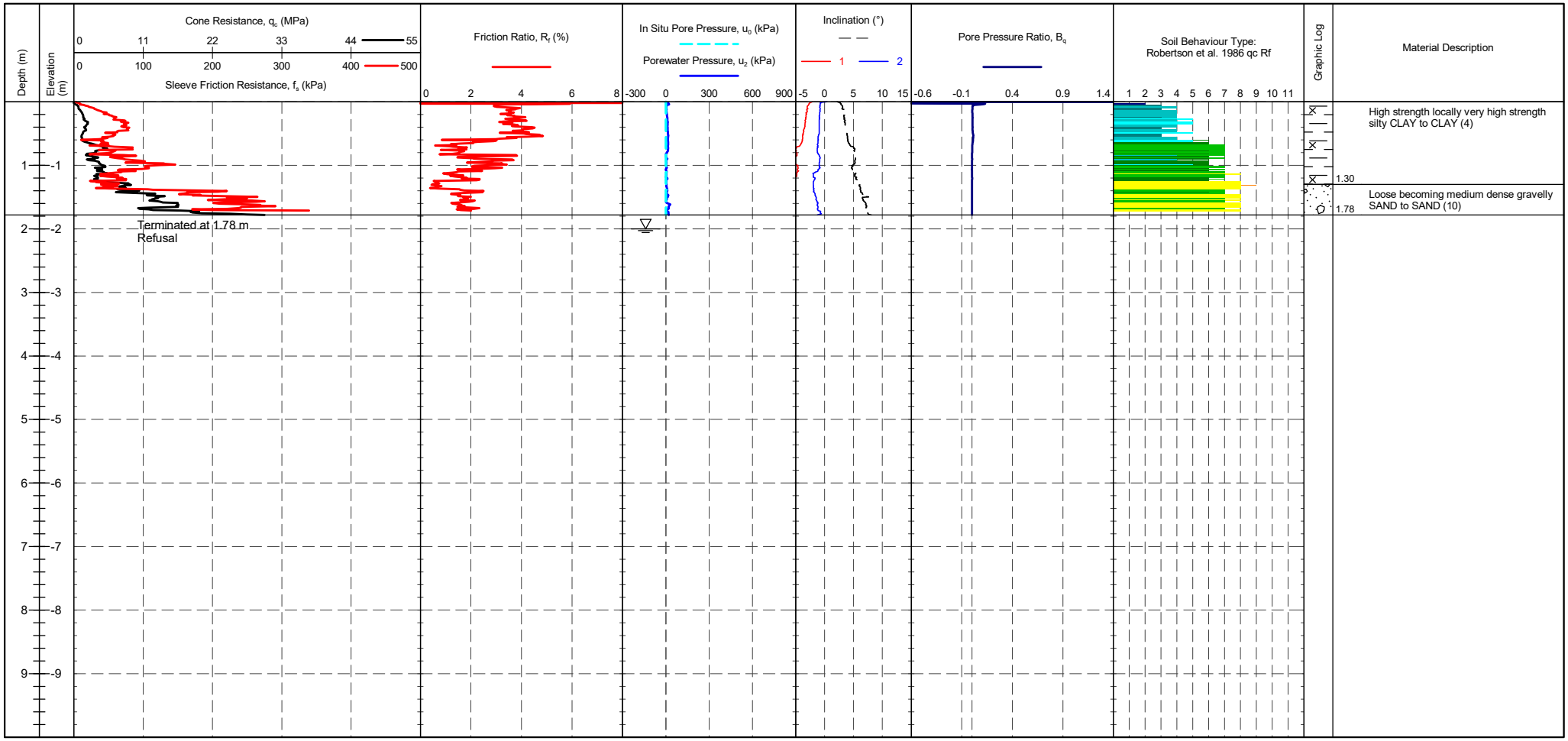
IN SITU SITE INVESTIGATION

Working with: Curtins

CPT LOG 01

PointID: **CPT109**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 27/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1867	TEST TYPE : TE2		
CALIBRATION DATE : 05/03/2021	APPLICATION CLASS : 2		
CONE MODEL : Subtraction	RIG : CPT 006 - Zoe		
CONE AREA : 15cm^2	OPERATOR : DB		
CONE AREA RATIO : 0.79	FRICTION REDUCER : None		
FILTER POSITION : u2	WEATHER : Overcast & Mild		
FILTER TYPE : HDPE	GROUNDWATER DEPTH : Assumed for calculation purposes		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	327 mV	497 mV	1.851 MPa
Sleeve	274 mV	360 mV	0.06 kPa
Pore Pressure 2	190 mV	190 mV	0 kPa
X-Y Inclinometer	2313 mV	1716 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

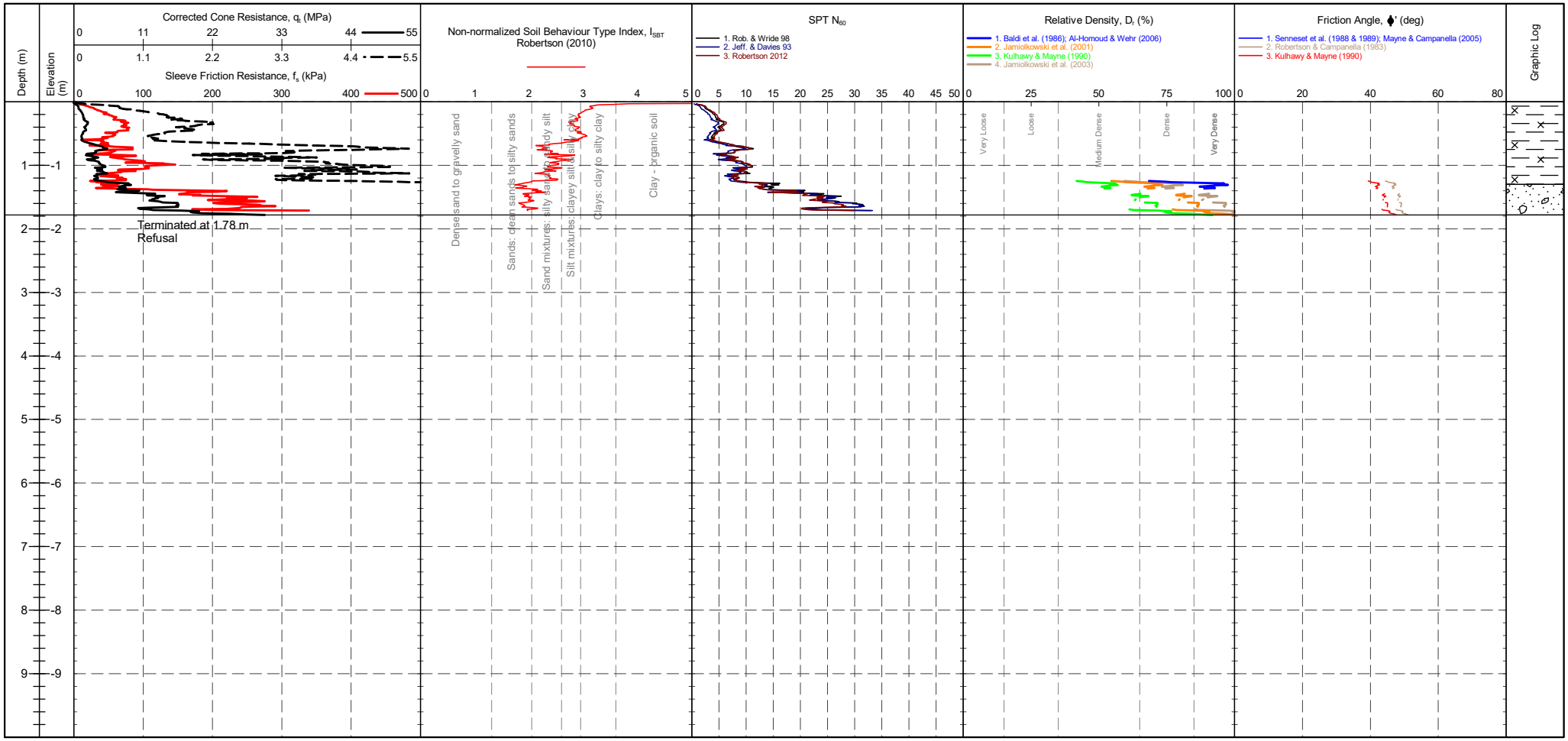
PointID: **CPT109**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 27/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2		
CONE AREA	: 15cm²	RIG	: CPT 006 - Zoe		
CONE AREA RATIO	: 0.79	OPERATOR	: DB		
FILTER POSITION	: u2	FRICTION REDUCER	: None		
FILTER TYPE	: HDPE	WEATHER	: Overcast & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	327 mV	497 mV	1.851 MPa
Sleeve	274 mV	360 mV	0.06 kPa
Pore Pressure 2	190 mV	190 mV	0 kPa
X-Y Inclinometer	2313 mV	1716 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

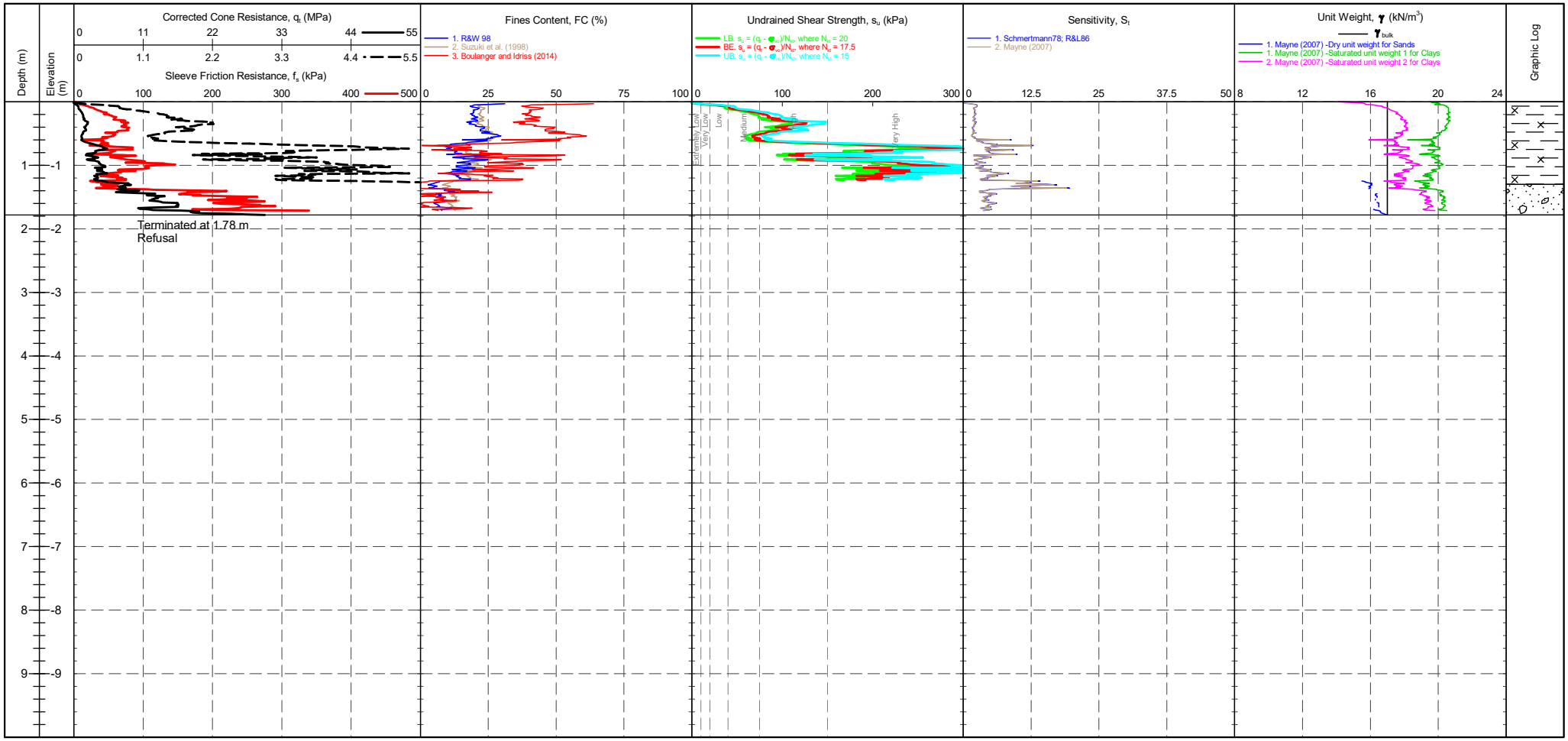
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 03

PointID: **CPT109**

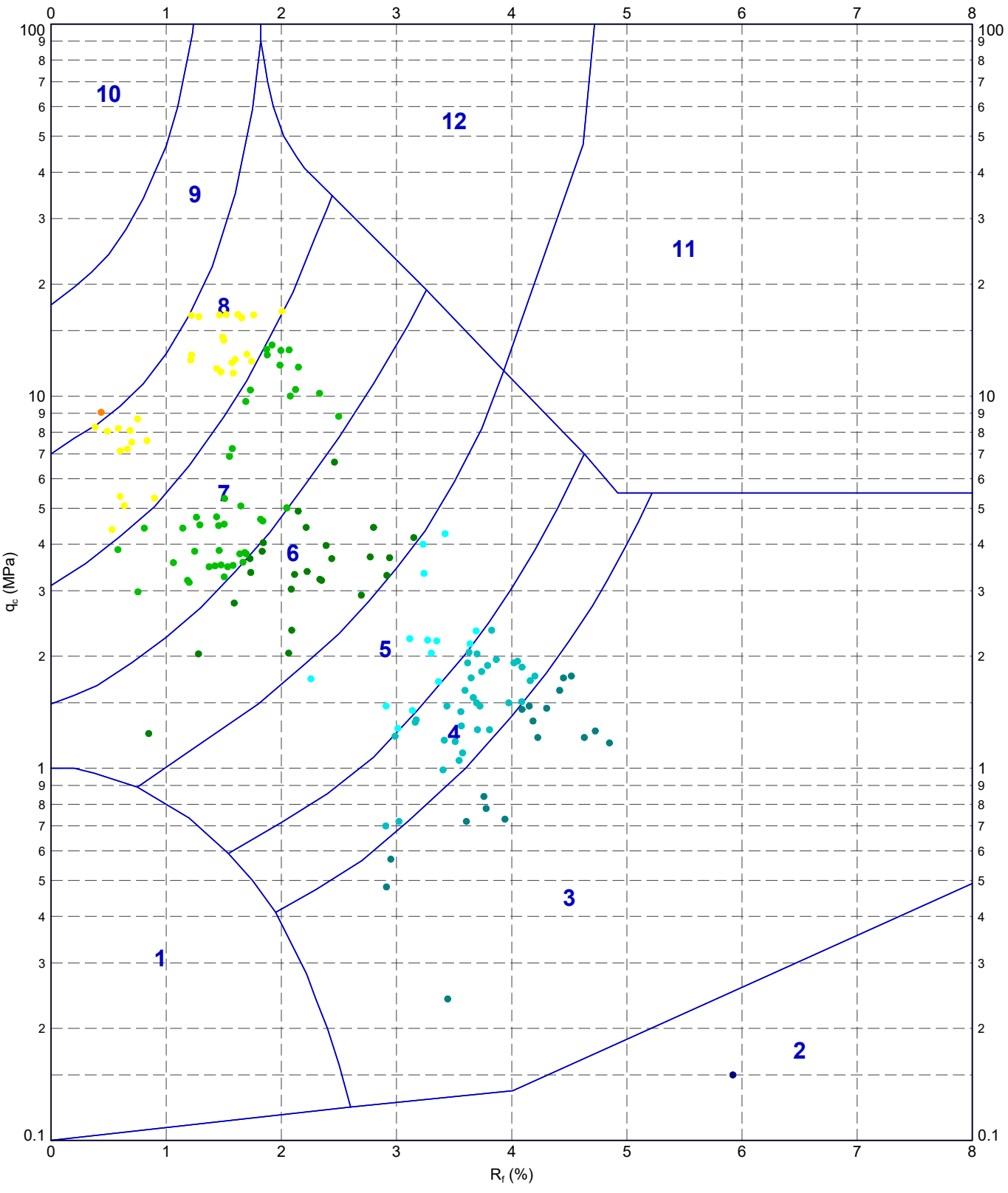
CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 27/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES				COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference	Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe	Tip	327 mV	497 mV	1.851 MPa	Extremely low strength	<10	Medium strength	40-75
CONE AREA RATIO	: 0.79	OPERATOR	: DB	Sleeve	274 mV	360 mV	0.06 kPa	Very low strength	10-20	High strength	75-150
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	190 mV	190 mV	0 kPa	Low strength	20-40	Very high strength	150-300
FILTER TYPE	: HDPE	WEATHER	: Overcast & Mild	X-Y Inclinometer	2313 mV	1716 mV				Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	4 - Silty CLAY to CLAY	7 - Silty SAND to sandy SILT	10 - Gravelly SAND to SAND
2 - Organic material	5 - Clayey SILT to silty CLAY	8 - SAND to silty SAND	11 - Very stiff fine grained
3 - CLAY	6 - Sandy SILT to clayey SILT	9 - SAND	12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT109

DRAWN	DATE 29/10/2021	
CHECKED	DATE 29/10/2021	
SCALE Not To Scale		A4
PROJECT No 1210518	FIGURE No	

210713-ADVANCED REPORT INSITUSI 2.02.1.LIB - LUISA.GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF AAP 1210518-PROPOSED LIDL.GPJ <<DrawingFile>> 29/10/2021 16:28 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Pfj: In Situ SI 2.02.0 2017-07-10

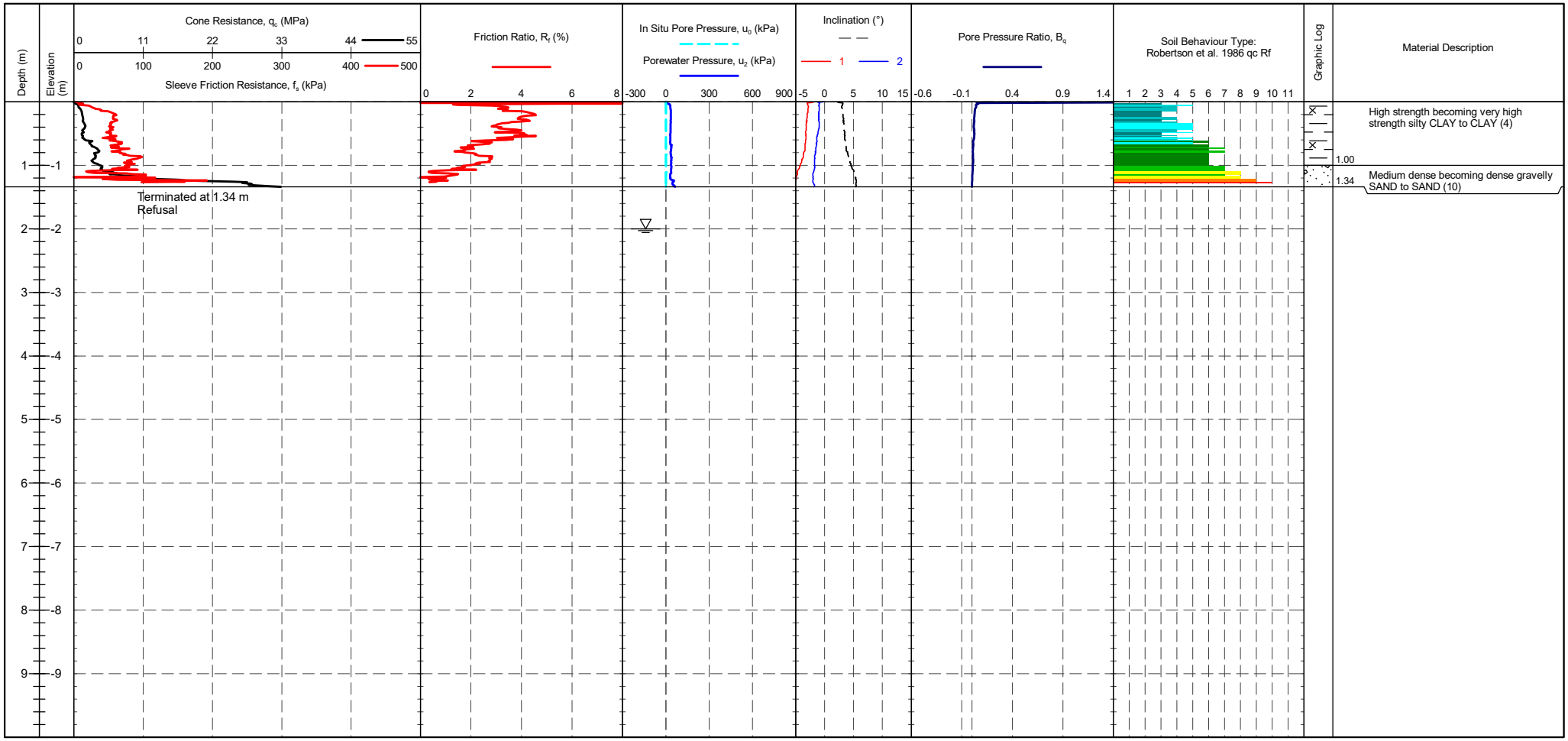
IN SITU SITE INVESTIGATION

Working with: Curtins

CPT LOG 01

PointID: **CPT109a**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 27/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CALIBRATION DATE	: 05/03/2021	APPLICATION CLASS	: 2		
CONE MODEL	: Subtraction	RIG	: CPT 006 - Zoe		
CONE AREA	: 15cm^2	OPERATOR	: DB		
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None		
FILTER POSITION	: u2	WEATHER	: Overcast & Mild		
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	326 mV	328 mV	0.022 MPa
Sleeve	273 mV	273 mV	0 kPa
Pore Pressure 2	189 mV	190 mV	0 kPa
X-Y Inclinometer	2277 mV	2272 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

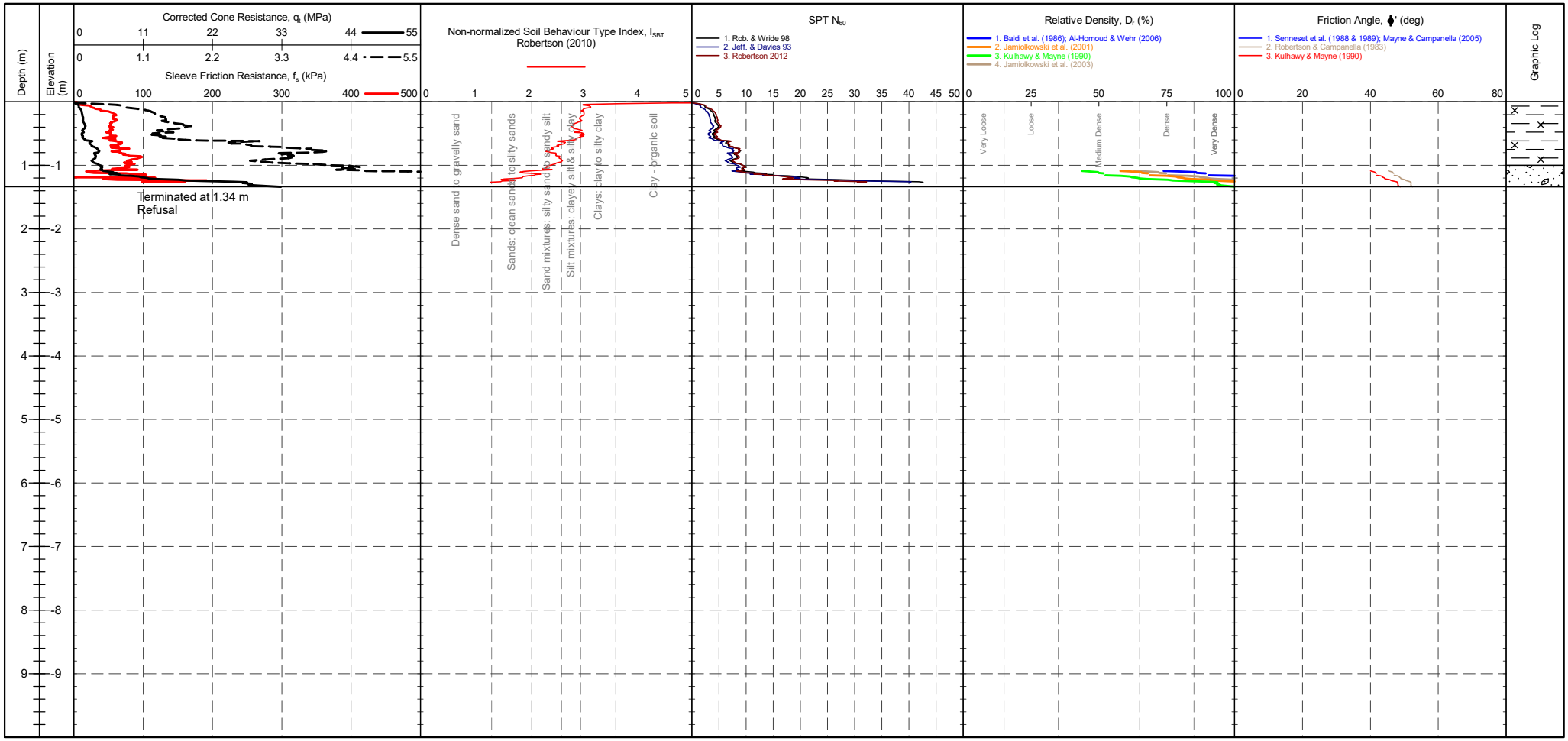
PointID: **CPT109a**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 27/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867
CONE MODEL	: Subtraction
CONE AREA	: 15cm²
CONE AREA RATIO	: 0.79
FILTER POSITION	: u2
FILTER TYPE	: HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 006 - Zoe
OPERATOR	: DB
FRICTION REDUCER	: None
WEATHER	: Overcast & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	326 mV	328 mV	0.022 MPa
Sleeve	273 mV	273 mV	0 kPa
Pore Pressure 2	189 mV	190 mV	0 kPa
X-Y Inclinometer	2277 mV	2272 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

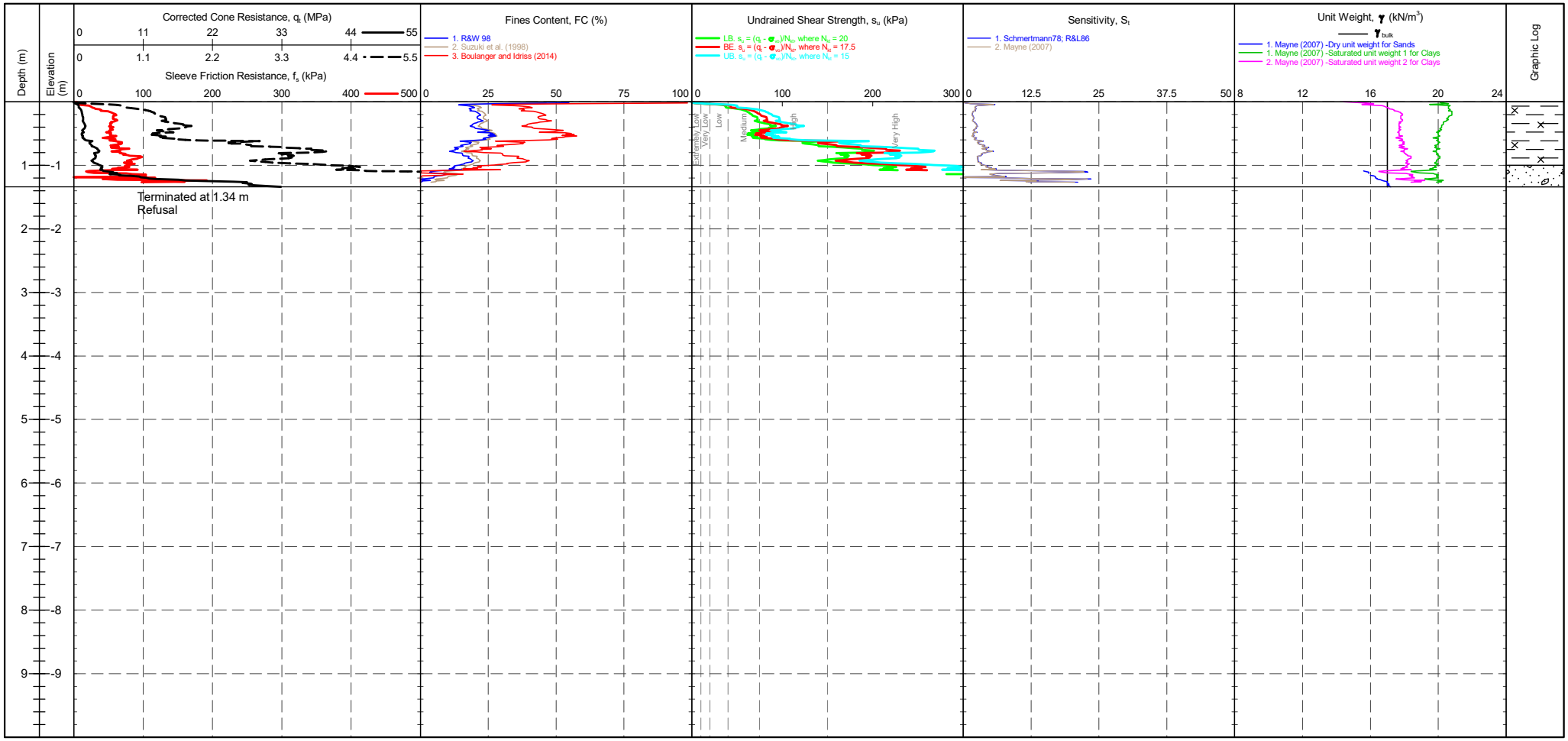
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

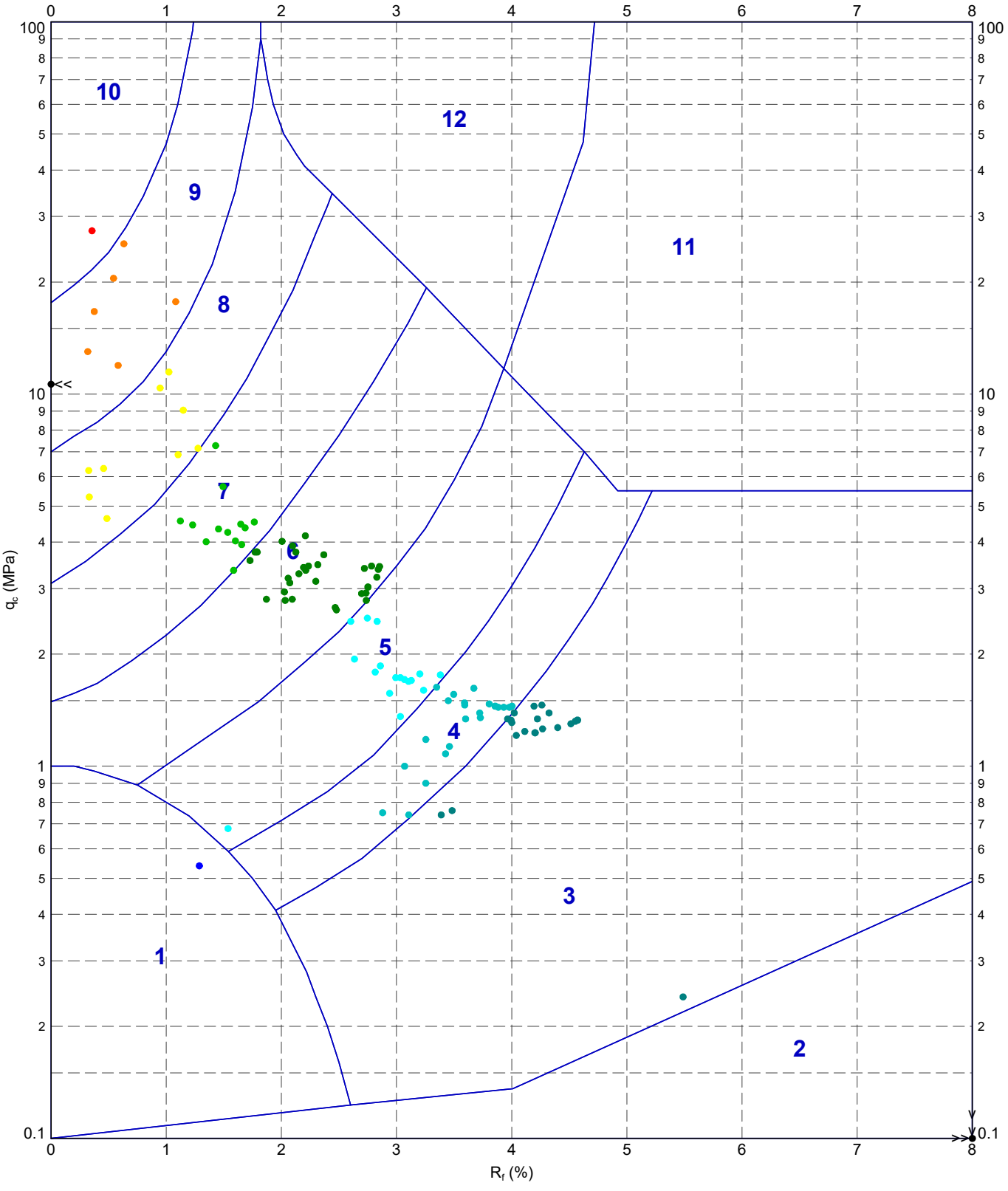
CPT LOG 03

PointID: **CPT109a**

CLIENT : Curtins PROJECT : Proposed LIDL LOCATION : Cross Keys Hoyland PROJECT No. : 1210518	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 27/10/2021 PLOT DATE : 29/10/2021 METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1867 CONE MODEL : Subtraction CONE AREA : 15cm^2 CONE AREA RATIO : 0.79 FILTER POSITION : u2 FILTER TYPE : HDPE	TEST TYPE : TE2 APPLICATION CLASS : 2 RIG : CPT 006 - Zoe OPERATOR : DB FRICTION REDUCER : None WEATHER : Overcast & Mild	CPTU ZERO VALUES Transducer / Pre / Post / Difference Tip 326 mV 328 mV 0.022 MPa Sleeve 273 mV 273 mV 0 kPa Pore Pressure 2 189 mV 190 mV 0 kPa X-Y Inclinometer 2277 mV 2272 mV	COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11 Term based on measurement / su (kPa) Extremely low strength <10 Very low strength 10-20 Low strength 20-40	Term based on measurement / su (kPa) Medium strength 40-75 High strength 75-150 Very high strength 150-300 Extremely high strength >300	Groundwater Level Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT109a

DRAWN	DATE 29/10/2021
CHECKED	DATE 29/10/2021
SCALE Not To Scale	A4
PROJECT No 1210518	FIGURE No

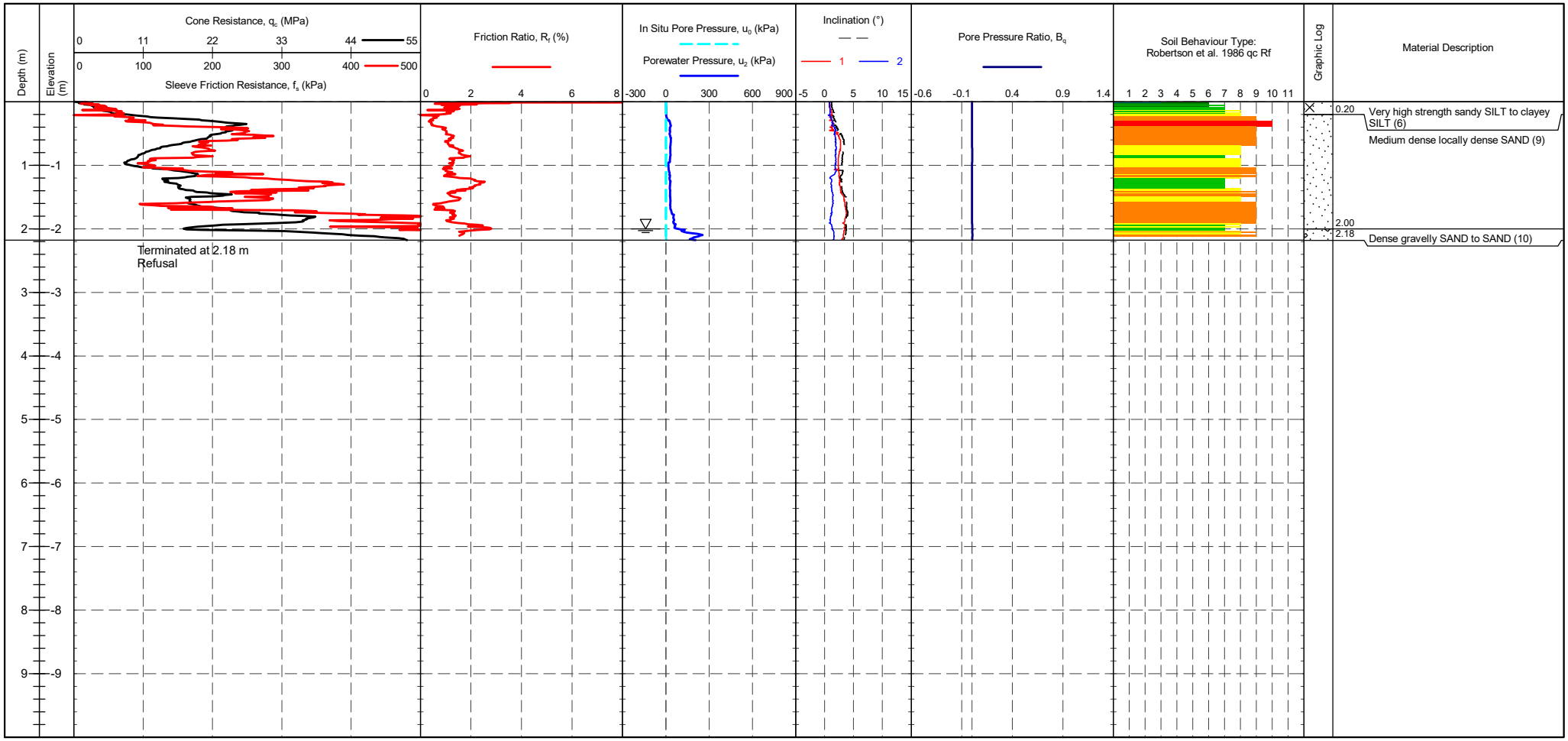
210713-ADVANCED REPORT INSITUSI 2.02.1.LIB - LUISA.GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF A4P 1210518-PROPOSED LIDL.GPJ <<DrawingFile>> 29/10/2021 16:30 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Pfj: In Situ SI 2.02.0 2017-07-10

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 01

PointID: **CPT110**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 26/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1867	TEST TYPE : TE2	CPTU ZERO VALUES	
CALIBRATION DATE : 05/03/2021	APPLICATION CLASS : 2		
CONE MODEL : Subtraction	RIG : CPT 006 - Zoe		
CONE AREA : 15cm^2	OPERATOR : DHo		
CONE AREA RATIO : 0.79	FRICTION REDUCER : None		
FILTER POSITION : u2	WEATHER : Overcast & Cold		
FILTER TYPE : HDPE	GROUNDWATER DEPTH : Assumed for calculation purposes		

Transducer	Pre	Post	Difference
Tip	313 mV	315 mV	0.022 MPa
Sleeve	269 mV	270 mV	0.001 kPa
Pore Pressure 2	163 mV	156 mV	-0.002 kPa
X-Y Inclinometer	2579 mV	2594 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

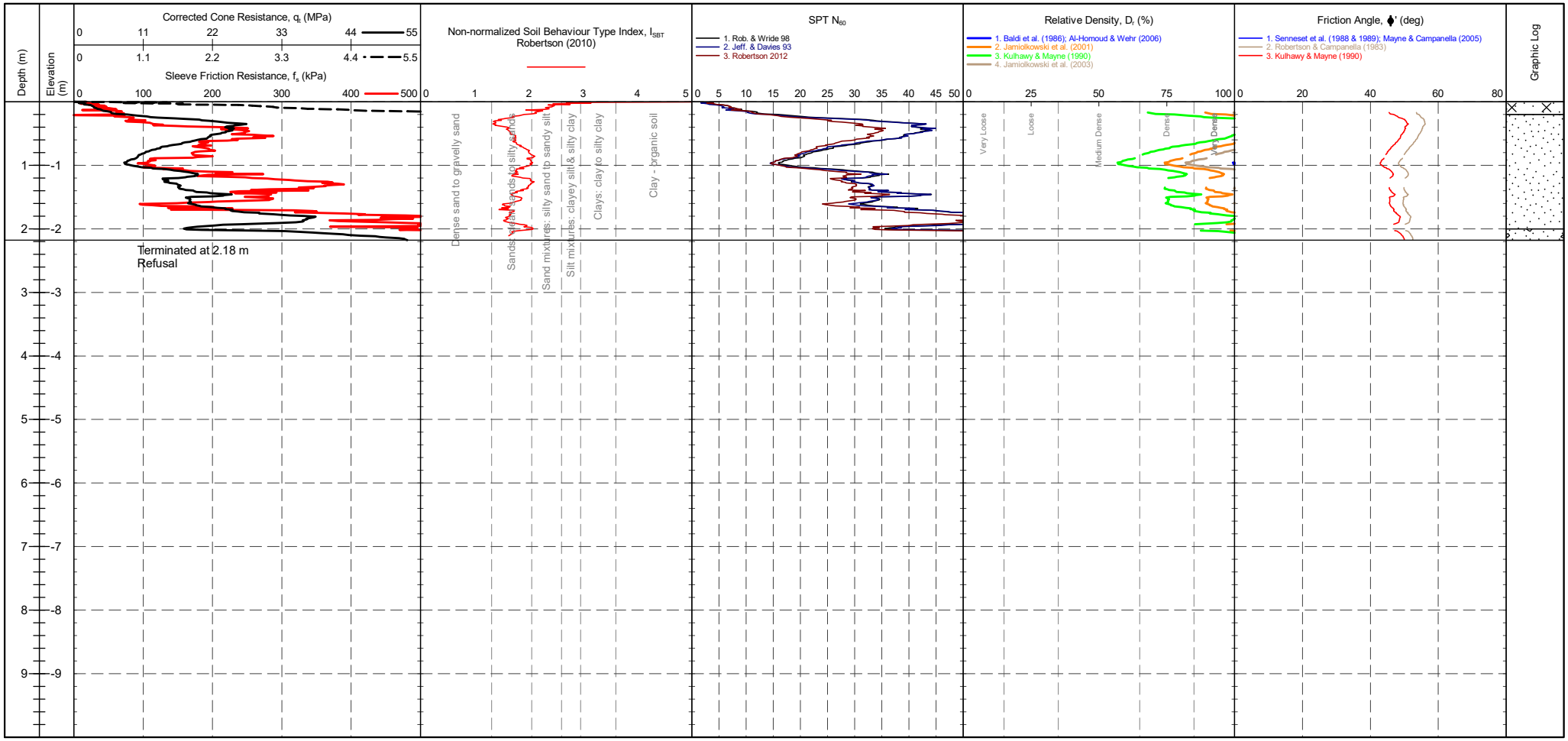
PointID **CPT110**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 26/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2		
CONE AREA	: 15cm²	RIG	: CPT 006 - Zoe		
CONE AREA RATIO	: 0.79	OPERATOR	: DHo		
FILTER POSITION	: u2	FRICTION REDUCER	: None		
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	313 mV	315 mV	0.022 MPa
Sleeve	269 mV	270 mV	0.001 kPa
Pore Pressure 2	163 mV	156 mV	-0.002 kPa
X-Y Inclinometer	2579 mV	2594 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

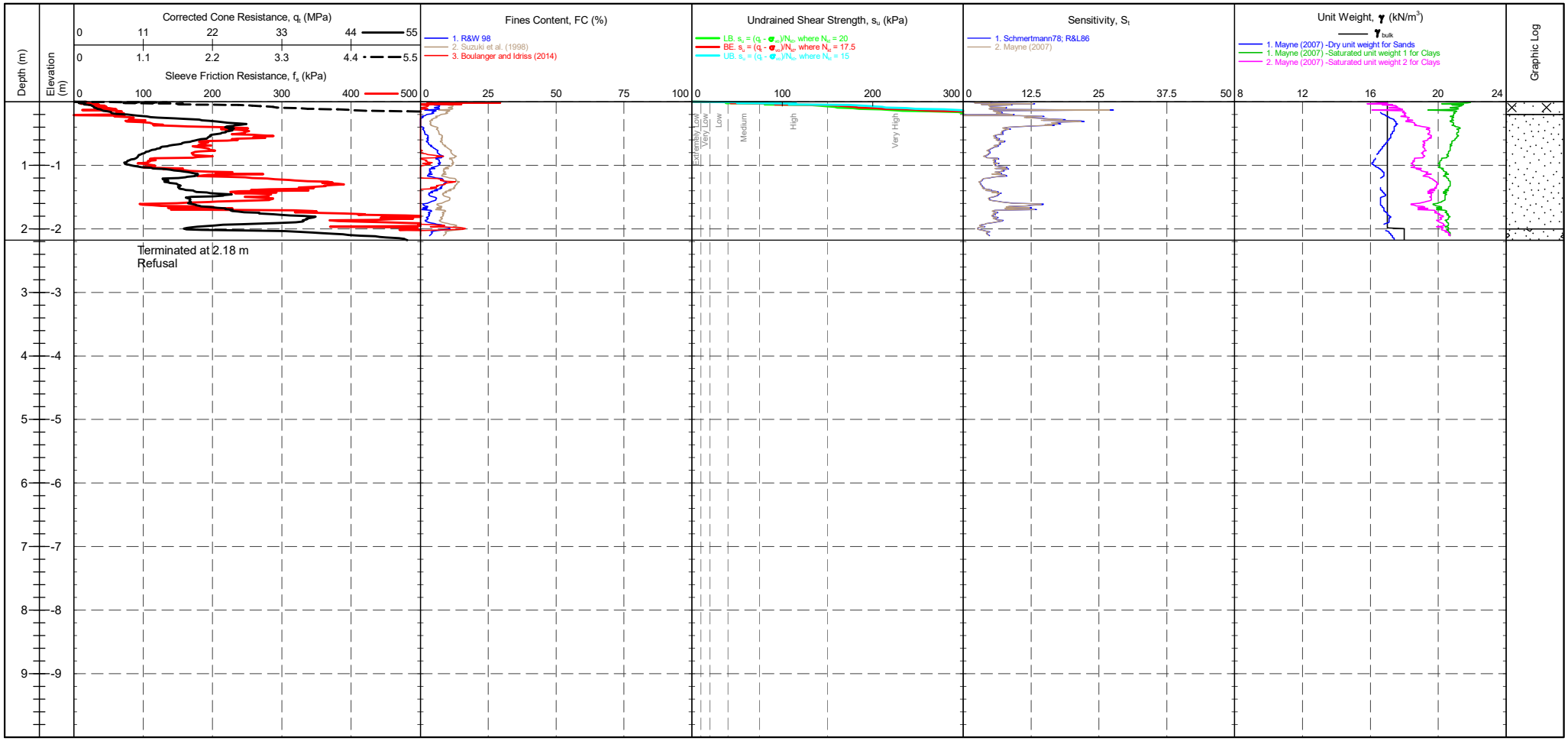
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 03

PointID: **CPT110**

CLIENT : Curtins PROJECT : Proposed LIDL LOCATION : Cross Keys Hoyland PROJECT No. : 1210518	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 26/10/2021 PLOT DATE : 29/10/2021 METHOD : ISO 22476-1:2012



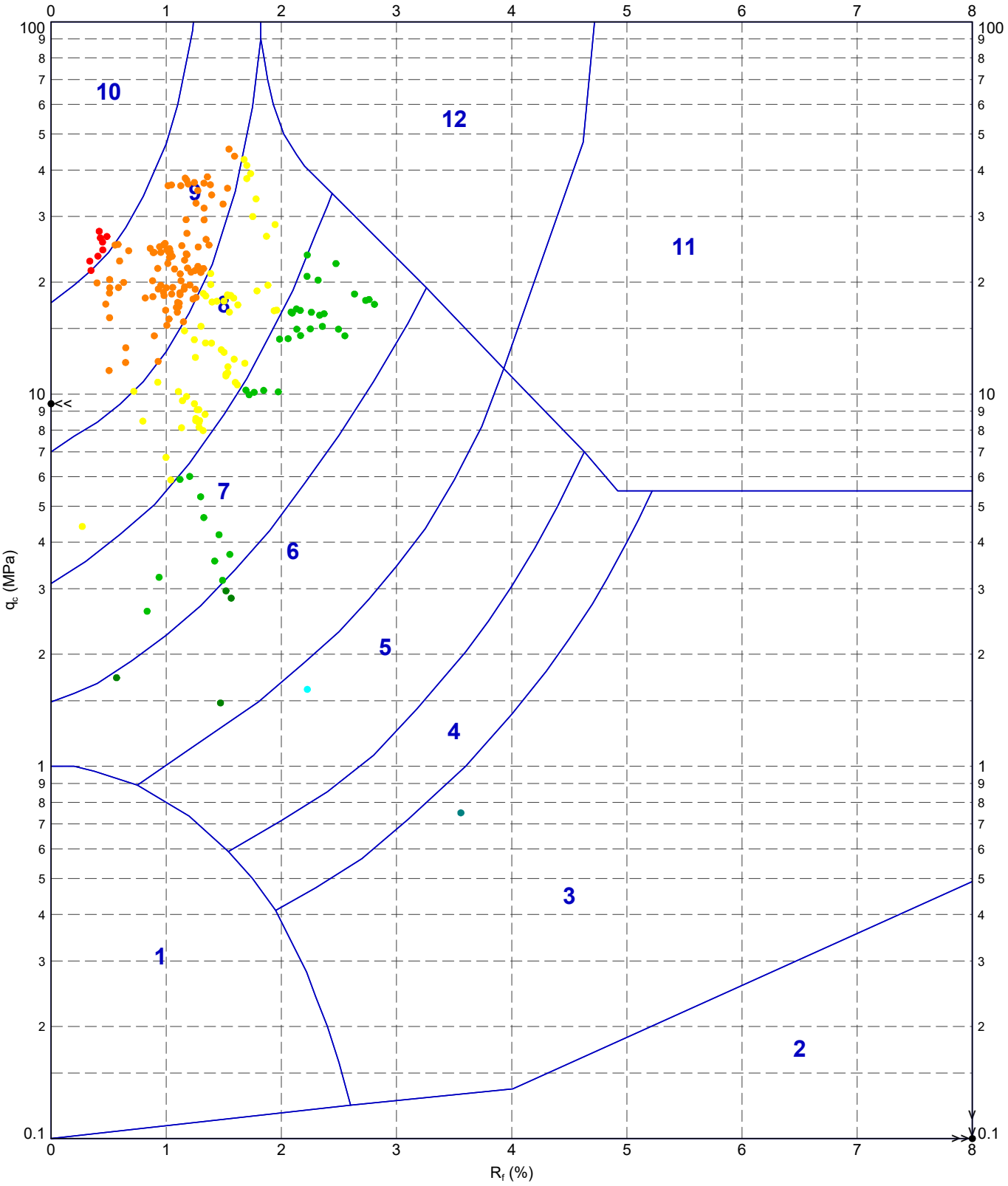
CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe	Tip	313 mV	315 mV	0.022 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: DHo	Sleeve	269 mV	270 mV	0.001 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	163 mV	156 mV	-0.002 kPa
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold	X-Y Inclinometer	2579 mV	2594 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT110

DRAWN	DATE 29/10/2021
CHECKED	DATE 29/10/2021
SCALE Not To Scale	A4
PROJECT No 1210518	FIGURE No

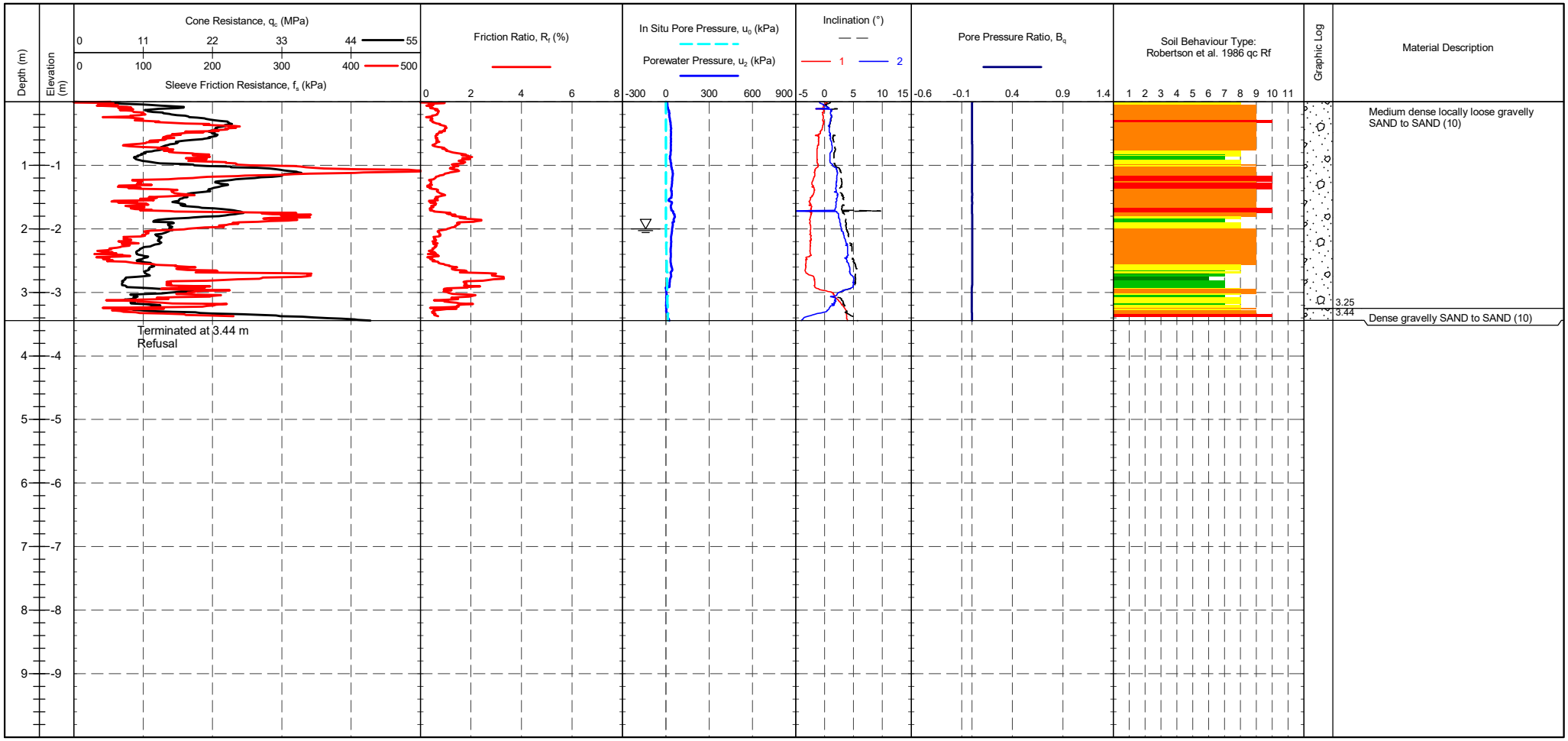
210713-ADVANCED REPORT INSITUSI 2.02.1.LIB - LUISA.GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF A4P 1210518-PROPOSED LIDL.GPJ <<DrawingFile>> 29/10/2021 16:31 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Pfj: In Situ SI 2.02.0 2017-07-10

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 01

PointID: **CPT110A**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on total pressure.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 26/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID : S15-CFIP.1867	TEST TYPE : TE2		
CALIBRATION DATE : 05/03/2021	APPLICATION CLASS : 2		
CONE MODEL : Subtraction	RIG : CPT 006 - Zoe		
CONE AREA : 15cm^2	OPERATOR : DHo		
CONE AREA RATIO : 0.79	FRICTION REDUCER : None		
FILTER POSITION : u2	WEATHER : Overcast & Cold		
FILTER TYPE : HDPE	GROUNDWATER DEPTH : Assumed for calculation purposes		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	322 mV	315 mV	-0.076 MPa
Sleeve	273 mV	268 mV	-0.004 kPa
Pore Pressure 2	201 mV	158 mV	-0.01 kPa
X-Y Inclinometer	2510 mV	2599 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

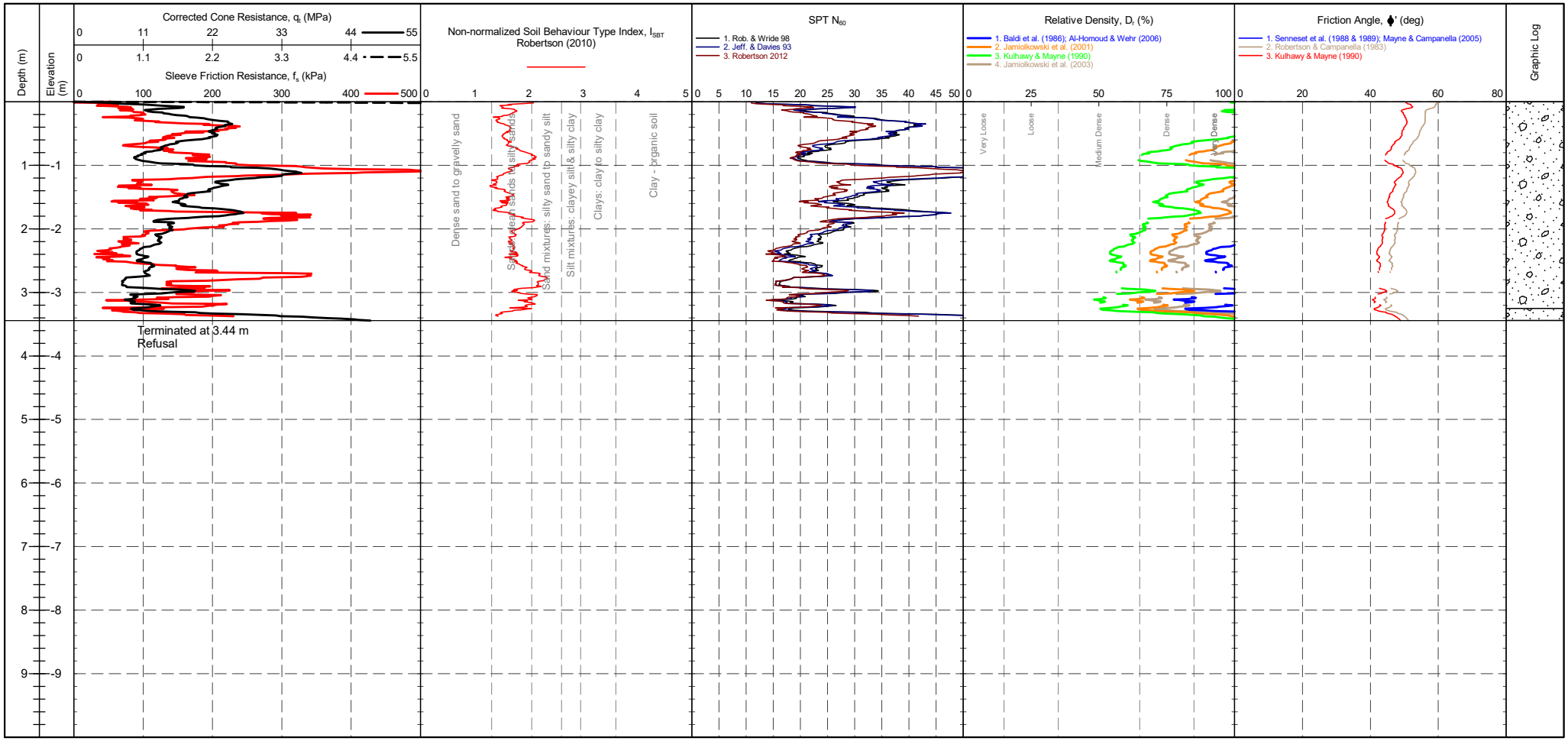
PointID **CPT110A**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 26/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm²	RIG	: CPT 006 - Zoe
CONE AREA RATIO	: 0.79	OPERATOR	: DHo
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	322 mV	315 mV	-0.076 MPa
Sleeve	273 mV	268 mV	-0.004 kPa
Pore Pressure 2	201 mV	158 mV	-0.01 kPa
X-Y Inclinometer	2510 mV	2599 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic
Clays	2.95-3.60
Silt mixtures	2.60-2.95
Sand mixtures	2.05-2.60
Sands	1.31-2.05
Gravelly sand	<1.31

Description	SPT N value, NSPT
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	>50

Description	Relative Density Dr (%)
Very Loose	0 - 15
Loose	15 - 35
Medium Dense	35 - 65
Dense	65 - 85
Very Dense	>85

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 03

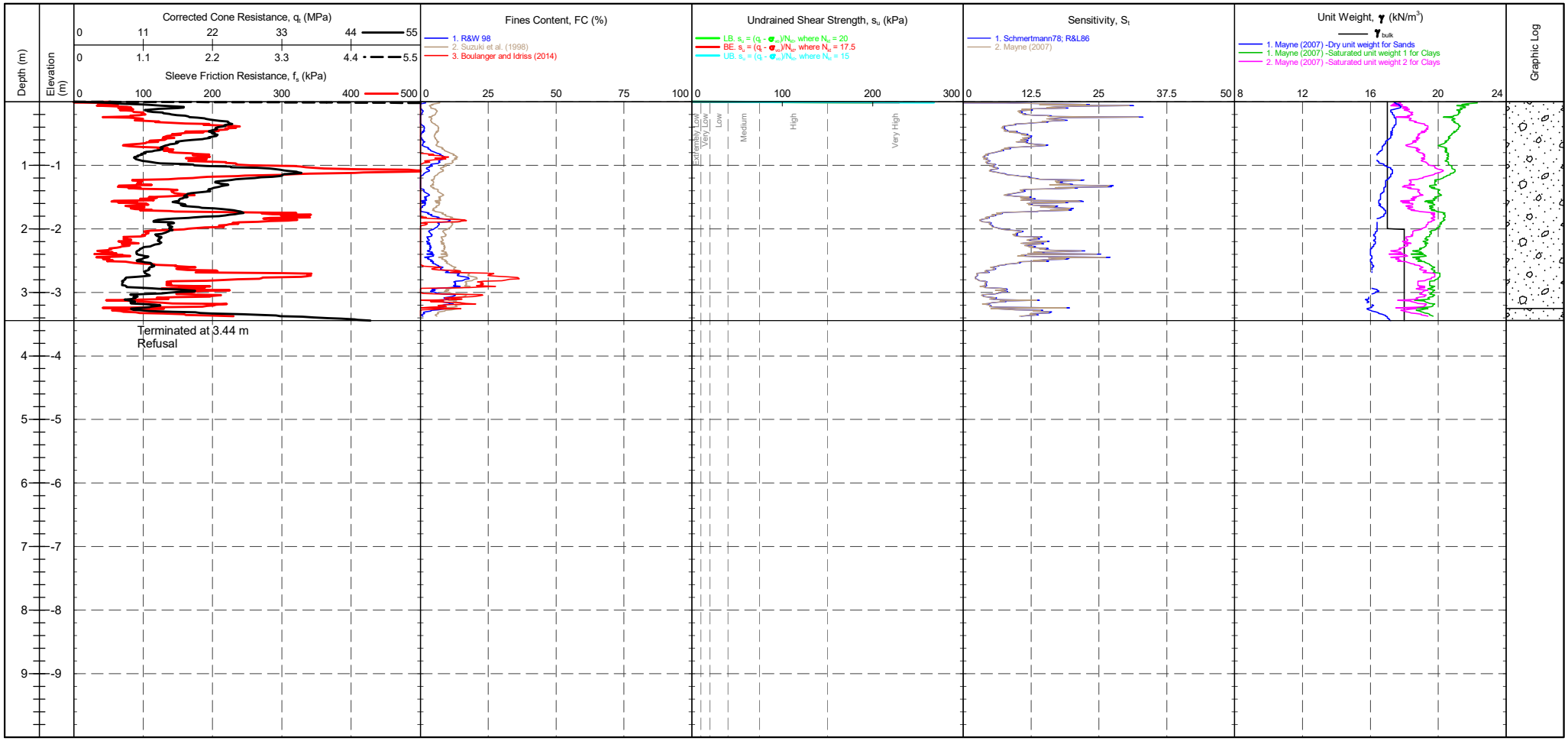
PointID **CPT110A**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 26/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2		
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe		
CONE AREA RATIO	: 0.79	OPERATOR	: DHo		
FILTER POSITION	: u2	FRICTION REDUCER	: None		
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	322 mV	315 mV	-0.076 MPa
Sleeve	273 mV	268 mV	-0.004 kPa
Pore Pressure 2	201 mV	158 mV	-0.01 kPa
X-Y Inclinometer	2510 mV	2599 mV	

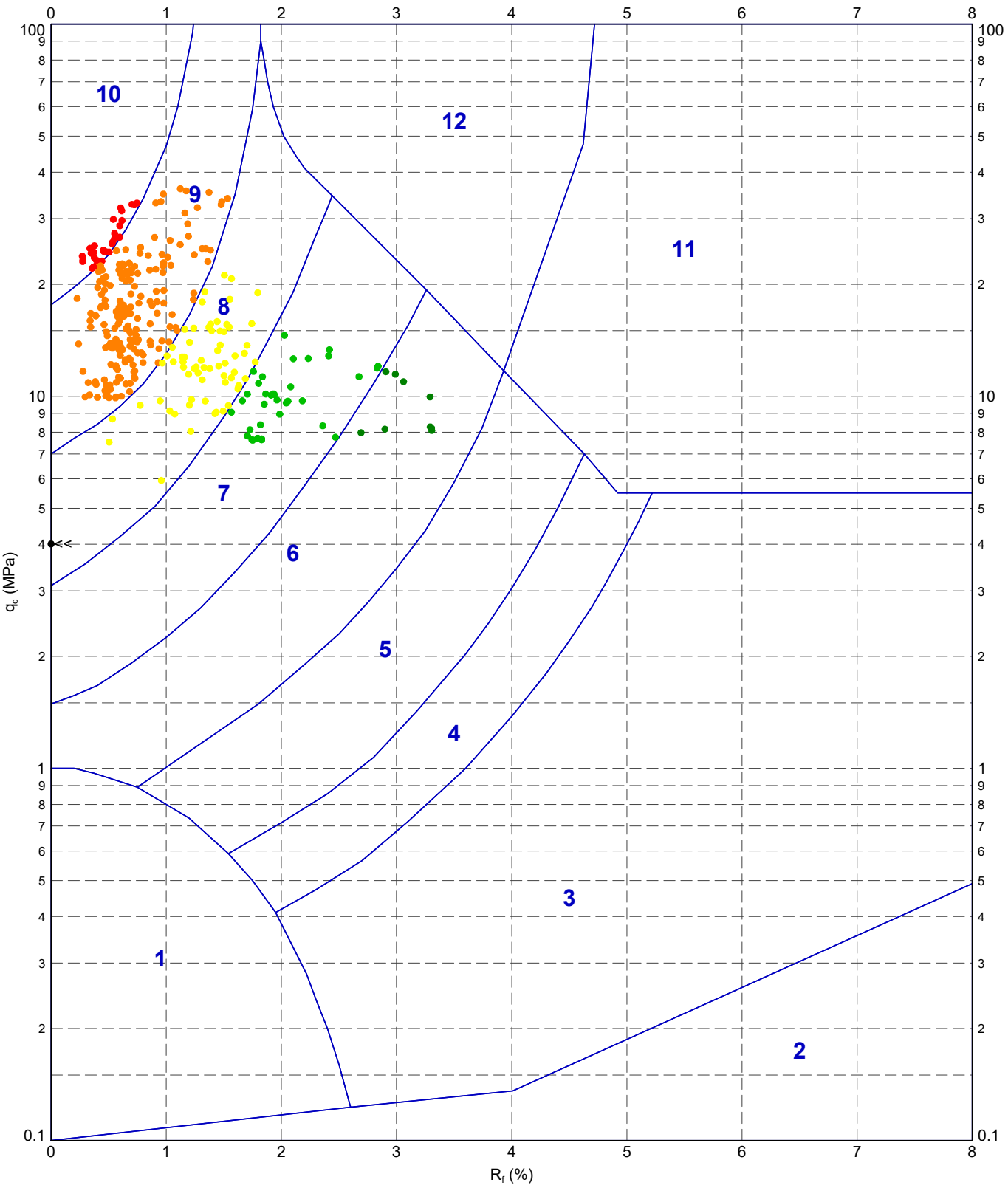
COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)
Extremely low strength	<10
Very low strength	10-20
Low strength	20-40

Term based on measurement	su (kPa)
Medium strength	40-75
High strength	75-150
Very high strength	150-300
Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT110A

DRAWN	DATE 29/10/2021
CHECKED	DATE 29/10/2021
SCALE Not To Scale	A4
PROJECT No 1210518	FIGURE No

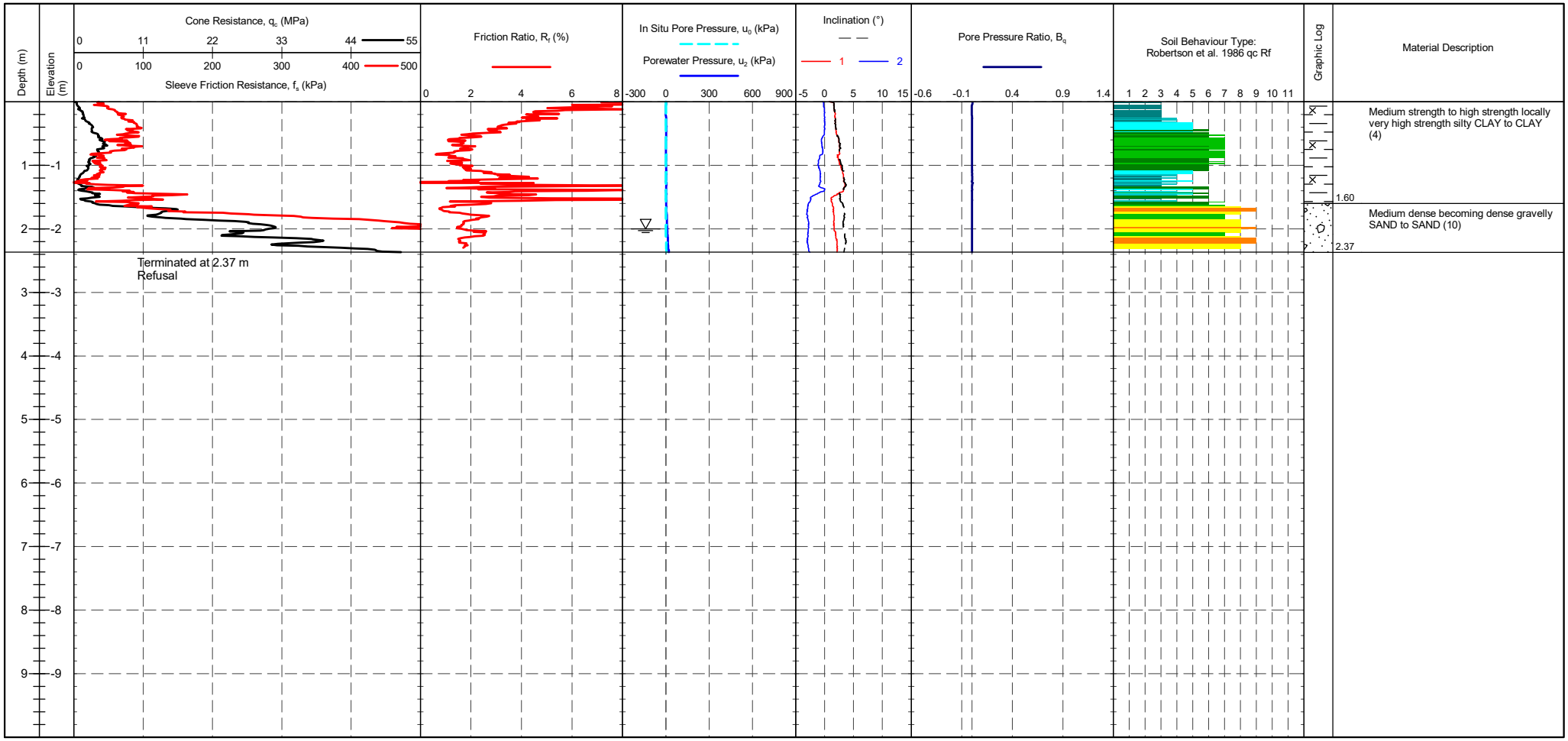
210713-ADVANCED REPORT INSITUSI 2.02.1.LIB - LUISA.GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF A4P 1210518-PROPOSED LIDL.GPJ <<DrawingFile>> 29/10/2021 16:33 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Pfj: In Situ SI 2.02.0 2017-07-10

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 01

PointID: **CPT111**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 26/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CALIBRATION DATE	: 05/03/2021	APPLICATION CLASS	: 2		
CONE MODEL	: Subtraction	RIG	: CPT 006 - Zoe		
CONE AREA	: 15cm^2	OPERATOR	: DHo		
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None		
FILTER POSITION	: u2	WEATHER	: Overcast & Cold		
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	315 mV	324 mV	0.098 MPa
Sleeve	269 mV	275 mV	0.004 kPa
Pore Pressure 2	159 mV	176 mV	0.004 kPa
X-Y Inclinometer	2599 mV	2629 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

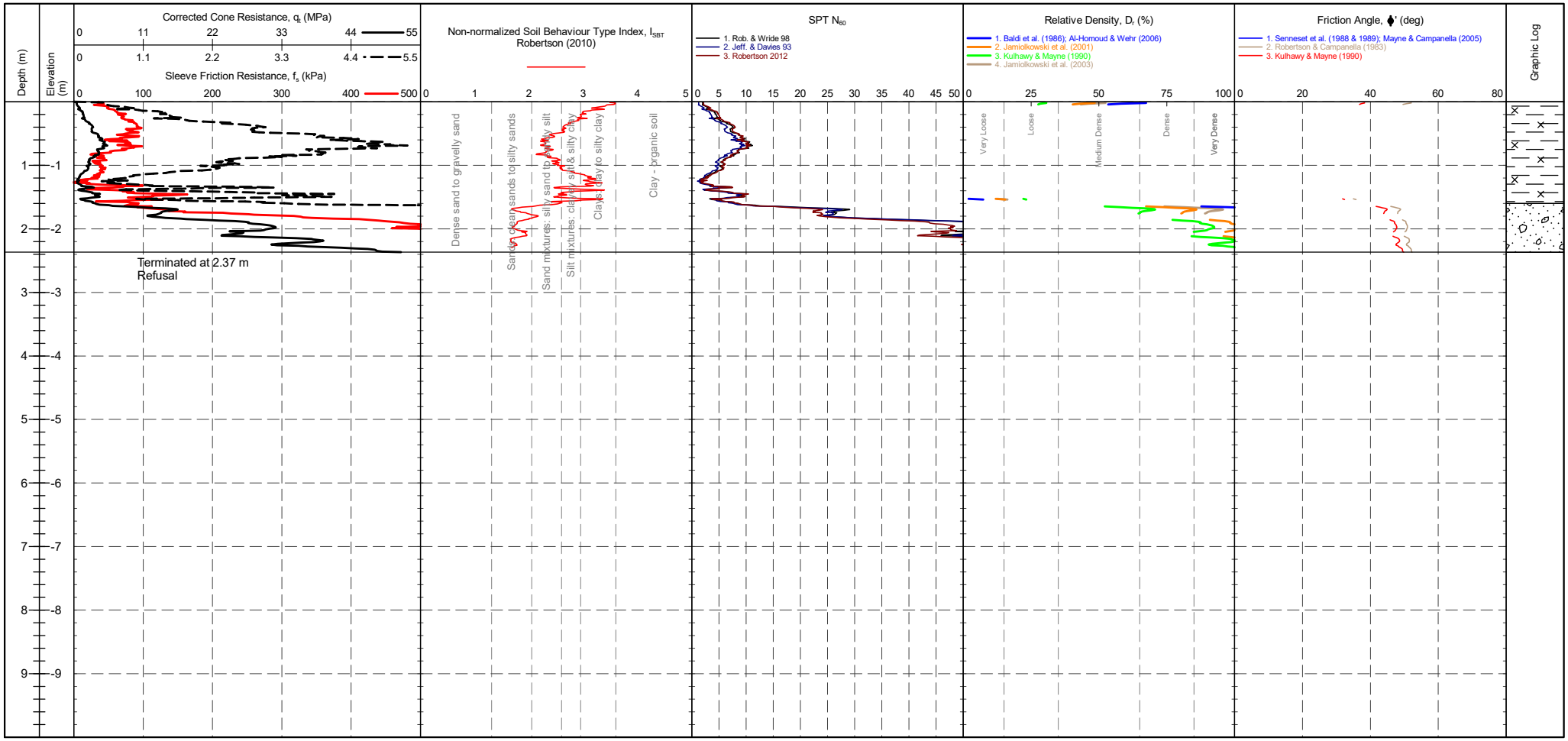
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

PointID **CPT111**

CLIENT : Curtins PROJECT : Proposed LIDL LOCATION : Cross Keys Hoyland PROJECT No. : 1210518	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 26/10/2021 PLOT DATE : 29/10/2021 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm²	RIG	: CPT 006 - Zoe	Tip	315 mV	324 mV	0.098 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: DHo	Sleeve	269 mV	275 mV	0.004 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	159 mV	176 mV	0.004 kPa
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold	X-Y Inclinometer	2599 mV	2629 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

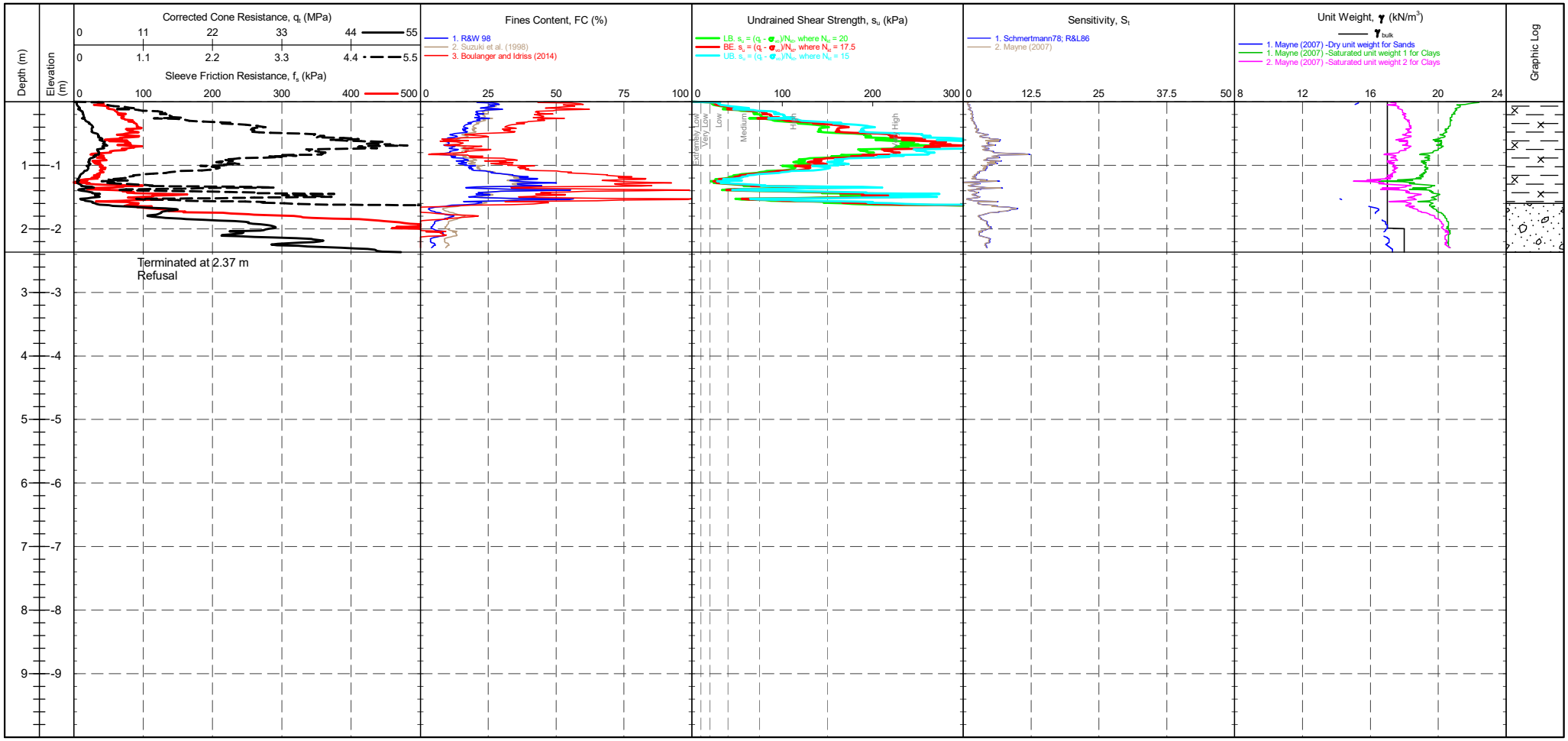
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 03

PointID: **CPT111**

CLIENT : Curtins PROJECT : Proposed LIDL LOCATION : Cross Keys Hoyland PROJECT No. : 1210518	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 26/10/2021 PLOT DATE : 29/10/2021 METHOD : ISO 22476-1:2012



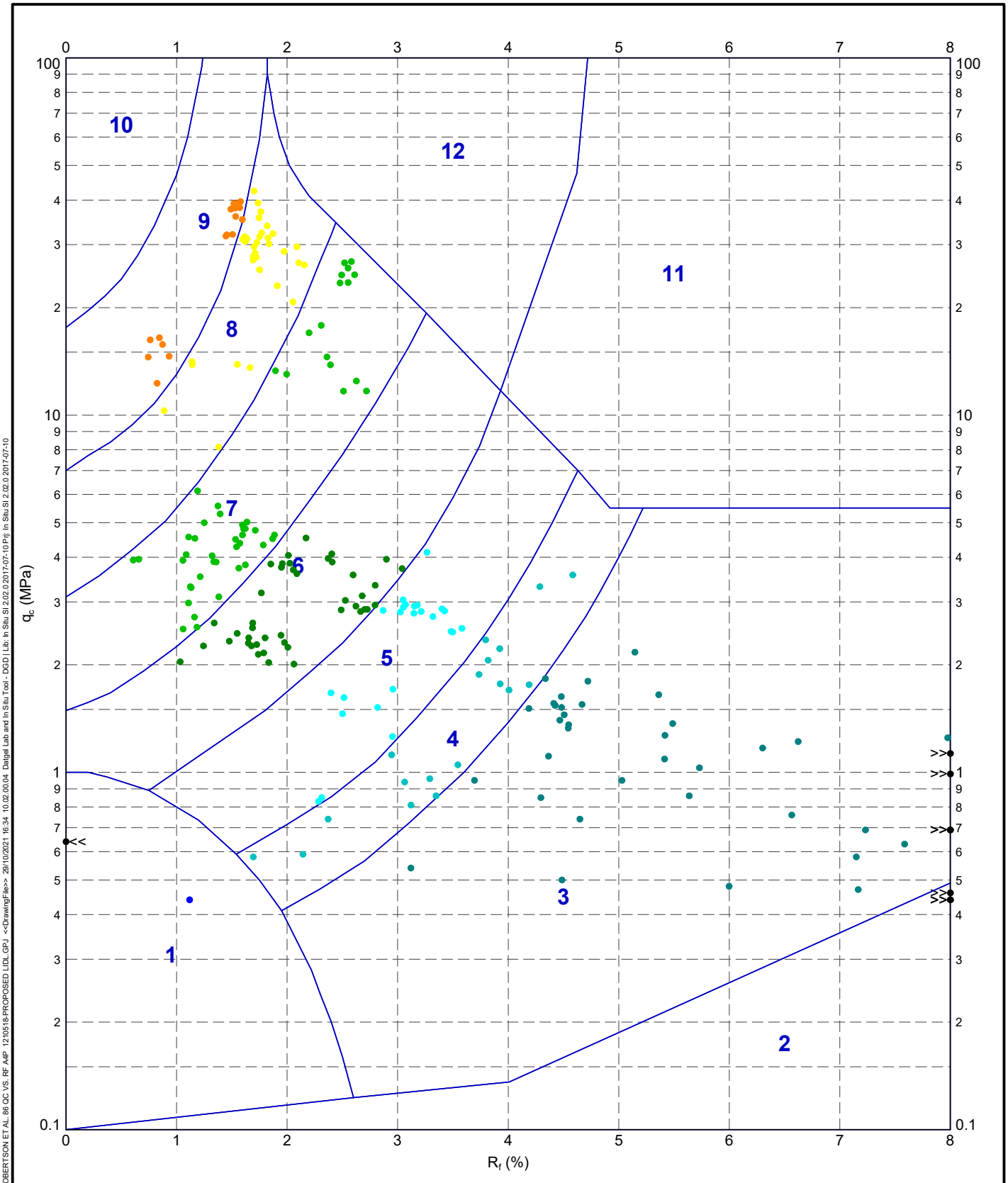
CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe	Tip	315 mV	324 mV	0.098 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: DHo	Sleeve	269 mV	275 mV	0.004 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	159 mV	176 mV	0.004 kPa
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold	X-Y Inclinometer	2599 mV	2629 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT111

DRAWN	DATE 29/10/2021
CHECKED	DATE 29/10/2021
SCALE Not To Scale	A4
PROJECT No 1210518	FIGURE No

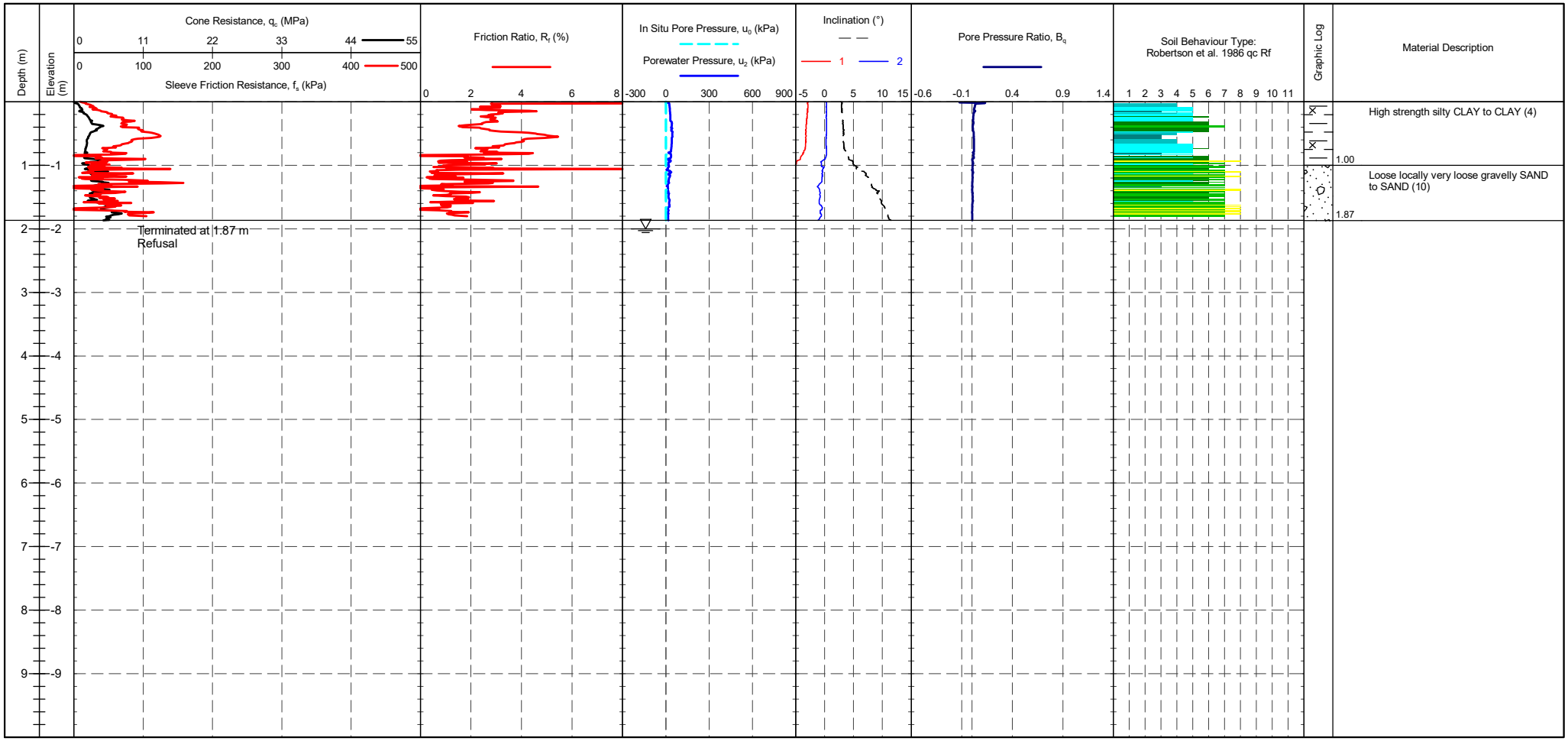
210713-ADVANCED REPORT INSITUSI 2.02.1.LIB - LUISA.GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF A4P 1210518-PROPOSED LIDL.GPJ <<DrawingFile>> 29/10/2021 16:34 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Pfj: In Situ SI 2.02.0 2017-07-10

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 01

PointID: **CPT112**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on inclination.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 27/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CALIBRATION DATE	: 05/03/2021	APPLICATION CLASS	: 2		
CONE MODEL	: Subtraction	RIG	: CPT 006 - Zoe		
CONE AREA	: 15cm^2	OPERATOR	: DB		
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None		
FILTER POSITION	: u2	WEATHER	: Overcast & Mild		
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	327 mV	328 mV	0.011 MPa
Sleeve	275 mV	275 mV	0 kPa
Pore Pressure 2	191 mV	192 mV	0 kPa
X-Y Inclinometer	2250 mV	2255 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

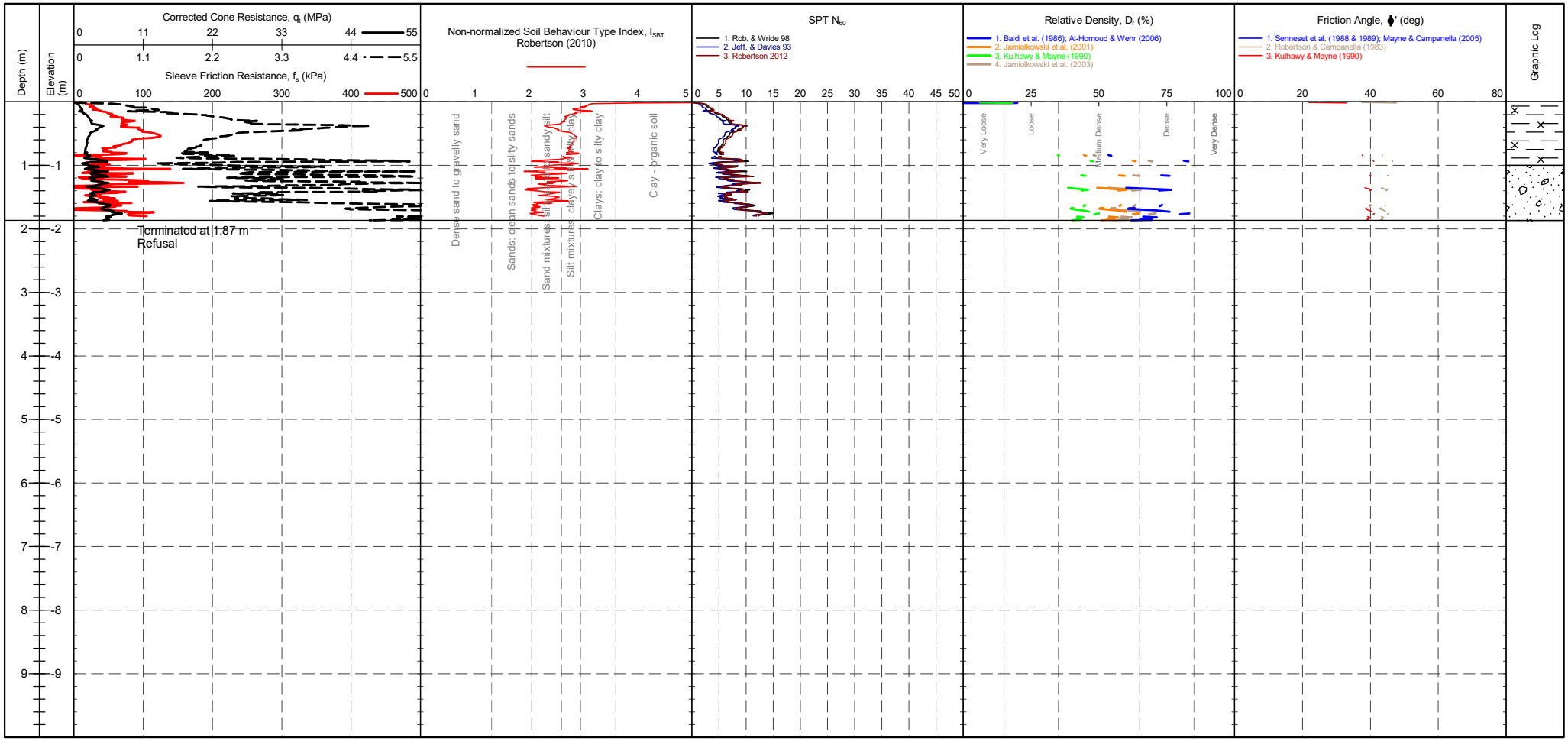
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

PointID: **CPT112**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on inclination.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 27/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post
CONE AREA	: 15cm²	RIG	: CPT 006 - Zoe	Tip	327 mV	328 mV
CONE AREA RATIO	: 0.79	OPERATOR	: DB	Sleeve	275 mV	275 mV
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	191 mV	192 mV
FILTER TYPE	: HDPE	WEATHER	: Overcast & Mild	X-Y Inclinometer	2250 mV	2255 mV

Transducer	Difference
Tip	0.011 MPa
Sleeve	0 kPa
Pore Pressure 2	0 kPa

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

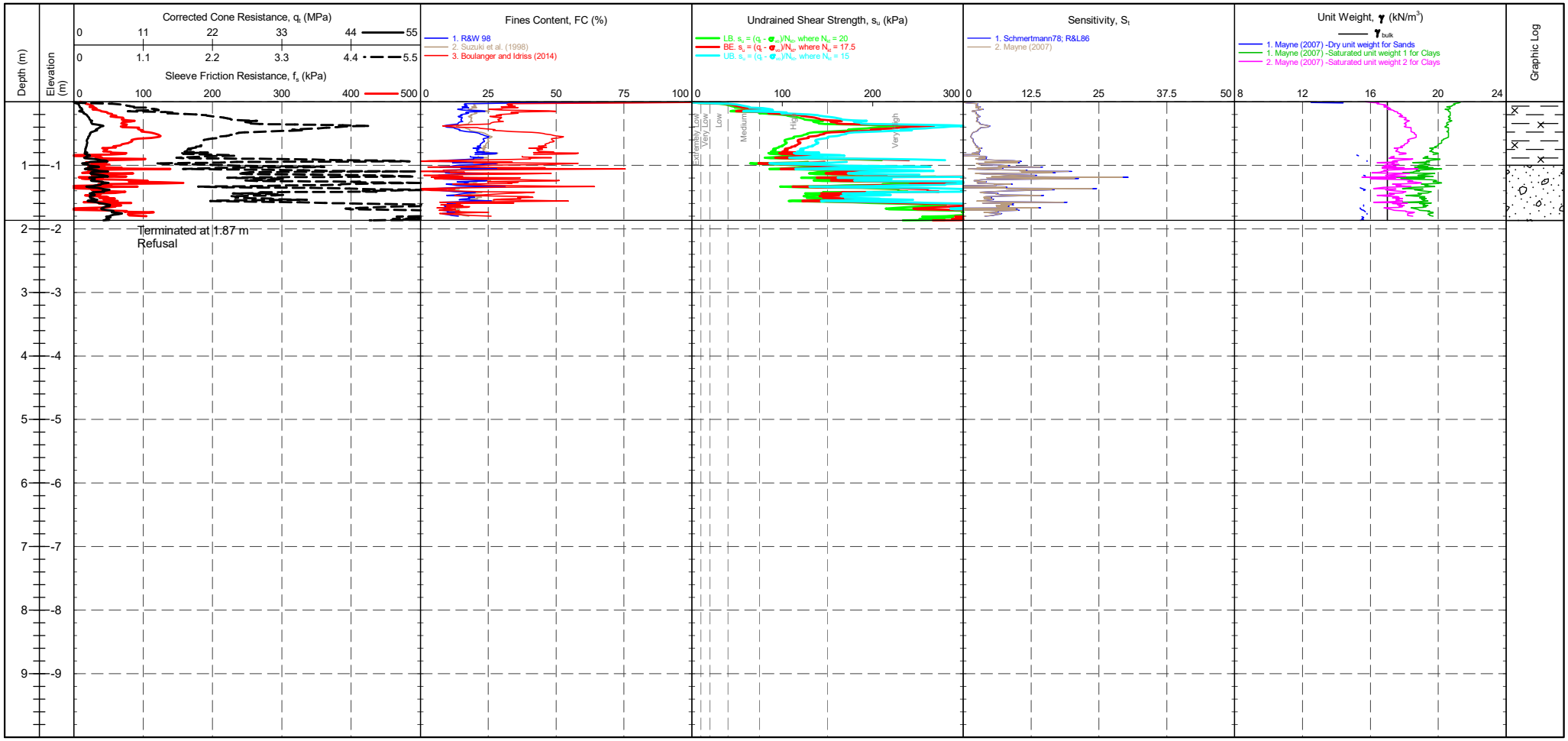
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 03

PointID **CPT112**

CLIENT : Curtins PROJECT : Proposed LIDL LOCATION : Cross Keys Hoyland PROJECT No. : 1210518	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on inclination.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 27/10/2021 PLOT DATE : 29/10/2021 METHOD : ISO 22476-1:2012



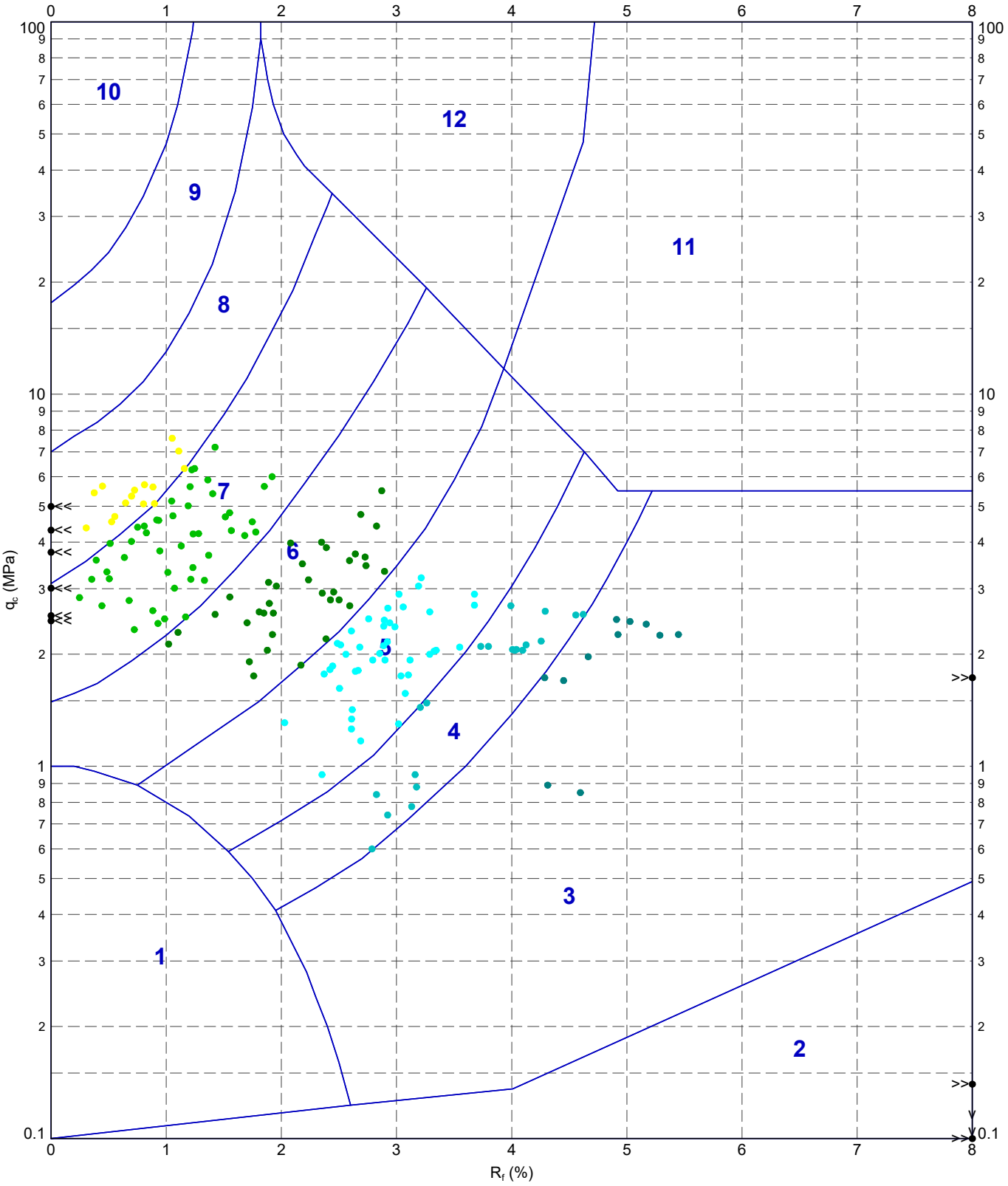
CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe	Tip	327 mV	328 mV	0.011 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: DB	Sleeve	275 mV	275 mV	0 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	191 mV	192 mV	0 kPa
FILTER TYPE	: HDPE	WEATHER	: Overcast & Mild	X-Y Inclinometer	2250 mV	2255 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	4 - Silty CLAY to CLAY	7 - Silty SAND to sandy SILT	10 - Gravelly SAND to SAND
2 - Organic material	5 - Clayey SILT to silty CLAY	8 - SAND to silty SAND	11 - Very stiff fine grained
3 - CLAY	6 - Sandy SILT to clayey SILT	9 - SAND	12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT112

DRAWN	DATE 29/10/2021	
CHECKED	DATE 29/10/2021	
SCALE Not To Scale		A4
PROJECT No 1210518	FIGURE No	

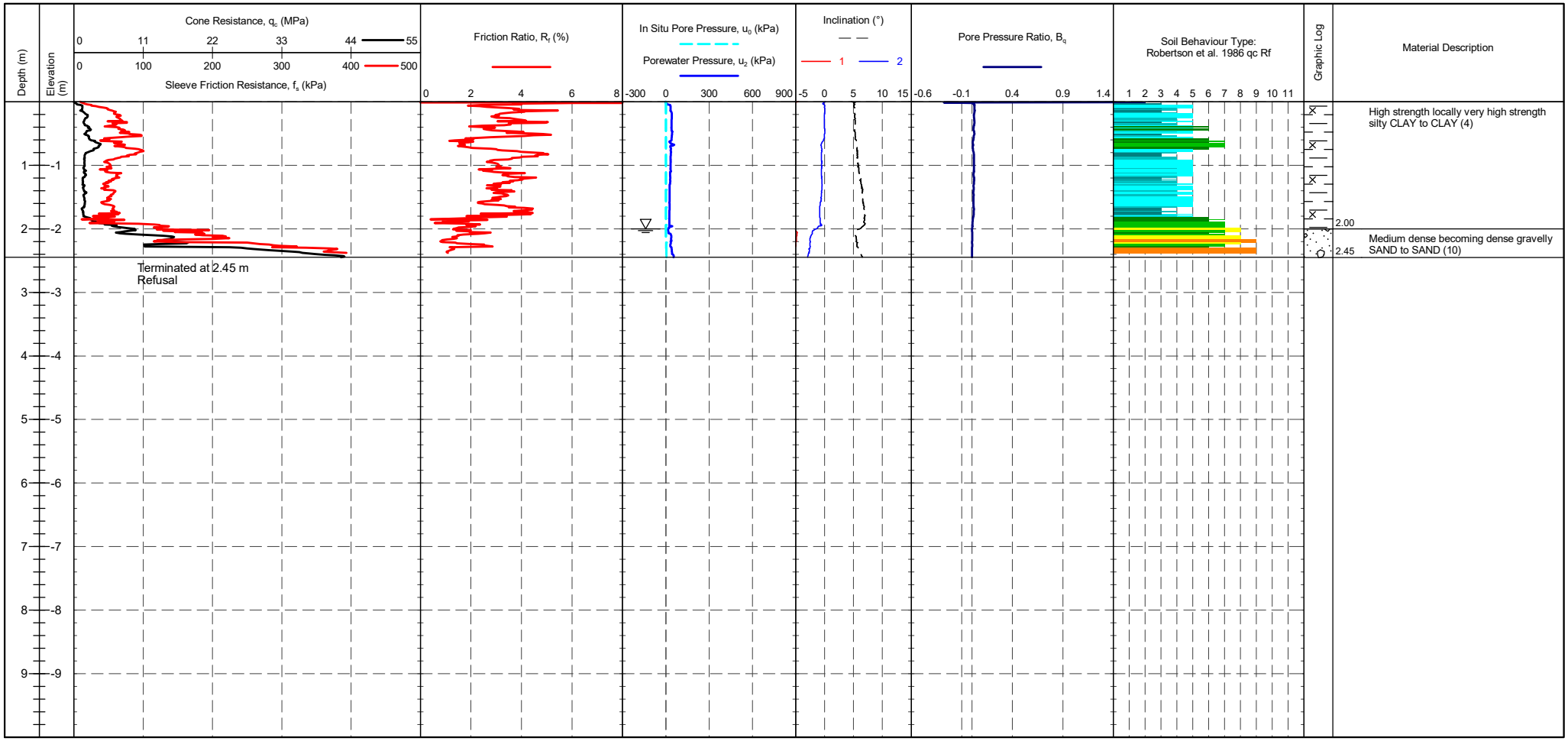
210713-ADVANCED REPORT INSITUSI 2.02.1.LIB - LUISA.GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF A4P 1210518-PROPOSED LIDL.GPJ <<DrawingFile>> 29/10/2021 16:36 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Pfj: In Situ SI 2.02.0 2017-07-10

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 01

PointID **CPT112a**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 27/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2
CALIBRATION DATE	: 05/03/2021	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 006 - Zoe
CONE AREA	: 15cm^2	OPERATOR	: DB
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Overcast & Mild
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	325 mV	325 mV	0 MPa
Sleeve	274 mV	272 mV	-0.001 kPa
Pore Pressure 2	230 mV	189 mV	-0.01 kPa
X-Y Inclinometer	2051 mV	2071 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

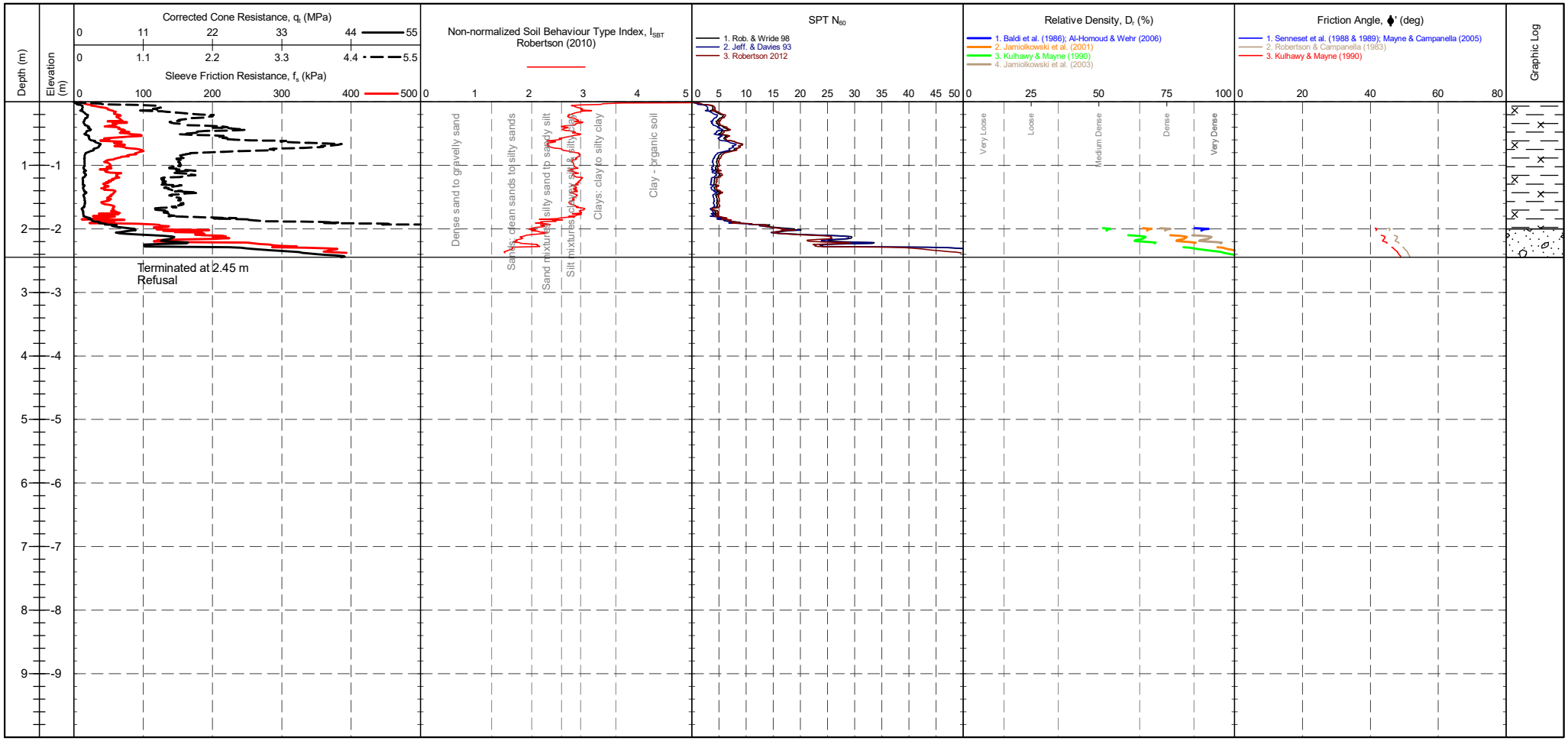
PointID **CPT112a**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 27/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm²	RIG	: CPT 006 - Zoe	Tip	325 mV	325 mV	0 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: DB	Sleeve	274 mV	272 mV	-0.001 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	230 mV	189 mV	-0.01 kPa
FILTER TYPE	: HDPE	WEATHER	: Overcast & Mild	X-Y Inclinometer	2051 mV	2071 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

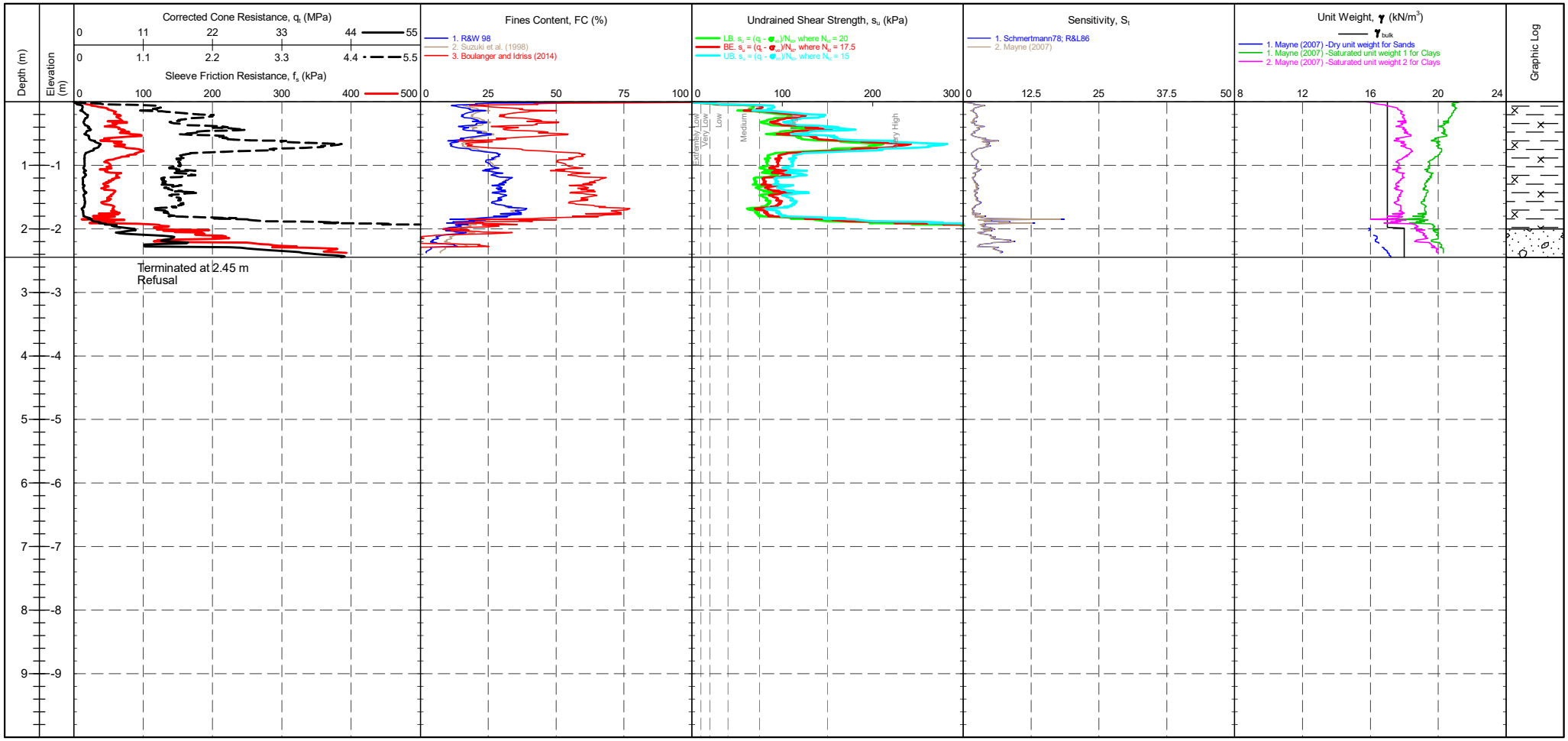
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 03

PointID: **CPT112a**

CLIENT : Curtins PROJECT : Proposed LIDL LOCATION : Cross Keys Hoyland PROJECT No. : 1210518	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 27/10/2021 PLOT DATE : 29/10/2021 METHOD : ISO 22476-1:2012



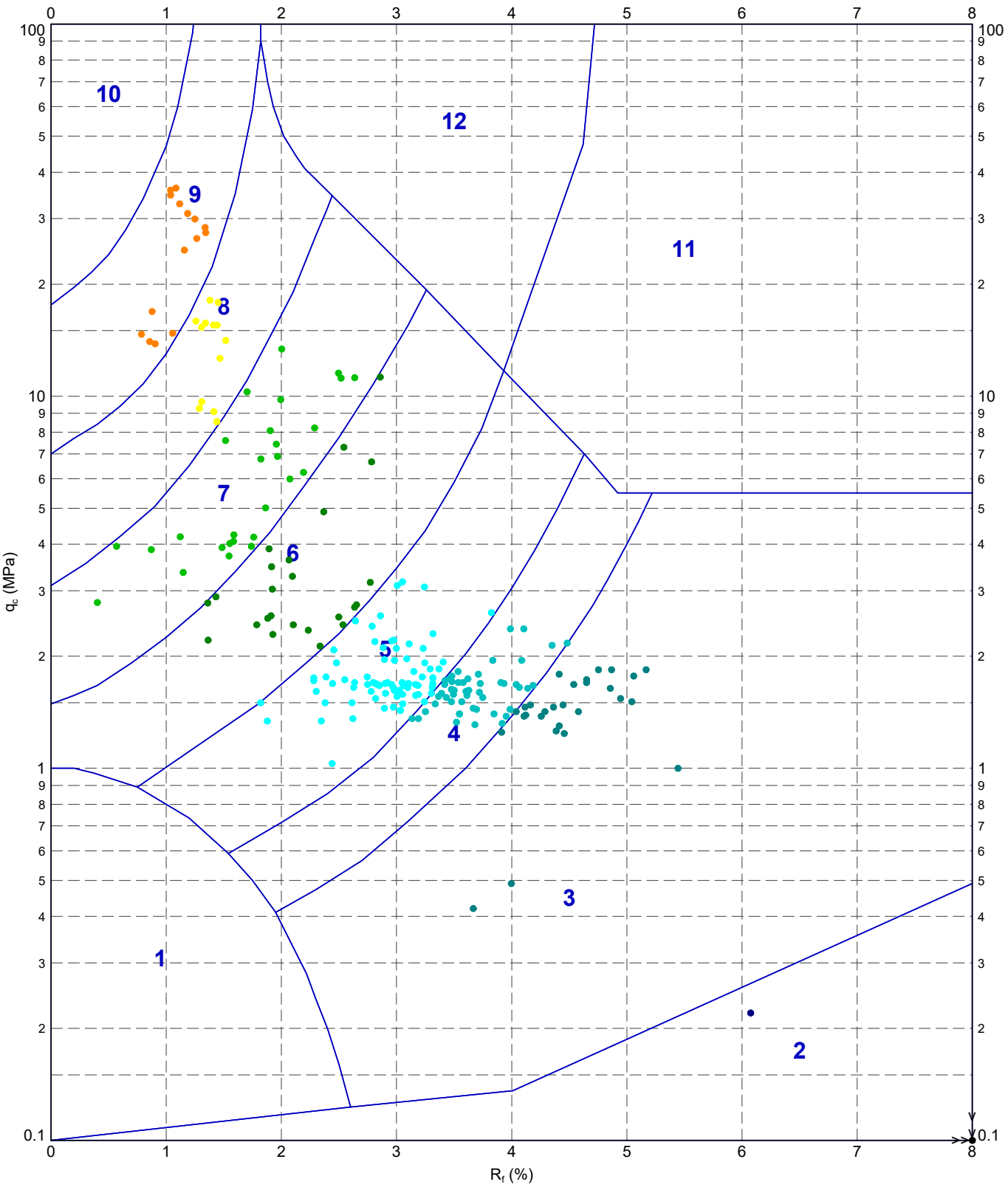
CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe	Tip	325 mV	325 mV	0 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: DB	Sleeve	274 mV	272 mV	-0.001 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	230 mV	189 mV	-0.01 kPa
FILTER TYPE	: HDPE	WEATHER	: Overcast & Mild	X-Y Inclinometer	2051 mV	2071 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	4 - Silty CLAY to CLAY	7 - Silty SAND to sandy SILT	10 - Gravelly SAND to SAND
2 - Organic material	5 - Clayey SILT to silty CLAY	8 - SAND to silty SAND	11 - Very stiff fine grained
3 - CLAY	6 - Sandy SILT to clayey SILT	9 - SAND	12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT112a

DRAWN	DATE 29/10/2021	
CHECKED	DATE 29/10/2021	
SCALE Not To Scale		A4
PROJECT No 1210518	FIGURE No	

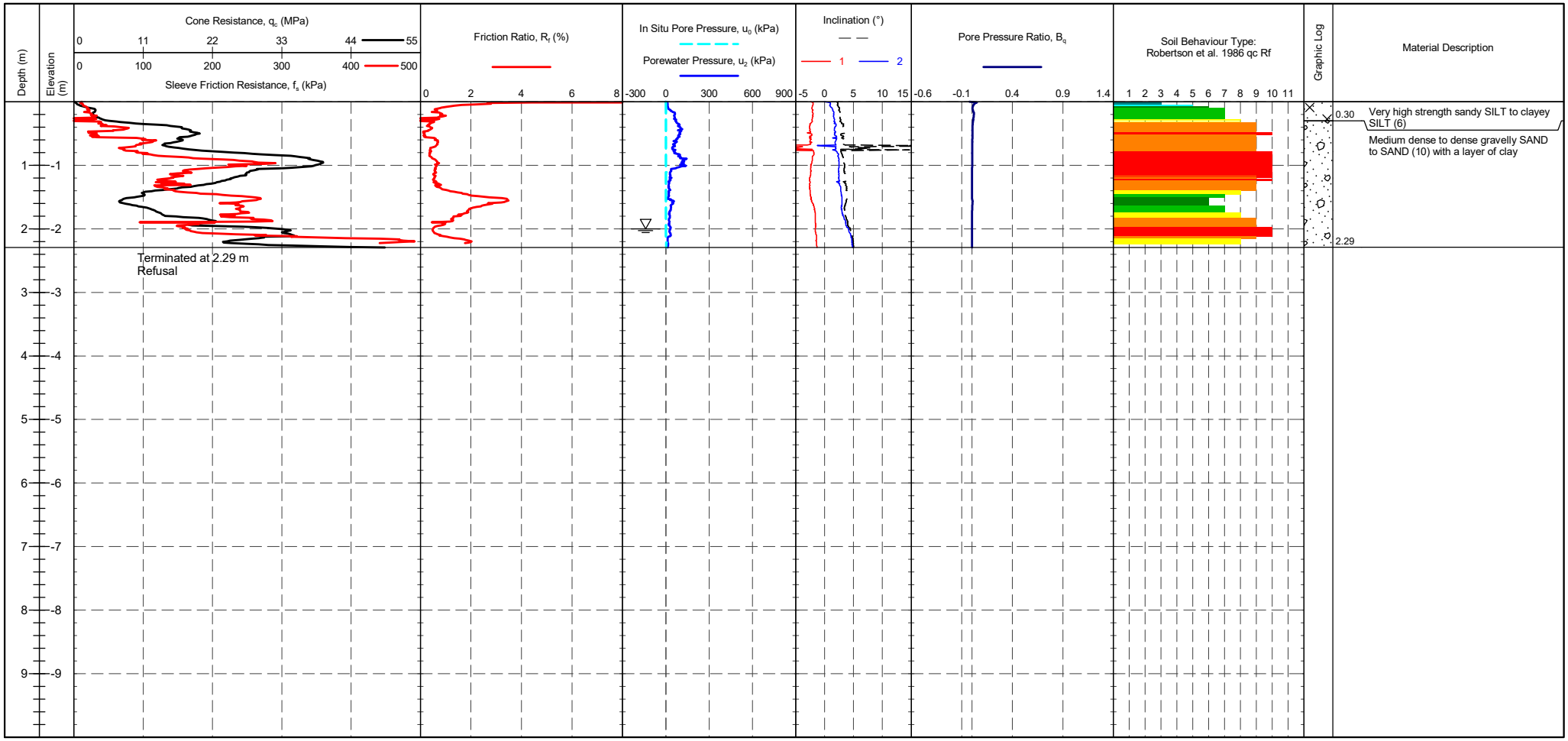
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IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 01

PointID: **CPT113**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 26/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CALIBRATION DATE	: 05/03/2021	APPLICATION CLASS	: 2		
CONE MODEL	: Subtraction	RIG	: CPT 006 - Zoe		
CONE AREA	: 15cm^2	OPERATOR	: DHo		
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None		
FILTER POSITION	: u2	WEATHER	: Overcast & Cold		
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	322 mV	317 mV	-0.054 MPa
Sleeve	273 mV	272 mV	-0.001 kPa
Pore Pressure 2	219 mV	160 mV	-0.014 kPa
X-Y Inclinometer	2290 mV	2299 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

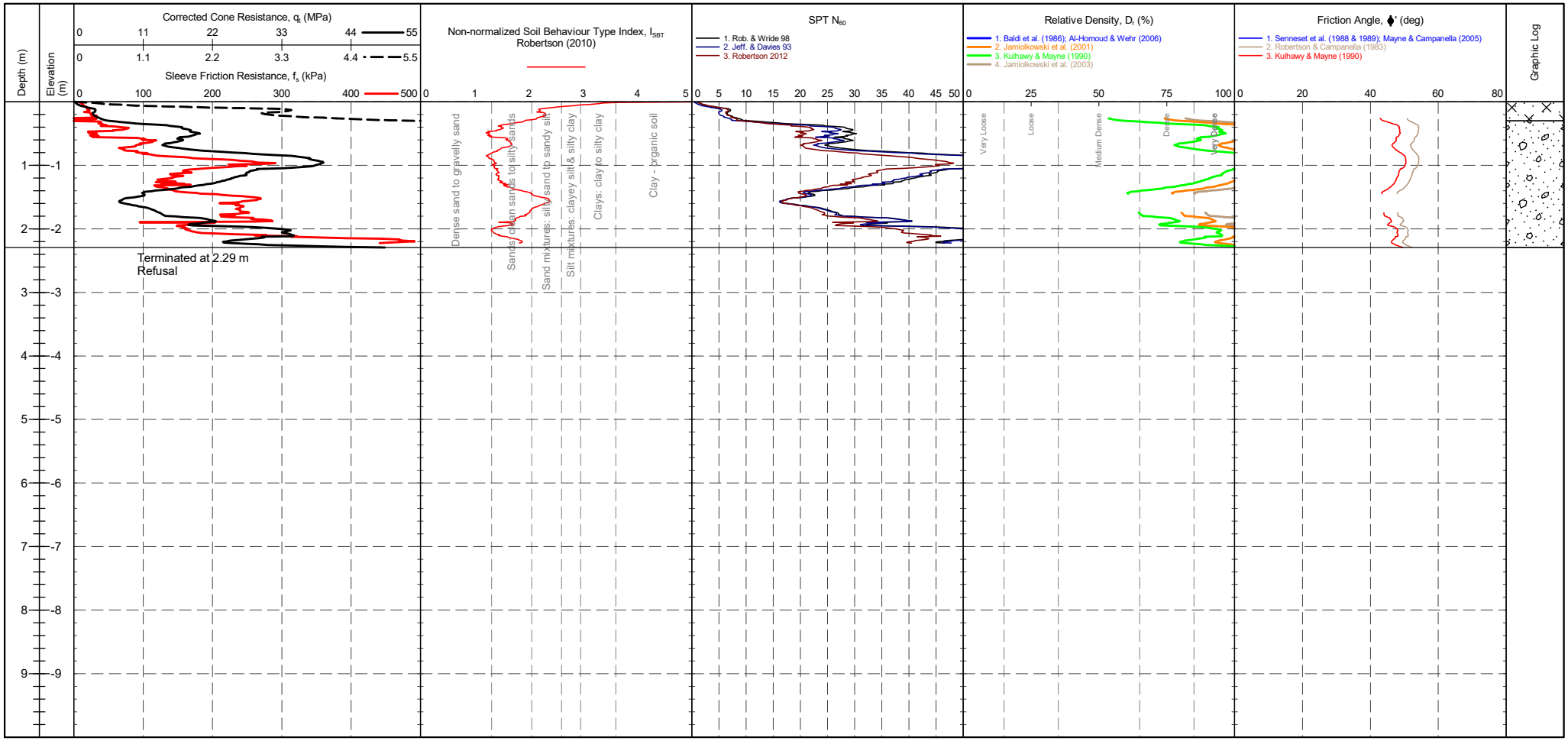
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

PointID: **CPT113**

CLIENT : Curtins PROJECT : Proposed LIDL LOCATION : Cross Keys Hoyland PROJECT No. : 1210518	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 26/10/2021 PLOT DATE : 29/10/2021 METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2		
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe		
CONE AREA RATIO	: 0.79	OPERATOR	: DHo		
FILTER POSITION	: u2	FRICTION REDUCER	: None		
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	322 mV	317 mV	-0.054 MPa
Sleeve	273 mV	272 mV	-0.001 kPa
Pore Pressure 2	219 mV	160 mV	-0.014 kPa
X-Y Inclinometer	2290 mV	2299 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

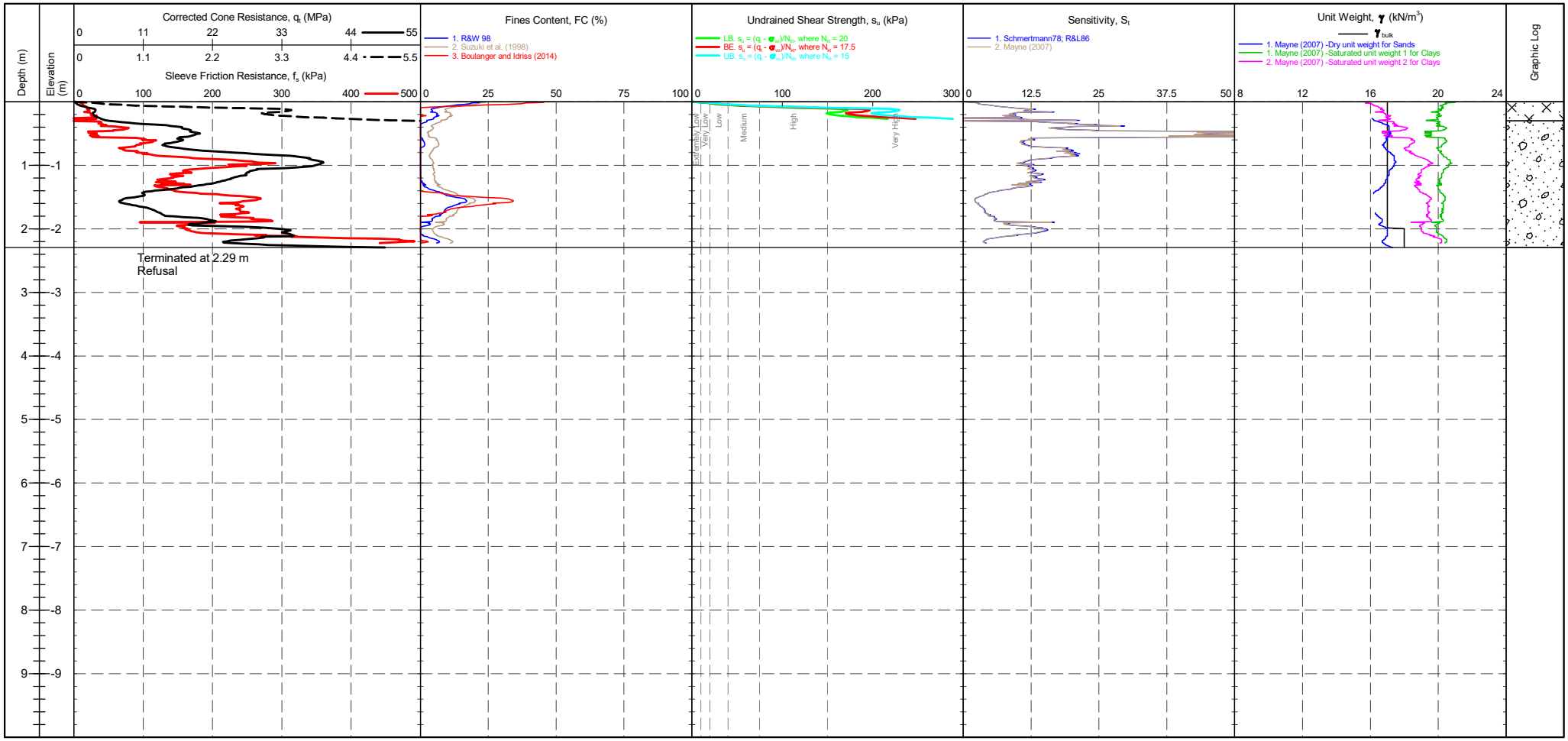
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 03

PointID: **CPT113**

CLIENT : Curtins PROJECT : Proposed LIDL LOCATION : Cross Keys Hoyland PROJECT No. : 1210518	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 26/10/2021 PLOT DATE : 29/10/2021 METHOD : ISO 22476-1:2012



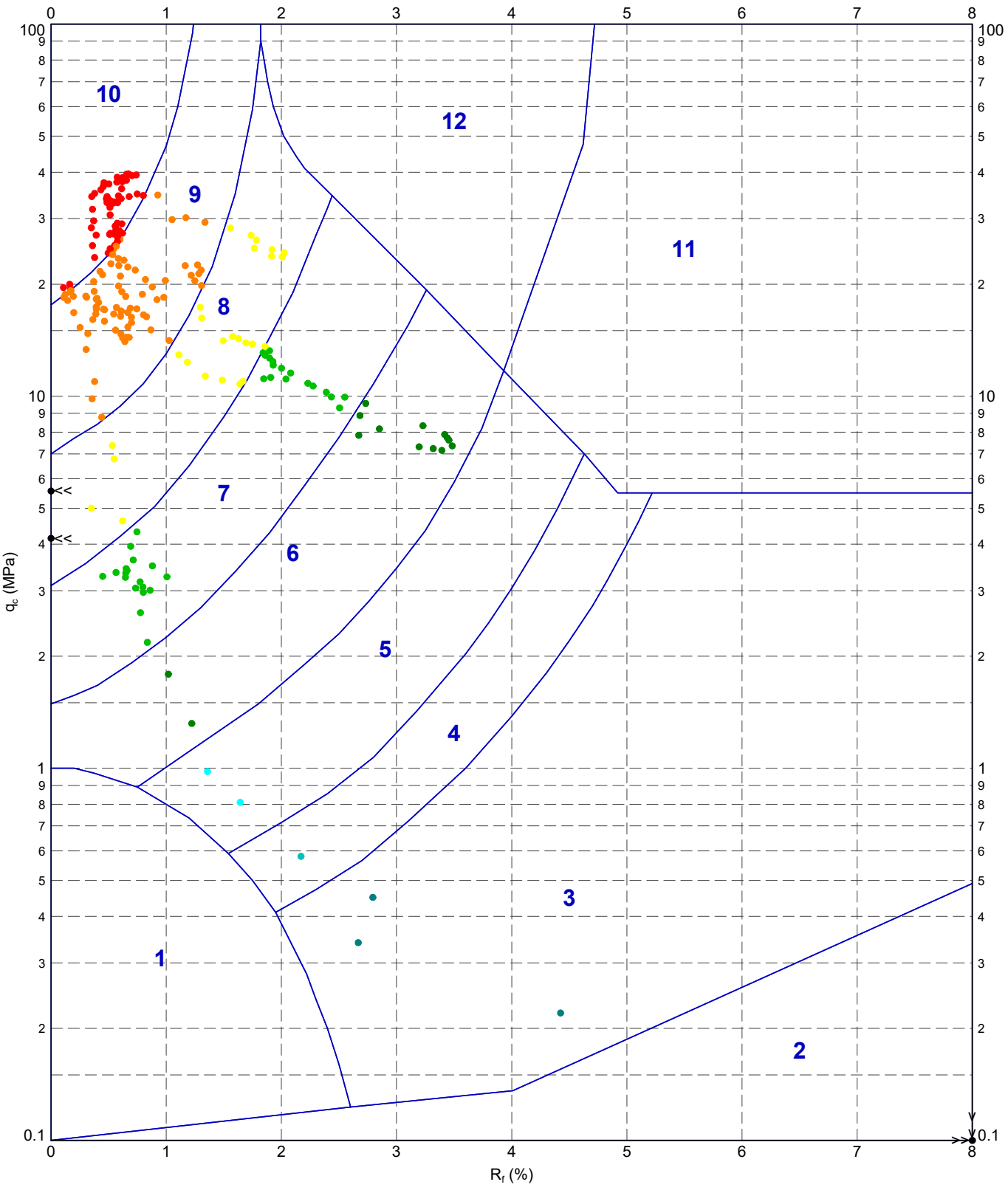
CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe	Tip	322 mV	317 mV	-0.054 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: DHo	Sleeve	273 mV	272 mV	-0.001 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	219 mV	160 mV	-0.014 kPa
FILTER TYPE	: HDPE	WEATHER	: Overcast & Cold	X-Y Inclinometer	2290 mV	2299 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT113

DRAWN	DATE 29/10/2021
CHECKED	DATE 29/10/2021
SCALE Not To Scale	A4
PROJECT No 1210518	FIGURE No

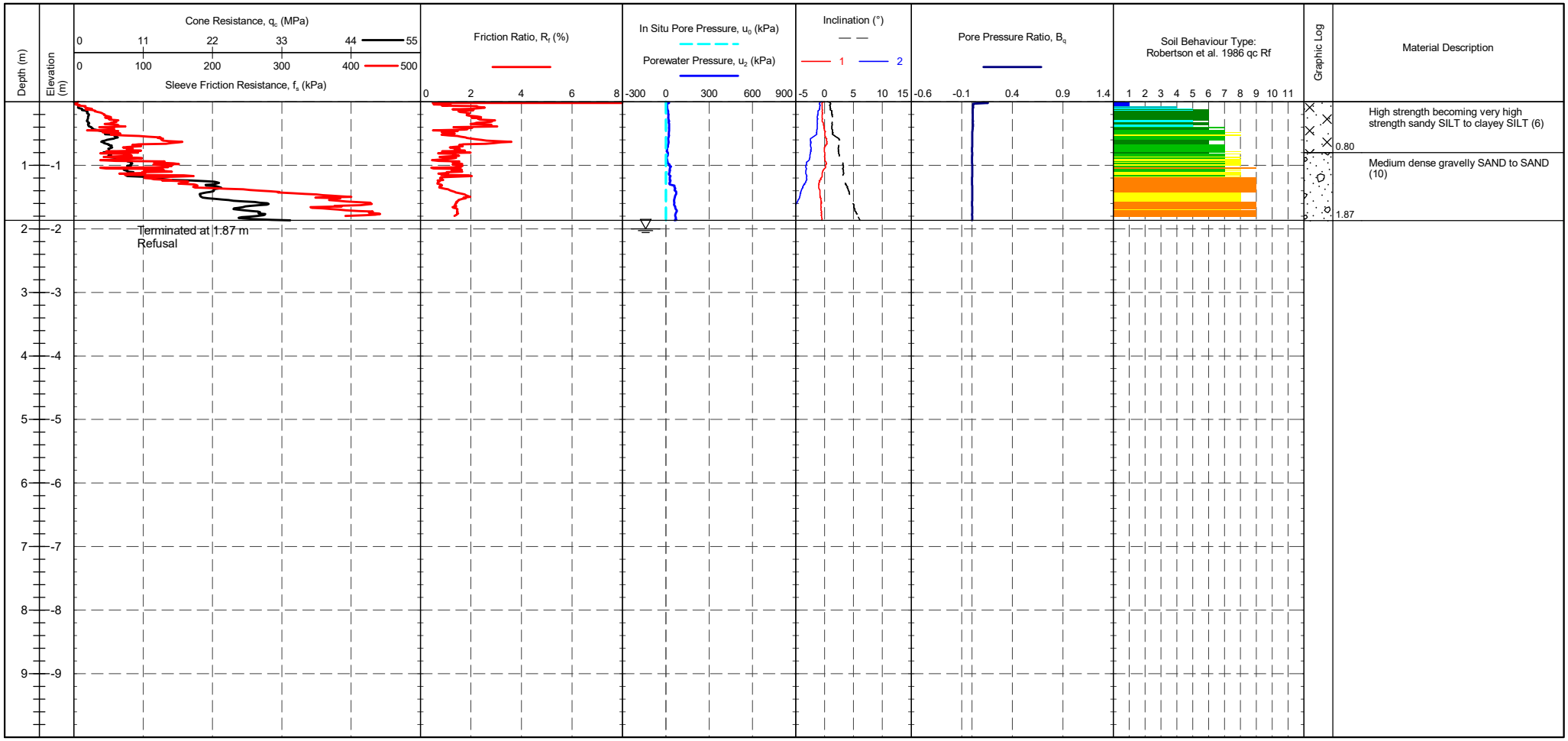
210713-ADVANCED REPORT INSITUSI 2.02.1.LIB - LUISA.GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF AAP 1210518-PROPOSED LIDL.GPJ <<DrawingFile>> 29/10/2021 16:39 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Pfj: In Situ SI 2.02.0 2017-07-10

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 01

PointID: **CPT114**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 27/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CALIBRATION DATE	: 05/03/2021	APPLICATION CLASS	: 2		
CONE MODEL	: Subtraction	RIG	: CPT 006 - Zoe		
CONE AREA	: 15cm^2	OPERATOR	: DB		
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None		
FILTER POSITION	: u2	WEATHER	: Overcast & Mild		
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	324 mV	327 mV	0.033 MPa
Sleeve	270 mV	273 mV	0.002 kPa
Pore Pressure 2	166 mV	162 mV	-0.001 kPa
X-Y Inclinometer	2523 mV	2519 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

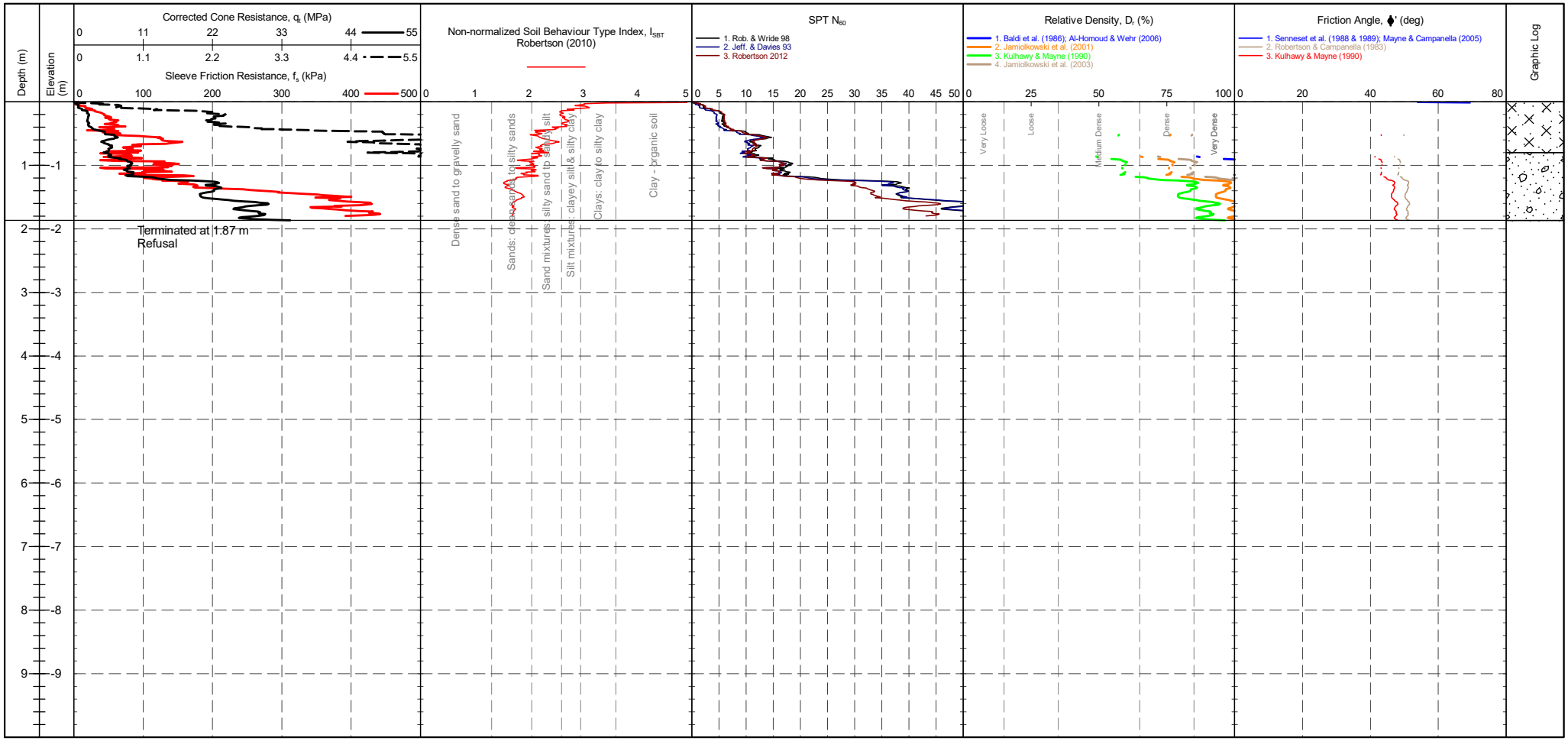
PointID **CPT114**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 27/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2
CONE AREA	: 15cm²	RIG	: CPT 006 - Zoe
CONE AREA RATIO	: 0.79	OPERATOR	: DB
FILTER POSITION	: u2	FRICTION REDUCER	: None
FILTER TYPE	: HDPE	WEATHER	: Overcast & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	324 mV	327 mV	0.033 MPa
Sleeve	270 mV	273 mV	0.002 kPa
Pore Pressure 2	166 mV	162 mV	-0.001 kPa
X-Y Inclinometer	2523 mV	2519 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

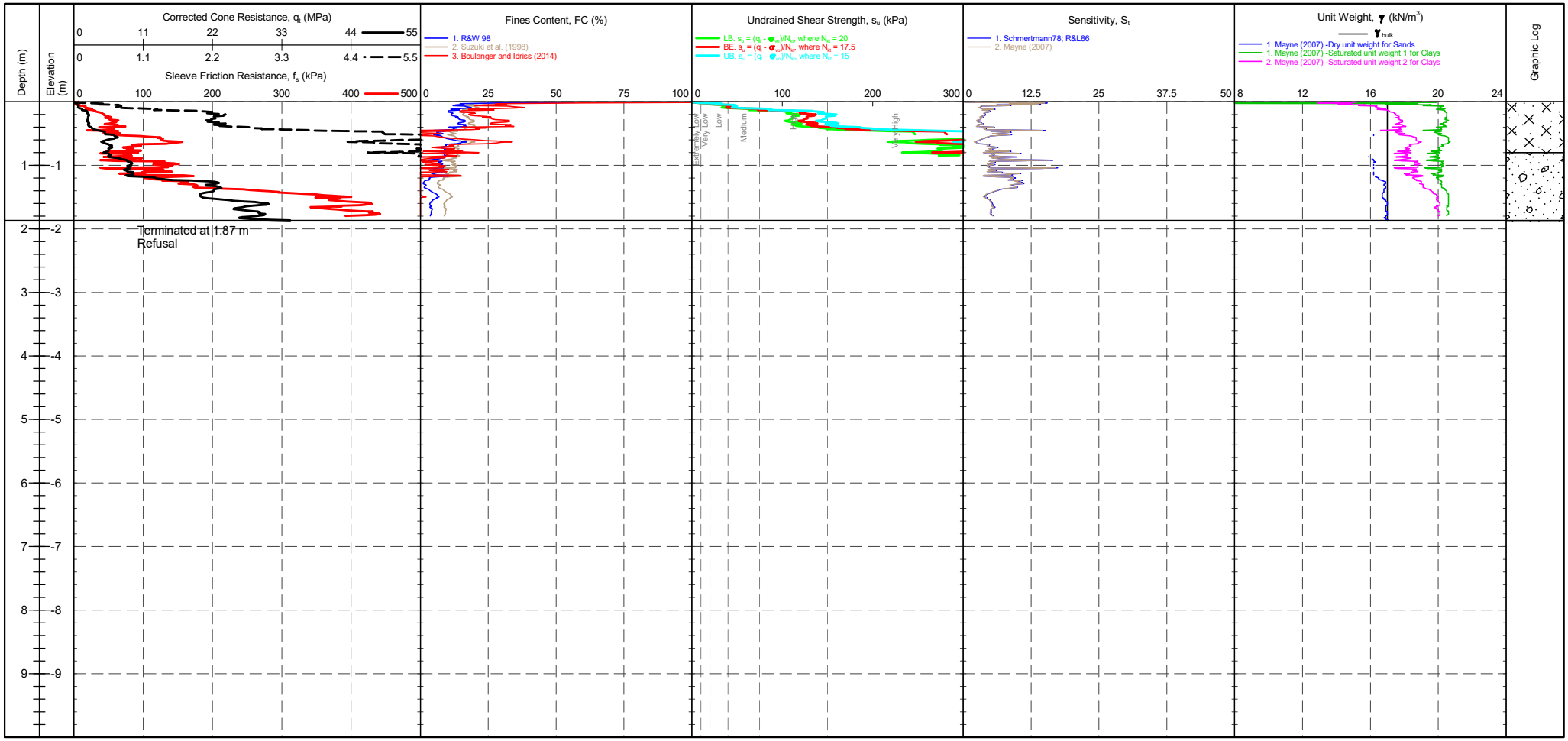
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 03

PointID **CPT114**

CLIENT : Curtins PROJECT : Proposed LIDL LOCATION : Cross Keys Hoyland PROJECT No. : 1210518	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 27/10/2021 PLOT DATE : 29/10/2021 METHOD : ISO 22476-1:2012



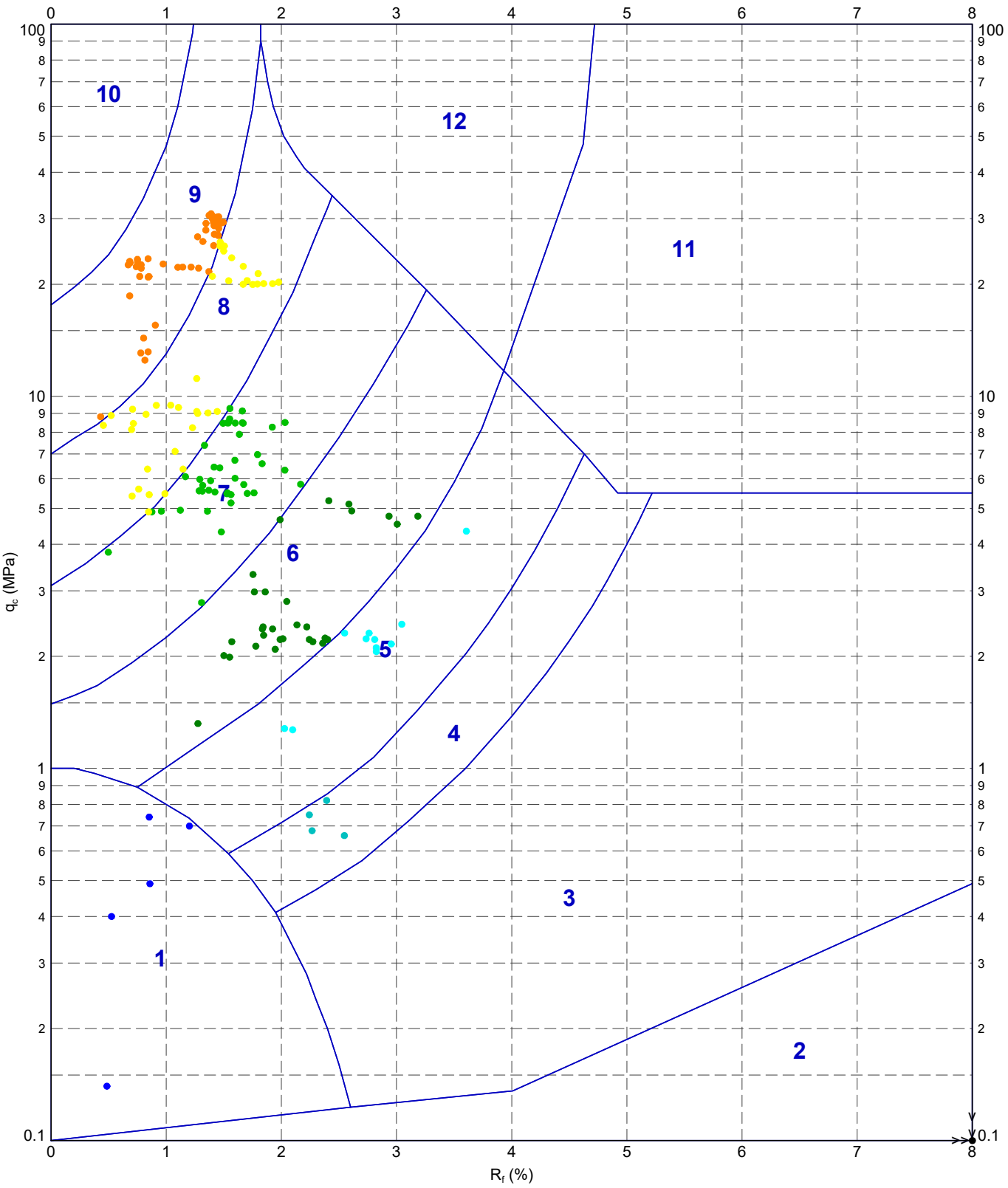
CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe	Tip	324 mV	327 mV	0.033 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: DB	Sleeve	270 mV	273 mV	0.002 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	166 mV	162 mV	-0.001 kPa
FILTER TYPE	: HDPE	WEATHER	: Overcast & Mild	X-Y Inclinometer	2523 mV	2519 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT114

DRAWN	DATE 29/10/2021
CHECKED	DATE 29/10/2021
SCALE Not To Scale	A4
PROJECT No 1210518	FIGURE No

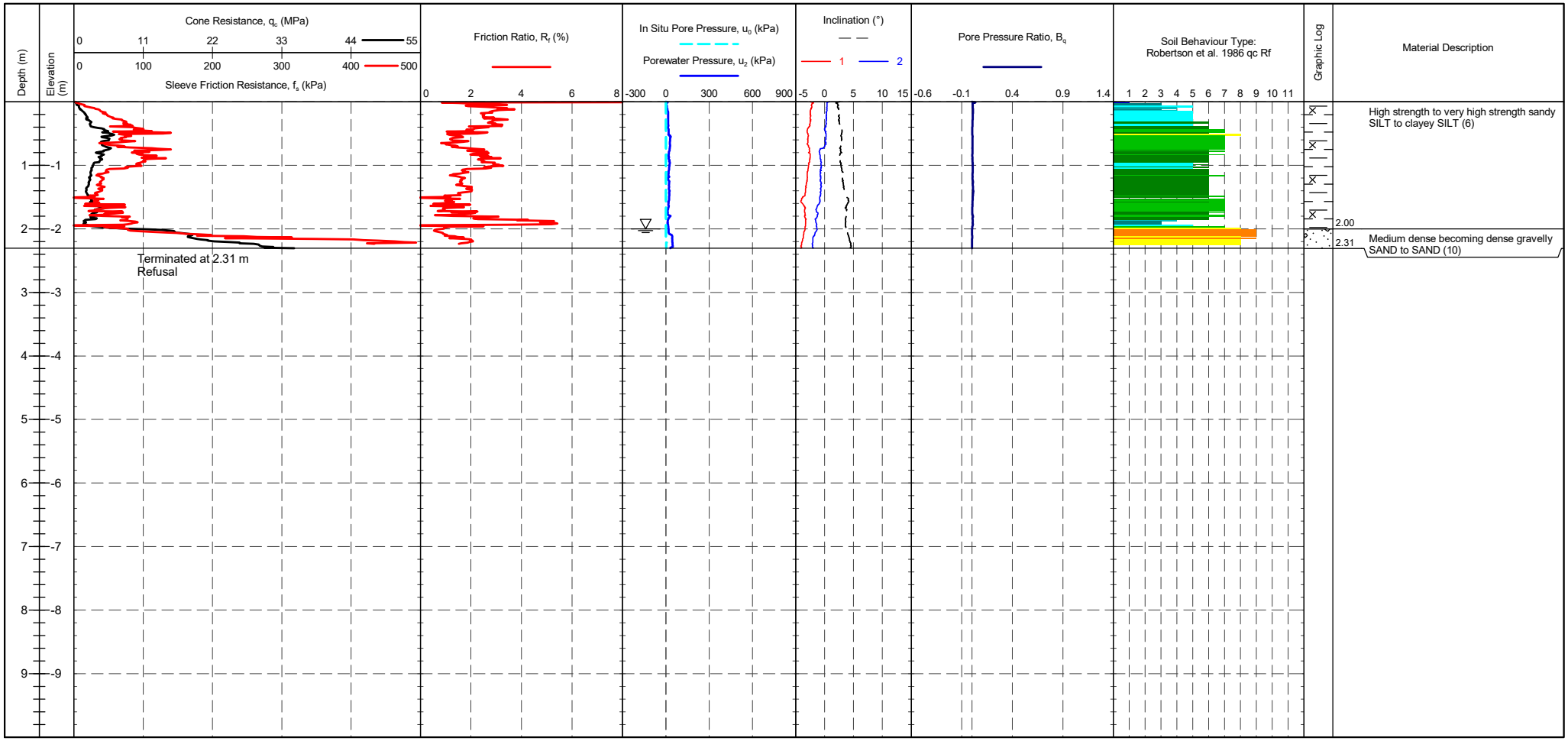
210713-ADVANCED REPORT INSITUSI 2.02.1.LIB - LUISA.GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF A4P 1210518-PROPOSED LIDL.GPJ <<DrawingFile>> 29/10/2021 16:40 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Pfj: In Situ SI 2.02.0 2017-07-10

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 01

PointID: **CPT115**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 27/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CALIBRATION DATE	: 05/03/2021	APPLICATION CLASS	: 2		
CONE MODEL	: Subtraction	RIG	: CPT 006 - Zoe		
CONE AREA	: 15cm^2	OPERATOR	: DB		
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None		
FILTER POSITION	: u2	WEATHER	: Overcast & Mild		
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	326 mV	326 mV	0 MPa
Sleeve	273 mV	274 mV	0.001 kPa
Pore Pressure 2	187 mV	186 mV	0 kPa
X-Y Inclinometer	2273 mV	2383 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

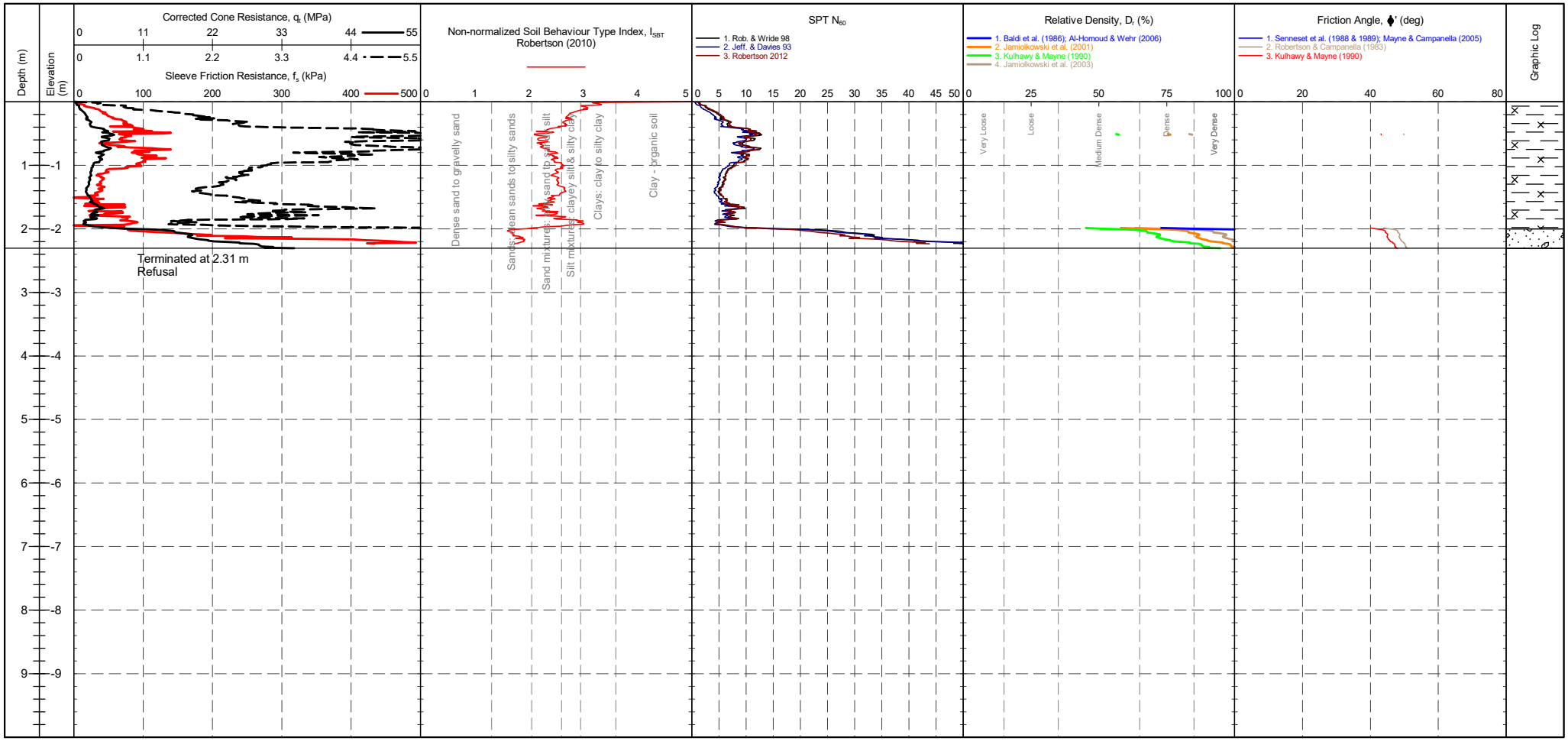
PointID: **CPT115**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 27/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2		
CONE AREA	: 15cm²	RIG	: CPT 006 - Zoe		
CONE AREA RATIO	: 0.79	OPERATOR	: DB		
FILTER POSITION	: u2	FRICTION REDUCER	: None		
FILTER TYPE	: HDPE	WEATHER	: Overcast & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	326 mV	326 mV	0 MPa
Sleeve	273 mV	274 mV	0.001 kPa
Pore Pressure 2	187 mV	186 mV	0 kPa
X-Y Inclinometer	2273 mV	2383 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 03

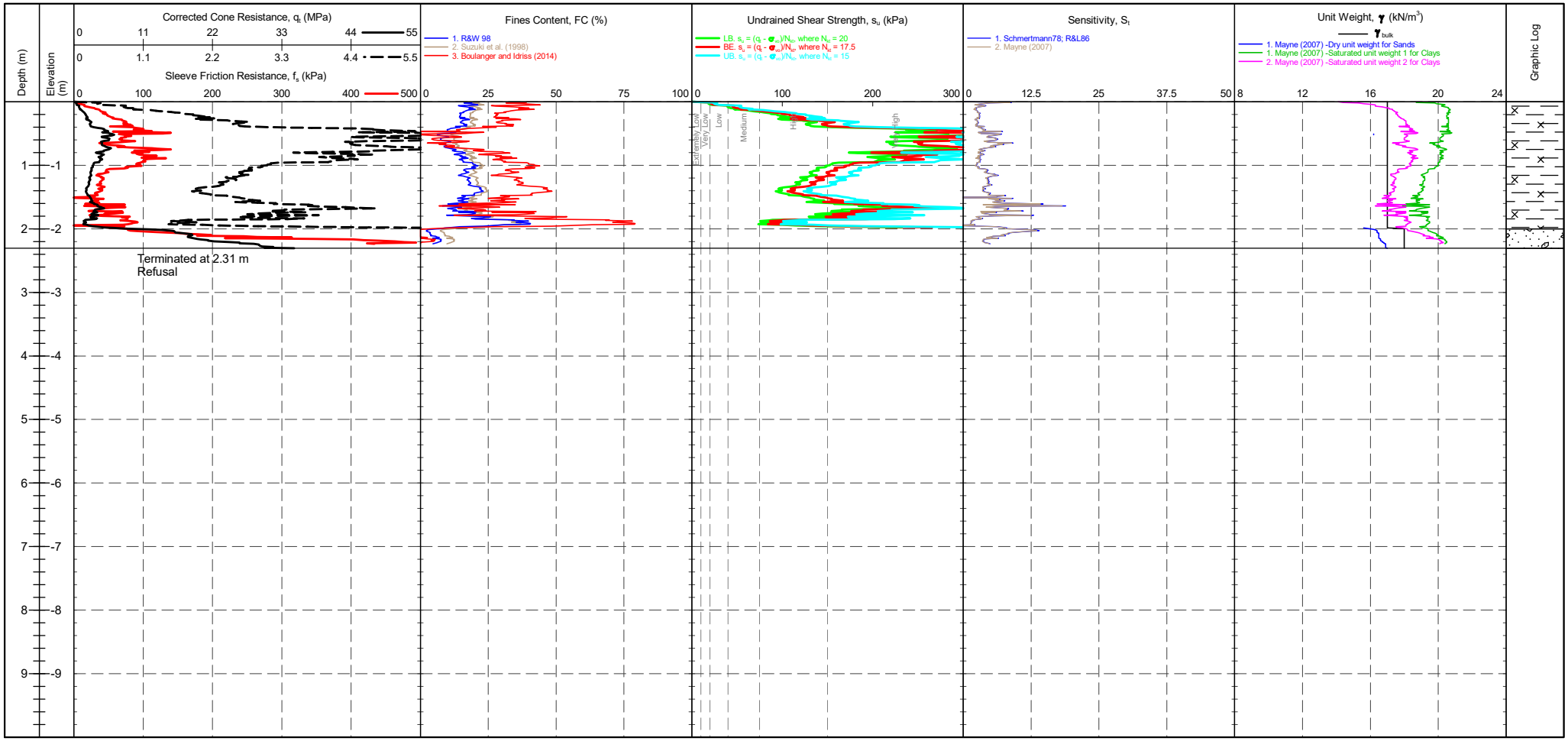
PointID: **CPT115**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 27/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2				
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2				
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe				
CONE AREA RATIO	: 0.79	OPERATOR	: DB				
FILTER POSITION	: u2	FRICTION REDUCER	: None				
FILTER TYPE	: HDPE	WEATHER	: Overcast & Mild				

CPTU ZERO VALUES

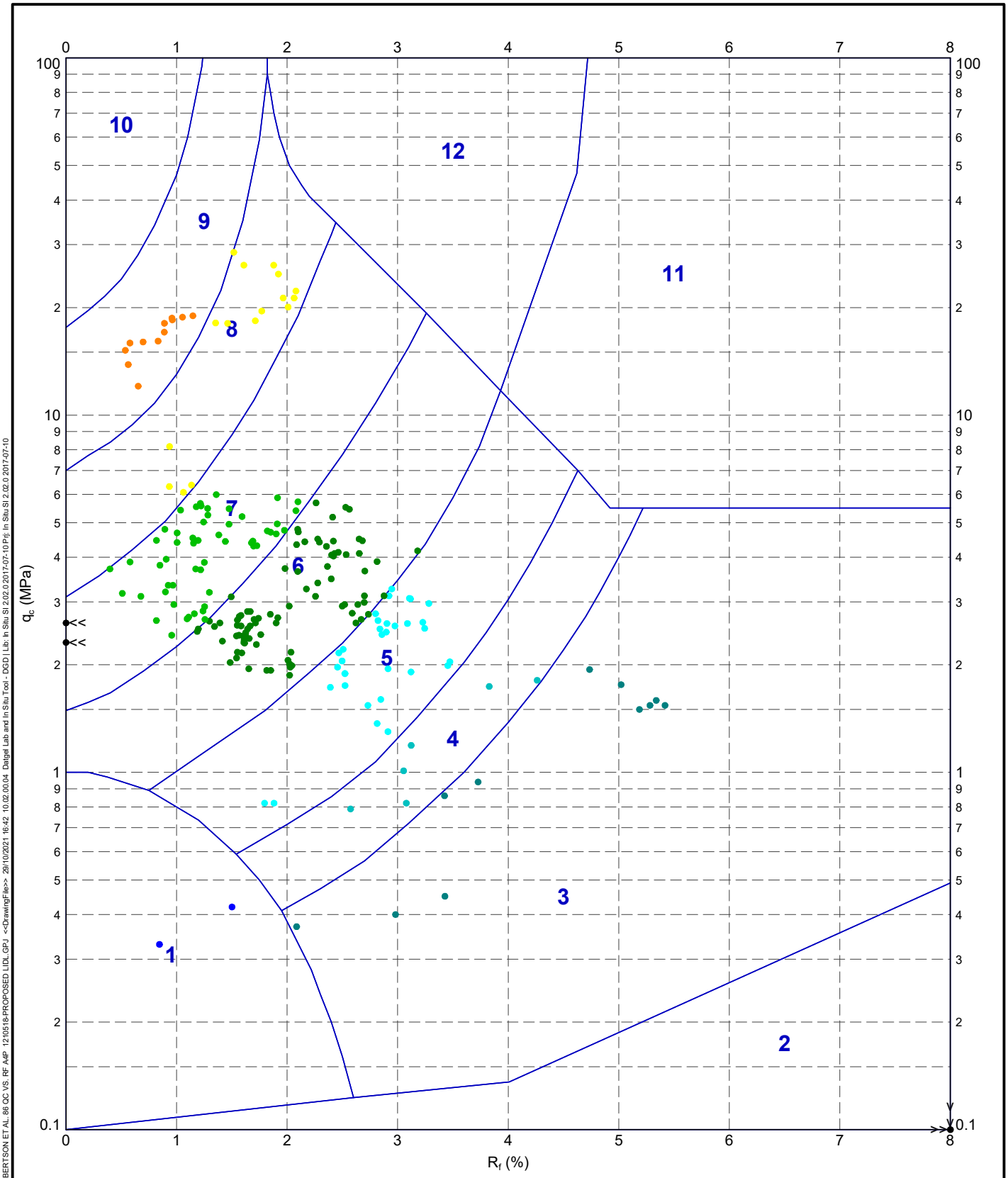
Transducer	Pre	Post	Difference
Tip	326 mV	326 mV	0 MPa
Sleeve	273 mV	274 mV	0.001 kPa
Pore Pressure 2	187 mV	186 mV	0 kPa
X-Y Inclinometer	2273 mV	2383 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	4 - Silty CLAY to CLAY	7 - Silty SAND to sandy SILT	10 - Gravelly SAND to SAND
2 - Organic material	5 - Clayey SILT to silty CLAY	8 - SAND to silty SAND	11 - Very stiff fine grained
3 - CLAY	6 - Sandy SILT to clayey SILT	9 - SAND	12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT115

DRAWN	DATE 29/10/2021	
CHECKED	DATE 29/10/2021	
SCALE Not To Scale		A4
PROJECT No 1210518	FIGURE No	

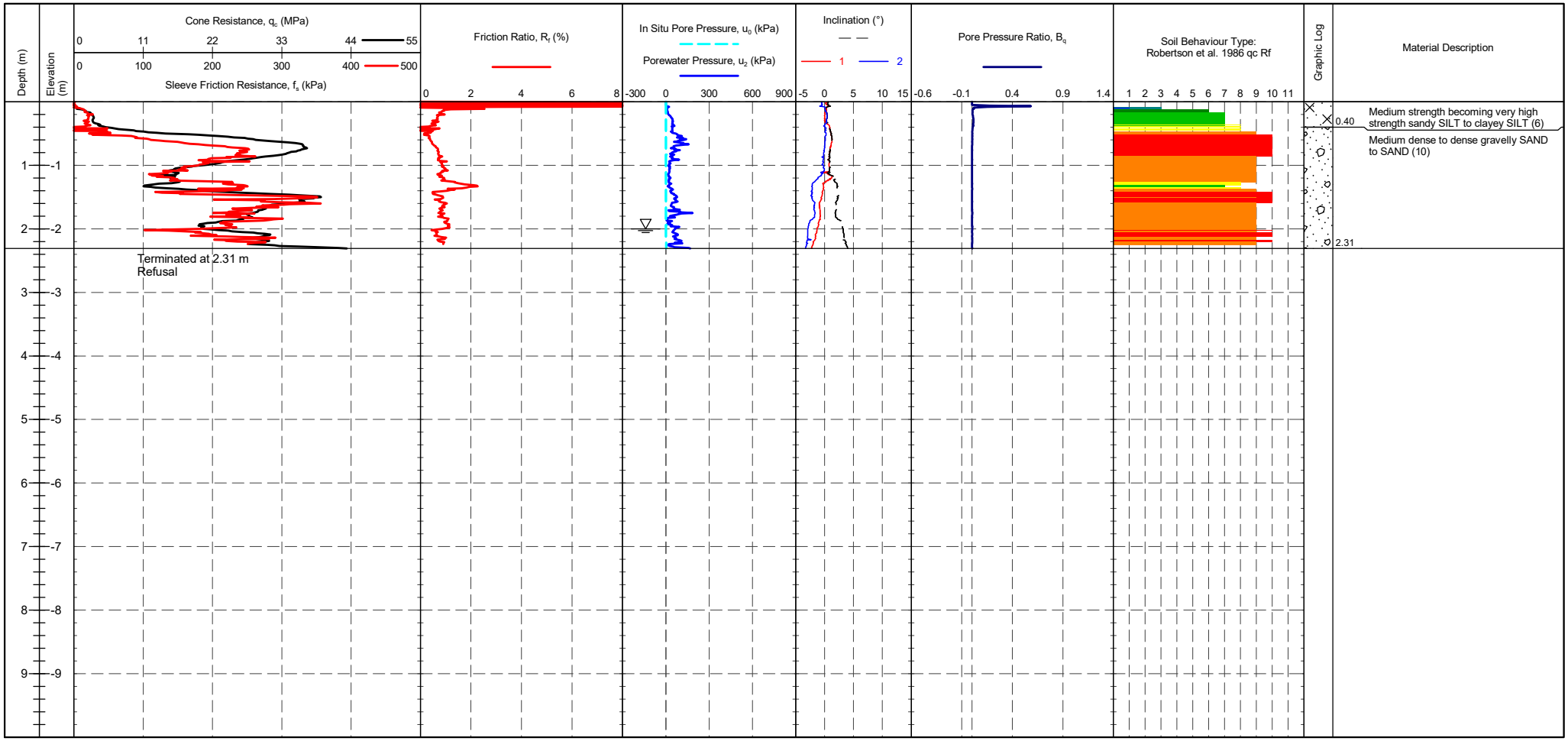
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IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 01

PointID: **CPT116**

CLIENT : Curtins	EASTING : 0.000 m	Remark:	SHEET : 1 OF 1
PROJECT : Proposed LIDL	NORTHING : 0.000 m	Test refused on tip resistance.	STATUS : Final
LOCATION : Cross Keys Hoyland	ELEVATION : 0.000 m OD		TEST DATE : 27/10/2021
PROJECT No. : 1210518	CHECKED BY : LD		PLOT DATE : 29/10/2021
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CALIBRATION DATE	: 05/03/2021	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE MODEL	: Subtraction	RIG	: CPT 006 - Zoe	Tip	325 mV	328 mV	0.033 MPa
CONE AREA	: 15cm^2	OPERATOR	: DB	Sleeve	271 mV	274 mV	0.002 kPa
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None	Pore Pressure 2	189 mV	151 mV	-0.009 kPa
FILTER POSITION	: u2	WEATHER	: Overcast & Mild	X-Y Inclinometer	2550 mV	2539 mV	
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes				

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 02

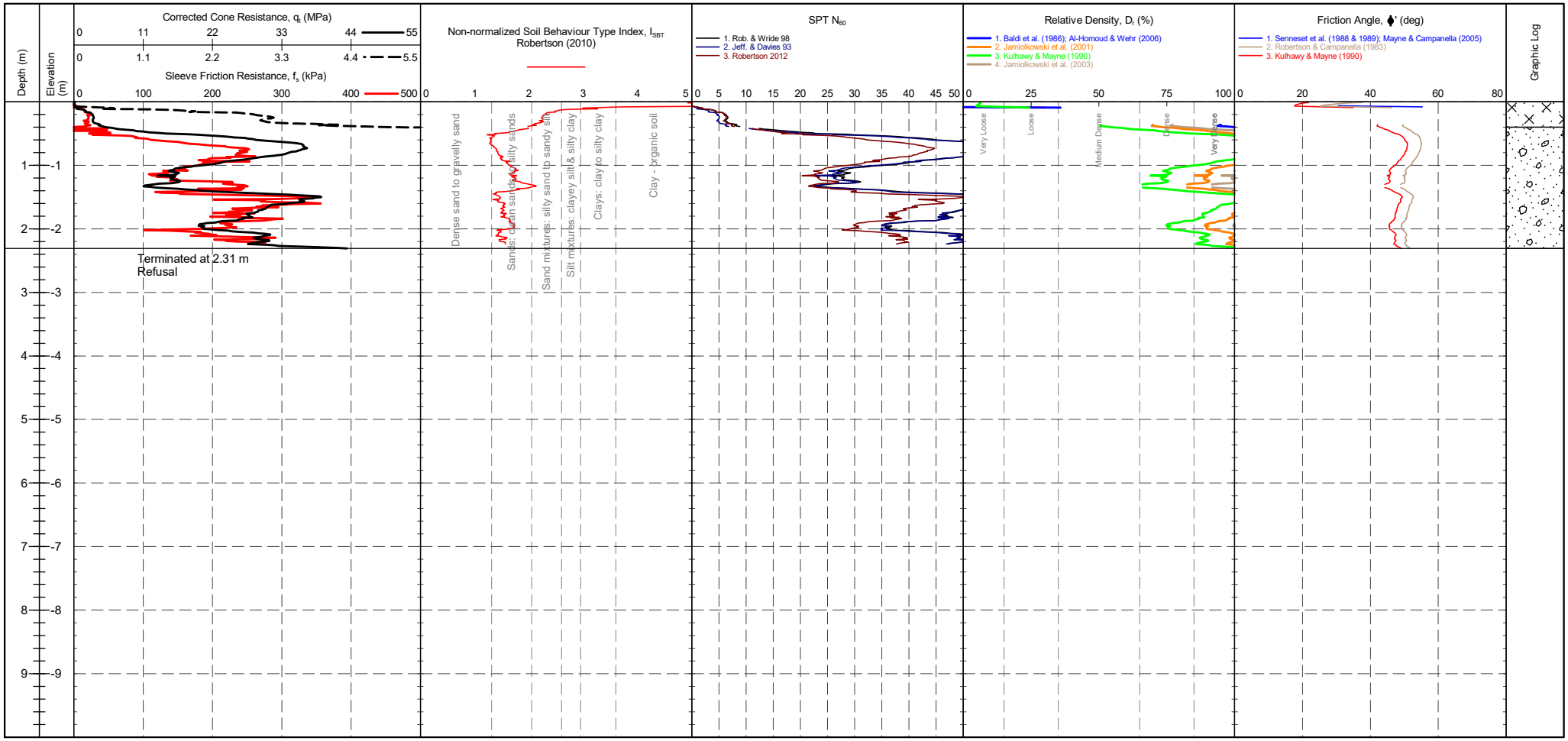
PointID **CPT116**

CLIENT : Curtins
PROJECT : Proposed LIDL
LOCATION : Cross Keys Hoyland
PROJECT No. : 1210518

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : LD
TERMINATION REASON : Refusal

Remark:
Test refused on tip resistance.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 27/10/2021
PLOT DATE : 29/10/2021
METHOD : ISO 22476-1:2012



CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2		
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2		
CONE AREA	: 15cm²	RIG	: CPT 006 - Zoe		
CONE AREA RATIO	: 0.79	OPERATOR	: DB		
FILTER POSITION	: u2	FRICTION REDUCER	: None		
FILTER TYPE	: HDPE	WEATHER	: Overcast & Mild		

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	325 mV	328 mV	0.033 MPa
Sleeve	271 mV	274 mV	0.002 kPa
Pore Pressure 2	189 mV	151 mV	-0.009 kPa
X-Y Inclinometer	2550 mV	2539 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, Ic	Description	SPT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

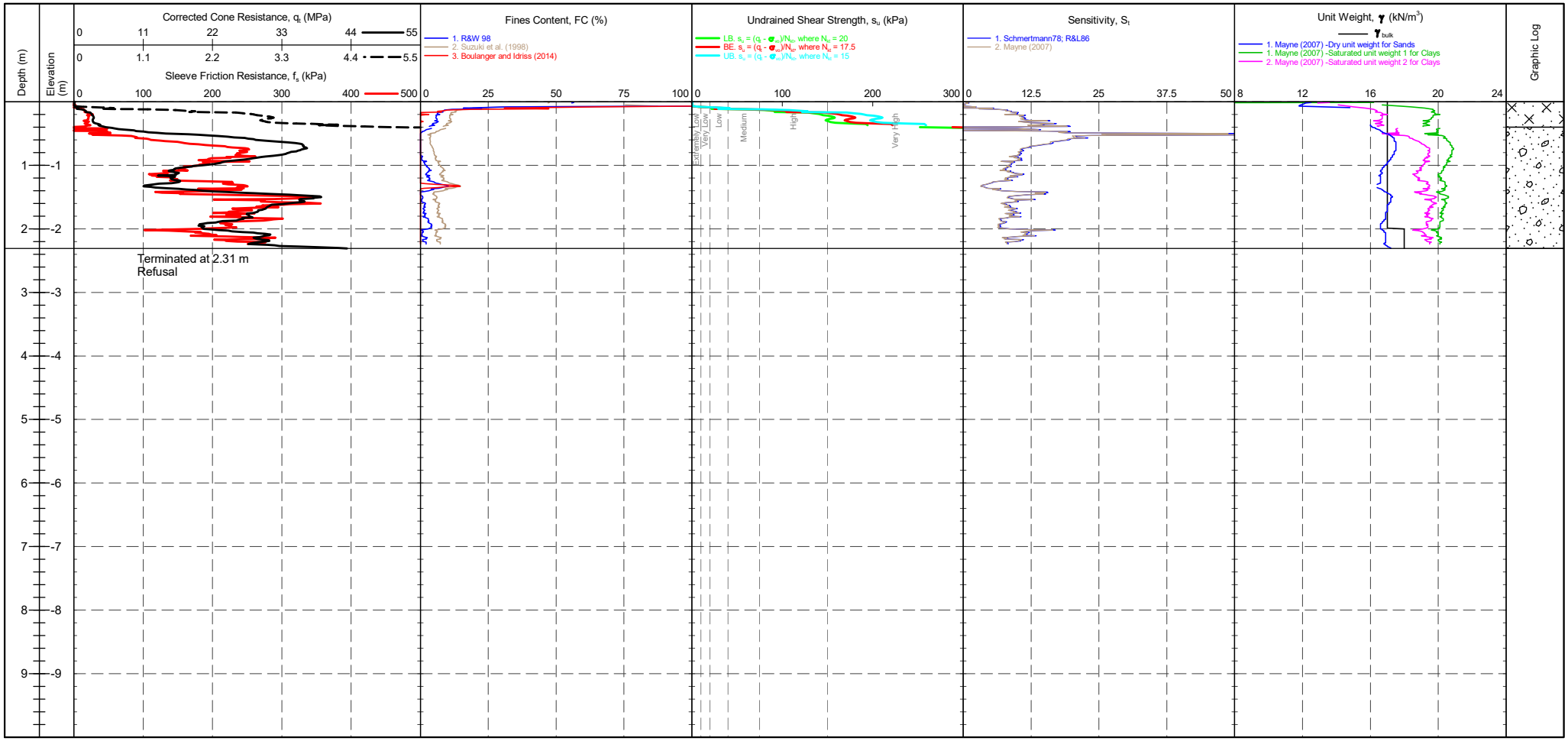
Dissipation Test

IN SITU SITE INVESTIGATION Working with: Curtins

CPT LOG 03

PointID **CPT116**

CLIENT : Curtins PROJECT : Proposed LIDL LOCATION : Cross Keys Hoyland PROJECT No. : 1210518	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : LD TERMINATION REASON : Refusal	Remark: Test refused on tip resistance.	SHEET : 1 OF 1 STATUS : Final TEST DATE : 27/10/2021 PLOT DATE : 29/10/2021 METHOD : ISO 22476-1:2012



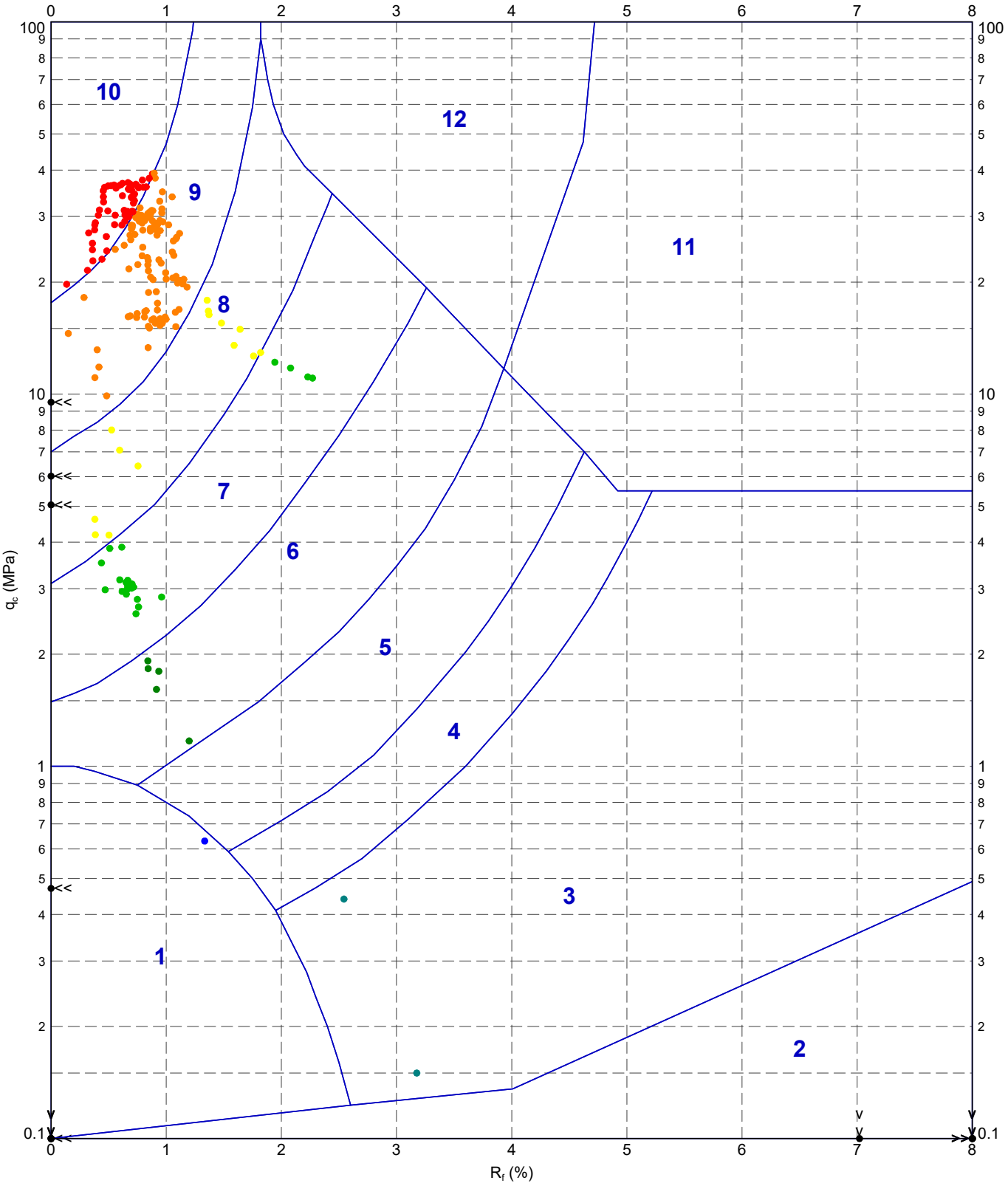
CONE ID	: S15-CFIP.1867	TEST TYPE	: TE2	CPTU ZERO VALUES			
CONE MODEL	: Subtraction	APPLICATION CLASS	: 2	Transducer	Pre	Post	Difference
CONE AREA	: 15cm^2	RIG	: CPT 006 - Zoe	Tip	325 mV	328 mV	0.033 MPa
CONE AREA RATIO	: 0.79	OPERATOR	: DB	Sleeve	271 mV	274 mV	0.002 kPa
FILTER POSITION	: u2	FRICTION REDUCER	: None	Pore Pressure 2	189 mV	151 mV	-0.009 kPa
FILTER TYPE	: HDPE	WEATHER	: Overcast & Mild	X-Y Inclinometer	2550 mV	2539 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test



METHOD: Robertson et al. 1986 qc Rf

- 1 - Sensitive fine grained material
- 2 - Organic material
- 3 - CLAY
- 4 - Silty CLAY to CLAY
- 5 - Clayey SILT to silty CLAY
- 6 - Sandy SILT to clayey SILT
- 7 - Silty SAND to sandy SILT
- 8 - SAND to silty SAND
- 9 - SAND
- 10 - Gravelly SAND to SAND
- 11 - Very stiff fine grained
- 12 - SAND to clayey SAND

IN SITU SITE INVESTIGATION

TITLE

Curtins
Cross Keys Hoyland
Proposed LIDL
Robertson et al. 1986 q_c vs. R_f - CPT116

DRAWN	DATE 29/10/2021
CHECKED	DATE 29/10/2021
SCALE Not To Scale	A4
PROJECT No 1210518	FIGURE No

210713-ADVANCED REPORT INSITUSI 2.02.1.LIB - LUISA.GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF AAP 1210518-PROPOSED LIDL.GPJ <<DrawingFile>> 29/10/2021 16:43 10.02.00.04 Datgel Lab and In Situ Tool - DGD | Lib: In Situ SI 2.02.0 2017-07-10 Pfj: In Situ SI 2.02.0 2017-07-10



IN SITU SITE INVESTIGATION

Unit 23 Hastings Innovation Centre,
Highfield Drive
St. Leonards on Sea, East Sussex,
TN38 9UH, U.K.

Company No.: 6339499
VAT No.: 922 3561 41

Appendix E Ground Gas and Groundwater Monitoring Results

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Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Lidl, Cross Keys Lane	**Date:**	26/05/2021
Job Number:	078794	**Visit:**	1
Client:	Lidl	**Weather:**	Raining
Barometric State:	Steady	**Ground Conditions:**	Wet

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
WS103	995	<0.1	<0.1	<0.1	<0.1	0.9	0.9	17.8	<0.1	<0.1	Dry	1.87	
WS106	995	<0.1	<0.1	<0.1	<0.1	0.2	0.2	20.0	<0.1	<0.1	Dry	1.84	
WS107	995	<0.1	<0.1	<0.1	<0.1	1.6	1.6	16.8	<0.1	<0.1	2.03	2.15	

Notes

Logged by

EM

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Lidl, Cross Keys Lane	**Date:**	03/06/2021
Job Number:	078794	**Visit:**	2
Client:	Lidl	**Weather:**	Sunny
Barometric State:	Rising	**Ground Conditions:**	Dry

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
WS103	1002	<0.1	<0.1	<0.1	<0.1	2.0	2.0	14.50	<0.1	<0.1	Dry	1.82	
WS106	1002	<0.1	<0.1	<0.1	<0.1	2.2	2.2	17.60	<0.1	<0.1	Dry	1.83	
WS107	1002	<0.1	<0.1	<0.1	<0.1	2.2	2.2	18.20	<0.1	<0.1	Dry	2.13	
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Notes

Logged by EM

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
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Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Lidl, Cross Keys Lane	**Date:**	10/06/2021
Job Number:	078794	**Visit:**	3
Client:	Lidl	**Weather:**	Overcast
Barometric State:	Falling	**Ground Conditions:**	Damp

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl
		Max	SS	Max	SS	Max	SS					
WS103	1002	<0.1	<0.1	<0.1	<0.1	4.1	4.1	17.4	<0.1	<0.1	Dry	1.83
WS106	1002	<0.1	<0.1	<0.1	<0.1	3.2	3.2	17.5	<0.1	<0.1	Dry	1.83
WS107	1002	<0.1	<0.1	<0.1	<0.1	3.2	3.2	15.6	<0.1	<0.1	Dry	2.12
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Notes

Logged by EM

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Lidl, Cross Keys Lane	**Date:**	25/06/2021
Job Number:	078794	**Visit:**	4
Client:	Lidl	**Weather:**	Overcast
Barometric State:	Rising	**Ground Conditions:**	Damp

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
WS103	997	<0.1	<0.1	<0.1	<0.1	3.5	3.5	18.4	<0.1	<0.1	Dry	1.86	
WS106	997	<0.1	<0.1	<0.1	<0.1	1.9	1.9	19.1	<0.1	<0.1	Dry	1.83	
WS107	998	<0.1	<0.1	<0.1	<0.1	2.7	2.7	18.3	<0.1	<0.1	Dry	2.13	
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Notes

Logged by EM

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Lidl, Cross Keys Lane	**Date:**	15/12/2021
Job Number:	078794	**Visit:**	1
Client:	Lidl	**Weather:**	Cloudy
Barometric State:		**Ground Conditions:**	Damp

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
WS202		0.1	0.1	0.0	0.0	1.4	1.4	17.2	<0.1	<0.1	Dry	2.30	
WS203		0.1	0.1	0.0	0.0	1.6	1.6	17.4	<0.1	<0.1	Dry	2.50	

Notes

Logged by

JE

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Lidl, Cross Keys Lane	**Date:**	21/12/2021
Job Number:	078794	**Visit:**	2
Client:	Lidl	**Weather:**	Cloudy
Barometric State:	Falling	**Ground Conditions:**	Damp

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
WS202	1006	0.1	0.1	0.0	0.0	1.6	1.6	16.3	<0.1	<0.1	Dry	2.29	
WS203	1005	0.1	0.1	0.0	0.0	3.0	3.0	14.3	<0.1	<0.1	Dry	2.51	
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Notes

Logged by

JE

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Appendix F GAC Screening Thresholds

- Curtins GACs.

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Adopted Soil Generic Assessment Criteria
Sandy loam with 6% SOM

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Contaminants	Residential with home grown produce	Residential without home grown produce	Allotments	Commercial	Public open space near residential housing POS_{resi}	Public park POS_{park}
Metals						
Beryllium	*1.7*	*1.7*	*35*	*12*	*2.2*	*63*
Boron	*290*	*11,000*	*45*	*240,000*	*21,000*	*46,000*
Cadmium	**10**[13] 22	**85**[13] 150	**1.8** 3.9	**230** 410	*120* 220	*560* 880
Chromium III	*910*	*910*	*18,000*	*8,600*	*1,500*	*33,000*
Chromium VI	*6* 21	*6* 21	*1.8* 170	*33* 49	*7.7* 21	*220* 250
Lead	200	310	80	2,300	630	1,300
Mercury *(elemental)*	**1**	**1**	**26**	**26**	*16*	**26**[8] [*30*]
Mercury (inorganic)	**170**	**240**	**80**	**3600**	*120*	*240*
Nickel	*130*[10]	*180*[10]	*53*[11]	*980*[10]	*230*	*800*
Vanadium	*410*	*1200*	*91*	*9000*	*2000*	*5000*
Copper	*2400*	*7100*	*520*	*68000*	*12000*	*44000*
Zinc	*3700*	*40000*	*620*	*730000*	*81000*	*170000*
Semi-Metals and non-metals						
Arsenic	**32**[12] 37	**35**[12] 40	**43**[12] 49	**640**[12] 640	*79* 79	*170* 170
Antimony		***550***		***7500***	***1500***	***3300***
Selenium	**350**	**600**	**120**	**13000**	*1100*	*1800*
Inorganic chemicals						
Cyanide	34	34	34	34	34	34
Organic contaminants						
Aliphatic risk banded hydrocarbons - TPHCWG method						
$EC_{>5}$ - EC_6	*160*	*160*	*3900*	*12000*	*600000*	*180000*
$EC_{>6}$ - EC_8	*530*	*530*	*13000*	*40000*	*620000*	*320000*
$EC_{>8}$ - EC_{10}	*150*	*150*	*1700*	*11000*	*13000*	*21000*
EC_{10}-EC_{12}	*760*	*770*	*7300*	*47000*	*13000*	*24000*
EC_{12}-EC_{16}	*4300*	*4400*	*13000*	*90000*	*13000*	*26000*
$EC_{>16}$ - EC_{35}	*110000*	*110000*	*270000*	*1800000*	*250000*	*490000*
$EC>_{35}$ - EC_{44}	*110000*	*110000*	*270000*	*1800000*	*250000*	*490000*
Aromatic risk banded hydrocarbons - TPHCWG method						
$EC>_5$ - EC_7	*300*	*1400*	*57*	*86000*	*56000*	*92000*
$EC>_7$ - EC_8	*660*	*3900*	*120*	*180000*	*56000*	*100000*
$EC_{>8}$ - EC_{10}	*190*	*270*	*51*	*17000*	*5000*	*9300*
EC_{10} - EC_{12}	*380*	*1200*	*74*	*34000*	*5000*	*10000*
EC_{12} - EC_{16}	*660*	*2500*	*130*	*38000*	*5000*	*10000*
$EC_{>16}$ - EC_{21}	*930*	*1900*	*260*	*28000*	*3800*	*7800*
$EC_{>21}$ - EC_{35}	*1700*	*1900*	*1600*	*28000*	*3800*	*7900*
$EC>_{35}$ - EC_{44}	*1700*	*1900*	*1600*	*28000*	*3800*	*7900*
Aliph + Arom EC >44-70	*1900*	*1900*	*3000*	*28000*	3800	7900
Aromatic						
Benzene	**0.33** 0.87	**1.0** 3.3	**0.07** 0.18	**95** 98	*73* 140	*110* 230
Ethyl benzene	**350**	**840**	**90**	**2800**[8] [66000]	**2800**[8] [*25000*]	**2800**[8] [*27000*]
Toluene	**610**	**2700**	**120**	**4400**[8] [190000]	**4400**[8] [*56000*]	**4400**[8] [*100000*]
Xylene[9]	**230**	**290**	**160**	**2600**[8] [32000]	**2600**[8] [*43000*]	**2600**[8] [*31000*]
Phenol	**420**	**520**	**280**	**3200**[14] (38000)	**3200**[14] (*10000*)	**3200**[14] (*9300*)
Polycyclic Aromatic Hydrocarbons (PAH)						
Naphthalene	*13*	*13*	*24*	*1100*	*4900*	*3000*
Acenaphthylene	*920*	*6000*	*160*	*100000*	*15000*	*30000*
Acenaphthene	*1100*	*6000*	*200*	*100000*	*15000*	*30000*
Fluorene	*860*	*4500*	*160*	*71000*	*9900*	*20000*
Phenanthrene	*440*	*1500*	*90*	*23000*	*3100*	*6300*
Anthracene	*11000*	*37000*	*2200*	*540000*	*74000*	*150000*
Fluoranthene	*890*	*1600*	*290*	*23000*	*3100*	*6400*
Pyrene	*2000*	*3800*	*620*	*54000*	*7400*	*15000*
Benz(a)anthracene	*13*	*15*	*13*	*180*	*29*	*62*
Chrysene	*27*	*32*	*19*	*350*	*57*	*120*
Benzo(b)fluoranthene	*3.7*	*4.0*	*3.9*	*45*	*7.2*	*16.0*
Benzo(k)fluoranthene	*100*	*110*	*130*	*1200*	*190*	*440*
Benzo(a)pyrene	*3.0* 5.0	*3.2* 5.3	*3.5* 5.7	*36* 77	*5.7* 10	*13* 21
Indeno(123cd)pyrene	*41*	*46*	*39*	*510*	*82*	*180*
Dibenzo(ah)anthracene	*0.3*	*0.32*	*0.43*	*3.6*	*0.58*	*1.4*
Benzo(ghi)perylene	*350*	*360*	*640*	*4000*	*640*	*1600*
Chlorinated Aliphatic Hydrocarbons						
Vinyl chloride	*0.0014*	*0.0015*	*0.0018*	*0.12*	*3.5*	*5.4*
Trichloroethene (TCE)	*0.075*	*0.08*	*0.21*	*5.7*	*120*	*120*
1,1,1,2 Tetrachlorethane	*6.4*	*8.2*	*4.4*	*560*	*1400*	*2100*
Tetrachlorethene (PCE)	*0.90*	*0.92*	*3.6*	*95*	*1400*	*1500*
1,1,1 Trichlorethane	*39*	*40*	*240*	*3000*	*140000*	*100000*

Notes

1. All values above are in mg/kg
2. **Numbers in bold are SGVs or GAC that are derived based on SGV report input parameters**, *numbers in italics are S4ULs* , ***numbers in bold-italics are based on EIC/AGS/CL:AIRE numbers & input parameters*** and underlined numbers are C4SLs
3. Soil organic matter (SOM) is assumed to be 6% - DEFAULT VALUE
4. Soil type is assumed to be sandy loam - DEFAULT SOIL TYPE
5. For residential, the building type is conservatively assumed to be a small terrace house where the development includes bungalows change to more conservative bungalow setting in computer model
6. For commercial, the building type is conservatively assumed to be a pre 1970s office building, where the proposed development comprises houses, flat with living spaces changes setting in model accordingly
7. For classrooms consider increasing the dust loading fator in the 'Soil and Building Data' of the CLEA 1.04 model from 50 to 100µg m^{-3}
8. Based on vapour saturation limt as suggested by EA / [ ] model value
9. Lowest of o-, m- and p-xylene
10. Based on comparison of inhalation exposure with inhalation TDI
11. Based on comparison of oral, dermal, and inhalation exposure with the oral TDI
12. Based on a comparison of oral and dermal soil exposure with oral Index Dose only
13. Averaged over and based on lifetime exposure
14. Based on critical concentration for skin irritation in humans arising from contact with phenol in aqueous solution (number in brackets based on health effects following long term exposure for illustration)
15. NA: Not applicable

Adopted Soil Generic Assessment Criteria
Sandy loam with 2.5% SOM

curtins

Contaminants	Residential with home grown produce	Residential without home grown produce	Allotments	Commercial	Public open space near residential housing POS_{resi}	Public park POS_{park}
Metals						
Beryllium	*1.7*	*1.7*	*35*	*12*	*2.2*	*63*
Boron	*290*	*11,000*	*45*	*240,000*	*21,000*	*46,000*
Cadmium	**10**[13] 22	**85**[13] 150	**1.8** 3.9	**230** 410	*120* 220	*560* 880
Chromium III	*910*	*910*	*18,000*	*8,600*	*1,500*	*33,000*
Chromium VI	*6* 21	*6* 21	*1.8* 170	*33* 49	*7.7* 21	*220* 250
Lead	200	310	80	2,300	630	1,300
Mercury *(elemental)*	**1**	**1**	**26**	**26**	*16*	**26**[8] [*30*]
Mercury (inorganic)	**170**	**240**	**80**	**3600**	*120*	*240*
Nickel	*130*[10]	*180*[10]	*53*[11]	*980*[10]	*230*	*800*
Vanadium	*410*	*1200*	*91*	*9000*	*2000*	*5000*
Copper	*2400*	*7100*	*520*	*68000*	*12000*	*44000*
Zinc	*3700*	*40000*	*620*	*730000*	*81000*	*170000*
Semi-Metals and non-metals						
Arsenic	**32**[12] 37	**35**[12] 40	**43**[12] 49	**640**[12] 640	*79* 79	*170* 170
Antimony		***550***		***7500***	***1500***	***3300***
Selenium	**350**	**600**	**120**	**13000**	*1100*	*1800*
Inorganic chemicals						
Cyanide	34	34	34	34	34	34
Organic contaminants						
Aliphatic risk banded hydrocarbons - TPHCWG method						
$EC_{>5}$ - EC_6	*78*	*78*	*1700*	*5900*	*590000*	*130000*
$EC_{>6}$ - EC_8	*230*	*230*	*5600*	*17000*	*610000*	*220000*
$EC_{>8}$ - EC_{10}	*65*	*65*	*770*	*4800*	*13000*	*18000*
EC_{10}-EC_{12}	*330*	*330*	*4400*	*23000*	*13000*	*23000*
EC_{12}-EC_{16}	*2400*	*2400*	*13000*	*82000*	*13000*	*25000*
$EC_{>16}$ - EC_{35}	*92000*	*92000*	*270000*	*1700000*	*250000*	*480000*
$EC_{>35}$ - EC_{44}	*92000*	*92000*	*270000*	*1700000*	*250000*	*480000*
Aromatic risk banded hydrocarbons - TPHCWG method						
$EC_{>5}$ - EC_7	*140*	*690*	*27*	*46000*	*56000*	*84000*
$EC_{>7}$ - EC_8	*290*	*1800*	*51*	*110000*	*56000*	*95000*
$EC_{>8}$ - EC_{10}	*83*	*110*	*21*	*8100*	*5000*	*8500*
EC_{10} - EC_{12}	*180*	*590*	*31*	*28000*	*5000*	*9700*
EC_{12} - EC_{16}	*330*	*2300*	*57*	*37000*	*5100*	*10000*
$EC_{>16}$ - EC_{21}	*540*	*1900*	*110*	*28000*	*3800*	*7700*
$EC_{>21}$ - EC_{35}	*1500*	*1900*	*820*	*28000*	*3800*	*7800*
$EC_{>35}$ - EC_{44}	*1500*	*1900*	*820*	*28000*	*3800*	*7800*
Aliph + Arom EC >44-70	*1800*	*1900*	*2100*	*28000*	3800	7800
Aromatic						
Benzene	**0.16**	**0.49**	**0.035**	**50**	*72*	*100*
Ethyl benzene	**150**	**380**	**39**	**1200**[8] [35000]	**1200**[8] [*24000*]	**1200**[8] [*22000*]
Toluene	**270**	**1300**	**51**	**1900**[8] [110000]	**1900**[8] [*56000*]	**1900**[8] [*95000*]
Xylene[9]	**98**	**120**	**70**	**1200**[8] [14000]	**1200**[8] [*42000*]	**1200**[8] [*23000*]
Phenol	**290**	**420**	**140**	**1500**[14] (35000)	**1500**[14] (*10000*)	**1500**[14] (*8300*)
Polycyclic Aromatic Hydrocarbons (PAH)						
Naphthalene	*5.6*	*5.6*	*10*	*460*	*4900*	*1900*
Acenaphthylene	*420*	*4600*	*69*	*97000*	*15000*	*30000*
Acenaphthene	*510*	*4700*	*85*	*97000*	*15000*	*30000*
Fluorene	*400*	*3800*	*67*	*68000*	*9900*	*20000*
Phenanthrene	*220*	*1500*	*38*	*22000*	*3100*	*6200*
Anthracene	*5400*	*35000*	*950*	*540000*	*74000*	*150000*
Fluoranthene	*560*	*1600*	*130*	*23000*	*3100*	*6300*
Pyrene	*1200*	*3800*	*270*	*54000*	*7400*	*15000*
Benz(a)anthracene	*11*	*14*	*6.5*	*170*	*29*	*56*
Chrysene	*22*	*31*	*9.4*	*350*	*57*	*110*
Benzo(b)fluoranthene	*3.3*	*4.0*	*2.1*	*44*	*7.2*	*15*
Benzo(k)fluoranthene	*93*	*110*	*75*	*1200*	*190*	*410*
Benzo(a)pyrene	*2.7*	*3.2*	*2*	*35*	*5.7*	*12*
Indeno(123cd)pyrene	*36*	*46*	*21*	*510*	*82*	*170*
Dibenzo(ah)anthracene	*0.28*	*0.32*	*0.27*	*3.6*	*0.57*	*1.3*
Benzo(ghi)perylene	*340*	*360*	*470*	*4000*	*640*	*1500*
Chlorinated Aliphatic Hydrocarbons						
Vinyl chloride	*0.00087*	*0.001*	*0.001*	*0.077*	*3.5*	*5*
Trichloroethene (TCE)	*0.034*	*0.036*	*0.091*	*2.6*	*120*	*91*
1,1,1,2 Tetrachlorethane	*2.8*	*3.5*	*1.9*	*250*	*1400*	*1800*
Tetrachlorethene (PCE)	*0.39*	*0.4*	*1.5*	*42*	*1400*	*1100*
1,1,1 Trichlorethane	*18*	*18*	*110*	*1300*	*140000*	*76000*

Notes

1. All values above are in mg/kg
2. **Numbers in bold are SGVs or GAC that are derived based on SGV report input parameters**, *numbers in italics are S4ULs* , ***numbers in bold-italics are based on EIC/AGS/CL:AIRE numbers & input parameters*** and underlined numbers are C4SLs
3. Soil organic matter (SOM) is assumed to be 2.5% - DEFAULT VALUE
4. Soil type is assumed to be sandy loam - DEFAULT SOIL TYPE
5. For residential, the building type is conservatively assumed to be a small terrace house where the development includes bungalows change to more conservative bungalow setting in computer model
6. For commercial, the building type is conservatively assumed to be a pre 1970s office building, where the proposed development comprises houses, flat with living spaces changes setting in model accordingly
7. For classrooms consider increasing the dust loading fator in the 'Soil and Building Data' of the CLEA 1.04 model from 50 to 100µg m^{-3}
8. Based on vapour saturation limt as suggested by EA / [ ] model value
9. Lowest of o-, m- and p-xylene
10. Based on comparison of inhalation exposure with inhalation TDI
11. Based on comparison of oral, dermal, and inhalation exposure with the oral TDI
12. Based on a comparison of oral and dermal soil exposure with oral Index Dose only
13. Averaged over and based on lifetime exposure
14. Based on critical concentration for skin irritation in humans arising from contact with phenol in aqueous solution (number in brackets based on health effects following long term exposure for illustration)
15. NA: Not applicable

Adopted Soil Generic Assessment Criteria
Sandy loam with 1% SOM

curtins

Contaminants	Residential with home grown produce	Residential without home grown produce	Allotments	Commercial	Public open space near residential housing POS_{resi}	Public park POS_{park}
Metals						
Beryllium	*1.7*	*1.7*	*35*	*12*	*2.2*	*63*
Boron	*290*	*11,000*	*45*	*240,000*	*21,000*	*46,000*
Cadmium	**10**[13] 22	**85**[13] 150	**1.8** 3.9	**230** 410	*120* 220	*560* 880
Chromium III	*910*	*910*	*18,000*	*8,600*	*1,500*	*33,000*
Chromium VI	*6* 21	*6* 21	*1.8* 170	*33* 49	*7.7* 21	*220* 250
Lead	200	310	80	2,300	630	1,300
Mercury *(elemental)*	**1**	**1**	**26**	**26**	*16*	**26**[8] [*30*]
Mercury (inorganic)	**170**	**240**	**80**	**3600**	*120*	*240*
Nickel	*130*[10]	*180*[10]	*53*[11]	*980*[10]	*230*	*800*
Vanadium	*410*	*1200*	*91*	*9000*	*2000*	*5000*
Copper	*2400*	*7100*	*520*	*68000*	*12000*	*44000*
Zinc	*3700*	*40000*	*620*	*730000*	*81000*	*170000*
Semi-Metals and non-metals						
Arsenic	**32**[12] 37	**35**[12] 40	**43**[12] 49	**640**[12] 640	*79* 79	*170* 170
Antimony		***550***		***7500***	***1500***	***3300***
Selenium	**350**	**600**	**120**	**13000**	*1100*	*1800*
Inorganic chemicals						
Cyanide	34	34	34	34	34	34
Organic contaminants						
Aliphatic risk banded hydrocarbons - TPHCWG method						
$EC_{>5}$ - EC_6	*42*	*42*	*730*	*3200*	*570000*	*95000*
$EC_{>6}$ - EC_8	*100*	*100*	*2300*	*7800*	*600000*	*150000*
$EC_{>8}$ - EC_{10}	*27*	*27*	*320*	*2000*	*13000*	*14000*
EC_{10}-EC_{12}	*130*	*130*	*2200*	*9700*	*13000*	*21000*
EC_{12}-EC_{16}	*1100*	*1100*	*11000*	*59000*	*13000*	*25000*
$EC_{>16}$ - EC_{35}	*65000*	*65000*	*260000*	*1600000*	*250000*	*450000*
$EC>_{35}$ - EC_{44}	*65000*	*65000*	*260000*	*1600000*	*250000*	*450000*
Aromatic risk banded hydrocarbons - TPHCWG method						
$EC>_5$ - EC_7	*70*	*370*	*13*	*26000*	*56000*	*76000*
$EC>_7$ - EC_8	*130*	*860*	*22*	*56000*	*56000*	*87000*
$EC_{>8}$ - EC_{10}	*34*	*47*	*8.6*	*3500*	*5000*	*7200*
EC_{10} - EC_{12}	*74*	*250*	*13*	*16000*	*5000*	*9200*
EC_{12} - EC_{16}	*140*	*1800*	*23*	*36000*	*5100*	*10000*
$EC_{>16}$ - EC_{21}	*260*	*1900*	*46*	*28000*	*3800*	*7600*
$EC_{>21}$ - EC_{35}	*1100*	*1900*	*370*	*28000*	*3800*	*7800*
$EC>_{35}$ - EC_{44}	*1100*	*1900*	*370*	*28000*	*3800*	*7800*
Aliph + Arom EC >44-70	*1600*	*1900*	*1200*	*28000*	3800	7800
Aromatic						
Benzene	**0.08**	**0.3**	**0.017**	**28**	*72*	*90*
Ethyl benzene	**65**	**170**	**16**	**520**[8] [17000]	**520**[8] *[24000]*	**520**[8] *[17000]*
Toluene	**120**	**610**	**22**	**860**[8] [59000]	**860**[8] *[56000]*	**860**[8] *[87000]*
Xylene[9]	**41**	**53**	**28**	**480**[8] [69000]	**480**[8] *[41000]*	**480**[8] *[17000]*
Phenol	**180**	**310**	**66**	**760**[14] (31000)	**760**[14] *(10000)*	**760**[14] *(7600)*
Polycyclic Aromatic Hydrocarbons (PAH)						
Naphthalene	*2.3*	*2.3*	*4.1*	*190*	*4900*	*1200*
Acenaphthylene	*170*	*2900*	*28*	*83000*	*15000*	*29000*
Acenaphthene	*210*	*3000*	*34*	*84000*	*15000*	*29000*
Fluorene	*170*	*2800*	*27*	*63000*	*9900*	*20000*
Phenanthrene	*95*	*1300*	*15*	*22000*	*3100*	*6200*
Anthracene	*2400*	*31000*	*380*	*520000*	*74000*	*150000*
Fluoranthene	*280*	*1500*	*52*	*23000*	*3100*	*6300*
Pyrene	*620*	*3700*	*110*	*54000*	*7400*	*15000*
Benz(a)anthracene	*7.2*	*11*	*2.9*	*170*	*29*	*49*
Chrysene	*15*	*30*	*4.1*	*350*	*57*	*93*
Benzo(b)fluoranthene	*2.6*	*3.9*	*0.99*	*44*	*7.1*	*13*
Benzo(k)fluoranthene	*77*	*110*	*37*	*1200*	*190*	*370*
Benzo(a)pyrene	*2.2*	*3.2*	*0.97*	*35*	*5.7*	*11*
Indeno(123cd)pyrene	*27*	*45*	*9.5*	*500*	*82*	*150*
Dibenzo(ah)anthracene	*0.24*	*0.31*	*0.14*	*3.5*	*0.57*	*1.1*
Benzo(ghi)perylene	*320*	*360*	*290*	*3900*	*640*	*1400*
Chlorinated Aliphatic Hydrocarbons						
Vinyl chloride	*0.00064*	*0.00077*	*0.00055*	*0.059*	*3.5*	*4.8*
Trichloroethene (TCE)	*0.016*	*0.017*	*0.041*	*1.2*	*120*	*70*
1,1,1,2 Tetrachlorethane	*1.2*	*1.5*	*0.79*	*110*	*1400*	*1500*
Tetrachlorethene (PCE)	*0.18*	*0.18*	*0.65*	*19*	*1400*	*810*
1,1,1 Trichlorethane	*8.8*	*9*	*48*	*660*	*140000*	*57000*

Notes

1. All values above are in mg/kg
2. **Numbers in bold are SGVs or GAC that are derived based on SGV report input parameters**, *numbers in italics are S4ULs* , ***numbers in bold-italics are based on EIC/AGS/CL:AIRE numbers & input parameters*** and underlined numbers are C4SLs
3. Soil organic matter (SOM) is assumed to be 1% - DEFAULT VALUE
4. Soil type is assumed to be sandy loam - DEFAULT SOIL TYPE
5. For residential, the building type is conservatively assumed to be a small terrace house where the development includes bungalows change to more conservative bungalow setting in computer model
6. For commercial, the building type is conservatively assumed to be a pre 1970s office building, where the proposed development comprises houses, flat with living spaces changes setting in model accordingly
7. For classrooms consider increasing the dust loading fator in the 'Soil and Building Data' of the CLEA 1.04 model from 50 to 100µg m^{-3}
8. Based on vapour saturation limt as suggested by EA / [ ] model value
9. Lowest of o-, m- and p-xylene
10. Based on comparison of inhalation exposure with inhalation TDI
11. Based on comparison of oral, dermal, and inhalation exposure with the oral TDI
12. Based on a comparison of oral and dermal soil exposure with oral Index Dose only
13. Averaged over and based on lifetime exposure
14. Based on critical concentration for skin irritation in humans arising from contact with phenol in aqueous solution (number in brackets based on health effects following long term exposure for illustration)
15. NA: Not applicable

Appendix G Risk Assessment Methodology

The site-specific risk assessment, presented in this report, follows the principle of establishing whether there is a viable linkage between a contaminant source to a potential receptor, via an exposure pathway.

The risk assessment corresponds with the total site area and incorporates both descriptive (qualitative) and, where available, numerical (quantitative) lines of evidence.

Risk assessment is the process of collating known information on a hazard or set of hazards to estimate actual or potential risk to receptors. The receptor may be humans, a water resource, a sensitive local ecosystem or future construction materials. Receptors can be connected to the source by one or several exposure pathways such as direct contact for example. Risks are generally managed by isolating the receptor or intercepting the exposure pathway or by isolating or removing the hazard.

Without the three essential components of a source, pathway and receptor there can be no risk. Therefore, the presence of contaminant source on a site does not necessarily mean there is a risk.

The risk assessment considers the likelihood of an event taking place (accounting for the presence of the source and receptor and the viability of the exposure pathway) in conjunction with the severity of the potential consequence (accounting for the potential severity of the hazard and the sensitivity of the receptor).

In the risk assessment, the consequence of the hazard has been classified as severe or medium or mild or minor and the probability (likelihood) of the circumstances occurring classified as high likelihood or likely or low likelihood or unlikely.

The consequences and probabilities are subsequently cross-correlated to give a qualitative estimation of the risk using Department of the Environment risk classifications as detailed in the table below and as referenced in EA LCRM, Version 3.

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability (Likelihood)	**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	Very Low Risk

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In accordance with DoE guidance, the following categorisation of **consequence** has been developed.

Classification	Definition	Examples
Severe	Short-term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resource. Catastrophic damage to buildings/property. A short-term risk to an ecosystem or organisation forming part of such ecosystem.	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
Medium	Chronic damage to Human Health. Pollution of sensitive water resources. A significant change in an ecosystem or organism forming part of such ecosystem.	Concentration of a contaminant from site exceeds the generic or site-specific assessment criteria. Leaching of contaminants from a site to a Principal or Secondary A aquifer. Death of a species within a designated nature reserve. Lesser toxic and asphyxiate effects
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/structures/services or the environment.	Pollution of non-classified groundwater (inc. Secondary B aquifers). Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	Harm, although not necessarily significant harm, which may result in a financial loss or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc). Easily repairable effects of damage to buildings, structures and services.	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discoloration of concrete.

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In accordance with DoE guidance, the following categorisation of **probability** has been developed.

Classification	Definition
High Likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage, but circumstances are such that it is improbable that an event would occur even in the very long term.

In accordance with DoE guidance, the following categorisation of **risk** has been developed.

Classification	Definition
Very High Risk	There is a *high probability* that *severe harm* could arise to a designated receptor from an identified hazard at the site without appropriate further action.
High Risk	*Harm* is *likely to arise* to a designated receptor from an identified hazard at the site without appropriate further action.
Moderate Risk	*It is possible* that without appropriate further action *harm could arise* to a designated receptor. It is relatively *unlikely* that any such harm would be *severe,* and if any harm were to occur it is *more likely* that such harm would be *relatively mild.*
Low Risk	*It is possible* that *harm could arise* to a designated receptor from an identified hazard. It is *likely* that, at worst, if any harm was realised any effects would be *mild.*
Very Low Risk	The presence of an identified hazard does not give rise to the potential to cause harm to a designated receptor.

The term ‘risk’ in this instance refers to the risk that the source, pathway, receptor linkage for a given source of contamination is complete. It does not refer to immediate risk to individuals or features present on the site from potential contaminants and is intended to be used as a tool to assess the necessity of further investigation.

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